



European  
Commission

# Tackling the Water Challenges

European Research Projects  
funded under the 6<sup>th</sup> and 7<sup>th</sup>  
Framework Programmes



Research and  
Innovation

EUROPEAN COMMISSION

Directorate-General for Research and Innovation  
Directorate I – Environment  
Unit I.2 – Environmental technologies

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# Introduction

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## *Water as a global societal challenge*

Beside its main life function, freshwater also provides many other functions essential to our economy such as transport, energy provision, heat exchange, cleaning, washing, and constitutes a necessary raw material for many industries.

Though water is generally abundant in much of Europe, large areas are affected by water scarcity and droughts, particularly in the south. In addition, Europe has been affected by more than 175 major floods over the last decade, causing loss of human life and substantial economic damage. Climate change is projected to further exacerbate the disturbance of ecosystems, with increased water shortages, more frequent, more severe droughts, especially in Mediterranean countries, but also with more frequent heavy precipitation and floods across much of Europe.

While it is of vital importance to the society, freshwater is becoming an increasingly scarcer natural resource. In front of an ever growing human demand for water (e.g. for agriculture, industry, public water supply or tourism), its availability in sufficient quantities and adequate quality is an issue of highest priority and represents a pan-European and even global societal challenge. Indeed, the worldwide gap between freshwater demand and availability is set to grow significantly over the next 20 years.

In terms of public health, water pollution raises concerns regarding exposure to known and new emerging contaminants, the effects of chemical mixtures found in some European waters, and to possible risks of microbiological contamination. Water pollution also increases the risk of eutrophication and the loss of freshwater flora and fauna.

Moreover, water has high strategic and economic importance. The European water sector has an average growth rate of 5 % and a turnover of about €80 billion p.a. about a third of the world water market. European companies are world leaders in drinking water supply and sanitation services. However, other regions in the world are making huge efforts to position themselves on this growing market, and are aiming to catch up with the EU scientifically and technologically as soon as possible.

We must avoid mismanaging our vulnerable, limited freshwater resources, secure the global competitiveness of the water sector, and support environmental policy-making and implementation. Balancing the difficult water supply and demand equation, setting priorities to handle water stress or water scarcity and sustaining our water ecosystems in the long term, requires concerted action and strong scientific and technological bases, fully taking into account local geographical, political, socio-economic and cultural conditions. Strengthening research, technological development and innovation in water sciences and technologies also improve the competitiveness of our water industry and support the green growth of our economy.

*With ever-growing demand for different uses and increased vulnerability due to climate change, pollution and over-exploitation of freshwater resources, competition is increasing between user groups and sectors such as irrigated-agriculture, manufacturing industry, municipalities, and freshwater ecosystems themselves. Coping with regional unbalances between water demand and availability, while developing a resource-efficient European economy and sustaining the essential functions of our natural ecosystems, requires a vast multidisciplinary expertise and collaborative effort in research, technological development and innovation.*

## *A strong EU research contribution for over 20 years*

Much excellent water research has been carried out and is still ongoing at all levels in Europe. At European level, Community research has supported water research since the first Framework Programme in the 1980's and has attracted increasing water-related scope and budget over time. Over the last 10 years, Community investment in water research projects can be estimated at over €1300 million which corresponds to a mean public investment at EU level of more than €130 million per year. This substantial European effort to collaborate in research tackling the water challenges has taken the form of more than 700 projects in the 10-year period 2002-2011. A wide range of research instruments have been used including collaborative research projects, international cooperation projects, coordination and support actions, research infrastructure projects, SME-targeted projects or Marie Curie fellowships. These various projects have looked at water issues under various perspectives including environment, technologies (eco-innovation, space, ICT, etc.), food and agriculture, material sciences, transport, energy, security, social sciences, or regional development.

Researchers have teamed-up with many actors such as policy-makers, water authorities, utility operators, industry, farmers, and the citizens to developing new solutions including for the safe supply of clean drinking water, for the improved protection against new emerging water pollutants or pathogens and water hazards like floods and droughts, or for a progressive shift towards a more water-efficient economy in Europe. This effort has enabled to sustain first class scientific and technological expertise in the water field in Europe and to deliver supporting methodologies, indicators, models, guidance, practical experiences, standards, tools and technologies.

*As an essential resource for life, sustainable growth and healthy ecosystems, water has been high on the European research agenda since the early years of the*

*EU research and technological development (RTD) Framework Programmes (FPs). The enclosed database is a snapshot of a significant part of water-related EU projects funded under FP6 and FP7 during the ten-year period 2002-2011. It provides a compilation of subjects, project abstracts and details to the consortia who have collaborated to address - through research and innovation - the various aspects of the water challenges.*

*In order to structure this database, the choice has been made to list by alphabetical order the projects' details according to the following main policy-relevant topics:*

- Chemical Aspects*
- Climate Change*
- Ecological Status*
- Floods*
- Groundwater*
- Hydro-morphology*
- Science-policy Interface*
- Socio-economy*
- Water and Agriculture*
- Water Scarcity and Droughts*

### *Examples of FP6/FP7 programmes and topics during the period 2002-2011*

Within successive Framework Programmes, Environment programmes for European collaborative research have been amongst the main EU instruments to co-fund water research. For instance, during the 5th Framework Programme (FP5, 1998-2002), the Key Action 'Sustainable Management and Quality of Water' under the 'Energy, Environment and Sustainable Development' Programme, supported a critical mass of researchers working towards an integrated multidisciplinary approach to water management and the implementation of the Water Framework Directive. During the 6th Framework Programme (FP6, 2002-2006), the scope of environmental

research activities on water was widened to include new concepts, strategies and tools to mitigate the impact of global change on water resources in Europe and worldwide. More attention was also given to the international dimension and to support to the UN Millennium Development Goals (MDGs) for water supply and sanitation. After the adoption of the Environmental Technologies Action Plan (ETAP) in 2003, research on water technologies moved up the agenda. Continued support for the Water Framework Directive took the form of a sub-programme 'Specific Support to Policies'. The 7th Framework Programme (FP7, 2007-2013), included the theme 'Environment (including climate change)', continuing research on climate change and extreme hydro-meteorological events, integrated water resources management, water supply and sanitation and issues relevant for the implementation of the Water Framework Directive. More technological research was supported including in relation to eco-innovation and water-resource efficiency, thus contributing to the objectives of the Lisbon agenda, the Europe 2020 Strategy, the Innovation Union and Resource-efficient Europe flagships.

Following FP6 activities in new materials, processes and nanotechnologies for water treatment, the FP7 Theme on 'Nanosciences, Nanotechnologies, Materials and new Production Technologies' (NMP) extended its water-related activities through another investment mainly for nanostructured materials or novel membranes for potable water technologies. This included projects in collaboration with Middle East and North African countries and a European cluster with projects on nanotechnology for water treatment.

In FP6 and FP7, the Theme on 'Biotechnologies, Agriculture, Food', has funded several projects and actions to improve the use of water in agriculture, food and biomass production addressing issues such as irrigation management, including treatment and reuse of waste water, plant breeding for drought resistance, improving water use efficiency and quality in food processing.

The FP7 Theme 'Information and Communication Technologies' (ICT) offered opportunities for research on ICT-enabled solutions

for integrated water resources management under its objective on 'ICT for Efficient Water management'. Three are main building blocks: innovative demand management systems, decision support systems and data management technologies. Substantial validation in real-life operational environments and collaboration with ICT industry and water utilities was a main focus. This strand built on significant FP6 investment in ICT-enabled systems for improving environmental monitoring and risk/disaster management applications.

The 'Space' Theme supported projects that were either related to the direct use of remote sensing for water management purposes, or to water as a component of land monitoring services dealing with land cover and land cover change including water bodies and wetland monitoring.

The 'Security' Theme supported activities on drinking water security against deliberate (criminal/ terrorist) or accidental chemical, biological, radiological and nuclear contaminations, including detection and decontamination.

Many energy technologies require water for production processes and energy is a key parameter for water infrastructure operators. In FP7, the 'Energy' Theme supported projects on cooling for concentrated solar power, for concentrated photovoltaics, for water desalination or for combined production of electricity and fresh water. This Theme also co-funded hydropower projects to make the most of this green energy source while minimising the environmental impact of hydropower infrastructure.

The 'Socio-Economic Sciences and Humanities' Theme, together with the 'Environment' Theme, supported several actions related to climate-induced changes on the hydrology of Mediterranean basins, water availability and security in Southern Europe and the Mediterranean, climate change, hydro-conflicts and human resources.

Water research was also supported by the FP7 'Ideas' Programme (European Research Council), the 'People' Programme (Marie Curie actions) and the 'Capacities' Programme. The latter includes an SME activity to reinforce the

competitiveness of the European water industry thanks to a bottom-up approach, helping SMEs to extend their networks, exploit research results more effectively, acquire technological know-how and bridge the gap between research and innovation.

The Regions of Knowledge activity supported several projects with the aim of developing regional 'research-driven clusters' to increase the capacity of European regions to invest in research and to contribute significantly to the economic development of the water sector. The 'Research potential' activity helped convergence regions to strengthen the capacities of their researchers in the field of water.

The 'Science and Society' activity promoted raising the knowledge and awareness of the general public about scientific and technological developments and associated research policies.

As regards international cooperation activities in the FP7 Capacities Programme, water-related projects were launched to reinforce research, development and innovation capacities of research centres in Southern Mediterranean countries (e.g. Tunisia, Lebanon, Syria, Palestine and Jordan) to address issues such as wastewater treatment, real-time monitoring of water infrastructures, agriculture, energy and coastal zone management.



# Project data

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## **Chemical Aspects**



## 236847- ABACCR

### Asymmetric Brønsted Acid Catalysed Cyclisation Reactions

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 9/15/2009 - 9/14/2011

*EC contribution:* € 178 515

*Policy drivers:* Chemical Aspects

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#### Abstract

We wish to develop new asymmetric Brønsted acid catalysed cyclisation reactions that will allow the efficient and highly enantioselective construction of azabicyclic structures from readily available starting materials. This will constitute a new, powerful and broadly applicable organocatalytic asymmetric strategy to such target molecules. Conceptually our proposal is to exploit the high reactivity of N-acyl iminium ions in cyclisation reactions within the asymmetric environment of an associated conjugate base of a chiral Brønsted acid (HA\*). For enantioselective N-acyl iminium ion cyclisations, a keto amide starting material with a suitable pi-nucleophile attached to the nitrogen atom of the amide is required. The reaction is technically trivial to perform; a solution of the keto amide starting material is treated with a catalytic quantity of an 'effective' chiral Brønsted acid. Loss of water should result in the formation of an N-acyl iminium ion, which, in a low polarity solvent, should be (tight) ion paired with the chiral conjugate base of the Brønsted acid. Provided there is sufficient ordering and effective facial differentiation in the ion pair, attack of the pendant pi-nucleophile will give rise to enantioselectivity in the (irreversible) cyclisation step. During the course of the Fellowship, through physical organic chemistry techniques and molecular modelling calculations we would like to elucidate the mechanistic pathway and origins of stereocontrol in the new catalytic asymmetric methods we are developing. Finally we wish to apply the developed chemistry as a key carbon-carbon bond forming step in the total asymmetric synthesis of an indole alkaloid natural product. Therefore this multidisciplinary Fellowship project will involve the development of innovative asymmetric organic methods, physical organic chemistry, computational chemistry and target synthesis.

## **014432- ABIOS**

Advanced Study on Biofilm Systems in Water and Wastewater Treatment

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 4/1/2005 - 3/31/2009

*EC contribution:* € 611 341

*Policy drivers:* Chemical Aspects

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### **Abstract**

Researchers in the Department of Civil Engineering at the National University of Ireland, Galway (NUI, Galway), under the direction of Dr. Michael Rodgers, have invented three efficient biofilm technologies for wastewater treatment. By the end of July 2004, these technologies will be patented and commercialization will begin with manufacturers who have expressed strong interest in the inventions. More fundamental work should be carried out on these biofilm technologies to ensure that their full potential is realized. This will require the transfer of knowledge (ToK) to NUI, Galway in four areas: (1) Genetic measures to identify the microbial ecology in the biofilm (one external researcher and one visiting expert); (2) Use of microelectrodes to quantify mass transfer and biokinetic parameters in biofilms (one external researcher and one visiting expert); (3) mathematical computer modelling for the growth and performance of biofilms (one external researcher and one visiting expert); (4) Use of the new biofilm technologies for the production of high value pharmaceutical and food products (one external researcher and one visiting expert). The ToK in the four areas above will: (1) Increase the long term research capacity, fundamental scientific skill base and multidisciplinary activities at NUI, Galway, with the objectives of carrying out new research and attracting research funding; (2) Lead to increased fundamental understanding of beneficial biofilms and harmful biofilms with a view to eliminating the harm; (3) Generate new simple efficient biofilm technologies for the protection of health and the environment, and the biological processing of high-value products, all resulting in increasing European competitiveness; (4) Build on the strong international research links and contacts that have been developed at NUI, Galway- located in a less-favoured region of the European Community - with universities and research institutes in the EU, USA and China.

## **222051- ACCEPT**

### ADVANCED CO<sub>2</sub> CLEANING AS AN ECOLOGICAL PROCESS TECHNOLOGY

<http://kreussler.com/accept/>

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*Funding scheme:* BSG-SME (Research for SMEs), FP7

*Project duration:* 9/1/2008 - 11/30/2010

*EC contribution:* € 1 192 400

*Policy drivers:* Chemical Aspects

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### **Abstract**

The cleaning of pliable (textiles and leathers) and hard surfaces (medical devices, medical implants and fine metal parts) requires solvents to remove dirt and soils before the materials can be (re-)used in their final applications. These solvents can be organic solvents (halogenated and non-halogenated hydrocarbons) for a-polar soils or water with chemicals for polar soils. Each type of liquid has environmental and hygienic drawbacks. The cleaning and hygienic efficiency of these is not sufficient as small amounts of residual cleaning agents and/or soil impair the quality of the cleaned surface. The (non) halogenated hydrocarbon and aqueous systems can be replaced by liquid carbon dioxide (LCO<sub>2</sub>) as a clean, hygienic and environmentally sound solvent. LCO<sub>2</sub> has shortcomings and needs improvement of its cleaning performance and quantification of its disinfecting/sterilisation potential. Project ACCEPT investigates the use of LCO<sub>2</sub> with respect to cleaning effectiveness and hygiene ability on pliable and hard surfaces (textiles, leathers, medical devices, implants and fine metal parts). The research continues earlier laboratory and pilot research, but will expand this to full scale industrial sized LCO<sub>2</sub> cleaning units. In order to remove surface residuals, a CO<sub>2</sub>-precision cleaning step is required for fine parts. The earlier research will be extended to other hygienically demanding materials to be cleaned. The project further improves LCO<sub>2</sub> for cleaning and hygienic quality of these materials. This will lead to replacement of (non) halogenated hydrocarbon solvents such as hazardous perc and toxic trichloroethene. The LCO<sub>2</sub> is non-toxic, non-flammable, has disinfecting/sterilising properties, is produced as an off-gas in almost pure form in the oil refining and ammonia production, causes no ground-water contamination, and is very sustainable and environmental friendly.

## **232302- ADD CONTROL**

### **ADVANCED CONTROL SOLUTIONS FOR WASTE WATER TREATMENT**

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*Funding scheme:* BSG-SME (Research for SMEs), FP7

*Project duration:* 6/1/2009 - 5/31/2011

*EC contribution:* € 1 277 058

*Policy drivers:* Chemical Aspects

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#### **Abstract**

Current procedures for the design of WWTP controllers are usually based on long and very expensive experimental studies. In this respect, the availability of WWTP simulation tools specific for control design would allow automation companies to establish and complement experimental procedures with enhanced procedures based on mathematical modeling and simulation. In addition, WWTP simulation software companies will find in automation companies a further potential market for selling their software products. Accordingly, the objective of this proposal is to design, implement and validate new simulation tools for practical control. Based on this WWTP virtualization, it will be feasible to manufacture enhanced and cost-effective control products, tested by simulation previous to their full-scale implementation. To achieve these objectives, 3 software layers will be developed: “Mass”, “Instrumentation and actuation” & “Automation and control” layers. These developments will then be tested both at industrial and urban WWTP scenarios. This work will be driven by 3 SME developers (M4W, software simulator, MSI, automation company, and NASKEO, environmental engineering) and 2 end user (SCAD, SME as industrial WWTP, and AGIPUZKOA as urban WWTP). They trust in the know-how of 3 key RTDs in this sector (CEIT, mathematic modeling and conventional control expert, UGENT, computer science expert, and INRA, advanced control and anaerobic digestion expert). Due to this project, 3 exploitable results will be developed: (1) WWTP Software simulator, (2) Advanced controllers and (3) Enhanced treatment technologies. IPR has been divided among partners in order to maximize impact at European level. If this project is successful, the gathered knowledge will put Europe in pole position with respect to tackling optimisation of wastewater treatment processes in a sustainable way. In this sense, exploitable results can be commercialized together in a joined offer or as separate results.

## **508723- ADOPBIO**

Advanced Oxidation Processes and Biotreatments for Water Recycling in the Textile Industry (ADOPBIO)

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*Funding scheme:* SME (SMEs-Co-operative research contracts), FP6

*Project duration:* 1/1/2005 - 12/31/2006

*EC contribution:* € 388 970

*Policy drivers:* Chemical Aspects

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### **Abstract**

The AdOPBio project aims to develop a decolouring and recycling treatment of the wastewaters in the textile finishing industry, based on two alternative methods: Advance Oxidation Processes (UV-activated photolysis of hydrogen peroxide and thermal activated oxidation process) for the decolouration of the spent bath, combined with a bioflotation process for the destruction of the residual organic load. The combination of these wastewater treatments is expected to achieve a complete decolourisation of the process waters for every type of wet process (finishing, bleaching, dyeing, etc.). The project will also develop and implement a process-control software based on artificial neural network and systems dynamics. Research centres in collaboration with textile finishing companies and suppliers of dyeing machines and wastewater treatment equipment will develop a prototype that will be tested and validated by the end-user companies (textile finishing companies) in order to accumulate experiences and improve the capability of the plant to match a wide range of industrial needs. The project includes all the steps in developing a wastewater treatment unit such as: \* modelling and laboratory investigations of AOP and bioflotation processes \* design and manufacture of AOP and bioflotation reactors \* design and manufacture of a dyeing machine, interfaced with both AOP reactors \* implementation of an ANN-based process control software \* interfacing the dyeing machine with the bioflotation treatment plant \* tests of the plant in and industrial validation of the decolouring and recycling process

## **508490- AEROSOL REDUCTION**

Nex Hygienic Cleaning Technique - for food production - reducing aerosol problems and water consumption (AEROSOL REDUCTION)

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*Funding scheme:* SME (SMEs-Co-operative research contracts), FP6

*Project duration:* 6/1/2004 - 11/30/2006

*EC contribution:* € 454 000

*Policy drivers:* Chemical Aspects

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### **Abstract**

Food-, pharmaceutical- and agricultural- industries allover the world, use high pressure water cleaning to get rid of contamination, micro organisms and bacteria. Enormous amounts of water and energy are used every day for different cleaning purposes. Still many people get serious ill/poisoned every year, due to hygienic problems contamination. Investigations show that a huge problem is contamination of already cleaned equipment. This contamination is a result of aerosols, spread all around the plant. The major route of contamination of food during production is by air. Micro organisms are normally transmitted through the air incorporated in particles and water droplets (aerosols) which is a result of the cleaning actions. Aerosols are fine, moisture droplets. Aerosol can be generated from the cleaning operations. This type of contamination may be a potential source of Listeria. The wish from the authorities in EU and other parts of the world is to assure the cleaning process avoid contamination and to reduce the water consumption. The overall objective is to develop a vacuum based cleaning system as a replacement for todays water wasting system. The objectives are to avoid harmful contamination and to reduce the total water consumption with about 40 %. The RTD will concentrate on solving the technical problems in the vacuum based cleaning system how to measure collect the aerosols and reduce the spreading Results-exploitation The result will be a new cleaning system for food and pharmaceutical industries. The SME proposers will exploit the results by selling the system in north Europe and UK. SMEs in other countries will be able to buy production sales licences. Exploitation and dissemination of result will start in 2006. The market for this new cleaning system is very large and through this RTD project the competitiveness of the SME proposers will be much improved.

## **240002- AFRIVAL**

African river basins: catchment-scale carbon fluxes and transformations.

[ees.kuleuven.be/project/afrival/](http://ees.kuleuven.be/project/afrival/)

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*Funding scheme:* ERC (ERC Grant), FP7

*Project duration:* 10/1/2009 - 9/30/2014

*EC contribution:* € 1 745 262

*Policy drivers:* Chemical Aspects  
Ecological Status

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### **Abstract**

This proposal wishes to fundamentally improve our understanding of the role of tropical freshwater ecosystems in carbon (C) cycling on the catchment scale. It uses an unprecedented combination of state-of-the-art proxies such as stable isotope,  $^{14}\text{C}$  and biomarker signatures to characterize organic matter, radiogenic isotope signatures to determine particle residence times, as well as field measurements of relevant biogeochemical processes. We focus on tropical systems since there is a striking lack of data on such systems, even though riverine C transport is thought to be disproportionately high in tropical areas. Furthermore, the presence of landscape-scale contrasts in vegetation (in particular,  $\text{C}_3$  vs.  $\text{C}_4$  plants) are an important asset in the use of stable isotopes as natural tracers of C cycling processes on this scale. Freshwater ecosystems are an important component in the global C cycle, and the primary link between terrestrial and marine ecosystems. Recent estimates indicate that  $\sim 2 \text{ Pg C y}^{-1}$  ( $\text{Pg}=\text{Petagram}$ ) enter freshwater systems, i.e., about twice the estimated global terrestrial C sink. More than half of this is thought to be remineralized before it reaches the coastal zone, and for the Amazon basin this has even been suggested to be  $\sim 90\%$  of the lateral C inputs. The question how general these patterns are is a matter of debate, and assessing the mechanisms determining the degree of processing versus transport of organic carbon in lakes and river systems is critical to further constrain their role in the global C cycle. This proposal provides an interdisciplinary approach to describe and quantify catchment-scale C transport and cycling in tropical river basins. Besides conceptual and methodological advances, and a significant expansion of our dataset on C processes in such systems, new data gathered in this project are likely to provide exciting and novel hypotheses on the functioning of freshwater systems and their linkage to the terrestrial C budget.

## **219976- AHICA**

### Autotrophic-Heterotrophic Interactions in Cyanobacterial Aggregates

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 8/1/2008 - 1/31/2011

*EC contribution:* € 241 538

*Policy drivers:* Chemical Aspects

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#### **Abstract**

Large, filamentous nitrogen-fixing cyanobacteria (*Trichodesmium* spp., *Nodularia spumigena* and *Aphanizomenon* spp.) play an important role for primary production, input of nitrogen, and the microbial food webs in the ocean, in brackish waters (e.g. the Baltic Sea) and in lakes. Gas vesicles within filaments make these cyanobacteria positively buoyant to reach high light intensities in surface waters where they cover the energy needed for nitrogen fixation through photosynthesis. These large cyanobacteria create their own microenvironment with steep gradients of gases and nutrients at the sea surface.

Hence, their growth conditions are significantly different to those of the bulk water. Direct measurements of small-scale physical-chemical characteristics and biogeochemical processes associated with large, filamentous nitrogen-fixing cyanobacteria are hence crucial to understand the role that these cyanobacteria have on a large scale in respect to their overall input of carbon and nitrogen from the atmosphere into aquatic systems. The present project aims at a detailed understanding of the carbon and nitrogen fluxes in aggregates of large, nitrogen-fixing cyanobacteria and their associated heterotrophic community.

## **220505- AIRMINWATSFG**

Structure and Ultrafast Dynamics of Water and the Hydronium Ion at the Air/Water and Mineral/Water Interfaces using Time Resolved 2D-Vibrational Sum Frequency Spectroscopy

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 8/1/2008 - 7/31/2010

*EC contribution:* € 167 697

*Policy drivers:* Chemical Aspects

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### **Abstract**

Molecular level descriptions of the structure and dynamics of water and the hydronium ion are essential to understand quantitatively the dispersion of contaminants in groundwater, the role of aqueous aerosols in atmospheric chemistry and the optimal design of biomaterials. The structure of water and the stabilization of the hydronium ion at interfaces is a function of a hydrogen bond network. Each hydrogen bond in the network breaks and reforms on picosecond timescales. Current work describes structure in these systems by measuring the interfacial water and hydronium OH stretch frequency range using vibrational sum frequency spectroscopy (VSFS). Generally VSFS is time averaged: each data point in a spectrum involves several seconds of data collection. This approach necessitates loss of molecular information (in reality water structure evolves on picosecond timescales) and makes comparison to simulation, where trajectories have a maximum length of tens of nanoseconds, challenging. The proposed experiments overcome this obstacle by examining the air/water and mineral/water systems using femtosecond time resolved two-dimensional VSFS (tr2D-VSFS). This method allows the quantification of hydrogen bond (as a function of frequency) and hydronium lifetime in interfacial water. The measurement of these quantities at a variety of interfaces will allow general insight into the structure of aqueous complexes at interfaces, directly connect with simulation and help supply an experimental molecular level picture of the air/water and mineral/water interfaces that has been lacking. tr2D-VSFS is a specialized technique (employed currently by 1-2 research groups in the world). The impact of this proposal rests on the combination of an Earth Scientist with a peculiar background (nonlinear optics and computational chemistry), a host research group at the forefront of chemical physics and a host institute well prepared to support such a multidisciplinary collaboration.

## **041600- ALIGNMENT-PROJECT**

Aligning Amphiphilic Molecules on A Water Surface into Large Two-Dimensional (2D) Crystals by Laser Field

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 6/1/2007 - 5/31/2009

*EC contribution:* € 181 268

*Policy drivers:* Chemical Aspects

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### **Abstract**

The self-assembly method of organizing water-insoluble molecules on water surfaces into Langmuir films is a common way to fabricate ordered monolayers. However, the 2D crystalline films formed on the water are composed of many grains all lying on the same face, but oriented randomly azimuthally into and quot;2D powders and quot;. The crystallites have a diameter that ranges typically between 100-1500Å. Controlling the alignment and size of the growing 2D crystalline grains is the aim of this proposal. Ultimately, this would require grazing incidence X-ray diffraction techniques using synchrotron light and nonlinear optical techniques to detect and characterize the aligned crystalline mono- (or multi-) layers on the liquid surfaces. Due to its interdisciplinary character, the outcome of the project will be relevant to fields in physics, chemistry and biology. From a physics point of view, the development of nonlinear optical methods to induce alignment of molecules on the water surface is a direct continuation to problems in the coherent control domain, which in the field of molecule-alignment has been focused to date in the gas phase. The challenge is in the design of amphiphilic systems that will form aligned 2D crystals via the laser field and their detection. The success of the project will allow the preparation of significantly large 2D crystals and so provide a template for addressing questions in 2D-physics, interface physics, and chemistry and biology that occur at organic interfaces. In addition, it will provide new routes for the preparation of functional materials, especially in the nano-scale, which is of central interest in molecular electronics. In addition, it may be possible to fabricate new organic 2 and 3D multilayer crystals employing Langmuir-Blodgett methods. Finally, it may prove possible by this method to form large 2D crystals of membranal proteins that are very difficult to obtain as 3D crystals.

## **274987- AMMDNACAT**

Asymmetric Aza-Michael reactions catalyzed by hybrids metal-DNA

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 5/1/2011 - 4/30/2013

*EC contribution:* € 185 040

*Policy drivers:* Chemical Aspects

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### **Abstract**

This project deals with the development of new asymmetric reactions catalyzed by metal-DNA hybrids in aqueous medium. The present proposal has two main features:

(i) The first feature lies on the design of novel catalytic systems putting into practice the concept of DNA-based asymmetric catalysis presented in the year 2005 by Ben. L. Feringa and G. Roelfes. This methodology involves the modular assembly of a DNA-based catalyst from natural duplex DNA and a metal complex of a nonchiral ligand that can bind to DNA. In the present proposal, the asymmetric addition of ammonia to  $\alpha,\beta$ -unsaturated substrates in aqueous medium will be studied using as catalysts hybrids Cu(II)-DNA, initially. After the optimization of the reaction conditions, the synthetic applicability of this process on the synthesis of intermediates of natural products and compounds with biological interest will be studied. Furthermore, the mechanistic study of the catalytic reaction will lead to achieve a better knowledge about the role and influence of DNA in this asymmetric process. Subsequently, this information can be applied in the development of new catalytic asymmetric reactions. Thus, the catalytic activity of new metal centres (i.e. scandium(III)) will be explored and applied to the concept of metal-DNA based catalysts in the asymmetric Michael addition in water to broaden further the scope of this transformation.

(ii) The second feature of this proposal lies in the fact that all these catalytic processes will be developed in accordance with the principles of Green Chemistry, where the application of catalytic technologies, atom-efficiency and innocuous reaction solvents are main characteristics of the processes presented in these proposal. Finally, this will contribute towards the development of novel friendly environmental transformations.

## **230829- ANAMIX**

A two year exchange programme on ANAerobic MIXed cultures to study and improve biological generation of chemicals and energy carriers from organic residues generated by agro-industrial activities

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 1/1/2009 - 12/31/2010

*EC contribution:* € 68 400

*Policy drivers:* Chemical Aspects  
Water and Agriculture

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### **Abstract**

The main objective of the ANAMIX project is to build a two year exchange programme among three of the leading worldwide research groups centered around ANAerobic MIXed cultures. More specifically, ANAMIX is dedicated to study and improve biological generation of chemicals and energy carriers from organic residues generated by agro-industrial activities. Effective leveraging of organic residues derived from human activity will be of vital importance for establishment of a sustainable society. More than 60% of all organic material obtained from agriculture is currently not made available for the production of chemicals or the generation of energy carriers. These residues generated include highly complex waste streams like pig manure, as well as more readily degradable mixtures of substrates like molasses, vinasses, and wastewaters generated during food processing. For processing of these streams, (genetically modified) pure culture based industrial biotechnology is generally not a prosperous route. The processes we intend to investigate in this project can overcome these limitations because they are based on natural ecosystems. The basic principle of these Anaerobic Mixed culture based processes is the establishment of the proper process conditions to direct the flow of electrons in a complex network of microorganisms to the product required. Anaerobic fermentative systems are ideal, as they allow for minimization of biomass that can be regarded as an unwanted side product in these processes. Valuable and realistic products are molecular hydrogen, methane rich biogas, solvents like ethanol and butanol, or the direct generation of electricity in so called microbial fuel cells. Many of these can be directly utilized in end-use applications, without further energy input. The scientific challenge in developing these processes is to identify and verify the biochemical driving forces for the establishment of specific production processes in mixed microbial environments.

## **232937- ANAMMOX**

Anaerobic ammonium oxidizing bacteria: unique prokaryotes with exceptional properties

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*Funding scheme:* ERC (ERC Grant), FP7

*Project duration:* 1/1/2009 - 12/31/2013

*EC contribution:* € 2 500 000

*Policy drivers:* Chemical Aspects

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### **Abstract**

For over a century it was believed that ammonium could only be oxidized by microbes in the presence of oxygen. The possibility of anaerobic ammonium oxidation (anammox) was considered impossible. However, about 10 years ago the microbes responsible for the anammox reaction were discovered in a wastewater plant. This was followed by the identification of the responsible bacteria. Recently, the widespread environmental occurrence of the anammox bacteria was demonstrated leading to the realization that anammox bacteria may play a major role in biological nitrogen cycling. The anammox bacteria are unique microbes with many unusual properties. These include the biological turn-over of hydrazine, a well known rocket fuel, the biological synthesis of ladderane lipids, and the presence of a prokaryotic organelle in the cytoplasm of anammox bacteria. The aim of this project is to obtain a fundamental understanding of the metabolism and ecological importance of the anammox bacteria. Such understanding contributes directly to our environment and economy because the anammox bacteria form a new opportunity for nitrogen removal from wastewater, cheaper, with lower carbon dioxide emissions than existing technology. Scientifically the results will contribute to the understanding how hydrazine and dinitrogen gas are made by the anammox bacteria. The research will show which gene products are responsible for the anammox reaction, and how their expression is regulated. Furthermore, the experiments proposed will show if the prokaryotic organelle in anammox bacteria is involved in energy generation. Together the environmental and metabolic data will help to understand why anammox bacteria are so successful in the biogeochemical nitrogen cycle and thus shape our planet's atmosphere. The different research lines will employ state of the art microbial and molecular methods to unravel the exceptional properties of these highly unusual and important anammox bacteria.

## **234974- ANDEMIC**

Unraveling key abiotic and biotic interactions for sustainable anaerobic biotransformation of chlorinated solvents in groundwater

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 3/1/2010 - 4/30/2013

*EC contribution:* € 226 833

*Policy drivers:* Chemical Aspects  
Groundwater

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### **Abstract**

Chlorinated solvents are potential carcinogens frequently found in groundwater and are classified as priority pollutants. Anaerobic biotransformation of these compounds to non-toxic ethene via reductive dechlorination is carried out by microorganisms living in consortia. Bioaugmentation – the addition of active microbial cultures to a contaminated site – is a low-cost and potentially highly effective remediation alternative, particularly for chlorinated solvents, where dechlorination is carried out by very specialized microbes not present at every site. However, there remain serious scientific gaps to more widespread adoption of bioremediation and bioaugmentation. Diagnostics and prognostic monitoring approaches are critically needed to improve our ability to sustain high rates of microbial activity and make bioremediation more reliable and more predictable. This project aims at providing new insights into the biogeochemical interactions affecting chlorinated solvent bioremediation in subsurface anaerobic environments. A stable microbial consortium (KB-1) developed in the Edwards' lab (Univ. of Toronto) and used commercially for bioaugmentation at field sites will be used as a model for lab-based and field experiments. The project will address three major issues: a) unravel contaminant metabolism and important interspecies interactions in mixed microbial communities with the help of metagenome sequences and metabolomic profiling, b) identify biomarkers through molecular screens and isotopic fractionation signatures to monitor biodegradative mechanisms and the key players involved in these processes and c) understand critical abiotic-biotic interactions and physiological influences on microbial activity in the subsurface at contaminated sites. Knowledge gained from this project will help establishing a sound basis for future research to find new consortia capable of biodegrading other priority pollutants and new chemicals entering our soils and waters.

## **254470- AQPASSOC**

Association of Aquaporin Transmembrane Channels and Influence of their Oligomerization State on the Transport Properties

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 10/22/2010 - 10/21/2012

*EC contribution:* € 165 958

*Policy drivers:* Chemical Aspects

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### **Abstract**

The goals of this proposal are to (i) determine how does the oligomerization state of aquaporin (AQP) transmembrane channels influence the water transport properties of these channels, and to (ii) understand how aquaporins' association and transport properties change under different lipid composition conditions. The study will be conducted on the human AQP5 aquaporin, whose atomistic high resolution structure has been recently determined. First we will determine the water transport properties of the wildtype tetrameric AQP5 channels from fully atomistic simulations. Then we will compare our results with the corresponding properties we obtain for a single channel in the same lipid bilayer. Second, we will study the association of AQP5 channels in a lipid bilayer closest to its natural environment by describing both the dynamics and the energetics of such associations. Since these processes occur on a mesoscopic timescale, unattainable from fully atomistic simulations, we will use a coarse-grained model of the AQP5 porins and its surrounding environment. Third, we will investigate the influence of lipid composition on the association of these aquaporins. Fourth, we will compare transport properties of AQP5 channels in various lipids that were studied at the third point. The simulated systems will use fully atomistic models with initial configurations obtained from the coarse-grained simulations. The techniques used in our research proposal are based on free energy profile calculations using well established methods from steered molecular dynamics, as well as new approaches from Monte Carlo based flat-histogram simulations. Our novel approach for studying aquaporins can help us understand better how their association influences their functionality. Furthermore, the proposed investigating methods can be, in principle, extended to any transmembrane Channel that manifest oligomerization.

## **035995- AQUA(GLYCERO)PORINS**

Integrated analyses of aquaporin structure and function

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 12/1/2006 - 11/30/2010

*EC contribution:* € 2 106 070

*Policy drivers:* Chemical Aspects

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### **Abstract**

Aqua(glycero)porins (AQP) are represented in all classes of organisms, suggesting universal importance. Aquaporins transport water and AQP transport glycerol and other small uncharged solutes. Aquaporins play important roles in human health. For instance, defects in AQP1 or 2 are known to cause diminished urine concentration ability and AQP4 of the brain-blood barrier is involved in brain swelling. This project aims at breakthroughs in our integrative understanding of the precise physiological roles of AQP. Work will also include studies on model organisms and mathematical modelling. The 3D structure of certain aquaporins has been resolved, providing a blueprint for understanding of the transport mechanism. Work in this project will target the structure of additional important aquaporins with a view to understand transport of unusual substrates, mechanisms of regulation and inhibition of blockers. Since AQP play crucial roles in physiology they are target for drugs. Built on existing lead compounds, such blockers will be further developed and their precise mode of action to be elucidated. Additional biotechnological applications for aquaporins are also subject of this network. "AQP" is an interdisciplinary endeavour involving molecular cell biology, physiology of cell, tissue and animal models, clinical samples, yeast and fish genetics, protein production, purification and crystallisation, atomic force microscopy, electron crystallography, x-ray crystallography, molecular dynamics simulation, mathematical modelling as well as rational molecular design, organic chemistry and combinatorial chemistry. Hence, the project offers an interdisciplinary, international research and training environment of high excellence that is used for advanced training of early stage and experienced researchers and transfer of knowledge within and to the outside of the network.

## **021733- AQUA-FINDER**

Locating chemical hot-spots in the water using underwater robots

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 3/31/2006 - 3/30/2009

*EC contribution:* € 263 880

*Policy drivers:* Chemical Aspects

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### **Abstract**

"Chemical hot-spots are geographic areas that contain rich sources of various chemical substances. The aquatic environment, and particularly the seabed, contains many chemical hot-spots that require identification, but doing so today is expensive and inefficient due to the limitations of underwater monitoring technologies. These limitations are most evident in three very important aspects of human aquatic activity: marine mining for precious minerals, detection and monitoring of chemical pollution, and detection of underwater unexploded ordnance. The proposed project will develop a novel method for locating chemical sources: small, low-cost AUVs (Autonomous Underwater Vehicles), capable of sensing a specific chemical and autonomously navigating to where its concentration is highest, thus locating the hot-spot. Since the turbulent aquatic environment disperses the chemical signals chaotically and obstructs the ability to track chemical plumes, the navigation algorithms for these torpedo-shaped robots will be developed by computerized simulations of chemical plumes. These will be based on Bio-navigation - unique knowledge obtained from studied marine animals which perform precisely the same task, i.e. tracking the odour plumes emanating from their targets and navigating in the chemical gradient fields to reach the source. The project will create effective AUV navigation software, enabling AUVs to efficiently locate chemical hot-spots in the water; demonstrate their abilities in flow-tank and field experiments; and implement the new technology, both scientifically and commercially, as an integrated part of the EC Marine Bio-Remediation project currently conducted at Coimbra, Portugal. Furthermore, it is a crucial part in strengthening the skills of the researcher towards creating a European research centre on robotic and cybernetic applications of marine animal behaviour."

## **211534- AQUAFIT4USE**

Water in Industry, Fit-for-Use Sustainable Water Use in  
Chemical, Paper, textile and Food Industry

[www.aquafit4use.eu/](http://www.aquafit4use.eu/)

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*Funding scheme:* CP (Collaborative Project), FP7

*Project duration:* 6/1/2008 - 5/31/2012

*EC contribution:* € 9 650 000

*Policy drivers:* Chemical Aspects  
Socio-economy

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### **Abstract**

Sustainable water use in industry is the goal of AquaFit4Use, by a cross-sectorial, integrated approach. The overall objectives are: the development and implementation of new, reliable, cost-effective technologies, tools and methods for sustainable water supply, use and discharge in the main water consuming industries in order to significantly reduce water use, mitigate environmental impact and produce and apply water qualities in accordance with industrial own specifications (fit - for - use) from all possible sources, and contributing to a far-going closure of the water cycle in a economical, sustainable and safe way while improving their product quality and process stability. The 4 pillars of the project are Industrial Water Fit-for-use, Integrated water resource management, Strong industrial participation and Cross-sectorial technologies and approach. Water fit-for-use is the basis for sustainable water use; the integrated approach a must. Tools will be developed to define and control water quality. The heart of AquaFit4Use however is the development of new cross-sectorial technologies, with a focus at biofouling and scaling prevention, the treatment of saline streams, disinfection and the removal of specific substances. By intensive co-operation between the industries, the knowledge and the technologies developed in this project will be broadly transferred and implemented. This AquaFit4Use project is based on the work of the Working group "Water in Industry" of the EU Water Platform WSSTP; 40 % of the project partners of AquaFit4Use were involved in this working group. The expected impacts of AquaFit4Use are: A substantial reduction of fresh water needs (20 to 60%) and effluent discharge of industries; Integrating process technologies for further closing the water cycles; Improved process stability and product quality in the different sectors and strengthening the competitiveness of the European Water Industry.

## 252531- AQUAMEC

Catalytic and mechanistic studies of Organometallic reactions in water: focus on alkylation processes

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 6/1/2010 - 5/31/2012

*EC contribution:* € 172 740

*Policy drivers:* Chemical Aspects

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### Abstract

Recently, concerns over hazardous waste generated during catalytic reactions and separation of products from catalyst increasingly led to the development of systems that employ water as solvent. An understanding of the specific mechanisms in water is required, however, for a rational optimization of processes. Pd-catalyzed allylation has played a major role in the evolution of synthetic catalysts for asymmetric C-C bond-forming reactions in organic solvent. However, whilst ligands are exceptionally selective, its mode of asymmetric induction has remained very much a 'black-box'. We propose to exploit the key interactions and how water could change the critical step of the reaction in classical organic solvents. Through the systematic study of structure-selectivity relationships, single crystal X-ray analysis, NMR spectroscopy of intermediates and Kinetic studies, the Fellow will study the asymmetric allylic alkylation reactions in aqueous medium, acquiring new competencies in the areas of physical organic chemistry, mechanistic aspects of catalysis, isotopic labelling, high field multinuclear (dynamic) NMR, and reaction kinetics. We will study as the enantioselectivity of asymmetric carbonylations could be controlled. Moreover, we want to understand the different behaviour of Pt catalyst in allylation reaction. Undertaking the project at the Community level will be very beneficial in three senses. Firstly, research and publications in mechanistic and synthetic aspects of asymmetric catalysis will strongly raise the profile of an area in which Europe lags substantially behind, as compared to the USA and Japan; secondly it will ensure that the Fellow's skills in aqueous chemistry will be retained in Europe and will be transferred to the host group. Finally, an excellent postdoctoral experience in a prime European university will actively encourage the Fellow to stay within Europe upon completion.

## **226565- AQUAREHAB**

Development of rehabilitation technologies and approaches for multipressured degraded waters and the integration of their impact on river basin management

[www.aquarehab.com/](http://www.aquarehab.com/)

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*Funding scheme:* CP (Collaborative Project), FP7

*Project duration:* 5/1/2009 - 12/31/2013

*EC contribution:* € 6 584 659

*Policy drivers:* Chemical Aspects

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### **Abstract**

Within the AQUAREHAB project, different innovative rehabilitation technologies for soil, groundwater and surface water will be developed to cope with a number of hazardous (nitrates, pesticides, chlorinated and aromatic compounds, mixed pollutions, ) within heavily degraded water systems. The technologies are activated riparian zones/wetlands; smart biomass containing carriers for treatment of water in open trenches; in-situ technologies to restore degraded surface water by inhibiting influx of pollutants from groundwater to surface water; multifunctional permeable barriers and injectable Fe-based particles for rehabilitation of groundwater. Methods will be developed to determine the (long-term) impact of the innovative rehabilitation technologies on the reduction of the influx of these priority pollutants towards the receptor. A connection between the innovative technologies and river basin management will be worked out. In a first stage of the project, the technologies and integration of their impact in river basin management will be developed in three different river basins (Denmark, Israel, Belgium). In a second stage, the generic approaches will be extrapolated to one or two more river basins. One of the major outcomes of the project will be a generic river basin management tool that integrates multiple measures with ecological and economic impact assessments of the whole water system. The research in the project is focused on innovative rehabilitation strategies to reduce priority pollutants in the water system whereas the generic management tool will include other measures related to flood protection, water scarcity and ecosystem health. The project will aid in underpinning river basin management plans being developed in EU Member States, and will demonstrate cost effective technologies that can provide technical options for national and local water managers, planners and other stakeholders (drinking water companies, industry, agriculture).

## **237819- AQUASENSE**

Development of Novel Sensors for Contaminant Detection in Water using Near Infrared Light and Aquaphotomics

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 5/1/2010 - 4/30/2013

*EC contribution:* € 265 736

*Policy drivers:* Chemical Aspects  
Ecological Status

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### **Abstract**

Although water is the most widespread molecule in biological systems, its interaction with light remains poorly understood. Water is prone to contamination through biological processes, industrial practises and malicious tampering. Surface water reservoirs are exposed to contamination by thousands of micropollutants from pharmaceutical, agricultural and natural origins. Aquaphotomics is a new scientific discipline that concerns the rapid and comprehensive analysis of water-light interaction as a potential source of information for better understanding of the biological world. This proposal investigates the potential use of Aquaphotomics combined with Near Infrared Spectroscopy (NIRS) and Near Infrared Chemical Imaging (NIR-CI) for early detection of contamination in water. Knowledge gained on the theory and application of Aquaphotomics acquired during the outgoing stage will be transferred to the EU during the incoming stage. This knowledge will be used in the development of real-time, multi-contaminant detectors based on NIRS and NIR-CI. Such real-time monitoring would enable dynamic modelling of water systems, which is not currently available, for increased understanding of the behaviour of contaminated water systems. It is envisaged that this work will lead to the development of a centre of excellence in Aquaphotomics at UCD and provide a protocol for the development of sensors based on NIRS and NIR-CI for rapid detection of contamination in water.

## **232241- AQUASZERO**

Development of a new adsorbent material for efficient and economic removal of Arsenic from potable water

[www.aquaszero.com/](http://www.aquaszero.com/)

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*Funding scheme:* BSG-SME (Research for SMEs), FP7

*Project duration:* 7/1/2009 - 6/30/2011

*EC contribution:* € 833 842

*Policy drivers:* Chemical Aspects

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### **Abstract**

The standards for arsenic in drinking water have been revised; in Europe, through the Directive 98/83/CE, and in the U.S., the new Maximum Contaminant Level is now 10 µgAs/L. Fulfilling these new requirements is therefore urgent and it will be a major challenge for the water supply companies, as existing technologies are partly meeting these needs. The major issue in the new Arsenic limit is the associated costs to the water treatment facilities. The common methods have been found to be cost effective only at a large scale, where labor costs are spread over a larger amount of treated water produced. The water treatment cost using conventional adsorbents ranges from 6.7-40 €/100m<sup>3</sup> (assuming adsorption capacity 1-3gAs/kg and adsorbent cost 5-10€/kg). Consequently, the main disadvantage of the available conventional adsorbent treatment technologies for arsenic removal seems to be the high cost of adsorbents. Additionally, Arsenic residuals have varying toxicity and mobility; thus, they require further treatment prior to disposal, which increases the total cost. The aim of this proposal is to develop a low-cost material (< 2 € per kg of material) that will be used in water treatment plants to absorb Arsenic from drinking water with high efficiency (> 99% As removal) and low operational cost. This will be accomplished with the use of iron-based adsorptive media FeSO<sub>4</sub> and Mn<sup>+2</sup> and O<sub>3</sub> as catalysts. As Mn<sup>+2</sup> accelerates the production of iron oxy-hydroxides, it increases the adsorption performance. Furthermore, FeSO<sub>4</sub> is considered as relatively low-cost material, making the proposed technology economically viable. This new adsorbent will have low capital cost and the water treatment system in which it will be integrated will have low energy consumption, low maintenance costs and reduced plant size. The AquAsZero project impacts on the market of chemicals used in water treatment systems to remove Arsenic and on the manufacturers of water treatment units.

## **037091- AQUATEST**

Low cost water test for developing countries - a preparatory study

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*Funding scheme:* SSA (Specific Support Action), FP6

*Project duration:* 7/1/2006 - 12/31/2007

*EC contribution:* € 446 000

*Policy drivers:* Chemical Aspects  
Ecological Status

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### **Abstract**

This project is a preparatory study for the development of a low-cost water quality test and associated management systems for use in developing countries and in disasters/emergencies. Contaminated drinking water remains a major cause of morbidity and mortality in developing countries, with 1.8 million deaths per year being attributed to water-borne disease. In addition, following major disasters such as hurricanes or earthquakes, many deaths result not from the disaster itself but from subsequent outbreaks of disease caused by contaminated drinking water. Existing water tests are largely designed for use in developed countries and not in situations where laboratory infra-structure, resources and trained personnel are lacking. There is thus a need for more appropriate water testing technology for use in resource-poor and disaster settings. This support action will lay the foundations for a subsequent grant application to develop a water test, with associated management systems, for use in developing countries and in emergency situations. The project will demonstrate to policymakers, donors and research funding organisations that there is an urgent and clear need to provide a low cost water test. Following an assessment of developing country and disaster relief agency needs, a network of experts will be formed to address these needs. This network will meet with stakeholders at the World Water Congress in Beijing. The project will establish how an appropriate water test can be developed from existing technologies within the near term. A follow-on funding application to develop this water test will then be submitted based on these activities. The principal delivery of this preparatory activity is therefore a carefully specified bid for further research funding based on a needs assessment and review of existing water test technology, supported by a high quality international consortium.

## **220220- AREUS**

### **ANISOTROPIC RESPONSE OF UNSATURATED SOILS: A MICROSTRUCTURAL APPROACH**

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 5/13/2009 - 5/12/2011

*EC contribution:* € 176 606

*Policy drivers:* Chemical Aspects

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#### **Abstract**

The expression “unsaturated soil” is used in geotechnical engineering to identify a class of soils whose pores are partially filled with water and partially filled with air. Unsaturated soils occur naturally above the water table as a superficial ground layer, whose thickness depends on the balance of precipitation and evapo-transpiration and, hence, on the prevailing local climatic conditions. Unsaturated soils also occur in manmade structures that are built by compacted earth such as embankments, gravity dams, barriers for underground nuclear waste repositories and flood defences. The engineering properties of unsaturated soils are therefore crucial to many civil engineering applications as well as to geohazards engineering (e.g. slope instabilities and landslides). The response of unsaturated soils to loading and environmental actions is crucially dependent on the mechanical anisotropy of this material. Anisotropy in unsaturated soils may be caused by two concurring factors, i.e. the nature of the soil fabric and the deviatoric component of the inter-granular stress generated by capillary pore water. This project aims at investigating anisotropy in unsaturated soils based on the appreciation of the microscopic interactions between solid grains, pore water and pore air. The research is divided in four main tasks: a) performance of laboratory tests on unsaturated soil samples compacted under different conditions to achieve different degree of initial cross-anisotropy, b) interpretation of test results in terms of theoretical models based on the mechanics of granular materials and continuum mechanics, c) microscopy analysis of soil samples subjected to cycles of wetting and drying and 4) study of boundary value problems where the anisotropy of unsaturated soils is particularly relevant. One of the main project deliverables will be the formulation of a constitutive model capable of representing the anisotropic mechanical behaviour of unsaturated soils.

## **015114- ARSLAND**

### **SUSTAINABLE MANAGEMENT OF ARSENIC CONTAMINATED WATER AND SOIL IN RURAL AREAS OF LATIN AMERICA**

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*Funding scheme:* SSA (Specific Support Action), FP6

*Project duration:* 1/1/2006 - 12/31/2007

*EC contribution:* € 129 964

*Policy drivers:* Chemical Aspects  
Water and Agriculture

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#### **Abstract**

The rational use of natural resources is of vital importance for sustainability and development of developing countries.

New policies must be adopted to guarantee sustainable management and utilisation of the natural resources of soil and water. Safe water for domestic and agrarian uses is a world-wide priority in all countries and for all people. The global impact of arsenic contamination on soils and groundwaters by natural (volcanic) and anthropogenic (mining) activities causes serious health issues which need to be addressed with some urgency in the near future. Nowadays, there are no simple and inexpensive technologies to mitigate arsenic contamination.

In isolated and poor rural areas in developing countries this problem is deeply aggravated as they cannot benefit from public water treatment processes. On the other hand, agricultural uses of arsenic polluted soil and water is an important issue for food safety concern. The aim of this project is the design and implementation of arsenic mitigation programmes to solve the specific problems of these poor and rural areas. A complementary topic of interest is the development of monitoring strategies aimed to assess the risk of arsenic accumulation in the food chain.

The present proposal is addressed to connect and feedback mechanisms between all the relevant sectors involved in arsenic pollution in Europe and Latin America (scientific expertise in arsenic mitigation and/or removal in water and soil; health agencies; national and regional Authorities; stakeholders such as communities, NGOs and the private sector.

Other aims of the project are the development of effective and sustainable strategies, compiling the right information, preparing emergency and long term programme phases, and coordinating mitigation and monitoring programmes.

## **267897- ATHENE**

Designing new technical wastewater treatment solutions targeted for organic micropollutant biodegradation, by understanding enzymatic pathways and assessing detoxification

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*Funding scheme:* ERC (ERC Grant), FP7

*Project duration:* 4/1/2011 - 3/31/2016

*EC contribution:* € 3 473 400

*Policy drivers:* Chemical Aspects

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### **Abstract**

The identification of degradation pathways relevant for organic micropollutants in biological wastewater treatment processes is currently a major gap, preventing a profound evaluation of the capability of biological wastewater treatment. By elucidating the responsible enzymatic reactions of mixed microbial populations this project will cover this gap and thereby allow finding technical solutions that harness the true potential of biological processes for an enhanced biodegradation and detoxification. Due to the multi-disciplinary approach Athene will have impacts on the fields of biological wastewater treatment, analytical and environmental chemistry, environmental microbiology, water and (eco)toxicity. The multi-disciplinary approach of the project requires the involvement of a co-investigator experienced in process engineering and microbiology in wastewater treatment. Athene will go far beyond state-of-the-art in the following fields: a) efficiency in chemical analysis and structure identification of transformation products at environmental relevant concentrations; b) identification of enzymatic pathways relevant for micropollutant degradation in biological wastewater treatment; c) designing innovative technical solutions to maximize biodegradation; d) map and model relevant enzymatic pathways for environmental concentrations. Furthermore, designing biological wastewater treatment processes by understanding enzymatic pathways relevant for organic micropollutants removal represents a paradigm shift for municipal wastewater treatment. In the context of the actual scientific discussion about the relevance of trace organics in the aquatic environment and in drinking water, this topic is deemed as highly innovative: for its potential of proposing new technical options as well as for the gain in understanding compound persistency. Finally enzymatic reactions as well as the treatment schemes will be assessed for their capability to reduce toxicological effects.

## **272569- BASIS**

PAH Anaerobic Biodegradation Assessment by Stable Isotope Technologies

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 5/1/2011 - 4/30/2013

*EC contribution:* € 169 863

*Policy drivers:* Chemical Aspects

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### **Abstract**

Hydrocarbon pollution has been recognized to be a major environmental and human health problem that require accurate exposure assessment and remediation. Oil and oily products are extremely complex mixtures, containing hundreds (even thousands) of different compounds, among which polycyclic aromatic hydrocarbons (PAHs) are of greatest regulatory concern due to their potential toxic, mutagenic and carcinogenic properties. 2- and 3-ring PAHs are water soluble and can be transported over significant distances.

Natural attenuation is a low-cost bioremediation option widely accepted for the clean-up of hydrocarbon polluted sites. Many efforts have been made to study and enhance aerobic biodegradation of hydrocarbons. However, anaerobic degradation of oily products is practically unknown, although in many environments, such as aquifers, marshes or intertidal zones oxygen is often a limiting factor.

Some studies have proven the ability of microorganisms to degrade aromatic hydrocarbons in different conditions, but there is a significant gap of knowledge regarding in situ anaerobic biodegradation of these compounds (metabolism, key microorganisms involved, etc.).

Stable isotope techniques (compound specific stable isotope analysis, CSIA, and stable isotope probing, SIP) are novel techniques which can help overcoming this situation, providing valuable information on biodegradation and coping suitably with linking biodegradation processes to microbial taxa. Despite their clear advantages these techniques have seldom been applied to field studies.

In the light of this situation, the main goals of this proposed project are to assess in situ biodegradation of PAHs under anaerobic environments in marine and fresh water systems, to describe microbial activities and to identify microbial key players.

The project will be carried out in the Isotope Biogeochemistry Department at the UFZ (Leipzig), which provide outstanding facilities for the achievement of these objectives.

## **252025- BAYEX**

Atmospheric Exchange of Persistent Chemicals in Bothnian Bay,  
Northern Baltic Sea

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 4/15/2011 - 4/14/2013

*EC contribution:* € 239 693

*Policy drivers:* Chemical Aspects

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### **Abstract**

Atmospheric deposition and air-sea exchange of persistent chemicals in Bothnian Bay are investigated with goals of understanding current atmospheric loadings and how future loadings will respond to changes in ice cover and air concentrations. Substances examined are organochlorine pesticides (OCPs), current-use pesticides (CUPs) and brominated flame retardants (BFRs), substances which have been shown to undergo long-range transport and deposition in the Arctic and other remote locations. The CUP endosulfan and the BFRs polybrominated diphenyl ethers (PBDEs) are listed among the eight “hazardous substances of specific concern to the Baltic Sea” by the Helsinki Commission (HELCOM). PBDEs were recently added to the Stockholm Convention, and endosulfan and trifluralin are candidate substances. Concentrations of target chemicals are measured in air, Bay water, Bay snowpack, and rain. Seasonal and annual atmospheric loadings to the Bay are estimated from: a) air-water gas exchange, b) winter deposition in the snowpack, and c) rain deposition. Chemical “markers” (enantiomers of chiral compounds, natural bromoanisoles) are employed to trace air-water gas exchange, with emphasis on the effects of ice cover loss and the spring phytoplankton bloom. Enantiomer proportions are also used to follow microbially mediated diagenesis of chiral chemicals in water and soils. The project brings benefits to Sweden and the European community by making the first atmospheric deposition estimates for these substances in the northern Baltic, providing the first data on two HELCOM hazardous substances in Bay air and water, complimenting air measurements made at European Monitoring and Evaluation Program (EMEP) stations in southern Sweden and arctic Finland, and linking with the EU project ARCRISK at Svalbard by providing measurements for a common suite of chemicals at a continental subarctic site.

## **024273- BDELLOID ROTIFERS**

Innate immune system of bdelloid rotifers.

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 12/1/2006 - 11/30/2008

*EC contribution:* € 160 487

*Policy drivers:* Chemical Aspects

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### **Abstract**

Bdelloid rotifers are freshwater micro-invertebrates being the largest, oldest, most successful group of multicellular organisms reproducing asexually. The existence and success of bdelloids has been called "an evolutionary scandal" because all theories on the evolution of sex predict that bdelloids should be extinct. Their existence thus indicates that they must have evolved alternate means of achieving the advantages conferred by sexual reproduction. One of the advantages of sex is that recombination efficiently creates genetic variation which allows a species to avoid being driven to extinction by pathogens. Bdelloids cannot create genetic variability by recombination, yet live in environments where they are exposed to parasites. The long-term success of bdelloids in such environments suggests that their innate immune system evolved in response to pathogens without the benefit of sexual reproduction. Here, we propose to: 1) Identify natural pathogens of bdelloids by microscopy and PCR 2) Challenge uninfected bdelloids with natural pathogens and non-specific bacterial pathogens infecting a wide range of species and investigate the genetic variation in resistance between bdelloid populations. 3) Examine the genetics of the bdelloid innate immune response by comparing gene expression in infected and uninfected bdelloids, revealing host genes up-regulated upon infection with possibly unusual anti-pathogen properties. This proposal offers the high reward of a unique model system that may have evolved novel mechanisms of anti-parasite defense that may be useful in combating infection. The proposal is founded on the fields of genomics, molecular and evolutionary biology as applied to parasitology, providing the applicant a first rate training in a wide variety of disciplines. Collaborators with varied research skills are involved, strengthening the research initiative and promising a greater unity in tackling an important problem.

## **274078- BEC-ME**

Microbial Electrochemical Cells with modified electrode based on "forest" like carbon nanotube (CNTs) and CNT- conducting polymers nanocomposites

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 11/1/2011 - 10/31/2013

*EC contribution:* € 271 636

*Policy drivers:* Chemical Aspects

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### **Abstract**

Microbial electrochemical cells (MECs) show promises for energy recovery from waste and efficient wastewater treatment. MECs are bioelectrochemical reactors in which chemical energy stored in reduced substrates is converted directly into electrical energy (or hydrogen) through immobilized microbial catalysts, usually termed electroactive biofilms (EAB). Current MEC performances are not optimal and prevent their use in large-scale applications. Slow electron transfer at the microorganisms/electrode interface and low overall electroactivity of EABs are among the key scientific bottlenecks that need to be resolved in order to increase MEC output and enable their cost-effective implementation in wastewater treatment plants (WWTP). A possible solution is the development of biocompatible advanced materials for electrodes that will enable efficient "wiring" of EAB to the electrode. This project focus on development of such electrode materials and their implementation in established MECs.

The candidate will use 'forest' like carbon nanotube (CNTs) and CNT- conducting polymers nanocomposites (CNT-NCs) to modify conventional electrodes for MECs. The new electrodes will have high surface and biocompatibility and support a fully active EAB, thereby increasing extracellular electron transfer and power (or hydrogen) output in MECs.

The training facilities and expertise of the host organization will be used to fulfill the multidisciplinary training of researcher needs for development of an independent research career. Additional training budget management and technology transfer provided within this project will add to the core skills of the candidate and enable her to take forward Research and Technology Development programmes.

Moreover, the results could be of enormous global environmental benefit by ensuring the optimization of MEC as well as economic benefit by reducing costs for existing wastewater treatment systems.

## **232082- BEEP-C-EN**

Bio-sensor for Effective Environmental Protection and Commercialization - ENhanced

www.beep-c-en.com

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*Funding scheme:* BSG-SME (Research for SMEs), FP7

*Project duration:* 10/1/2009 - 9/30/2011

*EC contribution:* € 1 044 837

*Policy drivers:* Chemical Aspects  
Ecological Status

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### **Abstract**

The objective of BEEP-C-EN is the integration of innovative biosensor research and technology and their exploitation by industry and/or other socio-economic entities in the fields of environment and agro-industry. The first target application is the detection of pesticides, heavy metal and organic compounds in water. The aim is building up a biosensor modular industrial platform, which can be easily adopted for multi-parameter/multi-sensor design and production. It consists of a series of electrochemical-optical sensors and microsystems suitable for various biomediators (microorganisms, DNA, proteins or cells) and based on new technologies studied and developed by the research performers in the consortium. The transduction approach is suggested by two main biomediator properties, often exploited in biosensor operation in response to analyte or modification of a physical-chemical condition: the variation of the bioluminescence/fluorescence emission and the internal electrical behaviour. These changes when transduced to readable electrical signals can give complementary information: the modification of a current signal is correlated to the electrogenic property of the biomediator (e.g. inhibition of Photosystem II electron transfer in the presence of a pesticide), while a modification of fluorescence is often correlated to a conformational modification (e.g. interaction of Photosystem II protein with ionizing radiation). The specific proposed devices are: 1) MultiLights: modular optical transducer for autonomous measurements of bioluminescence/fluorescence of several biomediators assembled in series; 2) MultiAmps: modular electrochemical transducer for measurements of current and voltage variations; 3) MultiTasks: a multitransduction biosensor based on simultaneous and autonomous measurement either of bioluminescence either of current variations.

## **275911- BIOFILMS AND FLOW**

An integrative study on the distribution, morphology and composition of biofilms under the influence of secondary flows around flow obstructions

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 9/1/2011 - 8/31/2014

*EC contribution:* € 241 237

*Policy drivers:* Chemical Aspects

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### **Abstract**

Biofilms are bacteria consortia, embedded in a self-secreted 'gel' matrix which provides bacteria with significant advantages for their survival and proliferation. Owing to this successful strategy, biofilms may be found virtually anywhere, provided some nutrients are available. Beneficial examples include biofilm-based wastewater treatment systems. On the 'negative' side, biofilms may cause disease transmission or trigger infections from medical implants; biofilms are a cause for increased resistance of heat-exchange equipment and clogging of filtration columns, water distribution pipes, drip-irrigation emitters and, the focus of this study - membrane separation modules. The latter are of particularly great importance as state-of-the-art technology for water treatment and desalination. Owing to this wide range of applications, biofilms have been extensively studied. In spite of these efforts, the interplay between the characteristics of a velocity field and biofilm distribution and composition remain largely illusive, particularly in complex velocity fields, such as those arising in the presence of flow obstructions.

The overarching goal of this project is to develop a mechanistic, quantitative approach to understanding the effect of hydrodynamics on bacterial deposition and biofilm development in the presence of a flow obstruction; a micro-fluidic approach will be developed for characterizing biofilm development under various hydrodynamic and physico-chemical conditions. Concurrently, two- and three-dimensional simulations of the flow field will be performed, so as to connect hydrodynamic characteristics, such as secondary flows, to the deposition patterns as well as biofilm morphology and composition.

The model system to be considered will have direct implication for the design and operation of membrane-based desalting. However, in a wider context, the methodology developed may be applied to study biofilms in any other flowing systems.

## **509567- BIOGEOLOGICAL ENGINE**

### **NOVEL BIOGEOLOGICAL ENGINEERING PROCESSES FOR HEAVY METAL REMOVAL AND RECOVERY**

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 6/1/2004 - 5/31/2008

*EC contribution:* € 1 663 736

*Policy drivers:* Chemical Aspects

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#### **Abstract**

The Team will carry out a research program on “Biogeological engineering”, in which biogeological processes (sulfur and heavy metal cycles, with particular emphasis on the transformations between the soluble and solid phase) are elucidated and engineered in order to develop more efficient treatment processes for heavy metal removal, recovery and reuse. The TEAM will be established at the Sub-department of Environmental Technology of the University Wageningen, The Netherlands ([www.spb.wur.nl/mt/](http://www.spb.wur.nl/mt/)), a world-wide known institute in the field of anaerobic technology for wastewater treatment. The research program is build around four research topics, corresponding to the four team members, where heavy metals play a key role. These include i) bioavailability and mobility of trace elements, ii) heavy metals for more efficient wastewater treatment, iii) heavy metal removal by dissimilatory metal reduction and iv) optimisation of heavy metal removal by sulfide producing bioreactors. Each topic consists of a blend of fundamental investigations on basic processes and applied work focused on bioreactors. Each of the research topics will provide the contracted researchers training in various innovative aspects of environmental chemistry, environmental engineering and bioprocess technology. The team will be composed of the team leader, one experienced researcher and three early stage researchers. The experienced researcher will do research on specific advanced analytical techniques on metal mobility and bioavailability, i.e. chemical sequential extraction, stripping voltametry, DGT, Donnan membrane technique and Nuclear Magnetic Resonance (NMR) spectroscopy and imaging. In addition, he/she will also contribute – together with the team leader - to the supervision of and collaboration between the work of the three early stage researchers. Each of the latter will be working on a separate topic so that they can do independent research.

## **021768- BIOMEM**

Interaction between biology and membranes in membrane bioreactors

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 3/22/2006 - 3/21/2008

*EC contribution:* € 153 319

*Policy drivers:* Chemical Aspects

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### **Abstract**

"Membrane bioreactors are a promising technology for wastewater treatment and reuse. Membrane fouling is inherent to their operation and seems to be affected by the composition of the sludge. In this fellowship the relation between biology and membrane fouling will be studied from three perspectives: the determination of slime materials produced by the sludge, the microbial community composition of the sludge with special emphasis on the presence of slime-producing organisms and the development of a fouling measurement method which allows studying the process and mechanisms of membrane fouling. The latter has been developed by the host institute for non-biological membrane filtration applications and will now be upgraded for MBRs.

The proposal goes beyond the state of the art by analyzing the relationship between biochemical sludge characteristics and membrane fouling for a wide range of operational conditions, wastewaters and MBR systems. It is highly innovative since no reports are known that try to find a relation between the composition of the microbial community in a MBR, the presence of specific organisms that may contribute to slime production, and membrane fouling. Finally, the combined approach of biochemical analysis, microbial monitoring and application of a new and versatile fouling measurement method with the purpose of studying fouling phenomena is completely new for this application. The derived information and relationships must allow adjusting MBR operation in such a way that membrane fouling is minimised. This results in a lower frequency of membrane cleaning and an increased membrane lifespan. The reduced operational cost will enhance MBR application for wastewater treatment and water reuse.

The fellow has the background and the host institute has the infrastructure and the supporting team to make this multidisciplinary proposal a success."

## **246039- BIONEXGEN**

Development of the next generation bioreactor system

[bionexgen-fp7.eu/](http://bionexgen-fp7.eu/)

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*Funding scheme:* CP (Collaborative Project), FP7

*Project duration:* 9/1/2010 - 2/28/2014

*EC contribution:* € 3 419 571

*Policy drivers:* Chemical Aspects

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### **Abstract**

Membrane bioreactor (MBR) technology is regarded as key element of advanced wastewater reclamation and reuse schemes and can considerably contribute to sustainable water management. MBR technology is used for wastewater treatment and reuse in municipal, agricultural and a variety of industrial sectors in Europe and MENA. The market pull, in the context of this NMP call, is the increasing demand for clean water complying with the strict European and MENA regulations. The European growing MBR market is dominated by two suppliers from Canada and Japan. Although, the European scientific community is strong in R&D, its expertise remains fragmented and lacks organization and communication within Europe. Despite the fact that the technical feasibility of this technology has been demonstrated through a large number of small and large scale applications, membrane fouling is regarded as an important bottleneck for further development. It is the main limitation to faster development of this process, particularly when it leads to flux losses that cleaning cannot restore. The objective of the BioNexGen project is therefore to develop a new class of functional low fouling membranes for membrane bioreactor technology with high and constant water flux (25 l/m<sup>2</sup>/h) and high rejection of organic pollutants with low molecular weight (down to 300 Da). The consortium consisting of European and MENA partners will develop a novel single step NF MBR operated with low energy consumption due to less aeration needed (0.2 Nm<sup>3</sup>/m<sup>2</sup>/h). Small footprint, flexible design, and automated operation make it ideal for localized, decentralized wastewater treatment and recycling in the European and MENA countries. Successful delivery will have a major impact on the competitiveness of the SME partners in the project and the European and MENA MBR market. Furthermore it will significantly contribute to scientific and technological cooperation between European and MENA countries in the provision of safe water.

## **268417- BIONIT**

### **BIOFILMS IN BIOREACTORS FOR ADVANCED NITROGEN REMOVAL FROM WASTEWATER**

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 9/1/2010 - 8/31/2013

*EC contribution:* € 45 000

*Policy drivers:* Chemical Aspects

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#### **Abstract**

For both economic and environmental reasons, maximal use of resources present in wastewater is becoming a very important issue. From this perspective, wastewater is not seen as waste that must be disposed off, but as resource that should be utilized. For energy recovery, anaerobic wastewater treatment is an ideal option, but further research and further developments on the application of combined systems for organics and nitrogen removal under low to moderate temperature conditions are deemed necessary to overcome challenges on extensive applications. The temperature aspect is most important, because even in moderate regions such as Central Europe, the average temperature of wastewater is not higher than 15 °C and e.g. in Scandinavia can be even much lower. Under such conditions, heating of the entire wastewater stream to temperatures favorable for anaerobic digestions and/or e.g. Anaerobic Ammonia Oxidation (ANAMMOX) process (around 30°C) is economically impossible.

Within the proposed project, the researcher will investigate the feasibility of combined anaerobic-aerobic treatment of municipal wastewater, specifically 1) at the temperature of municipal wastewater (<15 °C) and 2) using biofilm bioreactors for nitrogen removal to obtain robust and stabile biotechnology. The research fellow will apply number of novel and advanced techniques (MRI, NMR, FISH, microelectrodes) to elucidate mass transport phenomena in biofilms carrying out nitrogen removal from wastewater. As shown in literature, transport of nitrogen species and oxygen in the biofilm is the key phenomenon for control of the nitrification/denitrification process.

The output of this project is expected to improve ecological and economical aspects of municipal wastewater treatment in Europe, leading to less energy dependent wastewater treatment plants, less excess sludge production and lower operational costs.

## **032502- BIOSAFOR**

### **BIOSALINE AGROFORESTRY: REMEDIATION OF SALINE WASTELANDS THROUGH THE PRODUCTION OF BIOSALINE BIOMASS (FOR BIOENERGY, FODDER AND BIOMATERIALS)**

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*Funding scheme:* STP (Specific Targeted Research Project), FP6

*Project duration:* 12/1/2006 - 8/31/2010

*EC contribution:* € 1 198 817

*Policy drivers:* Chemical Aspects

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#### **Abstract**

Increasing salinity is more than a threat to agricultural production alone. It contributes to desertification, disrupts socio-economic structures, causes rural exodus. Biosaline agro-forestry applies innovative approaches to salinity, using the qualities of salt tolerant species combined with improved soil- and water management practices. Research on this subject is by far not complete and the potentials of biosaline agriculture and forestry are insufficiently investigated. The overall objective of the BIOSAFOR project is twofold:

1. To contribute to the development of biosaline agro-forestry systems for various saline environments (local/regional approach) and parallel to that
2. To explore the potentials and options for biomass production in saline environments (globally)

More specific objectives are

- To indicate the special role of biosaline agro-forestry for degraded areas with saline soils and/or areas with brackish water resources
- To contribute to the regeneration of saline wastelands
- to select and screen tree species for the production of biomass in specific saline environments
- To develop agro-forestry systems for biomass production in different kind of saline environments
- To assess the economic and environmental performance of selected biosaline agro-forestry production systems
- To estimate the amount of biomass that can globally be produced in saline environments
- To assess the potential contribution of biomass from saline environments to a sustainable biomass, respectively biofuel and biomaterial supply in DEV countries and the EU
- To disseminate the results to relevant gremia (decision makers, politicians) in the EU and to organizations dealing with salinity globally especially the biosaline networks.

## **041896- BIOTRAC**

### **BIOAVAILABILITY OF TRACE METALS IN ANAEROBIC GRANULAR SLUDGE REACTORS**

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 6/1/2008 - 5/31/2010

*EC contribution:* € 157 192

*Policy drivers:* Chemical Aspects

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#### **Abstract**

Research objectives and content

The effects of the metals Co and Ni on the treatment performance of a continuously operated methanogenic UASB reactor fed with methanol as the substrate will be investigated. The contracted research fellow will carry out a work program to characterize the bioavailable metal fractions in methanogenic granular sludge from an UASB reactor treating a wastewater containing a mixture of heavy metals. Dissolved Ni and Co in the sludge will be discriminated into labile and total species by the membrane separation techniques as Donnan membrane technique (DMT) and diffusive gradient gel techniques (DGT). These data will be compared with the theoretical metal concentration, as predicted by speciation model (MINEQL+). The granules will be analysed using a sequential metal extraction to distinguish various fractions. Thus, a targeted dosing of heavy metals can lead to an optimization of the process performance by studying bioreactor performance which would be correlated with the bioavailability of the metals.

Training content and expected impact for applicant and host According to applicant knowledge, he is very interested in studying metals bioavailability and mobility in UASB reactors. As he is also very interested to get international experience, working in an international research team will be very helpful. This training position will let him acquire knowledge concerning analytical methods. This will greatly enhance the academic carrier perspectives of the applicant. The host institute will benefit from the expertise in metal speciation, chemical analysis and modelling experience of the applicant. Also, he will bring specific expertise from another scientific field (aquatic chemistry) to the host institute. Moreover, as he anticipates to return to his home institute and continue to work in the scientific area, the established contact via the Marie Curie Fellowship will increase networking with his home institutes.

## **514262- BIOTRACS**

Bio-transformation of trace elements in aquatic systems

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 1/1/2005 - 12/31/2008

*EC contribution:* € 92 078 303

*Policy drivers:* Chemical Aspects

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### **Abstract**

Microbial organisms interact with trace elements in diverse aquatic systems ranging from glaciers to sediment pore-waters. These transformations can have profound implications for element cycles such as those of C and N. Microbially mediated changes to the form of trace elements have common underlying chemical and biological processes with associated implications for element cycles. Our detailed understanding of these bio-transformations is poor, but nonetheless central to our understanding of many key environmental processes, including marine ecosystem functioning. This is an excellent field for EST as it is highly inter-disciplinary, fundamental to our understanding of natural systems, and will provide Fellows and visiting researchers with training and skills needed in subsequent research careers. The inter-related group of high-calibre universities in BIOTRACS are all graded excellent for teaching and in the highest bands for their international quality research. The BIOTRACS group has extensive and powerful laboratory facilities coupled to knowledge and experience that will allow many of the questions about trace element transformations to be addressed in innovative and collaborative ways. The participants have extensive experience of early stage researcher training, with large graduate schools and embedded additional training in essential knowledge and key skills, tailored to individual development plans. The Schools also have a significant fraction of overseas students and are attuned to effectively assimilating them into the postgraduate training programmes. Current European research and personal links with BIOTRACS academics will provide an important context for further development of these EST Fellows. The BIOTRACS partners belong to the Worldwide Universities Network of outstanding international Universities that provides a powerful framework for this project.

## **252491- CAMSTAR**

Temporal regulation of starch degradation in CAM plants

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 1/1/2011 - 12/31/2012

*EC contribution:* € 180 103

*Policy drivers:* Chemical Aspects

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### **Abstract**

Crassulacean acid metabolism (CAM) is a photosynthetic adaptation to arid environments where water-use efficiency and biomass productivity is optimized by taking up CO<sub>2</sub> at night when evapo-transpiration rates are low. These desirable traits hinge on effective temporal coordination of the metabolic processes that determine the supply and demand for carbon over the day/night cycle. Data from the host lab has indicated that; a) starch availability is a key determinant of the amount of CO<sub>2</sub> taken up at night by CAM species and b) the internal circadian clock may play a key role in apportioning carbohydrates reserves for growth during the day whilst retaining sufficient starch for sustaining CO<sub>2</sub> uptake at night. Recent in-depth sequencing of the transcriptome of *Kalanchoë fedtschenkoi*, a CAM species amenable to genetic manipulation, provides a timely and novel opportunity to test the functional significance of enzymes implicated in starch degradation and their regulation via the clock for optimizing the photosynthetic performance and growth of CAM plants. The MC candidate will use existing clock transformants of *K. fedtschenkoi* and will also genetically modify the expression of certain genes that have been implicated in starch degradation in CAM plants. The aims of the project are; 1) to determine if the unique nocturnal demands for carbohydrate in CAM are accomplished by using a different pathway for starch degradation compared to that found in C3 plants and 2) to establish the role of the clock in maintaining carbon balance in CAM in terms of the metering of starch reserves between growth and as substrates for nocturnal CO<sub>2</sub> uptake under varying environmental conditions. This multidisciplinary program addresses several priorities within FP7 pertaining to abiotic stress tolerance in plants and is of high importance for contributing knowledge to assist in developing more drought resistant crops and for informing the potential use of CAM species as feedstocks for bioenergy.

## **246074- CAPWA**

Capture of evaporated water with novel membranes

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*Funding scheme:* CP (Collaborative Project), FP7

*Project duration:* 9/1/2010 - 8/31/2013

*EC contribution:* € 3 588 140

*Policy drivers:* Chemical Aspects  
Socio-economy

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### **Abstract**

One of the major challenges of this century is the provision of safe drinking water for a growing population. The shortage in water resources in arid areas requires the availability of more efficient and cheaper drinking water production processes. For groundwater, it is often sufficient to aerate and disinfect to produce drinking water. However, in large parts of the world the use of groundwater from aquifers is not possible due to excessive use and global climate change that allow penetration of salt sea water into the aquifers. Population growth, not surprisingly, leads to more pollution of aquifers rendering the water quality unsuitable for drinking water purposes without excessive treatment. In contrast, there are always large quantities of water vapor present in air. The objective within CapWa is produce a commercially available membrane modular system suitable for industrial applications within 3-4 years. The produced demin water from this system should be competitive with existing demin water technologies. The starting point will be the water vapour selective composite membranes that are developed in the proof of principle project. At the same time fundamental research will also be done on other alternative water selecting coatings. For both of these membrane paths the upscale from lab to industrial scale membrane production will be developed in CapWa. In CapWa the modular membrane system will also be developed and tested in the flue gas duct of a gas and coal-fired power plant, a cooling tower (or geothermal well) and in a paper or board mill. To achieve this goal the selective membranes must be thermal/chemically stable under the existing environmental conditions (50-150 °C) and resistant to fouling. To be competitive with existing demin production lines, the construction of the end system must be efficient and user friendly.

## **256367- CELLTOX**

Integration of living cells with organic transistors for the rapid detection of toxins and enteric pathogens

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 7/1/2010 - 6/30/2014

*EC contribution:* € 100 000

*Policy drivers:* Chemical Aspects

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### **Abstract**

The epithelium plays a significant role in resistance to infection in mammals, and is made up of a single layer of elongated, column-shaped cells that line the stomach and colon. This single layer of epithelial cells restricts the entry of toxins and pathogens, while selectively absorbing nutrients that sustain the body. Pathogens have devised multiple mechanisms to destroy the integrity of the intestinal epithelial barrier, compromising the normal absorption of water in the intestine and thereby causing diarrheal disease. The World Health Organization estimates that in 2005 alone 1.8 million people died from diarrheal diseases. CELLTOX is a novel type of biosensor for the detection of enteric pathogens and toxins, based on the principle of using live epithelial cells grown on an organic electrochemical transistor (OECT), which provides a very sensitive and convenient means of measuring ionic transport. When the epithelial cells form a monolayer, the integrity of the cell monolayer prohibits ion transport keeping the transistor in the ON state. Assault of the cells by an enteric pathogen or toxin will lead to a disruption of the cell monolayer and enable ion migration into the polymer, switching the transistor OFF. This novel “canary in a coal mine” platform will constitute a broad first-line diagnostic for gastrointestinal disease, with applications for food and water safety. It will lead to sensors that are fast, portable, inexpensive and label-free. Future use of different cell lines (eg. bronchial, dermal, etc.) with this platform will lead to a host of sensors for applications in medical diagnostics, agriculture, and environmental protection. This multidisciplinary project encompasses the disciplines of organic electronics, cell biology and microbiology, and will contribute to the successful and lasting reintegration of the applicant back to Europe.

## **032719- CHEM-FREE**

Development of a chemical-free water treatment system through integrating UV-C, ultra sound and fibre filters

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*Funding scheme:* SME (SMEs-Co-operative research contracts), FP6

*Project duration:* 7/1/2006 - 6/30/2008

*EC contribution:* € 1 355 130

*Policy drivers:* Chemical Aspects  
Water and Agriculture  
Groundwater

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### **Abstract**

The CHEM-FREE project proposes development of a process control instrument to integrate and optimise three well known physical water treatment devices: fibre filter, ultrasound and UV-C. Both lab-scale and pilot-scale research and validation will be performed to combine, arrange and steer efficiency of physical and biological processes. The resulting integrated technology must combine the economic and ecological advantages of all the individual devices to achieve targeted application in specific water qualities without the use of chemicals. Lab-scale experiments regarding microbiological decontamination and removal of algae will result in better understanding of the principal removal mechanisms to decrease the microbiological contamination for the applications using the individual devices and their combinations to determine the optimal operational parameters. The applied experiments include different raw water qualities and requirements for the treated water. Four types of field-scale applications will be investigated within the project: closed-loop water systems, crop irrigation, fish farming and groundwater recharge. The legal regulations, technical standards, market and operational requirements of the potential users will be analysed for integration into the prototype development process. The main output of the CHEM-FREE Project will be a prototype and technical specification as basis for patent registration for a process control instrument allowing integration and optimisation of the three devices as an integral unit. The optimal integration and control of fibre filters, ultrasound devices, and UV-C sets will result in chemical-free water treatment enabling ecologically prevention of algae, prevention of biofilm growth on walls, in pipelines, on fittings and in containers and completely new solutions for sensitive water treatment systems where chemicals are an unsatisfying solution like drinking water production from surface waters, groundwater recharge, etc.

## **221121- CHEMOARCH**

Identity and biogeochemical role of chemoautotrophic prokaryotes in aquatic ecosystems

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 5/1/2008 - 4/30/2010

*EC contribution:* € 169 563

*Policy drivers:* Chemical Aspects

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### **Abstract**

We aim to identify relevant aquatic chemoautotrophic prokaryotes, which can play a key biogeochemical role with the capacity to fix CO<sub>2</sub> independently of light. Although severely underestimated, chemoautotrophy can be widespread in natural systems and it can importantly participate in carbon cycling. Chemoautotrophs are highly diverse at the phylogenetical and metabolical levels, but our knowledge about both aspects is still very limited and will be assessed in this project. Firstly, we will identify active chemoautotrophs through Stable Isotope Probing with <sup>13</sup>CO<sub>2</sub>. By this approach, we will label and isolate the nucleic acids of aquatic chemoautotrophs with <sup>13</sup>C, and identify them through appropriate molecular tools. Large inserts of the isolated genomes will be analysed in fosmid clone libraries, in order to find genes that can shed light to the metabolic fashion of these organisms. This is particularly relevant in order to establish links between chemoautotrophy and other biogeochemical processes. We will focus on a specific group, Crenarchaeota, which grows chemoautotrophically and could play a key role in nitrogen cycle in marine waters, but has not yet been studied in freshwater/brackish systems such as the ones we will sample. Finally, a survey of distribution and activity of chemoautotrophs will be done by the combination of in situ hybridization with specific probes and microautoradiography with <sup>14</sup>CO<sub>2</sub>. This will allow us to quantify the amount of active cells of different groups in CO<sub>2</sub> uptake along environmental gradients (transcending the freshwater-coastal waters boundary), and evaluate their biogeochemical relevance in aquatic ecosystems.

## **236739- CLAY BIOMIMETICS**

Layer-by-layer assembly of novel bone-mimetic hydroxyapatite-fibrous clay-biopolymer hybrid membranes

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 1/18/2010 - 10/17/2011

*EC contribution:* € 251 299

*Policy drivers:* Chemical Aspects

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### **Abstract**

Biomimetics is a fast growing multidisciplinary field leading to the fabrication of novel materials with remarkable mechanical properties. Natural bone is a complex biomineralized system with an intricate hierarchical structure. It was widely reported that a typical secondary bone contains around 65 wt.% mineral phase, 25 wt.% organic and 10 wt.% water, among which carbonated hydroxyapatite (HAp) and collagen fibrils are the major components for the mineral and organic phases, respectively. High stiffness and large surface area fibrous clays, halloysite and sepiolite, will be used for the first time to biomimic collagen fibrils as the templates for the growth of HAp nanocrystals. Natural biopolymers, such as anionic sodium alginate, and cationic amino acids (lysine and arginine) and chitosan will be used to interact with HAp-clay composites and improve their toughness. HAp nanocrystals will be grown along the fibrous clays via co-precipitation methods, followed by preparing HAp-clay-biopolymer hybrid membranes by layer-by-layer (LBL) assembly. Processing conditions, materials composition and LBL assembly approaches will be varied to investigate their effects on structure and properties of the hybrid membranes. The chemical and crystalline structure of the HAp grown will be characterized, and its growth mechanisms in the presence of clay will be studied. Interfacial interactions among HAp, clay and biopolymer will be investigated, and the morphology of the hybrid membranes will be observed. Physical and mechanical properties, biodegradability, protein adsorbability as well as regeneration function of the membranes obtained will be measured. The resultant HAp-clay-biopolymer hybrid membranes are expected to have a good combination of stiffness and toughness through the bottom-up colloidal assembly of stiff fibrous HAp-clay with ductile biopolymers, and will have great potential in bone repair and regeneration in particular in scaffolds for tissue engineering.

## **227017- CLEAN WATER**

Water Detoxification Using Innovative vi-Nanocatalysts

[www.cleanwateraction.org/](http://www.cleanwateraction.org/)

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*Funding scheme:* CP (Collaborative Project), FP7

*Project duration:* 6/1/2009 - 5/31/2012

*EC contribution:* € 1 705 224

*Policy drivers:* Chemical Aspects

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### **Abstract**

The concept of the project is based on the development of innovative nanostructured UV-Visible photocatalysts for water treatment and detoxification by using doped TiO<sub>2</sub> nanomaterials with visible light response. The project aims at an efficient and viable water detoxification technology exploiting solar energy and recent advances in nano-engineered titania photocatalysts and nanofiltration membranes for the destruction of extremely hazardous compounds in water. To this aim, the UV-vis responding titania nanostructured photocatalysts will be stabilized on nanotubular membranes of controlled pore size and retention efficiency as well as on carbon nanotubes exploiting their high surface area and unique electron transport properties to achieve photocatalytically active nanofiltration membranes. This will be the crucial component for the fabrication of innovative continuous flow photocatalytic-disinfection-membrane reactors for the implementation of a sustainable and cost effective water treatment technology based on nanoengineered materials. Comparative evaluation of the UV-visible and solar light efficiency of the modified titania photocatalysts for water detoxification will be performed on specific target pollutants focused mainly on cyanobacterial toxin MC-LR and endocrine disrupting compounds (EDC) in water supplies as well as classical water pollutants such as phenols, pesticides and azo-dyes. Particular efforts will be devoted on the analysis and quantification of degradation products. The final goal is the scale up of the photocatalytic reactor technology and its application in lakes, tanks and continuous flow systems for public water distribution.

## **232459- CLEANSITE**

CLEANSITE: Novel Electrochemical Oxidation for Landfill  
Leachate Treatment

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*Funding scheme:* BSG-SME (Research for SMEs), FP7

*Project duration:* 1/1/2010 - 12/31/2011

*EC contribution:* € 1 200 000

*Policy drivers:* Chemical Aspects  
Socio-economy

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### **Abstract**

The CLEANSITE project will develop a novel system and technology for on-site treatment of collected landfill waste water – or leachate – through a novel and intelligent treatment method, which combines highly innovative electrochemical treatment or advanced oxidation methods with smart sensors and enabling microelectronic technology for optimised process control and design. Due to significant performance and efficiency gains, the innovation suggested will promote a modal shift of leachate and waste water management practices in the EU and add an important and significant contribution to the current Best Available Technique (BAT). The market opportunity for the SME consortium - group of European suppliers of windows and ventilation systems – lies in the provision of a treatment profile with improved environmental profile. The major innovation and point of market differentiation of the CLEANSITE system will be the elimination of current economic and environmental costs through on-site treatment and leachate management optimisation. The reductions in treatment costs alone are sufficient to render the product very attractive to customers. The envisaged solution, however, is likely to result in a paradigm shift towards much needed innovative solutions, with wider associated societal and economic benefits. The R&D work required to achieve project objectives is centred around technical work packages with regard to system design, electrochemical and advanced oxidation, integrated water management and control enabling technology – all of which are integrated in a novel waste water treatment system with wide application potential.

## **220579- CO OXIDATION**

A multiscale theoretical investigation of carbon monoxide oxidation on gold nanomaterials for energy and environmental applications

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 4/1/2008 - 3/31/2011

*EC contribution:* € 210 567

*Policy drivers:* Chemical Aspects

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### **Abstract**

A multiscale theoretical investigation of the CO oxidation on Au nanostructures supported on various oxides is proposed. Since Haruta's 1987 discovery of the exceptional activity of gold (Au) nanoparticles (2-5 nm in diameter), many groups have verified this exceptional activity towards many reactions when supported on certain oxides. For example, the Au/TiO<sub>2</sub> system exhibits unprecedented activity in low temperature CO oxidation via O<sub>2</sub>. CO oxidation is of paramount importance not only in automotive catalysis but also in modern energy related applications including hydrogen production via the water-gas shift reaction with steam from fossil and renewable fuels, hydrogen purification via selective oxidation of hydrogen with oxygen, fuel cells, etc. Although the high activity of Au is beyond any doubt, there is still much debate on the nature of active sites and the underlying reaction mechanisms. Herein, a multiscale bottom-up approach will be developed that cuts among "ab-initio" and semi-empirical (free-energy related) techniques and integrates this information into first-principles Monte Carlo kinetics simulations in order to explain the exceptional reactivity of Au nanoparticles on certain supports, explore its electronic properties and eventually pave the way for design of efficient catalysts for hydrogen purification and fuel cells applications.

## **286497- CONDUCTMEM**

Development of a conductive membrane that generates oxidising surface to prevent biofilm formation and fouling

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*Funding scheme:* BSG-SME (Research for SMEs), FP7

*Project duration:* 11/1/2011 - 10/31/2013

*EC contribution:* € 1 097 010

*Policy drivers:* Chemical Aspects  
Ecological Status

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### **Abstract**

This project deals with a central problem of filtration systems and in particular of membranes: biofilms and bio-fouling. By its very nature, the surface of a filter is an open structure in which microorganisms can readily settle. Nutrients available in the in-feed enable these to grow. As a result biofilms develop leading to an overall reduction of filtration efficiency of 30-50%, unstable processes and frequent filter change. A multitude of strategies are tried to reduce membrane fouling which in itself demonstrates the urgency of the problem. Current strategies, often used in combination, are: enhanced modules and membranes, cross-flow filtration, low flux, regular back flush, permeate stoppage, scouring, sparging, rinsing cycles, chemical cleaning with soda, caustic or tenside solutions. ConductMem will develop an advanced system that can permanently prevent biofilm formation and surface fouling by the electrolytic production of biocidal oxidising agents on the membrane surface itself. The conductive membrane operates as an anode. The current flow will generate OH-radicals, Ozone and Hydrogen Peroxide on the membrane surface. These oxidizing agents degrade organic matter and disinfect the surface. The technology will be demonstrated by an automated non-fouling membrane filtration unit fitted into the partner's membrane bioreactor design, incurring an additional cost of less than 15% compared with the state of the art - but with membranes that will last twice as long and not require chemical cleaning. It is expected that the MBR market will grow strongly as environmental directives, aimed at improving the quality of European water, are implemented. And domestic sewage will not be the only waste stream that can benefit from our apparatus. Other industries such as food production, pharmaceuticals, petrochemicals will also be convinced by the financial and environmental benefits of treating their waste streams using ConductMem technology.

## **272281- CORAGEM**

Copper isotopes as indicators of Redox processes during Acid mine drainage GEneration and Mitigation

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 6/1/2011 - 5/31/2014

*EC contribution:* € 225 911

*Policy drivers:* Chemical Aspects

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### **Abstract**

Acid Mine drainage (AMD) is the primary environmental threat connected to the mining industry leading to acute environmental pollution. Copper, a common contaminant in AMD, will be the focus of attention. If mobilized and discharged into the environment its ecotoxicity can have devastating effects on many receptors. A crucial aspect of addressing this pollution in a sustainable manner is a clear understanding of the biogeochemistry of pollutant generation and attenuation. I propose a multi-disciplinary study covering cutting edge metal isotope research in combination with biogeochemical, mineralogical and microbiological investigations paired with a quantitative assessment through reactive transport modelling to investigate AMD. With the advent of MC-ICP-MS we now are able to enhance biogeochemical studies on AMD with this powerful new analytical tool. Specific objectives include: 1) field studies on tailings and a passive mine treatment system to identify the factors controlling the release and attenuation of Cu and the extent of associated Cu fractionation, 2) laboratory studies to Cu bearing tailings to determine the degree of Cu-isotope fractionation associated with specific Cu mobilization and attenuation processes, these studies will be conducted in combination with mineralogical, microbiological and geochemical studies to thoroughly understand the reaction mechanisms, and 3) the integration of field and lab results within the rigorous quantitative framework provided by reactive transport modelling. The project will be developed at two internationally-renowned research institutions (Waterloo U., Canada, yr1+2; Newcastle U., UK, yr3) that will boost my career development. The project is at the forefront of a rapidly emerging new research field of non-traditional isotopes. The research will clarify processes that to date we have been unable to address but will help to safeguard natural resources in agreement with the FP7 Environment Programme.

## **269135- COTRAPHEN**

Coupled Ion- and Volume-Transfer Phenomena in Heterogeneous Systems: Modeling, Experiment and Applications in Clean Energy, Micro-Analysis and Water Treatment

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 7/1/2011 - 6/30/2015

*EC contribution:* € 256 900

*Policy drivers:* Chemical Aspects

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### **Abstract**

The passage of electric current through interfaces between media with different electrochemical properties is accompanied by changes in the solution composition close to the interfaces (concentration polarization). Another phenomenon occurring at solid-liquid interfaces is the charge separation and formation of (equilibrium and non-equilibrium) double electric layers. Subject to external and/or spontaneously arising electric fields and ion-composition gradients, the space charges give rise to volume-transfer phenomena. Their intensity is strongly dependent on the ion composition of the liquid phase, which can change considerably close to current-polarized interfaces. This is one of the mechanisms of coupling between the ion- and volume-transfer phenomena in heterogeneous systems. At the same time, the space-charge-related volume transfer can strongly modify the solution composition close to polarized interfaces via convective transfer of solutes. This is another mechanism of coupling between the phenomena of interest. The interplay of these two mechanisms gives rise to a number of non-linear, non-1D and non-stationary phenomena. Their modeling is difficult but important for the optimization of applications in clean energy, advanced water treatment, micro-analysis, and so on. Because of complexity of the objects involved, such a model cannot be formulated from first principles and has to use input parameters determined experimentally. Therefore, fundamental experimentation is an indispensable constituent part of the modeling effort.

Important elements of this model and/or corresponding fundamental experimentation have been developed in the previous studies of the Proposers. The purpose of this project is to facilitate the knowledge transfer between them to make possible further development and integration of these elements into a self-consistent and comprehensive model. Its utility will be validated via optimization of several practically-relevant systems/processes.

## **249182- CRYSTILS**

### Crystallization in Ionic Liquid Solutions

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 4/1/2010 - 3/31/2013

*EC contribution:* € 45 000

*Policy drivers:* Chemical Aspects

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#### **Abstract**

Crystallization is an essential process in the manufacture of products as varied as pharmaceuticals, electronic devices or biomimetic materials. In order to obtain a crystalline product with desirable characteristics (e.g. crystal size, morphology, structural organization) for specific applications it is crucial to control the mechanism and kinetics of crystal nucleation and growth. Yet, our understanding of the crystallization reactions remains limited, especially for organic, polymeric, and protein crystals. It is recognized that the specific chemistry of a solvent affects crystal growth and nucleation kinetics, morphology, crystal size distribution and purity of precipitates. Usually different solvents with respective properties are used for particular purposes, and organic solvents are ubiquitously applied in crystallization strategies in research and industry. However there is great concern in limiting the use of organic solvents because of their negative environmental and health impact. Ionic liquids (ILs) have earned special attention from the scientific community as alternatives to replace traditional volatile organic compounds. Some attempts have been made to exploit the unique properties of these salts in crystallization processes. Nevertheless the complexity of such systems and as yet not fully characterized chemistry of ILs make understanding of the underlying mechanisms and control of resulting precipitate characteristics quite difficult. The aim of this project is to use ILs as crystallization additives in order to design the aqueous solvent with predictable and controllable effect on respective characteristics of inorganic and protein crystals. Such an approach results from a novel concept that explains dependence of the crystallization reactions on additives present in solution by their effect on water structure and dynamics.

## **040163- DELAC**

### **ENGINEERING FUNGAL LACCASES BY DIRECTED MOLECULAR EVOLUTION AND SEMI-RATIONAL APPROACHES: APPLICATION IN BIOREMEDIATION OF POLYCYCLIC AROMATIC HYDROCARBONS (PAHs)**

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 9/24/2007 - 9/23/2009

*EC contribution:* € 145 232

*Policy drivers:* Chemical Aspects

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#### **Abstract**

The current research proposal claims to carry out the technology of the enzymatic bioremediation of polycyclic aromatic hydrocarbons (PAHs) by using biocatalysts (both native and tailored by directed molecular evolution). PAHs are a class of highly dangerous xenobiotics widely distributed in terrestrial and aquatic environments. Last trends in PAHs removal address to combine chemical and biological approaches for remediation of these persistent contaminants. However, high molecular weight PAHs can not be successfully metabolized by neither autochthonous populations nor genetically manipulated bacteria, both under in situ and ex situ applications. In this context, the only organisms known to oxidize efficiently high molecular weight PAHs are the white rot fungi. Many shortcomings have hindered the application of such organisms in large-scale bioremediation processes. Laccase is the one of the most promising and versatile biocatalyst in PAHs oxidation. This proposal deals with the use of laccases in PAHs detoxification from sea spills and waste waters. The dependence of redox mediators and the instability of laccases are the main hurdles for a practical application. The study of laccases in PAHs detoxification will be tackled by: (1) Biocatalyst engineering by directed molecular evolution to improve the enzyme stability against organic solvents. (2) The enhancing the redox potential of laccases will mean the increasing in the PAHs oxidation. The construction of combinatorial libraries by saturation mutagenesis will be performed to enhance the laccase ionization potential. (3) The biocatalyst will be immobilized on acrylic supports and used in a fixed-bed bioreactor to be tested with waste-waters contaminated with PAHs. The objectives of this Project are relevant to two of the activity areas of the Sixth Framework Program: a) Life sciences, genomics and biotechnology for health; b) Sustainable development, global change and ecosystems.

## **215360- DELTA-MIN**

### Mechanisms of Mineral Replacement Reactions

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 9/1/2008 - 8/31/2012

*EC contribution:* € 3 109 822

*Policy drivers:* Chemical Aspects

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#### **Abstract**

In this ITN we investigate the mechanism of mineral reequilibration (phase transformation) in the presence of a fluid phase in a wide range of minerals and rocks, under a range of chemical and physical conditions, using both natural and experimental samples. Interface-coupled dissolution-precipitation is a recently defined mechanism which applies to a wide range of mineral transformation phenomena. We apply these principles in individual projects to better understand the mechanisms of processes important in earth sciences and in industry, including metasomatic reactions in rocks, chemical weathering, mineral replacement mechanisms in CO<sub>2</sub> sequestration, the aqueous durability of nuclear waste materials, remediation of contaminated water by mineral reaction, and the preservation of stone-based cultural heritage. The research methods bring together a range of complementary expertise, from field-related studies to nano-scale investigations of reaction interfaces using state-of-the-art high resolution analytical methods. The application of fundamental principles of mineral reequilibration to a wide range of applications, together with industrial involvement at all levels will ensure that the project provides a strong platform for training.

## **026804- DINAMICS**

DIagnostic NANotech and MICrotech Sensors

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*Funding scheme:* IP (Integrated Project), FP6

*Project duration:* 4/1/2007 - 3/31/2011

*EC contribution:* € 4 499 542

*Policy drivers:* Chemical Aspects

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### **Abstract**

DINAMICS aims to promote the uptake of nanotechnological approaches by developing an integrated cost-effective nano-biological sensor for detection of bioterrorism and environmental assays. The prime deliverable is an exploitable lab-on-a-chip device for detection of pathogens in water using on-the-spot recognition and detection based on the nanotechnological assembly of unlabelled DNA. DINAMICS will integrate DNA hybridisation sensors with microfluidics and signal conditioning/processing both on silicon and polymer substrates avoiding the use of external apparatus for fluid handling, electrical signal generation and processing, based on DNA hybridisation. A sensory breakthrough will be achieved through two complementary technological solutions: Measurements based on electrical (capacitive) signals. If hybridization occurs between target and probe the detected change can be functionalised. Detection through UV light absorption. Based on the recognition of different UV absorptions induced by DNA hybridization. The development of a system where each sensing site in the microarray contains a UV microfabricated sensor is a goal of the project. After DNA hybridization the whole array is illuminated with UV light and the absorption of each site is measured by the sensor. The project will culminate in an integrated multi-technology product that will be high tech, low cost and time efficient sensing device applicable for use in the water industry via the coordination of nano and bio technologies with new sensory science to deliver a product that will lead to major changes in the way the testing and diagnostics of harmful substances is done. Both methodologies will ensure an additional and reliable source of cost-reduction through a drastic shortening of the sensing pipeline and without the need of transferring the samples to an analytical laboratory.

## **046433- DOUBLECHECK**

Double-check of Dissimilatory Nitrate Reduction to either Ammonium or Dinitrogen in Aquatic Habitats

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 2/1/2007 - 1/31/2008

*EC contribution:* € 40 000

*Policy drivers:* Chemical Aspects

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### **Abstract**

The proposed project focuses on the so far neglected comparative investigation of denitrification and DNRA (Dissimilatory Nitrate Reduction to Ammonium), two benthic microbial processes of great importance for nitrogen cycling in aquatic ecosystems. We aim at moving DNRA more into the spotlight, because (1) its metabolic control and phylogenetic diversity is understudied compared to denitrification, and (2) its environmental importance will increase relative to denitrification due to the excessive water use in aquaculture and desalination. Anthropogenic and environmental factors that change the partitioning between the two processes will also affect the ratio of nitrogen removal (denitrification) and nitrogen retention (DNRA) from and within the ecosystem. Therefore, we expect that a better understanding of the metabolic control and phylogenetic diversity of DNRA will aid in developing management strategies for handling nitrogenous pollution of aquatic ecosystems.

In an integrated approach using the contemporary techniques of Microbial Ecology we aim at: (1) measuring rates of denitrification & DNRA simultaneously and at high spatial resolution in marine sediments, aquaculture and desalination systems, (2) determining community structure and gene expression of denitrifying & DNRA-performing bacteria in natural sediments, and (3) correlating rates with presence & metabolic status of denitrifying & DNRA-performing bacteria, and with spatial gradients of environmental factors (H<sub>2</sub>S & TOC).

The field investigations will be complemented by laboratory incubations in which the short-term metabolic response and the long-term community shifts of denitrifying & DNRA-performing bacteria can be studied. Additionally, denitrifying & DNRA-performing strains will be isolated from the field-collected samples and screened for co-occurrence of functional genes of both metabolic pathways.

## **219781- DYNOLUG**

Biodynamic modelling of toxic metal accumulation by the lugworm *Arenicola marina*, a keynote deposit feeding polychaete in European estuaries: ecotoxicological and regulatory implications

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 10/1/2008 - 8/31/2010

*EC contribution:* € 162 498

*Policy drivers:* Chemical Aspects

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### **Abstract**

It is proposed to model the bioaccumulation of the toxic trace metals zinc (Zn) (essential), cadmium (Cd) and silver (Ag) (both non-essential) by an infaunal benthic invertebrate, the lugworm *Arenicola marina*, a keynote species in European estuaries, from solution and diet (sediment) using biodynamic modelling. The predictions of a model constructed from biodynamic accumulation parameters (uptake and efflux rates, assimilation efficiencies) measured in the laboratory will be validated against field data (from biological and physical (water and sediment) samples) from reference and metal-contaminated estuaries, particularly in southwest England. The subcellular compartmentalisation of accumulated trace metals in the lugworms will be fractionated into detoxified and non-detoxified components to model the metabolically available metal fraction, thereby predicting the potentially toxic fraction of accumulated metal, and hence toxicity. Toxicity tests will then be used to seek correlations between modelled concentrations of the potentially toxic component of accumulated metal and the environmental exposure conditions causing ecotoxicological effects in the field. The conclusions of the project will contribute to the advancement of our ability to develop a scientifically consistent basis for making a transition from the predictive modelling of bioaccumulation to the prediction of environmental thresholds of ecotoxicological effects. The results have the great potential to contribute to the implementation of environmental quality standards – for example, those for sediments in the Water Framework Directive.

## **022603- EAQC-WISE**

European Analytical Quality Control in support of the Water Framework Directive via the Water Information System for Europe

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*Funding scheme:* STP (Specific Targeted Research Project), FP6

*Project duration:* 12/1/2005 - 11/30/2008

*EC contribution:* € 1 014 119

*Policy drivers:* Chemical Aspects  
Ecological Status

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### **Abstract**

The implementation of the Water Framework Directive (WFD) requires the design of monitoring programmes for all Member States. The effectiveness of this implementation will highly depend on the ability of Member States' laboratories to measure chemical, biological and ecological changes of the quality of Community waters. As such data are the basis for regulatory decisions and measures required to achieve WFD environmental objectives, appropriate analytical quality assurance and control (QA/QC) has to be established across all EU monitoring laboratories.

Consequently, the objectives of EAQC-WISE are:

- to study existing QC tools and systems and scientific outputs suitable to set up a QC system to support the WFD implementation and future EU soil monitoring,
- to undertake research surveys to identify QC gaps, notably for pre-normative research on difficult parameters and sampling operations with emphasis on priority substances and pollutants of Annex VIII, biological and ecological parameters in water, biota and soil,
- to recommend key steps of a QC system that would provide confidence in the whole analytical process, from sampling to reporting, for chemical and biological parameters from monitoring at river basin scale as well as at European scale,
- to exemplify the feasibility of the proposed system through a series of case studies and if necessary through additional demonstrator experiments, such as a sequence of pan-European comparison for sampling and trace analysis of selected components integrated with detailed scientific evaluations and training components,
- to carry out an impact assessment of such a QC system ensuring data comparability at European level.

The main output will be a blue print of an efficient and potentially sustainable QC system for WFD implementation. It will be disseminated via CIRCA and the WISE portal.

## **235380- ECTOTOX**

A toxico-genomic study of the model brown alga *Ectocarpus siliculosus*

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 10/1/2009 - 9/30/2011

*EC contribution:* € 181 350

*Policy drivers:* Chemical Aspects  
Ecological Status

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### **Abstract**

Sequencing the genome of the model brown alga *Ectocarpus siliculosus* has afforded an unprecedented opportunity to investigate the molecular basis for metal tolerance in brown algae using a functional genomics approach. Despite the ecological relevance of brown seaweeds as pre-eminent primary producers, key bio-engineers and components of biofouling communities of temperate coastal waters, and their ability to grow in metal-polluted waters our attempts to unravel the underlying mechanisms of metal-tolerance have, until now, been hampered from a lack of genomic information.

Four key objectives are proposed for this study:

- establish the degree of metal-tolerance (Cu, Cd), from measurements of growth and photosynthesis, in strains of *E. siliculosus* that have been collected from pristine and polluted sites and are maintained, axenically, in the Plymouth culture collection;
- investigate the cellular responses to oxidative stress resulting from metal-exposure by measuring the various components of the reactive oxygen scavenging system using biochemical assays and fluorescent cellular probes;
- investigate the involvement of the thiol- proteins, phytochelatins and glutathione, in metal homeostasis and detoxification, and activity of the enzyme phytochelatin synthase in different tolerant and non-tolerant strains;
- evaluate the expression patterns of specific genes (<sup>3</sup>-Glutamylcysteine Synthetase, Glutathione Synthetase, Phytochelatin Synthetase) under metal stress conditions.

The results of this research will offer new insights on the evolution of metal-tolerance and on the metal-induced defence mechanisms in a phylogenetically distinct and ecological important group of marine organisms. Moreover, the findings can be exploited for developing more sensitive monitoring tools to assess the health status of transitional marine waters.

## **254111- EDCSANTIANDROGENS**

Integrative water sampling for the detection and identification of antiandrogenic contaminants in European rivers.

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 4/12/2010 - 4/11/2012

*EC contribution:* € 172 240

*Policy drivers:* Chemical Aspects  
Ecological Status

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### **Abstract**

Endocrine disrupting chemicals (EDCs) are environmental contaminants which have the potential to disrupt the normal functioning of the neuroendocrine system in animals and so result in physiological dysfunction. The effects of EDCs on wildlife and their potential effects on human health are a major concern to the scientific community and public. In Europe, EDCs with estrogenic activity are prevalent in effluents from wastewater treatment works (WwTWs), and may result in feminization of male fish in downstream waters reducing their fertility. Most recently, studies have shown that WwTWs effluents contain high concentrations of antiandrogenic activity, but unlike estrogenic chemicals, the identity of the antiandrogenic contaminants is currently unknown. This project aims to identify the antiandrogenic contaminants in WwTWs effluents using passive sampling techniques to obtain an integrative extract of contaminated waters over time. Antiandrogens in effluent extracts will be identified by bioassay-directed fractionation using a combination of in vitro androgen receptor assays and mass spectrometry analyses. Once identified, the range of concentrations of key antiandrogenic chemicals in river waters will be determined using integrative passive sampling of sites upstream and downstream of effluent discharges. This project will provide a more informed knowledge of the range of EDCs in river waters. The work will contribute to environmental impact assessments of these new and emerging environmental chemicals and have importance in the regulation of discharges, and thus is of very wide interest to the government regulatory bodies, environment protection groups, industry and the wider public in Europe. The project will bring Dr Liscio to work with Dr Hill, and allow her to benefit from a number of scientific and complementary training activities which will prepare the fellow for an independent research career in environmental science.

## 252231- EMOMFSSA

Extended metal-organic materials formed via subcomponent self-assembly

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 4/6/2010 - 4/5/2012

*EC contribution:* € 174 240

*Policy drivers:* Chemical Aspects

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### Abstract

This project aims to synthesise new metal-containing polymeric materials through self-assembly from simple building blocks. These self-assembled materials will be formed in water directly from diamine and dicarbonyl monomer units linked by imine bonds coordinated to copper(I) templates. The project is intrinsically multidisciplinary, building upon the techniques of organic synthesis and coordination chemistry to branch into applications in the fields of self-assembly and polymer chemistry. It spans the fields of organic and inorganic chemistry, bridging into materials science and nanotechnology. The project builds upon the experience of the applicant in metallo-supramolecular and materials chemistry to gain a deeper understanding of how subcomponent self-assembly may be used synthetically to generate complex and functional metal-organic materials. Then materials properties of the products including their electrical conductivity and light-harvesting properties will also be investigated. The materials produced will be dynamic-covalent polymers, capable of interchanging monomer units in solution. Despite their dynamic nature, the imine bonds between monomer units are not prone to rupture (C=N bond dissociation energy > 600 kJ mol<sup>-1</sup>), which could lead to strong polymer chains, and it has been demonstrated that coordination to copper(I) renders imines stable to hydrolysis even in aqueous solution. Although this project builds upon concepts developed in the fields of supramolecular and coordination polymers, the robust nature of the linkages between monomer units sets this project apart from these fields. The materials that will be prepared are predicted to be stiff and strong, and initial studies indicate that they could serve as electrically conductive “molecular wires” and lead to applications as sensors, conductors, magnetic materials or light harvesting devices.

## 247924- ENCAT

Synthesis of new Schiff base derived catalysts: application towards enantioselective reactions in greener and more sustainable media

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 12/3/2009 - 12/2/2012

*EC contribution:* € 45 000

*Policy drivers:* Chemical Aspects

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### Abstract

Over the past few years, the need for greener processes in chemical industries has considerably grown up. In order to solve the issue of organic solvents, non-pollutants media such as water, fluorinated solvents and supercritical fluids (SCFs) have attracted increasing attention. Beside, the demand for enantiopure compounds in the life sciences has stimulated interest in asymmetric catalysis. So the use of asymmetric catalysts in green solvents holds much promise for the development of sustainable chemical manufacturing. Among numerous catalysts, Schiff base complexes of metal ions show high catalytic activity and are commonly used in various reactions but the employment of these catalysts in environmentally friendly solvents still rare particularly for asymmetric catalysis. Also we propose to develop new chiral Schiff base complexes, which can be used in supercritical fluids and perfluorinated solvents. We will focus on supercritical carbon dioxide (scCO<sub>2</sub>). One of the challenges of the proposal consists in obtaining soluble ligands in these media. The synthesis of ligands with hydrocarbon or fluorocarbon chains should solve this issue. Another concept that will be envisaged is the use of water-soluble catalysts in scCO<sub>2</sub>-water biphasic systems by addition of hydrophilic arms on the ligands. The ligands will be synthesized in few steps by condensation of primary amines and aldehydes to match the demand of low-cost, environmentally friendly, and rapid synthesis. After complexation with metals, reactions such as oxidation, epoxidation and aldolisation will be studied as well as the recovery and reuse of the catalysts. Particularly, small cyclic ether molecules will be engaged in enantioselective reactions as models to develop useful methodologies in the synthesis of bioactive cyclic ethers. Finally, our objective is to bring efficient tools for the chemists worldwide to transfer the asymmetric catalysis methodology to large-scale synthesis technology.

## 236741- ENVIROCATHYDRO

Application of in situ techniques to real environmental catalytic processes

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 2/1/2010 - 1/31/2012

*EC contribution:* € 163 067

*Policy drivers:* Chemical Aspects

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### Abstract

In the 21st century, heterogeneous catalysis research should focus on achieving 100% selectivity for the desired product in all catalyst-based processes. However, this can only be achieved by understanding the fundamental steps of the reaction mechanisms, which allow better design of a catalyst with optimized performance with respect to selectivity and activity. With the development of surface science in the early 70s fundamental studies led to discovery, development and enhanced understanding of several catalyst systems. Many of the early surface science techniques along with the newly develop techniques continue to and will play a very important role in the future development of next generation catalysts and catalytic processes for the industrial use and environmental protection. This project will incorporate new techniques in the catalysis field to obtain valuable surface science information for the improvement of catalysis applied for environmental problems. This will be performed by the investigations of two different hydrogenation environmental reactions, (hydrodechlorination of trichloroethylene in gas phase using Pt,Pd-ternary hydrotalcites and the reduction of nitrates in water streams for drinking water using Pt/CeO<sub>2</sub> catalysts), using in situ SFG (Laser spectroscopy by sum frequency generation) and Transmission and ATR (attenuated total reflection) Fourier transform infrared techniques. A better understanding of the reaction mechanism will allow the design of catalysts with optimized performance. The main novelty of the project consists in the application of SFG techniques, used till now for single crystals or model systems, to real catalytic processes. In liquid phase systems, SFG will allow us to specify the species at the surface without contributions from the liquid phase. By using these techniques for monitoring of catalytic reactions, a new field opens up, which can be extended to other types of reactions.

## **502527- ESPREME**

Estimation of willingness-to-pay to reduce risks of exposure to heavy metals and cost-benefit analysis for reducing heavy metals occurrence in Europe

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*Funding scheme:* STP (Specific Targeted Research Project), FP6

*Project duration:* 1/1/2004 - 3/31/2007

*EC contribution:* € 892 078

*Policy drivers:* Chemical Aspects

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### **Abstract**

Heavy metals from different sources accumulate in the environment. From a policy point of view, it has been difficult to tackle the environmental problems due to heavy metals partly because the problem has been viewed from different policy domains (air, water, soils etc.). Thus, it is not guaranteed that the policy mix applied under environmental regulation is optimal. A systems analysis would be required to define the sources of heavy metals, how they are dispersed in the environment and which adverse effects they might cause on human and ecosystems health. From a policy point of view, it is also important to identify what kinds of policy responses would be most cost-effective to reduce the impacts of heavy metals. Such information is required for carrying out cost-benefit analyses of reducing the occurrence of heavy metals in our society. Identifying the benefits would include a monetary valuation of the impacts with contingent valuation (CV) approaches (e.g. assessing the willingness-to-pay, WTP). The focus of the work described will be on priority metals, which are mercury, cadmium, chrome, nickel, arsenic and lead. Core aim of the research is to carry out cost-effectiveness (CEA) and cost-benefit analyses (CBA) for reducing the heavy metals occurrence, in the EU Member States and candidate countries, including damage assessment to the environment and human health in the long term following the impact pathway analysis which assesses the impacts and damages of pollutants from their emissions over their dispersion to exposure and impacts. Finally, a feasibility study will be conducted to identify the potentials, strengths and weaknesses and uncertainties of currently available macro-economic models to identify further research needs in this field.

## **239459- FILM MOLECSTRUCT**

Molecular Structure in Thin Wetting Films

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 4/1/2009 - 3/31/2012

*EC contribution:* € 45 000

*Policy drivers:* Chemical Aspects

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### **Abstract**

The proposed project intends to obtain a molecular insight into the order and structure of thin wetting films (solid/liquid/gas) as an effort to relate molecular properties to macroscopic measurable parameters such as surface forces and contact angles. The approach will consist in combining two powerful surface sensitive vibrational spectroscopic techniques (Vibrational Sum Frequency and Total Internal Reflection Raman spectroscopies) with an apparatus capable of measuring the forces exerted between these asymmetric surfaces as a function of distance (Thin Film Pressure Balance). VSFS is intrinsically surface specific probing the first few monolayers and detecting only molecules with a preferred orientation. Conversely, TIR Raman probes deeper into the bulk (~100 nm), but detects all molecules making these two techniques complementary. Results will provide unique information on the structural changes in nanometer confined geometries of i) pure water films, ii) surfactant and polymer stabilized films and iii) biophysical relevant surfaces (planar supported lipid bilayers). The project will involve close collaboration between two research groups in Europe (Germany and England), and will help developing the applicant's independent research skills during his period of reintegration. The applicant's unique experience in surface vibrational spectroscopy and molecules under confinement, learnt particularly during his previous Marie Curie fellowship, will be decisive in the successful implementation of this challenging project.

## **036852- FLASH**

Observations, Analysis and Modeling of Lightning Activity in Thunderstorms, for use in Short Term Forecasting of Flash Floods

<http://flash-eu.tau.ac.il/>

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*Funding scheme:* STP (Specific Targeted Research Project), FP6

*Project duration:* 9/1/2006 - 8/31/2010

*EC contribution:* € 1 207 138

*Policy drivers:* Chemical Aspects

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### **Abstract**

Flash floods are a serious problem in the Mediterranean region in particular, and in Europe in general. Floods result from large weather systems with embedded severe thunderstorms that deposit large amounts of rainfall in short periods of time. Since lightning activity can be detected and monitored continuously from thousands of kilometers away, we propose the use of lightning data to better nowcast (3-hour prediction) and forecast (24-48 hour prediction) the location, intensity and timing of heavy convective precipitation events. For this we plan to develop rainfall-lightning relationships using lightning and precipitation data sets in the Mediterranean region, and to use lightning information in conjunction with infrared / microwave observations from geostationary / low Earth orbiting satellites to improve cloud characterization, convection detection and precipitation retrieval from space. With the help of cloud and meso-scale models we plan to simulate numerous cases studies of past flash flood events in Europe to better understand the connection between intense precipitation and lightning activity. The rainfall estimates for past and future floods will be input into hydrology models to investigate the ability to predict regions of flooding on the ground, together with the time lags between heavy rainfall and flooding. Once we have established a methodology to use lightning to help estimate rainfall location and intensity, we plan to develop algorithms for short-term nowcasting, to allow for the short-term flash flood warnings via the internet for the entire Mediterranean region, and perhaps later Europe. Furthermore, using assimilated lightning data in mesoscale meteorological models we plan to investigate the possibility of improving the 24-48 hour forecasts of severe precipitation events. The societal benefits of such advanced warnings will be investigated, especially in relation to risk management.

## **503166- FLEXFUEL**

Demonstration of a flexible plant processing organic waste, manure and/or energy crops to bio-ethanol and biogas for transport

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*Funding scheme:* STP (Specific Targeted Research Project), FP6

*Project duration:* 7/1/2004 - 12/31/2007

*EC contribution:* € 3 743 555

*Policy drivers:* Chemical Aspects  
Water and Agriculture

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### **Abstract**

The FLEXFUEL project aims to prove that organic waste, sludge from wastewater treatment plants, animal manure and energy crops may be converted to ethanol and biogas for motor fuel and to fertilizer. This type of treatment plant can be used all over Europe and can produce ethanol at the same price as upgraded biogas.

Furthermore the FLEXFUEL project has as objective to demonstrate how a gradual change to increased use of ethanol, and increased use of biogas for motor fuel may take place with public as well as private owners of motor vehicles. The aim of the FLEXFUEL project will be reached by Designing and demonstrating a plant which produces ethanol and biogas for the Danish island of Ærø. Demonstrating flexible change to using ethanol for transport in Ærø. Designing a plant which produces ethanol and biogas for a larger town, Göteborg, S, and demonstrating innovative upgrading of biogas.

## **256440- FLOMAS**

Floc modelling in activated sludge and beyond

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 4/1/2010 - 3/31/2012

*EC contribution:* € 45 000

*Policy drivers:* Chemical Aspects  
Ecological Status  
Climate Change

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### **Abstract**

The “Floc modelling in activated sludge and beyond” (FLOMAS) is a multidisciplinary proposal that seeks to obtain, through mathematical modelling backed by experimental evidence, a thorough understanding of the microbial community in activated sludge. In the present urbanized world the energy demand is increasing and need to reduce greenhouse gas emissions to tackle climate change grows ever more urgent. In environmental engineering in general, and in wastewater treatment in particular, meeting this challenge requires a reevaluation of existing processes. The most common wastewater treatment processes have been largely, though not entirely, developed empirically. It is not at all certain that such technologies are sustainable in the long term. A sustainable answer can be based only on a better understanding throughout modelling of the processes taking place in such treatment plants. FLOMAS will consider the relationships between physical, chemical and biological processes and take into account how they occur at different spatial and temporal scales. This implies, and requires, a powerful synthesis of applied mathematics, numerical methods, microbiology, environmental engineering, hydrodynamics and software developments skills. This powerful synthesis could find application, not just in activated sludge but any analogous microbial system be it engineered, such as granules in an upward flow anaerobic sludge blanket reactor, or a natural system such as marine snow. Thus this proposal, if successful, could represent the first generic step to a wide variety of applications. At the same time, the project will give the coordinator the opportunity to continue and develop the research theme she initiated and lead during the Marie Curie postdoctoral period at Newcastle University, allowing her simultaneously a better reintegration in the host institute (University Politehnica of Bucharest). The research will go on in close collaboration with the previous Marie Curie host.

## **042708- FOOD-BIOSENS**

New chemical and biochemical sensors for analysis of food, environmental and medical samples

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 10/1/2006 - 9/30/2010

*EC contribution:* € 445 112

*Policy drivers:* Chemical Aspects

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### **Abstract**

Intensive development of science and technology brought longevity and standard of living but paradoxically generated also new threats to human health. It is jeopardised by chemical compounds, both organic and inorganic, found in waste by-products of numerous technological processes. Moreover, daily use pharmaceuticals and pesticides introduced into food chain and their biological change by-products may have a negative impact on human life and environment. Therefore it is vital to formulate an integrated natural environment control system allowing its continuous monitoring and facilitating observation of movement of toxic and potentially toxic compounds in the environment, tracing how they are incorporated into the food chain and enabling their chemical analysis. To achieve this aim is necessary to develop new analytical methods, which should be easy to implement and have low exploitation costs in order to be used widely in less affluent countries. The main purpose of this project is the formulation of innovative tools for quick determination of hazardous components in food, water and soil. Tools will be designed to work as sensors of electrochemical modes of operation. Low cost, quick analysis and miniaturisation of analytical equipment justify such selection. The working mechanism of proposed sensors is based on the interface intermolecular recognition processes. Thus, designing new sensors will be connected with receptor's synthesis in order to obtain sensing materials which will be able selectively recognised target molecules at very low concentration levels by interaction of receptor-substrate.

## **008916- FOULING SIMULATION**

Modelling CaSO<sub>3</sub>/CaSO<sub>4</sub> precipitating flow in water treatment devices

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 11/1/2005 - 4/30/2007

*EC contribution:* € 97 193

*Policy drivers:* Chemical Aspects

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### **Abstract**

The intent of this project is the exploration of thermo- and hydrodynamics of water flows in reverse osmosis membranes and heat exchangers within water treatment plants. Fouling, the attachment or adsorption of substances onto the process equipment, limits heat and mass transfer, thus, the operation of the unit. A major fouling phenomenon in aqueous systems is scale formation due to precipitation of salts in water. Calcium carbonate and calcium sulphate are predominant sparingly soluble salts that are present in the seawater as well as brackish and industrial water systems. The first emphasis is the set-up of a model yielding consistent sets of thermodynamic properties (heat capacity, density, vapour pressure, osmotic pressure) for the aqueous systems. This model has two answer two purposes: applicability to numerical flow simulation and validity for a wide range of operating conditions - 0 to 100 bar in reverse osmosis membranes and 0 to 150 °C in heat exchangers at salinities up to 15 weight percent. Thus, a main effort is the modelling of the effects of varying temperature and pressure on the electrolyte equilibria. The topic of co-precipitation is addressed by differing equilibrium formulations, the range of validity and the applicability of the laws of thermodynamics is investigated. The second emphasis is the implementation of the thermodynamic model into a numerical flow simulation program. An existing stand-alone flow simulation code provides extensive opportunities to implement the property data and the specific boundary conditions for heat and mass transfer in the devices. The output of the overall simulation are predictions of scaling effects depending on the operating conditions. This knowledge can be used to optimise the these conditions as well as the usage of anti-scalants and other pre-processing steps. The information of salt concentrations and the osmotic pressure at the surface of the membrane leads to better assessment of the mass transfer.

## **236583- FUEL OXYGENATES WPO**

Assessment of wet peroxide oxidation using innovative catalysts for removal of fuel oxygenates from contaminated water

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 3/1/2009 - 2/28/2011

*EC contribution:* € 162 130

*Policy drivers:* Chemical Aspects

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### **Abstract**

Fuel oxygenates were developed in the 1970s as octane enhancers. Methyl tertiary butyl ether (MTBE) is by far the most commonly used oxygenate worldwide. Ethyl tertiary butyl ether (ETBE), having similar physical-chemical properties, is becoming a preferred alternative to MTBE in some countries due to tax incentives connected with biomass-derived ethanol which is utilized in ETBE production. As a result of its physical-chemical properties and resistance to biodegradation, MTBE persists in groundwater for long time. Several highly MTBE-polluted sites have been identified in Europe in the last years, particularly in Germany. The currently applied processes for removal of MTBE from groundwater (e.g. stripping and adsorption on activated carbon) require high operation costs. With regard to cost-effective management of contaminated sites and accomplishing the new EU chemical legislation there is clearly a need for the development of innovative, safe and efficient technologies of fuel oxygenates treatment. The main scientific aim of the present project is the assessment of wet peroxide oxidation (WPO) of fuel oxygenates (mainly MTBE and ETBE) using innovative catalysts based on Fe-containing zeolites. The project combines two main objectives: I) improvement of the knowledge about the mechanisms of the catalytic process II) proof-of-principle of the developed process by means of a pilot scale test at a field site. In the first period laboratory experiments will be conducted involving (1) synthesis and/or selection of new Fe-containing zeolites, (2) characterization of the catalysts, (3) catalytic activity tests under different conditions including column experiments and (4) studies on the reaction mechanism. In the second period the knowledge acquired in the laboratory experiments will be applied for a pilot scale test under real conditions.

## **039413- FUNPANE**

The Synthesis and Evaluation of Micro-engineered Functional Particles from Nano-emulsions

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 1/16/2007 - 1/15/2009

*EC contribution:* € 169 365

*Policy drivers:* Chemical Aspects

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### **Abstract**

This proposal concerns research aimed at the development of novel particles for the delivery of active components encapsulated within coating formulations. Specific objectives include the development of encapsulated pigments, cross-linking catalysts, fungicides and fragrances. In each case encapsulating the active will increase its efficiency, thereby reducing the amount of active required to achieve the desired benefits. In the case of fungicides and fragrances, the timescale over which these materials are released will also be considerably extended, greatly increasing their efficacy. Delivering these benefits into a coating formulation is a long term goal of the industry.

The particles will be produced using mini-emulsion polymerisation methods. However, to achieve the required particle properties new developments in mini-emulsion technology will be required. Firstly, the range of polymers that it is possible to produce by mini-emulsion methods will be developed to allow the synthesis of highly crystalline polymer particles - the high barrier properties of such materials to water and oxygen being necessary for the protection of some actives. Secondly, optimisation of the polymerisation methods used will be necessary to allow the incorporation of potentially reactive components into the polymer particles without any participation of the active species in the polymerisation reaction.

The candidate is well qualified to perform the work, having skills in the preparation and characterization of polymer nano-particles of controlled size, morphology and internal structure and experience in the application of polymer particles micro-carriers and coatings technology.

The research training will be complemented by the provision of broader business and personal development training delivered via the ICI European Graduate Development Programme.

The project will facilitate co-operation between Europe and Chinese academia, thus fulfilling an objective of the MC IIF.

## **256423- HCWPC**

### Health Consequences of Water Pollution in China

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 7/1/2010 - 6/30/2014

*EC contribution:* € 100 000

*Policy drivers:* Chemical Aspects  
Socio-economy

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### **Abstract**

During the 1980's and 1990's, China's rapid economic growth transformed the country and lifted millions of its citizens out of poverty. The economic boom, however, has been accompanied by environmental side effects, including a severe deterioration in the quality of the country's rivers and lakes. Concurrent with the decline in water quality in China's lakes and rivers, the country has witnessed an increase in rural cancer rates. Stomach cancer and liver cancer now represent China's 4th and 6th leading causes of death, and in combination with other digestive tract cancers (e.g. esophageal) account for 11% of all fatalities and nearly one million deaths annually (World Health Organization 2002). The goal of this project is to assess the causal link between water quality and digestive cancer rates in China. This research question has important implications for public health because of both by the high incidence of digestive cancers, and the fact that those who die from these diseases are relatively young – the average decedent loses 20.2 years of remaining life expectancy. In addition, recent estimates by the World Bank (2006) indicate that as many as half of China's inhabitants still lack access to safe drinking water. Identifying the causal connection between polluted water and cancer rates is therefore of great importance in China, and in other developing nations where industrialization precedes the widespread introduction of water treatment. Identifying risk factors for cancer is also of general scientific interest and the results and may provide information valuable to public health officials in the European Union and other developed nations.

## **221724- HG-197 MEHG ASSESS**

Evaluation of Methyl-mercury production and decomposition by using Hg-197 radiotracer produced out of mercury enriched in Hg-196 isotope

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 11/1/2008 - 10/31/2009

*EC contribution:* € 93 988

*Policy drivers:* Chemical Aspects

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### **Abstract**

Mercury (Hg) is in the form of monomethylmercury (MeHg) a biological neurotoxin, harmful to the wildlife and to humans. MeHg species is produced from Hg<sup>2+</sup> by natural processes occurring within the water bodies. MeHg can also be degraded by natural processes; therefore, the net MeHg production arise from the combination of both kind of processes. The analytical tools to assess these processes consist in the use of labelled Hg in laboratory experiments to trace Hg transformations. One of the factors affecting Hg transformations is its concentration. MeHg production studies performed up to present in the water column are few and limited, due to the limitation of existing techniques in simulating natural levels or real environmental contamination situations that involve levels of Hg<sup>2+</sup> from 0.1 to 50 ng.L<sup>-1</sup>, while most studies in sediments involve unrealistic Hg<sup>2+</sup> additions, since Hg concentrations at natural or low contaminated levels range from 10 to 200 ng.g<sup>-1</sup>, with a bio-available fraction for MeHg production from 0.1 to 10 %. Recent collaboration between the author and the DES of the Jozef Stefan Institute (JSI), Slovenia, showed the feasibility of these studies using the short-lived radiotracer Hg-197 produced out of Hg enriched isotopically in Hg-196, allowing realistic Hg<sup>2+</sup> additions to study MeHg production both in the water column and sediments. This project propose the development of analytical techniques to study de-methylation processes in water and sediments, by using traced MeHg in laboratory experiments. These processes are currently assessed using either C-14 and Hg-203 radiotracers, but the use of Hg-197 radiotracer will allow much lower MeHg additions, and hence realistic simulations of natural de-methylation processes. The project also consider the application of the Hg-197 radiotracer in the evaluation of MeHg production, including reduction of Hg<sup>2+</sup> to Hg<sup>0</sup>, in different real situations in environmental studies on going in the DES of the JSI.

## **232068- HI-FRE**

Efficient membrane filtration units with integrated High Frequency Backpulsing device

[www.hi-fre.eu/index.php?id=1](http://www.hi-fre.eu/index.php?id=1)

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*Funding scheme:* BSG-SME (Research for SMEs), FP7

*Project duration:* 6/1/2009 - 5/31/2011

*EC contribution:* € 660 000

*Policy drivers:* Chemical Aspects

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### **Abstract**

Membrane filtration has become a key technology for many environmental and industrial applications. Yet in spite of several cleaning options at hand, fouling phenomena such as cake layer formation and pore blocking still limit its performance. The objective of this project is to overcome these limits by developing, a high frequency back-pulsing device, integrating it into membrane filtration systems and transferring the knowledge gained to new, more competitive products and services offered by the SMEs involved. The key feature of the innovative back-pulse concept is a valve-less construction providing short response times, defined pulse shape and efficient membrane cleaning at minimal back-pulse flow. Selected membranes (polymeric and ceramic) and modules (capillary and flat sheet) will be tested. The integration of pulsing device and module is essential for successful scale up. It has to take into account inertia, viscosity and elasticity effects and gets prime attention in a dynamic modelling approach. The applications to be investigated range from the treatment of liquid residues of biomass-based power generation to treatment and reuse of process fluids and wastewater, including membrane bioreactor applications. The project addresses all critical points along the value chain from membrane supply to end-use. Its outputs include insight into the hydrodynamics of high frequency back-pulsing, novel back-pulsing devices, adapted membrane/module configurations and new applications for a new technique. The consortium includes 2 RTD partners focussing on technology (VITO), modelling (RWTH) and testing (FHNW), 4 SMEs manufacturing back-pulsing devices (Pirmatech), ceramic membranes (ATECH), polymeric membranes and filtration systems (Inge, A3), 1 SME as system integrator (Waterleau), 2 SME end-users (Agroservice, Bio-Energy Maasland) and one large end-user for demonstration (WSHD).

## **036224- HI-WATE**

### HEALTH IMPACTS OF LONG-TERM EXPOSURE TO DISINFECTION BY-PRODUCTS IN DRINKING WATER

<http://www.hiwate.eu>

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*Funding scheme:* STP (Specific Targeted Research Project), FP6

*Project duration:* 11/1/2006 - 8/31/2010

*EC contribution:* € 3 469 736

*Policy drivers:* Chemical Aspects

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#### **Abstract**

The overall aim is to investigate potential human health risks associated with long-term exposure to low levels of disinfectants (such as chlorine) and disinfectant by-products (DBPs) occurring in water for human consumption and use in the food industry. The study will comprise risk/benefit analyses including quantitative assessments of risk associated with microbial contamination of drinking water versus chemical risk and will compare alternative treatment options. The outcome will be improved risk assessment and management. The study will make use of existing studies/databases and newly collected information. Specific objectives are: I) To determine the DBP composition and levels in drinking water in various regions in Europe II) To identify the determinants of DBPs and develop predictive models III) To assess the risk of small for gestational age, premature birth, semen quality, stillbirth and congenital anomalies in relation to disinfection practices and levels of DBPs, including any gene-environment interactions where possible IV) To assessment the risk of cancer, particularly bladder cancer and colon cancer, in relation to DBP levels, including any gene-environment interactions V) Conduct risk/benefit analyses including quantitative assessments of risk associated with microbial contamination of drinking water versus chemical risk, compare alternative treatment options, and produce burden of disease estimates (e.g. DALYs) VI) To review the water and health policies in Europe, USA and worldwide in relation to water disinfection. VII) To assess the policy implications of current disinfection practices Water samples will be collected and analysed for a range of DBPs to give a wider picture on their levels and determinants. Epidemiological studies will be conducted or existing studies used to examine the relationship between DBPs and various outcomes to provide risk estimates for the risk/benefit analysis.

## **009152- HOMER**

### Hydrophobicity, Lipophilicity and Bioavailability of Trace Metals in Coastal Systems

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 6/1/2005 - 5/31/2007

*EC contribution:* € 168 232

*Policy drivers:* Chemical Aspects

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#### **Abstract**

It is widely accepted that the most chemically reactive and biologically available form of trace metal in natural environments is the free ion. For many metals, organic complexes dominate metal speciation in natural waters and the free ion comprises a relatively small fraction of total metal. Some complexes of trace metals are, however, thought to display toxic characteristics when they are sufficiently small and hydrophobic (or lipophilic) to cross the plasma membrane directly. The partitioning of a chemical between water and n-octanol is a widely used and internationally accepted standard test for determining the lipophilicity and bioavailability of organic contaminants. In this study, we propose to apply this approach to examine the hydrophobicity, lipophilicity and bioavailability of trace metals in estuarine environments of European coastal areas. Water samples from contaminated freshwater and brackish water environments will be filtered through a series of standard and ultra filters in the range 1000 Da to 0.5  $\mu\text{m}$  in order to distinguish the size fractionation of hydrophobic metals. Fractionated samples will be incubated with n-octanol and the two phases then separated and analysed for metals (Al, Cd, Cu, Fe, Hg, Mn, Pb, Zn) by ICP-MS or AAS. Additional experiments will involve the addition of toxic platinum group metals (Pt; Rh; Pd) to natural samples and the kinetics of formation of lipophilic platinum group metals will be examined. The results will be presented in terms of conditional octanol-water partition coefficients,  $D_{ow}$ , representing hydrophobicity, and  $K_{ow}$ , representing lipophilicity and specific to metal species that are small enough to penetrate the cell membrane. The results of this study will afford a novel, yet invaluable insight into the speciation (including the refinement of chemical speciation models), bioavailability and toxicity of trace metals in the natural environment and will have a general application to European coastal systems.

## **513660- HORIZONTAL-HYG**

Horizontal Standards on Hygienic parameters for  
Implementation of EU Directives on Sludge, Soil and Treated  
Bio-waste

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*Funding scheme:* STP (Specific Targeted Research Project), FP6

*Project duration:* 12/1/2004 - 2/29/2008

*EC contribution:* € 1 648 296

*Policy drivers:* Chemical Aspects

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### **Abstract**

The working documents on revision of the Sewage Sludge Directive (86/278/EEC) on Biowaste and the Soil Protection Communication call for standards on sampling and analysis of sludge, treated biowastes and soils. The European Directives are intended to prevent unacceptable release of contaminants, impairment of soil function, or exposure to pathogens, and to protect crops, human and animal health, the quality of water and the wider environment when sludges and treated biowastes are used on land. The EU animal by-product regulations are fixing microbiological threshold values, for which microbiological methods of analysis are needed. The European Commission wishes to cite European (CEN) standards in order that there is harmonised application of the directives and that reports from Member States (MS) can be compared. This project to develop standards for hygienic parameters in sludge, soil and biowaste, presented under the name "HORIZONTAL-HYG", will be carried out under the umbrella of the main project HORIZONTAL "Development of horizontal standards for soil, sludge and biowaste". This ensures full integration in the CEN system through BT Task Force 151 specially set up in support of this project as well as direct supervision by DG ENV and MS, which form the Steering Committee of HORIZONTAL. Preparation of HORIZONTAL-HYG was taken in a full agreement with the DG ENV, DG JRC and the MS already contributing to HORIZONTAL. HORIZONTAL-HYG's objective is to produce standardised methods for sampling and hygienic microbiological parameters, as Salmonella spp, Escherichia coli, Clostridium perfringens, Ascaris ova in sludges, treated biowastes and soils written in CEN format. Validation of the methods is an essential part of the development as it quantifies performance in terms of repeatability and reproducibility. The consortium is well connected in CEN and ISO and thus provides an excellent basis for implementation of the deliverables.

## **502411- HORIZONTAL-ORG**

Horizontal Standards on Organic Micropollutants for  
Implementation of EU Directives on Sludge, Soil and Treated  
Bio-waste

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*Funding scheme:* STP (Specific Targeted Research Project), FP6

*Project duration:* 10/1/2003 - 9/30/2006

*EC contribution:* € 1 627 652

*Policy drivers:* Chemical Aspects

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### **Abstract**

The working documents on revision of the Sewage Sludge Directive (86/278/EEC) and on Biowaste and the Soil Protection Communication call for standards for sampling and analysis of sludges, treated biowastes and soils. They list hygienic and biological parameters, and inorganic and organic contaminants. The European Directives are intended to prevent unacceptable release of contaminants, impairment of soil function, or exposure to pathogens, and to protect crops, human and animal health, the quality of water and the wider environment when sludges and treated biowastes are used on land. Analytical results are to some extent defined by the methods of determination, it is therefore desirable that methods are defined before setting limit values. The European Commission wishes to cite European (CEN) standards in order that there is harmonised application of the directives and that reports from Member States (MS) can be compared. This proposal to develop standards for organic compounds in sludge, soil and biowaste, presented by the consortium under the name "HORIZONTAL-ORG", will be carried out under the umbrella of the main project HORIZONTAL "Development of horizontal standards for soil, sludge and biowaste". This ensures full integration in the CEN system through a BT Task Force specially set up in for this project and direct supervision by DG ENV and MS, which form the Steering Committee of HORIZONTAL. HORIZONTAL-ORG's objective is to produce standardised methods for sampling and analysing organic micropollutants in sludges, treated biowastes and soils written in CEN format. Where possible these will be horizontal across the different media. Validation of the methods is an essential part of the development as it quantifies performance in terms of repeatability and reproducibility. The consortium is very well connected in CEN and ISO and thus provides an excellent basis for implementation of the deliverables.

## **222313- HYDRACT**

Hydraulic Actuator for Valves in Brewery, Dairy and  
Pharmaceutical Industries

[www.hydract.eu/index.html](http://www.hydract.eu/index.html)

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*Funding scheme:* BSG-SME (Research for SMEs), FP7

*Project duration:* 6/1/2008 - 1/31/2011

*EC contribution:* € 1 260 443

*Policy drivers:* Chemical Aspects

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### **Abstract**

The overall project objective is the development of an innovative hydraulic actuator based on sterile water to operate sanitary valves with a primary application in the brewery, dairy, and pharmaceutical industries. The final product will have clear advantages to current pneumatic process machinery in these industries, both in terms of performance, food safety, and in particular with regard to energy savings. Technical barriers in the project are primarily linked to the use of water hydraulics to fulfill the requirements of hygienic systems as regards ease of cleaning, being crevice free, and not providing a source of biological or chemical contamination for the processed product; the assessment and development of materials and seal designs aimed at maximising hydrodynamic effects and minimising wear; and exploitation of the direct flow/time relation of hydraulics - as opposed to compressed air - for efficient control and surveillance of the actuator/valve system. Accordingly, project development activities are structured around tasks related to fluid engineering and the mechanical design of the actuator; sealing and coating; and sensing and wireless RFID technology for the actuator control system.

## **039444- HYDRANT**

Instantly structured emulsions - How do they work?

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 1/1/2007 - 12/31/2006

*EC contribution:* € 146 440

*Policy drivers:* Chemical Aspects

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### **Abstract**

Innovative microstructural design in emulsion technology has led to the development of Instantly Structured Emulsions (ISE). This remarkable technology enables the creation of kinetically stable emulsions through a process of tailored ingredient hydration. Relative to conventional emulsification processes, energy input is negligible. HYDRANT is aimed: â€¢ To understand the range of colloidal phenomena and microstructural interactions responsible for the creation and stabilization of ISE. Specifically: o Interfacial design - How the competition for the oil/water interface between proteins and low molecular weight emulsifiers affects the resulting droplet size and stability in the presence of negligible amounts of energy. o Aqueous phase structuring - How biopolymers affect the hydration behaviour of cold-swelling starches. o Environmental conditions - The dependence of the above mentioned mechanisms on pH and ionic strength. â€¢ To develop models that allow the prediction of both, adsorption and hydration rates, based purely on matrix composition. â€¢ To create the scientific basis for the successful design and execution of Spontaneous Food Emulsions. â€¢ To contribute to the development of premium quality instant foods, which suit the needs of health-conscious consumers, while minimising ingredient, process and supply costs, which will have environmental and financial benefits. Due to the minimum energy expenditure in their manufacture, ISEs will benefit low-income consumers in third world countries by providing them with healthier, affordable, and ready-to-eat options. HYDRANT will boost the Fellowâ€™s scientific understanding of complex colloidal systems whilst positioning him ahead on how to develop food emulsion systems that utilise minimal energy input. Finally, HYDRANT will facilitate a highly-needed transfer of knowledge between Europe and Latin America to ameliorate the latterâ€™s technological lag.

## **212790- HYDRONET**

Floating Sensorised Networked Robots for Water Monitoring

[www.hydronet-project.eu/](http://www.hydronet-project.eu/)

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*Funding scheme:* CP (Collaborative Project), FP7

*Project duration:* 12/1/2008 - 1/31/2012

*EC contribution:* € 2 591 475

*Policy drivers:* Chemical Aspects  
Ecological Status

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### **Abstract**

Water is one of our most precious and valuable resources. It is important to determine how to fairly use, protect and preserve water. New strategies and new technologies are needed to assess the chemical and ecological status of water bodies and to improve the water quality and quantity. The relatively recent progress in micro-electronics and micro-fabrication technologies has allowed a miniaturization of sensors and devices, opening a series of new exciting possibilities for water monitoring. Moreover, robotics and advanced ICTbased technology can dramatically improve detection and prediction of risk/crisis situations, providing new tools for the global management of the water resources. The HydroNet proposal is aimed at designing, developing and testing a new technological platform for improving the monitoring of water bodies based on a network of autonomous, floating and sensorised mini-robots, embedded in an Ambient Intelligence infrastructure. Chemo- and bio-sensors, embedded in the mobile robots will be developed and used for monitoring in real time physical parameters and pollutants in water bodies. Enhanced mathematical models will be developed for simulating the pollutants transport and processes in rivers, lakes and sea. The unmanaged, self-assembling and self-powered wireless infrastructure, with an ever-decreasing cost per unit, will really support decisional bodies and system integrators in managing water bodies resources. The robots and sensors will be part of an Ambient Intelligence platform, which will integrate not only sensors for water monitoring and robot tasks execution, but also communications backhaul systems, databases technologies, knowledge discovery in databases (KDD) processes for extracting and increasing knowledge on water management. Following the computation on stored data, feedback will be sent back to human actors (supervisors, decision makers, industrial people, etc.) and/or artificial actuators, in order to perform actions.

## 231975- HYDRUS

Development of crosslinked flexible bio-based and biodegradable pipe and drippers for micro-irrigation applications

[www.aimplas.es/proyectos/hydrus/](http://www.aimplas.es/proyectos/hydrus/)

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*Funding scheme:* BSG-SME (Research for SMEs), FP7

*Project duration:* 7/1/2009 - 6/30/2012

*EC contribution:* € 1 104 858

*Policy drivers:* Chemical Aspects  
Water and Agriculture

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### Abstract

The Southern Accession countries and Southern EU countries use the largest percentages of abstracted water for agriculture (75 % and 50 %, respectively), primarily for irrigation. This means consume of 120.000 Millions of m<sup>3</sup>/year of water. The use of micro irrigation system can reduce the water consume in near 60%, i.e., reduction in consume of 70.000 millions of m<sup>3</sup>/year. Furthermore, this market is expected to grow quickly due to new water regulations in the near future (due to the worrying problems of the desertification and longer periods of drought). Despite the benefits that the micro-irrigation systems present, there are some limitations that burden its use by the farmers: a). High cost to remove the product at the end of its useful life (even higher in combination with mulching system) and b). Non recyclable pipes due to its conditions of use the material losses its mechanical properties by the effect of UV radiation, is chemically attacked and has contaminants. The aim is to develop plastic pipes and drippers for micro-irrigation produced with bio-based and biodegradable material which will maintain their functional properties during lifespan and at the same time biodegrade after use without the need to remove and dispose. HYDRUS approach will consist on two-step process: 1. Reactive extrusion: A low module biopolymer and/or polymeric plasticisers and graft coupling agents will be added to the current PLA, using a compounding multi screw extruder. 2. Extrusion pipe line+ crosslinking (standard equipment): Addition of organosilanes or peroxides to the previous blend (PLA + additives) and production of the pipe. The same process will be applied for the drippers with standard injection moulding machines. The new pipe will show Good thermal, Environmental Stress Cracking and flexural resistance, in addition to this, the drip will also meet the dimensional stability, fulfilling therefore the requirements needed in normal conditions for traditional micro-irrigation systems.

## **255635- HY-REM**

Metal-containing hybrid materials for water remediation from trace heavy metals

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 10/1/2010 - 9/30/2012

*EC contribution:* € 171 240

*Policy drivers:* Chemical Aspects

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### **Abstract**

Innovative approaches based on alloying of metals to remove mercury from drinking water will be developed. Gold and silver nanoparticles immobilized on the surface of silsesquioxane-hydride films deposited on silica-gel surfaces will be used as a novel adsorbent for trace mercury removal. Use of silsesquioxane-hydride as an additive for producing cryogels allows for creation of novel clean up devices for trace mercury removal from various environmental media. Incorporation of iron oxide nanoparticles in pores of silica-gel increase the specificity of the sorbent to arsenic removal.

## **515234- IASON**

International Action for Sustainability of the Mediterranean and Black Sea Environment(IASON)

[www.iasonnet.gr/](http://www.iasonnet.gr/)

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*Funding scheme:* SSA (Specific Support Action), FP6

*Project duration:* 1/1/2005 - 6/30/2006

*EC contribution:* € 452 550

*Policy drivers:* Chemical Aspects

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### **Abstract**

Under the 2003 EU Greek presidency, cooperation with Balkan countries on environmental issues was identified as a priority of the EU/Balkan Action Plan. Large-scale co-operation is essential for effective action in the vulnerable Mediterranean and Black Sea coastal zones. During the last 50 years both areas suffered major changes; as semi-enclosed basins, both Seas are ultra-sensitive to anthropogenic stress and to climate change. An EU Presidency Conference on Sustainable Development in the Mediterranean/Black Sea (May 2003), revealed major gaps in management structures, scientific strategies and identified a diversity of environmental issues to be resolved through priority-focused RTD cooperation. Yet, while pressure on the resources of the two seas increases and the potential impact of climate change on coastal and deep-sea resources remains unknown, the two seas have never been jointly studied as systems of interacting basins and ecosystems. The proposal outlines collaboration and clustering schemes involving environmental, economic and scientific organisations in Mediterranean, Black Sea and other EU nations, in order to create synergies in networking and exchanges at several levels, addressing for the first time the system of interconnected basins as one, based on the integration of, both horizontally and vertically, natural scientists and economists. These will: 1) Create an international, interdisciplinary platform coordinating the region's scientific potential in order to prepare RTD projects, based on a Science Plan for the region, securing sustainable development; 2) Focus on natural and anthropogenic pressures exerted upon the functioning of the ecosystem; 3) Reinforce RTD capacity by setting up an environment/resource monitoring network in the light of existing observation networks of different scopes.'

## **039185- IMPULSE**

InforMation Processing in PULSEd P Environments: Comparison of adaptive phosphorous uptake and the competitive abilities between bloom forming diatoms and the coccolithophore *Emiliana huxleyi*.

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 1/1/2007 - 12/31/2008

*EC contribution:* € 228 758

*Policy drivers:* Chemical Aspects

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### **Abstract**

To date, research on adaptation of photosynthetic microorganisms to external stimuli such as nutrients and light has mainly focussed on full adaptation. The aim of this study is to understand the largely unknown constraints that determine the transition from one adaptive state to another. This is not a time invariant phenomenon, but proceeds in a historical context in that every adaptation is determined by previous adaptation of an organism. In this respect the cellular memory will be studied as response to a sequence pattern of phosphorus pulses varying in amplitude and frequency. The <sup>32</sup>P-uptake experiments focus on the ecophysiological relevance of information processing in a P-pulsed environment. From this view, the P-uptake will be described phenomenologically as in thermodynamics. P is favoured because it can limit both marine and freshwater algal growth and plays a central role in metabolic pathways. In the past, nutrients as P have often been treated as slowly varying in ecological studies. However, we know that P is often supplied in pulses when microscopic animals or fish excrete, or when storms mix P-rich deeper waters into P-poor surface waters. A key issue here is, to gain a better understanding how the adaptive uptake of P-pulses interact with the utilisation of light and other nutrients. The P-light-interactions will be analysed by photosynthetic properties of contrasting states, the `adapted state and the `non-adapted (adaptive) mode. The study of cellular P-compounds as DNA, RNA and lipids will be linked to ecological stoichiometry. We will prove the hypothesis that distinct P-uptake strategists confirm a recently discussed concept of ecological strategists. Practical issues are to develop field bioassays determining the P-availability in marine systems. Experiments will be undertaken with two marine algae *Thalassiosira weissflogii* and *Emiliana huxleyi* which have contrasting P-light requirements and are representative of marine biochemical cycles.

## **036882- INNOWATECH**

Innovative and integrated technologies for the treatment of industrial wastewater

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*Funding scheme:* STP (Specific Targeted Research Project), FP6

*Project duration:* 11/1/2006 - 3/31/2010

*EC contribution:* € 2 750 000

*Policy drivers:* Chemical Aspects

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### **Abstract**

The main objective of the project is to investigate, assess and enhance the potentiality of promising technological options (i.e., technologies, processes and concepts) for the treatment of industrial wastewater with the specific aim to provide tailor-made solutions to end-users for a wide range of wastewaters. Such solutions will be essentially based on the optimized integration of the investigated options and on technological improvements with respect to treatment system components, operation and control. Referring to the investigated options and the envisaged technological solutions, the project's goals are:

- Investigating and enhancing the performances of promising wastewater treatment options such as aerobic granulation, integrated advanced oxidation processes (AOP) and membrane-based hybrid processes
- Achieving fundamental and technological knowledge advancements necessary for advanced wastewater treatment application in different industrial sectors
- Assessing the economic and environmental sustainability of promising wastewater treatment options
- Developing integrated tailor-made solutions for end-users in different industrial sectors
- Transferring the developed know-how to potential end-users inside and outside the project
- Favoring their actual implementation for enhancing the EU Water Industry competitiveness.

In order to achieve such goals, coordinated research activities will be carried out on selected options treating different wastewater. The experiences from such activities will be merged to define tailor-made solutions for end-users in different industrial sectors. A major goal will be the definition of treatment needs and framework conditions for a wide range of wastewaters based on the specific features of the options investigated (i.e., aerobic granulation, AOP combined processes, membrane contactors, membrane chemical reactors).

## **251863- INORGASS**

Determination of the Fate of Inorganic Components upon Gasification of Sewage Sludge

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 10/1/2011 - 9/30/2013

*EC contribution:* € 229 747

*Policy drivers:* Chemical Aspects

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### **Abstract**

Gasification is a promising technology for the production of renewable energy resources from biomass and waste streams, offering the advantage of providing a safe disposal route for organic pollutants. However, a major concern is the unclear fate of inorganic components during gasification, which brings about several environmental and technological issues. Because of its elevated content in N, P, S and heavy metals, sewage sludge forms an excellent model compound for a biomass waste stream with high inorganic loading. Hence, the current study focuses on elucidating the distribution and environmental risks of a series of target inorganic components into the gas phase, char residue and condensate, upon sewage sludge gasification. Hereto, an experimental study will be performed on bench scale, including advanced and complimentary chemical analyses, both on-line and off-line (GC-TCD, FTIR, ICP-AES, X-ray microfluorescence, X-ray diffraction and elemental analysis). The obtained experimental data will be used to develop strategies for clean gas production by operation at selected temperature stages and to extend existing gasification models with reaction mechanisms for inorganic components. Finally, the gathered know-how will be verified and updated through a pilot scale study. In view of the project management, a detailed workplan is set up, split into five subobjectives. The project results will contribute to European excellence by the dissemination of research results through international publications, possible patents and a workshop, allowing an immediate and clear impact on technology and legislation development. The scientific project and its many complimentary training aspects will allow the candidate to pursue and consolidate a European research career in the fields of wastewater treatment and renewable resources on the long term.

## **267853- INSPECTRA**

Silicon-photonics-based laser spectroscopy platform: towards a paradigm shift in environmental monitoring and health care

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*Funding scheme:* ERC (ERC Grant), FP7

*Project duration:* 4/1/2011 - 3/31/2016

*EC contribution:* € 2 183 000

*Policy drivers:* Chemical Aspects

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### **Abstract**

The Principal Investigator and his team will open up new horizons in the field of laser spectroscopy through basic research on silicon-photonics-based Spectroscopic Systems-On-Chip (SpecSOC's). The key question being addressed is: how can the powerful concepts of high-index-contrast nanophotonics be combined with the extreme accuracy of silicon technology and with the performance of hybrid silicon/III-V integration in order to create system-on-chip functionalities for advanced (bio-)spectroscopy.

We will first focus research on integrated lasers or Laser Systems-on-Chip (LaSOC's) capable of providing very wide wavelength tuning in the infrared, mid-infrared or visible. These lasers will have an unprecedented combination of properties. They will differ from existing semiconductor lasers in the sense that they combine the best of III-V semiconductor technology and silicon technology in unique cavity structures exploiting high index contrast in three dimensions. In the second phase of the project we will shift the focus from laser-oriented novelty to spectroscopy-oriented novelty and investigate SpecSOC's with an unprecedented system performance that matches the requirements of mainstream real-life spectroscopy. We will explore coherent optical detection techniques for sensitivity enhancement, microporous coatings for on-chip gas sensing and implant-oriented tissue spectroscopy.

Our research will lead to a paradigm shift in laser spectroscopy, in the sense that it will turn an advanced spectroscopy system into a small form-factor commodity system. This will have an enormous impact on applications such as point-of-care medical diagnosis and medical implants, monitoring of air, water and food quality. Furthermore the on-chip spectroscopy systems will be highly valuable for fundamental research.

## **246812- INTERCOM**

The Influence of Interfaces, Confinement and Compartmentalization on Chemical Reactions

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*Funding scheme:* ERC (ERC Grant), FP7

*Project duration:* 5/1/2010 - 4/30/2015

*EC contribution:* € 2 147 726

*Policy drivers:* Chemical Aspects

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### **Abstract**

Water is essential for life on our planet and is the solvent of choice for Nature to carry out her syntheses. In contrast, our methods of making complex organic molecules have taken us far away from the watery milieu of biosynthesis. Indeed, it is fair to say that most organic reactions commonly used both in academic laboratories and in industry fail in the presence of water or oxygen. At the same time of course, chemical reactors are very different from the cellular environment where Nature's synthesis is carried out. This research proposal aims to incorporate some of the key characteristic of cellular reactors, i.e. confinement, compartmentalization and interfaces, into model droplet-based reactors. The envisioned reactors will comprise of monodisperse aqueous droplets in oil carrier phases with volumes ranging from pL to nL, produced in microfluidics devices or in tubing, in very large numbers. These droplets will have precisely determined interfacial areas, which can be used for the study of so-called on water reactions, a new area of synthetic chemistry rapidly gaining in interest. Furthermore, the interfaces can be functionalized with catalytically active surfactants and by confining the droplets into ever decreasing volumes, the effect of nanoconfinement on enzymatic and other reactions can be studied. Finally, individual droplets provide a completely compartmentalized environment, suitable for the study of single enzymes in a crowded environment, but also for systematic studies into communication between compartmentalized, mutually incompatible, reaction systems. This proposal presents a radically new approach to increasing our understanding of chemical reactions in confined spaces and at interfaces and provides a technological platform for the creation of chemically linked networks with emerging complexity.

## **219675- INTERNAL EXPOSURE**

Internal exposure in tissue equilibrium sampling to bridge the missing link between bioavailability and bioaccumulation

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 4/15/2008 - 10/14/2011

*EC contribution:* € 177 320

*Policy drivers:* Chemical Aspects

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### **Abstract**

The training program is designed for Annika Jahnke, a very talented young researcher who has successfully completed her doctoral studies on polyfluorinated alkyl substances in the marine atmosphere. The proposed 24-month project seeks to extend her competencies to internal exposure, bioaccumulation and bioavailability of organic contaminants. The missing link between external concentrations of persistent organic pollutants (POPs) and their levels at target sites in organisms where adverse effects occur will be investigated. This research issue is fundamental for risk assessment of contaminants. The training program consists of three research objectives: (1) Internal exposure: Develop equilibrium sampling methods to measure chemical activity / fugacity of POPs in biota; use them to test the hypothesis that POP fugacity is the same in different tissues throughout a given organism. (2) Bioaccumulation: Explore bioaccumulation in marine food webs from the Baltic Sea by measuring the fugacity of a given POP at different trophic levels. (3) Bioavailability: Develop methods to measure the freely dissolved concentration of POPs in water and sediment, which is equivalent to the chemical activity / fugacity. Use them together with the above methods to explore bioavailability effects on bioaccumulation, and to determine differences in POP fugacity between benthic and pelagic organisms as well as their respective environments. An additional component of the training program will provide the applicant with important complementary competencies including research supervision and project management. This completes a program which is carefully matched to the applicant's needs and exploits the unique possibilities at Stockholm University and the Danish National Environmental Research Institute. With the experience gained in this project, the talented applicant will be well prepared for a successful independent research career.

## **275785- ISOCRIT**

Application of a Novel Magnesium-Lithium Dual Isotopic Tracer to Biogeochemical Cycles in the Soil Critical Zone

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 8/1/2011 - 7/31/2013

*EC contribution:* € 210 092

*Policy drivers:* Chemical Aspects

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### **Abstract**

Chemical weathering exerts a key control on global CO<sub>2</sub> cycles and ocean chemistry. Magnesium is a particularly important aspect of seawater chemistry, given that it controls the nature of carbonate precipitation is important tool in the reconstruction of past ocean temperatures. Stable isotopic tracers are increasingly being used to identify sources of Mg and other constituents in rivers and oceans and in marine sediments and sedimentary rocks to deduce paleoclimates, ancient ocean chemistry and circulation, and other aspects of Earth's history. However these interpretations are entirely dependent on the processes that may fractionate the isotopes during mineral weathering and (bio)geochemical cycling.

This proposal seeks to develop a novel biogeochemical multi-tracer using Mg and Li isotopes and apply it to test and interrogate the hypothesis that the isotopic composition of Mg in rivers is influenced by chemical weathering reactions in catchment soils. In particular, it seeks to understand processes in soils, the ultimate reactor in which the riverine flux to the oceans is determined. As an intensive case study, the isotopic multi-tracer technique will be applied to a large set of natural samples previously obtained from the Luquillo Mountains in Puerto Rico. This dataset will be used to demonstrate the potential of the multi-tracer technique and to move forward the models of biogeochemical mineral nutrient cycling that I am developing for the Luquillo Critical Zone Observatory (LCZO). The Mg-Li multi-tracer will also be applied on a global scale, by analyzing a large suite of soil samples from a variety of climates, latitudes, and rock types, which are currently archived by Professor Vance in Bristol.

## **266579- JORIEW**

Improving capacity of Jordanian Research in Integrated Renewable Energy and Water supply

[www.joriew.eu/sitegenius/index.php](http://www.joriew.eu/sitegenius/index.php)

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*Funding scheme:* CSA (Coordination - or networking - action), FP7

*Project duration:* 11/1/2010 - 10/31/2013

*EC contribution:* € 499 233

*Policy drivers:* Chemical Aspects  
Socio-economy

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### **Abstract**

The objective of the JoRIEW project is to reinforce the cooperation capacities of Jordanian research centres by promoting closer scientific collaboration with a number of ERA located research centres and universities. The JoRIEW project will help structure and enhance S&T cooperation in areas of common interest, such as research system integration, integrated energy and water planning, development of water supply systems that can be powered by intermittent renewable energies, in particular flexible pumping techniques and reverse osmosis desalination technology, where joint research efforts could bring common solutions and mutual benefits. It opens a new chapter of scientific cooperation between the EC and Jordan, an important partner in the EU/s neighbourhood policy.

Improving Jordanian capacities in research will be achieved through following activities: Networking of Jordanian and EU research centres in view of disseminating scientific information, identifying partners and setting up joint research Developing training modules to build competency and facilitate the Jordanian participation in FP7 regarding energy and water research Developing the Jordanian research strategy for sustainable and renewable energy and water desalination in order to increase its scope, in particular its regional coverage and to improve its responses to the socio-economic needs of Jordan and other countries in the region JoRIEW project actions aim to enhance international cooperation with Jordan by including S&T capacity building (human resources, research policy, networks of researchers and research institutes) activities. Project will enable Jordanian researchers to contribute to the solution of local, regional and global problems and to economic and social development. Enhanced research capacity will also encourage researchers to compete internationally in terms of scientific excellence and increase their incentives to continue to base their research activities in Jordan.

## **036864- KNAPPE**

Knowledge and Need Assessment on Pharmaceutical Product in Environmental Waters

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*Funding scheme:* SSA (Specific Support Action), FP6

*Project duration:* 2/1/2007 - 9/30/2008

*EC contribution:* € 593 136

*Policy drivers:* Chemical Aspects  
Ecological Status

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### **Abstract**

"Pharmaceuticals in the Environment" is an issue receiving growing attention. About 4000 medical compounds are being used in the drugs applied today. It is estimated that worldwide consumption of active compounds amounts to some 100 000 tons or more per year. Consequently, there is a need to highlight the most important questions and issues related to presence of pharmaceuticals in the environment. What we ought to know to understand the occurrence, the fate and the effects of pharmaceuticals in order to set up environmental risk assessment? By pulling together results of previous and on going EU projects and published data from both governmental sources and scientific literature, by involving manufacturers in supplying data on production and usage of pharmaceuticals, KNAPPE project will carry out the state of knowledge and put emphasis on questions deserving attention such as: - What is the spectrum of most relevant pharmaceutical products (PP's) for the aquatic environment? Which indicators for supporting environmental managers, health authorities? - What is the efficiency of urban and industrial sewage treatment plants over a year? What is the fate and behaviour of PP's in sewage treatment plants? If receiving waters are used for potable water supplies, does the presence of these compounds represent a potential hazard to human health? - Could we solve some problems by environmental or cleaner technologies? - What regulatory approaches, incentives, prevention actions can be implemented in order to lower PP's concentration in the environment? Does a European practical guidance can be developed? - Can the impacts of PPs on the environment be reduced through the use of eco-pharmacostewardship approaches including the use of clean synthesis, classification and labelling, and better communication of methods of 'good practice'? - How can we better monitor the environmental impact of a pharmaceutical once it has received a marketing authorisation?

## **512955- LASER-MEM**

Develop methods of manufacturing customized flexible membranes using laser technology

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*Funding scheme:* SME (SMEs-Co-operative research contracts), FP6

*Project duration:* 12/1/2004 - 2/28/2007

*EC contribution:* € 646 742

*Policy drivers:* Chemical Aspects

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### **Abstract**

Polymer membranes are used today for many industrial and municipal applications to separate solids such as activated sludge from fluids like waste water. Apart from membranes for very special applications all standard membranes for basic applications are imported from outside Europe like the United States, Canada and Japan. The membranes exhibit properties that are not suitable for many applications: they clog up easily and are unreliable. They are expensive to maintain as they need frequent cleaning. Material has a fixed structure and cannot be customised easily to meet the needs of different applications. Manufacturing processes are based on expensive continuous methods. Licenses to manufacture are not available to European SMEs. The LASER-MEM project will use a different method of manufacture to overcome all the disadvantages inherent in existing products. Laser technology will be developed to enable membranes to be created from low cost raw material, using a process that can be implemented by SMEs. This new technique will enable the characteristics of the membrane to be controlled and provide the capability to manufacture sheets in a controlled way to suit the requirements of individual applications. It will remove the dependence on the global suppliers of membranes and will provide significant opportunities for SMEs to identify and develop new applications for the use of membranes. Better performance will be to the benefit of the end users, mainly SMEs as well.

## **222111- LEGIOTEX**

Continuous bactericide water filtration for the prevention of Legionella contamination in large public and industrial facilities

[www.legiotex.eu/](http://www.legiotex.eu/)

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*Funding scheme:* BSG-SME (Research for SMEs), FP7

*Project duration:* 9/1/2008 - 11/30/2010

*EC contribution:* € 1 072 653

*Policy drivers:* Chemical Aspects  
Ecological Status

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### **Abstract**

The aim of LegioTex is to develop a filter capable to inhibit the growth and proliferation of the bacteria belonging to the Legionella Pneumophila Family (responsible of the Legionnaire's disease) in climate control equipment for large public and industrial facilities. For this purpose, environmental-friendly bactericides will be fixed onto nonwoven textiles assuring a long lasting biocide effect and optimum mechanical properties. Legionella is present in all aqueous media. However it becomes a threat for human health when appropriate conditions for its growth and proliferation are met, which frequently happens in large in-doors facilities using systems for climate control: cooling systems, sanitary water distribution equipment (tanks, boilers, heaters and pipes) and other equipment subject to similar conditions. All large public facilities need climate control equipment. The same happens in industrial facilities, where apart from human comfort, specific conditions are needed to prevent malfunctioning processes. During period 2003-2004, a total of 9.166 cases of legionnaire's disease were reported by 35 countries in the European continent. The overall mortality rate was 8,2%, increasing to a 40% for immunocompromised patients (i.e. in hospitals). Within this scenery, increasing regulation for the installation, operation and maintenance of climate control equipment for large facilities in relation to Legionella has lead to the requirement for more effective bactericide systems. LegioTex will be an opportunity for SMEs in the sector to improve their competitive position by developing an innovative product able to prevent Legionella outbreaks, which complies with applicable normative and minimizes installation and maintenance costs. LegioTex will also be an opportunity for SMEs in the textile sector, allowing for a high-tech application of nonwoven fabrics, and SMEs in the textile chemicals sector, by developing an environmental-friendly biocide for LegioTex.

## **284549- LEGIOTEX-DEMO**

DEMONSTRATION INSTALLATION OF A LEGIONELLA  
PREVENTIVE BACTERICIDE WATER FILTRATION FOR LARGE  
PUBLIC AND INDUSTRIAL FACILITIES

[www.legiotex.eu/](http://www.legiotex.eu/)

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*Funding scheme:* CP (Collaborative Project), FP7

*Project duration:* 9/1/2011 - 8/31/2013

*EC contribution:* € 348 592

*Policy drivers:* Chemical Aspects  
Ecological Status

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### **Abstract**

The LEGIOTEX-DEMO project will primarily impact on the market for water-based equipment for indoors climate control and water distribution systems within large public and industrial facilities. Legiotex Demo is based on the results of the Legiotex proposal. The general objective of the project was the development of a water filter (LegioTex®WATER) capable to inhibit the growth and proliferation of the bacteria belonging to the Legionella Pneumophila family in water-based climate control equipment and sanitary water distribution systems in risk of becoming a source for legionnaire's disease outbreaks in large public and industrial facilities. For developing the aimed filter, environmental-friendly bactericides were appropriately fixed onto nonwoven textiles, assuring a long lasting biocide effect and optimum mechanical properties. The filter was mounted onto a disposal cartridge for its quick replacement, and this within a metal housing to be easily installed in different equipments, to have an optimum fluid-dynamic behaviour and successful commercialization. The aim of LEGIOTEX-DEMO is to install the product prototype for the prevention of Legionella contamination in a demonstration installation of a representative facility in risk of becoming a source of legionnaire's disease (a potentially fatal pneumonia-like infection) to corroborate the efficacy of the developed prototype.

## **232073- LIGHT4CLEANWATER**

A NOVEL SYSTEM TO BREAKDOWN HAZARDOUS SUBSTANCES  
IN WASTE WATER STREAMS INTO HARMLESS BIO-FRIENDLY  
COMPOUNDS USING MULTI-CHROMATIC UV LIGHT

[www.light4cleanwater.fraunhofer.eu/](http://www.light4cleanwater.fraunhofer.eu/)

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*Funding scheme:* BSG-SME (Research for SMEs), FP7

*Project duration:* 9/1/2009 - 8/31/2011

*EC contribution:* € 821 052

*Policy drivers:* Chemical Aspects  
Socio-economy

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### **Abstract**

There is a need to manage Europe's finite water resources. Water discharged from industrial processes needs to be returned into our environment in a safe and clean state. This is reflected by the Water Framework Directive (EC 2455/2001/EC) and other legislation. Over 7,000 million cubic metres of heavily polluted water are discharged by our targeted industries every year in Europe, existing technologies that are used to address this issue do not resolve this problem in a satisfactory way, they simply just remove the problem for further environmentally unfriendly treatment elsewhere. Our technological concept is to develop an industrial wastewater treatment system for the removal of complex organic pollutants by advanced oxidation without chemical additives using a polychromatic light in the UV and VUV range. Basic research work has validated the feasibility of our approach and our proposed solution. Further innovations by us will be in; enabling effective breakdown of organic pollutants in waste streams into harmless material, without the use of chemical additions (measured by total organic carbon – TOC), using a novel, reliable and cost-effective polychromatic excimer UV and VUV source for in-line operation, with associated development of an on-line (TOC) sensor and process control to ensure clean continuous discharges from waste streams. With a potential market for our system in the priority sectors we have selected of over €550 million pa (EU27) and €10 billion globally, we anticipate that within 5 years post project we can save EU industry over €14 billion pa. and generate direct sales revenue of €45 million for our SME partnership led by our SME coordinator (SICO Austria). Our proposed system will be able to safely and cheaply treat toxic organic waste streams; breaking down hazardous substances into harmless bio-friendly compounds, using an advanced oxidation process based on multi-chromatic UV, without generating any secondary toxic by-products.

## **010927- LIQUIMEM**

Liquid Membranes and Ionic Liquids for Selective Downstream Processing

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 2/1/2005 - 1/31/2007

*EC contribution:* € 158 198

*Policy drivers:* Chemical Aspects

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### **Abstract**

Downstream processing is still one of the major challenges not only for chemical and biotechnological production processes, but also for wastewater treatment. Very often the treatment of aqueous process streams, which typically are obtained from biotransformations or from wastewater treatment, is necessary for the removal of either hydrophobic or hydrophilic compounds, which may be present at various concentration levels. The present proposal aims to combine recent developments in the field of membrane technology such as nanofiltration, liquid membranes or pervaporation with the use of ionic liquids for providing novel solutions for downstream processing or process intensification. The major objective of the project is to investigate the development and application of supported liquid membranes on the base of ionic liquids. When using liquid membranes the selectivity of the separation is not based on the solid support of a given membrane, but on the properties of the liquid. Liquid membranes offer a range of possible advantages, such as better control of the selectivity. The compounds to be separated may be products of biotransformations and fermentation processes or renewable materials. Compounds of interest are carbohydrates, chiral alcohols and amines and more complex metabolites, such as antibiotics. The potential of these new types of liquid membranes will also be tested for e.g. extraction of heavy metals from aqueous streams (wastewater). The potential of ionic liquids in combination with pervaporation shall be explored. First results indicate that volatile compounds can be removed from ionic liquids by pervaporation. Due to their negligible vapour pressure and relatively high viscosity ionic liquids may be used as pervaporation membranes. Together with the tunability of their solvation properties this will allow to improve the selectivity of this new type of pervaporation membrane.

## **222078- LOWTEV**

Low Temperature and Lean Volume Cleaning System

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*Funding scheme:* BSG-SME (Research for SMEs), FP7

*Project duration:* 11/1/2008 - 5/31/2011

*EC contribution:* € 1 093 976

*Policy drivers:* Chemical Aspects  
Socio-economy

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### **Abstract**

Under the current issues surrounding climate change, conserving water resources is becoming an increasing priority. As areas become stressed due to water exploitation or environmental pressures, the amount of water resources available for use have been decreasing (World Meteorological Organisation, 1999) and Europe has not been able to avoid these pressures. It is crucial to protect and improve water consumption to provide a sustainable practice for economic development and to maintain human settlements. LOWTEV will bring considerable water savings to the food industry which is comprised of over 230,000 SME organisations. With an excellent consortium with experts in the fields of food science and sanitisation we will develop a low water pressure ultrasound device integrated with an automated rapid hygiene monitoring system. By providing an alternative system for cleaning in place technology on bulk handling equipment for food processors, a factory site would benefit from at least a 10% savings in overall water use. This equates to an estimated €30,000 worth of savings on water and energy bills per factory, providing a return on investment in under 1 year of installation. The food industry sector within Europe lag behind in terms of innovation and R & D investment; this project will address the environmental issues to improve water resources and will also improve the competitiveness of the SME food processing and bulk handling communities. Through reducing the clean cycle times on conveyor equipment, this will realise more productivity within the food processing cycle by reducing the labour costs and times for cleaning.

## **220212- MACRO-CLEAN**

Macroclean - developing novel gel-based technologies for water clean-up

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 4/18/2009 - 4/17/2011

*EC contribution:* € 171 091

*Policy drivers:* Chemical Aspects  
Groundwater

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### **Abstract**

The management of contaminated groundwater, surface waters and drinking water is a major issue both in the EU and globally, where recent (and historical) industrial, urban and commercial activities have led to the presence of elevated concentrations of a wide range of contaminants in surface- and ground-waters, adversely affecting the health of millions of people. This has been recognised in a number of recent directives (e.g. the Water Framework Directive, the Groundwater Directive) aimed at protecting ground and surface water resources within the EU. However, despite much progress, groundwater and surface water quality is still highly variable across Europe, and there is an urgent need to develop and fully implement forward-looking technologies to clean-up water and keep it free from pollution. In this project we intend to combine innovative biomaterial / gel technologies with nanotechnologies to develop and commercialize innovative products for the remediation or clean-up of contaminated ground and surface waters. A range of permeable composite gels in which nanoparticles will be embedded will be produced and tested for application as water clean-up devices. Achieving the objectives of the project will benefit to all European citizens, economy, agriculture and industry and will place Europe in a leading position in the area of polymer-based remediation devices and technologies. This is an inter- and multidisciplinary proposal, which will offer a top class young researcher great opportunities to develop her existing skills, acquire new skills in the area of materials, environmental science and nanotechnology and, more specifically, in the area of technologies for remediation and clean-up devices, generate new knowledge and obtain training in transferable skills and thus develop a successful career as an independent researcher in the field of environmental science and materials for remediation.

## **021050- MBR-TRAIN**

Process optimisation and fouling control in membrane bioreactors for wastewater and drinking water treatment

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 1/1/2006 - 12/31/2009

*EC contribution:* € 2 047 783

*Policy drivers:* Chemical Aspects

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### **Abstract**

The research project MBR-TRAIN provides an Early Stage Research Training on process optimisation and fouling control in membrane bioreactors for water treatment. Membrane bioreactors (MBRs) which combine biological treatment with a membrane separation step are among the most promising emerging technologies in the water treatment sector.

As membrane fouling has been identified as a major barrier to sustainable MBR application, MBR-TRAIN undertakes dedicated efforts to characterise and investigate both biological and physico-technical aspects of this phenomenon and develop strategies to control it. The findings shall be used to advance the modelling of MBR processes in order to improve the prediction of plant performance and economic operation. The scope of the offered research projects ranges from laboratory scale experimental set-ups to pilot- and full-scale operational plants.

The consortium of MBR-TRAIN comprises 10 partners from the water-industry, research institutes and universities across Europe representing a cross-section of relevant disciplines, sectors and regions. Due to its consortium composition, the MBR-TRAIN project provides an ideal framework for young researchers to prepare for future assignments in intersectorial tasks pursuing a research career in both academic institutions and industrial enterprises.

MBR-TRAIN offers the young researchers a well organised and structured training programme in a technology field of growing relevance. They will benefit from a tutored PhD thesis work with additional scientific training offered in short-courses or workshops. The exchange of personnel between the participating institutions will train adapting to work in different research structures. In order to bring benefit to the researchers' careers beyond a merely scientific formation, MBR-TRAIN will provide training on complementary skills such as presentation techniques, communication skills, intellectual property rights or research project management.

## **254983- MEDEA**

Advanced Methodologies for the Determination of the Lability of Trace Metals and Their Application to Contaminated Soils

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 9/1/2010 - 8/31/2012

*EC contribution:* € 172 740

*Policy drivers:* Chemical Aspects

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### **Abstract**

Much of Western Europe has inherited soil contaminated with heavy metals from past mining, mineral processing and industrial activities. When performing risk assessment for eco-toxicological, human health or ground water vulnerability studies the major issue is not the total concentration of the heavy metal but its labile fraction i.e. the proportion of the metal transferable to an aqueous phase in ionic form. This may vary widely as a function of the solid forms in which the metal is hosted, the pH and redox conditions in pore waters that control the lability, or the occurrence of other species within the aqueous phase which may provide competitive sorption or preferential transport modes. Given the toxicity of a number of heavy metals even at low contents, accurate methods are required to properly monitor them in the environment and gain further insight in their behaviour. Simple extraction schemes are the most common procedure to assess natural availability of heavy metals in different scenarios. However, it has been demonstrated that these are unable to measure the true proportion of metal that may be exchangeable and contribute to lability, which may lead to unreliable risk assessments. This proposal seeks to accurately study the lability of heavy metals in several polluted scenarios by applying one of the most advanced methodologies for this purpose, namely 'isotope dilution' (ID). This technique reflects the pool of reactive metal in the soil and can be used to model solid-solution equilibria and the fixation of metal ions into less available forms. ID method has been successfully implemented for Cd, Zn and As, while a method for environmentally significant elements such as Fe, Sb and Se -particularly susceptible to redox conditions- remains to be developed. Data will be combined with soil pore water analyses to geochemically model scenarios and determine the role of changing redox conditions in the releases of heavy metals to the environment.

## **509159- MEDINDUS**

### **ADVANCED TECHNOLOGIES FOR TREATMENT OF INDUSTRIAL AND COASTAL WATERS OF THE MEDITERRANEAN REGION**

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*Funding scheme:* STP (Specific Targeted Research Project), FP6

*Project duration:* 10/1/2004 - 3/31/2008

*EC contribution:* € 941 995

*Policy drivers:* Chemical Aspects

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#### **Abstract**

A literature survey reveals the presence of high levels of persistent organic pollutants (POP's) and toxic inorganic species (phosphates and toxic metal cations) in the Coastal areas of Mediterranean Countries due to the discharge of industrial wastewater to the sea without treatment: As a result, public health and aquatic life have been seriously affected. Thus, following the selection of 3 pilot zones in Morocco, Tunisia and Lebanon, this proposal aims to develop novel technological approaches (making use of regional resources) for industrial (prevention) and coastal (remediation) water treatments with a higher degree of efficiency than existing ones. Advanced water technologies is a specific measure addressed in the Call (INCO 2002-B.1.3). These treatments are based on (i) the production of easily recyclable and low cost receptors grafted into regional silicates (modified silicates) for the removal of phosphates and POP's from industrial and coastal waters of the Mediterranean Region, (ii) the use of soil-applied mobilised receptors aiming to enhance the uptake of toxic metal cations by regional plants. These objectives are to be fulfilled as follows,

1. Search on water chemistry of Coastal Areas and industrial effluents.

Knowledge about the speciations present is crucial for the design of selective receptors. Samples of industrial, coastal and fresh water pilot zones would be investigated by electrochemical methods. On these basis steps 2 and 3 will be undertaken.

2. Design of immobilised receptors. Receptors to be attached to silicates are a) cyclodextrins (known to form inclusion and exclusion adducts with apolar substances), aminocalix(4)arenes (basic centers for interaction with acidic toxic phenols), calix(4)pyrrols (interact selectively with phosphates).

Several techniques are to be used to characterise the modified silicates. The synthetic protocol will be accompanied by computer simulation studies.

Optimum'

## **218938- MEDIRAS**

MEmbrane DIstillation in Remote AreaS

[www.mediras.eu/](http://www.mediras.eu/)

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*Funding scheme:* CP (Collaborative Project), FP7

*Project duration:* 9/1/2008 - 8/31/2011

*EC contribution:* € 2 118 196

*Policy drivers:* Chemical Aspects  
Socio-economy

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### **Abstract**

The overall objective of the MEDIRAS project is the development and demonstration of cost effective and very reliable solar driven desalination systems for water scarcity affected regions with high insolation. The modular system set up is based on the highly innovative Membrane Distillation (MD) technology. MD is favorably applicable for small distributed desalination systems in the capacity range between 0.1-20m<sup>3</sup>/day. MD is very robust against different raw water conditions and operable with alternating energy supply like solar energy.

With respect to demonstration and market penetration of MD systems, the project will be focused on cost reduction and quality improvement for life time extension of MD modules and MD systems, on the development of components such as brine cooler and brine disposal units for ground water desalination at inland locations with limited raw water resources, and on the development of scalable system configurations in order to adapt them to different customer demands. Solar energy driven units for potable water disinfection will be integrated into the desalination units for health protection. The emphasize of the MEDIRAS project is on the design, set up and operation of different demonstration systems.

Three compact systems of different sizes (150l/day and 300l/day) and two multi module two loop systems (3m<sup>3</sup>/day and 5m<sup>3</sup>/day) for full solar energy supply and for combined solar and waste heat energy supply will be installed in different European potential user sites in, Gran Canaria (Spain), Tenerife (Spain) and Pantelleria (Italy), as well as in Tunisia as an example for an North-African country. Comprehensive performance evaluation and water quality analyses will be conducted. With respect to market penetration in addition to the technological goals, focus will also be on the identification of suitable markets and target user-groups for the technology and the preparation of the conditions for the system to enter the identified markets.

## **033234- MEMBAQ**

Incorporation of Aquaporins in Membranes for Industrial Applications

<http://www.membaq.eu/>

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*Funding scheme:* STP (Specific Targeted Research Project), FP6

*Project duration:* 10/1/2006 - 3/31/2010

*EC contribution:* € 2 100 000

*Policy drivers:* Chemical Aspects  
Ecological Status

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### **Abstract**

In all living cells, channels transporting water - aquaporins - exist. They are proteins, which only transport pure H<sub>2</sub>O molecules. They have a unique selectivity and are extremely efficient being nature's own membrane systems. The purpose is to investigate whether these unique features can be industrially exploited: Recombinant aquaporin molecules will be embedded into water filtration membranes. Nano-biotechnological research of water transport in various organisms show that aquaporins have 100% selectivity: Only water molecules pass. They also maintain high water permeation rates.

Membrane technology is another rapidly developing technology within filtration and separation. Substantial research is done to enhance efficiency of membranes. The MEMBAQ project combines these two research spearheads. This combination has never been done before. A new filtration membrane with aquaporins is in theory up to 50 times more efficient (energy input reduction). It is truly radical innovation of the water industries, for instance for water purification (billions of EUR is spent every year), salinity gradient energy production (exploitable potential is 2000 TWh annually), waste water reclamation (water re-use). The MEMBAQ project will 1) produce recombinant aquaporin, 2) design nanotechnological membrane by means of computer simulation, 3) incorporate aquaporins into stable membranes, 4) engineer membranes based on characterising towards pressure, pH etc., 5) and finally test such membranes in three applications: Water purification, osmotic energy, and waste water reclamation for re-use. US and Japan invest significantly more per capita than EU in nanotechnology. This gap is expected to widen in the next few years. In MEMBAQ, we use real market needs in the water sector as a driver for accelerated research and innovation in nanotechnology. Enormous potentials in

filtering other fluids and gasses with natural proteins embedded in membranes exist.

## **029813- MEMBIOF**

Interactions between water treatment membrane surfaces and biofilms

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 10/1/2006 - 9/30/2010

*EC contribution:* € 576 904

*Policy drivers:* Chemical Aspects

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### **Abstract**

The present project will study the interaction between biofilm formation and structure, membrane surface properties and performance, and the characteristics of the treated water. Such a study requires interdisciplinary interaction between experts in the synthesis, physical chemistry and technology of membranes, who understand membrane properties and performance, and environmental microbiologists with expertise in the formation mechanism, structure and properties of biofilms. While researchers of the host organization BGU-ZIWR – have considerable expertise in membranes, knowledge on the mechanisms of biofouling and the techniques, knowledge on the mechanisms of biofouling and the techniques used to study the biofouling phenomenon is not available in any of the departments of BGU. It is proposed to form a close collaboration with leading laboratories in Europe in biofilm studies in order to form a solid basis for understanding the membrane -biofilm interactions in membrane based water treatment processes.

## **033049- MESH**

### **Integrated Wastewater Treatment Process using Mesh Filter Modules for Direct Activated Sludge Separation**

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*Funding scheme:* SME (SMEs-Co-operative research contracts), FP6

*Project duration:* 7/1/2006 - 10/31/2008

*EC contribution:* € 984 050

*Policy drivers:* Chemical Aspects

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#### **Abstract**

The challenges of removing contaminations from wastewater with maximum reliability and efficiency by using wastewater treatment processes, plants and systems are growing, offering good opportunities for new and advanced technologies. One such innovative wastewater treatment system is the membrane bioreactor, an activated sludge process, where the secondary settling tank is substituted by a membrane filtration unit. Membrane bioreactors become a highly attractive system where stringent standards have to be met and because of their small footprint. However, membrane bioreactors still need further improvement for a wider spread application. The main hindrances are high investments for membrane modules and high costs for membrane replacement as well as high operation costs due to increased energy demand. The innovation of this project is to overcome these drawbacks by substituting membranes by a cheaper filtration technique, offering higher flux rates at lower filter pressures. As activated sludge appears in form of flocs, a coarser filter material can be used to separate activated sludge from treated wastewater. The retention of sludge flocs leads to the formation of a secondary layer on the mesh surface, which serves as the actual filter membrane. By this means, even smaller particles than suggested by the mesh size are retained. Because of its high pore size, the filter mesh resembles almost no filter resistance. Another principal problem of membranes is fouling. Persistent deposits can only be removed by intensive periodical cleaning with chemical agents. In the MESH system, the secondary layer is periodically removed and a fresh layer is built up. Thus, the problem of fouling can be largely avoided and less frequent and intensive cleaning is necessary. In summary this improvements results in an innovative wastewater treatment process featuring high effluent quality and plant reliability at low investments and low operational costs.

## **266770- MICROMEGAS**

Nanofluidics inside a single carbon nanotube

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*Funding scheme:* ERC (ERC Grant), FP7

*Project duration:* 1/1/2011 - 12/31/2015

*EC contribution:* € 2 418 000

*Policy drivers:* Chemical Aspects

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### **Abstract**

Nanofluidics is an emerging field aiming at the exploration of fluid transport at the smallest scales. Taking benefit of the specific properties of fluids in nanoconfinement should allow to challenge the limits of macroscopic continuum frameworks, with the ultimate aim of reaching the efficiency of biological fluidic systems, such as aquaporins. Carbon nanotubes have a decisive role to play in this quest, as suggested by the anomalously large permeabilities of macroscopic carbon nanotube membranes recently measured. This behavior is still not understood, but may be the signature of a 'superlubricating' behavior of water in these nanostructures, associated with a vanishing friction below a critical diameter, a result put forward by our preliminary theoretical results.

To hallmark this groundbreaking behavior, it is crucial to go one step beyond and investigate experimentally the fluidic properties inside a single carbon nanotube: this is the aim of this proposal. To this end, the project will tackle two experimental challenges: the integration of a single nanotube in a larger nanofluidic platform; and the characterization of its fluidic properties. To achieve these tasks, we propose a fully original route to integrate the nanotube in a hierarchical nano to macro fluidic device, as well as state-of-the-art methods to characterize fluid transport at the 'zepto-litter' scale, based on single molecule fluorescence techniques and 'patch-clamp' characterization. In parallel, experimental results will be rationalized using modelization and molecular dynamics. This project will not only provide a thorough fundamental understanding of the properties of carbon nanotubes as fluidic transporter, but also provide an exceptional nanofluidic platform, allowing to explore the limits of classical (continuum) frameworks. It will also allow to envisage future potential applications, eg for desalination, separation, energy converter, jet printing, ...

## **275180- MIMÉ**

### The Role of Microbial Metabolites in Pb- Calcite Surface Interactions

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 9/1/2011 - 8/31/2013

*EC contribution:* € 230 627

*Policy drivers:* Chemical Aspects  
Ecological Status

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### **Abstract**

The behavior of metals, many of which are toxic even in trace quantities, is an important topic as population growth puts pressure on the world's drinking water resources. Relatively little is yet known about the interdependencies between the biotic and abiotic aspects of metal sorption. The overall aim of my project is to define the processes by which microbial metabolites mediate Pb sorption on calcite. I will use a combination of surface sensitive techniques, including X-ray Photoelectron Spectroscopy (XPS), Atomic Force Microscopy (AFM), and Quartz Crystal Microbalance with Dissipation Monitoring (QCM-D) to extend current understanding of the biogeochemical controls on Pb behavior to the molecular scale. My study lies at the intersection of geoscience, surface physics and biointerface science and uses an interdisciplinary approach to answer questions at the crossover of environmental bio- and geochemistry, that are critical for society. The results will provide insights for the water industry, so treatment can be improved by providing criteria for selecting bacteria that can synthesize particular metabolites to immobilize specific toxic metals. Internal corrosion of Pb pipes in water distribution systems is currently an immediate, world-wide public health concern. A recent study estimated that 25% of houses in the EU have at least one Pb pipe, putting 120 million Europeans at risk. My background in drinking water treatment, the new expertise I will gain and the results from the MiMe project will address this concern. I bring my experience and motivation to the members of the Nano-Science Center, to exchange for the opportunity to learn new skills on a set of unique instruments that can "see" at the molecular-level. This new knowledge will form the base for my future research. Indeed, my host, Prof. Stipp's expertise in the nano-scale processes on mineral surfaces is at the top of the field; I will benefit tremendously from my time at the University of Copenhagen

## **035488- MIN-GRO**

Mineal Nucleation and Growth Kinetics: Generating a general, fundamental model by integrating atomic, macro- and field-scale investigations

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 1/1/2007 - 12/31/2010

*EC contribution:* € 3 034 179

*Policy drivers:* Chemical Aspects  
Groundwater

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### **Abstract**

The MIN-GRO Research and Training Network (RTN) combines the expertise of eight universities and an industrial partner, joining together complementary skills and the analytical facilities of Europe's leading Mineral Growth specialists to train 12 young scientists for the European job market. The MIN-GRO fellows will be integrated into dynamic groups in Germany, France, Spain, Denmark, Norway, Iceland, and the United Kingdom, combining approaches and state-of-the-art instrumentation in a spear-headed attack on one of the mysteries of natural materials science. The answers found from the investigations of carbonate minerals will revolutionise the way crystal nucleation and growth are modelled in general, and provide required base information for advances in technology for CO<sub>2</sub> sequestration, groundwater treatment, waste management and storage, enhanced oil recovery from chalk reservoirs, manufacture of more functional materials for paper, paint, pigment, pharmaceuticals and optical devices, and provide clues for understanding biomineralisation, a necessary key for medical advances in treatment of osteoporosis and arthritis.

## **265946- MINOTAURUS**

Microorganism and enzyme Immobilization: NOvel Techniques and Approaches for Upgraded Remediation of Underground-, wastewater and Soil

[www.minotaurus-project.eu/index.php?id=3](http://www.minotaurus-project.eu/index.php?id=3)

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*Funding scheme:* CP (Collaborative Project), FP7

*Project duration:* 1/1/2011 - 12/31/2013

*EC contribution:* € 2 999 110

*Policy drivers:* Chemical Aspects  
Groundwater

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### **Abstract**

MINOTAURUS will deliver innovative bio-processes (bioaugmentation, enzyme technology, rhizoremediation with halophytes, and bioelectrochemical remediation), which are all based on the concept of IMMOBILIZATION OF BIOCATALYSTS (microorganisms and enzymes), to eliminate emerging and classic organic pollutants. The immobilization-based technologies will be applied to engineered (ex-situ) and natural systems (in situ) for the bioremediation of groundwater, wastewater, and soil. The selection and adaptation of modern physico-chemical, biological, and ecotoxicological monitoring tools combined to a rational understanding of engineering and enzymology/microbial physiology aspects is a pertinent approach to open the black-box of our technologies. The reliable process-monitoring will constitute a solid basis to develop and refine our biodegradation kinetics models, which will be the mean to improve the predictability of performances to be achieved with our technologies. A key strength of MINOTAURUS is the possibility of direct implementation of our technologies at five EU reference sites that are confronted with pollutants (two technologies will be tested on-site during the first year). We will deliver not only a set of tools, techniques and processes which will enhance the ability of our communities to respond to the challenges of organic pollutants but also frameworks for structuring and making evidence-based decisions for the most sustainable and appropriate bioremediation measures. MINOTAURUS consortium consists of fifteen partners from eight European and Europe-associated countries. Eight research & education institutions, five SMEs covering the whole chain of our bioremediation approaches (production/monitoring of biocatalysts, bioremediation, and engineering), one large end-user installing wastewater treatment plants, and one environmental agency will work together with the support of an advisory board mainly consisting of environmental decision-makers.

## **247594- MINPOLLCONTROL**

Mining wastes bio/weathering, pollution control and monitoring

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 9/1/2010 - 8/31/2014

*EC contribution:* € 158 400

*Policy drivers:* Chemical Aspects  
Water and Agriculture

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### **Abstract**

Mining in the State of Minas Gerais (Brazil) is one of the activities with the strongest impact on the environment: heavy metals (Zn, Cd and Pb) and metalloids (As) pollute surface water, sediments and irrigated agricultural soils. This is a major drawback of this economically important activity. This project will focus on pollution of zinc mining activities in this Brazilian region. The pluridisciplinary aspect of this project (geology, mineralogy, environmental chemistry, microbiology and environmental biotechnology research fields) will first require an advanced training and knowledge transfer program through the organization of a Summer-school (WP 1) that will be held in Belo Horizonte (Brazil). The research aspect of the project consists of 4 Work Packages. WP 2 studies mine waste mineralogy and weathering (monitoring and risk assessments) in the surroundings of zinc mines. WP 3 describes metallurgical waste mineralogy and weathering in the surroundings of zinc refinery plants. WP4 aims to develop an acid mine drainage treatment and metal recovery process with the help of biotechnological approaches and WP5 assesses the impact on agricultural irrigated polluted soils located downstream the mining and ore processing areas of Rio São Francisco. For each research WP advanced analytical techniques (i.e. X-ray Absorption Spectroscopy, Transmission Electron Microscope, Raman...) will be applied to study the mineralogy, the chemical composition (including heavy metals and metalloids speciation), the weathering and leachability of inorganic pollutants from mine waste and metal refinery wastes, soil pollution and mine drainage remediation. Equilibrated exchange of experienced and early stage researchers between involved partners will allow to establish high-quality research and knowledge transfer. WP 6 will synthesize and disseminate the findings of the project by the organization of an international symposium dedicated to mining pollutions and remediation technologies.

## **223975- MOBESENS**

MOBile watEr quality SENsor System

[www.mobesens.eu/](http://www.mobesens.eu/)

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*Funding scheme:* CP (Collaborative Project), FP7

*Project duration:* 5/31/2008 - 5/31/2011

*EC contribution:* € 3 799 787

*Policy drivers:* Chemical Aspects

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### **Abstract**

Management of the environment for predictable and sustainable use of natural resources is one of the great challenges of the 21st century. Although water covers most of the planet, it is becoming increasingly difficult to ensure adequate supplies of fresh, clean water for drinking, as well as, for sports and wellness activities. The demand for water resources is increasing as the population grows. At the same time, water resources are increasingly exposed to pollutants and spills as parts of the world become ever more crowded and industrialised. Potential climate changes due to global warming may also impact water resources.

Management of water quality requires regular measurements and monitoring. Today, measurements of water quality are performed manually. The process can be slow and painstaking. Multiple point measurements are needed to cover an area. The process needs to be automated and extended to provide rapid and effective monitoring. Autonomous, mobile and self-healing solutions are needed to identify trends and to help localize and track potential problems.

MOBESENS provides a modular and scalable ICT based solution for water quality monitoring. It enables data to be gathered quickly and reported across wide areas. The low power wireless sensor network gathers data samples, which are time and location stamped and automatically entered into the grid based information system to facilitate analysis and issue alarms if needed. Mobility is a unique feature of MOBESENS, which are capable of navigation and both surface and subsurface measurements. This extends range, enables 3D area measurements and facilitates operation, even in bad weather. MOBESENS may form ad-hoc networks enabling rapid and reliable reporting as well as relative localization and tracking (e.g. of contaminants). Opportunistic communication between MOBESENS and both fixed and mobile buoys is envisioned. Renewable energy sources are studied for self-sustained MOBESENS operation.

## **511237- MODELKEY**

Models for Assessing and Forecasting the Impact of Environmental Key Pollutants on Marine and Freshwater Ecosystems and Biodiversity

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*Funding scheme:* IP (Integrated Project), FP6

*Project duration:* 2/1/2005 - 1/31/2010

*EC contribution:* € 8 400 000

*Policy drivers:* Chemical Aspects

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### **Abstract**

MODELKEY comprises a multidisciplinary approach aiming at developing interlinked and verified predictive modelling tools as well as state-of-the-art effect-assessment and analytical methods generally applicable to European freshwater and marine ecosystems: 1) to assess, forecast, and mitigate the risks of traditional and recently evolving pollutants on fresh water and marine ecosystems and their biodiversity at a river basin and adjacent marine environment scale, 2) to provide early warning strategies on the basis of sub-lethal effects in vitro and in vivo, 3) to provide a better understanding of cause-effect-relationships between changes in biodiversity and the ecological status, as addressed by the Water Framework Directive, and the impact of environmental pollution as causative factor, 4) to provide methods for state-of-the-art risk assessment and decision support systems for the selection of the most efficient management options to prevent effects on biodiversity and to prioritise contamination sources and contaminated sites, 5) to strengthen the scientific knowledge on an European level in the field of impact assessment of environmental pollution on aquatic eco-systems and their biodiversity by extensive training activities and knowledge dissemination to stakeholders and the scientific community. This goal shall be achieved by combining innovative predictive tools for modelling exposure on a river basin scale including the estuary and the coastal zone, for modelling effects on higher levels of biological organisation with powerful assessment tools for the identification of key modes of action, key toxicants and key parameters determining exposure. The developed tools will be verified in case studies representing European key areas including Mediterranean, Western and Central European river basins. An end-user-directed decision support system will be provided for cost-effective tool selection and appropriate risk and site prioritisation.

## **226347- MONACAT**

Monolithic reactors structured at the nano and micro levels for catalytic water purification

[www.monacat.eu/](http://www.monacat.eu/)

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*Funding scheme:* CP (Collaborative Project), FP7

*Project duration:* 5/1/2009 - 4/30/2012

*EC contribution:* € 1 950 097

*Policy drivers:* Chemical Aspects

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### **Abstract**

This project aims at the preparation and testing of catalyst supported on structured reactors (ceramic and metallic honeycomb monoliths, metallic filters, carbon cloth) coated with nanocarbon materials (NCM), namely carbon nanofibers (CNF) and carbon nanotubes (CNT). This structured catalytic reactor will be used for catalytic water purification. Every partner responsible for testing the monoliths will focus on a different pollutant (Nitrates, organic matter...) and catalytic process (hydrogenation, oxidation) depending on the particular expertise of every partner. The properties of monolithic reactor coated with NCM, e.g. thin catalyst layer and mesoporosity, enable the control of the diffusion path and enhance the diffusion of reactant to catalytic sites. The objective is to achieve, via the use of monoliths coated with NCM, an intensification of the catalytic process in terms of improved selectivity, robustness, stability and performance while reducing energy requirements and by-product generation with respect to the catalytic process using conventional reactors, as e.g. trickled bed or slurry.

## **226791- NAMETECH**

Development of intensified water treatment concepts by integrating nano- and membrane technologies

[nano4water.eu/?id=111](http://nano4water.eu/?id=111)

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*Funding scheme:* CP (Collaborative Project), FP7

*Project duration:* 6/1/2009 - 5/31/2012

*EC contribution:* € 1 930 800

*Policy drivers:* Chemical Aspects

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### **Abstract**

The Nametech project harnesses benefits of nanotechnology to bring about improvements in membrane filtration for advanced water treatment. The general objective is to strengthen the European membrane market by making nanotechnology available to large scale European membrane manufacturers. A unique feature of the project is the knowledge transfer between the experienced membrane manufacturer Norit and the coating expert and newcomer to the membrane field Agfa Gevaert. The S&T focus is on the use of nano-structured materials to alter the physical and chemical properties of polymeric ultrafiltration membranes and thereby improving the filtration performance at macroscale installations. The project aims at adapting commercial nanoparticles such as TiO<sub>2</sub> and Ag for the modification of UF membranes to reduce fouling, and thus improve its permeability (i.e. Technology Path 1). In Technology Path 2 and 3, the potential of using active nanoparticles, such as bionano-catalysts, in combination with membranes is examined to remove micropollutants such as chlorinated compounds, nitroaromatic compounds or redox active metals, thus improving the water quality. A specific novelty is the development of an integrated permeate channel concept, whereby the nanoparticles are embedded in 3D textiles, functioning as membrane support and permeate channel. The nanoparticles will be deposited on the membrane surface or embedded in the membrane (mixed matrix). The S&T challenges regarding the modification of the nanoparticles, the deposition of the nanoparticles on membrane surface as well as the production of nano-activated membranes (NAMs) will be addressed in WP 1, 2 and 3. The newly developed NAMs will be tested at laboratory scale (WP 4) before selecting the most promising concept for testing at pilot scale (WP 5). The activities will be complemented by a toxicological study and the application of LCA to assess the environmental impacts (WP 6). The high industrial involvement puts a strong focus on the exploitation strategies and handling IPR issues (WP 7).

## **230796- NANO-ENAG**

### **USE OF NANOMATERIALS FOR ENVIRONMENTAL AND AGRICULTURAL APPLICATIONS**

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 9/1/2009 - 8/31/2011

*EC contribution:* € 46 800

*Policy drivers:* Chemical Aspects  
Water and Agriculture

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#### **Abstract**

The aim of the joint research programme is to study nanomaterials for environmental and agricultural applications. The global objectives of this project will be: 1. to synthesize and characterize low cost nanomaterials such as layered double hydroxides (LDHs) or fine grained poorly crystalline Fe-Al or Fe-Mn oxides. These nanomaterials will be used in native form and complexed with an organic matrix, named polymerin, recovered from olive mill wastewaters (OMW); 2. to study the behavior of nanomaterials for retention of pesticides and biophenols and to develop slow-release formulations of these chemicals, with particular emphasis on assessing their bioavailability; 3. to totally detoxify OMW through fractionation on nanomaterials.

## **247739- NANOFATE**

Nanoparticle Fate Assessment and Toxicity in the Environment

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*Funding scheme:* CP (Collaborative Project), FP7

*Project duration:* 4/1/2010 - 3/31/2014

*EC contribution:* € 2 497 100

*Policy drivers:* Chemical Aspects

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### **Abstract**

Concept: NanoFATE has been conceived to fill knowledge and methodological gaps currently impeding sound assessment of environmental risks posed by engineered nanoparticles (ENPs). Our vision is to assess environmental fate and risk of ENPs from high-volume products for which recycling is not an option; namely; fuel additive, personal care and antibacterial products. Two market ENPs from each product (CeO<sub>2</sub>, ZnO, Ag of varying size, surface and core chemistries) will be followed through their post-production life cycles i.e. from environmental entry as “spent product”, through waste treatment to their final fates and potential toxic effects. This will test the applicability of current fate and risk assessment methods and identify improvements required for a scientific assessment of ENPs at an early stage. Objectives: Such systematic study of the environmental fate and toxicity of selected ENPs will entail addressing 9 S&T objectives: 1: Design, tagging and manufacture of ENPs 2: Analysis of ENP interactions with abiotic and biotic entities 3: Generating predictive models for ENP exposure in waters and sludge-amended soils 4: Studying the fate and behaviour of ENPs through wastewater treatment 5: Determining acute and chronic ecotoxicity 6: Assessing effects of physico-chemical properties on ENP bioavailability 7: Defining mechanisms of uptake, internal trafficking, and toxicity 8: Developing spatial RA model(s) 9: Improving understanding of ENP risks Methodology: The work plan is designed to progress beyond the state-of-the-art through focused workpackages. While some objectives are delivered in single WPs, good cross WP integration will secure the key objectives of delivering new methods for quantifying ENP risks. Impact: NanoFATE will provide robust tools, techniques and knowledge needed by stakeholders to understand and communicate risks associated with different ENPs, including their environmental interactions and toxicity.

## **239313- NANOLUM**

Luminescently doped nanoparticles. Strategies for improving sensitivity in luminescence assays and implementation in microarray formats.

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 9/1/2009 - 8/31/2012

*EC contribution:* € 45 000

*Policy drivers:* Chemical Aspects

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### **Abstract**

This project aims to take advantage of polymeric nanoparticles as a tool for improving sensitivity and performance of (chemi)luminescence based assays. For instance, highly emissive red/near-infrared (NIR) dyes and long-lifetime luminophores like Ru(II) complexes will be combined in nanoparticles for increased emission efficiencies, better discrimination from background interferences and improved photostability. These beads will be employed for labelling antibodies to be used in immunoassays. Several strategies will be explored, taking advantage of FRET processes, (chemi)luminescence of Ru(II) complexes and high emission efficiencies of red/NIR boron-dipyrromethene (BODIPY) dyes. Additionally, the use of molecularly imprinted polymers (MIPs) as synthetic analogues of antibodies will be explored for the selective recognition and fluorescent indication of analytes containing carboxylic groups. The fabrication of the MIP fluorescent probes in a nanoparticle or core-shell nanoparticle form is expected to improve response time of the sensor and binding of the target analyte, and to allow ratiometric measurements or indication via energy transfer processes. The main task will cover the synthesis of luminescent molecular probes, nanoparticles and luminescently doped nanoparticles and MIPs, with a complete physical and photophysical characterization. These particles will be implemented in a final stage onto microarray based technologies for monitoring the presence of certain toxins and antibiotics in water and aquaculture products.

## **210947- NANOTUBEMEM**

Carbon NANOTUBE MEMbranes by Templated Growth in Oriented Molecular Sieve Films

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 11/1/2008 - 10/31/2012

*EC contribution:* € 100 000

*Policy drivers:* Chemical Aspects

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### **Abstract**

Recently, carbon nanotube membranes attracted attention because of experiments and simulations indicating extremely high fluxes. If selective separations can also be demonstrated, these membranes will be a major breakthrough in efficient gas, liquid and vapor separations with tremendous implications in energy efficiency, especially in hydrocarbon separations, water purification and microdevices for hydrogen purification and storage. The currently used multi-step microfabrication procedures, although appropriate for laboratory scale measurements, do not allow for efficient and economic production of the large membrane areas (e.g., hundred square meters) needed for membrane based purification applications nor they provide means for precisely controlling nanotube size and structure that may be desirable for highly selective separations. We propose to undertake the challenge to develop practical selective nanotube membranes by growing submicron thick, densely-packed, subnanometer diameter carbon nanotubes in the interior of the pores of oriented aluminophosphate (AlPO<sub>4</sub>) molecular sieve films. The proposed use of AlPO<sub>4</sub> films as hosts of carbon nanotubes is motivated by previous studies that demonstrate carbon nanotube synthesis inside the micropores of AlPO<sub>4</sub> crystalline powders and builds on our ability to grow well-intergrown and appropriately oriented AlPO<sub>4</sub> films. If successful, we expect to form high concentration of oriented and uniformly sized carbon nanotubes extending throughout the molecular sieve channels. It is possible that membranes with unprecedented performance (high selectivity and extremely high flux) will be the ultimate outcome of this work. Moreover, the growth technique that we propose to develop and the resulting oriented carbon nanotube films may be of interest for electronic and electrochemical applications.

## **036845- NEPTUNE**

New sustainable concepts and processes for optimization and upgrading municipal wastewater and sludge treatment

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*Funding scheme:* STP (Specific Targeted Research Project), FP6

*Project duration:* 11/1/2006 - 3/31/2010

*EC contribution:* € 2 799 323

*Policy drivers:* Chemical Aspects

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### **Abstract**

The scope of sewage treatment is changing: Up to date municipal wastewater treatment plants (WWTP) were seen as an end-of-pipe treatment just before discharge, having the aim to avoid eutrophication and hygienic health hazard in surface water. Due to the global demographic trends as well as new legislations (e.g. the Water Framework Directive, WFD) increased focus is put on quantity and quality of effluents: WWTP are more and more seen as interface between sanitation and environment, delivering resources to the environment or human activities (recharge of drinking water reservoirs, recycling of nutrient, efficient energy use). This focus shift has implications on the quality goals set for WWTP products:

- land requirement
- effluent N, P load
- effluent pathogen load
- energy optimization

New focus:

- nutrient recycling
- micropollutants: ecotoxicology of the effluent
- energy production

NEPTUNE is focusing on technology solutions allowing to meet present and future standards via upgrading of existing infrastructure (new control strategies with online sensors; effluent upgrading with oxidation, activated carbon or wetland treatment; sludge processing for safe nutrient recycle) as well as via new techniques (fuel cell applications; new oxidative agents; polymer production from sludge).

By including pathogen and ecotoxicity aspects into life cycle assessment studies (LCA), the project is helping improve the comparability of various technical options and propose a suitability ranking.

The new focus given by the WFD and the emerging interest on organic (eco)toxic compounds requires characterizing treated effluent and treatment technologies concerning ecotoxicologic aspects and micropollutants. The project is

contributing to this discussion by ecotoxicity assessment and micropollutant fate studies.

## **227004- NEW ED**

Advanced bipolar membrane processes for remediation of highly saline waste water streams

[www.new-ed.eu/](http://www.new-ed.eu/)

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*Funding scheme:* CP (Collaborative Project), FP7

*Project duration:* 6/1/2009 - 5/31/2012

*EC contribution:* € 1 163 159

*Policy drivers:* Chemical Aspects

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### **Abstract**

NEW ED aims at closing industrial water cycles and reducing the amount of waste water streams with highly concentrated salt loads stemming from a broad range of industrial production processes by exploiting the waste components (salts) and transforming them to valuable products. This will be achieved by developing new micro- to nano-porous bipolar membranes for bipolar electrodialysis (BPMED), a new membrane module concept and by integrating this new technology into relevant production processes. The bipolar membrane process produces acids and bases from their corresponding salts by dissociating water at the interface within the bipolar membranes. However, BPMED so far has been applied only in niche markets due to limitations of the current state of membrane and process development. Major drawbacks of the classic BPMED process are low product purity, limited current density and formation of metal hydroxides at or in the bipolar membrane. The objective of this project is to overcome these limitations by developing a new bipolar membrane and membrane module with active, i.e. convective instead of diffusive water transport to the transition layer of the bipolar membranes, where water dissociation takes place. The key feature of the innovative new bipolar membranes is a nano- to micro-porous and at the same time ion conducting intermediate transition layer, through which water is convectively transported from the side into the transition layer. The porous transition layer may have either the character of a cation or an anion exchanger. Several promising intermediate layer materials together with different monopolar ion-exchange layers will be tested and characterized. Membrane manufacturing and new module concepts will be investigated to exploit the full potential of the new bipolar membrane technique. Integration of the developed membranes and modules into relevant production processes is an essential part of the project.

## **248666- NOBLETITANIA**

### **MODIFICATION OF TITANIUM(IV) OXIDE WITH METAL COMPOUNDS FOR PHOTOCATALYSIS UNDER VISIBLE LIGHT IRRADIATION**

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 11/15/2009 - 11/14/2013

*EC contribution:* € 100 000

*Policy drivers:* Chemical Aspects

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#### **Abstract**

Although environmental remediation by TiO<sub>2</sub> photocatalysis has become increasingly interest among scientists in recent years, wide range application is still limited by its absorption below 400 nm. UV photons are much more expensive compared to visible ones, as the latter compose a large fraction of solar energy (UV light compose only 3% of the solar energy), and relatively cheap artificial light sources can be applied. In order to achieve a break through in photocatalytic applications of TiO<sub>2</sub> and other stable semiconductor materials (mostly oxides), the photocatalytic properties must be improved, either by red shifting of the light absorption and/or enhancing quantum yield by inhibition of recombination of photogenerated charge carriers (e<sup>-</sup>/h<sup>+</sup>). TiO<sub>2</sub> remains the most popular oxide semiconductor in photocatalysis & because of combination of unique features such as stability, low cost and high efficiency. It is believed that in addition to exploration of other oxides (e.g. WO<sub>3</sub>) and their mixtures, doping and surface modification of TiO<sub>2</sub> is highly promising for increasing the efficiency and reducing the cost of photooxidation. Noble metals seem to be excellent modifiers, because they accelerate the transfer of photoexcited electrons of titania to substrates, and due to their photoabsorption inducing photocatalytic reaction under visible-light irradiation either by metal complexes fixed on titania or by photoexcitation of localized surface plasmon resonance (LSPR) of nanoparticles of noble metal. The present proposal concerns preparation and testing of new nanoparticle photocatalysts composed of metal oxides, as well as binary and ternary metal oxides/metal (metal complex) systems. The principle is the reduction of appropriate metal ions and ion mixtures with controlled structure and tunable nanoparticle size and composition. These new materials will be tested for catalytic and photocatalytic activity, as well as for water splitting and solar cells application.

## **018486- NORMAN**

Network of reference laboratories and related organisations for monitoring and bio-monitoring of emerging environmental pollutants

[www.norman-network.net](http://www.norman-network.net)

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*Funding scheme:* CA (Coordination Action), FP6

*Project duration:* 9/1/2005 - 11/30/2008

*EC contribution:* € 1 899 831

*Policy drivers:* Chemical Aspects  
Groundwater  
Ecological Status

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### **Abstract**

NORMAN co-ordination action will develop and implement a methodology within a network of reference laboratories and related organisations (including standardisation bodies) to enable and improve EU capabilities for monitoring emerging pollutants, thereby ensuring the production of data that are valid, comparable and fit for purpose across EU25. The project will align the activities of the network with the requirements of organisations / stakeholders in charge of risk assessment and management. It will organise, via workshops, the EU-wide exchange of information between monitoring experts, environmental agencies and standardisation and regulatory bodies. NORMAN will facilitate access to existing data / information from research programmes by developing a database of i) leading European experts, organisations and projects dealing with emerging pollutants; ii) geo-referenced monitoring data; iii) mass spectrometric information on provisionally identified and unknown substances. Particular effort will be made to enable the final user to interpret the data and judge their representativeness, quality and comparability. Moreover, protocols for validation, harmonisation and dissemination of chemical and biological monitoring methods (including sampling methodology) will be provided. These protocols will be developed into technical guidelines / reports (e.g. CEN TR). To test these protocols and the ability of the network to meet EU demands for monitoring emerging pollutants, three case studies will be undertaken, involving partners from a wide selection of Member States, including New Member States. This will enable benchmarking of the competencies and expertise and foster the transfer of knowledge and techniques. The final goal of the project is the implementation of a network operating after the end of the project. The organisation of the follow-up of the network will therefore be one of the main tasks of the project.

## **021721- O2 BY PHOTOSYSTEM II**

Crucial intermediates in photosynthetic water splitting detected by time-resolved X-ray absorption spectroscopy (XAS) with synchrotron radiation

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 9/1/2005 - 8/31/2007

*EC contribution:* -

*Policy drivers:* Chemical Aspects

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### **Abstract**

Photosynthetic water oxidation by plants and cyanobacteria proceeds at a manganese complex bound to Photosystem II. It is a process of crucial importance for sustaining the atmospheric gas composition and for primary biomass production. The proposed fundamental research is aiming at an improved mechanistic understanding; European initiatives aiming at biological or biomimetic hydrogen production are supported. By identification of intermediates of the O<sub>2</sub>-formation a crucial 'bottleneck' in the field is tackled. By X-ray absorption spectroscopy (XAS, XANES, EXAFS) the changes in oxidation state and structure of protein-bound metal complexes in its functional cycle can be efficiently investigated (BioXAS method). The proposed time-resolved BioXAS on intermediates in the oxygen-formation transition represents an innovative and novel experiment which, to our best knowledge, is not pursued by any other group in the world. Of high priority is the training of the researcher in state-of-the-art BioXAS methodology to a level where he can prepare and lead BioXAS experiments independently, e. g. at the Beijing synchrotron. Further strategical objectives are (i) to strengthen and develop the BioXAS methodology in Europe and (ii) to establish the formation of BioXAS expertise in China and long-term Sino-European cooperation.

## **232158- ONLY WATER**

Autonomous and standardised container-based water treatment unit for production of potable water

[onlywater.info/](http://onlywater.info/)

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*Funding scheme:* BSG-SME (Research for SMEs), FP7

*Project duration:* 6/16/2009 - 6/15/2011

*EC contribution:* € 1 230 567

*Policy drivers:* Chemical Aspects  
Ecological Status

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### **Abstract**

Beside the lacking access to clean drinking water, the world are increasingly affected by natural disasters which require emergency water supply. Current water treatment systems require that they are designed to the specific water type and type of pollution which make them less suitable as emergency water suppliers. The existing mobile systems today are either not capable of cleaning the water sufficiently or too expensive for the end-users.

The project concern development of an autonomous and standardised container-based water treatment unit aimed at selected market segments, with a special emphasis on developing countries and regions.

The unit should be designed around flexible modules including pre-treatment, NF or RO membranes and post treatment, allowing it to be fitted to operate optimally under any given condition in a segment. The water treatment units must be able to operate decentralized in areas that are difficult to reach or have limited water resources necessitating water purification in order to guarantee safe drinking water for the population. The modulated design will make it possible to fit a standard unit to any of the given water resources and achieve optimal operation.

The project will focus on two water types: Groundwater of brackish nature and surface water.

The pre-treatment module will be flexible to be able to adapt to any given challenge the current water resource will show. The core will be a ceramic membrane treatment able to reliably filter out any particulate matter and dramatically reduce any micro-organisms present. Optionally a combined AOP and Activated Carbon treatment can be added after the ceramic membrane.

## 005032- ORTHO AND PARA WATER

ADVENTURE WITH NUCLEAR SPIN-ISOMERS: SEPARATION, PHYSICAL CHEMISTRY AND APPLICATIONS OF ORTHO- AND PARA-WATER

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*Funding scheme:* STP (Specific Targeted Research Project), FP6

*Project duration:* 2/7/2005 - 2/6/2008

*EC contribution:* € 1 600 000

*Policy drivers:* Chemical Aspects

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### Abstract

The two identical H atoms in the water molecule exist in two forms, with total nuclear spin number 1 (ortho isomer, o-) or zero (para isomer, p-) respectively. The equilibrium o/p ratio at RT is 3:1, but it has been recently shown that mixtures enriched in one isomeric species can be obtained by selective adsorption onto aluminum oxide or activated coal surfaces. The quantitation of the o/p ratio has been possible by means of submillimeter IR spectroscopy. The consequences of this breakthrough are not yet fully appreciated. Indeed, due to the central role of water for life on Earth, the availability of water with altered o/p ratio can be of paramount importance and may open new, highly innovative applications in a number of fields, ranging from medicine, biology, chemistry to earth sciences, meteorology etc. This Adventure project aims at exploring the feasibility of some of these exciting applications. To this end, it will deal with: 1) Optimizing the separation methods of o- and p-water isomers; 2) Developing new methods of identification and quantitation of o- and p-water; in particular, NMR approaches will be developed ( $^{17}\text{O}$ ,  $^1\text{H}$ ); 3) Understanding (and controlling) the determinants responsible for o- and p-isomers' lifetimes; 4) Characterizing the physico-chemical properties of the two isomers and studying natural and artificial systems displaying non-equilibrium o/p ratios. The different properties of the o- and p- isomers may open new adventures in the study of the spatial distribution in water containing objects, ranging from inorganic objects to biological systems, and the o/p ratio could be used as a sensor to assess functionality changes in material science and in living systems. 5) Designing new and innovative contrast agents for MRI, based on the peculiar properties of o- and p-water: a) generating "negative" images by using NMR-silent p-water, and b) producing  $^{13}\text{C}$ -hyperpolarized contrast agents by addition of p-water to suitable substrates

## **033475- OSIRIS**

OSIRIS (Open architecture for Smart and Interoperable networks in Risk management based on In-situ Sensors)

<http://www.osiris-project.eu>

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*Funding scheme:* IP (Integrated Project), FP6

*Project duration:* 9/1/2006 - 2/28/2009

*EC contribution:* € 6 462 870

*Policy drivers:* Chemical Aspects

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### **Abstract**

GMES is an information system which covers all the necessary steps from data acquisition to service delivery to the end-users. Data acquisition requires in-situ observations as well as space-based observations. By in-situ observations, we mean observations captured locally, i.e. within a few kilometres of the object or phenomenon being observed, thus including measurements taken at ground station or by aircraft. Space-based and in-situ observations are complementary, as both have limitations.

To address the limitations of in-situ monitoring systems, OSIRIS will focus on the state of the art technologies for smart sensors. The objectives of this project are to develop the technologies and necessary software for smart sensors networks deployments and operations.

The main objective of the OSIRIS project is to enhance the overall efficiency of the in-situ data processing chain by connecting the in-situ sensors via an intelligent and versatile network infrastructure that will enable the end-users to access to multi-domain sensors information.

Firstly, OSIRIS will address the smart deployment, use and reconfiguration of network of sensors in the monitoring or crisis phase.

Secondly, it will develop architectures enabling the easy share of data and access of services, taking into account the data right management.

Thirdly, it will provide the required technologies to allow for the customisation of sensors or sensors network to fulfil end-users needs and define interoperability within an In-situ Monitoring sensor web.

Finally, an experimental validation based on end-users requirements will be conducted to support the proposed concepts and investigate options to improve in-situ observations dissemination, addressing three thematic in the natural resources domain: forest fires monitoring, air pollution monitoring, water resource monitoring (in quantity and quality - pollution). A cost/benefit analysis will also verify technological choices made in OSIRIS.

## **228149- OUTREACH**

Overlooked Unresolved Toxic Organic Pollutants: Resolution, Identification, Measurement and Toxicity:OUTREACH

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*Funding scheme:* ERC (ERC Grant), FP7

*Project duration:* 7/1/2009 - 6/30/2014

*EC contribution:* € 2 000 000

*Policy drivers:* Chemical Aspects  
Ecological Status

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### **Abstract**

Organic pollution exceeds an area greater than that of France+Germany. Toxic, persistent, unresolved and unidentified, complex mixtures (UCMs) of organic chemicals are abundant all over the globe. These UCMs, which encompass a number of chemical classes, are outside present EU and world pollutant regulations. It is very important that these toxicants are identified, measured and their effects studied. Until recent work in my lab, few methods allowed such UCMs to be identified. Even now, we have only made studies of unresolved alkylated derivatives of benzene; there are numerous other unstudied classes of UCM chemicals widespread in the environment. These will be amenable to study by the new methods once optimised and new high throughput screening methods will then allow 10,000 chemicals per day to be tested for toxicity. In the present project, firstly, novel gas chromatography x gas chromatography-time of flight-mass spectrometry (GCxGC-ToF-MS) methods will be used to separate, identify and measure, novel UCM compounds isolated from water soluble fractions of a range of crude oils; secondly, the same methods will be used to identify previously UCM toxicants in polluted mussels collected from a range of global locations. Thirdly, representatives of each compound class will be synthesised and toxicities assayed using mussel feeding rates, amphipod reproduction and growth rates and fish hepatocyte assays. Finally, the UCMs, newly resolved and identified in polluted mussels will be isolated and fractionated by preparative high performance liquid chromatography and their toxicities assayed, in an effects-directed approach. This will establish definitively the range of compounds in the UCMs that are toxic, and will deliver new methods by which UCMs may be routinely assayed and no longer overlooked. The major outcome of this investigation will be much improved assessment of the effects of organic chemical pollutants on the health of the global coastal marine environment.

## **041297- OVERSOL-NANO**

Study of the oversolubility of gases in liquids of nanometric volume

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 3/1/2007 - 1/31/2009

*EC contribution:* € 149 670

*Policy drivers:* Chemical Aspects

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### **Abstract**

This project deals with the study of a basic phenomenon: the solubility of gases in liquids, which has many implications in physics, chemistry and engineering. What makes this proposal original is the nanometric scale of the system studied. Goals The main objective of this project is to understand why recent solubility measurements, on nanometer-scale gas/liquid systems, show values much higher than in a macroscopic bulk: what we called the oversolubility effect. A second objective is to build up a predictive model of the effect, as a function of the nature of the gas, the solvent, and the system size. A third objective deals with the search of possible applications of this effect, particularly for gas storage (hydrogen, carbon dioxide). Expected results Apart from the above model, the main expected results are quantitative data of the nano-scale oversolubility effect, for as much gas / liquid systems as possible. The results will be obtained as a function of temperature, gas pressure, and solvent volume size. We will focus on general interest systems in process engineering, such as H<sub>2</sub>, O<sub>2</sub>, N<sub>2</sub>, and gaseous hydrocarbons in liquid hydrocarbons and water. Special attention will be given to systems including CO<sub>2</sub> as a gas, due to its importance in the current global warming, and to those including H<sub>2</sub>, for its potential use as energy source. If the results are favourable, first tests of storage applications for these two gases will be considered. Methodology Three measurement methods will be used: - Quantitative NMR. - Micro-catharometric analysis. This device will be set up together with a high throughput feed and acquisition unit. - Micro-volumetric studies, based on very precise pressure sensors and temperature cycles. For modeling studies, the hypothesis of a purely physical effect will be used as a first ground, considering the preliminary results. As a function of further results, this approach may evolve.

## **220706- PARVIRDIS**

Enhancing natural wastewater treatment systems: the role of particles in sunlight-mediated virus inactivation

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 7/1/2008 - 6/30/2010

*EC contribution:* € 188 793

*Policy drivers:* Chemical Aspects  
Ecological Status

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### **Abstract**

The processes by which viruses are inactivated in sunlight-exposed surface waters remains largely unknown. This lack of information severely limits our ability to predict the efficiency of and rationally design natural treatment systems that utilize sunlight-mediated inactivation (e.g., constructed wetlands). Viruses commonly associate with particles in surface waters, including photoreactive particles that can 1) adsorb viruses and 2) produce reactive oxygen species (ROS) when exposed to sunlight. Virus adsorption onto the surface of photoreactive particles exposes them to elevated ROS concentration and may increase inactivation compared to free viruses. The goal of this research is to characterize the adsorption and inactivation of particle-associated viruses in the dark and exposed to sunlight, with the aim of predicting the fate of viral pathogens within natural systems and using this information to improve their efficiency. We will quantify how different viral characteristics (e.g., isoelectric points, capsid size and composition, genome type) influence adsorption and inactivation, and which modes of inactivation are dominant (e.g., ROS damage to viral host binding sites, destruction of viral capsids by ROS or adsorption, and modification or destruction of genomic nucleic acids by ROS or nucleases). To aid in this study, a novel qPCR-based method for determining virus viability will be developed, a tool that will be of use for a variety of fields including environmental microbiology, public health and medicine. The detailed information gathered in this study will then guide the development of methods to improve the viral removal efficiency of a highly controllable constructed wetland. Different wetland configurations will be tested to promote virus adsorption onto iron-oxide coated sand and to maximize viral exposure to ROS. In so doing, this project will increase the efficacy of low-cost, effective systems for water and wastewater treatment.

## **262107- PATOV**

Process Analytical Technology Unit for Online Verification of the CIP Process in the Pharmaceutical Industry

[www.patov.eu/?q=FP7](http://www.patov.eu/?q=FP7)

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*Funding scheme:* BSG-SME (Research for SMEs), FP7

*Project duration:* 1/1/2011 - 12/31/2012

*EC contribution:* € 1 246 355

*Policy drivers:* Chemical Aspects

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### **Abstract**

A group of European SMEs with expertise in process cleaning and cleaning validation as well as other environmental technologies addresses a major market opportunity in the supply of a Process Analytical Technology (PAT) compliant unit for online verification of Clean-in-Place (CIP) processes used in the pharmaceutical industry. CIP equipments provide Water for Injection (WFI) along with cleaning agents at predetermined temperatures and pressures for cleaning production equipments in pharmaceutical or food processing industry. To conform to high level cleaning regulations, preconfigured, longer than necessary cleaning cycles are followed wasting tremendous quantities of water and cleaning agents. Additional laboratory testing of residual samples from the vessels determines whether further cleaning is required or the production process can resume. This results in long periods of process downtime, while the laboratory results are awaited. PATOV is a project designed to significantly optimise these CIP processes by introducing an online, realtime cleaning validation system that will ensure optimal cleaning, but simultaneously control cleaning time and cleaning agents used. This will enable reduction in cleaning costs and process downtime while at the same time providing more analytical information to the client. The critical challenges in the project relate to the continuous sampling and the separation of the liquid component from the returned WFI so that it can be fed into commercially available analysers. The project is expected to have a severe potential to improve the efficiency and competitiveness of pharmaceutical and food processing industry with significant benefits on the quality of pharmaceutical and food products available to the public. At the same time PATOV will have direct environmental benefits by reducing water and energy consumption by optimizing cleaning cycle time.

## **262470- PHOTOMEM**

Photocatalytic and membrane technology process for olive oil mill waste water treatment

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*Funding scheme:* BSG-SME (Research for SMEs), FP7

*Project duration:* 12/1/2010 - 11/30/2012

*EC contribution:* € 909 935

*Policy drivers:* Chemical Aspects  
Ecological Status

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### **Abstract**

Presently available methods for the treatment of olive mill waste water are not acceptable from the environmental point of view (evaporation, discharge) or not suitable from the economic aspect (membrane treatments) costing 10-20% of revenues from oil selling. PHOTOMEM proposes a reliable and affordable technology solution to treat the waste water, applying a novel technical solution based on degradation of organic pollutants through photocatalysis. Dispersed ferromagnetic titania nanoparticles with a magnetic core will be used in a photocatalytic reactor and recovered through a magnetic filter. A subsequent membrane filtration step will be used to achieve the COD limit for reuse of the recycled 85% of wastewater as purified water to a grade compatible with irrigation use and/or dischargeable at low cost in the civil municipal sewer system. The combination of the 2 processes will grant strongly improved performances: double membrane lifetime, 50% cost saving for the operation, 3 times more compact plant, much faster operation. The recovery of polyphenols, a family of added value compounds (hydroxytyrosol) present in the wastewater will be performed to make the process more profitable. The tangible outcomes of the PHOTOMEM project will be: 1. Production process for ferromagnetic photocatalytic titania nanoparticles, 2. Economical wastewater treatment for OMWW, 3. PHOTOMEM pilot plant of 1 m<sup>3</sup>/day capacity to validate the treatment and evaluate scale-up. The 2 SMEs (ECS, BIOAZUL) specialised in waste water treatment plants design and construction will sell the PHOTOMEM plant in 2 different countries (Italy, Spain). The producer of custom-made ceramic powders and nanostructured materials for industrial use (MT) will produce the ferromagnetic photocatalytic titania nanoparticles. The end-user (FRA) will apply the technology in its production site. The market potential for such a solution would be of the order of several tens of millions of Euro.

## **033168- PHOTONANOTECH**

Photozyme Nanoparticle Applications for Water Purification, Textile Finishing, Photodynamic Biomineralization and Biomaterial Coating

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*Funding scheme:* STP (Specific Targeted Research Project), FP6

*Project duration:* 4/1/2007 - 3/31/2010

*EC contribution:* € 1 547 100

*Policy drivers:* Chemical Aspects

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### **Abstract**

The photozymes (P) are amphiphilic water-soluble copolymers consisting of hydrophobic chromophoric and hydrophilic monomer units forming nanosized pseudo-micelles which hydrophobic core allows to transfer the solar energy into chemical energy due to the antenna effect (AE) with singlet oxygen production (SOP) and the tailored photochemical transformation of the solubilized in the hydrophobic pocket molecules. The co-existence of these two distinctive for the photosynthesis effects in P opens wide range of possible technological innovation developments. The goal of PhotoNanoTech (PNT) is to develop new nano-based processes with long-term applications in the wastewater decontamination (WD), textile processing, biomedical coating and materials development, as well as for bone regeneration. New P will be synthesized to this goal, using zwitterionic (ZI) monomers providing them specific antipolyelectrolyte properties, salt-philicity as well as an unique self-organization ability (SOA), similar to that of phospholipids (PL).

AE-induced chemical reactions of the solubilized hydrophobic compounds is the fundament of P applications for the photocatalytic WD. pH-independent photocatalytic WD from dissolved hydrophobic compounds and damaging inorganic salts are the advantages of the suggested ZI P.

The combination of AE and SOP could find a new and promising application for making self-cleaning textiles.

PL vesicles are the place for the calcium phosphate nuclei formation and grow. PNT will exploit SOA of ZI P for their participation in the biomineralization (BZ) process. Photosensitizing characteristics of ZI P included in such vesicles opens the opportunity for light-controllable BZ, called photodynamic BZ.

A valuable property of ZI-based materials is their biocompatibility. PNT includes the production of such materials (by photoinduced graft-copolymerization) with suppressed inflammatory response, enhanced biolubrication characteristics and haemocompatibility.

## **908350- PHOTONIT**

Phototransformation and photonitration processes of aromatic compounds in surface waters: environmental significance and impacts on living organisms

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 2/9/2009 - 2/8/2011

*EC contribution:* € 15 000

*Policy drivers:* Chemical Aspects  
Ecological Status

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### **Abstract**

The Rhône river delta region and its lagoon system are located in the southern part of France, and it is a zone of great environmental importance as one of the main wintering sites for water birds in the Mediterranean area. It is also subject to a good level of environmental stress because of agricultural activities. The region is polluted by high usage of pesticides and herbicides, resulting in high concentration of aromatic and nitro-aromatic compounds (NACs). The latter are formed by photochemical reactions, are chemically stable, phytotoxic and genotoxic. Due to the significance of the Rhône delta region, it is very important to study the various photochemical pathways that are leading to the occurrence of the different pollutants in surface waters. The present study will be based, as starting point, upon the field monitoring carried out at the University of Marseille (with which the host institution is presently collaborating) on the surface water of the Rhône delta. From the time evolution data of the source compounds and their derivatives, combined with laboratory simulations of the processes involved, it will be possible to gain information concerning the relevant transformation pathways. Additionally, mutagenicity tests concerning the compounds under study will be carried out on inland water crustaceans such as the *Artemia* shrimps, which reproduce by parthenogenesis and, being monoclonal as a consequence, are particularly suitable for gene mapping and mutagenicity assessment. With the knowledge and experience gained during the fellowship, a similar study will be carried out within the framework of the Kolleru Lake of Andhrapradesh, India, contaminated by pesticides from the surrounding agricultural activities. The applicant will carry out this research work with Dr. M Subrahmanyam, Indian Institute of Chemical Technology at Hyderabad (India), as reintegration host.

## **273807- PHOTOTRAP**

Photo-Triggered Reversible Assembly of Polymers in Water

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 3/1/2011 - 2/28/2013

*EC contribution:* € 200 549

*Policy drivers:* Chemical Aspects

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### **Abstract**

The dynamic three dimensional structure of enzymes is dictated by secondary bonding interactions and plays a crucial role in both molecular recognition and allosteric regulation. "Smart" supramolecular polymers, similarly to natural enzymes, are also capable of undergoing self-organization into a defined structure on account of non-covalent interactions and subsequently exerting a function. A major limitation in the field of supramolecular self-assembly, however, has been access to synthetic systems showing reversible aggregation in water. The goal of this project is to prepare supramolecular polymers which demonstrate hierarchical assembly and light-triggered actuation in aqueous media. The self-assembly motif that will be exploited in the proposed materials is based on cucurbit[8]uril (CB[8]), a macrocyclic host molecule capable of simultaneously accommodating two guest molecules, including guests that display a photo-triggered binding affinity such as azobenzene or stilbene derivatives. Photochromic guests for CB[8] will be synthesized and combined with a variety of polymeric architectures; and CB[8] will be utilized as a molecular "handcuff" to hold together polymeric chains. This concept will be exploited in the light-controlled supramolecular polymerization of macromonomers and the preparation of polymeric micelles showing tuneable coordination modes. The light-induced modification of the stability, permeability or even morphology of the micelles will be explored. This project addresses major challenges in polymer science such as understanding the factors that determine the binding dynamics of supramolecular polymers in water and exerting reversible photo-control over macromolecular aggregation with impact on substance delivery applications, viscosity modification and the design of self-healable materials. This is a multidisciplinary project that will deliver a highly valuable educational training for the candidate in a cutting-edge scientific environment.

## **274985- POLARCLEAN**

Advanced methods for the removal and monitoring of polar organic contaminants

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 9/1/2011 - 8/31/2013

*EC contribution:* € 200 549

*Policy drivers:* Chemical Aspects

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### **Abstract**

The aim of the project is to develop advanced methodologies for the decontamination and monitoring of emerging polar contaminants in wastewaters and drinking waters.

There are no known technologies for cleaning e.g. endocrine disruptors, molluscicides, acrylamide, which are major problems affecting the quality of drinking water world-wide and can degrade aquatic ecosystems. Methods based on micro- and nano-composite materials and heterogeneous catalysis with superior cleaning properties will be developed and applied to achieve efficient and environmentally friendly remediation technologies. The decontamination strategy will be further developed as a new high throughput analytical tool for monitoring trace amounts of pollutants in water.

The project will tailor the structure of micro and nano-size carbon beads; nanotubes and graphene oxides to trap highly polar contaminants from water whose removal is not feasible today; embed the most effective structures in a polymeric matrix; and develop a process to decontaminate the material by means of heterogeneous catalysis where the adsorbent will act as catalyst in the degradation reaction. The carbon-based composites developed for water remediation will be optimised for use in analytical processes.

The outputs of the research will contribute to the betterment of ecosystems and human health through the improvement of water treatment technologies, and science with new methodologies to trap, degrade and monitor highly polar contaminants from water. Removal and monitoring highly polar small-size molecules from water is a significant challenge and an urgent need of today.

## **254339- POMHYDCAT**

Coupled Polyoxometalate Hydrogenase Catalysts for Photocatalytic Water Splitting

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 9/15/2010 - 9/14/2013

*EC contribution:* € 242 927

*Policy drivers:* Chemical Aspects

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### **Abstract**

Alternatives to fossil fuels are of rapidly increasing importance, driven by concerns over energy security, cost, and global warming. In response to these concerns, the EU has set the target of obtaining 20% of all energy from renewable sources by 2020. A key challenge in renewable energy is finding an efficient way to convert plentiful solar energy into a source of chemical energy which can be stored, used for applications such as transportation, and consumed without releasing carbon dioxide that is, a means of using solar energy to split water into molecular hydrogen and oxygen.

This fellowship aims to develop a novel approach to complete water splitting, taking an interdisciplinary approach that combines recent breakthroughs in polyoxo-metalate-based water oxidation catalysts and enzymatic hydrogen evolution catalysts. The proposed hybrid systems will be among the first complementary polyoxo-metalate-enzyme catalysts; they also promise to become the first molecular catalytic systems to efficiently split water under visible light irradiation in mild conditions.

## **039401- POPCON4BIOFILMS**

Microbial population control in biofilm reactors for sustainable nitrogen removal from wastewater

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 2/1/2007 - 1/31/2008

*EC contribution:* € 80 243

*Policy drivers:* Chemical Aspects

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### **Abstract**

In the search of improving the sustainability of nitrogen removal from wastewater, techniques that convert ammonium to nitrite only (i.e., the so-called nitritation reaction) and prevent further oxidation of nitrite to nitrate, have been denoted for quite a while as very promising. The nitritation step forms the key part of innovative sustainable nitrogen removal processes, that result in lower oxygen energy requirements, less or no need for external carbon dosage, at the same time minimizing sludge production and CO<sub>2</sub> emissions, compared to conventional nitrification-denitrification over nitrate. For this reason, this project will focus on the nitritation reaction and more specifically, on establishing stable nitrite formation in a stable and sustainable way, not only in the short term but also over long time periods. Different possible control approaches for the nitritation step will be investigated. Because of their distinct advantages, biofilm reactors have been selected for the development and implementation of control strategies. Although the application of control strategies for sustainable N-removal processes in biofilm reactors is a largely unexplored area, it will become very soon a key issue as biofilm applications are gaining more and more attention from the scientific community and the industry. But the main innovative nature of the project lies in the addition of microbial population optimisation as a new aspect to the control of the nitrogen removal processes under study. In this way short-sighted optimization that may have an adverse effect in the long term is avoided. Instead, the control objective consists of population dynamics management, maintaining microbial diversity to ensure a robust process on the long term. To reach this goal, a biofilm reactor model will be developed that accounts for microbial population dynamics. This model will subsequently be used for the development of control laws that can manage these dynamics.

## **033028- PRO PIPE**

The development of an impervious nano composite barrier system which can be used for potable water pipes in brownfield sites and other harsh environments

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*Funding scheme:* SME (SMEs-Co-operative research contracts), FP6

*Project duration:* 10/1/2006 - 1/31/2009

*EC contribution:* € 804 997

*Policy drivers:* Chemical Aspects

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### **Abstract**

The main objective of our project is to develop impervious potable water pipes for the Brownfield sites hence to avoid risks of hydrocarbons permeation from contaminated land and potentially problems of chemicals leaching from pipes. So safe and high quality potable water can be served in Brownfield site. Our technology objectives to deliver an impervious pipe are to gain increased knowledge regarding the mechanical property and impact behaviour of aligned nanoclays in polymer to develop an efficient method to disperse and exfoliate 99% of nanoclays to develop an online quality control system to check the performance dispersion alignment and barrier property of nanoclays in polymer to develop chaotic advection system that could generate thousand unbroken nanocomposite thin layer of 200nm. We will deliver the following economic objectives: Protect domestic sales in Europe of 368 M p a safeguarding 3 000 jobs. Create exports of materials of 78M p a creating 620 jobs. Growth will generate an additional 150M p a creating 1200 jobs. Create manufacturing systems sales of 25M p a creating 200 jobs. These objectives will be delivered by 8 SMEs from 7 member states three two research centres from two different member states and two LE providing the route to market. Our project contributes to the objectives of the Sixth Framework Programme in particular supports SMEs to respond to the pressures for continuous innovation and technological adaptations facilitates transnational co operation in research between SMEs research institutions and other organisations facilitates co operative relations in research activities between SMEs research institutions and other organisations.

## **272511- PSNOP**

Engineering aspects and mechanisms of a natural pyrrhotite simultaneous nitrogen and phosphorus removal (PSNOP) biofilter technology

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 10/1/2011 - 9/30/2013

*EC contribution:* € 273 095

*Policy drivers:* Chemical Aspects

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### **Abstract**

This project aims to develop a natural pyrrhotite simultaneous nitrogen and phosphorus removal (PSNOP) biofilter technology for treatment of wastewater lacking organic matter. In PSNOP biofilters, natural pyrrhotite particles are used as the bio-film carrier. By seeding the PSNOP biofilters with anaerobic sludge, sulphur autotrophic denitrifying bacteria bio-films will be grown. Sulphur autotrophic denitrifying bacteria will utilize pyrrhotite as the electron donor to reduce nitrate to nitrogen gas; simultaneously, iron and hydroxide ions generated during autotrophic denitrification will remove phosphorus via chemical precipitation and coagulation.

The main research contents will include: (1) to investigate the engineering aspects of PSNOP biofilters in nitrogen and phosphorus removals from synthetic and real wastewaters; and (2) to analyze the mechanisms by examining the ecological structure in bio-films, oxidation of pyrrhotite, and denitrification and phosphorus precipitation kinetics. The applicant is a highly experienced researcher and develops the PSNOP idea from his experience in sulphur-based autotrophic denitrification and environmental mineralogy.

With genuine mobility, he will transfer knowledge to the host group and the Europe. Being highly multidisciplinary, this project will: (1) generate a novel environmental technology which has a commercialization potential, and lead to fundamental understanding of sulphur autotrophic denitrification and bio-films, all resulting in increasing European competitiveness; (2) attract a top-class researcher active in a third country and increase the research excellence and multidisciplinary activities at the Community; (3) create long-term collaborations and mutually beneficial co-operation between research institutes in Europe and China; and (4) benefit the applicant's research career by training him as an independent researcher with specialized facilities, advanced techniques and European research culture.

## **024004- RAMADA**

Rapid Microbial Adaptation via Horizontal Gene Transfer:  
Environmental Management Opportunities and Public Health  
Concerns

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 1/1/2006 - 12/31/2009

*EC contribution:* € 1 913 370

*Policy drivers:* Chemical Aspects  
Groundwater

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### **Abstract**

Horizontal gene transfer (HGT) is a central process in microbial adaptation to xenobiotic chemicals, but also in their gain or loss of pathogenicity. The goal of the proposed research is to examine, describe, and control the incidence of extant HGT in microbial biofilm communities found in groundwater and drinking water treatment and distribution systems. The results of this project will answer questions with acute environmental and public health relevance: Can this natural process of rapid microbial adaptation (RaMAda) via HGT be harnessed to steer microbial attenuation of pesticide laden groundwaters? Does HGT need to be considered in a precautionary fashion when examining the fate of pathogenic traits in a drinking water distribution context? This project will employ advanced methods like novel molecular biomarkers to permit single-cell resolved detection of microbial growth and gene transfer dynamics; advanced microscopic tools and image analysis, innovative biomathematical approaches to model microbial activity from individual cell behavior to yield emergent system properties, and environmentally relevant biological and physico-chemical materials and conditions. This study can lead to innovative approaches to detoxify pesticide-laden groundwaters, and may drastically reform fate assessment of pathogenic and bioterrorism micro-organisms by explicit consideration of the survival of their horizontally transmissible genes. The central core of the proposal responds directly to 6th FP7s call for enhancement and structuring of the European Research Area via its HRM activity. It will support 2 early and 2 mid-career scientists who will join a trans-national, leading-edge, and interdisciplinary research programme with European dimension, built around a young EU researcher, returning from the USA where he established an excellent autonomous research program, in direct response to the goal of counteracting brain drain under the MC Excellence Grant action.

## 041374- RECRYST

Improving water treatment processes through chalk recrystallisation

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 8/1/2008 - 7/31/2010

*EC contribution:* € 182 403

*Policy drivers:* Chemical Aspects

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### Abstract

Calcite ( $\text{CaCO}_3$ ) plays a role in many public and industrial regimes that are critical for the health and economic well-being of society, but in many cases, a lack of understanding of the fundamental physical and chemical properties controlling calcite growth and dissolution translates to direct problems or to inefficiency in water treatment processes. A common method for removing toxic trace-metal contamination during water treatment is to add lime ( $\text{Ca(OH)}_2$  or  $\text{CaO}$ ). Trace metals are trapped in growing calcite as Ca combines with  $\text{CO}_3$  from the water. However, production of lime requires burning of calcite, often in the form of limestone or chalk. This emits  $\text{CO}_2$ , and though some  $\text{CO}_2$  is consumed during water treatment, considerable energy is required for lime production, which also contributes to the atmospheric carbon load. If a method could be developed to treat water directly with natural calcite, without first converting it to lime, considerable energy could be saved and  $\text{CO}_2$  emissions could be reduced. We will investigate methods to alter the surface properties of chalk, to make it more effective at trapping trace metals. Our approach is to promote Ostwald ripening, the natural process where small particles dissolve to provide material for growth of larger particles. The growing calcite traps trace-metals, removing them from the water. To achieve this, we will apply nano-technological methods for characterising particle surfaces and use a bio-technological approach to develop environmentally friendly enzymes that can degrade the organic coatings on chalk particles, which are known to inhibit natural recrystallisation. The Science and Technology results will lead to improved treatment processes for clean drinking water, and a decreased need for lime production with less consequent emissions of  $\text{CO}_2$ , thus significantly improving energy efficiency and environment sustainability.

## **018525- REMOVALS**

Reduction, modification and valorisation of sludge

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*Funding scheme:* STP (Specific Targeted Research Project), FP6

*Project duration:* 7/1/2006 - 6/30/2009

*EC contribution:* € 2 936 470

*Policy drivers:* Chemical Aspects  
Ecological Status

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### **Abstract**

The adoption of the Urban Waste Water Treatment Directive 91/271/EEC imposes the sewage sludge to be subsequently treated so it is expected by 2005 to increase twofold in comparison with 1992. However, classical incineration to treat this vast amount of sludge must be no longer accepted from an environmental point of view. In addition, the Sewage Sludge Directive 86/278/EEC regulates the uses and properties of stabilised sludge for being either recycled or disposed. Both directives drive specific actions in two complementary ways. Firstly, a deep knowledge of current sludge treatment, such as mesophilic, thermophilic or autothermophilic processes, must be promoted to solve that problem in the UE ambit, taking in account the particular considerations of each treatment facility. In second place, the development of new processes must be supported to open new alternatives that could valorise that waste. The proposal aims at developing strategies for the disposal and reuse of waste sludge. The scope envisages to develop several processes for reducing both amount and toxicity of sludge, with simultaneous transformation into green energy vectors such as methane or hydrogen. In outline, mesophilic and mainly thermophilic and autothermophilic conditions will be deeply explored as classical alternatives for sludge stabilisation, assuring sanitary conditions of the treated sludge. Also, valuable materials will be obtained from sludge, such as activated carbons, which will be used in conventional adsorption processes and in innovative advanced oxidation processes. The main outcomes expected at the end of the projects are guidelines for technology selection in agreement with the geographic, economic and technical characteristics of the sewage plants, demonstration of the feasibility of new applications for the sewage sludge, manufacturing of activated carbon from sludge sewage as innovative recycling of sludge waste, and a deep understanding of the methods involved.

## **507997- RO-SOLAR-RANKINE**

Development of an Autonomous Low-Temperature Solar Rankine Cycle System for Reverse Osmosis Desalination (RO-SOLAR-RANKINE)

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*Funding scheme:* SME (SMEs-Co-operative research contracts), FP6

*Project duration:* 7/1/2004 - 6/30/2006

*EC contribution:* € 1 137 805

*Policy drivers:* Chemical Aspects

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### **Abstract**

The research regards the development, application testing and performance evaluation of a low temperature solar organic Rankine cycle system for Reverse Osmosis (Ro) desalination. Below a technical description of the system to be developed is given: Thermal energy produced by the solar array evaporates the working fluid (HFC,;134a) in the evaporator surface. The super-heated vapour is driven to the expanders where the generated mechanical work drives the RO unit pumps (high pressure pump, cooling water pump, feed water pump) and circulating pump. The saturated vapour at the expanders' outlet is directed to the condenser and condensates. On the condenser surface, seawater is pre-heated and directed to the seawater reservoir. Seawater pre-heating is applied to increase the fresh water recovery ratio. The seawater tank is insulated. The use of seawater for condensation purpose on the condenser surface decreases the temperature of "Low Temperature Reservoir" of Rankine cycle thus a better cycle efficiency is achieved. The saturated liquid at the condenser outlet is pressurised in a special pressurisation arrangement consists of two vessels and three valves, substituting a pump. The sub-cooled liquid at the pressurisation arrangement outlet is driven to the economiser. The economiser acts as working fluid pre-heater. In the economiser outlet saturated liquid is formed, which is directed to evaporator inlet and the cycle is repeated. For the prototype system 240 m<sup>2</sup> of vacuum tube solar collectors will be deployed. The evaporator and condenser capacity is estimated about 100 kW. For these systems' characteristics and considering a water recovery ratio of seawater RO desalination unit of 30%, the average yearly fresh water production is estimated at 1450 m<sup>3</sup> (or 4 m<sup>3</sup> daily). Specific innovations of the system are: Low temperature thermal sources can be exploited efficiently for fresh water production; solar energy is used indirectly and does not heat seawater.

## **220665- RSMBR**

Engineering aspects and mechanisms of redox-stratified membrane bioreactors for completely autotrophic nitrogen removal from wastewater

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 1/1/2009 - 12/31/2010

*EC contribution:* € 184 602

*Policy drivers:* Chemical Aspects

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### **Abstract**

Novel redox-stratified membrane bioreactors (RSMBRs) will be developed for completely autotrophic nitrogen removal from wastewater. This technology is based on simultaneous nitrification and anaerobic ammonium oxidation (anammox) occurring in redox-stratified counter-diffusion biofilms grown on the surface of gas-permeable membrane. With precise control of the oxygen supply flux, the growth of nitrite oxidizing bacteria will be inhibited. A stable redox-stratified counter-diffusion biofilm with aerobic ammonium oxidizing bacteria (AeAOB) dominant in the inner side and anaerobic ammonium oxidizing bacteria (AnAOB) located in the outside surface will be achieved. The research work will include four parts: (1) to examine the operational strategy and investigate the performance of RSMBRs in nitrogen removal from synthetic and practical wastewaters; (2) to analyze the ecological structure in biofilms using genetic techniques; (3) to study the nitrite reaction kinetics in RSMBRs using DO and nitrite microsensors; and (4) to simulate RSMBRs in nitrogen removal from wastewater by using mathematical modelling. Being highly multidisciplinary, this project will: (1) generate novel membrane bioreactors for the protection of health and the environment and lead to fundamental understanding of the nitrification/anammox process, all resulting in increasing European competitiveness; (2) increase the long-term research capacity and multidisciplinary activities at the EU and the host group, which is located in a less-favored region of the EU; (3) establish strong international research links and contacts between the host group and other research groups in the EU and China; (4) benefit the applicant's research career by training him with specialized facilities, advanced techniques and multidisciplinary knowledge in the host organization; and (5) contribute to the environment protection in China by transfer of knowledge and human capacity building.

## **286889- SAFEFLAME**

Development of oxy-hydrogen flame for welding, cutting and brazing

[www.safeflameproject.eu/](http://www.safeflameproject.eu/)

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*Funding scheme:* BSG-SME (Research for SMEs), FP7

*Project duration:* 11/1/2011 - 10/31/2014

*EC contribution:* € 1 988 256

*Policy drivers:* Chemical Aspects

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### **Abstract**

The oxy-acetylene flame has been used very widely in industry for many years and enjoys several positive characteristics including a high combustion temperature, wide availability, trained workforce and process versatility. However, it also has some drawbacks which are becoming more significant with increasing health and safety and environmental concerns; having significant quantities of highly combustible gases is undesirable; dedicated training on safety aspects of handling oxy-acetylene; the production and transportation of large quantities of combustible gas is damaging to the environment.

In project SafeFlame, an alternative to oxy-acetylene heating will be developed, validated and exploited, particularly for SME fabricators.

Oxy-hydrogen flames can be generated by the combustion of oxygen and hydrogen produced locally using an electrochemical cell. This approach has the following advantages over oxy-acetylene heating:

- The cell is highly portable, reducing transportation costs and increasing the flexibility of the process.
- The fuel is water which is widely available and low cost.
- The process requires electricity to generate the gases but is >60% efficient.
- Storage of combustible gas is eliminated
- The system can be deployed flexibly and is cost-effective compared with oxy-acetylene.
- Control over the combustion process will enable reducing or oxidising conditions to prevail during the heating process.

The aim is to develop and validate the use of oxy-hydrogen combustion as an alternative to oxy-acetylene, for applications which could include precision welding, brazing and soldering, cutting, repair and heat treatment.

The project will involve the specification of the required heating for a given application, different design(s) of electrolyser, the design of heating torch (including process modelling) tailored to the application, product integration,

process trials and validation, the development of case studies, dissemination activities and training.

## **012675- SALINITY AND AQUAPORINS**

Molecular and biochemical responses to salinity. Functionality of aquaporins.

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 6/1/2005 - 5/31/2006

*EC contribution:* € 40 000

*Policy drivers:* Chemical Aspects

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### **Abstract**

Salinity constitutes the most severe agricultural problem in many parts of the world and is the major factor limiting crop production. For this reason, plant response to salinity is one of the most widely researched subjects in plant physiology. Aquaporins are membrane channel proteins that facilitate the permeation of water across biological membranes. Water relations are rather complex and aquaporin regulation can be one of the mechanisms for optimal water balance under changing environmental and developmental conditions. In this project we will determine the biochemical and molecular mechanisms involved in water uptake in different plants irrigated with water containing high salinity level. Therefore, we will study the tolerance to salinity in pepper plants and for this, we will try to isolate and characterize some aquaporin genes in pepper plants and study the changes in their expression under different stress conditions. Changes in membrane water permeability may be part of a general response to various abiotic and biotic stresses, such as pathogen attack or oxidative damage and may be related to aquaporin activation or inactivation. In consequence, we will analyse the effect of H<sub>2</sub>O<sub>2</sub> in aquaporins regulation and the correlation between the oxidative stress and aquaporin functionality. In order to elucidate the aquaporins function, the effect of virus on their regulation will be studied.

## **272234- SCENT**

Scanning chemical pollution as an ecological impact of non-native fish introductions: an experimental approach

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 11/1/2011 - 10/31/2013

*EC contribution:* € 271 636

*Policy drivers:* Chemical Aspects  
Ecological Status

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### **Abstract**

The proposed MC Fellowship will look for the first time into the concept of pheromone pollution within biological invasions, as we strongly suspect this is facilitating the establishment of introduced fish species in novel ecosystems from the results of preliminary experiments. In the same way that introduced species can disrupt native species genetics through hybridisation, they can also disrupt highly-evolved reproductive behaviours through a complex exchange of pheromones signals in chemical complexes of similar character. Species-specific modifications to separate similar pheromone systems, and prevent a generic response, have not previously been required due to geographical isolation, whereas today these species are increasing living in sympatry in European freshwaters. Correspondingly, a dominant individual of an invasive fish that uses chemical signals to modify behaviours among subordinates could, when introduced, also affect the individual behaviours of native species. This has been discovered in the most invasive fish in Europe, topmouth gudgeon *Pseudorasbora parva*, which has a sexual pheromone complex that causes the total inhibition of spawning in two small-bodied, nest-guarding cyprinids from continental Europe (sunbleak *Leucaspius delineatus*; IUCN Red List of Threatened Species) and North America (fathead minnow *Pimephales promelas*). Therefore, the overall aim of the project is to examine the concept of pheromone pollution as a facilitator of the establishment and invasion of *P. parva* in novel ecosystems. This will be completed through experimental studies of reproductive pheromone interactions between *P. parva*, and both *L. delineatus* and *P. promelas*, and so has high significance for the conservation of European fish diversity. The project will then provide fundamental information for guiding the formulation and implementation of EU policy and management decisions on the invasive species that are impacting most on the biodiversity of Member States.

## **037036- SCOREPP**

Source Control Options for Reducing Emissions of Priority Pollutants

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*Funding scheme:* STP (Specific Targeted Research Project), FP6

*Project duration:* 10/1/2006 - 3/31/2010

*EC contribution:* € 2 600 000

*Policy drivers:* Chemical Aspects

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### **Abstract**

The overall aim of the SCOREPP project is to develop comprehensive and appropriate source control strategies that authorities, cities, water utilities and chemical industry can employ to reduce emissions of priority pollutants (PPs) from urban areas into the receiving water environment. The SCOREPP project focuses on the 33 priority substances identified in the Water Framework Directive (WFD), and specifically on the 11 priority hazardous substances. However, this list may be expanded to include emerging pollutants or reduced if appropriate model compounds can be identified, depending on the local context.

The specific scientific objectives of the SCOREPP project are to identify the sources of PPs in urban areas, to identify and assess appropriate strategies for limiting the release of PPs from urban sources and for treating PPs on a variety of spatial scales. Furthermore to develop GIS-based spatial decision support tools for identification of appropriate emission control measures, to develop integrated dynamic urban scale source-and-flux models that can be used to assess the effect of source control options on PP-emissions and to optimise monitoring programmes, and to assess the direct and indirect costs, the cost-effectiveness and the wider societal implications of source control strategies. The developed approaches, models and assessments will be used to formulate a set of appropriate PP-emission reducing strategies, and a multi-criteria approach will be used to compare and evaluate these strategies in relation to their economic, societal and environmental impacts.

The SCOREPP project will interact with the European chemical industry and water utility trade associations together with representatives from ministerial, regional, municipal and community organisations to ensure that these key urban stakeholders can provide input to framing the scope of the project, adapting the project outcomes and communicating the results of the project to a wide audience.

## **021556- SEDCC**

Sorption of endocrine disrupting chemicals by colloids

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 5/1/2006 - 4/30/2008

*EC contribution:* € 169 365

*Policy drivers:* Chemical Aspects

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### **Abstract**

"This proposal aims to support the collaboration of leading researchers to study endocrine disrupting chemicals (EDCs), with the broad aim of supporting the development of dynamic world-class human resources in the European research system. The proposal consists of a scientific project and scientific and complimentary training. The scientific project aims to develop cross flow ultrafiltration (CFUF) for assessing the interactions of EDCs and colloids in aquatic systems. The key objectives are: To develop and validate a multi-stage CFUF system suitable for aquatic colloid isolation; To refine sampling and analytical methods for EDCs in water and particulate samples; To examine the recovery of chosen EDCs through the CFUF under laboratory condition; To conduct fieldwork by separating EDCs into particulate, colloidal and dissolved phases; To characterise the aquatic colloids in order to better understand the formation of EDC-colloid complexes; To predict the transport and fate of EDCs in aquatic systems using a multi-phase (dissolved-colloid-particulate) model. The fellow will receive scientific training to acquire further practical skills in environmental investigations and data analyses; to design, conduct and report on cutting edge research on EDCs; to operate modern instruments; and to develop pollution transport models. Complementary training will involve the fellow learning and practising transferable skills, e.g. presentation, project management and grant application, as part of his career development plan. The objectives will be achieved through careful planning and management of the fellowship. The proposed scientific project is timely and appropriate methodology has been established. Novel and state-of-the-art techniques will be used. The supervisors and the fellow have relevant expertises. Regular meetings will be held to ensure progress. The fellow is expected to become a fully independent researcher by the end of the fellowship."

## **237181- SEFCUMPAQ**

### **A NOVEL BIOPROCESS COUPLING WASTEWATER TREATMENT WITH ELECTRICITY PRODUCTION TO REMEDIATE METAL POLLUTED AQUATIC ENVIRONMENTS**

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 3/1/2010 - 2/29/2012

*EC contribution:* € 160 028

*Policy drivers:* Chemical Aspects

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#### **Abstract**

Worldwide contamination of the aquatic environment with heavy metals (such as Fe, Co, Ni, Se, Zn, Pb, and Ni) and organic compounds has become a major concern, disturbing the natural functions of rivers/lakes and ponds, causing ecological and health problems. The microbial fuel cell (MFC) is a special form of a fuel cell in which bacteria catalyze the oxidation of organics and produces electricity. MFCs could provide an elegant novel ecotechnology, combining the clean-up of the pollutants (organic matter, metals or sulfate) with electricity production. This IEF will study a particular form of MFCs, that can easily be integrated in natural treatment systems: sediment fuel cells (SFCs). SFCs rely on the natural voltage gradient between the sediments and the overlying seawater. This gradient is created by microbial oxidation of subfloor organics, which results in the generation of electron-rich reductants such as Fe<sup>2+</sup> or HS<sup>-</sup>. However, SFCs are still facing a challenge for consistent power production over extended periods. The composition, mechanisms involved in electroactive biofilms remained largely unknown and the potential of SFCs for metal polluted aquatic environments (MPAE) have not been explored yet. This IEF will develop a novel SFC, which will be tested on MPAEs, both polluted natural fresh and sea water. Thus, this IEF will contribute to the development of a cost effective alternative to current fuel utilization. The novel SFC will be evaluated as a function of organics/metals turnover and specific power production rates and in parallel, novel analytical techniques/methods to enhance/measure the biofilm activity (electrochemical). Finally, a prototype will be tested. This IEF will provide a tool and an instrumental role for water frame work Directive 2000/60/EC of the EU and Directive 2006/21/EC on management of industrial waste. This IEF falls into the category of renewable energy policy of EU, using sediment organic/inorganic pollutants as energy precursor.

## **228652- SELFMEM**

Self-Assembled Polymer Membranes

[www.selfmem.eu/](http://www.selfmem.eu/)

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*Funding scheme:* CP (Collaborative Project), FP7

*Project duration:* 9/1/2009 - 8/31/2012

*EC contribution:* € 3 599 734

*Policy drivers:* Chemical Aspects

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### **Abstract**

The aim of SELFMEM is to develop innovation in the field of nanoporous membranes. This will be achieved by taking advantage of the self-assembly properties of block copolymers leading to highly porous membranes with adjustable, regular-sized pores of tailored functionalities. Both polymeric and inorganic (silicon) membranes will be developed. In the case of isoporous polymeric membranes focus will be laid on the formation of integral-asymmetric block copolymer membranes with an isoporous top layer as a function of the block copolymer structure and the preparation conditions. Isoporous inorganic membranes will be prepared by using a thin block copolymer film as a mask for selective etching. The possibilities to systematically vary the pore size and density by varying the block copolymer mask structure will be investigated. The block copolymers will be synthesized by controlled polymerisation techniques (anionic, group transfer, and different radical polymerisations), depending on the chosen monomers. The characterisation during and after formation of the membranes will be carried out by light and various x-ray scattering techniques, by scanning force microscopy, and by different electron microscopic techniques. Both types of membranes will be post-functionalized in order to tune their final properties. The membranes will be tested for their applicability in different areas. Separation of gases (like H<sub>2</sub>/CO<sub>2</sub>) and proteins as well as water purification will be addressed in this project. Modeling and theory will support the understanding of the structure formation of these membranes and help to optimise membrane design. The results of SELFMEM will increase European competitiveness in strategic markets such as gas purification, water treatment and molecular biology. The consortium consists of 12 partners from 10 countries, including 4 companies from 3 countries.

## **020643- SENDICHEM**

Sensing Endocrine Disrupting Chemicals: development of novel solid phase extraction systems

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 9/1/2006 - 8/31/2010

*EC contribution:* € 646 482

*Policy drivers:* Chemical Aspects  
Ecological Status

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### **Abstract**

Endocrine disrupting chemicals (EDCs) are environmental pollutants endowed with endocrine activity. An increasing risk of cancerogenesis, disturbance of childrens development and reduced male fertility are attributed to EDCs in water and nutrition. The proposal will focus on an efficient collaboration between synthetic organic chemists, polymer chemists, separation scientists and specialists in structural characterization, for the design of novel solid phase extraction systems for EDCs. The specific challenge lies in the development of materials showing gradually differing affinity for several EDCs.

As a single host, the Department of Organic Chemistry at Ghent University, we propose to train 4 young scientists in a laboratory based programme involving three-year doctoral studies. The interdisciplinary nature of the proposed project defines a wide field of training for the early stage researchers. Furthermore next to training in scientific and technological competencies, training will be provided in complementary skills such as presentation and reporting capability, aspects of industrial research and time management.

The Department combines different research groups with relevant experience in several aspects of the project and has successfully delivered over 130 PhD degrees during the last 10 years.

The close connection between the Department of Organic Chemistry (UGent), the Research Institute for Chromatography and the Pfizer Analytical Research Center will ensure awareness of industrial needs and opportunities.

The defined research theme has been chosen for training on the basis of its innovative character, the potential for training in a multidisciplinary way and its relevance to priority areas of exceptional interest for Europe (sustainable development, knowledge-based functional materials). As such, the proposed early stage training site offers a valuable research experience as part of an integrated multidisciplinary team effort.

## **232249- SILCO**

Innovative electrodes to control trace metal ionization used to treat Legionella and other pathogens in water distribution systems

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*Funding scheme:* BSG-SME (Research for SMEs), FP7

*Project duration:* 11/1/2009 - 10/31/2011

*EC contribution:* € 953 667

*Policy drivers:* Chemical Aspects

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### **Abstract**

One of the most effective methods for the abatement and prevention of Legionella and other hazardous pathogens in water is copper-silver ionization. This method is based on channelling water through a device that applies low potential electricity to copper and silver electrodes, releasing Cu and Ag ions which kill the bacteria. Currently there is no device available for monitoring the trace metal content at ppb level in water, essential to gain approval from health authorities. This project develops a new monitoring tool based on Hg-free micro-electrodes capable of monitoring at low concentrations in water. Innovative boron doped diamond electrodes for longer term monitoring, and screen printed electrodes for shorter term monitoring will be incorporated into the analytical device. The device will be linked to a self-adaptive intelligent controller to control the dosing of copper and silver. Further the system will be provided with a wireless communication interface which will allow remote control over the internet as well as operation of a central data recording server. After laboratory calibration and operator training, 5 prototypes will be tested at sites provided by the SME partners in NL, SK, GR, and CY. Development of this tool will strengthen the market position of the SMEs in a field where no comparable device is currently present. Based on the number of copper-silver ionisation systems already sold in Europe, estimates indicate a market value of more than 100m euro over five years for the SILCO device. In addition, promising spin-offs are foreseen since the system will also be capable of measuring range of other trace metals in aqueous environments.

## **236799- SMARTMIP**

Modulated Catalysis by Smart Molecularly Imprinted Polymers

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 12/8/2009 - 12/7/2011

*EC contribution:* € 181 350

*Policy drivers:* Chemical Aspects

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### **Abstract**

Molecular imprinting, an important methodology for the straightforward prepared of antibody-like polymers, is recently one of focuses in chemistry because of its importance in catalysis, separation and sensing. Described usually as a 'from-key-to-lock' process, the molecular imprinting recognizes and interacts with substrates basing on a specifically complementary framework. The present proposal aims to design 'smart' imprinted polymers capable of showing tunable catalysis. Inspired by recent advances in the 'Smart' technology, a unique hydrophilic/hydrophobic transition is created within the binding framework. The design of this transition will cause an opening/closing-tunable mechanism within the binding framework, thereby allowing/refusing the substrates in water accessible to the interior. In the opening state, the substrate in water can be freely accessible to the binding framework, thus making possible efficient interaction. Above the transition the blockage of access to the inner largely restricts the diffusion of substrates. In this way, such recognition and catalysis are comparable to an on/off-switchable process, which thus allows one to manipulate the activity by controlling the phase behaviours of prepared materials.

## **046413- SMECTI-SCALE**

Structure and dynamics of water and ions in smectite

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 3/1/2007 - 2/29/2008

*EC contribution:* € 40 000

*Policy drivers:* Chemical Aspects

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### **Abstract**

Smectite is a clay mineral that occurs in multiple surface environments, both terrestrial and marine, frequently as one of their main mineral components. It has the unique property of admitting inorganic and organic species as well as water in its interlayer space. Smectite expandability and large surface area make it a main control of the physical and chemical behaviour of the environments where it is found. The present study aims at investigating the structure of smectite from molecular scale to the micrometer scale by coupling different techniques (experimental and numerical) in order to describe precisely the geometry of the system and to define the localisation and the organisation of water molecules and ions. In parallel a dynamical study will be done to determine the diffusion rate of ions and water molecules in the system. This coupled study will be used to determine the main parameters controlling the diffusion of ions and water in smectite and will provide a better understanding of the mechanisms of ions and pollutants migration in soil.

## **515386- SMECTITE-WATER**

Understanding smectite-water complex

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 1/10/2005 - 1/9/2007

*EC contribution:* € 158 480

*Policy drivers:* Chemical Aspects

Water Scarcity and Droughts

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### **Abstract**

Smectite is a clay mineral able to adsorb water. Water is retained between smectite layers, forming a complex with the interlayer cations that balance the charge caused by isomorphous substitution within the layers. This ability to adsorb water is an important control of the physical and chemical properties of soils and surface sediments: stability, subsidence and rising, plant nutrient availability, mobility of chemical species, water availability, etc. Water adsorption on smectite is controlled by the degree of water saturation, the nature of the interlayer cation and the extent and distribution of the layer charge. The effect of layer extent and distribution is not sufficiently understood yet and it is the focus of this study. The project has 3 goals: 1) Study the effect of layer charge on smectite hydration. For this, 3 specimens with different charge and charge distribution will be studied by means of X-ray diffraction, thermogravimetry, infrared spectroscopy and nuclear magnetic resonance to obtain the accurate description of layer charge distribution, layer hydration state and of water coordination at the atomic scale. 2) Investigate smectite dehydration mechanism. This will be achieved by isothermal dehydration experiments at several temperatures, using X-ray diffraction, infrared and thermogravimetry. 3) Study dehydration during the first stages of the smectite illitization and discriminate between this process and simple dehydration. Smectite will be altered to illite at different extent, in hydrothermal experiments at several temperatures and for different times. The products will be analysed in similar ways as the specimens in goals 1 and 2 to study how the illitization reaction affects the hydration state and to compare the parameters governing simple dehydration and dehydration caused by illitization. This study will produce a more complete picture of smectite-water interaction, including layer charge for the first time.

## **037038- SOCOPSE**

Source control of priority substances in Europe

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*Funding scheme:* STP (Specific Targeted Research Project), FP6

*Project duration:* 11/1/2006 - 10/31/2009

*EC contribution:* € 1 720 000

*Policy drivers:* Chemical Aspects

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### **Abstract**

With the new regulations included in the Water Framework Directive (WFD) (2000/60/EC), new strategies are needed for control of Priority pollutants (PP). For decision making and implementation of the WFD, the industrial sector, local water authorities and EU policy makers need guidelines for the selection and introduction of feasible and cost-effective measures. The overall objective of this project is to support the implementation process for the WFD by providing guidelines and decision support tools for the management of priority pollutants.

To fulfil this overall objective the following activities are proposed:

- To conduct a material flow analysis for selected priority pollutants.
- To evaluate available and emerging measures and management options for PPs.
- To develop a decision support tool for identification and selection of relevant measures on European, national and regional level.
- To evaluate different potential measures by applying the decision support tools in case studies.
- To facilitate the development of collective action plans (i.e. river basin management plans) involving all stakeholders (industries, authorities, citizens, NGOs).
- To disseminate results to stake-holders and to strongly interact with industrial organisations, research networks, authorities and NGOs.

A Stakeholder Advisory Group (SAG) will be formed with representatives from industries, authorities and NGOs.

The SAG will be consulted during all steps in the process of collecting information, developing the decision support tool and the suggested set of management measures. The cooperation with the industrial sector, the different authorities and other stakeholders (public, NGOs) will ensure the accuracy and relevance of basic data collection, as well as the

applicability, acceptance and relevance of the results from this project.

## **007362- SPANAMICO**

Spatial distribution of N processes and microbial communities in arable soils at micro- and nano- scales

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 2/1/2005 - 1/31/2008

*EC contribution:* € 217 912

*Policy drivers:* Chemical Aspects

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### **Abstract**

The activity of microorganisms in soil is regulated by soil-water-oxygen interactions, the availability of a habitable space and a food source. The relationship between the spatial location of microorganisms in soil and the actual physical structure of the soil has a major influence on nitrogen (N) cycling processes. However, to date the international research community knows very little about the interactions between soil physics and soil biology. This is because of a prior lack of sensitive techniques and equipment to apply to this emerging field of research. However, this is now possible with use of the latest technology available in microscopy, stable isotopes and molecular techniques. This can be achieved through collaborative research between the University of Newcastle upon Tyne (United Kingdom) and the University of Western Australia (UWA). The recent acquisition of the nano-Secondary Ion Mass Spectrometer at UWA (one of only 10 in the world) which links high-resolution microscopy to N isotope analysis provides the previously missing piece of the jigsaw in this proposed research. This means that the Marie Curie Fellow will be at the forefront of this emerging field of soil research. The aim of SPANAMICO is therefore to improve our understanding of how the soils 3-Dimensional (3-D) chemical and physical matrix regulates the cycling of N within the soil and from the soil to water and air. The main objective is to understand the direct importance of the soils 3-D matrix on the regulation of microorganisms involved in denitrification, nitrification and immobilisation. With the latest developments in technology this is now achievable at a micro- to nano-meter scale. Findings will be of direct relevance to the sustainable management of N in soil and from soil to water and atmosphere. In particular we address three key areas of thematic priority No 6: (i) greenhouse gases, (ii) water cycle and soil, and (iii) sustainable land management.

## **249271- STACS**

Stability of sorbed arsenic by pipe scales and biofilms in drinking water distribution systems

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 4/1/2010 - 3/31/2013

*EC contribution:* € 75 000

*Policy drivers:* Chemical Aspects

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### **Abstract**

The notion that inorganic contaminants behave conservatively between the point of entry (after conventional or reverse osmosis-desalination water treatment) and the point of use by consumers is currently being re-visited by EU regulatory agencies. One of the main reasons deteriorating the quality of home tap water is related to the accumulation of contaminants, such as arsenic (As) to scale and biofilm growth in drinking water pipe walls. The central hypothesis of the proposed research is that changes in solution chemistry of the finished water adversely influences the stability of sorbed As by pipe scales. Our long-range goal is to provide mechanistic insight to critical unanswered questions related to the stability of sorbed As by pipe scales and biofilm conglomerates (PSBC) in drinking water distribution systems, thereby eliminating health risk associated with human ingestion of As-contaminated water. If we identify the factors influencing the stability of sorbed As, then we could formulate guidelines to minimize the health risk from the release of sorbed As into the finished water. The stability of the pipe scales (amorphous masses of corrosion by-products mixed with biofilms) may be undermined by the presence of disinfection by-products, ii) to the nonconventional corrosivity of desalinated water or iii) by changes in bulk solution chemical properties and SBC surface chemical parameters. Knowledge obtained from this project will, i) minimize the human health risk associated with the presence of toxic As in the finished water; and ii) formulate specific guidelines for the effective decontamination of SBC in drinking water pipes. This IRG project will prove most useful to the recently reintegrated coordinator towards developing his Water and Health research program in the Eastern Mediterranean region.

## **031794- STEELWATER**

Effective use of water in coal and steel industry

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*Funding scheme:* SSA (Specific Support Action), FP6

*Project duration:* 1/10/2006 - 3/31/2008

*EC contribution:* € 110 000

*Policy drivers:* Chemical Aspects  
Socio-economy

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### **Abstract**

Egypt faces a strong demand for modernisation of their industrial sectors. Effective use of water is one of the most important activities for the sustainable society. The methodology of advanced water treatment is used in the European industry in production processes in line of EU directives. In Egypt there is a need for both theoretical and practical training of the target groups (researchers, governmental people and industrial companies) to increase the building capacity for technology transfer. One of the core activities in this project is therefore to introduce the technologies and the dissemination to the regions. The methodology will be implemented in at least five manufacturing companies. The project aim is to demonstrate, in full scale, solutions minimising the use of water in the production process and treatment of wastewater in a sustainable way. This will be achieved by demonstrating the methodology in three pilot cases for different companies. Results of the project will also be presented for a larger number of stakeholders and spread to other regions. This will give a base for improvements in the Egyptian industrial production and the regions towards sustainable development.

## **042637- STRENCEM**

Strengthening of the Environmental Chemistry Research

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 10/1/2006 - 9/30/2010

*EC contribution:* -

*Policy drivers:* Chemical Aspects

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### **Abstract**

This project is a novel and innovative effort to combine several methods and scientific disciplines such as electrochemistry, analytics and environmental technology, in order to develop an integrated, environmentally friendly and cost and time efficient remediation technique for selected contaminants in soil and water matrices. When implemented successfully, the proposed project has potential to overcome several limitations of the non-integrated techniques and methods currently in use, and the developed new technique can be a crucial key on the way of solving a global contamination problem. The Laboratory of Applied Environmental Chemistry (LAEC) at the University of Kuopio (UKu) will act as a host in the proposed project. LAEC is focused on the chemical treatment and analysis of soils and waters, and it has a global leading research position in the field of complexation chemistry in aquatic solutions. In order to be able to reach the scientific goal of creating a novel and innovative solution to a global problem, the weaker aspects of the knowledge base of LAEC need to be strengthened. This will be implemented by recruiting experienced researchers having wide knowledge of disciplines like: microbially enhanced electrokinetic phenomenon, microbial activities under the applied electric field and pH environment, technique enhancement methods, such as ultrasound and application of the most suitable electron donors and mediators, complexation chemistry and electrically assisted ion exchange. The project aims at strengthening the core competence of the LAEC. Moreover, it aims at networking and establishment of long-term research collaboration with high quality European and other international research partners. Networking and cooperation between the key players in the defined fields of science and technology will improve the performance of European research as a whole, and bring Europe a genuine leading position in a novel field of globally important research area.

## **230788- STRUVITE**

Nutrient removal and value added product formation from wastes via struvite precipitation

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 2/1/2009 - 1/31/2011

*EC contribution:* € 32 400

*Policy drivers:* Chemical Aspects

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### **Abstract**

The major goal of the proposed research is the investigation of the applicability of struvite precipitation technique (SPT) separately or coupled with in an anaerobic digester for recovering nutrients from the anaerobic digestion process (ADP) residues. Optimising SPT will not only improve the performance of ADP which is the most commonly used process for disposing many agro-industrial wastes, in terms of reduced the nutrient (nitrogen and phosphorus) loads discharged to natural aquatic environments, but also lead production of a value-added product in the form of struvite fertilizer. Nutrient recovery from sewage sludge and other organic solid wastes in the form struvite has become the focus of many research studies because of limited phosphorus (P) rock reserves, which are mainly exploited for the production of fertilizers, in the world. There are many additional benefits of recovering nutrients during the anaerobic digestion of the organics by fixing N and P as follows; • controlling struvite formation within the digester may prevent the undesired accumulation of struvite, which causes problems in the hydraulic works, • enrichment of the anaerobic sludge produced in huge amounts in terms of N and P and improvement of its fertilizer quality, • avoiding the nutrient removal requirement of the effluent from anaerobic digesters, which contains usually higher concentrations of N and P than discharge limits, • making the digestion process more self sustainable in terms of avoiding different pretreatment techniques for N and P, • more widespread use of anaerobic biotechnology due to better performance in terms of nitrogen and phosphorus, • reduced oxygen demand in the receiving water bodies, • reduced eutrophication risks in the lakes, etc.

## **219586- SULFUTOPES**

Isotope Studies of the Sulfur Cycling using the Four Sulfur Isotopes: Developing Tools to Investigate the Flow of Sulfur through Biogeochemical Systems

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 8/1/2008 - 7/31/2011

*EC contribution:* € 238 026

*Policy drivers:* Chemical Aspects

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### **Abstract**

New developments in isotope ratio mass spectrometry have made possible the use of both traditional and rare sulfur isotopes in biogeochemical systems studies and open new ways to explore natural sulfur cycle. The project will focus on the detection of the abundances of four sulfur isotopes in reduced and intermediate sulfur compounds such as sulfide, dispersed particulate elemental sulfur, polysulfides, thiosulfate and polythionates in natural aquatic and sedimentary systems. Quantitative detection of these compounds together with determination of four sulfur isotopes abundances will allow development of the method, which answers the following long-standing questions: a) how to differentiate between the systems, where production of hydrogen sulfide from sulfate is due to sulfate reduction to sulfide, and the systems, where disproportionation of intermediate compounds like sulfur occurs; b) how to differentiate between the systems, where intermediate sulfur compounds, especially dissolved (polysulfidic) and non-soluble (elemental) zero-valent sulfur, are produced by oxidation of hydrogen sulfide by biotic and abiotic routes. Various systems with different rates (from minutes to thousands of years), microbial activities, pH and mechanisms of reduced and intermediate sulfur compounds cycling will be studied. Systems may include: Black Sea, North Sea, salt marshes, meromictic lakes, monomictic lakes, acidic pools (i.e. at Yellowstone National Park) and soda lakes. The samples from both water column and sediment will be analyzed in order to reconstruct the flow of sulfur through the complex biogeochemical system. Bacterial cultures will be studied to explain the role of microbial processes in sulfur isotopes fractionation.

## **040534- SWAMP**

Silica fluxes and wetlands: assessment of a missing processor in the global Si cycle

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 2/1/2007 - 1/31/2009

*EC contribution:* € 165 921

*Policy drivers:* Chemical Aspects

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### **Abstract**

Recent estimates have shown that terrestrial silica cycling is strongly influenced by biota. Terrestrial silica transport is of utmost importance for the coastal zone: the ratio of the nutrients N-P and Si delivered to estuaries, is essential in influencing the occurrence of harmful eutrophication events in the coastal waters. Despite the importance, very little research has focused on quantifying the terrestrial silica cycle. Lack of knowledge has also prevented the correct quantification of an important CO<sub>2</sub> sink in the global carbon cycle: chemical weathering of lithogenic Si is a sink for atmospheric CO<sub>2</sub>. This project will investigate the virtually unstudied role of wetlands in the biogeochemical cycle of Si. Recent research in tidal freshwater marshes has indicated that wetlands have a large potential to store and recycle big amounts of biogenic Si. During this project, storage and processing of BSi in wetland vegetation and sediments will be investigated across a European gradient of wetland ecotypes, at different flooding frequencies and drainage capacity. The analysed biogenic Si will be studied microscopically to determine if either vegetation or diatom biogenic Si are buried or processed preferentially. The project is highly relevant to priority topics defined in the 6th Framework Programme. Proper knowledge of the terrestrial silica cycle and transport of Si towards the coastal zone, is essential for both the sustainable, integrated management of river basins and estuaries and the correct quantification of the lithogenic Si weathering sink for atmospheric CO<sub>2</sub>.

## **502492- SWIFT-WFD**

Screening method for Water data Information in support of the implementation of the Water Framework Directive

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*Funding scheme:* STP (Specific Targeted Research Project), FP6

*Project duration:* 1/1/2004 - 3/31/2007

*EC contribution:* € 4 034 000

*Policy drivers:* Chemical Aspects

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### **Abstract**

The monitoring requirements for successfully implementing the WFD will directly depend upon available measurement techniques of demonstrated quality, which will be able to deliver reliable data at an affordable cost. Besides the necessary "classical" laboratory analyses, screening methodologies will play a key role in the WFD implementation, in particular for the detection of accidental pollution or the control of water bodies at risk. The WFD will represent a powerful management tool only if monitoring data are of reliable and comparable quality. The costs of wrong decisions based on erroneous data could be tremendous, which justifies that Community efforts are made to ensure that data are produced according to a proper quality assurance regime. In the light of the above, the objectives of SWIFT-WFD should focus on the production of quality control tools for validation purposes of screening methods, an inventory of existing screening test (chemical and biological) methods through laboratory-based (tank experiments) and/or field interlaboratory studies based on a selection of reference aquatic ecosystems at European scale, and with classical laboratory-based analyses to validate their results and demonstrate their equivalence for parameters regulated by the WFD. In parallel, the project should consider the development of new "low-cost", innovative, screening techniques (both for chemical and biological parameters) and their validation using the same approach (interlaboratory testing and comparison with laboratory-based methods). In addition, exchange of knowledge, transfer of technologies and training related to water monitoring will represent a key issue for ensuring the comparability of data produced by screening methods

## **018320- TECHNEAU**

TECHNEAU: technology enabled universal access to safe water

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*Funding scheme:* IP (Integrated Project), FP6

*Project duration:* 1/1/2006 - 12/31/2010

*EC contribution:* € 13 242 749

*Policy drivers:* Chemical Aspects

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### **Abstract**

Many of the numerous small supply systems in rural areas in Europe and developing countries do not comply with regulations. Large centralised supply systems in industrialized regions are struggling to meet the challenge of a reliable, uninterrupted supply of water with a high level of compliance with standards and of minimal risk to human health, including the risk from deliberate contamination of water, whilst being accepted and trusted by consumers. It is the vision of TECHNEAU that, in order to cope with present and future challenges, water supply systems should consider a transformation from mono-scale to flexible multi-scale systems i.e. interlinked centralised and decentralised satellite treatment, monitoring and control systems. TECHNEAU will develop and demonstrate adaptive supply system options and new and improved supply and monitoring technologies and management practices. Treatment strategies will be based on robust multi-barrier schemes and control methodologies, providing safety against a broad spectrum of chemical and microbiological contaminants and avoiding organoleptic problems at the tap. Monitoring technologies will provide on-line and at the site information on water quality including parameters that relate to malicious contamination. Practices for risk assessment/risk management, operation and maintenance, and models for consumer acceptance will constitute the framework for these technologies. These technologies and management practices will enable end-users to make informed choices, appropriate to their own circumstances and constraints, for cost-effective and sustainable source-to-tap solutions for the provision of safe high quality drinking water that has the trust of the consumer. This step-change will be achieved by a critical mass of researchers, technology developers and users from across Europe and developing countries.

## **243791- TESTPEP**

Development and Validation of an Automated Non-destructive Evaluation (NDE) Approach for Testing Welded Joints in Plastic Pipes

[www.testpep.eu/](http://www.testpep.eu/)

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*Funding scheme:* BSG-SME (Research for SMEs), FP7

*Project duration:* 2/1/2010 - 1/31/2013

*EC contribution:* € 2 555 000

*Policy drivers:* Chemical Aspects

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### **Abstract**

Plastics pipes offer significant advantages over other materials such as cast iron, steel, copper and concrete, for the transportation of fluids such as natural gas, water, effluent and corrosive liquids. They do not corrode; have a longer predicted service life, leading to less frequent replacement; they are less expensive to install due to their light weight and flexibility; and have significantly lower leakage rates due to having an all-welded system. However, their more widespread use is being restricted by the lack of a reliable non-destructive evaluation (NDE) method for the welded joints. Pipeline leakage does not only cause high repair costs but can also result in disastrous environmental consequences and even in loss of life. This project will develop phased array ultrasonic NDE procedures for butt fusion and electrofusion joints in PE pipes of diameters up to 1m and also for pipes in other plastics materials, including PVC, ABS, PP and PVDF. In addition, the project will also develop an automated inspection system that will be able to inspect pipe-to-pipe and pipe-to-fitting (elbows, bends, reducers, tees, etc) butt and socket joints in various plastic pipe materials and diameters between 90 and 1000mm. The development will be made by manufacturing welded joints containing known flaws. The NDE data will be analysed to determine the limits of flaw detection for each technique. In parallel, the significance of flaw size and quantity will be established in relation to service requirements. This will be achieved by long-term mechanical testing of joints containing known flaws, and comparison with results for welds containing no flaws. The prototype equipment, designed and built as part of this project will be assessed under both laboratory and field conditions.

## **235291- TOP**

Trophodynamics of Organic Pollutants Studied by Compound-Specific Isotope Analysis

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 3/1/2010 - 2/29/2012

*EC contribution:* € 246 983

*Policy drivers:* Chemical Aspects

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### **Abstract**

Endocrine disrupting chemicals (EDCs) and emerging pollutants are of global concern, yet their potential to become biomagnified in the aquatic food webs has not been determined. 'TOP' aims to tackle this question by coupling the analyses of pollutants, lipid content, trophic position, and compound-specific stable isotope analyses (CSIA). The objectives are to develop and validate CSIA methods; to refine and apply sampling, extraction and analytical methods to target pollutants in water, sediment and biological samples; to perform field sampling in the UK and China followed by chemical and isotopic analyses; and to predict the transport and fate of the target compounds in the aquatic systems using a multi-compartment (water-plankton-invertebrates-fish) model. Both the host institute and fellow have a proven track record in pollutant fate studies and isotope analysis. TOP therefore supports the collaboration and development of dynamic world-class human resources in the European research system. This proposal consists of a scientific project and scientific and complimentary training. The fellow will receive scientific training to acquire further skills in environmental investigations and data analyses; to design, conduct and report on cutting edge research on emerging pollutants; and to develop novel CSIA approaches. Complementary training will involve the fellow learning and practising transferable skills, e.g. presentation, project management and grant applications, as part of his career development plan. The objectives will be achieved through careful planning and management of the fellowship. The proposed scientific project is timely and appropriate methodology has been established. Novel and state-of-the-art techniques will be used. The supervisors and the fellow have relevant expertises. Regular meetings will be held to ensure progress. The fellow is expected to become an international researcher by the end of the fellowship.

## **230876- TPN**

### Transport Phenomena at the Nanoscale

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 9/1/2008 - 8/31/2012

*EC contribution:* € 100 000

*Policy drivers:* Chemical Aspects

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#### **Abstract**

Mass transport through nanoscale pores (i.e. pores in the nanometre size range) has been studied for many years in disciplines as diverse as membrane science, soil permeability and cell physiology. However, in all these fields, though, the emphasis has always been placed on the macroscopic outcome, while the effects on fluid behaviour of intermolecular forces or physical and chemical interactions between the liquid and the solid surface have often been neglected. The primary objective of the proposed research is to understand quantitatively the behaviour of liquids flowing in nanoscale pores. In particular, a focus will be placed on the nature of interactions between liquids and the pore structures. This can be achieved by systematically studying the effect of pore size, shape, surface chemistry and structure on fundamental nanoscale transport phenomena including wall slip, liquid velocity, surface tension and contact angle of liquids. In order to achieve this objective, I propose the development of an innovative fluidic chip that combines nanochannel manufacturing with traditional microfabrication techniques. This capitalizes on my previous experience in the field of nanoporous alumina synthesis and liquid flow through carbon nanotubes. A detailed description of the nanofluidic chip design is provided in the proposal along with details about the fundamental fluid physics phenomena that will be investigated. Although the proposed research focuses on the fundamental understanding of liquid behaviour at the nanoscale, the development of the proposed nanofluidic device will have applications beyond the scope and duration of the work proposed here: Understanding the interactions occurring between liquids and the pore walls they flow through represents a key to optimizing the performance of many systems such as water filtration and desalination processes, separation of liquids, and energy storage systems such as supercapacitors.

## **038977- TRENDIC**

Treatment of endocrine disrupting chemicals in wastewater

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 4/11/2007 - 4/10/2009

*EC contribution:* € 229 327

*Policy drivers:* Chemical Aspects

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### **Abstract**

This proposal aims to support the collaboration of leading researchers to study the degradation of endocrine disrupting chemicals (EDCs), with the broad aim of supporting the development of dynamic world-class human resources in the European research system. The proposal consists of a scientific project and scientific and complimentary training.

This project aims to investigate the use of ferrate, photocatalytic and photo-electrocatalytic oxidation for degrading EDCs in wastewater and to optimise the operating conditions. The key objectives are:

To develop a sampling and analytical strategy for monitoring target EDCs in effluent before and after treatment.

To prepare ferrate using the patented technology for EDC oxidation so as to identify the optimum operating conditions.

To perform photocatalytic experiments for the degradation of EDCs.

To design and construct a photo-electrocatalytic oxidation reactor for evaluating its performance for the degradation of EDCs.

To comprehensively assess the technical and economic performance of the ferrate and photo-electrocatalytic oxidation for degrading EDCs through site trials.

The fellow will receive scientific training to acquire further practical skills in environmental investigations and data analyses; to design, conduct and report on cutting edge research on EDCs; to operate modern instruments; and to develop novel treatment methods for removing EDCs from wastewater.

Complementary training will involve the fellow learning and practising transferable skills, e.g. presentation, project management and grant application, as part of his career development plan. The objectives will be achieved through careful planning and management of the fellowship. The scientific project is timely and appropriate methodology has been established. Novel and state-of-the-art techniques will be used. The supervisors and the fellow have relevant expertises. The fellow is expected to become a fully independent researcher.

## **226870- UMBRELLA**

Using MicroBes for the REgulation of heavy metaL mobiLity at ecosystem and landscape scAle: an integrative approach for soil remediation by geobiological processes

[www.umbrella.uni-jena.de/cms/index.php](http://www.umbrella.uni-jena.de/cms/index.php)

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*Funding scheme:* CP (Collaborative Project), FP7

*Project duration:* 5/1/2009 - 4/30/2012

*EC contribution:* € 2 337 421

*Policy drivers:* Chemical Aspects  
Groundwater

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### **Abstract**

The overall goal of UMBRELLA is to use microorganisms to develop cost-efficient and sustainable measures for soil remediation at heavy metal contaminated sites throughout Europe. This will be facilitated by research in microbiology, plant uptake and (hydro)geochemistry centers on the study of microbial influence on metal biogeochemical cycles and their impact for use in soil and water protection. The technologies developed provide a speed-up of existing bioremediation techniques and will provide a tool-box to end-users with microbes for remediation actions in different European climatic, geological and biological setting which will allow low-cost, sustainable, on-site bioremediation of metal contaminations. At the same time, the introduction of a concerted, internationalized education of interdisciplinary trained PhD students across Europe will ascertain a long-lasting, sustainable education profile with relevance to soil remediation. The involvement of government agencies is focussing on the possibility to provide governments with fused guidelines for soil and water protection in a way that overcomes the practises of separated agencies by focussing on ecotoxicological risks resulting from metal contamination on-site as well as by transport through water paths in ground water and international water ways. Dissemination of results will be ensured by international congresses and publications. The management of an integrative, multi-partner consortium ensures the applicability by combination of eight sites across Europe in one modeling approach which will cover Northern, Southern, Middle and Eastern European sites to guarantee future applicability across Europe.

## **286572- UV-MON**

An Integrated and Modular Bio-Monitoring Ballast Water Treatment System based on Advanced UV Plasma Technology Delivering Maximum Performance and Lowest System Lifetime Cost

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*Funding scheme:* BSG-SME (Research for SMEs), FP7

*Project duration:* 11/1/2011 - 10/31/2013

*EC contribution:* € 1 251 918

*Policy drivers:* Chemical Aspects

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### **Abstract**

Ballast Water poses a significant threat to the environment since it contains invasive species which are discharged to sea. The cost for controlling invasive species is very high (€9.6 - €12.7 billion). Prevention is better, hence the IMO introduced standards in 2004 (due to come into force). The Convention requires ships to have Ballast Water Treatment (BWT) system installed by 2016. BWT is an evolving technology. However, it is generally accepted across industry that viable BWT consist of at least 2 stages targeting both macro and micro IS separately. Filtration is generally as the 1st stage and according to a Lloyd register survey and one we conducted ourselves, UV seem to be relatively the most preferred 2nd stage treatment as the water treated by UV seems to have the least effect on the environment and the ship. UV treated water is less likely to cause corrosion of the ballast tanks compared to other commonly used treatment such as Electrolysis. However, they have the highest operation cost/m<sup>3</sup> and their performance can be affected by water turbidity and fridity. Hence, as UV is the most preferred and with the highest cost of ownership, the rest of the market will migrate towards UV systems if effort can be made to reduce the ownership cost and overall performance issues for a given water turbidity and fridity level. The highest cost for UV is energy needed for a given dose, maintenance and replacement of UV lamps. We have identified a way we would be able to reduce the operation cost of using UV still with a high efficacy under difficult water conditions. The UV-Mon project will aim to develop an integrated and modular BWT system that intelligently combines a novel electromagnetic wave generated UV plasma treatment system with information from a bio-monitoring system (micro-organisms concentration level and water quality/turbidity indicator) in order to optimise the UV dosage required at filling/discharge to completely eliminate the viable micro-organisms.

## **218280- VESICOUNT**

Methods for quantification of free protozoa vesicles containing legionella in a water environment

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 10/1/2008 - 9/30/2012

*EC contribution:* € 831 557

*Policy drivers:* Chemical Aspects

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### **Abstract**

Legionella are an important health and environment issue. Regular outbreaks of Legionellosis in certain cases causing the disease of patients show the dangerousness and reality of an infection risk. A significant number of Legionella contaminations are related to industrial complexes where cooling towers present a high Legionella risk. The bacteria colonize the water of these cooling towers and in some cases they are transported outside by the exhaust steam and may thus cause infections. The Vesicount project focuses on Legionella in cooling towers and public health constituting the main industrial and community risk issue. Current difficulties in Legionella detection and treatment arise because the bacteria are sometimes contained in protozoa vesicles where they grow and multiply. The vesicles do not appear with classic detection methods. Also they are able to protect Legionella from deleterious action of disinfectants and biocides. Vesicount project is intended as a long term industry-academia-cooperation concerning research for, firstly, indisputable methods detecting digestive vesicles transported and freed by typical protozoa containing Legionella inside of the industrial cooling towers and, secondly, for efficient ways of eliminating them in a healthy and reliable way. The university partners contribute to this project by offering specialized research experience and the industrial partner by bringing in his field experience. Secondments, recruitments and knowledge transfer between the partners will give the necessary frame to this 4 year cooperation aiming at the establishment of a new Legionella detection and treatment standard.

## **513648- VIROBATHE**

METHODS FOR THE CONCENTRATION AND DETECTION OF ADENOVIRUSES AND NOROVIRUSES IN EUROPEAN BATHING WATERS WITH REFERENCE TO THE REVISION OF THE BATHING WATER DIRECTIVE 76/160/EEC

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*Funding scheme:* STP (Specific Targeted Research Project), FP6

*Project duration:* 1/1/2005 - 3/31/2007

*EC contribution:* € 2 247 624

*Policy drivers:* Chemical Aspects  
Ecological Status

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### **Abstract**

The Project will provide a procedure for analysis of EU bathing waters for noroviruses and adenoviruses by validated comparisons of methods for processing water samples to achieve the best virus recovery consistent with cost and feasibility of use in routine monitoring laboratories. Objectives are (a) compare methods for norovirus and adenovirus detection in recreational waters (b) derive a combination of concentration and detection techniques to provide a reproducible system of testing bathing waters for the target viruses (c) furnish scientific evidence to provide support for norovirus and adenovirus testing of environmental samples in respect of their role as the appropriate viral indicator of faecal pollution (c) prepare the technology for Accession States as part of the development of their environmental and social programmes (d) share technology between laboratories to achieve wider competence in the virological analysis of environmental materials. Detection by PCR and cell culture together with the concentration procedure will provide a combined technique. PCR products will be sequenced and data analysed to derive strain and serotype information. The work addresses the research objectives of SSP 8.1 task 1.5 directly through relevance to the revision of the Bathing Water Directive. Inter-Laboratory comparisons and a large field based surveillance Phase are integrated to ensure that the new combined method will have immediate applicability in EU bathing water monitoring. It will be done by 16 Participant Laboratories in a unified approach to derive a harmonised combined method to provide credibility for future monitoring regimes give the potential to place a virus parameter on a footing equal to the bacterial indicators. Inclusion of Laboratories representative of the Accession States will ensure rapid dissemination to enhance the monitoring of their bathing waters and thus sustain the development of their own tourism and that of the European tourism worldwide.

## **507981- WAPSCIENCE**

Wastewater Treatment Plant Improvement by Smart Sensors and Computational Intelligence (WAPSCIENCE)

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*Funding scheme:* SME (SMEs-Co-operative research contracts), FP6

*Project duration:* 10/27/2004 - 10/26/2007

*EC contribution:* € 754 200

*Policy drivers:* Chemical Aspects  
Ecological Status

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### **Abstract**

The project aims to develop an integrated solution that will improve the efficiency of municipal and industrial wastewater treatment plants at comparatively small costs. Two workpackages will be executed in parallel: WP1 refers to the development of a robust, smart, lowcost on-line-sensor for the measurement of the concentration of nitrate and ammonia in wastewater treatment plants (WWTPs). WP2 refers to the development of a self-adaptive system to identify abnormal situations, predict critical states of the process and generate warnings about malfunctions of sensors and control-circuits. Both workpackages include an applied research phase where the state of the art, the requirements and specifications as well as the design of the hardware and software will be accomplished. Furthermore they involve a development phase to implement and test the sensor unit and the self-adaptive system. In WP1 a number of problems will be faced: Membrane fouling, which will be faced by using a robust mechanical cleanable anti-fouling-membrane for which a patent has been applied for recently by one of the SME partners, HYDRION, To avoid falsification due to interactions, additional sensors for chloride and potassium will also be included and a mathematical algorithm for compensation will be implemented in the sensor. For simple installation, the sensor will be equipped with a standard computer interface (USB or Bluetooth). In WP2 the development of a self-adaptive system will be based on Computational Intelligence to gain information about the present and future state of the plant and allow for automatic generation of predictive warnings and alarms. Predictions of state values will allow predictive feedback-control. System development will be based on commercially available software-tools and software-libraries but also new algorithms that will be developed.

## **034472- WARMER**

WATER Risk Management in Europe

<http://www.zetaced.com/projectwarmer/>

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*Funding scheme:* STP (Specific Targeted Research Project), FP6

*Project duration:* 9/1/2006 - 8/31/2009

*EC contribution:* € 1 826 000

*Policy drivers:* Chemical Aspects

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### **Abstract**

The project aims to create an extended system for on-line water monitoring with main purpose of risk management, integrating mixed technology in the areas of semiconductors, analytical chemistry, micro-mechanical fluidic systems, ICT, remote sensing and extensive networking of environmental water monitoring data.

The innovative idea is to develop an integrate an innovative field deployable monitoring system working on different innovative sensors, ranging from CHEMFETs, miniaturised potentiometric, voltammetric sensors and biosensors in industrial way, ready to be later improved for mass production. The system will be ready to be connected in a large network with of terrestrial "in situ" sensors and satellite remote sensing data.

This new measuring device will be integrated with conventional multiparametric probes and flow sensors, to obtain the largest multiparametric detection capability requested by the current European water directives.

The proposed system will enable creation of a European-wide water monitoring and risk management system, which would handle both "hard risk" (catastrophic changes in water quality) as "soft risk" (slow, but dangerous).

The in situ monitoring system will form a network of nodes, consisting of a unified hardware platform using wireless modules and TCP-IP technology to allow the maximum flexibility.

Satellite remote sensing of water parameters will be integrated with the in situ monitoring network in order to provide large-scale synoptic observation of water quality. In GMES, satellite observations need to be supported by in situ observation for validation of the satellite data and for observation of a wide range of biological and chemical parameters, which cannot be observed from space.

An extensive laboratory validation followed by field experiments including integration with remote sensing data will be performed.

## **005864- WASHCONTROL**

Development of an online-sensor-based WashControl system and water recycling for use in textile dyeing houses and laundries

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*Funding scheme:* SME (SMEs-Co-operative research contracts), FP6

*Project duration:* 4/1/2005 - 3/31/2007

*EC contribution:* € 1 032 550

*Policy drivers:* Chemical Aspects

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### **Abstract**

Washing and rinsing processes represent very important and cost intensive steps in SME dyeing houses and laundries. Rinsing and washing is mostly performed under weak process conditions and without any controlling due to lack of suitable sensors. In order to get high quality products and excellent fastness properties the goods are usually washed too long and too intensely. Such a non-controlled washing process is very time consuming and requires a lot of water and energy. Within this project, a very innovative online sensor-based WashControl system will be developed for use in discontinuous dyeing ranges and in laundries, which will particularly enable water savings of at least 30% and economic recycling of process water with membrane technology. The sensor-controlled washing is marked by an online-measurement of the removed stain, so that several fillings of the washing apparatus can be saved. The required multi-sensor device and controlling techniques as well as recycling technique will be developed and verified with respect to proper performance and ecologically and economically optimised processing conditions as well as high quality products. The WashControl system will be applied under real industrial process conditions and coupled with membrane filtration. The use of an optimised WashControl system will guarantee savings of water and time of at least 30%. At the same time, the reuse of recycling water for rinsing and washing as well as for dyeing will be developed, which will enable closed water loops and results in much less pollution. Results will be very profitable for the involved SMEs, which are coming from machinery industry and dyeing houses as well as laundries from 5 EU states. The outcome of this project will ensure a clean and proper production in an ecological and economical emphasized production environment and will refresh the competitiveness of the European SME textile industry, which suffers from cheap production in low cost countries.

## **513778- WATER\_TRAFFIC**

Cellular mechanisms controlling the water permeability of the plant plasma membrane

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 11/1/2004 - 10/31/2005

*EC contribution:* € 40 000

*Policy drivers:* Chemical Aspects

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### **Abstract**

The prominent role of water in the plant life provides the motivation for a number of scientific groups to investigate the role of water channels, aquaporins (AQPs), in the plant water relations. AQPs are present in all the living organisms that have been researched to date. They transport water as well as small neutral solutes across the cell membranes.

The understanding of the AQP molecular functionality and structure progressed considerably during the last decade. In spite of that, the mechanism by which the AQP activity is being regulated at the plant cell level is still poorly understood.

Our main objectives are to achieve a better understanding of the mechanism controlling the water permeability at the level of a single cell via the regulation of its plasma membrane AQPs, and to correlate this mechanism with the whole plant-water relationship. Two major mechanisms are likely to be involved: gating (conformational changes of the AQPs) and trafficking (shuttling of small vesicles rich in AQPs). Specific AQP gating models in plants are based mainly on data obtained after plant AQP expression in *Xenopus* oocytes (e.g. gating behavior of AtPIP2;2. controlled by the cytosolic pH, of Soybean nodulin 26 controlled by phosphorylation). Trafficking models in plants are based on proteins other than AQPs (e.g. Auxin transporter PIN1) or on mammalian AQP2 and AQP4 trafficking models.

Identifying similar mechanisms directly involved in the regulation of plant cell water permeability should enable us to achieve these objectives.

To this end, we plan to investigate the plant AQP activity using specific chemicals known to affect the cellular concentrations of protons or Ca<sup>2+</sup>, second messenger ions involved in many regulations processes.

## **219996- WATERDYNAMICS**

Femtosecond mid-infrared study of water at electrified interfaces

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 9/1/2009 - 2/29/2012

*EC contribution:* € 159 434

*Policy drivers:* Chemical Aspects

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### **Abstract**

Water has a paramount importance in chemical, biochemical and electrochemical processes. However, very little information is known about the microscopic mechanism by which water affects these processes. This is due to the fact that water in the condensed phase shows ultrafast (sub-picosecond) molecular dynamics and forms an extremely inhomogeneous system. Femtosecond pump-probe mid-infrared spectroscopy is ideally suited to distinguish different types of water molecules and it also provides sufficient time resolution to resolve the translational and orientational dynamics of water molecules. The essence of this technique is the excitation of a selected type of molecules by a pump pulse, and the subsequent analysis of its relaxation and molecular motions by a probe pulse at varying time delays. This technique has been applied successfully to water and aqueous solutions. The challenge presented here is to apply this technique, for the first time, to the study of the behavior of water at electrified interfaces under potential control. For this purpose, it is crucial to develop an adequate experimental set-up that allows probing preferentially interfacial water. In this regards, the use of the surface enhancement effect in ATR-SEIRAS (Attenuated Total Reflection-Surface Enhanced IR Absorption Spectroscopy) is specially promising. It should be stressed that the excellent experience of the candidate in the study of metal|water interfaces and the impressive achievements of the host institution in femtosecond mid-infrared spectroscopy of water, makes this project unique and unprecedented. The results of this project will constitute a breakthrough in the molecular-level understanding on the role of water in electrochemical reactions. In turn, this information will be also invaluable for the understanding of the general effect of electrocatalysis. For this reason, the present project can play a very important role in the development of electrochemical technologies.

## **226524- WATERMIM**

Water Treatment by Molecularly Imprinted Materials

[lpre.cperi.certh.gr/watermim/EU.aspx](http://pre.cperi.certh.gr/watermim/EU.aspx)

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*Funding scheme:* CP (Collaborative Project), FP7

*Project duration:* 5/1/2009 - 4/30/2012

*EC contribution:* € 2 491 334

*Policy drivers:* Chemical Aspects

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### **Abstract**

The present “WATERMIM” proposal is focused on the advancement and optimization of the MIP technology in order to produce functional materials with well-defined morphologies with respect to pore structure and selectivity for water treatment applications. The project aims at the elimination of the random distribution and the uneven accessibility of receptor sites in the volume of the imprinted material that is crucial for its performance. Such novel materials will immediately gain practical relevance, especially, due to their increased selectivity and superior stability under long and harsh technical conditions. The simultaneous optimization of the imprinting efficiency, polymer membrane morphology and separation conditions will enable the development of a truly molecular selective water purification process, based on affinity interactions that would have a large application impact on the water treatment industry. All types of synthetic organic compounds (i.e., triazines, pharmaceutical compounds and endocrine disruptors) are considered target compounds in the WATERMIM project. More specifically, the present project aims at the following S&T objectives:

- Selection of template molecules and synthesis of functional monomers.
- Optimization of molecularly imprinted polymer (MIP) composition by computational design techniques and combinatorial screening.
- Synthesis of well-defined MIP nanoparticles and microgels.
- Production of novel composite membranes utilizing preformed MIP nanoparticles.
- Production of composite filters both on organic and inorganic supports via novel grafting techniques.
- Synthesis of molecularly imprinted membranes (MIMs) for molecular sensor applications.
- Separation and catalytic decomposition of the pollutants.
- Advanced monitoring of the target compounds.
- Benchmark testing of the produced MIMs for water purification.

## 236511- WATEROX

Polynuclear manganese and manganese calcium complexes: searching for water oxidation catalysts.

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 3/1/2009 - 1/31/2012

*EC contribution:* € 178 089

*Policy drivers:* Chemical Aspects

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### Abstract

The project deals with the synthesis and characterization of polynuclear Mn and Mn/Ca complexes as potential water oxidation catalysts. The “direct synthesis” approach in which zerovalent metals or metal oxides are employed as starting material will be used for the preparation of the polynuclear complexes. The isolated complexes will be identified by analytical methods (atomic absorption, CHN-analysis) and characterized by IR, UV-Vis, EPR spectroscopy, magnetochemistry, electrochemistry and single crystal X-ray diffraction analysis. Their catalytic activity in the reaction of chemical water oxidation by Ru(III) polypyridyl complexes will be tested. In the next step of the project, an oxidant will be generated by light irradiation from a Ru(II) polypyridyl complex and a sacrificial electron acceptor. The systems, in which the photooxidant not covalently linked to the Mn or Mn/Ca complex, will be investigated focusing on oxygen evolution measurement, EPR spectroscopy for the observation of electron-transfer from the Mn catalyst to Ru photosensitizer and by laser flash photolysis for kinetic evaluation of this process. In returning phase, reactive functional groups will be introduced into the most active manganese containing complexes. These building blocks then will be employed by Consortium for the synthesis of photocatalytic dyads and triads.

## **262033- WATERPLASMA**

Water Decontamination Technology For The Removal Of Recalcitrant Xenobiotic Compounds Based On Atmospheric Plasma Technology

[www.waterplasma.eu/](http://www.waterplasma.eu/)

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*Funding scheme:* BSG-SME (Research for SMEs), FP7

*Project duration:* 1/1/2011 - 12/31/2012

*EC contribution:* € 1 069 934

*Policy drivers:* Chemical Aspects  
Ecological Status

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### **Abstract**

Assuring good quality water supply is a major concern in Europe. Wastewater treatment is carried out in order to minimise environmental impact, as well as to provide an alternative source of potable water. Unfortunately, currently available treatments based on physico-chemical or biological processes are limited, since they are unable to efficiently remove recalcitrant xenobiotic substances commonly present in chemical industry wastewaters. As a consequence, EC legislation is becoming more stringent, further reducing dumping limits of hazardous chemicals from effluents, requiring ever increasing investments in decontamination. In this context, SME consortium members have identified the need to develop new cost-efficient water decontamination technology to comply with EU regulations. The WATERPLASMA project aims at developing an innovative decontamination process based on a one atmosphere uniform glow discharge ("OAUGD") plasma reactor that makes possible to eliminate recalcitrant molecules without the need of chemicals or filters or that result in residual materials. The commercial objective of the project is to scale-up a reactor based on discharge technologies to remove toxic organic molecules from water. The system will be applicable to any industry producing water mixed with toxic organic substances in concentrations that cannot be disposed off in effluents. Initial targeted industries are pharmaceutical and personal care SMES using solvents and managing wastewaters with high organic loads, nevertheless the potential market of the system can extend to other contaminants, even AOX, and to water disinfection. The project will focus on up-scaling of atmospheric glow discharge plasma reactor, achieving a continuous treatment module. Reaction chamber, power electronics design, process optimisation, chemical and toxicological analyses, and monitoring will ensure the resulting wastewater decontamination and will broaden knowledge about plasma decontamination.

## **268445- WATERSPLIT**

Modular Ligands for Water Splitting

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 9/1/2011 - 8/31/2014

*EC contribution:* € 45 000

*Policy drivers:* Chemical Aspects

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### **Abstract**

This project aims at addressing several key issues in the highly importance and challenged topic of water splitting by solar energy, an alternative energy source. Additionally, the designed systems will provide a starting point explore further catalytic applications. Its originality and timeliness lies in the design and study of two highly modular families of ligands which will be use as platforms to get insights and key features to enlarge the reactivity, such as: the basic geometrical and electronic parameters, the modification of the second coordination sphere, presence of multi-metallic systems among others.

## **980021- WWLC**

Weak Water vapour Lines Contribution to the absorption of atmospheric radiation

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 9/1/2007 - 8/31/2008

*EC contribution:* € 50 418

*Policy drivers:* Chemical Aspects

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### **Abstract**

The spectroscopic properties of water vapor are of crucial importance for the understanding of the energy balance in the Earth atmosphere because water is the most important absorber of both incoming and outgoing radiation. However models of atmospheric absorption using available spectroscopic data significantly underestimated the total absorption. Water has many, many weak transitions which are routinely neglected and it is possible that these are responsible for much of the missing absorption. We will evaluate the contribution of weak water vapour lines to the absorption of solar radiation in the Earth's atmosphere and determine their contribution in different spectral intervals, especially in the atmospheric transparency windows. A new detailed database of water transitions will be created using the latest high quality potential energy and dipole moment surfaces constructed at the host Institute. Precise, synthetic linelists calculated using variational methods, together with calculations performed using an effective Hamiltonian approach will be used to extend the spectroscopic information about H<sub>2</sub>O absorptions, particularly by weak lines, over a wide spectral region. In particular, spectroscopic data on isotopically substituted water molecules, such as H<sub>2</sub><sup>18</sup>O, H<sub>2</sub><sup>17</sup>O and HDO, will be calculated over the entire visible region. This resulting improved database of water transitions will be used in calculations of atmospheric absorption of solar radiation. These calculations will be performed in the wide spectral region from 10000 to 20000 cm<sup>-1</sup> and will use a realistic atmospheric model, which includes diffuse light scattering in a cloudless atmosphere. The final result will be the first realistic calculation of atmospheric absorption with accuracy better 1% for a clear and cloudless atmosphere. This result will be tested against direct observations of atmospheric spectra obtained both from the ground and via remote sensing satellites.



# Climate Change



## **267760- ACCI**

### Atmospheric Chemistry-Climate Interactions

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*Funding scheme:* ERC (ERC Grant), FP7

*Project duration:* 5/1/2011 - 4/30/2016

*EC contribution:* € 2 496 926

*Policy drivers:* Climate Change  
Chemical Aspects

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### **Abstract**

Global change involves a large number of complex interactions between various earth system processes. In the atmosphere, one component of the earth system, there are crucial feedbacks between physical, chemical and biological processes. Thus many of the drivers of climate change depend on chemical processes in the atmosphere including, in addition to ozone and water vapour, methane, nitrous oxide, the halocarbons as well as a range of inorganic and organic aerosols. The link between chemistry and climate is two-way and changes in climate can influence atmospheric chemistry processes in a variety of ways.

Previous studies have looked at these interactions in isolation but the time is now right for more comprehensive studies. The crucial contribution that will be made here is in improving our understanding of the processes within this complex system. Process understanding has been the hallmark of my previous work. The earth system scope here will be ambitiously wide but with a similar drive to understand fundamental processes.

The ambitious programme of research is built around four interrelated questions using new state-of-the-art modelling tools: How will the composition of the stratosphere change in the future, given changes in the concentrations of ozone depleting substances and greenhouse gases? How will these changes in the stratosphere affect tropospheric composition and climate? How will the composition of the troposphere change in the future, given changes in the emissions of ozone precursors and greenhouse gases? How will these changes in the troposphere affect the troposphere-stratosphere climate system?

ACCI will break new ground in bringing all of these questions into a single modelling and diagnostic framework, enabling interrelated questions to be answered which should radically improve our overall projections for global change.

## **237297- ACOUSTIC RAINFALL**

### Acoustic Monitoring of Marine Rainfall

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 10/1/2009 - 9/30/2011

*EC contribution:* € 201 028

*Policy drivers:* Climate Change

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### **Abstract**

Understanding the distribution and change of oceanic rainfall patterns is a major component of global/regional water cycle and climate change. Underwater acoustic measurements of rainfall can be used to detect and classify marine rainfall type and subsequently quantify the rainfall rate and its drop size distributions. These measurements if proven robust and accurate can be used to (1) provide continuous measurements of precipitation characteristics in the Oceans and (2) as in situ reference to physically validate satellite observations. In turn, the acoustic measurements of rain need to be evaluated using near-range high-quality weather radar and if possible co-located rain gauge arrays and disdrometers. These type of data will be available from the POSEIDON project operated by the Hellenic Centre for Marine Research (HCMR) and represents a unique data set worldwide to pursue this concept. Dr. Nystuen is the world leader in the interpretation of the underwater sound to measure rainfall. By working closely with scientists from HCMR Dr. Nystuen will be able to transfer knowledge and understanding of the technique to European scientists and allow them to become competitive for future grants applying the acoustical measurement of rainfall to validate radar and satellite rainfall observations and other related opportunities.

## **212250- ACQWA**

Assessment of Climatic change and impacts on the Quantity and quality of Water

[www.acqwa.ch](http://www.acqwa.ch)

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*Funding scheme:* CP (Collaborative Project), FP7

*Project duration:* 10/1/2008 - 9/30/2013

*EC contribution:* € 6 493 573

*Policy drivers:* Climate Change  
Ecological Status

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### **Abstract**

As the evidence for human induced climate change becomes clearer, so too does the realization that its effects will have impacts on natural environment and socio-economic systems. Some regions are more vulnerable than others, both to physical changes and to the consequences for ways of life. The proposal will assess the impacts of a changing climate on the quantity and quality of water in mountain regions. Modeling techniques will be used to project the influence of climatic change on the major determinants of river discharge at various time and space scales. Regional climate models will provide the essential information on shifting precipitation and temperature patterns, and snow, ice, and biosphere models will feed into hydrological models in order to assess the changes in seasonality, amount, and incidence of extreme events in various catchment areas. Environmental and socio-economic responses to changes in hydrological regimes will be analyzed in terms of hazards, aquatic ecosystems, hydropower, tourism, agriculture, and the health implications of changing water quality. Attention will also be devoted to the interactions between land use/land cover changes, and changing or conflicting water resource demands. Adaptation and policy options will be elaborated on the basis of the model results. Specific environmental conditions of mountain regions will be particularly affected by rapidly rising temperatures, prolonged droughts and extreme precipitation. The methodological developments gained from a European mountain focus will be used to address water issues in regions whose economic conditions and political structures may compromise capacities to respond and adapt, such as the Andes and Central Asia where complex problems resulting from asymmetric power relations and less robust institutions arise. Methodologies developed to study European mountains and their institutional frameworks will identify vulnerabilities and be used to evaluate a range of policy options.

## **262254- ACTRIS**

Aerosols, Clouds, and Trace gases Research Infrastructure Network

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*Funding scheme:* IA (Large-scale integrating project), FP7

*Project duration:* 4/1/2011 - 3/31/2015

*EC contribution:* € 7 800 000

*Policy drivers:* Climate Change

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### **Abstract**

Climate change is for a large part governed by atmospheric processes, in particular the interaction between radiation and atmospheric components (e.g. aerosols, clouds, greenhouse and trace gases). Some of these components are also those with adverse health effects influencing air quality. Strengthening the ground-based component of the Earth Observing System for these key atmospheric variables has unambiguously been asserted in the IPCC Fourth Assessment Report and Thematic Strategy on air pollution of the EU. However, a coordinated research infrastructure for these observations is presently lacking. ACTRIS (Aerosols, Clouds and Trace gases Research InfraStructure Network) aims to fill this observational gap through the coordination of European ground-based network of stations equipped with advanced atmospheric probing instrumentation for aerosols, clouds and short-lived trace gases.

ACTRIS is a coordinated network that contributes to: providing long-term observational data relevant to climate and air quality research produced with standardized or comparable procedures; supporting transnational access to large infrastructures strengthening collaboration in and outside the EU and access to high quality information and services to the user communities; developing new integration tools to fully exploit the use of atmospheric techniques at ground-based stations, in particular for the calibration/validation/integration of satellite sensors and for the improvement of global and regional-scale climate and air quality models.

ACTRIS supports training of new users in particular young scientists in the field of atmospheric observations and promotes the development of new technologies for atmospheric observation of aerosols, clouds and trace gases through close partnership with SMEs.

ACTRIS will have the essential role to support integrated research actions in Europe for building the scientific knowledge required to support policy issues on air quality and climate change.

## **282664- AMAZALERT**

Raising the alert about critical feedbacks between climate and long-term land use change in the Amazon

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*Funding scheme:* CP (Collaborative Project), FP7

*Project duration:* 9/1/2011 - 8/31/2014

*EC contribution:* € 3 494 422

*Policy drivers:* Climate Change  
Science-policy Interface

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### **Abstract**

AMAZALERT will enable raising the alert about critical feedbacks between climate, society, land-use change, vegetation change, water availability and policies in Amazonia. We will:

- 1) analyze and improve coupled models of global climate and Amazon, land use, vegetation and socio-economic drivers to quantify anthropogenic and climate induced land-use and land cover change and non-linear, irreversible feedbacks among these components
- 2) assess the role of regional and global policies and societal responses in the Amazon region for altering the trajectory of land-use change in the face of climate change and other anthropogenic factors and finally
- 3) propose i) an Early Warning System for detecting any imminent irreversible loss of Amazon ecosystem services, ii) policy response strategies to prevent such loss.

We first prioritise the functions of Amazonia and threats to these. We then will analyse uncertainties in biogeochemistry, land cover (vegetation), land-use change and regional hydrology, as well as nonlinear responses and feedbacks using existing and new simulations from state of the art models in which land surface is coupled to global climate. The way in which policies and possible future response strategies of policy makers, trade and economy will affect land-use change will be modelled. This will lead to (A) understanding the impact on and effectiveness of a range of international and regional policy options, including REDD+; and (B) identification of both biophysical and socio-economic indicators of irreversible change.

AMAZALERT integrates the multidisciplinary knowledge and research of world-renowned, highly influential climate, land cover, land use change scientists and also policy analysts from 14 European and South-American institutions that have been collaborating for 10 to 30 years. Thus, this project can achieve maximum impact on EU (2020 climate goals), international and South-American strategies, including REDD

## **029791- ASPIRE**

Collaborative Signal Processing for Efficient Wireless Sensor Networks

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 9/1/2006 - 8/31/2010

*EC contribution:* € 1 256 423

*Policy drivers:* Climate Change

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### **Abstract**

There has been great interest recently towards the development of Wireless Sensor Networks, whose goal is to monitor the physical world by means of densely distributed wireless nodes. It is envisioned that it will soon be feasible to deploy massive amounts of inexpensive devices to observe large ground surfaces, underwater regions, and areas in the atmosphere. These devices will be able to provide unprecedented opportunities for instrumenting and controlling the environment, our cities, both our microcosm and macrocosm. Networked microsensors is a key technology in various disciplines such as: (i) environmental monitoring, including wildlife habitat sensing and preservation, climate observation and prediction, seismic activity monitoring and impact; (ii) industrial sensing, including factory and appliances management, (iii) infrastructure integrity, comprising power grid and public construction control and command, and (iv) education, art, and entertainment, enabling exciting virtual and immersive digital spaces. Realisation of large distributed sensor systems requires major advances in the theory and understanding of distributed data processing in highly uncertain environments with power, computation, and communication constraints. Hence, the fundamental scientific reason for conducting research in this field is to address problems including: adaptive collaborative processing in highly uncertain environments, consistent fusion algorithms for networked sensors, and representation and transmission of information in large and uncertain networks. Our goal is to address these challenges drawing on obtained experience in array and statistical non-Gaussian signal processing, adaptive systems, multiresolution signal and image denoising, compression, classification, communication theory, and immersive multimedia. The major objective of this project is to make contributions to the foundations of what is truly a new discipline.

## **012257- AWARE**

A tool for monitoring and forecasting Available WATER REsource in mountain environment

<http://www.aware-eu.info/eng/home.htm>

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*Funding scheme:* STP (Specific Targeted Research Project), FP6

*Project duration:* 7/1/2005 - 6/30/2008

*EC contribution:* € 1 292 750

*Policy drivers:* Climate Change  
Hydromorphology

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### **Abstract**

The aim of the AWARE project is to provide innovative tools for monitoring and predicting of water availability and distribution in those drainage basins where snowmelt is a major component of the annual water balance, a common condition in Alpine catchments. Recent droughts observed in these basins call for the need of an efficient technology to predict medium and long-term flows for sustainable water resources management.

The project will develop appropriate mathematical models to represent snow-pack dynamics and snowmelt runoff. These models will be expressly designed to integrate Earth Observation data and in-situ hydrological and meteorological measurements, introducing therefore a novel approach to the representation of the involved physical processes in time and space. Model innovation stems with the enhanced capability of Earth Observation data to provide continuous information on state variables, that can be poorly accounted for using the traditional approach based on input-output control. Model calibration, validation and demonstration will be performed for representative catchments of different geographic conditions (climate, geology, geomorphology, hydrography) in the European Alps.

Models will be implemented in a geo-service for tailoring data and models to different environments under an integrated, but modulated approach capable of effectively addressing the specific problems raising from different stakeholders, these including water policy makers, economic (hydropower companies, irrigation schemes, municipal water supply), and social (regional, basin and municipal authorities, citizens) stakeholders.

The geo-service, fully compliant with the architecture of the Inspire initiative, will be capable of coupling global and local data to compute, archive, upgrade and distribute snow derived information.

## **040885- BIWACLIM**

Evaluating the effects of species composition and biodiversity on ecosystem water fluxes in a changing climate

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 12/1/2007 - 11/30/2010

*EC contribution:* € 270 003

*Policy drivers:* Climate Change  
Ecological Status

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### **Abstract**

Research addressing the effects of global change on ecosystem ecology has mainly focused on carbon cycling, while the consequences for ecosystem water pools and fluxes have received little attention. Given the important regulating role of the vegetation for ecosystem hydrology it is hypothesized that global change will not only affect ecosystem water relations directly (e.g. by altered precipitation patterns) but also indirectly through changes in plant water demand or altered plant species composition. The main goal of the proposed work will be to act here and to address the effects of species composition or biodiversity for ecosystem water pools and fluxes in a changing climate. In addition to established ecophysiological tools, a particular emphasis will be on the use of  $^{18}\text{O}$  isotopes in ecosystem water pools and fluxes to address the main goal of the study.  $^{18}\text{O}$  isotopes have been suggested as an indispensable tool for the understanding of ecosystem hydrology that allow a much deeper insight into patterns and processes than conventional methods. Despite the high potential, however, uncertainties remain in the interpretation of  $\text{d}^{18}\text{O}$  signals that have prevented the general application of  $\text{d}^{18}\text{O}$  in ecological studies. In the outgoing phase of the proposed activity, these uncertainties will be addressed in experiments and observational studies. In particular, the potential of  $\text{d}^{18}\text{O}$  in leaf water of different plants as an integrated measure of the plant's transpiration as well as the use of  $\text{d}^{18}\text{O}$  in ecosystem water vapor to partition ecosystem evapotranspiration into the component fluxes for the validation of SVAT models will be evaluated. The improved understanding of  $\text{d}^{18}\text{O}$  signals will finally be applied during the return phase of the activity to an ongoing climate change experiment in European grasslands to address the main scientific goal of the proposal, the effects of species composition and diversity on ecosystem water relations in a changing climate.

## **006955- BRYOARC**

Biodiversity and adaptation in Arctic bryozoans

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 1/10/2005 - 1/9/2007

*EC contribution:* € 158 479

*Policy drivers:* Climate Change  
Ecological Status

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### **Abstract**

Bryozoans are benthic, sessile colonial organisms inhabiting both marine and freshwater habitats. The number of species is estimated to be 6000, making them a significant contributor to global macrofaunal biodiversity. In the Arctic, bryozoans are the second most numerous group of macro-organisms after annelids. Future temperature changes due to global warming are expected to be greater in the Arctic than at lower latitudes. Bryozoans, especially endemic Arctic species, will be among the first victims of these changes. The current proposal aims to enhance our sparse knowledge of bryozoan biodiversity, to assess the risks posed to them by global warming. Within the broad scope of the BRYOARC study the major objectives are as follows. To determine how many bryozoan species there are in the Arctic and how they can be recognized. This will be accomplished predominantly through the study of museum collections, using environmental SEM, supplemented by a full literature survey. The output will be the first comprehensive synopsis of Arctic bryozoans. Distributions of species geographically and by habitat will be mapped. The ranges of species according to water temperature, and correlations with depth and substrate (algae, rocks, shells, etc) will be documented. Putative bryozoan adaptations to living in cold Arctic environment will be identified by making comparisons with closely related species from warmer waters. Particular attention will be paid to adaptations of zooid size, skeletal mineralogy, zooidal polymorphism and reproductive strategies. Implications of global warming to Arctic bryozoan biodiversity will be investigated, including establishing the number of species at risk of extinction. Management and conservation strategies to minimise the biodiversity crisis for Arctic bryozoans will be suggested. Project BRYOARC falls within the priority issue in the 6th European Framework Programme theme Global Change and Ecosystems, topic Biodiversity and Ecosystems.

## **226144- C8**

Consistent computation of the chemistry-cloud continuum and climate change in Cyprus

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*Funding scheme:* ERC (ERC Grant), FP7

*Project duration:* 1/1/2009 - 12/31/2013

*EC contribution:* € 2 196 000

*Policy drivers:* Climate Change  
Chemical Aspects

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### **Abstract**

We have developed a new numerical method to consistently compute atmospheric trace gas and aerosol chemistry and cloud processes. The method is computationally efficient so that it can be used in climate models. For the first time cloud droplet formation on multi-component particles can be represented based on first principles rather than parameterisations. This allows for a direct coupling in models between aerosol chemical composition and the continuum between hazes and clouds as a function of ambient relative humidity. We will apply the method in a new nested global-limited area model system to study atmospheric chemistry-climate interactions and anthropogenic influences. We will focus on the Mediterranean region because it is a hot spot in climate change exposed to drying and air pollution. The limited area model will also be applied as cloud-resolving model to study aerosol influences on precipitation and storm development. By simulating realistic meteorological conditions at high spatial resolution our method can be straightforwardly tested against observations. Central questions are: - How does the simulated haze-cloud continuum compare with remote sensing measurements and what is the consequence of abandoning the traditional and artificial distinction between aerosols and clouds? - How are cloud and precipitation formation influenced by atmospheric chemical composition changes? - To what extent do haze and cloud formation in polluted air exert forcings of synoptic meteorological conditions and climate? - Can aerosol pollution in the Mediterranean region exacerbate the predicted and observed drying in a changing climate? The model system is user-friendly and will facilitate air quality and climate studies by regional scientists. The project will be part of the Energy, Environment and Water Centre of the newly founded Cyprus Institute, provide input to climate impact assessments and contribute to a regional outreach programme.

## **037005- CECILIA**

### Central and Eastern Europe Climate Change Impact and Vulnerability Assessment

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*Funding scheme:* STP (Specific Targeted Research Project), FP6

*Project duration:* 6/1/2006 - 12/31/2009

*EC contribution:* € 2 749 891

*Policy drivers:* Climate Change

Floods

Water Scarcity and Droughts

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### **Abstract**

The main objective of CECILIA is to deliver a climate change impacts and vulnerability assessment in targeted areas of Central and Eastern Europe. Emphasis is given to applications of regional climate modelling studies at a resolution of 10 km for local impact studies in key sectors of the region. The project contains studies of hydrology, water quality and water management (focusing at medium-sized river catchments and the Black Sea coast), air quality issues in urban areas (Black Triangle - a polluted region around the common borders of the Czech Republic, Poland and Germany), agriculture (crop yield, pests and diseases, carbon cycle), and forestry (management, carbon cycle). Very high resolution simulations over this region are necessary due to the presence of complex topographical and land use features. Climate change impacts on large urban and industrial areas modulated by topographical and land-use effects which can be resolved at the 10 km scale, are investigated by CECILIA. The high spatial and temporal resolution of dense national observational networks at high temporal resolution and of the CECILIA regional model experiments will uniquely feed into investigations of climate change consequences for weather extremes in the region under study. Comparison with the results based on statistical downscaling techniques will also be provided. Statistical downscaling methods for verification of the regional model results will be developed and applied, and assessments of their use in localization of model output for impact studies will be performed.

## **251801- CHAOS**

### **CLIMATE CHANGE AND SPECIES INVASIONS IN AQUATIC SYSTEMS: A COMPARATIVE PERSPECTIVE**

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 9/1/2011 - 10/31/2015

*EC contribution:* € 197 431

*Policy drivers:* Climate Change  
Ecological Status

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#### **Abstract**

Climate change and invasive species are widely recognized to be pervasive aspects of global change. However, in aquatic systems a synthetic approach that specifically addresses their important interactive and synergistic effects is missing. CHAOS aims at filling this gap in knowledge by strengthening the scientific basis also needed to formulate management recommendations and to develop integrated policies. Specifically, the project will: (1) synthesize historical records on the climate of inland waters, transitional waters, and coastal areas in the Mid-Atlantic Region of North America and in the Mediterranean Europe, identify the animal species introduced to these systems, and analyze these data in conjunction with geographical, ecological, and socio-economic variables; (2) detail, by collecting in situ first-hand information, the synergistic effects of climate change and targeted invasive species on a range of ecosystems and their services for a selected area in North America; and (3) explore, through laboratory-based experiments, the influence of temperature and salinity on biological traits of an invasive crustacean of particular concern for both North America and Europe, the Chinese mitten crab *Eriocheir sinensis*. During the 2-year outgoing phase, the fellow researcher will be hosted by the Department of Ecology and Evolution at Stony Brook University (USA). In this prestigious institution, she will acquire new knowledge in the field of global change and complementary skills that will be conveyed to the home country upon her return to the Department of Evolutionary Biology at the University of Florence (Italy). The IO Fellowship will help the proponent reach professional maturity and independence, and ultimately will allow her to reinforce the profile of the European contribution to the current debate around the many factors responsible of global change.

## **036961- CIRCE**

Climate Change and Impact Research: the Mediterranean Environment

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*Funding scheme:* IP (Integrated Project), FP6

*Project duration:* 4/1/2007 - 6/30/2011

*EC contribution:* € 10 000 000

*Policy drivers:* Climate Change  
Water Scarcity and Droughts

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### **Abstract**

CIRCE aims at developing for the first time an assessment of the climate change impacts in the Mediterranean area. The objectives of the project are:

- To predict and to quantify physical impacts of climate change in the Mediterranean area
- To evaluate the consequences of climate change for the society and the economy of the populations located in the Mediterranean area
- To develop an integrated approach to understand combined effects of climate change
- To identify adaptation and mitigation strategies in collaboration with regional stakeholders

CIRCE wants to understand and to explain how climate will change in the Mediterranean area. The project will investigate how global and Mediterranean climates interact, how the radiative properties of the atmosphere and the radiative fluxes vary, the interaction between cloudiness and aerosol, the modifications in the water cycle. Recent observed modifications in the climate variables and detected trends will be compared.

The economic and social consequences of climate change shall be evaluated by analyzing direct impacts on migration, tourism and energy markets together with indirect impacts on the economic system. CIRCE will moreover investigate the consequences on agriculture, forests and ecosystems.

human health and air quality. The variability of extreme events in the future scenario and their impacts will be assessed.

A rigorous common framework, including a set of quantitative indicators developed specifically for the Mediterranean environment will be developed and used in collaboration with regional stakeholders. The results will be incorporated in a decision support system tool and disseminated to the relevant users. Possible adaptation and mitigation strategies will be identified.

The integrated results discussed by the project CIRCE will be presented in the first Regional Assessment of Climate Change in the Mediterranean area.

## **212492- CLARIS LPB**

A Europe-South America Network for Climate Change  
Assessment and Impact Studies in La Plata Basin

[www.claris-eu.org/](http://www.claris-eu.org/)

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*Funding scheme:* CP (Collaborative Project), FP7

*Project duration:* 10/1/2008 - 9/30/2012

*EC contribution:* € 3 358 995

*Policy drivers:* Climate Change

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### **Abstract**

The CLARIS LPB Project aims at predicting the regional climate change impacts on La Plata Basin (LPB) in South America, and at designing adaptation strategies for land-use, agriculture, rural development, hydropower production, river transportation, water resources and ecological systems in wetlands. In order to reach such a goal, the project has been built on the following four major thrusts. First, improving the description and understanding of decadal climate variability is of prime importance for short-term regional climate change projections (2010-2040). Second, a sound approach requires an ensemble of coordinated regional climate scenarios in order to quantify the amplitude and sources of uncertainties in LPB future climate at two time horizons: 2010-2040 for adaptation strategies and 2070-2100 for assessment of long-range impacts. Such coordination will allow to critically improve the prediction capacity of climate change and its impacts in the region. Third, adaptation strategies to regional scenarios of climate change impacts require a multi-disciplinary approach where all the regional components (climate, hydrology, land use, land cover, agriculture and deforestation) are addressed in a collaborative way. Feedbacks between the regional climate groups and the land use and hydrology groups will ensure to draw a first-order feedback of future land use and hydrology scenarios onto the future regional climate change. Fourth, stakeholders must be integrated in the design of adaptation strategies, ensuring their dissemination to public, private and governmental policy-makers. Finally, in continuity with the FP6 CLARIS Project, our project will put a special emphasis in forming young scientists in European institutes and in strengthening the collaborations between European and South American partners. The project is coordinated with the objectives of LPB, an international project on La Plata Basin that has been endorsed by the CLIVAR and GEWEX Panels.

## **220189- CLASS**

Cold season climate reconstructions from Lakes in the Alpine regions of Switzerland and Sweden

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 5/1/2008 - 4/30/2010

*EC contribution:* € 178 730

*Policy drivers:* Climate Change

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### **Abstract**

Past variations in interannual climatic variability are currently not well understood, mainly due to a lack of temperature reconstructions for the winter season. This proposal aims to provide quantitative data on winter-spring temperatures for two lake sites in the Alpine regions of Switzerland and northern Sweden, since these are likely to contain sensitive archives of past climate change. The reconstruction of winter temperatures in these two regions is highly relevant, since local winter temperatures and precipitation are controlled by the variability and strength of the North Atlantic Oscillation (NAO). Increased knowledge on the impact of NAO in these sensitive mountain regions is crucial for a better understanding of future impacts on e.g. lake ecology, water-and energy supplies and winter tourism. In addition, obtained data can be compared to existing summer temperature reconstructions to study changes in interannual variability. A novel methodology developed at the host institute is proposed, using Chrysophyte stomatocysts as a proxy for winter-spring temperatures. However, to distinguish between climate-induced changes in stomatocyst assemblages and the impact of other factors affecting lake ecology, such as human influence, a multi-proxy approach is required including the analysis of pollen, C and N ratios, total biogenic silica and sediment grainsize. At the Swiss site the proposal targets three time periods; I) modern time (AD 1864-present), for validation with measurement data, II) the most intense phase of the Little Ice Age, including the Maunder Minimum (AD 1650-1800) and III) the warmest phase of the Mediaeval Warm Anomaly (a 100 years window, possibly AD 850-950). In Sweden the proposed method has not been applied before, and therefore the method will be tested here for the calibration period, AD 1913-present.

## **037013- CLAVIER**

CLimate ChAnge and Variability: Impact on Central and Eastern EuRope

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*Funding scheme:* STP (Specific Targeted Research Project), FP6

*Project duration:* 9/1/2006 - 8/31/2009

*EC contribution:* € 2 020 990

*Policy drivers:* Climate Change

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### **Abstract**

Observational records show that the global climate is changing and ongoing changes are also visible in Central Eastern Europe. About 64% of all catastrophic events in Europe since 1980 can directly be attributed to weather and climate extremes. Climate change projections show even an increasing likelihood of extremes. Certainly negative impacts of climate change will involve significant economic losses in several regions of Europe, while others may bring health or welfare problems somewhere else. Within CLAVIER three representative Central and Eastern European Countries (CEEC) will be studied in detail: Hungary, Romania, and Bulgaria. Researches from 6 countries and different disciplines, will identify linkages between climate change and its impact on weather patterns with consequences on air pollution, extremes events, and on water resources. Furthermore, an evaluation of the economic impact on agriculture, tourism, energy supply and the public sector will be conducted. This is of increasing importance for CEEC, which are currently facing a rapid economic development, but also for the European Union as e.g. Romania's and Bulgaria's high vulnerability from extreme events such as floods will impact not only the respective economic goals for joining the EU but also the EU solidarity fund. CLAVIER will focus on ongoing and future climate changes in Central and Eastern European Countries using measurements and existing regional scenarios to determine possible developments of the climate and to address related uncertainty. In addition, climate projections with very high detail will be carried out for CEEC to fulfill the need for a large amount of detail in time and space which is inherent in local and regional impact assessment. CLAVIER will establish a large data base, tools and methodologies, which contribute to reasonable planning for a successful development of society and economy in Central and Eastern European countries under climate c

## **244240- CLIMAFRICA**

Climate change predictions in Sub-Saharan Africa: impacts and adaptations

[www.climaffrica.net/index\\_en.jsp](http://www.climaffrica.net/index_en.jsp)

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*Funding scheme:* CP (Collaborative Project), FP7

*Project duration:* 10/1/2010 - 9/30/2014

*EC contribution:* € 3 496 231

*Policy drivers:* Climate Change  
Water Scarcity and Droughts

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### **Abstract**

Africa is probably the most vulnerable continent to climate change and climate variability and shows diverse range of agro-ecological and geographical features. Thus the impacts of climate change can be very high and will greatly differ across the continent, and even within countries. There is a urgent need for the most appropriate and up-to-date tools to better understand and predict climate change, assess its impact on African ecosystems and population, and develop the correct adaptation strategies. In particular the current proposal will focus on the following specific objectives: 1- Develop improved climate predictions on seasonal to decadal climatic scales, especially relevant to SSA; 2- Assess climate impacts in key sectors of SSA livelihood and economy, especially water resources and agriculture; 3- Evaluate the vulnerability of ecosystems and civil population to inter-annual variations and longer trends (10 years) in climate; 4- Suggest and analyse new suited adaptation strategies, focused on local needs; 5- Develop a new concept of 10 years monitoring and forecasting warning system, useful for food security, risk management and civil protection in SSA; 6- Analyse the economic impacts of climate change on agriculture and water resources in SSA and the cost-effectiveness of potential adaptation measures. This objectives will be achieved by an integrated working approach that involves 9 European, 8 African and 1 International Organization.

## **212774- CLIMATECOST**

Full Costs of Climate Change

[www.climatecost.cc/](http://www.climatecost.cc/)

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*Funding scheme:* CP (Collaborative Project), FP7

*Project duration:* 12/1/2008 - 7/31/2011

*EC contribution:* € 3 499 994

*Policy drivers:* Climate Change  
Socio-economy

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### **Abstract**

There is increasing interest in the economics of climate change to inform policy on a) long-term targets, b) the costs of inaction (the economic effects of climate change), and c) the costs and benefits of adaptation. The objectives of this study are to advance knowledge across all three areas, i.e. the full economic costs of climate change, through the following tasks: 1. To identify and develop consistent climate change and socio-economic scenarios, including mitigation scenarios; 2. To quantify in physical terms, and economic costs, the 'costs of inaction' for these scenarios, with bottom-up disaggregated (spatial) modelling for market and non-market sectors (coasts, health, ecosystems, energy, water, infrastructure) in the EU and other major negotiator countries (US, China, India). To extend analysis to quantify and value the costs and benefits of adaptation, and the residual costs of climate change' after adaptation. 3. To assess the physical effects and economic damages of a number of the most important major catastrophic events and major socially contingent effects. 4. To update the mitigation costs of GHG emission reductions for medium and long-term reduction targets/ stabilisation goals. To include (induced) technological change, non CO2 GHG and sinks, and recent abatement technologies. 5. To quantify the ancillary air quality benefits of mitigation, using a spatially detailed disaggregated approach to quantify in physical terms and monetary benefits, in Europe and major negotiator countries. 6. To apply a number of complementary CGM and IAM models to incorporate the information from the tasks above. 7. To bring all the information above together to provide policy relevant output, including information on physical effects and economic values, and undertake analysis of policy scenarios. The project involves a multi-disciplinary team with leading impact and economic experts. It is innovative in developing bottom-up and top-down analysis within consistent scenarios and a single integrated framework, providing highly dis-aggregated outputs on impacts and economic costs.

## **211894- CLIMATEWATER**

Bridging the gap between adaptation strategies of climate change impacts and European water policies

[www.climatewater.org/](http://www.climatewater.org/)

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*Funding scheme:* CSA (Coordination - or networking - action), FP7

*Project duration:* 11/1/2008 - 10/31/2011

*EC contribution:* € 956 932

*Policy drivers:* Climate Change

Floods

Water Scarcity and Droughts

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### **Abstract**

The Project ClimateWater is aimed as the first step on the analysis and synthesis of data and information on the likely (known, assumed, expected, modelled, forecasted, predicted, estimated etc.) water related impacts of the changes of the climate with special regard to their risk and to the urgency of getting prepared to combat these changes and their impacts. The Project will identify all adaptation strategies that were developed in Europe and also globally for handling (preventing, eliminating, combating, mitigating) the impacts of global climate changes on water resources and aquatic ecosystems, including all other water related issues of the society and nature. Research needs in the field of 'climate impact on the water cycle and water users' will be identified with special regard to enable the ranking of adaptation action in the light of the magnitude of impact on water resources and the urgency of the action needed. The most important output of the project will be the identification of gaps that would hinder the implementation of the EU water policy in combating climate impacts on water.

## **244151- CLIMB**

Climate Induced Changes on the Hydrology of Mediterranean Basins: Reducing Uncertainty and Quantifying Risk through an Integrated Monitoring and Modeling System

[www.climb-fp7.eu/home/home.php](http://www.climb-fp7.eu/home/home.php)

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*Funding scheme:* CP (Collaborative Project), FP7

*Project duration:* 1/1/2010 - 12/31/2013

*EC contribution:* € 3 148 945

*Policy drivers:* Climate Change  
Water Scarcity and Droughts

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### **Abstract**

With regard to the objectives specified in ENV-2009.1.1.5.2, modeling capabilities must be improved and appropriate tools developed to advance the capability to assess climate effects on water resources and uses. The project consortium will employ a combination of novel field monitoring concepts, remote sensing techniques, integrated hydrologic (and biophysical) modeling and socioeconomic factor analyses to reduce existing uncertainties in climate change impact analysis and to create an integrated quantitative risk and vulnerability assessment tool. Together, these will provide the necessary information to design appropriate adaptive water resources management instruments and select suitable agricultural practices under climate change conditions. The integrated risk and vulnerability analysis tool will also enable assessment of risks for conflict-inducing actions, e.g. migration. The improved models, new assessment tools, and their results will be evaluated against current methodologies. Improvements will be communicated to stakeholders and decision makers in a transparent, easy-to-understand form, enabling them to utilize the new findings in regional water resource and agricultural management initiatives as well as in the design of mechanisms to reduce potential for conflict (linkage to SSH-2009.4.2.1).

## **244031- CLIMSAVE**

Climate change integrated assessment methodology for cross-sectoral adaptation and vulnerability in Europe

[www.climsave.eu/climsave/index.html](http://www.climsave.eu/climsave/index.html)

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*Funding scheme:* CP (Collaborative Project), FP7

*Project duration:* 1/1/2010 - 6/30/2013

*EC contribution:* € 3 149 644

*Policy drivers:* Climate Change

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### **Abstract**

CLIMSAVE will develop and apply an integrated methodology for stakeholder-led, climate change impact and vulnerability assessment that explicitly evaluates regional and continental scale adaptation options, and cross-sectoral interactions between the key sectors driving landscape change in Europe (agriculture, forests, biodiversity, coasts/floodplains, water resources, urban development and transport). A range of sectoral meta-models will be linked within a common assessment platform that is user-friendly, interactive and web-based to allow the rapid reproduction of climate change impacts by stakeholders themselves. The meta-models will be derived from detailed state-of-the-art models which represent the latest results on impacts of, and vulnerability to, climate change and which are appropriate for multi-scale spatially explicit impact studies. Indicator metrics, which translate the outputs from the integrated models into ecosystem services outcomes, will create a standardised approach across sectors ensuring comparability in quantifying impacts and vulnerability. The integrated assessment platform will use these metrics to identify hotspots of climate change vulnerability and provide the ability to assess adaptation strategies for reducing these vulnerabilities, in terms of their cost-effectiveness and cross-sectoral benefits and conflicts. Methods for reducing uncertainties and increasing the transparency of model and scenario assumptions will be implemented to inform the development of robust policy responses. A series of professionally facilitated workshops will identify stakeholder needs and test an innovative methodology for participatory scenario development specifically geared towards interactive climate change impact and adaptation assessment. Two sets of three workshops at two levels (European and regional) will ensure that the CLIMSAVE methodologies work at different scales and provide for continuity of engagement and mutual learning.

## **265137- CLUVA**

CLimate change and Urban Vulnerability in Africa

[www.cluva.eu/](http://www.cluva.eu/)

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*Funding scheme:* CP (Collaborative Project), FP7

*Project duration:* 12/1/2010 - 11/30/2013

*EC contribution:* € 3 494 580

*Policy drivers:* Climate Change  
Socio-economy

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### **Abstract**

The social and economic impact of natural disasters in emerging economies and developing countries is growing. Many African countries have fragile economies unable to absorb the shocks caused by natural disasters enhanced by the increasing vulnerability of rapidly expanding urban areas. Climate change is likely to rapidly exacerbate this situation. The overall objective of CLUVA is to develop methods and knowledge to be applied to African cities to manage climate risks, to reduce vulnerabilities and to improve coping capacity and resilience towards climate changes.

CLUVA will explore these issues in selected African cities (Addis Ababa, Dar es Salaam, Douala, Ougadougou, St.Louis). The project aims at improving the capacity of scientific institutions, local councils and civil society to cope with climate change.

CLUVA will assess the environmental, social and economic impacts and the risks of climate change induced hazards expected to affect urban areas (floods, sea-level rise, storm surges, droughts, heat waves, desertification, storms and fires) at various time frames. The project will develop innovative climate change risk adaptation strategies based on strong interdisciplinary components.

CLUVA will be conducted by a balanced partnership of European and African partners. The 7 European partners will bring together some of EU's leading experts in climate, quantitative hazard and risk assessment, risk management, urban planners and social scientists. The 6 African partners from South Africa and from the Universities of the selected cities cover a similar range of expertises, making possible an effective integrated research effort. The project is structured in 6 WorkPackages dealing with climate change and impact models (WP1), multiple vulnerability (WP2), urban planning and governance as key issues to increase the resilience (WP3), capacity building and dissemination (WP4), coordination of the activities in the selected cities (WP5) and project management (WP6).

## **226520- COMBINE**

Comprehensive Modelling of the Earth system for better climate prediction and projection

[www.combine-project.eu/](http://www.combine-project.eu/)

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*Funding scheme:* IA (Large-scale integrating project), FP7

*Project duration:* 5/1/2009 - 4/30/2013

*EC contribution:* € 7 922 679

*Policy drivers:* Climate Change  
Science-policy Interface

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### **Abstract**

The European integrating project COMBINE brings together research groups to advance Earth system models (ESMs) for more accurate climate projections and for reduced uncertainty in the prediction of climate and climate change in the next decades. COMBINE will contribute to better assessments of changes in the physical climate system and of their impacts in the societal and economic system. The proposed work will strengthen the scientific base for environmental policies of the EU for the climate negotiations, and will provide input to the IPCC/AR5 process. COMBINE proposes to improve ESMs by including key physical and biogeochemical processes to model more accurately the forcing mechanisms and the feedbacks determining the magnitude of climate change in the 21st century. For this purpose the project will incorporate carbon and nitrogen cycle, aerosols coupled to cloud microphysics and chemistry, proper stratospheric dynamics and increased resolution, ice sheets and permafrost in current Earth system models. COMBINE also proposes to improve initialization techniques to make the best possible use of observation based analyses of ocean and ice to benefit from the predictability of the climate system in predictions of the climate of the next few decades. Combining more realistic models and skilful initialization is expected to reduce the uncertainty in climate projections. Resulting effects will be investigated in the physical climate system and in impacts on water availability and agriculture, globally and in 3 regions under the influence of different climate feedback mechanisms. Results from the comprehensive ESMs will be used in an integrated assessment model to test the underlying assumptions in the scenarios, and hence to contribute to improved scenarios. COMBINE will make use of the experimental design and of the scenarios proposed for IPCC AR5. Therefore the project will be able to contribute to the AR5, by its relevant research and by the contribution of experiments to the IPCC data archives.

## **042718- COMPACT**

Combining palaeoecology and aquatic sciences to assess ecosystem thresholds to changes in nutrient inputs and climate

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 1/1/2007 - 12/31/2009

*EC contribution:* € 383 016

*Policy drivers:* Climate Change

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### **Abstract**

Ecosystems can abruptly shift from one state to another contrasting state changing dominance of organisms and overall ecosystem behaviour. Regime shifts often occur after reaching an ecological threshold as driven by an external driver. Land use changes and the associated increases in anthropogenic nutrient loadings in conjunction with climate are the major drivers of environmental change and have been shown to cause regime shifts in aquatic ecosystems. COMPACT will apply the knowledge of regime shifts from contemporary studies to identify and test for past regime shifts in aquatic ecosystems using data derived from palaeoecological studies analysed through meta-analysis and synthesis activities. This exercise will allow the identification of how these changes affect aquatic ecosystems. This knowledge is fundamental to predict future changes in aquatic ecosystems and to produce forecasts of how extant aquatic ecosystems are likely to respond to nutrient reductions associated with application of the EU Water Framework Directive. The research will be carried out at the GeoBiosphere Centre (CGB), Lund University. The CGB is a unique setting to promote the integrated study of Earth processes and their development in space and time. The research is relevant to European environmental policies, is cutting edge in its concepts and approach, and will act as an excellent platform to educate the next generation of young researchers in Europe. A vigorous multi-disciplinary training program will be established which includes new university courses centred on regime shifts and global environmental change, training, supervision of M.S. and Ph.D. students, synthesis activities through workshops and conferences, and public outreach in partnership with on-going activities at Lund University.

## **042443- COMPAREVOL**

Parasitoid life history evolution and climate change

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 11/1/2006 - 10/31/2009

*EC contribution:* € 303 939

*Policy drivers:* Climate Change

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### **Abstract**

The chair holder is the Prof. van Alphen (Univ- Leiden, The Netherlands) who wants to come for three years at the UMR ECOBIO for 3 years. He has more than 150 international publications and 3000 citations. For 2007, the UMR ECOBIO, in accord with the regional policy (decrease of water pollution), aims to regroup researchers on the thematic of biological control by insect parasitoids. The research project concerns the fact that modern global change at regional scales is predicted to alter species distributions, life histories, community composition, and ecosystem function. Concerning the effect of the climate, in ecosystems, tritrophic interactions (plants-herbivorous insects- natural enemies) result from long co-evolved processes under well-defined climatic conditions. Climate change will influence the biology of the interacting species and the stability of these systems. Within this framework, the present project, based on two food-web model (wheat, related pests (aphids) and their parasitoids and larval parasitoids of *Drosophila* and their *Drosophila* hosts) aims to do (1) A comparison of closely related parasitoid species and their host originating from different climatic zones (2) A comparison of life-history traits in populations of a particular parasitoid species and its host collected along a climatic gradient in Europe (3) Selection experiments on life history traits in the laboratory (4) Measurements of the energy cost of diapause in several host and parasitoids species as well as winter mortality under different temperatures. The training programme implies 6 complementary aspects, and will take 70% of the time of the chair holder: 1. Courses at the Master degree (5%), 2. Involvement in PhDs by direct co-supervision and by participation to PhDs committees (30%), 3. Top-level interdisciplinary training (10%) 4. Summer school for international audience, (10%) 5. Seminars for students and researchers (10%) 6. Scientific presentations for a public audience (5%).

## **202835- COSIRIS**

Investigating the terrestrial carbon and water cycles with a multi-tracer approach

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*Funding scheme:* ERC (ERC Grant), FP7

*Project duration:* 7/1/2008 - 6/30/2013

*EC contribution:* € 1 822 000

*Policy drivers:* Climate Change  
Chemical Aspects

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### **Abstract**

The aim of COSIRIS is to isolate the simultaneous fluxes of photosynthesis and respiration of the terrestrial biosphere. With explicit knowledge of the component fluxes, we will: 1) test process based models of photosynthesis and respiration, 2) determine the sensitivity of each flux to environmental conditions, and 3) derive predictions of their responses to climate change. Specifically, COSIRIS aims to build a research facility to integrate a new tracer, carbonyl sulfide (COS) with CO<sub>2</sub>, water and their stable isotopes in a multi-tracer framework as a tool to separately investigate photosynthesis and respiration. In terrestrial ecosystems, CO<sub>2</sub> is often taken up and released at the same time. Similar to CO<sub>2</sub>, COS is taken up during photosynthesis, but unlike CO<sub>2</sub>, concurrent COS emissions are small. Parallel COS and CO<sub>2</sub> measurements thus promise to provide estimates of gross photosynthetic fluxes – impossible to measure directly at scales larger than a few leaves. The use of COS to derive CO<sub>2</sub> fluxes has not been verified yet, but enough is known about their parallel pathways to suggest that COS, CO<sub>2</sub> and its isotopes can be combined to yield powerful and unique constraints on gross carbon fluxes. COSIRIS will develop the expertise necessary to achieve this goal by providing: 1. an in-depth analysis of processes involved in COS uptake by vegetation, and of potentially interfering influences such as uptake by soil, 2. a novel process-based multi-tracer modelling framework of COS, CO<sub>2</sub>, water and their isotopes at the ecosystem scale, 3. extensive datasets on concurrent fluctuations of COS, CO<sub>2</sub>, water and their isotopes in ecosystems. This innovative approach promises advances in understanding and determining gross carbon fluxes at ecosystem to continental scales, particularly their variations in response to climate anomalies.

## **262263- DARECLIMED**

DATA REPOSITORIES AND COMPUTATIONAL INFRASTRUCTURE  
FOR ENVIRONMENTAL AND CLIMATE STUDIES IN THE EASTERN  
MEDITERRANEAN

[eewrc.cyi.ac.cy/DARECLIMED](http://eewrc.cyi.ac.cy/DARECLIMED)

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*Funding scheme:* CSA (Coordination - or networking - action), FP7

*Project duration:* 2/1/2011 - 1/31/2013

*EC contribution:* € 500 000

*Policy drivers:* Climate Change

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### **Abstract**

The Mediterranean and Middle East, with a combined total population of more than 400 million people, are characterized by strong environmental gradients, climate extremes and diverse economic, social and cultural identities. It is expected that throughout the 21st century the region will experience substantial adverse climate changes and face major challenges in energy demand and supply, as well as a decreasing availability of fresh water. It will be essential to address the undesirable economical and societal consequences and manage them cooperatively. Rethinking energy and water policies and adopting new concepts to respond to these challenges are increasingly recognized as a high priority, both regionally and internationally. The main objective of the project is to favor and prepare the creation of a regional data infrastructure devoted to climate, water, energy and related topics, by engaging relevant entities into a coordinated effort at the regional scale. To this end the project will set up a Task Force including internationally recognized experts and carry out studies of all relevant scientific, technical, legal and political issues. It will also carry out networking activities aimed at regional climate stakeholders (Research institutions, public authorities, relevant state agencies, NGOs, etc.), in order to raise their awareness and engage key actors into creating the appropriate conditions for the formation of a regional data infrastructure devoted to climate, energy and water related data, and into capacity building, prospective & incubation activities for future collaborative climate research.

## **024717- DEMETRA**

Determination and measure of transport and mixing at the tropopause

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 12/1/2005 - 11/30/2007

*EC contribution:* € 151 982

*Policy drivers:* Climate Change

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### **Abstract**

The transport and mixing occurring across the tropopause is a fundamental mechanism determining atmospheric and climate dynamics. Examples of phenomena affected by tropopause exchange include water vapour distribution (and thus weather patterns), greenhouse gases vertical distribution, ozone depletion, and fate of pollutants like airplanes exhausts. Many mathematical tools are available for extracting from wind datasets transport and mixing information, but when applied to the tropopause and compared with tracer profiles often provide conflicting answers. This is due to the fact that the tropopause is a complex, active interface, and hence each method only unveils one aspect. This project proposes to integrate several methods for studying the exchange events occurring at the tropopause. The outcome of this approach will be used to explain tracer profile observed in tracer measurements of airborne missions.

## **242564- DOFOCO**

Do forests cool the Earth? Reconciling sustained productivity and minimum climate response with portfolios of contrasting forest management strategies

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*Funding scheme:* ERC (ERC Grant), FP7

*Project duration:* 2/1/2010 - 1/31/2015

*EC contribution:* € 1 296 125

*Policy drivers:* Climate Change

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### **Abstract**

Forests, of which globally 70% are managed, play a particularly important role in the global carbon cycle. Recently, forest management became a top priority on the agenda of the political negotiations to mitigate climate change because forest plantations may remove atmospheric CO<sub>2</sub> and if used for energy production, the wood is a substitute for fossil fuel. However, this political imperative is at present running well ahead of the science required to deliver it. Despite the key implications of forest management on: 1) the carbon-energy-water balance, and 2) production, recreation and environmental protection, there are no integrated studies of its effects on the Earth's climate. The overall goal of DOFOCO is to quantify and understand the role of forest management in mitigating climate change. Specifically, I want to challenge the current focus on the carbon cycle and replace it with a total climate impact approach. Hence, the whole forest management spectrum ranging from short rotation coppice to old-growth forests will be analyzed for its effects on the water, energy and carbon cycles. Climate response of forest will be quantified by means of albedo, evapotranspiration, greenhouse gas sources and sinks and their resulting climate feedback mechanisms. The anticipated new quantitative results will be used to lay the foundations for a portfolio of management strategies which will sustain wood production while minimizing climate change impacts. DOFOCO is interdisciplinary and ground breaking because it brings together state-of-the-art data and models from applied life and Earth system sciences; it will deliver the first quantitative insights into how forest management strategies can be linked to climate change mitigation.

## **272284- DYVERSE**

Vegetation dynamics and ecosystem services provision in a fragmented landscape in response to global change

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 6/1/2011 - 5/31/2014

*EC contribution:* € 225 047

*Policy drivers:* Climate Change  
Ecological Status

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### **Abstract**

Anthropogenic land use change, caused by increasing needs for energy and resources, is driving dramatic changes in biodiversity, ecosystem functioning and consequently ecosystem services, such as water quality or crop pollination. New quantitative tools are needed to refine our understanding and projections of these processes into the coming century. Such tools are needed to develop policies and management strategies (e.g. ecological networks) required to mitigate the effects of climate change and land-use change. We will develop such a tool by adapting and coupling BIOMOVE, an existing landscape modelling shell, to existing ecosystem services models, in order to simulate vegetation dynamics in the Monteregie (a case study region in south west Quebec), a biodiversity-rich area with a highly fragmented landscape. The model will be combined with projections from regional climate models and planned land use changes in the Monteregie to simulate future changes in biodiversity and ecosystem functioning and services. We will then analyse the effects of changing landscape connectivity by establishing ecological networks linking forest fragments with corridors within the region. The model will help search for synergies and trade-offs between biodiversity and ecosystem services. The model will also uncover potential critical connectivity thresholds for key elements of regional biodiversity and associated services (e.g. plant-pollinator interactions). Finally, we will test the robustness of various ecological network designs to projected natural and anthropogenic disturbances, and in so doing rank the importance of the different habitat nodes and corridors to connectivity and landscape resilience.

## **233886- ECCONET**

Effects of Climate Change On the inland waterway and other transport NETWORKS

[www.econet.eu/](http://www.econet.eu/)

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*Funding scheme:* CSA (Coordination - or networking - action), FP7

*Project duration:* 1/1/2010 - 12/31/2012

*EC contribution:* € 1 633 087

*Policy drivers:* Climate Change  
Hydromorphology

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### **Abstract**

The objective of this study is to gather the expertise of partners from different fields related to meteorology, hydrology, infrastructure operation, transportation and economics to assess the effect of climate change on the transport network, taking the inland waterway network as a case-study. The project is based on consolidation and analysis of earlier and existing research work as well as application of existing climate change and hydrological assessment tools for evaluation of climate change effects on the inland waterway transport (IWT) network. The development of new models is excluded from the study. During the project, cooperation and exchange of information is foreseen with other FP7 projects, namely EWENT and WEATHER. These projects are also focussed on the effects of extreme weather conditions on transport modes, but do not focus in particular on the IWT mode.

The project initially evaluates recent climate change scenarios, leading to predictions on the weather conditions in the future. Naturally, these may result in changes of the hydrological balance of the inland waterway network, being either associated with less ice formation and more balanced waterway conditions over the year or extreme situations such as prolonged low water periods or floods, depending on the region considered. The next step of the project is to evaluate the effect of these changes on the costs and reliability associated with inland waterway transport and other transport, which might lead to changes in transport flows. These calculations form the basis of a baseline scenario, assuming little or no deviation in policy related to IWT or other transport modes. In parallel with the evaluation of the service quality of the baseline scenario, proper adaptation strategies for coping with possible climate change effects on inland waterway transport are identified and assessed.

It is expected that these measures will improve the service quality of IWT even in the case of a changing climate. Final results contain projections of service

quality, flows on the inland waterway network under climate change conditions, as well as cost-benefit assessments of possible adaptation strategies. The project provides essential information for decision makers and guidelines for future research on climate change and IWT.

## **010726- ECOTRENDS**

Long-term trends on high-diverse benthic communities in the NW Mediterranean Sea: Ecological consequences of climate change

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 3/1/2005 - 2/28/2007

*EC contribution:* € 158 219

*Policy drivers:* Climate Change  
Ecological Status

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### **Abstract**

Human activities have extensively altered the global environment, changing biological cycles, transforming land and oceans, and enhancing the mobility of biota. These changes have also altered the biological diversity producing important ecosystem and societal consequences. The need to collect long-term data sets has been stressed by marine ecologists because such data provide baselines to verify trends in marine communities. Long-term approaches produce meaningful data, essential for the conservation of biodiversity and the successful management of marine ecosystems. The Mediterranean coralligenous benthic communities are valuable from the ecological viewpoint, beautiful as seascapes, and unique communities. However, they are among the most endangered Mediterranean ecosystems due to overexploitation of living resources, urban development, anthropogenic effects on water quality, and the increase of diving tourism. In addition to this scenario, the mass mortality event of invertebrates detected in 1999 and 2003 has been associated with elevated seawater temperatures supposedly related to global climate change. Therefore the aim of this project is to understand the ecological structure and dynamics and of NW Mediterranean coralligenous communities, which are considered particularly sensitive to global climate change. To achieve this goal this study integrates complementary approaches to enhance our ecological knowledge and to determine how resilient Mediterranean communities are. This scientific project is based on the analysis of decadal trends of two photographic series of these communities and on population genetics experiments of key species. The expected results will provide the proper scientific context for biological conservation of the diverse Mediterranean coralligenous communities.

## **038366- ENDURE**

Ecosystem resistance to climate change: feeding and survival strategies in the face of global warming

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 1/1/2007 - 12/31/2008

*EC contribution:* € 259 484

*Policy drivers:* Climate Change

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### **Abstract**

Climate change is a threat to ecosystems, both aquatic and terrestrial. Shallow lakes are aquatic systems of global importance for their economic, amenity and biodiversity values. They seem to exist in one of two alternative states, both of which are resistant to change due to multiple buffering mechanisms. Much research has gone into elucidating under what conditions and how will these mechanisms be overcome as a result of climate change. However, the results obtained have provided little information about the potential responses to climate change under intermediate nutrient regimes and most probable warming scenarios. The zooplankton is a key link in trophic cascades of shallow lakes, since they provide the food base of fish through planktivory, and the limit to phytoplankton crops, through herbivory. Shifts from a clear to a turbid state in shallow lakes typically involve an increase or decrease in their capacity to control algal biomass and therefore water transparency. This pivotal role of zooplankton could be affected by global warming, with cascading effects on algal dominance and lake ecosystem state. Specifically, global warming may influence the survival and feeding strategies of the zooplankton in shallow lakes. The present proposal aims to examine zooplankton-related processes behind the switch to turbid conditions in shallow lakes occurring in response to global warming through the study of their survival and feeding strategies. A combination of empirical and mechanistic approaches will be used, through inter-seasonal variations and time series analyses of contemporary data, novel stable isotope analyses of zooplankton populations and their egg banks and mesocosms experiments. In these, zooplankton population dynamics and feeding activities will be examined under nutrient and fish treatments in novel flow-through warmed mesocosms mimicking global warming trends.

## **505539- ENSEMBLES**

ENSEMBLE-based Predictions of Climate Changes and their Impacts

<http://www.ensembles-eu.org/>

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*Funding scheme:* IP (Integrated Project), FP6

*Project duration:* 9/1/2004 - 12/31/2009

*EC contribution:* € 15 000 000

*Policy drivers:* Climate Change

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### **Abstract**

Prediction of both natural climate variability and human impact on climate is inherently probabilistic, due to uncertainties in forecast initial conditions, representation of key processes within models, and climatic forcing factors. Hence, reliable estimates of climatic risk can only be made through ensemble integrations of Earth - System Models in which these uncertainties are explicitly incorporated. For the first time ever, a common ensemble forecast system will be developed for use across a range of timescales (seasonal, decadal, and longer) and spatial scales (global, regional, and local). This model system will be used to construct integrated scenarios of future climate change, including both non-intervention and stabilisation scenarios. This will provide a basis for quantitative risk assessment of climate change and climate variability, with emphasis on changes in extremes, including changes in storminess and precipitation, and the severity and frequency of drought, and the effects of "surprises", such as the shutdown of the thermohaline circulation. Most importantly, the model system will be extensively validated. Hindcasts made by the model system for the 20th century will be compared against quality-controlled, high-resolution gridded datasets for Europe. Probability forecasts made with the model system on the seasonal and decadal timescales will also be validated against existing data. The exploitation of the results will be maximised by linking the outputs of the ensemble prediction system to a wide range of applications. In turn, feedbacks from these impact areas back to the climate system will also be addressed. Thus ENSEMBLES will have a structuring effect on European research by bringing together an unprecedented spectrum of world-leading expertise. This expertise will be mobilised to maintain and extend European pre-eminence in the provision of policy-relevant information on climate and climate change and its interactions with society.

## **909122- EU-ISOTREC**

Climatic and environmental changes in the Eurasian Subarctic inferred from tree-ring and stable isotope chronologies for the past and recent periods

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 3/1/2010 - 2/29/2012

*EC contribution:* € 15 000

*Policy drivers:* Climate Change

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### **Abstract**

The goal of this project is: • to develop a comprehensive description of the climatic and environmental changes in the Eastern Taimyr [72N-102E] for the warmest periods during the Holocene using tree ring width, latewood density, cell size, carbon and oxygen isotope data in wood and cellulose; • to improve our understanding of the physiological response of larch trees to environmental changes in the Eurasian north. We propose to investigate three periods, which are characterized by high temperatures during the Holocene: • the natural warm period BC 3700-3800, with an average temperature, which was three degrees higher than at present; • the Medieval Warm period AD 950-1150, with a similar rise in temperature compared to today; • the current period AD 1945-2006, which is characterized by the highest level of atmospheric carbon dioxide due to anthropogenic activities besides a temperature increase. The work will be conducted in three major fields: 1. Climatology – analyses of statistical relationships between climatic parameters (temperature, precipitation, relative humidity, and vapor pressure deficit) and carbon, oxygen isotope data during the current period. Comparison of isotope chronologies along the Subarctic latitudes from Yakutia to Sweden with Greenland ice core and pollen data. 2. Physiology - investigation of the physiological response of trees to environmental changes during the current and past periods based on a combined carbon and oxygen isotope fractionation model developed by Scheidegger et al. (2000). 3. Modeling – the new isotope and tree ring chronologies will be used to verify the ecophysiological model [Hemming et al. 2001; Vaganov et al. 2006] for the current period and to extend the model for the past to infer new environmental information (e.g. on water use efficiency).

## **009972- EU-MEDIN COMPANIONS**

Supporting publications on Natural Hazards Research

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*Funding scheme:* SSA (Specific Support Action), FP6

*Project duration:* 7/1/2005 - 11/30/2007

*EC contribution:* € 300 000

*Policy drivers:* Climate Change

Floods

Water Scarcity and Droughts

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### **Abstract**

The proposed project aims basically to provide a set of publications that will be created within the scope of the Eu-Medin initiative and will be used by the stakeholders of research in the field of Natural Hazards. The above mentioned publications include: a. A book on the state of the art in the various natural hazards from the research point of view. A wide board of Editors and external experts will collaborate for the preparation of this publication b. English glossaries of terms commonly used to describe concepts and senses used in references of various types of Natural Hazards (Forest fire, Earthquakes, Landslides, Floods, Desertification, Volcanic risk etc) and c. c. A publication including a collection of information regarding the initiatives, services and policies of the EC and International organizations to support R&D activity in the field of Natural disasters. Furthermore the envisaged project aims to update the EU-Medin database of metadata, concerning projects results and to ensure the maintenance of the EU-Medin web portal to serve as a web platform of a virtual organization for supporting the dissemination of R&D results regarding natural disasters and for facilitating the interaction and synergy between research groups and scientists in Europe and worldwide.

## **505968- EUROCHAMP**

Integration of European Simulation Chambers for Investigating Atmospheric Processes

<http://www.eurochamp.org/eurochamp-1/>

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*Funding scheme:* I3 (Integrated Infrastructure Initiatives), FP6

*Project duration:* 6/1/2004 - 5/31/2009

*EC contribution:* € 5 000 000

*Policy drivers:* Climate Change

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### **Abstract**

## **273215- FRESHCLIM**

Freshwater biodiversity and community composition in a changing climate: from ecosystem manipulation to biogeographical patterns

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 8/1/2011 - 7/31/2013

*EC contribution:* € 307 970

*Policy drivers:* Climate Change  
Ecological Status

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### **Abstract**

The project has three main objectives: i) To assess climate change and nutrient effects on phenology, biodiversity (taxon richness and species derived measures), and community composition of freshwater organisms, ii) To assess the importance of connectivity for species diversity (taxon richness and species derived parameters) and community composition of freshwater organisms under climate change, and iii) Predict the geographic range of individual species as a function of climate and other environmental variables (e.g. land-use and stream flow) including forecast range shifts of organisms due to climate change and identify potential climate change sensitive (species) indicators. The main reason for suggestion this project is that human activities are causing water pollution, habitat loss and/or degradation, overexploitation, flow modifications, and alien species invasions to freshwater ecosystems on all continents and at the same time freshwater ecosystems contain a especially high amount of biodiversity. There are also evidence that climate change effects are already taking place in freshwater ecosystems across Europe. FRESHCLIM therefore aims at combining research questions at the forefront of freshwater- (including both lakes and rivers) as well as terrestrial ecology, investigating responses to climate change as well as other human induced pressures on these ecosystems. It links climate change effects on phenology as well as biodiversity and community composition with the effects of multiple stressors such as eutrophication, hydrology and morphology. FRESHCLIM spans timescales of 10 years to 10.000 years and spatial scales from meters to more than 3.000 km. With the FRESHCLIM project I expect to advance current knowledge of how freshwater ecosystems react to climate change in a multiple stressors environment. An area that are of high priority for the adaptation, mitigation, and restoration of our important freshwater resources.

## **020269- GLASEAL**

Acceleration of glacier wastage and sea level rise

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 8/1/2006 - 7/31/2008

*EC contribution:* € 226 057

*Policy drivers:* Climate Change

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### **Abstract**

"GLASEAL will be a multidisciplinary study at Stockholm University (Department of Geography and Quaternary Geology, Tarfala Research Station). The project includes ""global"" components, such as change in volume of glaciers outside the Antarctic and Greenland ice sheets, glacier contribution to sea level and the relation to global geodesy. Glacier contribution to sea level rise has accelerated implying serious environmental, social and economic impacts. This has a broad impact on several global processes, including affects on Earth gravity and rotation, on land hydrology and ventilation of ocean water. The demand for new and more precise calculation of glacier impacts to these global changes has increased. This two-year project aims at a new regional and global analysis of glacier volume change using new data sources and better understanding the processes that have led to increased glacier wastage. This study is performing new regional and global syntheses of the glacier contribution to changes in water cycle and the Earth gravity field. The new analysis is bringing a better understanding and visualization of the role of glaciers to the multidisciplinary scientific community. Intellectual merit of the proposed research is summarized as following: - shows the relationship between several scientific disciplines, involving glaciology within the larger family of Geoscience; - estimates the net melt-water exchange between land and ocean due to shrinking glaciers, with application of these results to changes in Earth's water balance, gravitational and rotational fields; - updated results serve as the necessary source of historical data for validation of model results, projection of future sea level change, interpretation of space images and other newly developed technologies; - develop innovative methodology of glacier mass balance monitoring."

## **268135- GNSS METEOROLOGY**

Exploitation of ground-based Global Navigation Satellite Systems (GNSS) for Meteorology and Climate studies in Bulgaria/Southeast Europe

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 1/1/2011 - 12/31/2014

*EC contribution:* € 100 000

*Policy drivers:* Climate Change

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### **Abstract**

The Global Navigation Satellite Systems (GNSS), a new technology that revolutionised the navigation, is becoming an indispensable part of our daily life with millions of chips installed in portable car navigation devices and mobile phones. Beside the numerous civilian and commercial applications, GNSS proved to be an accurate sensor of the most abundant greenhouse gas, namely atmospheric water vapour. Application of GNSS in Meteorology is a well established research field in Europe and GNSS data from 1,200 stations are available for model validation and assimilation in state-of-the-art models used for operational weather prediction by the National Meteorologic Services. Advances in GNSS data processing is making possible to also use the GNSS data for climatic trend analysis, an emerging new area of research that is both attractive and important.

This project is a first step towards application of GNSS for Meteorology and Climatic studies in Bulgaria and Southeast Europe. The work will be conducted in close collaboration with the University of Bern, Switzerland and the Delft University of Technology, Netherlands. It is expected to foster national links that will lead to integration of the GNSS data from Bulgaria in the European data exchange within EUMETNET – EGVAP project. A user friendly water vapour database will be developed and used for (1) cross-validation of ground-based and satellite observations and derivation of systematic biases, (2) validation of numerical models used for research and weather prediction, (3) study of water vapour distribution in Bulgaria and Southeast Europe, (4) detection of long term trends in water vapour and links to heat waves, droughts and changes in the pathway of the Atlantic Cyclones, and (5) studies of accuracy of state-of-the-art climate models for Bulgaria and Southeast Europe.

## **031109- GRASSLAND**

Effects of climate warming and altered biodiversity on the carbon, water and nitrogen balance of grasslands under drought conditions

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 3/1/2006 - 2/29/2008

*EC contribution:* € 80 000

*Policy drivers:* Climate Change  
Water Scarcity and Droughts

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### **Abstract**

Global change includes both climatic change as well as changes in land use and in biodiversity. The impact of climatic environmental stresses and land use pressure on grasslands are not well known. Grasslands are expected to undergo the largest changes in diversity, as they are affected simultaneously by a combination of factors [e.g. nitrogen (N) deposition, overgrazing, increasing of atmospheric CO<sub>2</sub> concentrations and temperature]. This is particularly significant since grasslands constitute a major pool of the global C cycle, accounting for 20% of the terrestrial CO<sub>2</sub> fluxes and contributing to a similar share of the global soil organic C. Until today rather few studies have considered the combined effects of increased temperature and 1) drought stress, or 2) increased N deposition rates on loss of diversity. The proposed project aims to investigate the outcome of these combined effects on diversity loss and on C and N cycles, including C and N plant-soil allocation, during different stages of plant development. Specifically, we will evaluate (1) the performance, productivity, and water use efficiency, (2) soil C balance, and (3) different aspects of the N cycle and plant N-use efficiency, all in different types of grassland communities. Several experiments will be performed using model ecosystems grown in 12 sunlit, climate-controlled chambers. Each chamber will contain 24 plant communities, with different combinations of nine grassland species: three grass species, three N-fixer dicots and three non-N-fixing dicots. Each plant community will consist of one, three, or nine species, in order to simulate different species richness levels. Half of the chambers will be exposed to ambient air temperatures, while the other half will be warmed by 3°C. The proposed study will advance our knowledge of how ecosystem diversity will respond to stresses in a future climate, and will contribute to reducing the current uncertainties surrounding diversity loss in grasslands.

## **259219- GWESCB**

Global warming effects on the stream carbon balance

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 1/1/2011 - 12/31/2013

*EC contribution:* € 45 000

*Policy drivers:* Climate Change  
Ecological Status

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### **Abstract**

Global warming has altered and will further alter the temporal patterns of the water temperature in stream ecosystems. These changes in the temperature patterns include an increasing frequency and magnitude of heat waves, as well as an alteration of the diel temperature patterns, with warmer night-time temperatures. A growing number of studies are assessing the effect of a mean temperature increase in the ecology of wetlands, forests, streams and other ecosystems, but the effect of the alteration of the temporal patterns is mainly unexplored and might have a major impact on the C balance of streams. Any change in the C balance in streams will be reflected in the global C balance given the connecting role of river networks between donor terrestrial ecosystems and sink marine ecosystems. In this research project, I aim to experimentally assess the effects of the alteration of the previously mentioned temporal temperature patterns on the stream C balance. Thus, 2 different types of mesocosms will be assembled and used within the framework of this research. Expected results might help better understanding how global warming influences the C cycle at both ecosystem and global scales.

## **266327- HEALTHY FUTURES**

Health, environmental change and adaptive capacity: mapping, examining and anticipating future risks of water-related vector-borne diseases in eastern Africa

[www.healthyfutures.eu/](http://www.healthyfutures.eu/)

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*Funding scheme:* CP (Collaborative Project), FP7

*Project duration:* 1/1/2011 - 12/31/2014

*EC contribution:* € 3 377 998

*Policy drivers:* Climate Change  
Chemical Aspects

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### **Abstract**

The HEALTHY FUTURES project is motivated by concern for the health impacts of environmental changes. HEALTHY FUTURES aims to respond to this concern through construction of a disease risk mapping system for three water-related high-impact VBDs (malaria, Rift valley fever and schistosomiasis) in Africa, accounting for environmental/climatic trends and changes in socio-economic conditions to predict future risk. Concentrating on eastern Africa as a study area, HEALTHY FUTURES comprises a comprehensive, inter-disciplinary consortium of health, environment, socio-economic, disease modelling and climate experts in addition to governmental health departments. To achieve its aims, HEALTHY FUTURES will deploy a bottom-up, end-user/stakeholder-focused approach combining field-, laboratory- and library-based research.

## **227087- HIGHNOON**

HighNoon: adaptation to changing water resources availability in northern India with Himalayan glacier retreat and changing monsoon pattern

[www.eu-highnoon.org/](http://www.eu-highnoon.org/)

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*Funding scheme:* CP (Collaborative Project), FP7

*Project duration:* 5/1/2009 - 4/30/2012

*EC contribution:* € 3 311 751

*Policy drivers:* Climate Change

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### **Abstract**

The hydrological system of Northern India is based on two main phenomena, the monsoon precipitation in summer and the growth and melt of the snow and ice cover in the Himalaya, also called the “Water Tower of Asia”. However, climate change is expected to change these phenomena and it will have a profound impact on snow cover, glaciers and its related hydrology, water resources and the agricultural economy on the Indian peninsula (Singh and Kumar, 1996, Divya and Mehrotra, 1995). It is a great challenge to integrate the spatial and temporal glacier retreat and snowmelt and changed monsoon pattern in weather prediction models under different climate scenarios. Furthermore, the output of these models will have an effect on the input of the hydrological models. The retreat of glaciers and a possible change in monsoon precipitation and pattern will have a great impact on the temporal and spatial availability of water resources in Northern India. Besides climate change, socio-economic development will also have an influence on the use of water resources, the agricultural economy and the adaptive capacity. Socio-economic development determines the level of adaptive capacity. It is a challenge to find appropriate adaptation strategies with stakeholders for each of the sectors agriculture, energy, health and water supply by assessing the impact outputs of the hydrological and socio-economical models. The principal aim of the project is to assess the impact of Himalayan glaciers retreat and possible changes of the Indian summer monsoon on the spatial and temporal distribution of water resources in Northern India and to provide recommendations for appropriate and efficient response strategies that strengthen the cause for adaptation to hydrological extreme events.

## **274827- HUMANARIDADAPT**

### **HUMAN ADAPTATIONAL PATTERNS TO ARID ENVIRONMENTS IN NORTH AFRICA**

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 10/1/2011 - 9/30/2013

*EC contribution:* € 200 549

*Policy drivers:* Climate Change  
Water Scarcity and Droughts  
Socio-economy

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#### **Abstract**

The relationship between climate and culture is one of the most important areas of debate in the case of the Late Pleistocene, c.60,000-10,000 BP (years ago), when profound and frequently abrupt climatic changes coincided with significant human migrations and shifts in behavioural complexity. A major weakness in past research is that models of climate:people interactions in the Late Pleistocene have been based on regional data sets of very variable quality, so it is impossible to move beyond broad generalisations about how humans did or did not respond to climatic change. This is particularly the case in North Africa, the focus of the proposed project. There were certainly climate shifts, but they did not result in uniform environmental change: the peak of cold conditions c.18,000 BP was characterized by considerable aridity and steppe-like vegetation, but certain locations may have remained better-watered 'rifugia'. Cultural shifts were also profound but not uniform: in the Maghreb, for example, 'Iberomaurusian' stone technologies continued to be used from c.24,000 BP right up to the end of the Pleistocene c.10,000 BP, whereas in Libya a distinctive Late Stone Age industry ('Dabban') was replaced by an 'Oranian' industry in some respects similar to the Maghreb Iberomaurusian c.15,000 BP. The relationships between shifts in climate, environment, and human behaviour therefore remain obscure. The proposed project will examine the stone industries of two contrasting case study regions in Libya where the results can be compared with high quality palaeoenvironmental and palaeoeconomic data. It will apply innovative methodologies to determine the likely significance of technological change in terms of cultural (social networks) and behavioural (subsistence) shifts. Integrating the various data sets will yield a nuanced perspective on human responses to climate change in North Africa in the Late Pleistocene, of wide relevance for Palaeolithic studies generally.

## **221827- HYDRAMITRA**

Atmospheric Humidity Distribution and the impact of Mixing and Transport in the free troposphere

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 7/1/2008 - 6/30/2010

*EC contribution:* € 153 777

*Policy drivers:* Climate Change

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### **Abstract**

Understanding the processes that control the distribution of water vapour, the Earth's dominant greenhouse gas, is central to understanding climate. This project proposes to determine the combined effect of transport and mixing as well as micro-physical processes on the distribution of water vapour in the free troposphere. It will integrate theoretical knowledge acquired from idealised models with wind data sets and tracer measurements. The outcome of this approach is intended to contribute to a deeper understanding of the mechanisms controlling this distribution and thus to comprehend the implications of the corresponding structure on the radiative balance of the Earth.

## **224416- HYDROSYS**

HYDROSYS: Advanced spatial analysis tools for on-site environmental monitoring and management

[www.hydrosonline.eu/](http://www.hydrosonline.eu/)

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*Funding scheme:* CP (Collaborative Project), FP7

*Project duration:* 5/31/2008 - 5/31/2011

*EC contribution:* € 3 260 611

*Policy drivers:* Climate Change

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### **Abstract**

HYDROSYS aims at providing a system infrastructure to support teams of users in on-site monitoring events analysing natural resources. The project introduces the innovative concept of event-driven campaigns with handheld devices, potentially supported by an unmanned aerial vehicle (UAV). In these campaigns, users can setup and retrieve data from mobile sensorstations, the UAV and external sources (sensor network) generating dense information on a small area. The sensor network system gathers and stores sensor data, and processes simulations based on physical process models. To obtain rich data sets from a specific location, additionally, remotely controlled cameras are deployed, mounted on sensorstations and below the UAV. Users can analyse the environment using cell phones and handheld computers, supported by advanced user interface techniques. The system is validated in two application areas, dealing with pollution caused by storm water, and permafrost melting. The project will improve environmental monitoring and management for environmental scientists, institutions and service providers, through its strong integration of handhelds and sensor networks. The project will progress well beyond the current state in the art, by dealing with short-term events and detailed analysis of small sites. The analysis of such events is hardly supported by current methods, but has a large impact on environmental degradation. Additionally, information is dispersed to citizens by providing mechanisms to access top-level environmental data.

Within the project, cutting edge inter-disciplinary research will be performed to develop user-centred solutions. When the data is integrated with analytical tools in a shared information space it will also aid a wide range of managers and planners in the pursue of more environmentally sensitive solutions to engineering problems. To aid the process, the research is steered by considerable end-user involvement throughout the full project.

## **226213- HYPOX**

In situ monitoring of oxygen depletion in hypoxic ecosystems of coastal and open seas, and land-locked water bodies

[www.hypox.net/](http://www.hypox.net/)

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*Funding scheme:* CP (Collaborative Project), FP7

*Project duration:* 4/1/2009 - 3/31/2012

*EC contribution:* € 3 499 710

*Policy drivers:* Climate Change  
Ecological Status

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### **Abstract**

Hypoxic (low oxygen) conditions in aquatic ecosystems increase in number, duration and extent due to global warming and eutrophication. Global warming will lead to degassing of oxygen, increased stratification, reduced deep-water circulation and changes in wind patterns affecting transport and mixing. Projected increases in hypoxia (e.g. doubling of “dead zones”) are accompanied by enhanced emission of greenhouse gases, losses in biodiversity, ecosystem functions and services such as fisheries, aquaculture and tourism. A better understanding of global changes in oxygen depletion requires a global observation system continuously monitoring oxygen at high resolution, including assessment of the role of the seafloor in controlling the sensitivity of aquatic systems to and recovery from hypoxia. Here we propose to monitor oxygen depletion and associated processes in aquatic systems that differ in oxygen status or sensitivity towards change: open ocean, oxic with high sensitivity to global warming (Arctic), semi-enclosed with permanent anoxia (Black Sea, Baltic Sea) and seasonally or locally anoxic land-locked systems (fjords, lagoons, lakes) subject to eutrophication. We will improve the capacity to monitor oxygen depletion globally, by implementing reliable long-term sensors to different platforms for in situ monitoring; and locally by training and implementing competence around the Black Sea. Our work will contribute to GEOSS tasks in the water, climate, ecosystem and biodiversity work plans, and comply to GEOSS standards by sharing of observations and products with common standards and adaptation to user needs using a state of the art world data centre. We will connect this project to the GOOS Regional Alliances and the SCOR working group and disseminate our knowledge to local, regional and global organisations concerned with water and ecosystem health and management.

## **041142- IMDALCC**

Impact of mesoscale dynamics and aerosols on the lifecycle of cirrus clouds

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 7/1/2007 - 6/30/2009

*EC contribution:* € 177 217

*Policy drivers:* Climate Change

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### **Abstract**

One of the most crucial issues for predicting future climate change is the role of clouds. Clouds can warm and cool the atmosphere depending on their properties like water content, droplet size and cloud thickness. Unfortunately, our knowledge on clouds is limited and due to the insufficient representation of cloud processes in existing climate models it is difficult to predict the role of clouds in a changing climate. We want to focus on the high level clouds (cirrus clouds) consisting purely of ice crystals. These clouds cover approximately 20-30% of the Earth and its surface. For cirrus clouds, a warming of the atmosphere is possible. However, it is rather difficult to provide estimates for the radiative effect of cirrus clouds because very little is known about the life cycle of cirrus clouds. In global climate models (GCMs) usually only the formation of cirrus clouds by synoptical dynamics (e.g. uplift along warm fronts) is regarded. However, recent studies have showed that the restriction on these processes lead to an underestimation of cirrus clouds in GCMs, because the formation of cirrus clouds due to mesoscale waves has not been taken into account. Additionally, it is not clear, how aerosols, which affect seriously the formation of cirrus clouds at synoptical conditions, will contribute to the life cycle of cirrus clouds generated by waves. Therefore, we want to study the impacts of mesoscale dynamics and aerosols on the life cycle of cirrus clouds using a highly resolved model including a complete ice microphysics. Our objectives are to improve our knowledge about cirrus clouds and to determine the impact of dynamics versus aerosols for these clouds. From these new insights we will be able to improve our existing cirrus cloud parameterisations in the GCMs and to develop new parameterisations, which will lead to better estimates of the radiative impact of cirrus clouds on climate.

## **282746- IMPACT2C**

Quantifying projected impacts under 2°C warming

[www.hzg.de/mw/impact2c/](http://www.hzg.de/mw/impact2c/)

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*Funding scheme:* CP (Collaborative Project), FP7

*Project duration:* 10/1/2011 - 9/30/2015

*EC contribution:* € 6 999 900

*Policy drivers:* Climate Change

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### **Abstract**

Political discussions on the European goal to limit global warming to 2°C demands that discussions are informed by the best available science on projected impacts and possible benefits. IMPACT2C enhances knowledge, quantifies climate change impacts, and adopts a clear and logical structure, with climate and impacts modelling, vulnerabilities, risks and economic costs, as well as potential responses, within a pan-European sector based analysis. IMPACT2C utilises a range of models within a multi-disciplinary international expert team and assesses effects on water, energy, infrastructure, coasts, tourism, forestry, agriculture, ecosystems services, and health and air quality-climate interactions. IMPACT2C introduces key innovations. First, harmonised socio-economic assumptions/scenarios will be used, to ensure that both individual and cross-sector assessments are aligned to the 2°C (1.5°C) scenario for both impacts and adaptation, e.g. in relation to land-use pressures between agriculture and forestry. Second, it has a core theme of uncertainty, and will develop a methodological framework integrating the uncertainties within and across the different sectors, in a consistent way. In so doing, analysis of adaptation responses under uncertainty will be enhanced. Finally, a cross-sectoral perspective is adopted to complement the sector analysis. A number of case studies will be developed for particularly vulnerable areas, subject to multiple impacts (e.g. the Mediterranean), with the focus being on cross-sectoral interactions (e.g. land use competition) and cross-cutting themes (e.g. cities). The project also assesses climate change impacts in some of the world's most vulnerable regions: Bangladesh, Africa (Nile and Niger basins), and the Maldives. IMPACT2C integrates and synthesises project findings suitable for awareness raising and are readily communicable to a wide audience, and relevant for policy negotiations.

## **227628- INCREASE**

An integrated network on climate change research activities on shrubland ecosystems

[/www.increase-infrastructure.eu/](http://www.increase-infrastructure.eu/)

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*Funding scheme:* IA (Large-scale integrating project), FP7

*Project duration:* 2/1/2009 - 2/28/2013

*EC contribution:* € 5 999 764

*Policy drivers:* Climate Change

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### **Abstract**

The network INCREASE consists of 6 infrastructures (large-scale field sites) with experimental manipulation of climate e.g. night time warming and extended summer drought. Within INCREASE we will improve the technology and methodology for studies of climate change effects on European shrublands.

The main objectives of INCREASE are:

- To optimize technologies and methodologies for non-intrusive field manipulation of climate change in shrubland ecosystems by development, testing and application of new technology and methods i) to optimize the field manipulations of warming to 3-4 °C (in agreement with the newest predictions of global warming by the IPCC (2007)), ii) to develop, test and apply the combination of warming and drought and the combination with CO<sub>2</sub>.
- To improve and develop non-destructive techniques and methods for measurements of physical, chemical and biological effects of climate.
- To stimulate collaboration within the scientific community around climate manipulation experiments i) within the infrastructure by means of e.g. common research, common protocols, test of equipment, data syntheses, ii) between the infrastructure and related infrastructures beyond the proposal, and iii) scientists within relevant fields
- To provide access to a unique set of large scale climate change experiment for European scientists.
- To develop and provide access to a comprehensive data base of experimental data.
- To develop and provide access to a dynamic ecosystem model for scrubland ecosystems
- To test and apply non-destructive methods for ecosystem carbon assessment and important underlying processes of root dynamics and carbon transformations in the soil.

## **033811- INTAMAP**

INTERoperability and Automated MAPPING

<http://www.intamap.org/>

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*Funding scheme:* STP (Specific Targeted Research Project), FP6

*Project duration:* 9/1/2006 - 8/31/2009

*EC contribution:* € 1 856 000

*Policy drivers:* Climate Change

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### **Abstract**

The main objective of this project is to develop an interoperable framework for real time automatic mapping of critical environmental variables by extending spatial statistical methods and employing open, web-based, data exchange and visualisation tools. To illustrate the potential of the framework at the European scale we will apply the framework to produce a system for automatic mapping of radiation levels reported by 29 European countries that participate in the European radiological data exchange platform (EURDEP). In case of hazards and emergencies (e.g. pollution peaks, nuclear/radiological accidents, flash-floods), maps of environmental variables interpolated from monitoring network measurements are needed in real time with minimum or no human intervention to reflect the monitored situation. In particular when dealing with unforeseen events ('hot spots' or extreme values) environmental monitoring systems (EMS) usually lack adequate automatic mapping systems. Because spatial interpolation has an associated interpolation error, an automatic mapping system must inform decision makers about the uncertainties associated with the interpolated maps, such as by means of probabilities that a critical threshold is exceeded over a certain geographic region. Combining these probabilities with population density yields a system for rapid assessment of exposed population at risk. This project addresses key issues of GMES and integrates the results in an INSPIRE compliant framework, based on open standards (OGC/Orchestra/OASIS) and web (feature) services. Hence, the project has the ambition to lay down the foundations that set the technology and science necessary to realise the above objectives in the most accurate, reliable and extensible form.

## **262693- INTERACT**

International Network for Terrestrial Research and Monitoring in the Arctic

[www.eu-interact.org/](http://www.eu-interact.org/)

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*Funding scheme:* IA (Large-scale integrating project), FP7

*Project duration:* 1/1/2011 - 12/31/2014

*EC contribution:* € 7 300 000

*Policy drivers:* Climate Change

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### **Abstract**

Environmental change and particularly amplified global climate change are accelerating in the Arctic. These changes already affect local residents and feedback from the Arctic's land surface to the climate system, will have global implications. However, climate change and its impacts are variable throughout the wide environmental and land use envelopes of the Arctic. Unfortunately, the Arctic is generally remote, sparsely populated and research and monitoring activities are more restricted in time and space than elsewhere. This limitation comes when there is a rapidly expanding need for knowledge as well as increasing technological opportunities to make data collection in the field and accessibility more efficient.

INTERACT is a network under the auspices of SCANNET, a circumarctic network of terrestrial field bases. INTERACT specifically seeks to build capacity for research and monitoring in the European Arctic and beyond. Partnerships will be established between Station Managers and researchers within Joint Research Activities that will develop more efficient networks of sensors to measure changing environmental conditions and make data storage and accessibility more efficient through a single portal. New communities of researchers will be offered access to Arctic terrestrial infrastructures while local stakeholders as well as major international organisations will be involved in interactions with the infrastructures.

This will lead to increased public awareness of environmental change and methods to adapt to them, increased access to information for education at all levels, and input to major international research and assessment programmes. The whole consortium will form a coherent and integrated unit working within a concept of a wide environmental and land use envelopes in which local conditions determine the directions and magnitudes of environmental change whereas the balance and synergies of processes integrated across the whole region have global impacts.

## **237890- INTRAMIF**

Initial TRaining network on Mass Independent Fractionation

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 9/1/2009 - 8/31/2013

*EC contribution:* € 3 036 392

*Policy drivers:* Climate Change

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### **Abstract**

Molecules containing the element oxygen can be further characterized by the distributions of the stable oxygen isotopes. In some cases, these isotopes have an anomalous distribution, which is evidence of Mass Independent Fractionation (MIF). MIF has become a powerful research tool in earth system science and its use is expected to spread from the core science disciplines to industrial applications. With INTRAMIF, we bring together experts from atmospheric and climate research, hydrology, oceanography and molecular physics. 13 ESR projects from these disciplines are connected by the common theme of MIF. Sharing expertise and world-class facilities will allow the individual groups to do research that would otherwise be impossible.

This will create a center of excellence for MIF research in Europe. The associated industrial partners of INTRAMIF will integrate the research and training programs with real-world opportunities, including commercialization of new techniques and the application of MIF to solve questions on water supplies and food authentication. The broad scientific program allows us to combine specialized training at the host institutions with a unique interdisciplinary and intra-sector network training program on the climate system involving associated partners from the industrial, political and economic sectors. The strong interest from our associated partners documents the need for highly qualified scientists with a wide interdisciplinary background. INTRAMIF will educate the next generation of scientists that can tackle new challenges to society in a changing climate.

## **042268- ISOCYCLE**

Tracing the carbon and water cycle in terrestrial ecosystems with stable isotope spectroscopy

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 5/1/2007 - 4/30/2011

*EC contribution:* € 1 468 110

*Policy drivers:* Climate Change  
Chemical aspects  
Water Scarcity and Droughts

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### **Abstract**

Understanding the processes and mechanisms that control carbon and water flow through terrestrial ecosystems is essential both to estimate the current capacity of terrestrial ecosystems to absorb carbon from the atmosphere and to predict the ecosystem's responses under a changing climate. Stable isotopes of carbon and oxygen provide a powerful tool to trace the flow of carbon and water through ecosystems and to elucidate the interplay between various ecosystem compartments. So far, stable isotope research has been restricted to discontinuous field sampling due to laborious flask sampling and expensive lab analysis. With this project we propose to build one of the first laser spectroscopy facilities for stable isotope ecology research in Europe based on a newly developed laser spectroscopy technology from the USA. Based on these laser systems for continuous stable carbon and oxygen isotope measurements together with the eddy covariance technique and chamber systems we want to (a) quantify a complete stable carbon isotope budget of an ecosystem in the field, (b) trace the flow of carbon from the atmosphere through the plant to the soil via isotopes in natural abundance and isotope labelling, (c) link the carbon and water cycle at ecosystem level, and (d) study the impact of climatic extreme events, such as drought, on the carbon flow. The project will combine observational field work with manipulative drought experiments and ecosystem scale modelling. This project will complement research activities at the host ETH Zürich and will integrate into European carbon cycle projects. Findings from this project are expected to contribute to a better mechanistic understanding of the terrestrial carbon sink in Europe and of its response to climatic extreme events.

## **516761- JAYHUN**

### **INTERSTATE WATER RESOURCE RISK MANAGEMENT: TOWARDS A SUSTAINABLE FUTURE FOR THE ARAL BASIN**

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*Funding scheme:* STP (Specific Targeted Research Project), FP6

*Project duration:* 11/1/2005 - 4/30/2009

*EC contribution:* € 1 040 000

*Policy drivers:* Climate Change

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#### **Abstract**

Glacial and snow melt is essential for the well being of all the states of Central Asia and provides over 90% of their water requirements. Unfortunately, climate change is causing rapid recession of the glaciers, which in the short-term helps meet the States ambitious water requirements, but in the long term will result in decreased runoff and increased evapotranspiration from higher temperatures. In addition because of the young nature of the mountain ranges they are unstable with the result that the reservoirs and potential reservoir sites have very limited life expectancies because of rapid siltation. It is also known, however that vast quantities of water is wasted by inefficient and poorly managed irrigation schemes. The water resources of the region are already overstretched and hence, in the foreseeable future the very existence of their agricultural economies is at stake. This project is designed to assess the level of risk associated with these different variables and to develop a management strategy for the water resources of the region. This will be achieved by firstly determining the rate of glacial retreat and the implications for future water resources and the assessment of the likely impact of global changes on the annual precipitation in the region. Rates of reservoir siltation will also be established by hydrographic survey, and the wastage and effectiveness of water use in the large irrigation massifs will be established from both historic data and satellite data based methods of estimating water use. The data will be analysed in water resources models that are calibrated on existing data and then used to look at different scenarios up to 50 years into the future by combining the data gathered from the data collected and analysed in other work packages. The outcome will be a risk analysis identifying future risk and identifying future sustainable management options for water in the Aral Basin.

## **237582- LATIS**

Linking the Atmosphere and Terrestrial biosphere carbon and water cycles using oxygen ISotopes

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 8/1/2009 - 12/31/2011

*EC contribution:* € 173 401

*Policy drivers:* Climate Change  
Ecological Status

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### **Abstract**

Quantifying terrestrial carbon storage and predicting the sensitivity of ecosystems to global climate change relies on the ability to separately investigate photosynthesis and respiration. The oxygen ( $^{18}\text{O}/^{16}\text{O}$ ) isotope ratios of  $\text{CO}_2$  and water can substantially advance our understanding of how carbon and water cycle through the terrestrial biosphere. This is because a large isotopic disequilibrium often exists between the oxygen isotope composition of  $\text{CO}_2$  exchanged by leaves and soils with the atmosphere making it a powerful independent tool for quantifying and understanding variability in the  $\text{CO}_2$  gross fluxes of the terrestrial biosphere. The aim of LATIS is to improve our understanding of  $\text{C}^{18}\text{O}$  fluxes between the terrestrial biosphere and the atmosphere. We will achieve this by: 1) elucidating the role of soil biology on the oxygen isotope composition of the net soil  $\text{CO}_2$  flux, 2) incorporating up-to-date theoretical models of  $\text{C}^{18}\text{O}$  exchange from foliage and soils into the unique soil-vegetation-atmosphere transfer model, MuSICA-iso and, 3) developing and testing new theory to mechanistically interpret the oxygen isotope signals of  $\text{CO}_2$  exchanged between tree stems and the atmosphere and how they relate to tree physiology. LATIS is a multi-disciplinary project utilising state-of-the-art field measurements observing the continuous fluctuation of branch, stem and soil isofluxes. These observations will be used to validate the novel models developed in LATIS. This innovative and ambitious approach will result in: 1) an improved understanding of the oxygen isotope  $\text{CO}_2$  exchange between the terrestrial biosphere and the atmosphere, 2) the development of a state-of-the-art soil-vegetation-atmosphere water and  $\text{CO}_2$  isotope exchange model and, 3) a deeper understanding of oxygen isotope signals involved during the transport of water and carbon within plants and how these processes are preserved in wood cellulose.

## **243827- LC-IMPACT**

Development and application of environmental Life Cycle Impact assessment Methods for imProved sustAinability Characterisation of Technologies

[www.lc-impact.eu/](http://www.lc-impact.eu/)

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*Funding scheme:* CP (Collaborative Project), FP7

*Project duration:* 12/1/2009 - 11/30/2012

*EC contribution:* € 3 413 950

*Policy drivers:* Climate Change

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### **Abstract**

LC-IMPACT is a 3-year project and its main objective is the development and application of life cycle impact assessment methods, characterisation and normalisation factors. Impact from land use, water use, marine, mineral and fossil resource use, ecotoxicity and human toxicity, and a number of non-toxic emission-related impact categories will be considered in LC-IMPACT. First, new impact assessment methods will be developed for categories that are not (commonly) included in life cycle impact assessments and categories for which model uncertainties are very high, i.e. land use, water exploitation, resource use, and noise. Second, LC-IMPACT will provide spatially explicit characterisation factors based on global scale models for land use, water exploitation, toxicants, priority air pollutants, and nutrients. Thirdly, parameter uncertainty and value choices will be assessed for impact categories with high uncertainties involved, such as ecotoxicity and human toxicity. Fourthly, ready-to-use characterisation factors will be calculated and reported. Fifthly, normalisation factors for Europe and the world will be calculated for the impact categories included. Sixthly, the improved decision support of the new characterisation factors and normalisation factors will be demonstrated in the context of the following three case studies: i) food production (fish, tomatoes, margarine), ii) paper production and printing, and iii) automobile manufacturing and operation. Finally, verification and dissemination of the new life cycle impact assessment methods and factors will be done by a portfolio of actions, such as stakeholder consultation, a project website, workshops, course developments, and training of user groups. In short, LC-IMPACT will provide improved, globally applicable life cycle impact assessment methods, characterisation and normalisation factors, that can be readily used in the daily practice of life cycle assessment studies.

## **023053- MODEL FOR METABOLISM**

Effects of pulse events at different spatial and temporal scales on stream ecosystems

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 5/7/2006 - 5/6/2008

*EC contribution:* € 184 022

*Policy drivers:* Climate Change

Floods

Water Scarcity and Droughts

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### **Abstract**

The primary objective of the project is to investigate the effect of spatial and temporal scales on the ecosystem response to flow pulse events. Flooding and drying episodes influence ecosystem dynamics at multiple spatial and temporal scales. Ecosystem processes like nutrient cycles and carbon fluxes are differentially shaped at variable spatial scales by both flood events and droughts. Stream metabolism (primarily gross primary production and ecosystem respiration) will be used to evaluate ecosystem processes. Better understanding of flood and drought effects on stream and river ecosystem processes and how these processes are affected by the spatial and temporal scales will improve strategies for conservation and restoration as well as redefine and enhance the state of the science in stream and river ecology. With this background, I propose to study the effect of flow pulse events on stream metabolism at different spatial scales within one river system in the Swiss Alps. The project will be carried out at the Swiss Federal Institute for Environmental Science and Technology (EAWAG, Switzerland), in the Department of Systems Analysis, Integrated Assessment and Modelling and the Department of Limnology. The submitted project fits in the general objectives and principles of the `Specific Programme: Structuring the European Research Area as it involves a more effective co-operation between the research disciplines (modelling and stream ecology), promotes further co-operation between research and environmental public agencies, reinforces the linkages between European researchers and research centres from associated countries.

## **273108- MONSOON**

### Role of the Indian Monsoon on Global Climate Change

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 7/22/2011 - 7/21/2013

*EC contribution:* € 280 680

*Policy drivers:* Climate Change

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#### **Abstract**

The monsoon system in the Indian Ocean exerts a strong influence upon the climatic conditions in south and Southeast Asia and the associated monsoon rainfall have great impact on the socio-economic and agriculture development in the densely populated south Asia. Therefore, understanding and predicting the monsoon behavior in response to global change is a high scientific priority. Most of the monsoon reconstructions from the Arabian Sea are based on the upwelling indices, which essentially represent the South West (SW) monsoon wind strength rather than precipitation. A robust indicator of monsoon rainfall is a key requirement to reconstruct monsoon variability. In this regard, Bay of Bengal is a highly suitable region to evaluate the SW monsoon precipitation mainly because four major rivers Irrawaddy, Brahmaputra, Ganges and Godavari discharge annually approximately  $1.5 \times 10^{12} \text{m}^3$  of fresh water into the Bay of Bengal. In this context, we propose to exploit marine sediment archives from the Bay of Bengal to reconstruct monsoon rainfall changes on centennial time scale by using very sensitive proxy (salinity) over the last 25-30 kyrs. This will bridge the gap between the instrumental record showing (interannual to decadal variability) and the existing paleoceanographic records (mainly glacial-interglacial to millennial time scales) and use these monsoon reconstructions to explore the teleconnections between monsoon activity and global climate. Ratios of oxygen isotopes and Mg/Ca in planktic foraminifera and quantitative SST estimates based on planktic foraminifer will be used to reconstruct sea surface temperature and salinity changes at century scale. These will be complimented with other surface ocean changes inferred from planktic foraminifer assemblages. These records, in turn, are used to unravel temporal link between monsoon records and other records of low-and high-latitudes climate change.

## **021920- MORE ICE**

Combined remote sensing and modelling approach to assess the past, present and future evolution of Alaska/Yukon glaciers (northwest North America)

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 1/1/2006 - 12/31/2006

*EC contribution:* € 166 949

*Policy drivers:* Climate Change

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### **Abstract**

"The arctic regions are expected to experience the most profound impacts of the ongoing global warming. Some alarming observations have recently been reported by the Arctic Climate Impact Assessment group, such as reduced sea ice cover or freshening of the Arctic Ocean. One of the most striking features is the rapid wastage of glaciers and ice caps. Improved knowledge of the evolution of these glaciers toward the end of this century is crucial as they significantly contribute to water resources, sea level rise. We propose in this project to use a combined modelling and remote sensing approach to assess the past, present and future evolution of the glaciers and icefields of northwest North America with special emphasis of those in the Yukon (Canada) and Alaska (USA). This goal will be achieved through the development and validation of a new Regional land Ice Dynamics Model (RIDM). A two-step approach is planned: The first step of the project is the development and validation of the RIDM under the well known 20th century climate forcing and glacier response. Remote sensing measurements will play a major role by providing: 1. Boundary conditions for the model. In particular, we will develop a method to retrieve the subglacial topography in regions that are currently ice-covered using satellite-derived velocity fields. 2. Tight constraints on model performance. We will test the capability of the model to reproduce the present day ice cover and ice flow dynamic. In a second step, we will run the RIDM under different climate conditions. First, we will force our model with surface temperature and precipitation fields derived from paleoarchives, including ice-core climate records from Mt. Logan (5960 m asl) to study the evolution of the Yukon/Alaska glaciers during the Holocene (past ~10000 yr). Then, we will use scenarios of greenhouse gas induced global warming to assess the mass loss and associated sea level rise contribution of these glaciers."

## **211590- MOVE**

Methods for the improvement of Vulnerability Assessment in Europe

[www.move-fp7.eu/](http://www.move-fp7.eu/)

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*Funding scheme:* CP (Collaborative Project), FP7

*Project duration:* 10/1/2008 - 12/31/2011

*EC contribution:* € 2 078 067

*Policy drivers:* Climate Change  
Science-policy Interface

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### **Abstract**

MOVE will create knowledge, frameworks and methods for the assessment of vulnerability to natural hazards in Europe. It will use indices and indicators to help improve societal and environmental resilience. Floods, temperature extremes, droughts, landslides, earthquakes, wildfires and storms will be studied. Emphasis will be placed on clear, capable measurement and accounting for uncertainties. MOVE will identify gaps in existing methodologies. It will produce a conceptual framework that is independent of scale and hazard type. It will analyse physical (technical), environmental, economic, social, cultural and institutional vulnerability. These will be measured for specific hazards and at different geographical scales. Methodologies will be tested in case study regions on vulnerable elements and appropriate hazard types. Case studies will enable the availability and quality of existing data at sub-national (NUTS 3-5) and local scales to be examined. MOVE will evaluate statistical data (for cities, from EUROSTAT, etc.) and remote sensing information. The case studies will integrate and combine economic damage and social vulnerability methods. The generic framework, data analysis and applicability tests will result in a standard approach to vulnerability assessment in Europe. Stakeholders will be consulted systematically in order to understand their needs and to enable MOVE to draw attention to the practical value of its methodologies. There will be six work-packages. First, terms will be defined and gaps in existing methodologies identified. Next, a generic framework will be developed, with variants for particular scales, hazards and situations. Thirdly, the methods will be applied to case studies. The fourth and fifth packages will develop co-operation processes with stakeholders and ensure that the framework and the methods are disseminated for the benefit of European citizens. Project co-ordination will occupy the final package.

## **220546- MTVEGMOD**

Advancing dynamic vegetation modeling for mountain systems vulnerable to climate and land-use change

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 7/1/2009 - 6/30/2011

*EC contribution:* € 180 628

*Policy drivers:* Climate Change

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### **Abstract**

Significant uncertainties on the response of ecosystems to climate change remain to be addressed to advance the progress of the Intergovernmental Panel on Climate Change. We propose to investigate several of these uncertainties by improving regional-scale dynamic vegetation modeling for montane systems vulnerable to climate and land-use change. Our approach will modify a state-of-the-art dynamic global vegetation model (LPJ-DGVM) to include a new disturbance module for grazing, a key driver of alpine treeline dynamics. High-spatial resolution data for soils and climate (20th century and climate projections), essential for regional modeling, will be available from the Host institute and international collaborators based in the United States and China. The direct effects of grazing on seedling mortality and on light and water competition with grasses will be incorporated to the framework of LPJ. Model output, including net ecosystem exchange and species biogeography, will be evaluated for the Swiss Alps against databases from Swiss FluxNet, phenology observations from MeteoSwiss, and net primary productivity modeled from tree rings. Physiological parameters for plant functional types found in mountain habitat will be evaluated and adjusted following this assessment. The modified dynamic vegetation model, LPJ 'Grazing', will be applied with various climate scenarios to a biodiversity hotspot in the Hengduan Mountains in the Yunnan Province of China where little field-data exist and where the vulnerability to climate and land-use change is highly uncertain. The proposed research combines expertise and datasets of researchers from three continents to reduce uncertainties related to regional-scale climate attribution, impacts, and vulnerability. Our modifications to the LPJ-DGVM will have a significant impact globally for mountain biogeography and biogeochemical modeling because the model provides the basis for vegetation dynamics in many coupled global climate models.

## **256961- MUSICA**

Multi-platform remote sensing of isotopologues for investigating the cycle of atmospheric water

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*Funding scheme:* ERC (ERC Grant), FP7

*Project duration:* 2/1/2011 - 1/31/2016

*EC contribution:* € 1 500 000

*Policy drivers:* Climate Change  
Hydromorphology

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### **Abstract**

MUSICA aims to understand the atmospheric water cycle and its interplay with climate change applying unique long-term high quality and global remote sensing observations of tropospheric stable water vapour isotopologues. It is well established that water in its various forms plays a dominant role in nearly all aspects of the Earth's climate system. Understanding the full cycle of evaporation, cloud formation, and precipitation is of highest scientific priority for predicting climate change.

The ratio of the isotopologues (e.g. HD16O/H216O) is affected by evaporation, condensation, and cloud processes, and offers a unique opportunity for investigating how water moves through the troposphere. Incorporating isotopologues in atmospheric general circulation models (AGCM) and comparing the isotopologue simulations to observations has the potential to test the models' ability of reproducing the global atmospheric water cycle and its interplay with climate change. So far this research field has not been explored due to the lack of consistent, long-term, high-quality, and area-wide observational data. MUSICA will for the first time combine long-term ground- and space-based remote sensing measurements in a consistent manner, and will generate novel tropospheric HD16O/H216O data, taking benefit from both the high and well documented quality of the ground-based observations and the wide geographical coverage of the space-based observations. This unique observational data set will allow a new dimension of water cycle research. MUSICA will collaborate with the Stable Water Isotope Intercomparison Group (SWING) in order to improve current state-of-the-art water isotope AGCMs. MUSICA will investigate and improve the understanding of tropospheric water vapour sources and transport pathways, and empirically assess how well climate feedbacks are captured by current climate models and thereby it will constrain a major uncertainty of climate projections.

## **274325- PACEMOD**

Development of integrated modelling techniques to assess impacts of climate change on pathogens and water quality

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 12/1/2011 - 11/30/2014

*EC contribution:* € 226 024

*Policy drivers:* Climate Change  
Groundwater

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### **Abstract**

Dr Rory Coffey graduated with an honours primary degree in Agricultural Science in 2003, he subsequently went on to complete a research masters and PhD in University College Dublin with a focus on Biological Systems Engineering. He is currently working as a Postdoctoral researcher in Ireland. The researcher is requesting funds for 3 years under the guidance of Professor Shane Ward, University College Dublin, Ireland. A two year outgoing phase will be spent working with Dr Mary Leigh Wolfe at the Centre for Watershed Studies, Biological Systems Engineering, Virginia Polytechnic Institute and State University, USA. Knowledge acquired during the outgoing phase will be transferred to the EU in year 3 during the return phase when Dr Coffey will rejoin the Bioresources Research Centre at University College Dublin.

The overall scientific aim of the project is to apply watershed modelling techniques to integrate the effects of climate change on waterborne pathogenic organisms and transport of such substances to water sources (groundwater and surface water). Ongoing work in these areas is still in its infancy, and the project proposes a bottom-up approach to investigation.

As the project progresses, the emphasis will shift from water quality monitoring techniques, theoretical modelling and simulation (relying on third country host expertise) to model development, application and evaluation within the EU (using home institutions expertise). The project will be completed with a view to environmental application and development of new protocols for water source protection (taking advantage of the home institution's experience in training, communication, scientific management, intellectual property, etc.)

## **219357- PPEPSI**

Precipitation pattern effects on plant-soil microbial interactions

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 3/1/2009 - 2/29/2012

*EC contribution:* € 246 186

*Policy drivers:* Climate Change  
Water Scarcity and Droughts

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### **Abstract**

Global environmental change is predicted in Europe to result in increased frequency and intensity of extreme climatic events, including severe droughts and intense precipitation events. Such changes will affect plant physiology, microbial activity and soil nutrient cycling, inducing changes in ecosystem functioning, with expected consequences on in plant community composition, net primary productivity and carbon balance. Thus, it is crucial to consider the effect of precipitation patterns of contrasted amplitude on the plant-soil interaction.

The main objective of this project is to understand the mechanisms of the coupling between precipitation patterns and carbon and nitrogen cycling in the plant-soil microbial system. The effect of precipitation patterns of contrasting amplitude will be addressed in a multidisciplinary approach combining state-of-the-art molecular techniques with stable isotope approaches to enable a detailed understanding of the functioning of the plant-soil system that ultimately relates belowground fluxes to the activity of the soil microbial population. Changes in the structure of the active microbial community over the long term will be assessed using a high-density oligonucleotide microarray chip, a cutting-edge tool which allows to assess which prokaryotic operational taxonomic units are active in the soil.

The fluxes of carbon and nitrogen between plant and soil microbes will be determined using isotopic methods. The mechanisms underlying plant-soil microbial interactions in response to contrasting precipitation patterns will be identified under controlled conditions during the outgoing phase then validated in the field during the return phase, enabling valuable insight into the future implications of changes in European summer climate for plant nitrogen availability, and providing crucial information for the development of mitigation strategies.

## **274895- PRIMA**

Priming in an aquatic ecosystem - Stream biofilms as hotspots for carbon cycling

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 6/1/2011 - 5/31/2013

*EC contribution:* € 175 844

*Policy drivers:* Climate Change  
Ecological Status

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### **Abstract**

Recent findings concerning the role of inland waters in global carbon cycling is currently having a major impact of the view of the global carbon cycle. These findings highlight inland waters - such as streams, rivers and lakes - as major sites of carbon cycling, implying that they must be considered in the context of climate change. Microbial degradation of organic carbon is a process that is central to carbon cycling in all ecosystems. In soils, microbial degradation of recalcitrant carbon is often controlled by the availability of labile carbon sources. This is linked to the priming effect (PE). Mounting evidence suggests that PE is also important in aquatic ecosystems but it has yet to be explicitly addressed. Biofilms are vital components of aquatic ecosystems. In stream biofilms, heterotrophic bacteria and algae coexist in close proximity, exposing the bacteria to both recalcitrant organic carbon of terrestrial origin and labile organic carbon from the algae. This could make stream biofilms hotspots for PE. In PRIMA, I propose an innovative effort cutting across aquatic and terrestrial ecosystems, spanning single-cell to ecosystem scales, and combining methods from biogeochemistry and molecular microbiology to study PE in stream biofilms. Carbon flux in stream biofilm microcosms and in ecosystem scale stream mesocosms will be measured to quantify PE and its implications for carbon cycling in streams. The mechanisms of PE will be addressed on single-cell and community scales using cutting edge methods, such as NanoSIMS and 454-sequencing. I am an experienced researcher trained in Norway and Sweden. In PRIMA, I seek to combine my existing skills with the unique expertise and facilities of Prof. Tom J. Battin at the University of Vienna. The many conceptual and methodological training objectives of PRIMA, as well as its outstanding scientific quality, will strengthen my scientific skills and will enable me to reach my goals as an independent researcher.

## **244092- RESPONSES**

European responses to climate change: deep emissions reductions and mainstreaming of mitigation and adaptation

[www.responsesproject.eu/](http://www.responsesproject.eu/)

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*Funding scheme:* CP (Collaborative Project), FP7

*Project duration:* 1/1/2010 - 12/31/2012

*EC contribution:* € 3 149 658

*Policy drivers:* Climate Change  
Water and Agriculture

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### **Abstract**

EU action on climate change is now focused on accelerating mitigation efforts, while seeking to reduce risks associated with climate change impacts. To achieve the multiple goals of cutting greenhouse gas emissions, reducing vulnerability to climate impacts, and building mitigative and adaptive capacities, climate action needs to be mainstreamed across all EU policy sectors. As the scale of European policy grows, mitigation and adaptation need increasingly to be integrated. These policies have strong international dimensions. The RESPONSES project addresses EU policy challenges by: developing new global low emissions scenarios, placing EU efforts in a global context; building an approach for assessing EU policies against mitigation and adaptation objectives and for developing alternative policy options; applying this framework in five EU policy sectors (water and agriculture, biodiversity, regional development/infrastructure, health and energy), linked by a set of cross-sectoral integrative activities; and synthesizing the results to new policy strategies. The main outputs of the project will be: a set of global low emission scenarios, differentiated by key countries; options and strategies for integrating mitigation and resilience to climate impacts into EU policies; a validated strategic climate assessment approach. The RESPONSES consortium brings together seven leading European research institutes working on climate change scenarios, modelling, analysis and policy, combining the necessary disciplinary and sectoral expertise. Chinese, Indian and US partners and associates will also participate in the project. The consortium builds on partners' experience in other EU and national projects, including the ADAM project, and will foster close relationships with policymakers. Research outputs will be of direct relevance to the IPCC and to post-2012 international negotiations, as well as supporting implementation of the EU White Paper on Adaptation.

## **33564- SANY**

Sensors anywhere

<http://sany-ip.eu/>

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*Funding scheme:* IP (Integrated Project), FP6

*Project duration:* 9/1/2006 - 8/31/2009

*EC contribution:* € 7 002 000

*Policy drivers:* Climate Change

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### **Abstract**

The European Commission (EC) and the European Space Agency (ESA) have established a joined Global Monitoring for Environment and Security (GMES) initiative. Sensors Anywhere Integrated Project (SANY) will contribute to this initiative by improving the interoperability of in-situ sensors and sensor networks, and allowing quick and cost-efficient reuse of data and services from currently incompatible sources in future environmental risk management applications. Five major SANY objectives are: 1) Specify a standard open architecture for fixed and moving sensors and sensor networks capable of seamless "plug and measure" and sharing (virtual networks), applicable to all kinds of in-situ sensors, classical and ad-hoc sensor networks, virtual sensors (sensor-like software), roving and airborne sensors, and ensure interoperability between ground and in-orbit sensors. 2) Develop and validate re-usable data fusion and decision support service building blocks. 3) Assure a reference implementation of the architecture, i.e. an on-demand environment for accessing the GMES information and services is operational as GMES building block in 2008. 4) Assure the new architecture is generic and provides added value for end users. 5) Assure the outcome of SANY is accepted by end users and international organisations and contributes to a future standard applicable to GMES. SANY inherits and extends the results of two high profile EC and ESA infrastructure projects; ORCHESTRA and MASS/SSE. All architecture specifications shall be publicly available and compatible with EC and ESA infrastructure initiatives, such as INSPIRE (standard interfaces with geospatial information) , and Heterogeneous Missions Accessibility project (standard interfaces for EO Ground Segments); SANY specifications shall be validated by experts trough OGC technical committee and realised in three innovative risk management applications covering the areas of air pollution, marine risks and geo hazards.

## **036822- SCENES**

### Water Scenarios for Europe and for Neighbouring States

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*Funding scheme:* IP (Integrated Project), FP6

*Project duration:* 11/1/2006 - 4/30/2011

*EC contribution:* € 6 993 477

*Policy drivers:* Climate Change  
Socio-economy

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### **Abstract**

The SCENES project will develop and analyse a set of comprehensive scenarios of Europe's freshwater futures up to 2025, covering all of Greater Europe reaching to the Caucasus and Ural Mountains, and including the Mediterranean rim countries of north Africa and the near East. These scenarios will provide a reference point for longterm strategic planning of European water resource development, alert policymakers and stakeholders about emerging problems, and allow river basin managers to test regional and local water plans against uncertainties and surprises which are inherently imbedded in a longer term strategic planning process. The scenarios developed by SCENES will be policy-relevant by identifying the requirements of stakeholders and decision makers, and including stakeholders in the scenario-building process.

The SCENES project will deliver combined qualitative and quantitative scenarios. The qualitative scenarios (storylines) provide an internally-consistent picture of how water resources in different parts of Europe may develop up to 2025. The quantitative scenarios, produced by state-of-the art models, complement the storylines by providing numerical information and by enriching the qualitative scenarios by showing trends and dynamics not apparent in the storylines. The qualitative scenario analysis will also focus on water quality, ecological and hydrological aspects, with special regard to the requirements of the WFD. Scenarios will be interactive and adaptive in the sense that they will be developed through a three phase approach. The first phase will be a fast track pan-European scenario exercise using existing information. The second phase will involve regional and pilot area scenario enrichment. The final phase will be the drawing together of results and dissemination of the scenario outputs. SCENES is planned as a 4-year Integrated Project with a total budget of 10.1 million EUR, of which 7 million EUR is requested as EC contribution.

## **035164- SCIER**

Sensor and Computing Infrastructure for Environmental Risks

<http://www.scier.eu/>

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*Funding scheme:* STP (Specific Targeted Research Project), FP6

*Project duration:* 7/1/2006 - 12/30/2008

*EC contribution:* € 2 091 000

*Policy drivers:* Climate Change

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### **Abstract**

The SCIER project will design, develop, and demonstrate an integrated system of sensors, networking and computing infrastructure for detecting, monitoring, predicting and assisting in the crisis management of natural hazards or accidents at the "urban-rural-interface" (URI), i.e., in areas where forests and rural lands interface with homes, other buildings and infrastructures. The overall goal of the SCIER system is to make the much neglected URI zone safer for the European citizens against any type of natural hazards or accidents. To achieve its ambitious objective, SCIER pushes the state of the art and combines several technologies: 1) self-organizing, self-healing re-configurable sensor networks for the detection and monitoring of disastrous natural hazards, 2) advanced sensor data fusion and management schemes capable of deducing the required information needed for accurately monitoring the dynamics of multiple interrelated evolving hazardous phenomena (multi-risk), 3) environmental risk models for predicting the evolution of hazardous phenomena using a robust GRID computing infrastructure. The proposed system promotes public-private sector cooperation: indeed, SCIER involves the private sector (e.g., house/land owner, security company) as an "active player" in the URI zone protection and the monitoring of hazardous events. A prototype system integrates state-of-the-art sensors (e.g., vision sensors, wireless sensor networks with low energy requirements) with the communications and computing infrastructure. The SCIER system will be demonstrated and evaluated in four European regions (Greece, France, Czech Republic and Portugal). Such sites have suffered in the past from forest fires and/or floods. The project mobilizes partners from research institutes, academia, public authorities and SMEs and service providers from (7) EU countries which combine specialized skills with complementary expertise to fully cover the project requirements.

## **247708- SUDPLAN**

Sustainable urban development planner for climate change adaptation

[www.sudplan.eu/](http://www.sudplan.eu/)

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*Funding scheme:* CP (Collaborative Project), FP7

*Project duration:* 1/1/2010 - 12/31/2012

*EC contribution:* € 2 530 393

*Policy drivers:* Climate Change  
Socio-economy

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### **Abstract**

The SUDPLAN project aims at developing an easy-to-use web-based planning, prediction, decision support and training tool, for the use in an urban context, based on a what-if scenario execution environment, which will help to assure population's health, comfort, safety and life quality as well as sustainability of investments in utilities and infrastructures within a changing climate.

This tool is based on an innovative and visionary capacity to link, in an ad-hoc fashion, existing environmental simulation models, information and sensor infrastructures, spatial data infrastructures and climatic scenario information in a service-oriented approach, as part of the Single Information Space in Europe for the Environment (SISE). It will provide end users with 3D modeling and simulation as well as cutting edge highly interactive 3D/4D visualization, including visualisation on real 3D hardware. The tool includes the SUDPLAN Scenario Management System with three so-called Common Services. The latter will allow downscaling of regional climate change model results to a spatial and temporal scale useful for urban planning in whatever European city.

SUDPLAN Common Services include gridded information on present and future extreme rainfall, temperature, river runoff and air pollution. Vital consequences of climate change are considered in 4 carefully selected urban pilot applications located in Austria, the Czech Republic, Germany and Sweden.

The SUDPLAN Scenario Management System with Common Services information will here be used to execute and visualize results from local high resolution models and sensor systems, covering such diverse applications as:

- extreme rainfall episodes causing problems with
- uncontrollable, extremely localized runoff, - drainage and sewage systems
- hazardous air pollution and high ambient temperature episodes causing health risks
- social dynamics (movement of people) as function of climate change and quality of living

Through innovative ICT, SUDPLAN contributes to SISE, provides new perspectives for a distributed service market, reinforces European leadership in the research area and fosters the capacity to cope with climate change impacts in urban environments.

## **501732- SWORD**

Studies on distribution and variability of water vapour concentrations on base of remote sensing and in-situ data

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 11/1/2004 - 10/31/2005

*EC contribution:* € 75 712

*Policy drivers:* Climate Change  
Chemical aspects

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### **Abstract**

The water vapour plays a major role in the balance of planetary radiation, influences and responds to atmospheric motions and plays a key role in many aspects of atmospheric chemistry. It is emphasized that an increase of water vapour causes a cooling of the lower stratosphere that is comparable to the contribution due to ozone changes. In view of the potential effects on climate change it is important to assess reciprocal relationship between water vapour and climate change. Water vapour measurements have been difficult. In situ ones suffer from water sticking to surfaces, while sharp gradients present difficulties for remote sensing techniques. The analysis of remote sensing data is additionally complicated by a lack of understanding of the fundamental physics behind the observed spectrum. To rise to the task, the researcher proposes to tap both, the remote sensing and in situ data. Satellite data sets enable characterising large-scale variations of water vapour. In situ and ground-based data sets make possible the investigation at smaller spatial scales, for long-term monitoring and for validation of satellite data. Mean distribution of the gas, its seasonal, non-seasonal and long-term variations will be considered including the dependence on macro circulation patterns. The project will allow the researcher an advanced training in the host organisation, especially in satellite data validation.

## **029080- THALES WAS RIGHT**

Transients in the Hellenic and Antilles Loci of Earthquakes of European Subductions Water Activity Structure and Seismic Risk Illuminated by Geophysical High Technology

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*Funding scheme:* STP (Specific Targeted Research Project), FP6

*Project duration:* 5/15/2006 - 5/14/2010

*EC contribution:* € 1 748 000

*Policy drivers:* Climate Change

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### **Abstract**

The occurrence only few months ago of the catastrophic Sumatra M9 earthquake was unexpected, hence Thematic Priorities of FP6 could not have included study of hazard of that type, which this occurrence now proved possible against previous state-of-the-art wisdom. This project presents a scientific measurement approach for the detection of new types of seismic signals, as well as deep structural images that are relevant to the problem, being possible heralds of mega-thrust earthquakes. This will be applied in the two European subduction zones, the Western Hellenic and Lesser Antilles Arc, that may be prone for M>8 earthquakes as they share characters of the Sumatra-Andaman case. These water-related phenomena, deep seismic tremor and silent earthquake, were recently discovered in Japan and NW US subduction zones, where advanced technologies and methods have been applied. They were reported to have their source region close to the interplate subduction boundary, the mega-thrust fault plane, where possible water content has been revealed by deep structural seismic images. Importantly, these transient signals, are observed in advance of the major M>8 earthquakes expected there. They might in case be considered as possible silent heralds of megathrust earthquakes and monitored. Our project is to apply to these two European subduction areas advanced studies of activity and structure, with novel High-Tech observation means. Among them: Broad-Band Ocean Bottom Seismometers just developed that may detect these new transient signals, an opportunity of seismic reflection imaging with the French academic seismic ship for the Antilles, novelty of a joint integrated approach possible by merging forces at European scale. This scientific measurement approach may open the way to monitoring evolution, with high-yield/high-risk possible societal impact for hazard preparedness and mitigation.

## **023822- TICOPIC**

Triple Isotopic Composition of Oxygen in Polar Ice Core to understand the links between climate change and water cycle

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 11/1/2005 - 1/31/2007

*EC contribution:* € 172 254

*Policy drivers:* Climate Change  
Chemical aspects

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### **Abstract**

Strong modifications of the water cycle favoured the major climate changes. Over the late Quaternary, the measurements of three water isotopes (H<sub>2</sub><sup>16</sup>O, HDO, H<sub>2</sub><sup>18</sup>O) in deep Antarctic and Greenland ice cores suggested a strong relationship between climate and water cycle over the succession of glacial and interglacial period and over the rapid climatic variability of the last glacial period. Such a result comes from the different mass-dependent fractionation processes (equilibrium and kinetic) in the water cycle. However, even if a huge measurements and isotopic modelling efforts was produced, no quantitative reconstruction of past changes of water cycle could be proposed (especially changes in temperature and humidity of evaporative regions). It therefore prevents correct description of water cycle in global model to describe climate change mechanism. The last water isotope, H<sub>2</sub><sup>17</sup>O, as additional ice core tracer, should provide the missing information because of different equilibrium and kinetic fractionation coefficients (as shown by preliminar measurements and simple modelling studies). Its difficult analytical measurement with sufficient precision for that purpose is now possible at the Institute of Earth Sciences in Jerusalem. After a first calibration part with laboratory experiment and existing sampling over polar transects, we propose to measure H<sub>2</sub><sup>17</sup>O in deep ice cores in Antarctica and Greenland where H<sub>2</sub><sup>18</sup>O and HD<sup>16</sup>O are available to understand quantitatively the links between climate and water cycle variations. The use of simple and GCM models including water isotopes will favor the interpretation. My knowledge of isotopes in ice cores and of the european ice cores community, the unique expertise of the Institute of Earth Sciences in H<sub>2</sub><sup>17</sup>O measurements and the collaboration with Laboratoire des Sciences du Climat et de l'Environnement for isotopic modelling are great advantages for the success of the project.

## **243923- VIROCLIME**

Impact of climate change on the transport, fate and risk management of viral pathogens in water

[www.viroclime.org/](http://www.viroclime.org/)

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*Funding scheme:* CP (Collaborative Project), FP7

*Project duration:* 1/1/2010 - 12/31/2012

*EC contribution:* € 2 421 016

*Policy drivers:* Climate Change  
Chemical Aspects

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### **Abstract**

The use of hydrological models to determine the effects of climate change on the variation in viral flux, and therefore in risk associated with viral disease, constitutes a novel approach to the management of water-related disease. Tools developed in previous EU Projects will be used to conduct case studies on five selected sites (in Sweden, Spain, Hungary, Greece and Brazil) vulnerable to climate change (principally rainfall events), and the empirical baseline data accrued will be used in mathematical models constructed to estimate changes in exposure under defined conditions. Exposure levels will then be used to estimate risk of disease associated with such changes. Tools will include novel methods for processing of sewage, effluent and water samples, for quantitative detection of the target viruses, and for the determination of the source (human or animal) of viral pollution. Models will be adapted from existing epidemiological models for viral disease in the community, or will be generated de novo as required. Bacterial faecal indicator analysis will permit the determination of any relationships between virus levels and water quality standards, and also between changes in virus concentration in water and risk to public health activities, such as bathing in polluted water or consumption of shellfish.

## **230845- WARECALC**

### **WATER RESOURCES VULNERABILITY TO CLIMATE AND ANTHROPOGENIC LANDSCAPE CHANGES**

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 4/15/2009 - 4/14/2013

*EC contribution:* € 90 000

*Policy drivers:* Climate Change  
Hydromorphology  
Ecological Status

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### **Abstract**

Climate projections and trend analysis of historical data suggest that precipitation and temperature changes can dramatically alter the supply of and the demand for water in the human- and eco-systems. Moreover, anthropogenic landscape changes are occurring at unprecedented scales and rates given the societal needs for various (and often competing) ecosystem goods and services (food, energy, and water). How stable or resilient are the human- and eco-systems to climatic and anthropogenic perturbations remain a major societal concern. Of these concerns, hydrologic cycle changes, water resources availability and related management rank among the highest because of their importance in regulating human and ecological sustainability and climate feedbacks.

A number of recent studies suggest that continental runoff increased throughout the 20th century despite a rapid increase in water consumption by humans and their activities. Scope of the project: The goal of this research program is on the overall impact of such changes on rainfall (the source of water) and concomitant replenishment of usable water supplies (e.g. ground- and stream- water) given their high priority to any future water resource planning. Even within this restricted scope, the barriers to scientific progress are numerous necessitating an inter-disciplinary approach that combines principles from eco-hydrology, hydraulics and fluid mechanics, soil physics, plant physiology, stochastic processes, dynamical systems theory, and water resources management.

This project aims to build a network of researchers with complementary talents to begin progress on these fronts. Moreover, this network of researchers will be actively engaged in preparing the next generation of international scientists (via graduate student exchanges) who will be trained to approach such interdisciplinary societal problems and progress on them by adopting trans-disciplinary approaches now emerging from complex systems science.

## **244255- WASSERMED**

Water Availability and Security in Southern Europe and the Mediterranean

[www.wassermed.eu/](http://www.wassermed.eu/)

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*Funding scheme:* CP (Collaborative Project), FP7

*Project duration:* 1/1/2010 - 12/31/2012

*EC contribution:* € 2 933 973

*Policy drivers:* Climate Change  
Water Scarcity and Droughts

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### **Abstract**

The WASSERMed project will analyse, in a multi-disciplinary way, ongoing and future climate induced changes in hydrological budgets and extremes in southern Europe, North Africa and the Middle East under the frame of threats to national and human security. A climatic and hydrological component directly addresses the reduction of uncertainty and quantification of risk. This component will provide an interface to other climatologic projects and models, producing climate change scenarios for the Mediterranean and Southern Europe, with special emphasis on precipitation. Five case studies will be considered: 1) Syros Island (Greece), 2) Sardinia Island (Italy), 3) Merguellil watershed (Tunisia), 4) Jordan river basin, and 5) the Nile River system (Egypt). The case studies are illustrative and represent situations which deserve special attention, due to their relevance to national and human security. Furthermore, impacts on key strategic sectors, such as agriculture and tourism, will be considered, as well as macroeconomic implications of water availability in terms of regional income, consumption, investment, trade flows, industrial structure and competitiveness. WASSERMed is an interdisciplinary project, which overall aims at all three targets of the call, through the integration of climate change scenarios, holistic water system modelling and interdisciplinary impact assessment, with three main contributions: a) Integration of climate change scenarios, holistic water system modelling. This provides results for reduction of uncertainties of climate change impacts on hydrology in the identified regions; b) Interdisciplinary approach, coupling macroeconomic implications and technical indicators. This provides a better assessment of climate effects to water resources, water uses and expected security risks; c) Proposal of specific adaptation measures for key sectors of the Mediterranean economy. This provides better basis for achieving water security.

## **036946- WATCH**

WATER and global CHange

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*Funding scheme:* IP (Integrated Project), FP6

*Project duration:* 2/1/2007 - 7/31/2011

*EC contribution:* € 9 980 096

*Policy drivers:* Climate Change  
floods

Water Scarcity and Droughts

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### **Abstract**

The Integrated Project (WATCH) which will bring together the hydrological, water resources and climate communities to analyse, quantify and predict the components of the current and future global water cycles and related water resources states, evaluate their uncertainties and clarify the overall vulnerability of global water resources related to the main societal and economic sectors.

WATCH project will:

- analyse and describe the current global water cycle, especially causal chains leading to observable changes in extremes (droughts and floods)
- evaluate how the global water cycle and its extremes respond to future drivers of global change (including greenhouse gas release and land cover change)
- evaluate feedbacks in the coupled system as they affect the global water cycle
- evaluate the uncertainties in the predictions of coupled climate-hydrological-land-use models using a combination of model ensembles and observations
- develop an enhanced (modelling) framework to assess the future vulnerability of water as a resource, and in relation to water/climate related vulnerabilities and risks of the major water related sectors, such as agriculture, nature and utilities (energy, industry and drinking water sector)
- provide comprehensive quantitative and qualitative assessments and predictions of the vulnerability of the water resources and water-/climate-related vulnerabilities and risks for the 21st century
- collaborate intensively with the key leading research groups on water cycle and water resources in USA and Japan
- collaborate intensively in dissemination of its scientific results with major research programmes worldwide (WCRP, IGBP)
- collaborate intensively in dissemination of its practical and applied results with major water resources and water management platforms and professional organisations worldwide (WWC, IWA) and at a scale of 5 selected river basins in Europe

## **229459- WATERWORLDS**

Waterworlds: Natural environmental disasters and social resilience in anthropological perspective

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*Funding scheme:* ERC (ERC Grant), FP7

*Project duration:* 1/1/2009 - 12/31/2013

*EC contribution:* € 2 979 882

*Policy drivers:* Climate Change  
Socio-economy

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### **Abstract**

The present times are haunted by a sense of vulnerability in the face of major environmental disasters and global climate change. Whatever course and speed the current changes may accrue, their effects on the human world are already manifest. People suffer from a loss of habitual natural resources, from fear of an increasingly unpredictable nature, and from social disruptions as natural habitats are destroyed. Water is the most vital natural resource; it is the sine qua non of human life, and the idea of the present project is to study local, social responses to environmental disasters related to water. They are the melting of ice in the Arctic and in other glacier areas, the rising of seas that flood islands and coastal communities, and the drying of lands accelerating desertification in large parts of Africa and elsewhere. The ambition is to contribute to a renewed theory of social resilience that builds on the actualities of social life in distinct localities, and on human agency as the basis for people's quest for certainty. The proposed research is groundbreaking empirically as well as theoretically. Empirically it contributes a substantial ethnographic supplement to the sweeping diagnoses of the global malaises captured in notions like global warming. Theoretically, the project will allow for a new, general understanding of the effects of environmental disaster on social life, and of the responsibility that people take locally to ensure the survival of their community. New concepts will be developed to facilitate interdisciplinary research and worldwide dialogue. The larger vision is to rethink the human implications of climate change in the wider world, including Europe, by way of an explication of what is and what can be done on the ground. Technologies are useful, but the human and social potential is vital in long-term adaptation to new environmental realities. Frontier research as proposed here will show how.

## **039646- WAVES**

Water Vapour Exchange Study - WaVES

A 3D Lagrangian Model Study of Troposphere-Stratosphere Exchange Focusing on Water Vapour

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 10/1/2007 - 9/30/2009

*EC contribution:* € 142 918

*Policy drivers:* Climate Change

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### **Abstract**

Current state-of-the-art modelling tools do not fully explain the observational records for stratospheric water vapour. Observed stratospheric water vapour trends can only partially be explained by increasing methane. The development of a 3D Lagrangian coupled tropospheric-stratospheric model to study water vapour transport into the stratosphere is proposed. Existing state-of-the-art capabilities will be extended by improving vertical wind transport and mixing schemes, and incorporating a microphysical model. These advancements in modelling tools will allow the assessment of the radiative forcing and climate change implications due to particulate water transport into the stratosphere induced by anthropogenic aerosol emissions. Also, the implications for surface ultra-violet levels will be able to be assessed due to the role that stratospheric water vapour plays in stratospheric ozone loss processes. Advanced modelling capability over the current error prone assimilation methods for the vertical wind transport scheme will be achieved by radiative transfer calculations. A mixing parameterization will enable a physically realistic representation of transport processes in the tropical tropopause layer and into the stratosphere. Incorporation of a microphysical model will allow the interaction of non-equilibrium microphysics and sedimentation of particles to be studied. The modelling approach proposed will facilitate the examination of eddy transport processes on water vapour variability and allow drivers of observational stratospheric water vapour records to be assessed. Furthermore, the assessment and quantification of the impact of anthropogenic emissions on stratospheric water vapour will be able to be performed with more rigour than previously.

## **245418- WCC 3**

World Climate Conference 3 - <Better Climate Information for a Better Future>

[www.wmo.int/wcc3/page\\_en.php](http://www.wmo.int/wcc3/page_en.php)

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*Funding scheme:* CSA (Coordination - or networking - action), FP7

*Project duration:* 1/1/2009 - 11/30/2009

*EC contribution:* € 200 000

*Policy drivers:* Climate Change

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### **Abstract**

The World Climate Conference-3 (WCC-3) is aimed at initiating a global action to address the management of climate related risks and opportunities in the interest of supporting sustainable socio-economic development, especially in developing and least developed countries, in the face of current climate variability and predicted climate change.

The theme of WCC-3 is Climate prediction and information for decision-making , focusing on the application of climate information and predictions to societal problems enabling adaptation to the current climate conditions and predicted future changes in areas such as agriculture, forestry, water, health, infrastructure, urban cities and sustainable development. The involvement and participation of scientists from developing and least developed countries, which are often affected by climate related disasters and endowed with unique opportunities for development, shall help in developing appropriate climate services that would support the various sectors of the economy to spur growth. The WCC 3 is intended to establish an international framework that will enhance the provision, exchange, and application of climate prediction and information services for a wide range of socio-economic sectors and in doing so make a significant contribution to the UNFCCC COP15. This includes improving the ability of societies to reduce and manage climate related risks, through the provision of skilful climate prediction and information services as well as the integration of these services into decision-making as a means of enhancing the resilience of governments, society, and institutions to adapt to current and changing climate conditions.

WCC-3 will also further the scientific basis to explain and predict changes in the global climate in the context of both natural and anthropogenic forcing with an emphasis on contributing, from the science perspective, to the development of policy options for appropriate responses to global changes.

## **024096- WUPC**

Water Use Efficiency as a means of up scaling carbon fluxes from leaf to stand.

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 10/1/2006 - 9/30/2008

*EC contribution:* € 23 247

*Policy drivers:* Climate Change  
Water and Agriculture  
Ecological Status

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### **Abstract**

The Kyoto protocol allows separate countries to include carbon uptake from natural sinks as a way to decrease the net emissions of carbon dioxide. More specific, the term sinks concerns Article 3.3 and 3.4 in the protocol, giving the possibility to include carbon uptake by soil and vegetation in forests and by changes in land-use in agricultural areas. By the international agreements reached in Bonn, 2001, the signatory states also must account for the effect of management on the carbon balance of their forests. Such effects could be addressed from already running forestry management field trials. Nevertheless, this requires a new methodology for assessing the carbon fluxes. In this project, a novel approach to assess net stand carbon uptake will be used. The approach has an interdisciplinary character as it introduces the concept of water use efficiency (WUE) traditionally used for agricultural yield estimations and drought tolerance of plants, in the field of biosphere carbon cycling and greenhouse gas mitigation. The suitability for using the concept of WUE as a means of up-scaling carbon fluxes for deciduous forests will be evaluated. This will be achieved through estimations of transpiration and carbon flux relations at leaf level, including both analysis of earlier measurements on a large number of leaves and new measurements of leaf carbon and water exchange as well as branch sap-flow. The results will be validated against net ecosystem fluxes measured by eddy covariance techniques. The study will be carried out at Riso National Laboratory, Roskilde, Denmark. If stand carbon allocation and sequestration can be assessed using the WUE concept, the possibilities to assess the stand carbon cycle are increased significantly. A variety of management practices and species compositions of forests can be evaluated. This would be of great importance for climate change research, where biosphere-atmosphere interactions and carbon cycling are essential processes.



## **Ecological Status**



## **265409- $\mu$ AQUA**

Universal microarrays for the evaluation of fresh-water quality based on detection of pathogens and their toxins.

[microaqua.eu/project](http://microaqua.eu/project)

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*Funding scheme:* CP (Collaborative Project), FP7

*Project duration:* 3/1/2011 - 11/30/2014

*EC contribution:* € 2 905 659

*Policy drivers:* Ecological Status  
Chemical Aspects

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### **Abstract**

Monitoring the quality of drinking water is of paramount importance for public health. "Water is not a commercial product but a heritage that must be protected, defended and treated as such" (Water Framework Directive 2000/60/EC). The threat of waterborne diseases in Europe will predictably increase in the future as the human population increases and as a result of globalization and migration from non-EU countries and of climate change. Development of efficient, sensitive, robust, rapid and inexpensive tests to monitor various aspects of water quality represents an essential milestone within the strategy for control and prevention of diseases caused by waterborne pathogens and by algal toxins. Traditional methods for the detection of waterborne pathogens, based on cultivation, biochemical characterisation and microscopic detection are laborious and time-consuming; molecular biological tools have now greatly enhanced our ability to investigate biodiversity by identifying species and to estimate gene flow and distribution of species in time and space.  $\mu$ AQUA aims to design and develop a universal microarray chip for the high-throughput detection in water of known and emerging pathogens (bacteria, viruses, protozoa and cyanobacteria) and to assess the water quality monitoring the presence of select bioindicators (i.e. diatoms). A chip able to detect cyanobacterial toxins will also be developed. These innovative molecular tools should be amenable to automation so that they could be deployed on moorings for routine semi-continuous monitoring of water quality.  $\mu$ AQUA also aims to identify cyanophages potentially capable of controlling and mitigating the periodical blooming of toxic cyanobacteria in drinking water reservoirs. Overall, these innovative and cost efficient technologies will reduce energy requirements and improve performance of water treatment, and allow rapid management response to new situations brought about by environmental (including climatic) changes.

## **018157- ADOXPOL**

Development of Advanced Wastewater Treatment with Ozone Oxidation and Flotation Technique for Maximum Water Reuse

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*Funding scheme:* SME (SMEs-Co-operative research contracts), FP6

*Project duration:* 9/15/2005 - 3/14/2008

*EC contribution:* € 827 080

*Policy drivers:* Ecological Status

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### **Abstract**

The EU countries are still far away from the goal of reducing hazardous substances polluting European waters. Today, the Union's problem in this regard is worsening considering the state of water quality in the new member countries. Due to the lack of available effective onsite technologies, a bulk of the industrial activities are not treating their wastewater as required. In 2001, 38% of the total pollution management expenditure by environmental media in EU15 constituted wastewater management. However, available technologies in wastewater treatment have not been able to redress the pressure on European waters to an acceptable level. In light of this, the European Parliament and the Commission have now launched the Environmental Technologies Action Plan (ETAP) where Water Quality and development of advanced treatment methods are among the main issues. Our idea is to develop an advanced oxidation method by innovative development of ozone flotation technology for treatment of industrial wastewater cost effectively, fulfilling the need of the European industry meet emission standards and apply water reuse. The treatment system addresses the challenges related to sustainability of the European manufacturing industry, competitiveness and issues of water resource management. To achieve these objectives, we need to develop a novel ozone injection unit which maximizes the oxidation process with minimal amount of ozone especially for oxidation of recalcitrant substances; development of flotation chamber that enhances optimal diffusion of microbubbles, and a process control unit for ozone injection and pollution removal.

## **516852- ALGAEIRE**

Management and conservation of freshwater habitats:  
developing expertise on freshwater algae in Ireland

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 4/1/2005 - 3/31/2009

*EC contribution:* € 169 343

*Policy drivers:* Ecological Status

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### **Abstract**

The importance of algae as indicators of the conditions of the freshwater bodies in which they live is generally accepted and has been recognised at the European level by the EU Water Framework Directive. Capacity of a correct identification of these organisms is therefore fundamental for environmental management. For some regions of the Union, such as the Republic of Ireland, this is an important problem, due to the current lack of expertise on this subject. The section of Phycology of the Martin Ryan Institute, National University of Ireland, Galway, is formed by a full professor and several postdoctoral researchers with expertise of international level on many aspects of the biology of marine algae. However, no expertise on freshwater algae is currently available in this institution. The section of Phycology wants to establish a permanent research group of international level on freshwater algal biology. The necessary knowledge can be obtained only by transfer from an internationally recognised freshwater algal biologist. The transfer of knowledge would take place by a theoretical and practical approach. It is estimated that two years of intensive teaching and research carried out in collaboration with a top-class Fellow would be sufficient to create a permanent core of expertise on taxonomy and ecology of freshwater algae. The section would thus be able to offer a number of new courses and degrees in freshwater algal biology that would be highly attractive at European level. Graduates with this type of competences would find good possibilities of employment in organisations involved in the environmental area. In general, the creation of a large number of graduates with good knowledge of freshwater algae would have important benefits both at national and European level, allowing correct decision-making in management of freshwater habitats; for Ireland, in particular, this would enable to comply with the directives of the EU Water Framework.

## **219707- ALIENFISH&CLIMCHANGE**

Modelling of non-native fish species responses to climate change

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 4/1/2008 - 3/31/2010

*EC contribution:* € 178 307

*Policy drivers:* Ecological Status  
Climate Change  
Water and Agriculture

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### **Abstract**

Non-native species introductions are a major concern in Europe and globally, threatening biodiversity, ecosystem function and global economies; this will be exacerbated with climate change. Current climate change models for Europe and the UK predict: progressively warmer, wetter winters; warmer, dryer summers; an increase in extreme river flows. This is likely to increase the risk of non-native species reproductive potential and dispersal, which are key factors in establishment success. Using pumpkinseed *Lepomis gibbosus* in ambient and warm-water conditions as a case study, the Fellowship aims to: 1) Assess pumpkinseed growth and reproductive traits in nature (using methods currently employed for the species); 2) Acquire estimates of spawning event frequency in nature and in the lab to assess reproductive output (direct observation in semi-natural ponds via a novel telemetry array system, and in lab experiments, plus egg size distribution analysis on wild caught fish); 3) Determine pumpkinseed dispersal rates from floodplain water bodies into receiving streams (using drift nets to estimate propagule pressure); and 4) Develop (or improve existing) models of pumpkinseed reproductive output and dispersal (using relationships between juvenile growth and mean age at maturity, gravity models to assess the dispersal process, and GIS software to produce risk maps to aid in identifying areas at risk of biological invasion). The proposed fellowship is particularly novel in aiming to two important and timely questions relevant to the assessment of risks posed by non-native species in general, and of pumpkinseed in particular: 1) Will climate warming increase the risk of non-native fish establishing self-sustaining populations? 2) Will increased variability in precipitation and river discharge increase the risk of non-native fishes expanding their current ranges? The MC Fellow will receive invaluable training and experience, which will enhance his career prospects at home.

## **501750- ALIENFISHMIGRATIONS**

Assessing the risk and understanding the processes of invasion by non-native fish species within and between river catchments

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 1/1/2004 - 12/31/2005

*EC contribution:* € 169 366

*Policy drivers:* Ecological Status

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### **Abstract**

With increased trade in the expanded EU and between the EU and the rest of the world, alien species introductions are a growing concern to national governments and international organizations. Protocols are being developed to assess the risks and impacts of alien fishes, but these require knowledge of the processes and mechanisms associated with the four phases of biological invasion: Introduction, Establishment, Dispersion, and Impact. Of these, dispersion is least understood for alien freshwater fishes. The proposed fellowship will contribute to international efforts in biodiversity and species conservation through an understanding of dispersion processes of invasive freshwater fishes, in particular a sedentary omnivorous North American sunfish and two top European predators. The fellowship's specific objectives will be to: 1) determine the dispersion potential of predatory fishes, in particular the wels catfish *Silurus glanis* and the pikeperch *Sander lucioperca*, with specific reference to the frequency and timing of salt/brackish water incursions by pikeperch; and 2) assess the dependence of successful establishment in river catchments by the sedentary omnivorous North American sunfish, pumpkinseed *Lepomis gibbosus* on access to adjacent still waters, with particular regard to diel and seasonal movements. The objectives will be achieved using telemetry and otolith micro-chemistry, methods for which the host institution is an international centre of excellence. To enhance quality and assure success, the fellowship will be nested within, and will receive complementary resources from, a nationally-funded research contract on the risks and impacts of non-native freshwater fishes, led by the Scientist-in-Charge, an experienced supervisor of successful post-doctoral (including Marie Curie) and PhD training periods. The candidate will acquire expertise and technical know-how currently unavailable in Lithuania.

## **018328- AMEDEUS**

Accelerate Membrane Development for Urban Sewage Purification

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*Funding scheme:* STP (Specific Targeted Research Project), FP6

*Project duration:* 10/1/2005 - 5/31/2009

*EC contribution:* € 2 959 829

*Policy drivers:* Ecological Status  
Socio-economy

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### **Abstract**

Over the past decade, membrane bioreactors have been increasingly implemented to purify municipal wastewater. However, even with submerged membranes which offer the lowest costs, the MBR technology remains in most cases more expensive than conventional processes. In addition, the European municipal MBR market is to date a duopoly of two non-European producers, despite many initiatives to develop local MBR filtration systems. The proposed AMEDEUS research project aims at tackling both issues, accelerating the development of competitive European MBR filtration technologies, as well as increasing acceptance of the MBR process through decreased capital and operation costs. The project will target the two markets for MBR technology in Europe: the construction of small plants (semi-central, 50 to 2,000pe, standardized and autonomous), and the medium-size plants (central, up to 100.000pe) for plant upgrade. Technological development of new MBR systems will be fostered by a consortium composed of 12 partners, of which five SMEs proposing novel concepts of low-cost and high-performance filtration systems. Two end-users, three non-profit institutions and two universities, all of them well versed in R&D in the MBR field, will investigate solutions to reduce operation costs such as fouling control, membrane cleaning optimisation, aeration decrease, or optimise capital costs through improved implementation of membrane bioreactor process. Furthermore, an analysis of the potential for standardisation will be performed, and a technology transfer towards Southern and Eastern Europe will be organised in order to facilitate the penetration of these new markets. AMEDEUS will achieve concrete and realistic technological breakthroughs for the MBR technology, and improve the current process engineering and operation practices. It will improve the competitiveness of the MBR European market and render common this high-tech process for municipal wastewater treatment.

## **509226- AMERAC**

Advanced Methods for Environment Research and Control

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 9/1/2004 - 8/31/2008

*EC contribution:* € 502 460

*Policy drivers:* Ecological Status  
Chemical aspects

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### **Abstract**

The project addresses multi-disciplinary aspects of environment research, control and protection. Scientific and technological approach of the project concerns important domains of air and water resources research and control as well as environment monitoring by use of new methods based on isotopic ratio mass spectrometry and developed and constructed in INCT monitoring systems. Modern methods of water pollution control as various membrane and hybrid processes will be tested in INCT with collaboration of leading European research institutions. New methods of air pollution reduction, like application of electron beam (EB) generated in accelerator, developed in INCT for combustion gas purification from SO<sub>2</sub> and NO<sub>x</sub>, will be tested for removal of volatile organic compounds and polycyclic aromatic hydrocarbons, as well as for mercury control. Exchange of information between leading centres in Europe, transfer of knowledge via personal contacts, workshops and seminars, as well as common research using complementary apparatus and measuring equipment, will provide host institution with new investigation possibilities, create new areas of competence and broaden the field of research which may result in new industrial and environmental applications. Advanced knowledge transfer and integration of activities will strengthen scientific potential of the INCT, will supplement its research abilities and integrate the Institute with European research and academic centres. The increase of research potential will implicate the engagement of new employees and postgraduates. In order to reach the goals of the project the specific measures will be taken, like providing the specialized training for young researchers and students, improvement of teaching process for postgraduates, development of links to modern technologies, improvement of the existing links with outstanding centres in European countries, dissemination of scientific and technological achievements by improvement of information.

## **505169- AQUABASE**

Organic micropollutants in the aquatic environment -  
interdisciplinary concepts for assessment and removal

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 4/1/2004 - 3/31/2008

*EC contribution:* € 1 331 608

*Policy drivers:* Ecological Status  
Chemical aspects

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### **Abstract**

The research training project intends to focus the concerted effort of a multinational group of students with multidisciplinary backgrounds upon a topic growing concern, the presence of so called micro-pollutants in our aqueous environment. This topic is of global relevance, what makes it particularly suitable for an international scope. Quantifying the occurrence, analysing the distribution pathways, evaluating the various effects of micro-pollutants, and studying methods to prevent them from passing through wastewater collection and treatment systems into rivers, lakes and ground water bodies will represent a truly interdisciplinary task that requires the long term development and application of a complex set of tools and resources. The programme's focus will be on endocrine disruptors, but also broader a group of micro-pollutants, including antibiotics, other pharmaceuticals and residues of personal care products will be considered. The goal is a better understanding of the fate of civilisation-related chemicals in an aqueous environment and of ways to control it. The research training will be based on an interdisciplinary collaboration of several Departments at the RWTH Aachen University from Science and Engineering Faculties. Young researchers in the proposed scheme will be able to benefit from the coherent structure established, where complementary research topics and methods are the core of the programme. Besides the mainly experimental work in the participating laboratories the full range of training activities will be provided to achieve a maximum effectiveness of the individual training periods. The programme will include internal and open workshops on current scientific issues, tailor made course work to back up both fundamental knowledge and stress particular aspects of the integrated scientific fields.

## **504356- AQUACOLL**

Colloids in the natural aquatic environment : impacts on pathogens and pollutant fate and behaviour

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 9/1/2004 - 12/31/2008

*EC contribution:* € 873 362

*Policy drivers:* Ecological Status

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### **Abstract**

The training programme, deals with the scientific area of colloids and particles in the natural aquatic environment, particularly freshwaters such as rivers and groundwaters. It will train 15 early stage researches in the quantitative understanding of this area of environmental chemistry and biology. In particular training will be in the understanding of colloid influence on pollutant fate and behaviour. This area is of great importance and relevance to the future of environmental sciences and will play a significant role in promoting future research in the field of sustainable development and to lesser extent in areas such as Nanotechnology. The early stagefellows will also be trained (and assessed) in more generic skills (e.g. Research Project Management, Obtaining Research Funding etc), communicating with society and transferable skills (e.g oral and written communication,ethics, health and safety etc.). The training programme will have a Scientist in Charge (Dr Lead), immediately supported by a research team (4 staff members), supervisory boards (20 further staff, with overlap) and training course leaders (approximately 20 additional staff). In addition, much support will come from the technical staff, other early stage researchers and other departments from the University. In particular, Staff development Unit,Information Services and Press Office. The Host is fully capable of meeting the training needs of the Fellows. Early stage researchers will be a mixture of PhD students registered at Birmingham University and fellows attending from other European research institutes. The early stage researchers registered for PhDs will be expected to actively collaborate with a substantial number of other research groups, enhancing their mobility and training. A large number of collaborations with university and SME research groups have been fostered within this proposal. Further collaborations will also be developed during the proposal lifetime.

## **500305- AQUAETREAT**

Improvement and innovation of aquaculture effluent treatment Technology (AQUAETREAT)

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*Funding scheme:* SME (SMEs-Co-operative research contracts), FP6

*Project duration:* 5/15/2004 - 2/14/2008

*EC contribution:* € 1 382 541

*Policy drivers:* Ecological Status  
Water and Agriculture

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### **Abstract**

The project examines the feasibility of cost-effective systems for the treatment and valorisation of aquaculture farm effluent, and the re-use of products and by-products of such systems, providing a solid base for reducing the environmental impact of commercial aquaculture and reinforcing the sustainable development of the sector. Systems and applicable technology will be designed, according to well-defined parameters, for installation in 3 European sites that are geographically/environmentally and operationally different. Their efficiency to prevent recipient ecosystem pollution will be verified and monitored through analytic characterisation of water, waste and the recipient wetland ecosystems. Finally, the system output products and by-products will be fully identified and characterised, accompanied by identification of the potential and means of their further use. The research programme encompasses a series of interdisciplinary and interconnected work packages which will complementarily contribute to the investigation of the technological, biological, physiological, ecological, environmental and economical aspects related to mentioned topic. The work packages contain well-defined tasks for laboratory investigations (RTD performers) and/or field work (European fish farms). A specific training technical programme for SME staff and young European researchers will be developed. This will be accompanied by the application of a capillary dissemination plan to allow the effective transfer of the innovative skills and technology developed by this project to the European aquaculture sector. A consortium agreement between the participants, regarding the purpose of the collaboration, their interest in the exploitation of the results and IPR management and access, will clearly define all the rights, obligations and responsibilities of the partners. This agreement will be finalised upon implementation of the project, in agreement with the FP6 Rules for participation.

## **286641- AQUA-PULSE**

Photocatalysis with UV LED Sources for Efficient Water Purification

[www.aqua-pulse.org/](http://www.aqua-pulse.org/)

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*Funding scheme:* BSG-SME (Research for SMEs), FP7

*Project duration:* 9/1/2011 - 8/31/2013

*EC contribution:* € 1 127 578

*Policy drivers:* Ecological Status  
Chemical Aspects

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### **Abstract**

Water purification requirements feature in a wide range of applications, from residential homes, office and hotel buildings, to high-specification environments such as hospitals, laboratories and industrial production facilities, as well as municipal water supply and wastewater treatment. Consequently, the world demand for water treatment products is estimated at \$44.6 billion, with a projected 5.7% annual growth. The European Technology Platform, WssTP (Water Supply and Sanitation Technology Platform), in its Strategic Research Agenda 2010, has identified the need for new water technologies, and greater technology transfer between industry and the research sector.

This AQUA-PULSE project aims to realise a low-power, low-maintenance water purification solution based on high-brightness UV Light Emitting Diodes (LEDs) and a photocatalysis method. Such a system would be effective against viruses, bacteria and organic compounds, and would provide an attractive and innovative alternative to current technology utilising mercury-based UV lamps. It brings together three European SMEs in three different, but complementary, technology areas, and links them with three RTD Performers to develop new knowledge and a new water purification product which will have significant commercial benefits for all of the SME partners.

## **015105- AQUAS**

### **WATER QUALITY AND SUSTAINABLE AQUACULTURE: LINKS AND IMPLICATIONS**

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*Funding scheme:* SSA (Specific Support Action), FP6

*Project duration:* 1/1/2006 - 6/30/2007

*EC contribution:* € 150 000

*Policy drivers:* Ecological Status  
Water and Agriculture

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#### **Abstract**

In the last years there has been a steady growth in the development of aquaculture farms due to the increased demand of cultured species for consumption. One of the by-products of aquaculture is the creation of specific environmental problems related to intensive production and unsustainable farm expansion, leading to a boom and burst behaviour of aquaculture industries. Examples are the increasing occurrence of toxic red tides and the consequent incidence of diarrhetic and paralytic shellfish poisoning in southern European countries in the early nineties, or the permanent alteration of natural habitats in Latin America. Therefore, aquaculture and local water quality (WQ) are closely linked. The large inputs of nutrients and chemicals and the release of wastes into the environment may favour toxic algae blooms and induce bottom anoxia and eutrophication, especially where the carrying capacity of the receiving domain is limited (e.g., bays and semi-enclosed waterbodies. In turn, low aquaculture production rates may result from the appearance and spreading of diseases propitiated by a poor WQ. This proposal will help to better "structure" the understanding on the relationship between aquaculture and WQ, aiming towards the establishment of a set of aquaculture-related predictors for WQ. This is the soundest way to increase farm production and product quality in a sustainable manner, i.e., within the frame of a socially acceptable ICZM. This goal will be achieved by collecting and combining existing field observations with available numerical simulations, "paving" the way for quantifying the relation between WQ and farm productivity. It will also allow the use of natural forcing mechanisms to increase or get the most out of the carrying capacity of the waterbody. The final results will be a starting point towards enhanced aquaculture production without compromising the "health state" of the receiving domain for future generations.

## **239175- ARISTEUS**

Environmental VARiTableS RegulaTing DivErsity and FaUnal DistributionS in Canyon and Lower Slope Ecosystems of the Western Mediterranean

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 3/16/2009 - 3/15/2012

*EC contribution:* € 45 000

*Policy drivers:* Ecological Status  
Hydromorphology  
Water and Agriculture

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### **Abstract**

Major questions about the functioning of marine ecosystems on the continental margin concern their interrelationship/dependence on the natural drivers (physical and geological processes), as they are strongly physically and geologically mediated and potentially affected by human and climate change perturbations. Indeed, recent studies in the Western Mediterranean have demonstrated that flows triggered by dense shelf water cascading transport large amounts of water and sediment from the shelf to the deep basin. Cascading waters directly affect the functioning of the deep ecosystem by providing a fast way of fuelling highly nutritive, fresh organic matter to the deep, transforming brusquely authentic biological deserts in real oases. In addition, water and sediments transported from the coastal zone can act as preferential transfer vectors for contaminants, which may affect negatively marine ecosystems. Therefore, this highly energetic mechanism of flushing of dense shelf waters may be crucial to control benthic community structure, but little is now at the moment.

The main objective of the ARISTEUS (Environmental VARiTableS RegulaTing DivErsity and FaUnal DistributionS in Canyon and Lower Slope Ecosystems of the Western Mediterranean) project is to carry out multidisciplinary research in canyon and lower slope ecosystems of the Western Mediterranean aimed at i) characterize the physical (water column current regime and near-bed current regime) and biogeochemical (sediment transport, seabed composition, input of particulate organic matter) factors regulating diversity and faunal distributions, and ii) determine how do these environmental variables influence biological communities (establishment of the relationships between the abiotic factors and the spatial and temporal structure of meio-, macro- and megafauna populations) with special attention to the deep-sea living resource *Aristeus antennatus*.

## **039074- ARSENIC REDUCTION**

Influence of arsenate adsorption onto Fe- and Al hydroxide mineral surfaces on microbial arsenate reduction rates

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 2/1/2007 - 1/31/2009

*EC contribution:* € 183 454

*Policy drivers:* Ecological Status  
Socio-economy

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### **Abstract**

Due to its chronic toxicity, arsenic (As) in drinking water poses a serious threat to millions of people worldwide. In most cases, As release is thought to result from microbial AsV reduction coupled to surface chemical interactions in the sediments. However, the interdependence of chemical reactions at the mineral-water interface and microbial AsV reduction processes and the biogeochemical conditions leading to As release in sediments are not well understood. This study aims at elucidating the influence of As adsorption reactions on Fe- and Al-hydroxides on the reduction rates of AsV using incubation studies. Factors to be studied include surface loading of AsV, competitive sorption of As, PO<sub>4</sub>, and SO<sub>4</sub>, the interaction of As-reducing and Fe-reducing bacteria, and the transferability of results to the complex soil environment. The knowledge generated in this study provides new insight into an important environmental process and is needed for the implementation of powerful strategies to cope with the problem of large-scale As release from sediments into water worldwide. The applicant has excellent skills in field studies on trace element fluxes and transformation in forest ecosystems as well as in speciation techniques for trace elements in environmental samples. In the proposed study, the applicant extends his scientific skills in various fields, including surface, soil, and colloid chemistry, mineralogy, microbiology, and various experimental and analytical techniques. It offers the applicant a new and stimulating research environment and contacts to internationally well-known researchers in environmental chemistry and microbiology. Through training and presentations on international conferences, the applicant will improve his communication and presentation skills. The fellowship at ETH Zurich allows the applicant to complement its scientific skills and provides the ideal basis for his further research career in environmental sciences.

## **003659- ASSESS-HKH**

Development of an Assessment System to Evaluate the Ecological Status of Rivers in the Hindu Kush-Himalayan Region

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*Funding scheme:* STP (Specific Targeted Research Project), FP6

*Project duration:* 4/15/2005 - 4/14/2008

*EC contribution:* € 1 329 412

*Policy drivers:* Ecological Status

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### **Abstract**

The Hindu Kush-Himalayan region is not only the world's highest mountain region, but also the most populous, covering some 3,500 km<sup>2</sup> over eight countries from Pakistan in the west to Myanmar in the east.

It sustains approximately 140 million people and affects the lives of more than three times as many in the plains and river basins below. The HKH region is a vast storehouse of hydropower, timber, firewood, medicinal plants, rich minerals and last, but not least, water.

The specific and verifiable objectives of the ASSESS-HKH Project are:

1. Develop and validate a three-tier methodology to identify environmental hot spots in rivers of the HKH region.

For incrementally complex ecological assessment using benthic invertebrates from a manually calculated overview method to computer-aided detail analyses of selected regions or sites.

2. Adapt and further develop an information management tool (application software and databases) to perform analysis calculations for quantification and rating of eco-logical status of rivers based on biotic data.

3. To interpret ecological data collected in the HKH region to validate the assessment methodology and information management tool and provide a basis for policy recommendation, transnational water resource planning and ecosystem management.

4. Capacity Building of local scientists in the field of recognition and application of criteria for biological indicators in ecosystem management.

5. Dissemination and awareness creation on the importance and usefulness of biological indicators in ecosystem management.

The ASSESS-HKH Project addresses research priority A.2.1. (managing humid and semi-humid ecosystems), which is part of the chapter 10.3.1.A of the specific measures in support of international co-operation in developing countries.

## **008332- AXIOM**

Assessment of in situ Transformation of Xenobiotic Organic Material

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 1/1/2005 - 12/31/2008

*EC contribution:* € 764 509

*Policy drivers:* Ecological Status  
Chemical aspects

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### **Abstract**

AXIOM provides an early stage research forum for doctoral studies integrated into applied research projects dealing with transformation and fate of organic chemicals in the environment. Microbiologists, hydrologists, chemists, and ecologists will be trained in the application of novel stable isotope techniques to evaluate the fate of organic contaminants in the context of contaminated land rehabilitation and testing of the environmental behaviour of chemicals. Within this research area, interdisciplinary stable isotope approaches receive increasing attention in both applied science and academia. AXIOM helps to implement the knowledge of well trained isotope specialists into the field of environmental biogeochemistry in Europe. In an inter-sectorial approach the fellows will apply (i) stable isotope techniques to assess the in situ transformation of organic chemicals and (ii) microbiological techniques to elucidate factors controlling the in situ transformation. This includes scientific and technical aspects to investigate metabolite production, bioavailability, assessment of environmental stress factors and the elucidation of microbial diversity. This combination will provide training on the application of scientific results in the field of risk assessment, rehabilitation of contaminated soils, ground water and sediments, natural attenuation strategies and other remediation measures. Because of its integrated training concept, AXIOM will provide a close collaboration of the trainees with possible future employers to improve their market opportunities within interdisciplinary academia, industry, government and consultants. The thoroughly structured training program provides a research platform for short term fellowships as well as European Ph.D. students to strengthen thematic program orientated research skills with respect to multilateral scientific project organisation.

## **253096- BAAGS**

Bacterial alginate: isolation, fine structure characterization and role in aerobic granular sludge formation

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 9/8/2010 - 9/7/2012

*EC contribution:* € 170 535

*Policy drivers:* Ecological Status  
Chemical Aspects

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### **Abstract**

Aerobic sludge granulation is a promising innovative technology with the potential to be an alternative to the activated sludge process. It allows running a wastewater treatment plant with 30% less energy input, and requiring 75% less space combining with significant lower investment costs. Aerobic granules' stability is the main concern of this process. It is strongly connected with the property of exopolysaccharides, particularly the bacterial alginates, which have been recently shown to be more than 10% of aerobic granules' organic carbon content. Determining their function based on clearly defined analytical methods is significant for bringing this technology into practice. The proposed research aims at establishing and utilizing integrated analytical methods for looking into functional exopolysaccharides and their fine structures, and elucidating its role in aerobic granular sludge formation and stability based on their structure-function relationship. Bacterial alginates will be isolated both from the lab-scale and pilot-scale reactors. Their properties as block fraction, fine chemical structures, monomer ratio, molecular weight, acetylation degree, and etc. will be studied by chemical and advanced instrumental analysis as UV-visible, FT-IR, MALDI-TOF MS, NMR, MS-GC and etc. A qualitative and quantitative correlation between bacterial alginates' property alteration and aerobic granular sludge formation and stability will be presented. Methods established will greatly facilitate exopolysaccharides research in aerobic granular sludge area; knowledge obtained will provide insight on exopolysaccharides function both in aerobic granules and normal biofilms. This research will accelerate aerobic sludge granulation technology leadership by EU; enhance EU scientific excellence in exopolysaccharides advanced characterization, provide researcher an advanced level of training, and increase European Research Area's attractiveness to researchers all over the world.

## **022131- BANGLARSENIC**

Arsenic poisoning in Bangladesh: health and social hazards

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 9/1/2005 - 2/28/2007

*EC contribution:* -

*Policy drivers:* Ecological Status  
Chemical aspects

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### **Abstract**

The arsenic hazard arising from the consumption of contaminated groundwater has created one of the world's largest environmental health crises. At least 30 million people are at risk of serious medical consequences that include cancer. Morbidity is already widespread and mortality will increase as the poison accumulates in people's bodies. This project will deploy innovative and varied methods to produce (a) risk maps using Geographical Information Systems and models of other databases of biological samples and field-based medical diagnoses; (b) qualitative insights of social hazards arising from arsenic poisoning; (c) policy analyses and recommendations. Although there is a large literature on arsenic in Bangladesh and West Bengal from the points of view of environmental science and geochemistry, relatively little work has been published from a geographical or social science perspective. We seek to provide the first comprehensive insights that draw upon interdisciplinary methodologies that are, on the one hand, technical and scientific, and, on the other hand, draw upon the methodologies of the social sciences and humanities. The result will be a powerful hybrid that will (a) assist with the development of new techniques, (b) provide novel insights into a hitherto intractable problem, and (c) give an opportunity for training and research at the highest level to a Bangladeshi researcher of great promise. On completion of the project, the researcher will return to Bangladesh and pursue an independent research career. Overall the project will provide significant benefits to both participating institutions, to the individual researchers, and to the development of the research infrastructures of Bangladesh and the European Union.

## **31529- BAWAPLA**

### Sustainable Ballast Water Management Plant

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*Funding scheme:* STP (Specific Targeted Research Project), FP6

*Project duration:* 11/15/2006 - 5/14/2010

*EC contribution:* € 1 699 956

*Policy drivers:* Ecological Status  
Chemical aspects

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### **Abstract**

Maritime transport is of fundamental importance to Europe and the rest of the world. Over 90% of European Union external trade goes by sea and more than 1 billion tonnes of freight a year are loaded and unloaded in EU ports. Shipping is the most important mode of transport in terms of volume. Transfer of species in ballast water started as early as shipping trade. The movement of some 3 to 12 billion tonnes of ballast water (BW) in ships internationally each year has been responsible for the settlement of about 100 million tons of sediment. Its cleaning and the disposal of the ballast sludge produced involve enormous costs, (approximately 30.000 ? for a small bulk carrier). Besides these economic aspects, BW has been recognised as a major vector for the translocation of aquatic species across bio-geographical boundaries. It is estimated that as many as 10,000 alien species of plants and animals are transported per day in ships around the world. As ships travel faster and world trade grows, organisms are better able to survive the journey, using the settled sediments as a substrate, and the threat of invasive species from ballast water increases. Aim of the project is the development of a new hybrid BW treatment technology (UV, filters and electrolysis) into a self-controlled BW treatment system. The main objective of the proposed project is the invention of an effective treatment technology incorporating non permanent, seawater-generated active substances as a necessary measure to UV and Filter treatment technology. By producing active substances through electrolysis of sea water, there will be no need to carry or store hazardous and corrosive chemicals onboard ships. It also represents a more economical alternative to using chemicals for treating large volume of ballast water onboard ships.

## **039798- BIOASIA**

### **MULTIDISCIPLINARY APPROACHES TO BIODIVERSITY ANALYSIS: TESTING EVOLUTIONARY HYPOTHESES IN SOUTH-EAST ASIAN FRESHWATER TAXA**

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 6/1/2008 - 5/31/2010

*EC contribution:* € 161 314

*Policy drivers:* Ecological Status

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#### **Abstract**

The origins of biodiversity have intrigued evolutionary biologists since the earliest times, and have resulted in a plethora of theories to explain these origins. To date, there has been a tendency to use distribution patterns of biota to confirm preferred hypotheses (a field known broadly as historical biogeography), instead of a genuine attempt to test between competing hypotheses. A recently emerging field utilises the ease with which DNA sequences can be read to provide more objective testing of hypotheses; an approach referred to as “comparative phylogeography”. Here we advocate the use of a novel replicated approach to distinguish between sets of alternative hypotheses as a route towards testing the major theories. A number of theories have been put forward for diversification in one of the global “hotspots”, the archipelagos of SouthEast Asia, although a general theory has yet to emerge. This region of high species richness allows for a replicated sampling of taxa to infer general biogeographic patterns. Our approach aims to examine phylogenetic and population genetic patterns in multiple co-distributed freshwater taxa from the region, to enable us to test between competing hypotheses of diversification. Freshwater taxa are ideal model organisms for such an approach as they reflect well the underlying geological history of a given region, due to limited dispersal abilities to cross marine environments between land-masses. A further aim of the present study is to contribute towards documenting the rapidly declining biodiversity of SE Asia, which is a high priority in global conservation at present. Findings will provide a case study both for the experimental analysis of trends in biodiversity and the use of such data in biodiversity conservation- two issues of high applicability to other geographic regions, especially in those subjected to major anthropogenic impacts.

## **238579- BIOCOR ITN**

Initial training network on biocorrosion

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 9/1/2009 - 8/31/2013

*EC contribution:* € 3 249 870

*Policy drivers:* Ecological Status  
Chemical Aspects

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### **Abstract**

Any material in contact with water or moisture during its life-cycle is rapidly colonised by microbial species which can be the source of severe deterioration processes, such as microbially influenced corrosion (MIC), also called biocorrosion. The annual direct and derived costs of corrosion are estimated to be around 4% of the GNP of developed countries, of which 10-20% are related to biocorrosion. Today the main treatment against biocorrosion is the massive application of biocides that lead to significant environmental pollution. Currently, European research teams are concentrating efforts on biocorrosion, but there is a lack of harmonisation and collaboration due to the differences of approaches, analytical methodologies and disciplines involved, from chemistry through materials to biology. The objectives of BIOCOR are: 1) to develop a new profile of researcher, capable to address and manage all aspects of scientific and/or industrial problems related to MIC and 2) to provide the European industries with alternative multidisciplinary expertise in this area. The “problem-oriented approach” developed in the project is essential when dealing with such a complex topic as MIC. This pioneer training programme will open the road to new generations of research project managers capable to lead groups of experts from different disciplines and countries. Such results will ultimately lead to increase the competitiveness of the European scientific and industrial communities. The objectives will be achieved by: 1) linking up 10 research teams and 4 associated partners from 9 different countries during 4 years, from both scientific and industrial sectors, and 2) by implementing a new research methodology based on multidisciplinary and combined analytical approaches, and a close intersectorial arrow “From the field through the lab to the field”. The project will offer an overall effort of 488 person-months of which 81% will be dedicated to ESRs.

## **024068- BIODEM**

Biogeochemical and physical drivers of deep European margin ecosystems

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 4/1/2006 - 3/31/2008

*EC contribution:* € 149 103

*Policy drivers:* Ecological Status

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### **Abstract**

Ocean margins are areas of special interest in the field of biogeochemical processes governing exchanges between the continent and the open ocean, and specially those of the carbon cycle. Also, owing to their high biodiversity, ocean margin biota represents an enormous genetic resource which we are only just beginning to appreciate. The present application, named BIODEM (BIOgeochemical and physical Drivers of deep European Margin ecosystems), aims to understand the biogeochemical (sediment transport, seabed composition, organic matter input) and physical (water column and near-bed current regime) drivers of two margin ecosystems: canyon systems and cold-water coral systems. Canyons are deep incisions of the continental shelf and slope, known as hotspots of biodiversity, major pathways for transportation and burial of organic carbon, and fast-track corridors for material transported from the land to the deep sea. BIODEM will focus on two canyons in the western Mediterranean Sea, the Lacaze-Duthiers and Cap de Creus Canyons (Gulf of Lions). Cold-water corals are suspension feeders, and therefore they are commonly found along bathymetric highs such as seamounts and ridges where currents tend to increase food availability. Even cold-water corals are widely distributed in the Mediterranean Sea, living cold-water corals are only reported near the Cap de Creus and at the Strait of Gibraltar, and only in the Strait of Gibraltar an active living reef has been observed. BIODEM will focus on these two coral systems in the western Mediterranean Sea. The integrated study of environmental constraints upon which these deep-ocean ecosystems and communities rely will improve the scientific knowledge and will support policy decisions concerning the sustainable management of natural resources.

## **501482- BIO-ENGINEERS**

Influence of biological and physical processes on intertidal sediment dynamics and on the release of pollutants trapped in sediments and the toxicity of these pollutants

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 2/1/2004 - 1/31/2006

*EC contribution:* € 159 046

*Policy drivers:* Ecological Status

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### **Abstract**

Estuaries and coasts in the SW of England contain historically contaminated sediments. These contaminants include heavy metals PAHs and organic compounds. They accumulate in the sediment which can then act as a contamination source. Bottom-dwelling organisms, like shellfish, can accumulate these chemicals making them a potential risk to human health when consumed. Several processes can lead to pollutant release into the water column: diffusion, physical processes (climate change - tidal currents, storms & rainfall) and biological processes (bioturbation). The aim of this multidisciplinary project is to improve understanding of biological and physical processes influencing sediment erodability and pollutant mobilisation. We will focus on the impact of various biota as bio-engineers and their influence on sediment dynamics, the release of pollutant trapped in sediments and the toxicity of these pollutants. There is no similar study devoted to the interactions between chemical, biological and physical processes. This subject is a new approach coupling physical and biological processes to gain insights into the combined actions which influence sediment stability, erodability and deposition in estuaries and finally pollutant fluxes. The research project includes both field and laboratory studies. It is based on several novel methods and techniques presently available at Plymouth Marine Laboratory (host institution) or developed and used by the researcher at the Marine Biological Station in Arcachon (France): mesocosms, annular flumes, micro-acoustic Doppler velocimeter, fluorescent particulate tracers, pollutant analyses, sensitive measurements of sublethal stress. This proposal is submitted jointly by Professor John Widdows from the Plymouth Marine Laboratory and by the individual researcher Aurélie Ciutat (Ph.D in Ecotoxicology) for whom this period of advanced training and mobility will provide further maturation and independence as a researcher.

## **239252- BIOFER**

BIOgeochemical cycling of iron in FreshwatER sediments under  
oxic and anoxic conditions

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 4/1/2009 - 3/31/2011

*EC contribution:* € 30 000

*Policy drivers:* Ecological Status  
Chemical Aspects

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### **Abstract**

Iron constitutes one of the most abundant elements in the earth crust, and the second most abundant element that is redox-active in the near-surface aqueous environments. Although, it has long been recognised that microorganisms participate in the global iron cycle, the interconnection between biotic and abiotic reduction and oxidation processes in an ecosystem has not yet been demonstrated. This research proposal deals with the functioning of the iron biogeochemical cycle in a freshwater ecosystem that is influenced by biotic activity coupled with purely chemical processes. A complete description of the physicochemical parameters and redox gradients in the littoral sediment of Lake Constance will be performed. As a second step a modelling approach based on these field data is proposed, in order to simulate the variations in the energetical budget available to abundant microbes and their competition with the abiotic reaction processes throughout the entire iron cycle. The presented project is expected to provide important information for environmental and ecological studies, as well as engineering projects in the field of waste- or polluted natural water treatment.

## **226874- BIOFRESH**

Biodiversity of Freshwater Ecosystems: Status, Trends, Pressures, and Conservation Priorities

[www.freshwaterbiodiversity.eu/](http://www.freshwaterbiodiversity.eu/)

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*Funding scheme:* CP (Collaborative Project), FP7

*Project duration:* 11/1/2009 - 4/30/2014

*EC contribution:* € 6 465 406

*Policy drivers:* Ecological Status

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### **Abstract**

Scientists and water managers have collected a vast amount of data on freshwater organisms, and yet it is rarely possible to describe the geographic range of an organism. Why is this? It is because the data are dispersed in many locally-managed databases, many of which are not publically available. The bits of the puzzle are scattered, and it is difficult even to find them. What story might they tell if they were combined and easily accessible to scientists, policy makers and planners? Such an integrated and accessible dataset could be used not only to help to protect and take better advantage of the services provided by aquatic ecosystems, but also to make it possible to establish effective regional plans for conservation. BioFresh, a major new FP7 project, will design and provide a single point of access to the extensive information on freshwater organisms that is currently stored in the databases. The BioFresh information portal for freshwater biodiversity will allow scientists and planners to complement, integrate, and analyse quantitative data to discover, evaluate and examine patterns that will shed new light on how freshwater biodiversity responds to global, European, and local environmental pressures. The spatially-explicit data will help to reveal the status and trends of freshwater biodiversity, and the services that it provides. Scientists in the BioFresh consortium will take advantage of the information in the databases that the project links, by using the data to examine how various stressors interact to impact freshwater biodiversity. This work will help to shed light on how future climate and socioeconomic pressures will give rise to global, continental and local responses in freshwater biodiversity. Until now, it has not always been easy to incorporate understanding of freshwater biodiversity explicitly into environmental agreements (EU WFD, for example) or in related policy instruments (for example the Habitats Directive). BioFresh aims to change that, by providing both the access to valuable data and an appropriate and coherent scientific foundation. The products and findings of the project will be used on the one hand to make people more aware of the importance and beauty of freshwater biodiversity,

and on the other to help policy makers take decisions based on the best available evidence.

## **505561- BIOMERCURY**

Worldwide remediation of mercury hazards through biotechnology

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*Funding scheme:* SSA (Specific Support Action), FP6

*Project duration:* 3/1/2004 - 2/28/2007

*EC contribution:* € 468 000

*Policy drivers:* Ecological Status  
Chemical aspects

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### **Abstract**

Mercury is a priority pollutant because of its extreme toxicity, global atmospheric transport and accumulation in the food chain. Its removal from current industrial emissions as well as from previously polluted sites is therefore mandatory and should take into account the latest achievements in science and technology. A unique biotechnological process for removal of mercury from wastewater based on the enzymatic transformation reactions of live mercury resistant bacteria has been developed and operated at a Czech chloralkali electrolysis factory. This new technology is environmentally friendly and cost effective and has a much broader potential than that realized to date, which, however, needs to be assessed carefully for each new application. In the case of microbes, barriers of understanding and acceptance also must be overcome in order to promote their application. Microbiological technologies have to be integrated into a complete process remediation scheme including physical and chemical technologies, pre-treatment steps and waste disposal strategies. The aim of the SSA BIOMERCURY therefore is to (1) evaluate the applicability of the microbe based technology for clean-up of all types of contaminated environments; (2) monitor the longterm performance of the first industrial microbe based mercury removal plant, (3) compare costs, safety and efficiency of the biotechnological approach with traditional methods; (4) transfer knowledge into developing countries where the problems are most urgent; (5) exchange information with US agencies. These goals shall be approached by an international consortium which will first conduct case studies on hot spots of pollution as well as on current mercury emitting industries. On this basis, integrated engineering concepts will be developed. They will be communicated to governments and International Agencies with the aim of implementing demonstration or remediation projects.

## **233625- BIOPACA**

Biomonitoring of anthropogenic pollutants in coastal areas

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 6/1/2009 - 5/31/2012

*EC contribution:* € 45 000

*Policy drivers:* Ecological Status

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### **Abstract**

The BIOPACA project is intended for the study of fate and effects of the most commonly used anionic surfactants (Linear alkylbenzene sulfonates: LAS) present in household cleaning detergents. Despite their high biodegradability, their constant discharge in coastal areas with urban effluent lead to detect a sufficiently high background concentration to raise concern about its toxicity for marine ecosystems. Within this framework, BioPACA project objectives are threefold: (1) draw up a state of knowledge about the contamination and the impact of these organic compounds on the marine ecosystem (water, sediment and the marine mussel, *Mytilus galloprovincialis*), with the Golfe-Juan bay (France) as pilot site because a biological treatment will be soon operational. A cartography of LAS contamination will be performed along the French coast (via biomonitoring programme Rinbio 2009 - Ifremer) in order to assess the distribution of LAS in seawater, sediments and in the mediterranean mussels - used as a sentinel species; (2) develop a methodology for the extraction, preconcentration, purification, identification and quantification of the different LAS congeners and their metabolites in seawater, sediments and tissue from living organisms; and (3) identify biomarkers to assess subcellular toxicity of LAS accumulated in marine organisms. Scientific results will enable to complete the knowledge of fate, behaviour, distribution, bioaccumulation, toxicity and depollution of LAS in the different marine coastal compartments, that is a crucial need in risk assessment for the new european legislation REACH.

## **509821- BIOSPEC**

Remote Monitoring and Control of Biological Processes for Environmental Protection and Sustainable Development

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 11/1/2004 - 10/31/2008

*EC contribution:* € 523 849

*Policy drivers:* Ecological Status  
Chemical aspects  
Hydromorphology

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### **Abstract**

The objective of this proposal is to bring together, through the Transfer of Knowledge, a number of areas of expertise in order to develop effective remote monitoring and control of specific biological processes. The biological processes referred to are those used in wastewater treatment, treatment of solid waste and for the production of renewable biofuels. Use of these processes is increasing worldwide, whilst the expertise to manage them is becoming increasingly centralised. Therefore, efficient remote management is essential to enable the processes to be used and controlled across greater geographical areas. The processes are key in delivering the aims of sustainable development and in the protection of the environment. The need for the development of new knowledge in this area is of major importance when considering the increasing pressure on water resources in Europe and the fact that sustainable hydrogen production will, in future, be part of the Distributed Energy Networks for the EU. The objectives of the scheme will be achieved through the recruitment of three Fellows, with appropriate expertise, in order to transfer knowledge so that we may better understand the fundamentals of the processes and, in turn, monitor and control them remotely. The Fellows would transfer knowledge, which will significantly increase the research quality and potential of the University. The project will also further the development of research capabilities in a less favoured region of the EU, as the University is situated in an Objective One area. The proposal will support the establishment and structuring of the European Research Area by providing a structured mobility opportunity for three researchers aimed at the development and transfer of knowledge, improved research competencies, a widening of career opportunities and the possibility of further collaborative research. It will also support the development of an abundant world-class resource in researchers.

## **003998- BIOTOOL**

Biological procedures for diagnosing the status and predicting evolution of polluted environments

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*Funding scheme:* STP (Specific Targeted Research Project), FP6

*Project duration:* 9/1/2004 - 12/31/2007

*EC contribution:* € 1 800 000

*Policy drivers:* Ecological Status  
Groundwater

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### **Abstract**

The objective of BIOTOOL is the generation and validation of novel conceptual and material instruments, rooted in biological processes, for diagnosing soil status and predicting evolution of contaminated soil and groundwater. The focus is on the assessment and evaluation of natural attenuation processes. This will require benchmarked monitoring tools and warning criteria to implement natural attenuation as the key groundwater and soil remediation strategy in Europe. It will be materialized through the application of a suite of state-of-the-art genomic, proteomic and analytical technologies to environmental samples and sites themselves. We will exploit the translocation of indicator chemicals from below ground into above-ground vegetation as a cheap and rapid monitoring tool for subsurface contamination. Diagnosis of the biological status and evolution models for polluted environments will be achieved through [i] the design and utilization of DNA and specifically DNA-array technology for examining the catabolic potential of any given particulate sample and [ii] the identification of protein biomarkers as descriptors of soil and groundwater quality and biological attenuation clocks.

The progress in microbial community functional genomics and proteomics will be employed to gain a mechanistic understanding of prevailing stresses, global responses to chemical insults, plant/microbe interactions and microbial community adaptations that determine microbial-driven soil and groundwater processes. This will add a considerable predictive power to the genomic and proteomic approaches mentioned above. Determining the links between environmental factors and expression of degradation abilities will be crucial for strategies aiming at an optimal expression of the catalytic power of the indigenous microbial community.

## **266039- BIOTREAT**

BIOTREATMENT OF DRINKING WATER RESOURCES POLLUTED BY PESTICIDES, PHARMACEUTICALS AND OTHER MICROPOLLUTANTS

[extra.geus.info/cet/biotreat/biotreat.html](http://extra.geus.info/cet/biotreat/biotreat.html)

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*Funding scheme:* CP (Collaborative Project), FP7

*Project duration:* 1/1/2011 - 12/31/2014

*EC contribution:* € 2 999 520

*Policy drivers:* Ecological Status  
Chemical Aspects

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### **Abstract**

BIOTREAT brings together six research institutions and four SMEs to develop much-needed water treatment biotechnologies for removing pesticides, pharmaceuticals and other organic micropollutants from contaminated drinking water resources. These biotechnologies will be developed into prototype biofilter systems ready for subsequent commercialisation. The biofilters will contain non-pathogenic pollutant-degrading bacteria, with the bacteria being immobilised on specific carriers to ensure their prolonged survival and sustained degradative activity. Through beyond state-of-the-art research, BIOTREAT will ensure that these novel water treatment biotechnologies are highly transparent, reliable and predictable. Two complementary biotreatment strategies will be followed, one based on metabolic processes whereby the bacteria completely mineralise specific micropollutants and the other based on cometabolic degradation utilising the ability of methane- and ammonium-oxidising bacteria to unspecifically degrade a range of micropollutants for which specific degraders are not yet available. The biofilter systems will be carefully validated through cost-benefit analysis and environmental life cycle assessment. A road map will be drawn up for post-project exploitation, including individual SME business plans. Effective dissemination of the BIOTREAT results will be ensured by close collaboration with an End-user Board comprised of representatives from waterworks, water authorities, industry, etc. In addition to bringing considerable advances to water treatment biotechnology, the main outcome of BIOTREAT will thus be prototype biofilter systems (metabolic and cometabolic) ready for commercialisation in a number of highly relevant water treatment scenarios, including existing sand filters at waterworks, mobile biofilters placed close to groundwater abstraction wells, sand barriers between surface waters and abstraction wells, and protective barriers in aquifers.

## **031069- BIOTURANIUM**

Bioturbation effects on distribution, fluxes, bioavailability and toxicity of uranium in freshwater ecosystems.

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 6/5/2006 - 7/4/2006

*EC contribution:* € 40 000

*Policy drivers:* Ecological Status

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### **Abstract**

The aim of this project is to understand and quantify the effect of the bioturbating activity of macro-invertebrates on transfers and bioavailability of uranium in freshwater ecosystems. Uranium is a toxic non-essential metal that can be concentrated at high levels in sediments. One of the major processes that can enhance the transfer of uranium between the sediments and the overlying water is the activity of benthic macrofauna. Our project aims at improving knowledge and understanding about uranium fate and effects in freshwater ecosystems and the ecotoxicological consequences of a chronic exposure situation. Our work will deal with several connected aspects as follows: (1) the impact of the benthic macrofauna on sediment biogeochemistry and thus on uranium distribution and fate in the sediment; (2) the impact of the benthic macrofauna on uranium transfers from the sediment to the overlying water and from the overlying water to the sediment; (3) the bioavailability and the toxicity of uranium (from both sediment and overlying water sources) for benthic organisms; (4) the long-term effect of uranium on the composition of natural benthic communities and on their bioturbation activities. The research project is based on a multi- and inter-disciplinary laboratory-based approach using several methods and techniques presently available at the host institution (Laboratory of Radioecology and Ecotoxicology (LRE/IRSN/DEI/SECRE/LRE, Centre de Cadarache, Saint Paul Lez Durance cedex, France). These original techniques are: fluorescent tracers to study the bioturbation activity; DET gel probes, O<sub>2</sub>, Eh and pH microelectrodes, planar 2D oxygen optodes, to monitor the biogeochemistry of the sediment; DET gel probes ICP-AES and isotopic ratio measurements to quantify uranium concentrations in sediment, overlying water and organisms; histological analysis, uranium micro-localisation (TEM) in cells, estimation of genotoxicity and of oxidative stress to investigate uranium toxicity.

## **252159- BRYOZOA**

Ecological genetics of Bryozoa-Myxozoa host-parasite interactions

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 5/1/2010 - 7/31/2011

*EC contribution:* € 109 290

*Policy drivers:* Ecological Status

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### **Abstract**

Understanding the clonal and population genetic structure of the freshwater bryozoan *Fredericella sultana* is essential for understanding the epidemiology and management of the myxozoan parasite *Tetracapsuloides bryosalmonae* that causes the Proliferative Kidney Disease (PKD) in wild and farmed salmonids. Common, widespread and susceptible *F. sultana* clones can serve as a persistent parasite reservoir, supplying disease epidemics in fish, yet, at present, no information of the clonal structure of *F. sultana* populations exists. To predict the impact of environmental change on spread of PKD in fish, it would be essential to resolve questions regarding geographic distribution of susceptible and resistant *F. sultana* genotypes, and their potential response to environmental change. At present such information is not available due to lack of neutral genetic markers for *F. sultana*. This 15 month fellowship proposal will (i) develop the required nuclear genetic markers that will allow high resolution genetic studies of the clonal and population genetic structure of *F. sultana* populations, and (ii) use these markers in the first genetic surveys of *F. sultana* populations that are either known to carry the disease or known to be healthy, based on earlier ecological surveys. Results of the study will be highly beneficial for preventive and predictive applications to manage PKD in salmonids.

## **039159- CARBOCYC**

Carbon cycling in lakes: Response to water column stratification

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 5/1/2007 - 4/30/2009

*EC contribution:* € 239 782

*Policy drivers:* Ecological Status  
Chemical aspects  
Hydromorphology

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### **Abstract**

Recent advances in biogeochemistry (biomarker analyses, compound-specific carbon isotope analyses of lipids) and microbiological techniques (FISH, DNA sequencing) have been very successfully employed in deciphering formation and/or transformation processes of organic material in the ocean. In contrast to the marine environment, the contribution of terrestrial ecosystems to the global carbon budget and the concentration of greenhouse gases (carbon dioxide, methane) in the atmosphere is only scarcely known. Terrestrial aquatic ecosystems participate in biogeochemical cycling of carbon species and act as carbon sinks or sources in response to environmental parameters. In this study, we will analyse particulate organic matter from different levels of the water column and on the underlying sediments from an eutrophic (Lake Lugano) and from an oligotrophic lake (Lake Thun, Switzerland). Lipids as markers specific for phytoplankton groups, land plants, bacteria, and archae will be quantified in the extractable organic matter and analysed for their carbon isotopic composition. The project will also include analyses of water chemistry, isotopic composition of dissolved inorganic carbon species, total organic carbon and sedimentary carbonates. The differences in the net carbon fluxes and isotopic fractionation processes within an oligotrophic lake and an eutrophic limnic environment will be outlined. Information about the environmental parameters affecting the carbon cycles within the water column and their influence on the net carbon fluxes of the lakes are expected from the proposed research.

## **230676- CARBOSORB**

CARBOSORB - Carbon (Nano) Sorbents for Environmental Remediation

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 5/1/2009 - 4/30/2013

*EC contribution:* € 1 284 892

*Policy drivers:* Ecological Status  
Socio-economy  
Chemical Aspects

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### **Abstract**

The aim of this project is to develop and manufacture permeable composite “filters” in which carbon-rich nanoparticles (or nanoporous materials) will be embedded (and contained in a recyclable 3D structure), and use these as the basis of recyclable, high performance water clean-up devices, for application in the environmental and industrial sectors. It brings together a multidisciplinary consortium of specialists in different areas of environmental (geo)chemistry, nanotechnology, and physical, analytical, synthetic, polymer and surface chemistry, working with a common aim of developing new and efficient methods of contaminant removal from surface and groundwaters, drinking waters, and trade and industrial effluents.

## **021149- CATSCI**

Early Stage Training in Catchment Science

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 1/1/2006 - 12/31/2009

*EC contribution:* € 1 428 219

*Policy drivers:* Ecological Status

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### **Abstract**

The EU Water Framework Directive (WFD) is the most significant piece of EU water legislation to date. Meeting the requirements of the WFD will require catchment-scale land and water resource management to enhance and protect the ecological status of freshwaters. However, there remain significant gaps in our understanding of the physical and biogeochemical processes affecting water quality and quantity at the catchment-scale, and the links between these processes and ecosystem structure and functioning. The project will provide 288 person-months of high quality research training in catchment science. Expertise will be drawn from a multi-sectorial team, including the University of Sheffield, the Environment Agency of England and Wales, business and consultancy organisations. The programme will produce independent young researchers with skills that cut across traditional discipline boundaries, who are well placed to develop their own research career or to take up appointments outside of academia. The Fellows will conduct research within four interlinked work packages which are: i) Hyporheic zone processes, ii) Catchment-scale analysis, iii) Novel pollutants in catchment systems, and iv) Elucidating the links between chemical and ecological quality. An integrated training package will develop the Fellows' skills in field, laboratory and modelling-based investigation. The University of Sheffield works closely with other research organisations in this area in the UK and in other European countries and there will be opportunities for the Fellows to network and interact with other scientists through research events and short-term secondments in relevant groups. The team of Fellows will be drawn from a range of European and third countries, with an emphasis on recruiting from Eastern Europe where problems implicit in catchment management are particularly acute and the skills gap is greatest.

## **265676- CLARA**

Capacity-Linked water supply and sanitation improvement for Africa's peri-urban and Rural Areas

[clara.boku.ac.at/](http://clara.boku.ac.at/)

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*Funding scheme:* CP (Collaborative Project), FP7

*Project duration:* 3/1/2011 - 2/28/2014

*EC contribution:* € 1 989 826

*Policy drivers:* Ecological Status

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### **Abstract**

There are a large number of small communities and towns in Africa that suffer from severe problems with water supply and sanitation. Small communities in rural areas and peri-urban areas of small towns have comparable settlement structures in which reuse of water and use of sanitation products can be utilized. However, there is only limited local capacity to adopt, implement and operate integrated water supply and sanitation. CLARA's overall objective is to strengthen the local capacity in the water supply and sanitation sector. From a technological point of view, existing low cost technologies for decentralized water supply and sanitation systems shall be assessed and adapted for African conditions with the focus on reducing risks in use and reuse of water and sanitation products, and providing demand oriented water quality. Based on these technological improvements and the experiences from the FP6 projects ROSA and NETSSAF, a simplified planning tool for integrated water supply and sanitation systems for small communities and peri-urban areas shall be developed that incorporates the key factors for success, i.e. operation and maintenance issues and reuse potential, form the beginning of the planning process, and that can be tailored to available local capacities. This simplified integrated CLARA planning tool shall then be tested and evaluated in different geographical African regions to incorporate different economic, cultural and social boundary conditions. For the communities participating in the planning process, application documents will be prepared as a final output that serve as basis to ask for funding of their implementation plans for integrated water supply and sanitation.

## **263295- CoBIOS**

Coastal Biomass Observatory Services

[www.cobios.eu/](http://www.cobios.eu/)

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*Funding scheme:* CP (Collaborative Project), FP7

*Project duration:* 1/1/2011 - 12/31/2013

*EC contribution:* € 2 500 000

*Policy drivers:* Ecological Status

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### **Abstract**

The proposed CoBiOS project aims to integrate satellite products and ecological models into a really operational and user-relevant information service on high biomass blooms in Europe's coastal waters. To this end CoBiOS will produce a harmonized and validated water transparency product based on satellite images for a large variety of coastal water types which will be used to force ecological models. While earth observation can provide information on the state of superficial algal blooms, the improved CoBiOS ecological models will make predictions on the fate of blooms, thus allowing assessment of e.g. the risks on hypoxia and dead zones. CoBiOS operates in overlapping model domains in the Northern part of Europe in order to derive uncertainty information from ensemble runs. During two extended trial runs and one operational demonstration phase the combined service will be demonstrated to groups of users and validated by a panel of key users. All facets of post-project sustainable commercial continuation of the services will be analysed in concert with the end-users. CoBiOS aims to make optimal use of MCS products and services and will provide feedback to this project.

## **505564- COBO**

Integrating new technologies for the study of benthic ecosystem response to human activity: towards a Coastal Ocean Benthic Observatory (COBO)

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*Funding scheme:* STP (Specific Targeted Research Project), FP6

*Project duration:* 3/1/2004 - 2/28/2007

*EC contribution:* € 1 999 485

*Policy drivers:* Ecological Status

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### **Abstract**

Coastal ecosystems are particularly vulnerable to anthropogenic perturbation, affecting biodiversity and ecosystem stability and resilience. Shallow water sediments and their associated biota represent a reservoir for biodiversity, hosting resting and reproductive stages of planktonic organisms, and regulating carbon and nutrient biogeochemical cycles. However, the relationship between tightly coupled biological and geochemical processes in this environment is poorly defined with respect to their temporal and spatial variability. The overall objective of COBO is to integrate emerging and innovative technologies from different disciplines (physics, chemistry, biology, imagery) to provide in situ monitoring of sediment habitats, a key component of coastal marine ecosystems, in order to understand complex interactions between the biota (function and diversity) and their chemical environment. Existing technologies have limited spatial and temporal sampling resolutions and this has hampered progress in determining key parameters and in explaining biogeochemical patterns / processes and in modeling ecosystem dynamics. Improved in situ technologies are required to provide rigorous scientific information on processes regulating this unique and fragile habitat and for assessing, controlling and minimising human impact on European coastal waters thus addressing societal need. Organism-sediment processes, with both enhancing and mediating effects, are still poorly understood in shallow water sediments that receive the bulk of anthropogenic disturbance. The combination of innovative instruments from the different disciplines will provide powerful tools to significantly advance our understanding of organism sediment relations under dynamic coastal conditions and enhance predictive capability. COBO represents a major step towards the development of permanently operating benthic observatories for coastal management.

## **014825- COCERSI**

Contamination in drinking water distribution systems: Consumer Exposure Risks and Source Identification

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 4/15/2005 - 4/14/2007

*EC contribution:* € 80 000

*Policy drivers:* Ecological Status

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### **Abstract**

There is a growing debate among research and practice communities on adequate strategies that reduce consumer exposure to accidental microbial contaminations or deliberate attacks in drinking water distribution systems (DWDS). To limit the spread of disease in a contamination event, effective strategies are multi-barrier approaches that include prevention, detection, mitigation and source elimination. Typically, early public health protection relies on the passive efficacy of a disinfectant residual. However, little is known on its real ability to successfully inactivate intruding pathogens in the DWDS before water reaches consumers. A second barrier is provided by rapid and adequate response to emergency scenarios. To this aim, an automatic sensor system to continuously monitor water quality in DWDS would be very important as an early detection system and for contamination source location identification to eliminate or isolate the source problems. First preliminary objective is the development of a general method that, through the use of water quality modelling, systematically and quantitatively measures the ability of a particular system operation design to reduce consumer exposure to hazardous contaminations in DWDS. Second objective is to explicitly use the vulnerability assessment scheme to compare and select alternative system operation designs that may preventively provide an improved barrier to protect consumers until a contamination event is detected and consequent action is taken. This scheme will also allow for the evaluation of adequate mitigation strategies to be adopted once water quality problems have been detected. Finally, a methodology and tool set will be developed to identify the optimal sensor layout that, from the one hand reduces consumer exposure risks to contaminations and from the other hand is able to provide valuable information to identify, at least statistically, network zones that may be the cause of water quality problems.

## **021634- COMEHERE**

### **COMBINING METHODOLOGIES TO ASSESS WATER POLLUTANT HAZARD AND ENVIRONMENTAL RISK IN SOUTH EUROPE**

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 1/2/2006 - 1/1/2008

*EC contribution:* € 80 000

*Policy drivers:* Ecological Status

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#### **Abstract**

The project aims to develop, improve and test a multidisciplinary approach to assess the bioavailability and ecotoxicity of several organic contaminants in sediments of water bodies and estuaries sampled in different Italian locations. Chemical and biological techniques will be adopted in order to assess the actual risk posed by sediment contamination, i.e. the sum of exposure (bioavailability chemical assessments) and effects (ecotoxicity tests with metabolic and catabolic biosensors). This will be achieved through the following sub-objectives: (a) assess reliable chemical techniques for the quantification of the actual and potential bioavailable fractions of contaminants; (b) assess the general and toxic effects of contaminants, with particular regard to their bioavailable fractions; (c) assess any synergistic and additive effects between different chemicals; (d) predict the bioremediation potential for a different number of case studies. Sediments and water samples from different contaminated Italian sites will be sampled and analysed. They will differ in terms of physico-chemical properties, contamination extent, history and presence of specific compounds. The feasibility of the innovative approach proposed here will be therefore tested on a number of different case studies. Useful information on the remediation potential will be achieved as well. Together with the coordinator the researcher has planned a three year project to allow a reintegration in the HOST or other institutions in EU.

## **237535- COMPLEX**

Community Dynamics and Phenotypic Changes of Limnic Bacteria During Experimental Manipulation of Bottom-up and Top-down Factors

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 7/1/2009 - 10/31/2010

*EC contribution:* € 143 006

*Policy drivers:* Ecological Status

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### **Abstract**

Bacteria in freshwaters are key players in the degradation of organic carbon. Their important functional role is related to the specific growth features of different genotypes within mixed assemblages. Limitation by substrates and nutrients (bottom-up factors) and high predation by bacterivorous protists (top-down factors) together shape the composition of microbial assemblages. Bacterial species have developed strategies that are either aimed at maximizing their competitive abilities for bottom-up limitations or at resisting protistan top-down control. Both specializations conceivably also represent trade-offs, either of metabolic versatility or of growth efficiency. We propose studying the effects of different types of growth limitations (carbon and phosphorus) on experimental assemblages of freshwater bacteria in the presence and absence of predation. Particular focus will be put on the relationship between the diversity and the metabolic function of the bacterial communities. Representatives of key populations will be isolated and tested for physiological versatility, growth efficiency and sensitivity to chemical cues (kairomons) by the predator. The growth of isolates and their response to predation will also be determined at close to natural conditions. The proposed work will provide novel insight into the specific metabolic differences of freshwater bacteria that are most successful at either top-down or bottom-up selection. It will also produce new physiologically well characterized model strains to study chemical interactions between bacteria and predators. The project will combine the research proficiency of the applicant with the ample facilities and the expertise available at the host institution. The candidate will benefit from a research environment that offers possibilities for fruitful collaborations. Moreover, it will be advantageous for his envisaged career to gain teaching experience in a university environment.

## **506069- COSTAR**

Coal Mine Sites for Targeted Remediation Research

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 5/1/2004 - 10/31/2008

*EC contribution:* € 468 875

*Policy drivers:* Ecological Status  
Chemical aspects

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### **Abstract**

CoSTaR is a globally unique outdoor research facility focused on the sustainable remediation of aquatic pollution arising from mine sites. It comprises six, full-scale, passive treatment systems (totalling more than 5 ha in area) located in close proximity with one<p>another, all centrally managed by the University of Newcastle. The six CoSTaR systems comprise representative examples of all major types of passive mine drainage treatment systems: aerobic wetlands, compost wetlands, vertical flow (RAPS) systems and permeable reactive barriers. GSM-based telemetry facilitates real-time transmission of key 'state variables' for the six systems (including flow, groundwater levels, pH, temperature, conductivity etc) to the CoSTaR headquarters on the campus of the University of Newcastle. These telemetry capabilities also make it possible for visitors to remotely monitor their experiments on CoSTaR systems after they return to their home institution, taking advantage of the powerful database-driven computing facilities of the Regional e-Science Centre, which is co-located with the CoSTaR headquarters in the newest and most prestigious research premises on campus (the Devonshire Building). This building houses the central environmental science and engineering laboratories of the University's Institute for Research into the Environment and Sustainability, which provide first-class analytical facilities (chemical, geotechnical, microbiological) for samples of water and sediments retrieved from the CoSTaR systems (using our auto-samplers and sediment coring devices). Dedicated field equipment<p>also includes in-situ gas detection and analysis sensors and novel gel probes (providing sub-millimetre resolution of pore water chemistry within reactive substrates). CoSTaR is thus an unparalleled facility within which research teams and individual researchers can develop their<p>own top-quality research.

## **040247- CRENARC**

Functional diversity of Crenarchaeota in aquatic ecosystems

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 9/1/2007 - 8/31/2009

*EC contribution:* € 146 366

*Policy drivers:* Ecological Status

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### **Abstract**

Archaea are prokaryotic microorganisms that constitute the third phylogenetic domain of life. Up to recently Archaea were thought to be mostly restricted to extreme environments but it has recently been established that the biodiversity and metabolic capabilities of the phylum Crenarchaeota is substantially larger than previously assumed. Recent evidence suggests that ubiquitous pelagic Crenarchaeota play an essential role in biogeochemical cycling in aquatic ecosystems. It is, however, unknown which crenarchaeotal groups are participating, to which extent, and under which environmental conditions. Recent findings suggest that marine and freshwater Crenarchaeota could act as chemoautotrophs and fix inorganic carbon in the dark. The project CRENARC will focus on the possible role of Crenarchaeota in fixing carbon in aquatic ecosystems using a fresh water lake and a coastal marine site as model ecosystems. The proposed research requires a molecular ecological approach using high-resolution technologies. We will perform stable isotopic probing (SIP) to monitor the assimilation of <sup>13</sup>C-labelled substrate by Crenarchaeota and we will apply molecular ecological methods to analyse the labelled DNA/RNA. DNA/RNA sequences will be screened for both phylogenetic marker and functional genes. We will also develop metagenomic technologies to clone large labelled crenarchaeotal DNA fragments. Consecutive sequencing and gene screening combined with comparative genomics will increase our understanding of the ecological role and phylogenetic diversity of Crenarchaeota. It is foreseen that CRENARC will result in a substantially increased understanding of the role of this enigmatic group of aquatic prokaryotes in biogeochemical cycling.

## **029454- CRYPTONET.IE**

Cryptosporidiosis Network Ireland: Development of Skills and Knowledge to Predict Cryptosporidiosis Risk in Catchment Waters

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 6/1/2006 - 5/31/2010

*EC contribution:* € 693 508

*Policy drivers:* Ecological Status

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### **Abstract**

Cryptosporidium species are the most important newly recognised contaminant of potable water in Europe. The scientific objective of the Cryptonet.ie project is to develop a Cryptosporidium specific Microbial Risk Assessment (MRA) model for catchment waters that can be used to identify when potable water is at high risk of being contaminated. The MRA will be developed for a specific catchment in the Border, Midlands and Western less-favoured region but the method will be generally applicable to any catchment in Europe. Experienced Researchers in geospatial data analysis, cryptosporidium biology, soil physics and risk analysis will transfer knowledge to University College Dublin. In conjunction with a multi-disciplinary team (including PhD students) at the host location, the Experienced Researchers will develop techniques for predicting the spatial pattern of oocyst contamination of surface water, and will develop a risk assessment model to give an indication of the proportion of the initial oocyst population that reaches surface waters and retains an ability to infect humans and animals. Cryptonet.ie will bring together knowledge of geospatial informatics (based on GIS), soil and catchment hydrological modelling, veterinary epidemiology, risk assessment and molecular biology. Cryptonet.ie will be structured with 3 work packages: (i) spatial data collation and analysis; (ii) Cryptosporidium biology; and (iii) transport risk model development. Four experienced researchers will be recruited.

## **210514- CYANOIT**

Identification and toxic potential of Cyanoprokaryota in the Bulgarian water bodies. Environmental health risks.

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 10/1/2007 - 9/30/2010

*EC contribution:* € 45 000

*Policy drivers:* Ecological Status

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### **Abstract**

Blue-green algae (Cyanoprokaryota) are increasingly gaining importance in view of health hazards and ecological risks caused by secondary metabolites with toxic properties named “cyanotoxins”. More than 40 Cyanoprokaryota species are capable to form blooms and produce cyanotoxins. The most common and well-studied producers of cyanotoxins are *Microcystis aeruginosa*, *Aphanisomenon flos-aquae*, *Anabaena flos-aquae*, *Cylindrospermopsis raciborskii*, *Planktothrix agardhii*, *Lyngbya majuscula*, *Nodularia* and *Oscillatoria*. Yet, Cyanoprokaryota, often detected in the Bulgarian water bodies, are not studied in toxicological aspects. Therefore, the main goal of this project on the one hand is to identify and characterize the blue-green algae distributed in different Bulgarian freshwater bodies (especially those used for potable and recreational purposes as well as fish-ponds) and on the other hand, to examine their ability to produce intracellular and extracellular toxins. Also, implications on human health and ecological risks caused by harmful freshwater algal blooms will be evaluated and perilous water bodies will be noted and mapped. Correlation between the capacity of toxin production and different environmental factors will be analyzed by ecological models as well as mimicking some environmental factors in *in vitro* conditions. Collected cyanoprokaryotic samples will be identified by the classical morphological method and if it is necessary by molecular-genetic methods. Determined Cyanoprokaryota species will be adjusted for *in vitro* culturing and used to study their toxic potential. The toxicity of algal extracts and collected natural water samples will be tested by combination of different *in vitro* biological assays (enzymatic activity, viability of different cell lines) and the toxins will be identified using ELISA and HPLC methods.

## **024578- DIATPIN**

An experimental approach to the systematics of the diatom *Pinnularia*

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 9/1/2005 - 8/31/2007

*EC contribution:* -

*Policy drivers:* Ecological Status

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### **Abstract**

Among plants, diatoms are the second only to the flowering plants in terms of their biodiversity (c. 200,000 species) and their contribution to global photosynthetic productivity (c. 20% of the total annually). They are also the most important organisms for studying changes in water quality and aquatic conditions over time-scales of months to millions of years. Diatom taxonomy, however, is relatively primitive. During the last 30 years, species concepts have changed, from narrow to broad definitions and then back to narrow ones, with accompanying confusing changes in nomenclature. The reasons for these changes have not been tested and it is not clear that the newest classification is the best. As consequence several incompatible classifications are in use, compromising ecological and other applied studies.

Therefore, the main objectives of this project are to test the diatom species concept using the genus *Pinnularia* as a study model and to establish a secure taxonomy for *Pinnularia*. The genus inhabits mostly freshwater and reaches its maximum diversity in low electrolyte waters that are highly sensitive to environmental disturbance, thus it is a worthwhile subject of research. The objectives will be achieved by using recently developed mating protocols to investigate reproductive isolation; by complementing this with molecular genetic studies using appropriate markers (rbcL and ITS rDNA sequence analysis); and by testing agreement between morphology, molecular data and mating experiments. Therefore, the project and its objectives are relevant to the Specific Programme: III.1.1 and III.2.1.

Working at the Royal Botanic Garden Edinburgh will provide advanced training in experimental culture techniques, the reproductive biology of diatoms and molecular methods in a close-knit institute with specialists in all appropriate fields. The project will be also an opportunity to develop new lines and methods of research and to strengthen writing and communication skills.

## **518043- ECODIS**

Dynamic Sensing of Chemical Pollution Disasters and Predictive Modelling of Their Spread and Ecological Impact

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*Funding scheme:* STP (Specific Targeted Research Project), FP6

*Project duration:* 10/1/2005 - 12/31/2008

*EC contribution:* € 3 499 780

*Policy drivers:* Ecological Status

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### **Abstract**

ECODIS will develop sensor technologies for monitoring the physicochemical reactivity and biological impact of inorganic and organic pollutant species in aquatic systems. ECODIS will also apply these technologies to the study of the short and long term chemical and biological status of aquatic ecosystems following a pollution disaster. Exposure conditions experienced by organisms are defined by the temporal profiles of concentration and speciation of pollutants. These profiles will be quantitatively linked to biological effects via an innovative dynamic approach based on the flux of pollutant species as a key parameter in effective ecosystem quality. The dynamic features of pollutant species distributions over biotic and abiotic components will be a basic component of a new generic dynamic approach for any macroscopic aquatic ecosystem impacted by a pollution disaster event. This will involve the integration of the dynamic features of pollutants with their macroscale transport resulting from diffusion and flows in the water body. One of the major goals of ECODIS is to arrive at a model that includes predicted pollutant species distributions, and ensuing biological risks, in all compartments of the aquatic ecosystem as a function of time and space. Especially in disaster situations, the pollutant sink/source functioning of ecosystems under extreme load will be a key factor in the rate of spread of the disaster impact. ECODIS will couple the sink/source function with the transport modelling and derive the ensuing immediate and long term impact of a given pollution disaster. ECODIS will also open the way for developing sophisticated strategies for dynamic risk assessment and disaster management policies. One of the ultimate goals in ECODIS's action plan is the formulation of a set of guidelines for monitoring, data management, and interpretation of pollution disasters.

## **208841- ECODOM**

Advancing Understanding of Carbon Cycling and Coloured Dissolved Organic Matter Dynamics in European Wetlands & Coastal Ecosystems through integration of observations and novel modelling approaches

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 5/1/2008 - 4/30/2012

*EC contribution:* € 100 000

*Policy drivers:* Ecological Status  
Chemical Aspects

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### **Abstract**

This proposal aims at facilitating an efficient and lasting re-integration of Dr Maria Tzortziou in the Hellenic Center for Marine Research (HCMR). The main goal is to initiate a competitive and interdisciplinary research program at HCMR that will advance our understanding of the role that wetlands and tidal marshes play in dissolved organic matter (DOM) dynamics, carbon cycling, photochemistry, biogeochemistry, and water quality changes in coastal margin ecosystems. Specific objectives of the research initiated with EcoDOM include: (i) Characterize landscape-scale variation in the quantity and quality of the dissolved organic compounds exported from different wetlands and coastal tidal marshes in SE Europe, and understand implications of such variation for estuarine biogeochemistry, ecosystem productivity, and water optics. (ii) Develop novel and improved modelling approaches for describing and predicting effects of photochemical processes on DOM quality and degradation. Accurate quantitative description of these effects is prerequisite for improving the accuracy of more general biogeochemical/ecological models of carbon cycling. (iii) Apply a novel radiative transfer model to examine the effects of wetland DOM inputs on underwater light fields. (iv) Link the proposed work to remote sensing applications by developing bio-optical relationships between remotely sensed quantities, DOM optical properties and biogeochemical variables in coastal waters. EcoDOM research is highly relevant to the European Union policy making and research initiatives for increased understanding and modelling of climate-related biogeochemical cycles in European wetland ecosystems and sustainable management of EU's coastal natural resources. The HCMR Institute of Inland Waters is committed to absorb the research initiated in the proposed project by offering job stability through long-term research scientist appointments to Dr Tzortziou with the conclusion of the project.

## **221050- ECOECO MONITORING**

Optimal monitoring of socio-economic and ecological systems for robust natural resource management

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 7/1/2008 - 4/24/2012

*EC contribution:* € 170 709

*Policy drivers:* Ecological Status

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### **Abstract**

A fundamental component of successful resource management is monitoring. The aim of this project is to develop a framework for optimal monitoring of conservation activities, integrating both monitoring for compliance and monitoring for detection of biodiversity trends. A robust monitoring strategy must consider the goals of the programme, the type of monitoring that is most effective, and the overall level of investment. This project draws upon and integrates many disciplines, including ecological models of species and ecosystems, socio-economic models of human decision-making and behaviour, optimal monitoring, and decision making under uncertainty. The project will focus on community-based conservation, where local communities are granted control over resources, including monitoring biodiversity trends and compliance with rules. The proposed framework is however highly relevant to a wide range of management situations, such as international fisheries regulation and water management. The specific objectives are: 1. To develop a model framework that integrates the dynamics of socio-economic and ecological systems; 2. To explore the effectiveness and efficiency of monitoring strategies that target resource users' behaviour and populations of conserved species; 3. To apply the framework to a case study of community-based natural resource management in the Alaotra Wetland, Madagascar, where local people and threatened species depend on an ecosystem vulnerable to degradation; 4. To generalise the framework to a wider set of situations and explore changes in key parameters, particularly the structuring of external incentives and the spatial distribution and ecology of natural resources; 5. To communicate findings to the research community and to natural resource managers, making recommendations for the design of community-based conservation schemes and effective resource monitoring.

## **293535- ECOMAWAT**

Ecosystem-based management strategies for urban wastewater systems

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 9/1/2011 - 8/31/2015

*EC contribution:* € 100 000

*Policy drivers:* Ecological Status  
Hydromorphology  
Science-policy Interface

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### **Abstract**

Ecosystem-based management strategies for the urban wastewater system (UWWS) are needed for the successful implementation of Water Framework Directive. UWWS discharges should be dynamically regulated to not exceed the river waste treatment capacity. The overall aim of this project is to increase the knowledge about the interactions between UWWS and rivers in order to propose strategies to maximize ecosystem services at the same time that operating costs of the UWWS are minimized. Field experimental work will be conducted to understand the effects of UWWS discharges (organic matter, nutrients and priority pollutants) and river waste treatment capacity. A dynamic model of the whole UWWS and river will be developed and several management strategies will be tested against different types of environmental conditions and disturbances. These strategies include implementation of control and infrastructure upgrades. The knowledge acquired will be integrated into an Environmental Decision Support System that water managers can use to make decisions.

## **262190- ECOSEASAFE**

Development of a sustainable and cost effective ballast water treatment technology with reverse pulsed DC electric field that excludes formation of oxidising free radicals

[www.ecoseasafeproject.com/](http://www.ecoseasafeproject.com/)

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*Funding scheme:* BSG-SME (Research for SMEs), FP7

*Project duration:* 11/1/2010 - 10/31/2012

*EC contribution:* € 956 881

*Policy drivers:* Ecological Status  
Socio-economy

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### **Abstract**

The objective of the proposed project is development of a ballast water treatment system by using a pulsed DC electrical field for microbial inactivation of invasive species in ballast water. The EcoSeaSafe applies an electrical designed pulse shape with instant reversion of the current direction, which generates a reversed electric field that prevents a secondary reaction of radicals which change the water chemistry while fully eliminating target species specified by the guidelines of International Maritime Organisation (IMO). Transfer of invasive marine species by ballast water is a major global ecological and economic problem. As a result, IMO has adopted a convention that requires proper management of ballast water that all ships must comply with progressively starting in 2009. There are, however very few treatment systems that have obtained IMO approval in spite of efforts being done a number of technology developers and vendors. With huge global market for new ballast water treatment technologies, the proposers of EcoSeaSafe have identified a new and big market opportunity that can enable them exploit a superior technology and enhance their competitive position and economic growth as well as international network of cooperation. The EcoSeaSafe system is a cost effective, environmentally accepted, user friendly, compact and safe technology. It has minimal footprint and can be easily installed on new ships and retrofitted on existing vessels without disrupting the structural integrity of the vessel. To attain the technological objectives of the proposed project, innovative developments will be undertaken that include development of innovative pulse generator, a novel radical reactor of innovative alloys and a process control unit for controlling the required pulse frequency, amplitude and shape as well as efficient inactivation with minimal electrode distance.

## **044096- EFI+**

Improvement and spatial extension of the European Fish Index

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*Funding scheme:* STP (Specific Targeted Research Project), FP6

*Project duration:* 1/1/2007 - 4/30/2009

*EC contribution:* € 899 960

*Policy drivers:* Ecological Status

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### **Abstract**

EFI+ is a research and technological development project designed to gain new knowledge and to develop and improve new biological assessment methods to meet needs of the Water Framework Directive (WFD). The output of the project will be a methodological approach to assess the ecological status of rivers in accordance with the WFD. Therefore the EFI+ project represents a direct and obligatory contribution to the Water Framework Directive in further development and implementation of harmonised fish-based assessment tools and methodology that can be used as a standard method in EU Member States, as well as Candidate countries. The objective of EFI+ is to overcome limitations of the existing European Fish Index (EFI) produced in the FAME project by developing a new, more accurate and pan-European fish index. Specific tasks are (1) to evaluate the applicability of the existing EFI and make necessary improvements to the existing EFI in Central-Eastern Europe and Mediterranean ecoregions, (2) to extend the scope of the existing EFI to cover very large rivers, (3) to analyse relationships between hydromorphological pressures (incl. continuity) and fish assemblages to increase the accuracy of the EFI, (4) to adapt existing software to the requirements of the new EFI to allow calculation of the ecological status for running waters, (5) to implement and disseminate the EFI and supporting software by integration of the project results in the CIS activities (Common Implementation Strategy) and ongoing national and international monitoring programmes such as the Joint Danube Survey and to present results in end-user workshops and an international conference.

## **509188- EMCO**

Reduction of environmental risks, posed by Emerging Contaminants, through advanced treatment of municipal and industrial wastes

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*Funding scheme:* STP (Specific Targeted Research Project), FP6

*Project duration:* 7/1/2004 - 6/30/2007

*EC contribution:* € 1 199 987

*Policy drivers:* Ecological Status

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### **Abstract**

In the Western Balkans, a decade of regional conflicts combined with insufficient institutional infrastructure, decaying industrial system and a legacy of years of unchecked pollution have left the environment of the region in a state of serious neglect, which is especially reflected in poor water quality and waste problems. Currently, urban wastewaters are mainly discharged untreated to the rivers and industrial wastewater receives little or no treatment. Thus, the future of indirect potable reuse requires a planned protection of surface waters through efficient treatment of wastewaters prior to their discharge and the occurrence of contaminants is a key issue in relation to the quality of water supplies. Project EMCO addresses the hot issue of so-called "emerging" or "new" contaminants (i.e. human and veterinary drugs, surfactants, textile dyes), whose emission has recently emerged as an environmental problem. It focuses on their tracing in industrial and municipal effluents and removal by advanced water treatment technologies (membrane processes: MBR, RO/UF/NF and advanced sorbents). Emphasis is given on the application of small units for on-site treatment of industrial and municipal effluents with the objective to reduce environmental and health risks through an improvement of the quality of receiving surface waters. Approach chosen is based on the stepwise adjustment of wastewater treatment technologies from laboratory scale to pilot plants installed at industrial partner sites evaluating the efficiency of the technology under real-world conditions. Additionally, EMCO aims to provide comprehensive data on the occurrence of emerging contaminants in effluents in the participating WB and EU countries and the extent to which these compounds can be removed by advanced treatment technology in order to allow their introduction on the list of relevant compounds to be monitored, and setting of new limits of emission and the development of avoidance strategies.

## **226364- ENERGEO**

Energy Observation for monitoring and assessment of the environmental impact of energy use

[www.energeo-project.eu/mainmenu/home.html](http://www.energeo-project.eu/mainmenu/home.html)

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*Funding scheme:* CP (Collaborative Project), FP7

*Project duration:* 11/1/2009 - 10/31/2013

*EC contribution:* € 6 010 977

*Policy drivers:* Ecological Status

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### **Abstract**

The main objective of the EnerGEO project is to develop a strategy for a global assessment of the current and future impact of the exploitation of energy resources on the environment and ecosystems and to demonstrate this strategy for a variety of energy resources worldwide. The global observation strategy will be developed to appropriately assess the impacts of current and future transitions in energy-use on the environment by a combination of:

- models already available for the different sources of energy: TASES, REMIX and MESSAGE
- existing global datasets from which environmental indicators will be derived to quantify changes to freshwater systems, biosphere, ecosystems, atmosphere and oceans.
- existing and currently developed models capable of assessing and forecasting environmental impacts and costs of energy exploitation.

By developing a distributed system based on the recommendations of the GEO-Architecture and Data Committee global collection and dissemination of data relating to the effect of energy use on the environment will be supported. By including members of the Energy-Community of Practice of GEO, sustained contribution of the GEO-tasks EN-07-02 and EN-07-3 will be realised. The project takes the testing and demonstration of the observing system and developed scenarios through the execution of dedicated pilots at heart. The pilots are focused on the most important issues relating to atmospheric composition and land degradation through the use of fossil fuels, future impacts of the use and production of biomass on land ecosystems and food security, sustainable integration of solar energy in current grids as well as its visual impact and relating to the impact of wind energy on marine ecosystems. Attention will be given to pollutants that are continuously cycling between the atmosphere and aquatic ecosystems. The results of the pilots feed into an integrated platform that will be run for known scenarios in order to assess energy strategies.

## **022618- EPIBATHE**

Assessment of human health effects caused by bathing waters

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*Funding scheme:* STP (Specific Targeted Research Project), FP6

*Project duration:* 12/1/2005 - 3/31/2009

*EC contribution:* € 1 990 185

*Policy drivers:* Ecological Status

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### **Abstract**

The scientific evidence base to support credible risk assessment for the design of appropriate microbial standards for bathing waters is insufficient. This is particularly true for Mediterranean waters, for new member states and for effects associated with exposure to toxic algal products. This is a pressing problem as Directive 76/160/EEC is currently in the process of amendment by the EU.

It is therefore intended to address three questions, namely:

- a. What is the nature and level of the risk and how does exposure affect risk?
- b. What level of protection is afforded by the threshold values in Directive 76/160/EEC and CEC (2004)?
- c. How do the risks vary between fresh and marine waters and does the 1:2 ratio of the faecal indicator threshold values in coastal waters vs freshwaters ensure a comparable level of protection?

In the first 12 months, this proposal will (i) complete a literature review and meta-analysis of current epidemiological data derived principally from UK and German studies, (ii) define data gaps restricting the application of credible health-evidence-based policy to bathing water standards outside these regions and (iii) design and agree a suitable research protocol for filling these data gaps. The second twelve months of research (from month 13 to 24) will (iv) implement this protocol and the project will deliver (v) a scientific report of the findings and detailed policy interpretation before the project end, i.e. 36 months following commencement.

## **505540- EURO-LIMPACS**

Integrated Project to Evaluate the Impacts of Global Change on European Freshwater Ecosystems

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*Funding scheme:* IP (Integrated Project), FP6

*Project duration:* 2/1/2004 - 1/31/2009

*EC contribution:* € 12 647 141

*Policy drivers:* Ecological Status  
Climate Change  
Hydromorphology

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### **Abstract**

Freshwater ecosystems, under stress from land-use change and pollution, face additional pressures from climate change, directly and through interaction with other drivers of change. Euro-limpacs is concerned with the science required to understand and manage the ecological consequences of these interactions. It is relevant to the Water Framework Directive and other international directives and protocols and supports the EU's Charter on Sustainable Development. The Project comprises a consortium of leading scientists to integrate river, lake and wetland ecosystem science at the catchment scale. It focuses on the key drivers of aquatic ecosystem change (land-use, nutrients, acid deposition and toxic substances) and examines their interactions with global, especially climate, change using time-series analysis, space-for-time substitution, palaeolimnology, experiments and process modelling. It considers these interactions at 3 critical time-scales: (i) hours/days, concerned with changes in the magnitude and frequency of extreme events; (ii) seasons, concerned with changes in ecosystem function and life-cycle strategies of freshwater biota; (iii) years/decades, concerned with ecological response to environmental pressure, including stress reduction and ecosystem recovery. An innovative toolkit for integrated catchment analysis and modelling will be developed to simulate hydrological, hydrochemical and ecological processes at the catchment scale for use in assessing the potential impact of global change under different climate and socio-economic scenarios. A unified system of ecological indicators for monitoring

freshwater ecosystem health, and new methods for defining reference conditions and restoration strategies will be developed. These will take into account the probable impacts of future climate change and the need for a holistic approach to restoration based on habitat connectivity.

## **018480- EUROMBRA**

Membrane bioreactor technology (MBR) with an EU perspective for advanced municipal wastewater treatment strategies for the 21st century

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*Funding scheme:* STP (Specific Targeted Research Project), FP6

*Project duration:* 10/1/2005 - 5/31/2009

*EC contribution:* € 2 998 969

*Policy drivers:* Ecological Status  
Water Scarcity and Droughts

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### **Abstract**

The World is running out of clean, safe, fresh water. By 2025 one third of humanity (ca. 3 billion people) will face severe water scarcity. This has been described as the "single greatest threat to health, the environment and global food security". Water is essential and preservation of its safety in quantity and in quality is critical to the sustainable development of any society. The goal of this project is to make a contribution to meet this challenge. The protection of water in the European Union has been encouraged through the Water Framework Directive (WFD). The intention of WFD is to protect water resources (quality and quantity) through an integrated water resource management policy.

Wastewater treatment is an important aspect of water management. Efficient, cost effective treatment processes are needed for transforming wastewater into water free from contamination which can be returned to the hydrological cycle without detrimental effects. The development and application of MBR for full scale municipal wastewater treatment is the most important recent technical advance in terms of biological wastewater treatment. It represents a decisive step further concerning effluent quality by delivering a hygienically pure effluent and by exhibiting a very high operational reliability. The overall objective of EUROMBRA is to develop a cost-effective, sustainable solution for new, efficient and advanced municipal wastewater treatment based on MBR technology. This will be achieved through a multi-faceted, concerted and cohesive research programme explicitly linking key limiting phenomena (fouling, clogging) observed and quantified on the micro-, meso- and macro-scale. Key to the success of the programme is the harnessing specialist knowledge, conducting of dedicated yet interlinked experiments and incorporating key aspects of both system design and operational facets, the latter encompassing hydrodynamics and mass transfer, foulant speciation and dynamic impacts

## **502571- EVENT**

Providing tools to prevent emergence of enteric viruses

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*Funding scheme:* STP (Specific Targeted Research Project), FP6

*Project duration:* 9/1/2004 - 2/28/2009

*EC contribution:* € 2 437 941

*Policy drivers:* Ecological Status  
Chemical aspects

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### **Abstract**

Food- and waterborne transmission play an important role in the spread of norovirus (NV, previously named Norwalk-like viruses) throughout Europe. NV are ubiquitous, highly contagious, and cause large international outbreaks of gastro-enteritis. This is of concern: current quality control for food and water in Europe measures bacterial contamination, and does not monitor viral contamination. Therefore, food can pass microbiological quality control, but still contain viruses. Matched with the virtual absence of a surveillance system for detection of common-source outbreaks of illness due to enteric viruses, this highlights a weak spot in European infectious disease control. The NV in fact serve as sentinels: when present, common-source outbreaks will relatively easily be detected due to the high attack rate and short incubation period. More insidious, however, are the enteroviruses and fecally-transmitted hepatitis viruses with a high proportion of asymptomatic infection after an incubation period of up to 2 months. These viruses cause illnesses like hepatitis (hepatitis A and E viruses) and infections of the central nervous system (enteroviruses). Signaling common source outbreaks with these viruses is virtually impossible without a strong (molecular) laboratory component to underpin the epidemiological investigations, aided by international exchange of laboratory data. The work in this proposal aims at providing the laboratory tools needed for successful (epidemiological) surveillance networks on food-borne outbreaks, hepatitis A viruses, and rare and emerging diseases (attributable to enteric viruses) that are being developed under DG Sanco's Communicable Disease Surveillance Network. We build on information gathered through a previously funded (FP5) research network, in collaboration with coordinators of surveillance networks in DG Sanco, to help put the research findings into practical use for the above mentioned activities'

## **262060- EXPEER**

Distributed Infrastructure for EXPERimentation in Ecosystem Research

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*Funding scheme:* IA (Large-scale integrating project), FP7

*Project duration:* 12/1/2010 - 11/30/2014

*EC contribution:* € 7 400 000

*Policy drivers:* Ecological Status

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### **Abstract**

EXPEER will bring together, major observational, experimental, analytical and modelling facilities in ecosystem science in Europe. By uniting these highly instrumented ecosystem research facilities under the same umbrella and with a common vision, EXPEER will form a key contribution to structuring and improving the European Research Area (ERA) within terrestrial ecosystem research. EXPEER builds on an ambitious plan for networking research groups and facilities. The joint research activities will provide a common framework and roadmap for improving the quality, interaction and individual as well as joint performance of these infrastructures in a durable and sustainable manner. EXPEER will provide a framework for increased use and exploitation of the unique facilities through a strong and coordinated programme for Transnational Access to the infrastructures. Extensive outreach and collaboration with related networks, infrastructures as well as potential funding bodies will ensure that EXPEER will contribute with its key experiences to the shaping and designing of future research networks and infrastructures, and that it has full support from all stakeholders in reaching its long-term objectives.

The establishment of the EXPEER Integrated Infrastructure will enable integrated studies of the impacts of climate change, land use change and loss of biodiversity in terrestrial ecosystems through two major steps:

1. Bringing together the EXPEER Infrastructures to enable collaboration and integration of observational, experimental and modelling approaches in ecosystem research (in line with the concept developed in ANAEE);
2. Structuring existing network of ecosystem observational, monitoring and experimental sites across Europe (LTER-Europe).

Through its integrated partnership, uniting both the experimental, observational, analytical and modelling research communities, EXPEER has the multidisciplinary expertise and critical mass to integrate and structure the European long-term ecosystem research facilities providing improved services and benefits to the whole research community as well as the society in general.

## **273831- EXTREMOPHIL**

Screening and Functional Analyses of Photoreceptors  
in Extremophilic Microbial Communities

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 5/1/2011 - 4/30/2013

*EC contribution:* € 164 242

*Policy drivers:* Ecological Status  
Hydromorphology

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### **Abstract**

The High-Altitude Andean Lakes (HAAL) in the South American "Puna-High Andes" are an almost unexplored ecosystem of shallow lakes at altitudes from 3,000 to 6,000 m above sea level. Although exposed to a broad range of extreme conditions they harbour an abundant microbial biodiversity that thrive in environmental conditions of high resemblance to those present in Earth's early atmosphere. As part of our team in Argentina I have investigated this wide-ranging diversity by culturable and non-culturable methods: so far we have assembled a collection of 200 extremophilic strains from shallow waters, sediments, flamingo faeces and even stromatolites (the only modern stromatolite-ecosystem on Earth recorded at such hostile environments!). The HAAL are clearly conditioned by the high intensity of UV irradiation - in addition to further extreme conditions (e.g. hypersalinity, drastic temperature changes, desiccation, high pH). The rich microbial diversity found in these lakes points to the presence of outstandingly active DNA repair systems - topics of high interest for colleagues worldwide investigating biomass for energy research. Unfortunately our scientific methods are limited - and thus I would like to use the expertise and excellent equipment at the host institute to investigate extensively the strain resistance mechanisms towards UV. These studies on indigenous extremophiles will provide important information about early life - but clearly are of biotechnological and astrobiology interest too. The research will focus on screening and molecular analyses of blue-light driven enzymatic activities such as photolyases involved in DNA-repairing systems - and in particular from the HAAL stromatolite-ecosystems. Their further overexpression and functional study will lead to their photochemical characterization and will highlight the potential of these microbial communities as valuable sources of novel bacteria and bio-molecules of biotechnology interest.

## **018391- FACEIT**

Fast Advanced Cellular and Ecosystems Information  
Technologies

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*Funding scheme:* STP (Specific Targeted Research Project), FP6

*Project duration:* 9/1/2005 - 2/28/2009

*EC contribution:* € 3 694 753

*Policy drivers:* Ecological Status

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### **Abstract**

Marine and freshwater ecosystems continue to be threatened by large scale pollution disasters. Such disasters are often caused by oil-related activities, but pollution nature, magnitude and site of occurrence all can be very different, with unpredictable outcome on the responses of individual organisms, the biodiversity and the functioning of the aquatic ecosystems. The FACEIT project proposes to develop rapid, cost-effective and reliable innovative measurement technologies to analyze and predict in situ population effects and ecosystems community diversity and functioning. For this purpose, FACEIT will develop in-situ pollutant monitoring technologies with semi-continuously operated microbial reporter systems, will design and test rapid methods based on unicellular planktonic viability and cell integrity, on diversity and functional responses of the whole microbial community and on multibiomarkers in organisms at higher trophic levels. FACEIT will also develop a set of state-of-the-art ex-situ sample incubation analysis methods, including a multianalyte microbial reporter platform and whole genomic tests based on pollutant-induced transcriptomic and proteomic responses in microorganisms, mammalian cell lines and fish eggs. Innovative modeling approaches will focus on understanding and predicting pollutant fate in organisms, communities and the natural environment, which will be based on metabolic pathway prediction networks, physicochemical distribution processes and biota activities. All developed measurement technologies will be extensively validated on realistic samples from contaminated sites, and coherently tested in a pollution disaster scenario. Dissemination plans include various prototype developments up to market level implementation and two advanced courses for transferring FACEIT technologies and concepts to the end-user community.

## **002918- FAIRY**

Factors controlling the bioavailability of Atmospheric Iron in the maRine ecosYstems

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 11/1/2004 - 4/30/2006

*EC contribution:* € 84 968

*Policy drivers:* Ecological Status  
Chemical aspects

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### **Abstract**

During the past decade, an increasing interests of the international community towards the 'Iron Hypothesis' has bring the scientists to investigate the actual role of iron in contrasted environments. Despite the effort done in this large research field concerning the fate of atmospheric iron toward the biological activity, there is still only few direct evidence of the link between dust deposition and an increase in biological productivity in surface waters. 'FAIRY' will aim to tackle the question of the bioavailability of atmospheric iron in surface waters by coupling a series of in vitro experiments and field observations. The 2 main objectives are (1) to investigate the processes that make atmospheric iron bioavailable and (2) to observe if marine biological activity is actually stimulated by dust input. FAIRY will bring new knowledge at 3 different scientific levels:- From an experimental approach, we will first, characterise the iron content in dust on a large variety of dust sources.- Second, we will conduct in vitro experiment to increase our knowledge on inorganic/organic processes; the role of bacteria will be considered for the first time as marine studies have shown their potential role in supplying/sequestering bioavailable iron. The coupling of organic/inorganic processes using desert dust collected in source region of desert aerosol constitute a total innovative approach.- Finally, we propose to couple the geochemistry approaches with satellite observation in a marine area submitted to desert dust inputs (coastal waters off Los Angeles): in this multidisciplinary effort, the simultaneous measurement of the dust flux and of the in situ iron concentrations, the knowledge of the dissolution processes affecting the dust and the remote sensing observations will constitute a panel of actions that definitely may allow to answer the question about the stimulation of the biological activity after a desert dust event.'

## **257024- FISH4KNOWLEDGE**

Supporting humans in knowledge gathering and question answering

w.r.t. marine and environmental monitoring through analysis of multiple video streams

[homepages.inf.ed.ac.uk/rbf/Fish4Knowledge/](http://homepages.inf.ed.ac.uk/rbf/Fish4Knowledge/)

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*Funding scheme:* CP (Collaborative Project), FP7

*Project duration:* 9/30/2010 - 9/30/2013

*EC contribution:* € 1 915 000

*Policy drivers:* Ecological Status

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### **Abstract**

The study of marine ecosystems is vital for understanding environmental effects, such as climate change and the effects of pollution, but is extremely difficult because of the inaccessibility of data. Undersea video data is usable but is tedious to analyse (for both raw video analysis and abstraction over massive sets of observations), and is mainly done by hand or with hand-crafted computational tools. Fish4Knowledge will allow a major increase in the ability to analyse this data: 1) Video analysis will automatically extract information about the observed marine animals which is recorded in an observation database. 2) Interfaces will be designed to allow researchers to formulate and answer higher level questions over that database.

The project will investigate: information abstraction and storage methods for reducing the massive amount of video data (from 10E15 pixels to 10E12 units of information), machine and human vocabularies for describing fish, flexible process architectures to process the data and scientific queries and effective specialised user query interfaces. A combination of computer vision, database storage, workflow and human computer interaction methods will be used to achieve this.

The project will use live video feeds from 10 underwater cameras as a testbed for investigating more generally applicable methods for capture, storage, analysis and querying of multiple video streams.

We will collate a public database from 2 years containing video summaries of the observed fish and associated descriptors. Expert web-based interfaces will be developed for use by the marine researchers themselves, allowing unprecedented access to live and previously stored videos, or previously extracted information. The marine researcher interface will also allow easy formulation of new queries. Extensive user community evaluations will be

carried out to provide information on the accuracy, ease and speed of retrieval of information.

## **237026- FLOODPLAIN EVOLUTION**

An Evolutionary Approach to Biodiversity Conservation: Riverine Floodplains of the European Alps as a Model System

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 3/1/2009 - 2/29/2012

*EC contribution:* € 170 418

*Policy drivers:* Ecological Status  
Hydromorphology

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### **Abstract**

The importance of evolutionary relatedness of species is increasingly recognized in both ecology and conservation. What remains is a need for quantitative predictions on the role of evolution and a synthesis of methods. This project uses DNA surveys of aquatic insect communities to measure species diversity and genetic relatedness in riverine floodplains. Riverine floodplains are one of the most biodiverse ecosystems on earth and create a very high spatio-temporal heterogeneity. Unfortunately, the most diverse and abundant aquatic insects are poorly known at the species level, therefore research that has been carried out to link biodiversity and the spatio-temporal heterogeneity relies on estimates of diversity and has lacked an evolutionary perspective. The project examines the role of habitat heterogeneity in the evolutionary processes of structuring biodiversity by sampling communities from 4 habitat types at each of 6 study reaches along 3 natural riverine corridors in the Alps. It will construct a 'DNA profile' of macroinvertebrate communities using DNA sequences and coalescent-based modeling to delineate species, determine the extent of local and regional endemism of species, reconstruct a phylogeny of all samples and calculate phylogenetic diversity of individual habitats, individual reaches, and whole river corridors, and use the resulting tree topology to examine the degree of phylogenetic clustering and overdispersion as a means to quantify the role of evolution in community assembly. The project explores 3 timely research topics: the linkage of ecology and phylogeny, the integration of evolutionary criteria in conservation management, and DNA-based biodiversity surveys. The applicant has high potential for knowledge transfer to the European freshwater science and the implementation of the project. His expertise in river ecology and population genetics, problem-oriented approach as an engineer by training, and international experience will ensure success.

## **022704- FOOTPRINT**

FuncTional tOOls for Pesticide RIsK assessmeNt and management

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*Funding scheme:* STP (Specific Targeted Research Project), FP6

*Project duration:* 1/1/2006 - 6/30/2009

*EC contribution:* € 1 209 762

*Policy drivers:* Ecological Status

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### **Abstract**

FOOTPRINT aims at developing a suite of three pesticide risk prediction and management tools, for use by three different end-user communities: farmers and extension advisors at the farm scale, water managers at the catchment scale and policy makers/registration authorities at the national/EU scale.

The tools will be based on state-of-the-art knowledge of processes, factors and landscape attributes influencing pesticide fate in the environment and will integrate innovative components which will allow users to:

- i) identify the dominant contamination pathways and sources of pesticide contamination in the landscape;
- ii) estimate pesticide concentrations in local groundwater resources and surface water abstraction sources;
- iii) make scientifically-based assessments of how the implementation of mitigation strategies will reduce pesticide contamination of adjacent water resources.

The three tools will share the same overall philosophy and underlying science and will therefore provide a coherent and integrated solution to pesticide risk assessment and risk reduction from the scale of the farm to the EU scale. The predictive reliability and usability of the tools will be assessed through a substantial programme of piloting and evaluation tests at the field, farm, catchment and national scales.

The tools developed within FOOTPRINT will allow stakeholders to make consistent and robust assessments of the risk of contamination to water bodies at a range of scales relevant to management, mitigation and regulation (farm, catchment and national/EU). They will in particular i) allow pesticide users to assess whether their pesticide practices ensure the protection of local water bodies and, ii) provide site-specific mitigation recommendations. The FOOTPRINT tools are expected to make a direct contribution to the revision of the Directive 91/414/EC, the implementation of the Water Framework Directive and the future Thematic Strategy on the Sustainable Use of Pesticides.

## **263287- FreshMon**

High Resolution Fresh Monitoring: FreshMon GMES Downstream Services

[www.freshmon.eu/](http://www.freshmon.eu/)

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*Funding scheme:* CP (Collaborative Project), FP7

*Project duration:* 12/1/2010 - 11/30/2013

*EC contribution:* € 2 160 000

*Policy drivers:* Ecological Status  
Hydromorphology

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### **Abstract**

In-land aquatic systems are under significant pressure from agriculture, economical development and climate change. EU water policy consists of several European directives; most important the Water Framework Directive (WFD) to sustain aquatic ecosystems. Monitoring programmes have been defined that require a coherent and comprehensive overview about the water status within each river basin and lake district, i.e. continuous and frequent high resolution water quality map products are required. Earth Observation (EO) products improve the capability for harmonized monitoring of water constituents at catchment scale, indicating impacts on water quality and changes within the aquatic ecosystem directly.

The FRESHMON consortium will develop a new service-line for the frequent provision of Earth Observation based products for water quality monitoring, combining in situ and hydrodynamic modelling components and integrating the information in a GIS,. The users targeted by FRESHMON are international, national and state-wide authorities, who have a mandate for coordinating the implementation of the WFD. Additional users are national and international private entities, who are dealing with water quality and related issues. By providing high-resolution spatial geo-information on water quality parameters a wide group of user needs is addressed, that cannot be satisfied by existing GMES Core services. The main objective is to create continuous and well accepted downstream services for inland water monitoring at European level, through:

- \* methodological research in improving and harmonizing different EO-based methodologies for retrieving water constituents and water depth
- \* establishment of validation and quality management standards with end users
- \* providing customization, confidence and acceptance of EO products for end users
- \* establishment of a European business network of Downstream inland water service providers and end-users

## **251785- FRESIS**

Freshwater invasive species in Europe: control, prevention and eradication

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 5/1/2010 - 4/30/2012

*EC contribution:* € 172 740

*Policy drivers:* Ecological Status

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### **Abstract**

Invasive species together with climate change are currently the greatest threats to biodiversity worldwide and constitutes a great challenge to scientist, environmental managers, the water industry and the society at pan-European and international levels. Consequently, national and international organizations have defined action plans to control and prevent invasions which are structured into three main axes: (i) control, (ii) prevention and (iii) eradication. The FRESIS project proposes an integrative and multidisciplinary approach to implement these three major axes of action that will contribute towards and enhance the competitiveness of Europe in the management of biological invasions. First, multivariate statistical modelling will be used to identify multiple factors that affect the occurrence and abundance of freshwater invasive species. Second, the artificial-intelligence algorithm GARP will be used to model the ecological niche of freshwater invasive species that are afterward mapped using GIS tools. Spatial modelling is directed to (i) understand the actual distribution of invasive species, (ii) their potential range-of-invasion, and (iii) forecast shifts in geographical range due to global changes. Finally, bioassays will be designed to evaluate an innovative cost-efficient green technology to mitigate biofouling: the BioBullets. The combination of traditional and modern statistical modelling together with ecological niche models and bioassays constitutes an innovative approach to freshwater invasive species and will provide outstanding and unique results regarding the ecology, distribution and eradication of aquatic invasions. I highlight the multidisciplinary aspect of this project requiring abilities in ecology, limnology, geography, statistics and chemical engineering. Given the high ecological and economic costs of invasive species, the project has a strategic impact in Europe, both from scientific, economic and social points of view.

## **276358- GEN-RESP**

Evaluation of the genetic response to climatic changes: the demographic history of the cottoid fish flock from Baikal.

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 6/1/2011 - 8/31/2011

*EC contribution:* € 193 564

*Policy drivers:* Ecological Status  
Hydromorphology

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### **Abstract**

Little is known about the evolutionary response of species to climate changes because time scales are too long to be directly studied; however recent phylogenetic studies on ancient lakes taxa suggest that climate- and/or geological-induced environmental changes can be reconstructed by analyzing genetic patterns within and among species. Lake Baikal is the most voluminous and deepest freshwater lake in the world. Therefore population genetics patterns can be compared between populations over a latitudinal range from the northern to the Southern basin (650 km) but as well over a large bathymetric range (1600m). Very little population genetics researches have been conducted on endemic Baikal species probably due to geopolitics and sampling difficulties. The endemic cottoid fishes flock contains only 33 described species. Our project attempts to combine population genetics, demographic and paleoclimatic data to investigate the effects of major climatic and geological changes on the Baikal endemic ichthyofauna given the various cottoid fishes habitats (e.g. benthic/pelagic species, shallow water/deep water species, latitudinal differences). We will genotype populations of 6 target sculpin species from different habitat types using 15 microsatellites. For the analytic part of the project we will use the Approximate Bayesian Computation methods, recent model-based methods used in very diverse fields. To reconstruct the recent evolutionary history of species or populations these methods use genetic data to test alternative models of speciation and genetic divergence. One of the main advantages of these methods is their flexibility; there is indeed no a priori limitation on the demographic models that can be built in terms of number of species involved, population structure, and demographic events. Our project will help elucidating the effects of global climatic changes on the general dynamics of diversification, loss of variation, adaptive radiations and speciation events.

## **282915- GEOWOW**

GEOSS interoperability for Weather, Ocean and Water

[www.geowow.eu/project.html](http://www.geowow.eu/project.html)

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*Funding scheme:* CP (Collaborative Project), FP7

*Project duration:* 9/1/2011 - 8/31/2014

*EC contribution:* € 6 999 122

*Policy drivers:* Ecological Status

Floods

Science-policy Interface

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### **Abstract**

GEOWOW (GEOSS Interoperability for Weather, Ocean and Water) is the responds to call ENV.2011.4.1.3-1 Inter-operable integration of shared Earth Observations in the Global Context.

The objectives of GEOWOW are to:

- Propose and validate a distributed architectural model federating Earth observation and other Earth Science data holdings, including specific communities' infrastructures, and put this model forward as the European contribution to the GEOSS Common Infrastructure (GCI) and its evolution toward a wider GEOSS architecture;
- Develop innovative methods for harmonized access and use of heterogeneous data, services, and models to foster the sharing of knowledge among multiple disciplines, and the more integrated assessment and understanding necessary to advance global sustainability research;
- Contribute to the GCI interoperability, standardisation and operability via developments and evolution;
- Develop and support services for data dissemination, access, use (and processing) for the selected SBAs, contributing to the development of assessment tools and monitoring methods for sustainable development;
- Establish, harmonise and promote data sharing and usage procedures consistent with the GEOSS Data Sharing Implementation Guidelines, and contribute to the development of the GEOSS Data CORE.
- Provide harmonized and fast data access for meteorological hazards/extreme events, e.g., floods, including pre-processing services aimed at making the data of immediate use;
- Deploy an e-infrastructure giving access to in-situ and satellite data as needed by hydrological application and Run-off process;

- Support and enhance the access to in-situ and satellite ocean observations, to information on threats to ocean ecosystems, and to key ocean forecasts and projections - for research and assessment.  
A particular focus will be on supporting inter-disciplinary interoperability and on the use of semantics for enhanced discovery of data in the selected SBAs' domains.

## **031077- GLUES**

### **A MODEL-DATA FUSION SYSTEM FOR GLOBAL FUSION OF ECOSYSTEM OBSERVATIONS, BIOGEOCHEMICAL MODELLING AND SPATIAL DATA SETS**

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 4/1/2006 - 3/31/2007

*EC contribution:* € 40 000

*Policy drivers:* Ecological Status  
hydromorphology

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#### **Abstract**

The proposal aims at improved biogeochemical ecosystem modelling through the integration of ecosystem site level and spatial data (e.g. remote sensing) in a model-data fusion approach. For that purpose, global eddy covariance net ecosystem carbon and water flux data from all available biomes will be subject to quality control, processing and uncertainty estimation. Subsequently, a synthesis of those data sets with respect to carbon-water cycle interactions will be performed and a robust Bayesian inverse modeling system will be developed to constrain ecosystem models with those data. Furthermore, the merit of adding spatial model constraints, that bridge the scale gap between ecosystem site and continental level will be analysed. For this purpose uncertainties of the spatial data sets will be quantified and these data sets used to improve structure and parameterisation of a prognostic ecosystem model. Thus, for the first time a Bayesian robust inverse modelling tool for biogeochemical modeling will be developed and be applied to simultaneously add local ecosystem-level and spatial constraints to a biogeochemical model. The project will be carried out via the establishment of a strong Independent Junior Research Group at one of the core centres of European biogeochemical cycle research, that is crucially involved in the CARBOEUROPE and NITROEUROPE Integrated projects. The scientific issues addressed in the proposal (environmental data integration through advanced computational methods) will be of wide interest during the coming decades, not only for carbon cycle science. These scientific prospects in combination with the extraordinary research environment at the host render a successful long-term establishment of the applicant very likely. The proposal is related to European policy positions such as the UN Framework Convention on Climate Change and the Kyoto protocol, since it contributes to spatial continental carbon accounting.

## **269985- GOLDFISH**

Detection of Watercourse Contamination in Developing Countries using Sensor Networks

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*Funding scheme:* CP (Collaborative Project), FP7

*Project duration:* 10/31/2011 - 10/31/2014

*EC contribution:* € 1 681 968

*Policy drivers:* Ecological Status

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### **Abstract**

Preserving unpolluted ecosystems is of vital importance to the whole world. Rivers play an important role in the ecosystem preservation as, if they not protected, this will contribute to spreading contamination in the surrounding areas. Tracking of contamination in watercourses requires a system that persistently monitors the presence of specific chemical agents in the water. Deployment of such systems, being relatively easy in urbanized areas, remains a great challenge in remote unpopulated areas without infrastructure.

With this motivation, GOLDFISH is focused on investigating technological means for tracking pollution in remote rivers using sensor network technology.

As the ecosystems of the Amazon jungle and the Andean mountains are of utmost global importance, rivers in these areas have been chosen for testing and pilot deployment of the GOLDFISH system.

The GOLDFISH project will employ European ICT research capabilities for designing, development, testing and piloting of a system that aids localization of pollution in watercourses. GOLDFISH will make sure that its target solution will provide an affordable, technologically efficient, and easy to deploy and operate ICT system.

More particularly, the core of the GOLDFISH solution will consist of a sensor network, management and data processing system. The sensor network is composed of sensor clusters and gateways. A sensors cluster will be located under water in a watercourse and it will be composed of: a set of chemical sensors, a processing unit and an antenna assembled in one waterproof structure. All the measurement results gathered via chemical sensors is transmitted to the gateways and further, via satellite communication links, to the central Monitoring and Management Station (MMS). MMS will process the data as they are being received in order to immediately detect conditions that indicate the presence of contaminating substances in water.

The GOLDFISH system will be designed and produced by the EU partners of the GOLDFISH consortium, including three universities and two SMEs, using EU research and technological (hardware and software) know-how and EU-manufactured equipment such as chemical sensors, signal interfaces, network

processing units, transceivers, antennas, gateways, etc. The ICT system will be tested in Europe and Latin America.

## **230636- GREEN ROOF SYSTEMS**

Collaborative research and development of green roof system technology

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 5/1/2009 - 4/30/2013

*EC contribution:* € 1 185 261

*Policy drivers:* Ecological Status

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### **Abstract**

In the last 20 years green roofs (vegetated layers that sit on top of the conventional roof surfaces of a building) have become relatively commonplace in Germany, Austria and Switzerland because of their role in urban stormwater management. In particular, the so-called 'extensive' green roof technology (very lightweight, low maintenance, vegetated roof surfaces) has been adopted widely because of its capacity to be 'retro-fitted' onto existing buildings, or incorporated onto new buildings without the need for major structural modification or support. Specific benefits of green roofs include: a) Overall reduction of rainfall run-off and attenuation of storm run-off; b) Summer cooling and reducing the urban heat island effect; c) Contribution to biodiversity e.g. ground-nesting birds; d) Improved quality of life for urban citizens; e) Extended roof life: a roof life is at least doubled with the addition of a green roof. This project seeks to establish a long term partnership between a leading commercial provider of green roof technology (Zinco) and an internationally leading research institution (University of Sheffield) through a collaborative programme of research and development and a suite of knowledge transfer activities. The project brings together established academic researchers with technicians, engineers and marketing specialists from Zinco each with highly relevant expertise in key areas. There is a balance of longer term and short term staff exchanges at different levels throughout the programme as well as recruitment of experienced researchers to fulfill particular tasks within the collaborative programme. This innovative programme of interdisciplinary research is targeted to fill a research gap that is constraining the development and exploitation of urban green roof technologies in the EU.

## **036306- HEALTHY-WATER**

### **ASSESSMENT OF HUMAN HEALTH IMPACTS FROM EMERGING MICROBIAL PATHOGENS IN DRINKING WATER BY MOLECULAR AND EPIDEMIOLOGICAL STUDIES**

[http://www.helmholtz-hzi.de/en/healthy\\_water](http://www.helmholtz-hzi.de/en/healthy_water)

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*Funding scheme:* STP (Specific Targeted Research Project), FP6

*Project duration:* 10/1/2006 - 3/31/2010

*EC contribution:* € 2 400 000

*Policy drivers:* Ecological Status

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#### **Abstract**

The overall goal of the project is to advance our knowledge on pathogenesis of emergent microbial pathogens in drinking water to understand their transmission to humans. The project will focus on all major types of pathogens, i.e. viruses, bacteria and protozoa, and will concentrate on a representative set of European drinking water supply systems and source waters of specific sensitivity to human health. This project will build on the output of the MicroRisk project by focussing on water systems that are in general not as well protected as the systems within MicroRisk. To reach the overall goal the following detailed objectives are approached: 1. Validation and application of detection technologies for emerging microbial pathogens based on nucleic acids. 2. Molecular survey and comparative detailed study of emerging pathogens in European drinking water sources and supply systems. 3. Understanding the human health impact of emerging pathogens by primary epidemiological studies targeted at specific systems and pathogens. 4. Determination of epidemiological correlations with molecular and environmental data and assessment of risk for waterborne microbial infections in Europe. An integrated research approach will be pursued to achieve these objectives by combining molecular and classical detection, activity assessment and epidemiological understanding of emerging pathogens in a specific set of drinking water systems from different European regions. The project will generate validated detection technologies for the targeted waterborne pathogens and reveal possible routes of transmission to humans via drinking water consumption. This new knowledge will provide guidance to improve the hygienic quality of European drinking water supplies and reduce the burden of waterborne infections for the people in Europe.

## **247786- HOBITS**

Hot-spots in biological transformation of silica

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 1/1/2010 - 12/31/2012

*EC contribution:* € 45 000

*Policy drivers:* Ecological Status  
Hydromorphology

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### **Abstract**

Our scientific concept of the silica cycle is evolving rapidly. New research during the first decennium of this new millennium has clearly shown that silica mobilisation from terrestrial habitats to the aquatic continuum is biologically controlled. Vegetation takes up dissolved silica (DSi) from soil and ground-water and temporally stores it as amorphous Si (ASi) in biomass. This new concept of biological buffering of the silica cycle is essential. The relative newness and novelty of the concept means there are still major gaps in our fundamental understanding, and the integration of processes at different spatial and temporal scales is lacking. Addressing these knowledge gaps is essential. The silica cycle is closely connected to the carbon cycle. Mineral weathering of silicates is an important sink for atmospheric CO<sub>2</sub>: incomplete knowledge of the bio-Si buffer impedes the accurate quantification of this sink. Moreover, the import of Si into coastal zones from the terrestrial environment is essential to sustain diatom growth. Diatoms play a key role in the oceanic C-sink and in the eutrophication problems in coastal zones. Wetlands provide prime circumstances for biological silica accumulators like grasses, sedges and diatoms to flourish. In this context, tropical rivers attract special attention. They transport huge amounts of suspended material of biological origin into coastal zones. Yet, these areas have received virtually no scientific attention regarding silica biogeochemistry. In this proposal, we aim to conduct studies in two tropical systems, which can be considered hot-spots for biological Si cycling: the Okavango Delta (Kenya) and the Fly River (Papua New Guinea). The overall objective of the proposed research is to increase our understanding of the biological Si processing in tropical river systems. The objectives will be met both through well-planned sampling expeditions and analysis.

## **275577- HOLRIVERMED**

Environmental River Management: An Innovative Holistic Approach for Mediterranean Streams

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 9/1/2011 - 8/31/2013

*EC contribution:* € 166 565

*Policy drivers:* Ecological Status  
Hydromorphology

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### **Abstract**

Within the Mediterranean area water abstractions strongly affect water-related organisms, increasing the duration and magnitude of droughts and impairing the capacity of streams to support the ecosystem. This alteration of the natural flow regime act on biota through an hydro-morphologic template. Consequently, the development of models and methods able to relate stream flow alterations and the ecological responses of aquatic and riparian species (such as vegetation, macroinvertebrates and fish) is a fundamental issue for water resources management, including the maintenance of water quality and quantity for wildlife conservation.

In response to the lack of available information and to the present scientific criticisms, this project aims to devise improvements for the environmental management of Mediterranean streams (i) for a comprehensive analysis of the various taxonomic and functional groups composing the riverine ecosystem, (ii) to represent rivers at large spatial and temporal scales and (iii) to provide knowledge and the ecological understanding of temporary and intermittent watercourses. Furthermore, flexible tools will be developed for the efficient implementation of the obtained methodologies and the applications within different Mediterranean river basins will contribute to the development of a sustainable water resources management at European level.

The project also represents a strong possibility for the fellow researcher to boost his competences in several disciplines (such as hydraulics, hydrology and ecology) and to foster multidisciplinary collaborations, in order to reach professional maturity, bring forth high-level research and establish long-term, high quality activities and education in Europe.

## **276680- HUMADE**

Structural and functional biodiversity of humic matter degrading freshwater microbial communities

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 5/1/2011 - 10/31/2013

*EC contribution:* € 62 500

*Policy drivers:* Ecological Status

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### **Abstract**

Humic substances (HS) are complex and heterogeneous mixtures of polymers formed in soils, sediments and natural waters during the decay of plant biomass. HS represent an important carbon source in aquatic environments accounting for up to 80% of the total dissolved organic carbon (DOC). Historically, HS were considered to be biologically inert but discovery of the “microbial loop” changed this view in which DOC enters planktonic food webs through incorporation into bacterial biomass and protozoan grazing upon bacteria.

Despite extensive research it is still not clear how exactly HS are converted and degraded by microorganisms in nature. We particularly lack a detailed understanding of the metabolic diversity present in a community that is used to attack the complex structure of these heterogeneous polymers. Based on current structural concepts it is assumed that HS cannot be degraded by simple enzymatic reactions but rather by a combination of different enzymes including peroxidases, phenol oxidases and many carbohydrate active enzymes.

The proposed project aims to resolve the genomic and metabolic diversity of freshwater microbial communities involved in HS cycling using state of the art sequencing-based approaches. Metagenomic and metatranscriptomic approaches will be used to perform in-depth genomic analysis of freshwater microbial communities and to study their physiological response to HS based on gene-expression analysis. Different habitats and ecological niches will be sampled and analyzed to enable detailed comparative analysis (e.g. aerobic vs. anaerobic habitats).

Considering the environmental and economic importance of HS it is very important to understand mechanisms involved in HS cycling in nature. The proposed project will provide the scientific community with a detailed description of microbial diversity and activity involved in freshwater HS cycling and the data will be a valuable foundation for future research in this field.

## **021860- INTERACT**

Improving EU-risk assessment of toxicants for aquatic communities by considering competition on the population and community level

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 3/5/2006 - 3/4/2008

*EC contribution:* € 157 063

*Policy drivers:* Ecological Status  
Chemical aspects

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### **Abstract**

At present prospective risk assessment (RA) of toxicants is based on laboratory single-species tests and field test systems used in regulatory testing (91/414/EEC). Retrospective effects of contaminants are assessed by field monitoring (2000/60/EEC). The EU-SETAC workshop "EPIF" (France, 2004) identified a gap between the results of prospective and retrospective RA: Prospective RA should be improved by integrating environmental parameter. Competition was identified as such a parameter as it is ubiquitous present in natural populations and communities. Hence, there is an urgent need to incorporate this parameter into future RA. Also recent papers of the applicant and studies of other authors indicate the great importance of competition for forecasting chronic effects of toxicants on the community level. However, it remains the question on how to integrate competition in RA. In the light of this situation the aim of the project "INTERACT" is to improve the scientific basis of risk assessment concerning the parameter competition. To achieve this, investigations of the role of competition will be conducted on three levels of biological organisation: (i) a one-species system of aquatic invertebrates (ii) a two-species system (iii) and a multi-species mesocosm system with a nearly natural aquatic invertebrate community. The expected major outputs of "INTERACT" will be: (a) basic ecotoxicological knowledge about the interaction of toxicants and competition. On the basis of this mechanistic understanding additional outputs of the project will be (b) support for the interpretation of the above-mentioned regulatory tests and (c) of field monitoring data from retrospective RA according the EU water framework directive. The applicant has a strong interest to conduct his work at the working group "Effect propagation" at the UFZ as this group is an international accepted in this field and organized the EU EPIF workshop on this topic as mentioned above.

## **509167- INTREAT**

Integrated Treatment of Industrial Wastes towards Prevention of regional Water Resources Contamination

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*Funding scheme:* STP (Specific Targeted Research Project), FP6

*Project duration:* 8/1/2004 - 7/31/2007

*EC contribution:* € 1 000 000

*Policy drivers:* Ecological Status  
Chemical aspects

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### **Abstract**

The Western Balkan Peninsula is rich in natural resources. Among the most important of them are considered the polymetallic complex sulphide ore deposits used for the production of base and precious metals. Exploitation of these ore deposits, one of the most dynamic sectors in the Western Balkan region, along with metal extraction that follows cause severe environmental pollution problems in the area, related to contamination of soil and surface-groundwater. This project addresses environmental pollution problems associated with solid and liquid wastes/effluents produced by complex sulphide ore mining and metallurgical activities in two Western Balkan countries, in order to develop preventive and remedial technologies aiming at waste minimization, remediation of waste disposal sites and ultimately prevention of the regional water resources contamination. In order to achieve this objective, the project deals with (a) harmonization of the environmental legislation in Western Balkan countries through implementation of the relative EU directives and particularly the IPPC directive, (b) identification and full characterization of the major pollution sources at the selected sites in the two Western Balkan countries and evaluation of the risk for humans and ecosystem on a source-pathway-target principle and (c) development of an innovative and cost effective integrated management scheme aiming at waste minimization, prevention of surface-groundwater contamination and safeguarding the ecosystem of the affected areas. The strategic objective of this project is the reinforcement of environmental protection, one of the three distinct pillars on which sustainable development for both developed and developing countries is based. It is hoped that this will be one of the first steps towards sustainable development of mining and metallurgical industry in Western Balkan countries setting the basis for social cohesion, peace, political stability and prosperity.

## **021571- ISFREM**

### **IMPROVED SPATIAL FRAMEWORKS FOR RIVER ENVIRONMENT MANAGEMENT**

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 10/2/2006 - 10/1/2008

*EC contribution:* € 216 291

*Policy drivers:* Ecological Status

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#### **Abstract**

European Water Framework Directives such as reaching a 'good ecological status' require that achievable conditions be assessed, and restoration targets are set, over large areas. In this context, spatial frameworks (delineation of ecological pattern) are used to predict ecological potential over large scales and to implement harmonious ecological objectives. We propose to undertake management-oriented research to develop new spatial frameworks for river management. Methods, developed by the researcher in New Zealand, provide high spatial resolution ecological classifications of rivers and use advances in Geographic Information System and classification methods. In contrast with existing regionalisation approaches (subdividing landscapes into large regions), they classify individual segments of digital representations of river networks using functionally important ecological attributes (of the segment or inherited from the river's catchment through the network structure). Our first and second objectives are to define new classifications and compare them with existing regionalisations. Tests will be based on taxonomic and functional descriptions (e.g., biological traits) of river ecosystems. Objective three is to use the classifications to extrapolate existing general ecological models to entire river systems (e.g., models of ecological responses to flow modifications). The work will be based on available databases, models and tools. Tests using functional descriptors are uncommon and can demonstrate the generality of our approach. Spatial extrapolation of ecological models will increase their value as management and research tools. The researcher will work in an environment with a strong background in ecological research, modelling and spatial framework development. The project will benefit international and national research projects that use spatial frameworks and ecological models.

## **211386- ISOIL**

Interactions between soil related sciences - Linking geophysics, soil science and digital soil mapping

[www.isoil.info/](http://www.isoil.info/)

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*Funding scheme:* CP (Collaborative Project), FP7

*Project duration:* 6/1/2008 - 11/30/2011

*EC contribution:* € 3 420 623

*Policy drivers:* Ecological Status  
Hydromorphology

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### **Abstract**

As formulated in the Thematic Strategy for Soil Protection prepared by the European Commission soil degradation is a serious problem in Europe. The degradation is driven or exacerbated by human activity and has a direct impact on water and air quality, biodiversity, climate and human life-quality. High-resolution soil property maps are one major prerequisite for the specific protection of soil functions and restoration of degraded soils as well as sustainable land use, water and environmental management. However, the currently available techniques for (digital) soil mapping still have deficiencies in terms of reliability and precision, the feasibility of investigation of large areas (e.g. catchments and landscapes) and the assessment of soil degradation threats at this scale. A further quandary is the insufficient degree of dissemination of knowledge between the scientific community, relevant authorities and prospective users and deficiencies in standardisation. The focus of the iSOIL project is on improving fast and reliable mapping of soil properties, soil functions and soil degradation threats. This requires the improvement as well as integration of geophysical and spectroscopic measurement techniques in combination with advanced soil sampling approaches, pedometrical and pedophysical approaches. An important aspect of the project is the sustainable dissemination of the technologies and concepts developed. For this purpose guidelines will be written and published. Furthermore, the results will be implemented in national and European soil databases. The present state of technologies and future perspectives will also be transferred to authorities, providers of technologies (SMEs), and end users through workshops at regional level, international conferences and publications throughout the duration of the project.

## **029133- KARSTANPS**

### **TRANSPORT AND ATTENUATION OF NON-POINT SOURCE POLLUTANTS IN KARSTIC AQUIFERS**

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 1/1/2006 - 12/31/2007

*EC contribution:* € 80 000

*Policy drivers:* Ecological Status

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#### **Abstract**

The principle objective of the proposed project is to investigate the influence of non-point source pollutant releases on water supply wells in karstic flow zones. The proposed study site is the karstic aquifer of Mount Nif, which is hydraulically connected to valuable water resources for city of Izmir. The study will primarily focus on nitrate and pesticide releases and their mobilities in karstic aquifers. There are three main objectives of the proposed study: (1) Investigate nitrate and pesticide transport characteristics in karst aquifers, under saturated and unsaturated conditions, (2) develop several non-point source pollutant release scenarios, and evaluate these using numerical model applications, (3) define wellhead protection buffer zones that will be based on findings from tracer and modelling studies. Following a thorough hydrogeological site characterisation, intact core samples will be collected from the site for laboratory column studies. Transport and attenuation of nitrate and atrazine will be studied under saturated and unsaturated flow conditions. A 1-D numerical model will be developed and model parameters will be fitted to column test results in order to obtain nitrate and atrazine migration properties in karst soil. Tracer experiments will be conducted by mimicking a non-point source release, and by using an injection well with the assumption of a previous release having reached the water table. Breakthrough of tracer concentrations at monitoring wells will be observed. Using a detailed 3-D flow and transport model that will be calibrated to tracer experiment results, effects of several non-point source release scenarios on nearby water resources will be evaluated. Also, wellhead protection buffer zones will be defined by modelling. The researcher will apply knowledge and expertise gained in the U.S.A to conduct this study. The number of studies of this nature is limited in Turkey as the researcher's field of expertise is still unexploited.

## **035695- KEYBIOEFFECTS**

Cause-effect relationships of key pollutants on the European rivers biodiversity

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 10/1/2006 - 9/30/2010

*EC contribution:* € 3 410 617

*Policy drivers:* Ecological Status

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### **Abstract**

The overall objective of KEYBIOEFFECTS is to provide new generations of scientists with the skills needed to assess the effects of pollution on European Rivers' biodiversity. The scientific objective of this project is to provide a better understanding of the causes of ecological quality loss and the cause-effect relationships of pollution and to derive from this knowledge practical tools for water quality assessment. The development of complementary tools is crucial to achieving this objective: the identification of key toxicants, the quantification of the influence of environmental conditions on toxicant bioavailability, the assessment of these effects at the organism, on populations, on communities and ecosystems, and testing in micro- and mesocosms will result in the description of cause-effect relationships and allow the modelling of toxicant effects on the biota. This RTN will achieve the training and scientific objectives as well as the Transfer of Knowledge to end-users by providing training in the required competences and abilities to early-stage researchers (ESR) and by the participation of water agencies and SME in research, training and the elaboration of "case-oriented guidelines for assessing pollution effects in European Rivers". The trainees will achieve the required competences by training through research in different institutions, in courses covering the basis of fundamental and applied research issues and by a practicum in a water agency or an enterprise involved in water pollution assessment. For each ESR, a senior researcher will assume the role of a tutor responsible for a clear definition of the working plan, for the supervision of training through research activities and the coordination of the ESR mobility plan. Twelve [12] PhD projects and five [5] post-doc projects covering the specific objectives and corresponding tasks of research, training and transfer of knowledge of KEYBIOEFFECTS are proposed.

## **283157- LAGOONS**

Integrated water resources and coastal zone management in European lagoons in the context of climate change

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*Funding scheme:* CP (Collaborative Project), FP7

*Project duration:* 10/1/2011 - 9/30/2014

*EC contribution:* € 2 545 660

*Policy drivers:* Ecological Status

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### **Abstract**

**Issue:** The environmental issue of concern of the LAGOONS project is the anthropogenic deterioration and climate change impacts - especially the effects of extreme weather events- on surface water and lagoons ecosystems.

**Objectives:** The main objective of the LAGOONS project is to contribute to a science-based seamless strategy - in an integrated and coordinated fashion - of the management of lagoons seen under the land-sea and science-policy-stakeholder interface; i.e., the project seek to underpin the integration of the EU Water Framework Directive, Habitat Directive, the EU's ICZM Recommendation, and the EU Marine Strategy Directive.

**Methodology:** Four case study lagoons have been selected to represent a set of "hotspot" coastal lagoons with a wide and balanced geographical distribution and different characteristics. The lagoons included are: Vistula Lagoon in Baltic Sea (transboundary Poland/Russia); Tylygulskiy Lagoon in Black Sea (Ukraine); Ria de Aveiro Lagoon in Atlantic Ocean (Portugal), and Mar Menor in the Mediterranean Sea (Spain). By means of elaborating integrated strategies for sustainable development of the case study lagoons in the climate change context, the LAGOONS project will contribute to the goals of the Call showing that it is possible to enhance connectivity between research and policy-making in a lagoons context using a proactive approach to water issues, which assures more efficient use of existing research results.

**Impact:** In management terms, LAGOONS will contribute to the decision-support methodologies for a coordinated approach to the Water Framework Directive and the Marine Strategy Directive. In addition, LAGOONS will propose actions to tackle bottlenecks in the context of climate change, i.e., LAGOONS will propose actions foreseen in the goals of the Europe 2020 strategy - A strategy for smart, sustainable and inclusive growth.

## **211372- LIFEWATCH**

Life Watch

[www.lifewatch.eu/](http://www.lifewatch.eu/)

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*Funding scheme:* CSA (Coordination - or networking - action), FP7

*Project duration:* 2/1/2008 - 1/31/2011

*EC contribution:* € 4 999 998

*Policy drivers:* Ecological Status

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### **Abstract**

The Life Watch e-Science and Technology Infrastructure for biodiversity data and observatories will be a large-scale European research infrastructure bringing together: -a system of marine, terrestrial and freshwater observatories; - common access to a huge amount of interlinked, distributed data from databases and monitoring sites; -computational facilities in virtual laboratories with analytical and modelling tools; -targeted user and training support and a programme for public services. The biodiversity research infrastructure will open up new and exciting research opportunities, and will help to enhance the understanding and sustainable management of our natural environment. This preparatory project brings together the interested EU Member and Associated States with the objective to prepare a cooperation agreement on the construction and maintenance of the Life Watch research infrastructure. In addition, the leading networks in biodiversity science and stakeholder institutes are preparing the organisation and logistics for the following construction phase. The current project delivers the technical, legal and financial preparations required for entering and managing the Construction Phase. A range of policy issues are resolved with respect the organisation of the distributed infrastructure, its legal implications, construction logistics, user service, cost analysis and planning. In addition the project makes the necessary preparations in the domain of risk management and quality control. The project is planned to take three years. A Policy and Science Board, populated by the representatives of fourteen potentially interested partner countries and eight cooperating scientific networks, oversees the progress of the preparations. The individual members of the Board act as the liaison with their political domains and the research communities, respectively.

## **224890- LUSOAQUABARCODE**

Implementing DNA barcoding into aquatic biodiversity research in Portugal and priming new macrobenthos monitoring tools

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 9/8/2008 - 9/7/2011

*EC contribution:* € 45 000

*Policy drivers:* Ecological Status

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### **Abstract**

DNA barcoding - a research approach that aims to simplify species identifications and accelerate the inventory of the world's biodiversity - is being gradually implemented worldwide, but only recently a specific framework started to be organized at the European level. Luso-AquaBarcode aims to implement DNA barcoding into aquatic biodiversity research in Portugal, thereby standing at the forefront of the activation of this approach in Europe, and acting as a model project at the European level. Given its large, diverse and rich EEZ, Portugal is an ideal country within Europe to implement this project. With the introduction of the EC's Water Framework Directive, there will be greater demand for tools to expedite macrobenthos monitoring. This proposal also aims to prime the development of DNA barcoding-based tools for species identification in marine and freshwater macrobenthic communities. This proposal constitutes an objective capitalization of the research and management skills acquired by the fellow during his mobility programme at Bangor University, UK. Upon initiation of this project the fellow will have completed 5 years of Post-Doctoral activity, and therefore it is in an appropriate timing to start up a career as an independent academic. The fellow will be hosted by the Department of Biology at the University of Minho, Portugal, where he will be assigned to a starting academic position, and will be granted opportunity to lead his research group within the Centre for Molecular and Environmental Biology. Luso-Aquabarcode will provide the fellow with a significant head start for a swift integration in the institution and work environment while enabling him to expand current research endeavours. This will greatly contribute for the development of the fellow's appointment into a permanent academic position. Hence, this proposal will be key for the development of a coherent professional project and to improve the fellows' long-term career prospects.

## **219818- MARURBE**

Sustainable Urban Development: solutions to promote the biological and conservation value of marine urban structures.

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 3/7/2008 - 3/6/2010

*EC contribution:* € 171 469

*Policy drivers:* Ecological Status  
Hydromorphology

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### **Abstract**

Urbanization has been historically widespread and one of the leading causes for habitat and species loss in coastal waters. Today 22,000 km<sup>2</sup> of the European coastlines are covered by urban marine structures such as marinas, breakwaters, and seawalls, and development is expected to increase further. However, understanding and mitigating the effects of urban structures on marine life have not been a top priority in marine science and conservation. MarUrbe aims to encourage sustainable management of coastal urban structures by acquiring and disseminating knowledge on methods to promote desired species or prevent nuisance species in order to meet specific management goals, including 1) mitigating loss of species with high conservation value (e.g. *Cystoseira* spp.), 2) monitoring/controlling the spread of invasive/nuisance species, 3) enhancing fishery resources (e.g. mussels, crabs, and fish stocks) and 4) improving water quality. These goals will be achieved by: 1) exploring, through monitoring and experiments, the relationships between the characteristics of urban marine structures, species distribution and ecological functioning; 2) experimentally testing the effects of fine structural modifications to urban marine structures on the distribution of target species and 3) open communication with the public, local authorities and the scientific community. Expected deliverables include baseline information on the relationships between structure and ecological functioning of urban marine structures, protocols for enhancing or restricting the abundance of target species, and site-specific management guidelines. The links between MarUrbe and the inter-disciplinary international and national research initiatives in which the host laboratory is involved, will be one of the keys to the successful transfer of knowledge and establishment of collaboration, and will contribute greatly to my own scientific knowledge and career.

## **022222- MATEMIN**

Mating incompatibility among toxic and non-toxic strains of the dinoflagellate *Alexandrium minutum*

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 9/1/2005 - 2/28/2007

*EC contribution:* -

*Policy drivers:* Ecological Status

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### **Abstract**

In modern society, incidents concerning Harmful Algal Blooms (HABs) are reported with an alarming frequency and there has been an apparent increase in HABs throughout the world over the last decades. Among the multiple poisoning syndromes linked to HABs, Paralytic Shellfish Poisoning (PSP) is the most widespread and significant on a global basis. Dinoflagellates within the genus *Alexandrium* are responsible for many of the PSP outbreaks in Europe. The geographic expansion of toxin-producing species, and in particular of species with the capability to form cysts, is believed to be aided by human activities such as the use of ballast water or the movement of shellfish stock from one area to another. The objective of the proposed study is to investigate a significant constraint to colonization of a new area by an introduced organism, namely reproductive barriers within a species, and in particular, between European toxic and non-toxic strains of the dinoflagellate *Alexandrium minutum*. The hypothesis is that mating between toxic and non-toxic populations results in cysts with a low viability. In addition, I aim to identify a genetic marker capable of distinguishing between toxic and non-toxic *A. minutum*. The ecological relevance of the proposed study is significant as mating barriers have the potential to affect biogeography of the investigated species as well as formation, persistence and the potential suppression of toxic blooms.

## **036997- MEDINA**

### **ME**Membrane-based Desalination: an INTe

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*Funding scheme:* STP (Specific Targeted Research Project), FP6

*Project duration:* 10/15/2006 - 1/14/2010

*EC contribution:* € 3 295 848

*Policy drivers:* Ecological Status  
Chemical aspects

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### **Abstract**

RO is today the dominant technology in water desalination. However, some critical issues remain open: improvement of water quality, enhancement of the recovery factor, reduction of the unit water cost, minimizing the brine disposal impact. With the aim to solve these problems, an innovative approach based on the integration of different membrane operations in pre-treatment and post-treatment stages is proposed. Expected outcomes and contributions of the research are: i)the development of advanced analytical methods for feedwater characterization, appropriate fouling indicators and prediction tools, procedures and protocols at full-scale desalination facilities; ii)identification of optimal seawater pre-treatment strategies by designing advanced hybrid membrane processes (submerged hollow fiber filtration/reaction, adsorption/ion exchange/ozonation) and comparison with conventional methods; iii)the optimization of RO membrane module configuration, cleaning strategies, reduction of scaling potential by NF; iv)the development of strategies aiming to approach the concept of Zero Liquid Discharge (increasing the water recovery factor up to 95% by using Membrane Distillation - MD;bringing concentrates to solids by Membrane Crystallization or Wind Intensified Enhanced Evaporation) and to reduce the brine disposal environmental impact and cost; v)increase the sustainability of desalination process by reducing energy consumption(evaluation of MD, demonstration of a new energy recovery device for SWRO installations)and use of renewable energy (wind and solar). The research team embodies science and engineering from both the practitioner and academic perspectives. Potential end-users and participating utilities will be involved in research activities and applications. Linkages with ongoing research activities and demonstration studies at full-scale desalination plants will be conducted to ensure the applicability and transfer of the findings of the proposed research project.

## **254361- METALTRANSP**

Characterization of the trace metals transport and interaction mechanisms in zebrafish *Danio rerio* using molecular and stable isotope approaches

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 6/20/2011 - 6/19/2013

*EC contribution:* € 179 603

*Policy drivers:* Ecological Status  
Chemical Aspects

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### **Abstract**

Due to anthropogenic activities, concentrations of both essential and non-essential elements in surface waters are often far above the natural levels imposing a threat to the health of aquatic organisms. At present, Biotic Ligand Model (BLM) is the most widely used computational concept used for setting water quality criteria. It predicts the effects of water chemistry on metal bioavailability and toxicity by linking metal speciation in solution with the amount of accumulated metal and relating that to the toxicity. However, the links between metal accumulation and toxicity are complex. Therefore, to create a model which would effectively correlate laboratory-based predictions and field observations, bioaccumulation processes must be understood and quantified. This requires consideration of not only the total metal accumulated in tissues, but also determination of internal metal reactions, and quantification of uptake, detoxification (metal partitioning) and elimination processes in the organisms. The objectives of the current proposal are to identify the metal transporting proteins in zebrafish *Danio rerio* that are responsible for essential (Cu, Fe, Zn) and non-essential (Cd and Pb) trace metal transport during multimetal exposure and to assess the influence of multimetal interactions on compartmentalization of individual metals in tissues. To address these tasks, gene expression patterns will be correlated to metal uptake *in vivo*. Then, the identified candidate transporters will be over expressed in a *Xenopus* oocyte expression system and metal uptake affinities (Cu, Fe, Zn, Cd and Pb) will be determined. Metal uptake and elimination studies, as well as investigation of the effects from multimetal exposure on distribution of individual metals in the body, will be performed using a novel stable isotope approach, which enables accurate determination of amounts of metal accumulated at low, environmentally relevant exposure concentrations.

## **222343- METELCAD**

Development of a Cost Effective, Low-Maintenance, On-Line Instrument to Detect Heavy Metal Concentrations in Wastewaters

metelcad.eu/

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*Funding scheme:* BSG-SME (Research for SMEs), FP7

*Project duration:* 11/1/2008 - 1/31/2011

*EC contribution:* € 1 015 081

*Policy drivers:* Ecological Status

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### **Abstract**

All contaminated water, whether originating in industry, agriculture or households, causes damage to the environment and to human health. Industrial wastewater, contaminated by heavy metals, migrates to surface and underground water sources. Heavy metals are elements that have a high density and are toxic or poisonous even at low concentrations. In addition to wastewater, sewer sludge, the residual semi-solid material remaining from urban and industrial wastewater treatment processes, also contains high levels of heavy metals. Consortium members of the current METELCAD project recognize that with the advent of increasing environmental EC Directives, there is a critical need in Europe to develop a low cost, and efficient detection technology for metal contaminated wastewater to safeguard public health and reduce pollution and clean up costs. METELCAD will allow consortium SMEs to detect heavy metal presence in industrial wastewater before it is released into the environment or before it reaches the sludge stage. The commercial objective of the proposal is to develop an on-line, low maintenance, on-site, continuous monitoring technology utilizing electrolyte cathode glow discharge technique to monitor heavy metal contaminated wastewaters that are loaded with high fat emulsion. This cost-effective technology will facilitate compliance with EU environmental legislation in a business-friendly manner, facilitating industrial wastewater management. The proposed technology is also relevant to other industrial sectors including ferrous and non-ferrous metals industry.

## **275283- MICROIPB**

Microbial activities of the sulfur cycle in the subsurface of the Iberian Pyritic Belt

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 9/30/2011 - 9/29/2013

*EC contribution:* € 166 565

*Policy drivers:* Ecological Status  
Groundwater

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### **Abstract**

Microbial processes in subsurface ecosystems are of increasing interest due to their implications for mankind, in regards to energy, climate and health. However, these ecosystems are among the least understood. The Iberian Pyritic Belt (IPB), located in southwestern Spain is one of the largest sulfide deposits on Earth. It is of tremendous interest due to its high concentrations of metals (As, Fe, Cu, Zn, Mn, Cr, Ni ..), and constant low pH (mean 2.3) in ground and surface waters. This has been largely attributed to mining practices over the last 5,000 years. However, recent evidence points to subsurface microbial processes contributing significantly to the oxidative processes that lead anomalous metal concentrations and low pH. Next to nothing is known about microorganisms and the processes they mediate in this system. The sulfur cycle occupies a central role in the biogeochemical pathways that occur in this ecosystem. Therefore, the goal of this project is to conduct a multidisciplinary study into the role microorganisms play in the cycling of sulfur, and implications of this on the local geology and groundwater geochemistry within the IPB. This project will innovatively combine tools that span engineering, geology, geochemistry and microbiology to achieve the following: (1) Identify regions where the oxidation of sulfides, both pyritic and non pyritic and the reduction of sulfate are occurring. (2) Determine the relationship between microbial community structure and underlying geochemical changes. (3) Determine microorganisms, mechanisms, and factors controlling pyrite oxidation, sulfide oxidation and sulfate reduction. (4) Develop a geomicrobial model for the sulfur cycle and it affects on local geology and groundwater geochemistry in the IPB. This project responds to key targets set by FP7: It will contribute to the competitiveness of European science by promoting the transfer of knowledge, and by engaging in timely, innovative and novel research.

## **201724- MIDTAL**

### **MICROARRAYS FOR THE DETECTION OF TOXIC ALGAE**

[www.midtal.com/](http://www.midtal.com/)

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*Funding scheme:* CP (Collaborative Project), FP7

*Project duration:* 9/1/2008 - 5/31/2012

*EC contribution:* € 2 234 850

*Policy drivers:* Ecological Status  
Chemical Aspects

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### **Abstract**

Microalgae in marine and brackish waters of Europe regularly cause «harmful effects», considered from the human perspective, in that they threaten public health and cause economic damage to fisheries and tourism. Cyanobacteria cause similar problems in freshwaters. These episodes encompass a broad range of phenomena collectively referred to as «harmful algal blooms» (HABs). They include discoloration of waters by mass occurrences of microalgae (true algal blooms that may or may not be «harmful») to toxin-producing species that may be harmful even in low cell concentrations. A broad classification of HAB distinguishes three groups of toxic organisms. For adequate management of these phenomena, monitoring of microalgae is required. However, the effectiveness of monitoring programmes is limited by the fact that it is time consuming and morphology as determined by light microscopy may be insufficient to give definitive species and toxin attribution. Once cell numbers reach a threshold level, then shellfish are selected to toxin analysis by the mouse bioassay. The mouse bioassay is continued on a daily basis until no more toxin is detected. Molecular and biochemical methods are now available that offer rapid means of both species and toxin detection. In this project we will target rapid species identification using rRNA genes as the target. We include antibodies to specific toxins because even when cell numbers are very low, the toxins can be present and can be accumulated in the shellfish. Microarrays are the state of the art technology in molecular biology for the processing of bulk samples for detection of target RNA/DNA sequences.. The purpose of MIDTAL is to support the common fisheries policy to aid the national monitoring agencies by providing new rapid tools for the identification of toxic algae and their toxins so that they can comply with ECC directive 91/1491/CEE that can be converted to cell numbers and reduce the need for the mouse bioassay.

## **021120- MIR**

### Mineral-fluid Interface Reactivity

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 12/1/2005 - 11/30/2009

*EC contribution:* € 2 129 824

*Policy drivers:* Ecological Status  
Groundwater

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### **Abstract**

The Mineral-fluid Interface Reactivity (MIR) Early Stage Training Network (EST) is comprised of 5 universities located in Germany, France, Spain, Denmark, and the United Kingdom offering structured training for students pursuing a PhD or Masters Degrees. This training program is intended to produce young scientists to fill needs in industry, consulting engineering firms, regulatory agencies, and local government in addition academic positions. The core objective of the MIR network is the training and professional development of young scientists in the state-of-the-art in the field of mineral-fluid reactivity. Mineral-fluid reactions, including dissolution, adsorption, nucleation, precipitation, and solid-solution formation are key to solving such pressing issues as development of smart coatings on body implants or drug delivery systems, minimizing risk in groundwater extraction, safer pesticide application, optimizing CO<sub>2</sub> sequestration, assuring drinking water quality, safe storage of radioactive waste products, and minimizing pollutant transport. The ability to accurately predict reactions in these systems is of utmost importance for municipalities and for industry in Europe today, but it relies on a detailed description of mineral-fluid reactions. Because of the cost of acquiring and maintaining the facilities and the time required to become an expert, only a few of these expertises are available in any single laboratory or any single European country. The MIR network has been created to overcome the limitations by combining forces from University research centers from several countries. This multi-site, international network will provide the cross-disciplinary training that will produce scientists ready to advance the limits of knowledge for true innovative breakthroughs.

## **211732- MIRAGE**

Mediterranean Intermittent River Management

[www.mirage-project.eu/news.php](http://www.mirage-project.eu/news.php)

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*Funding scheme:* CP (Collaborative Project), FP7

*Project duration:* 1/1/2009 - 12/31/2011

*EC contribution:* € 3 498 479

*Policy drivers:* Ecological Status  
Hydromorphology

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### **Abstract**

The implementation of the WFD in catchments with temporary rivers presents a significant challenge for watershed managers. The MIRAGE project will, for the first time, comprehensively investigate the applicability of specific management options under the characteristic flush and drought conditions of temporary streams. Through investigations in seven basins, MIRAGE will provide a framework for managing the many Mediterranean water bodies dominated by temporary waters. MIRAGE will deploy a multi-scale approach to improve understanding of temporary river responses to hydrologic, biogeochemical and sediment transport events. The principal research and project objectives of MIRAGE are to (1) provide an applicable and transferable set of reference conditions for temporary streams, specifically linking terrestrial and aquatic ecology; (2) determine effects of dry periods on accumulation and transformation of nutrients, sediments and hazardous substances on land and in river channels, at selected sites with test catchments. (3) specify and test measures to support achieving good ecological and water quality status including the integration of up- and downstream management. This will be done initially for the two mirror basins Candelaro (Italy) and Evrotas (Greece) in close cooperation with local water management organisations; (4) support the implementation of the WFD and the development of strategies for integrated water resources management for Mediterranean river basins, generalising from the Mirror Basins on the basis of modern ecohydrology concepts, in the context of characterising runoff regimes and flood responses on a regional basis. Five other Mediterranean catchments, including one in Morocco, will be used as the primary focus for this work; The transfer of experience and the establishment of common guidelines is then seen as a significant support for WFD implementation across the region.

## **245513- NATIOMEM**

Nano-structured TiON Photo-Catalytic Membranes for Water Treatment

[www.natiomem.eu/](http://www.natiomem.eu/)

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*Funding scheme:* CP (Collaborative Project), FP7

*Project duration:* 7/1/2010 - 6/30/2013

*EC contribution:* € 2 993 230

*Policy drivers:* Ecological Status

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### **Abstract**

More than 1.2 billion people, mostly in poor regions, suffer from water scarcity, due to a global shortfall of potable water caused by population growth, over-exploitation, and pollution. NATIOMEM proposes to alleviate this by developing novel technology for treating contaminated surface and waste water so that it will be potable. This technology will not require electrical power, chemicals or other logistical support, and hence will be suitable for poor areas lacking infrastructure. The technology uses membranes functionalized with a photocatalytic material, eg. N-doped TiO<sub>2</sub> (TiON). Raw water will be directed through the membrane while it is exposed to solar radiation. The membrane will filter out particles and micro-organisms larger than its pore size, and TiON photocatalysis will kill micro-organisms, decompose and mineralize organic pollutants, and oxidize dissolved metals, thus providing a one-step treatment against a broad spectrum of contaminants. In the NATIOMEM project, functionalized membranes will be developed with two approaches: (1) coating conventional membranes with TiON nanostructured films, using several candidate deposition methods, and (2) electrospinning TiON fibers, from which membranes will be fabricated. The functionalized membranes will be characterized for their morphological, physical, mechanical, chemical, and in particular, their photocatalytic properties, and the most effective will be extensively tested to determine their pollution abatement mechanisms and kinetics. A pilot plant incorporating these photocatalytic membranes will be designed, and field tested in the Middle East and in Africa. The results of these tests will be correlated with potential end-user requirements to set the stage for industrial exploitation. Achieving this result will be a breakthrough in water purification and reclamation technology, advancing far beyond the state of the art with a system which is simple, solar enabled, and chemical free.

## **286061- NEFELE**

Nano- Electrospun Filter for Efficient Liberation & Encapsulation of acticides for water treatment in transportation applications

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*Funding scheme:* BSG-SME (Research for SMEs), FP7

*Project duration:* 12/1/2011 - 11/30/2013

*EC contribution:* € 831 899

*Policy drivers:* Ecological Status

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### **Abstract**

In recent years, word of aircraft water quality issues has spread, generating negative media coverage, attracting the attention of regulators worldwide, and giving airline passengers a new cause for concern. Health enforcement agencies are currently in the process of drafting new, more stringent quality regulations for aircraft potable water and the world's other regulators will follow suit. Aircraft potable water is typically loaded from municipal systems which are susceptible to contamination. While municipal water quality has always been a concern in some parts of the world, it is now becoming an issue in North America as well. As recent outbreaks of waterborne disease in carries Canada and the US illustrate, dependence on any municipal water supply carries an inherent risk. Even when the source water is clean, contamination can make its way into a water supply during ground handling because of contaminated water trucks, contaminated hoses, or from improper handling procedures by ramp crew.

The aircraft water system itself can be the source of contamination.

Microorganisms can grow within the water tanks, water lines, and even the water filters. This situation is exacerbated by the standard, air pressurized water systems that allow water to remain still in the tank and distribution lines until a faucet is opened and the water begins to move. Bacteria thrive in such conditions, which also encourage bacterial regrowth almost immediately after system cleaning.

The present project aims to provide an advanced treatment system which will make use of core/sheath polymer nanofibres which are filled with biocidal substances. This will provide a way of maintaining a constant level of biocide in the water without the need to dose or measure the quantities present. In addition the nanofibres will provide a means of physical entrapment for viruses.

## **037099- NETSSAF**

### **NETWORK FOR THE DEVELOPMENT OF SUSTAINABLE APPROACHES FOR LARGE SCALE IMPLEMENTATION OF SANITATION IN AFRICA**

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*Funding scheme:* CA (Coordination Action), FP6

*Project duration:* 6/1/2006 - 11/30/2008

*EC contribution:* € 1 541 800

*Policy drivers:* Ecological Status

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#### **Abstract**

Without a sharp acceleration in the rate of progress, the world will miss the MDG sanitation target by half a billion people. For instance, in sub-Saharan Africa almost two-thirds of the population (64%) are lacking adequate access to excreta disposal facilities. In African countries the sanitation coverage varies from 84% in urban areas to 45% in rural areas. To achieve the year 2015 goal for urban water supply coverage an additional 210 million (194 in rural areas) people over the next 15 years will have to be provided with service. The proposed Coordination Action, aims to congregate the most relevant stakeholders in the field of sustainable sanitation in the Sub-Saharan African and European frame. NETSSAF will promote international cooperation between research organisations, associations, universities and social and governmental stakeholders in a European and Sub-Saharan African context, focussed in particular in the West African countries. A sustainable sanitation expert and research co-ordination platform and an expertise network will be established, in order to co-ordinate, assess and guide suitable research and strategic activities with the aim of identifying best practices, gaps in knowledge and barriers to further execution and to propose directions for futures research. The aim of the proposed network will be to develop a variety of innovative, adaptable and replicable approaches to sustainable sanitation, integrating appropriate low cost technologies in the context of community based management and their relevant governance, institutional frameworks and socio-economic constraints. The main outcome will be the development of a Participative Multi-stakeholder Sanitation Management Support Tool aimed for the end-users to be able to apply large scale sanitation concepts and technologies adapted to the different conditions prevailing in Africa.

## **515515- ONUREM-COWSIM**

Optimization of Nutrient Removal in Constructed Wetlands Using Special Substrates and Numerical Simulation

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 9/1/2005 - 8/31/2007

*EC contribution:* € 158 454

*Policy drivers:* Ecological Status  
Chemical aspects

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### **Abstract**

The Council Directive "Urban Wastewater Treatment" [91/271/EEC], and very recently the Water Framework Directive [2000/60/EEC] have come to remind of the necessity of natural and energy saving appropriate treatment for the urban and domestic wastewater discharges with the objective of a "good ecological status" of European water by the year 2015. In this regard, the 5th Framework Programme has promoted research on the subject of urban and domestic wastewater treatment using appropriate treatment techniques. In particular, research projects have been launched, among others, on improvement of extensive treatment techniques to treat urban wastewater produced by agglomerations with less than 2000 PE, which have already a waste water collection network, but also must set up an appropriate treatment by the end of 2005."

Constructed wetlands" (CWs), one of the widely used extensive treatment techniques, are now standing as proper solutions for the treatment of municipal, industrial and agricultural wastewater in many part of the world due to their nutrient capturing capacity, simplicity, low construction, operation and maintenance cost, low energy demand and potential for creating biodiversity. Nowadays, vertical subsurface flow CWs with intermittent feeding are state-of-the-art in Europe. However, the larger surface area requirement (3-10 m<sup>2</sup>/PE) of the CWs to meet the specified quality objectives makes it sometimes impossible to set up these reed beds in small/medium communities, where land is at a premium. Therefore, several wetlands and researchers have recently focused on optimisation of the design of CWs, on use of special substrates in CWs for enhanced nutrient removal, and also on the related pollutant retention mechanisms. In this context, the main objective of this proposed research is to quantify the effect of different natural and artificial substrates that are commercially available in the markets of Turkey, Austria and other.

## **236127- PARAWARM**

From communities to individuals: development of an early warning system to assess the relationship between climate warming and pollution in European freshwater ecosystems

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 3/1/2010 - 11/30/2010

*EC contribution:* € 161 563

*Policy drivers:* Ecological Status  
Chemical Aspects

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### **Abstract**

The project addresses the interaction between parasitism and pollution in the context of climate change using parasites in freshwater fish as a model early warning system for altered environmental conditions by the application of a two-fold approach. First, a comparative assessment of the effect of temperature on parasite population and community structure dynamics will be carried out using 'matched pairs' control-impact design in a 'natural experiment' setup to test the 'parasite numerical response' hypothesis. Simultaneously, structural patterns in a free-living freshwater system, macrozoobenthic communities, will be evaluated. Secondly, using the same sampling design the hypothesis of temperature-mediated alteration of pollutant metabolism will be tested by a comparative evaluation of the rates of toxic metal accumulation in selected dominant parasite and benthic invertebrate species. Identification of temporal and spatial patterns of abundance and community structure at different thermal regimes is the key to forecast the impacts of climate change on parasite communities in fish in European freshwater ecosystems. Further, linking ecological data to pollutant metabolism will provide novel insights on the response of parasite communities to environmental change which may help predict possible outcomes of host-parasite interaction and forecast minimum index values to detect pollution in the context of the effect of global warming. The novelty of the proposed research lies in its trans-disciplinary approach linking advanced ecology and ecotoxicology concepts and methods. The quantification of the response to increased ambient temperature of the model organism groups relates not solely to issues fundamental to assessment of climate-mediated community level alterations and host-parasite interactions but to wider conceptual and applied domains such as synergism and/or antagonism among multiple stressors and pollution risk analysis using model indicator systems.

## **235755- PARTS**

Probabilistic Assessment of the Retention and Transport of Sediments and Associated Pollutants in Rivers

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 4/1/2009 - 3/31/2011

*EC contribution:* € 171 867

*Policy drivers:* Ecological Status  
Chemical Aspects  
Hydromorphology

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### **Abstract**

Sediment dynamics in water bodies has been the subject of much study. Previously studies on moving sediments has focussed on their role in morphology. Recently, the transport and accumulation of sediment in natural rivers has become of interest to environmental scientists, as many pollutants are associated with sediments. Deterministic models still commonly used in engineering practice model sediment transport with average quantities. The latest research models use stochastic and now particle tracking approaches to better reflect nature. Random variable analysis is starting to be used but there is little data to test the new models. Grain scale measurements of transport have only recently been achieved as instrumental capabilities have increased. Increasing computing capability now has the potential to treat fluvial sediment systems with true probabilistic based simulations in which the fate of each particle can be individually tracked and modelled. Such a form of sediment modelling is still limited by the existing knowledge of the relevant grain scale physics rather than by computational limitations. The oldest but still most difficult questions to answer about river sediments is whether they do or do not move under the action of the flow and when in motion, where do they rest and for how long. The current proposal will use advanced instrumentation to measure hundreds of moving grains and local flow velocities. This data will be used to develop probabilistic approaches for transport rate prediction, further development of an existing discrete particle model will allow the time history of their grain movement including rest periods and their ultimate fate to be statistically described. This level of information will be required in the next generation of modelling tools that environmental scientists will need to predict the impact of pollutants associated with sediments that move and are then retained within river deposits for periods of time.

## **008073- P-DIAGENEX**

Pathways for Phosphorus (and Nitrogen) Release from Sediments of the Tamar Estuary (SW England) and the Gippsland Lakes (Australia) Eutrophic Ecosystems: Diagenesis Experiments and Modeling

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 3/1/2005 - 2/29/2008

*EC contribution:* € 236 141

*Policy drivers:* Ecological Status  
Chemical aspects

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### **Abstract**

European coastal ecosystems because the nutrient load has greatly increased in recent years through human activity. Phosphorus has a critical role in the eutrophication of water bodies, the adverse effects of which are most apparent during algal blooms. Algal outbreaks of cyanobacteria (blue-green algae) carry significant risks to human and animal health, as well as a major economic cost. Ecosystems are particularly badly affected, to the extent that toxic algal blooms occur annually, accompanied by fish kills and significant loss of recreational and conservation value. High priority is given to minimization of phosphorus inputs to rivers and waterways. Despite these measures, algal blooms may continue to occur on a seasonal basis years after phosphorus inputs have ceased, and it is thought that this is due to periodic remobilization of phosphorus bound in the sediments. This remobilization may occur as a result of changes in redox condition, pH, ionic strength or bioturbation, but as yet, the factors controlling this complex biogeochemical process are only poorly understood. Because to date most coastal water eutrophication research has focussed on the water column, the objective of the proposed research is to increase our understanding of the role of coastal sediments in the seasonal storage and recycling of Phosphorus (and Nitrogen). This project will provide new data, which are essential for enhanced environmental monitoring and decision support systems, and will contribute to realistic diagenesis modeling. It will aid our capacity to predict environmental change and allow us to develop better strategies for prevention, mitigation and adaptation in the management of coastal and estuarine ecosystems in the European Union.

## **004401- PEIPSIREM**

Satellite based remote sensing of aquatic environment in Estonia by the example of Lake Peipsi

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 6/1/2004 - 5/31/2005

*EC contribution:* € 40 000

*Policy drivers:* Ecological Status

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### **Abstract**

There is need for cost effective ways to supplement the present monitoring of water environment with more resolute spatial and temporal data particularly in states soon joining European Community. The project is designed to improve remote sensing methods that can be applied to lakes and coastal waters; develop water quality algorithms and processing methods that are appropriate for the ocean color satellite sensors MODIS and SeaWiFS. Strong attention will be paid to the use of lately available sensor MERIS/ENVISAT, specially designed for remote sensing of optically complex waters. During the last two years of EU Marie Curie founded project it has become clear that the existing atmospheric correction procedures when applied to lakes need to be further evaluated in order to produce an operational remote sensing based monitoring system. In the present project we will concentrate investigation on Lake Peipsi on the border between Estonia and Russia. Lake Peipsi is one of the largest lakes in Europe and is intermediate in size between Lake Vanern and Lake Vattern, Sweden, investigated during initial fellowship. Compared to the two Swedish lakes, L. Peipsi has higher concentrations of the optically active substances known to influence satellite measurements. Therefore, the lake compliments the continuum between lakes Vanern and Vattern both spatially and in terms of water quality. Another advantage is that there is an AERONET sun photometer relatively close to this lake, which will provide invaluable atmospheric data. The project will lead to an increased enlargement of application the remote sensing method and gives new information about optical properties of turbid and humic lakes which are specially sensitive to climate change. It increase awareness of water management authorities involved in the monitoring of large European lakes and , scientists investigating aquatic environment.

## **023872- PHARMARINE**

Fate and properties of selected pharmaceuticals and personal care products (PPCP) in the marine environment

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 9/1/2005 - 8/31/2006

*EC contribution:* € 93 983

*Policy drivers:* Ecological Status  
Socio-economy

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### **Abstract**

The proposed project PHARMARINE intends to investigate the fate of selected pharmaceutical residues and their metabolites in a Norwegian marine environment. As model area the Oslofjord (Norway) is chosen because known point sources (sewage treatment plants) are directly discharging into a sea area with restricted water exchange with the open sea. Thus, relatively high concentrations are expected, on one hand facilitating the analytical determination of the target analytes, on the other bearing the potential of serious risks for the local ecosystems and for the contamination of natural and aquaculture-derived seafood. After implementation of advanced state-of-the-art analytical methodology including large-volume solid-phase extraction, high performance liquid chromatography mass spectrometry (HPLC-MS/MS, HPLC/TOF and HPLC-IT-MS) and gas chromatography-mass spectrometry (GC-MS/MS, GC/HRMS), concentration gradients will be determined from point sources to the open sea. From the concentration data, transformation and distribution properties will be derived, applying and evaluating new concepts for the description and tracing of the environmental behaviour of contaminants. The thereby obtained property data will be of large value for subsequent environmental risk assessment of Pharmaceuticals and personal care products (PPCPs).

## **031106- PILICA**

Bioaccumulation and distribution pattern of persistent organic pollutants in the Pilica River basin: An ecohydrology approach

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 2/1/2006 - 1/31/2008

*EC contribution:* € 80 000

*Policy drivers:* Ecological Status

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### **Abstract**

The goals of the proposed interdisciplinary project in environmental chemistry and ecohydrology are focused on linking functional interrelations between bioaccumulation of persistent organic pollutants (POPs) in biota and factors governing that process at a catchment scale. The dynamics of POPs within aquatic systems and their accumulation in the biota is driven, in general, by sources and loads and complex physical and biological processes. In river systems, the contaminant dynamics and bioaccumulation is greatly related to hydrology, sediment re-suspension and transport, in addition to the biotic factors such as feeding ecology and food chain structure. A set of field sites will be selected along the corridor of the Pilica River that vary in the contamination level, hydrology and catchment land use, for analysis of POPs. The sediment, suspended particles, water and biota will be analyzed for PCB and selected dioxin and furan levels and congener patterns. The proposed research will demonstrate that an understanding of the hydrological, chemical and biological determinants of bioaccumulation at a catchment scale will improve the ability to model and predict bioaccumulation of POPs and will provide ecologically sound foundations for designing effective management strategies for sustainable water ecosystems.

## **286580- PIPEGUARD**

A novel technology for sewerage mapping, inspection and cleaning with integrated real-time self-audit capability

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*Funding scheme:* BSG-SME (Research for SMEs), FP7

*Project duration:* 9/1/2011 - 8/31/2013

*EC contribution:* € 1 174 693

*Policy drivers:* Ecological Status

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### **Abstract**

Sewage systems are crucial to reduce the risks of water borne diseases and avoid flooding of cities. Cleaning processes are thus highly important to avoid health risks and environmental, economic and societal impacts which can be caused by damaged or blocked sewerage. European sewerage networks are operated by over 20,000 municipalities and public entities which spend over €6.5 billion annually to clean and maintain over 2.25 million km of pipes that are constantly deteriorating. Over 10,000 SMEs are employed by network operators to keep the sewerage clean and operable. Recent budget cuts and the implementation of the water framework directive (2000/60 EC) that requires new measures for more efficient use of water resources have put pressure on municipalities and therefore on the service providing SMEs in the cleaning business in order to save water resources and find cheaper ways of maintaining efficient sewerage networks. Current systems for sewer cleaning are highly inefficient. During the cleaning process, high amounts of water are used to clean the pipes regardless of the real cleaning demands. Hence, there is a high need to develop a system integrating a reliable inspection tool which efficiently varies the cleaning process according to the real demand. The PIPEGUARD system will consist of an ultrasonic inspection system, which will detect the degree of pollution and damages. The data captured will be used to adjust the cleaning through algorithms. After cleaning, the system will keep a record that will provide a reliable cleaning audit trail. Further, PIPEGUARD will monitor with inertial sensors the system position in real-time in order to obtain reliable position mapping for the creation of network maps. The solution will not only cut costs for cities due to the use of an integrated system which will eliminate various inspection and cleaning steps, it will also save ca. 35% of cleaning costs due to reduced fresh water usage thanks to the on-demand cleaning.

## **009058- POMFLUX**

Particulate organic matter and nutrient fluxes in European margins

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 11/28/2005 - 10/27/2007

*EC contribution:* € 255 187

*Policy drivers:* Ecological Status

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### **Abstract**

The main objective is to investigate the transfer of particulate organic matter and nutrients from the surface towards the deeper ocean both in continental margin and open sea settings. The control mechanisms and forcing conditions of this process will be studied as they are the input needed to pin down the capacity of the marine environment of absorbing carbon and withdrawing it from the atmosphere. To address this issue three contrasted sites have been chosen: the continental margin at the Gulf of Lions, one oligotrophic-mesotrophic site at the Ligurian Sea and one site southwest of the island of Gran Canaria affected by the Canary Current and Saharan atmospheric inputs. In the continental margin site transfer near the bottom and along canyons will be studied by analysing the material collected by sequential sediment traps located at 30 meters above the bottom at 7 different locations. In both open sea sites investigations a multi-tracer approach will be used to test that: a) ballast minerals physically protect a fraction of their associated total organic matter, which persists to predominate over the unprotected fraction in the lower (>1000 m) part of the water column. And b) the ratio of organic carbon to ballast is key to predicting variability in export fluxes, deep fluxes, sinking velocities, and remineralisation of particulate organic carbon. This multi-tracer approach will be conducted on samples collected with sediment traps at 4 different depths at the Ligurian Sea site and at 3 different depths at the Canary current site. Sediment traps samples will be analysed for major constituent composition in order to characterise the collected material and estimate flux variability. Organic matter characterisation analyses will be performed to trace the pathways and processes that affect organic matter during its transfer.

## **510012- POPIS**

Polar organic pollutant integrative sampler for assessing bioavailability

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 8/18/2004 - 8/17/2005

*EC contribution:* € 47 813

*Policy drivers:* Ecological Status

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### **Abstract**

This proposal aims to support the collaboration of world-class researchers to study endocrine disrupting chemicals (EDCs), with the broad aim of supporting the development of dynamic world-class human resources in the European research system. The proposal consists of a scientific project and scientific and complimentary training. The scientific project aims to develop a polar organic pollutant integrative sampler (POPIS) for assessing the bioavailability of polar EDCs in fish. The specific objectives are:

- To develop a novel POPIS device suitable for concentrating polar and most potent EDCs.
- To refine and apply sampling and analytical methods to target EDCs in water and sewage samples.
- To perform laboratory experiments to determine the relationship between the levels of EDCs in POPIS and those in water, sediment and fish under controlled conditions.
- To conduct site trials to assess the performance of POPIS in simulating bioaccumulation of EDCs in fish.
- To develop and validate a multi-compartment model for simulating and predicting POPIS performance.

The fellow will receive scientific training to acquire further practical skills in environmental investigations and data analysis; to design, conduct and report on cutting edge research on EDCs; and to strengthen collaboration with European scientists. Complementary training will involve the fellow learning and practising transferable skills. The proposal objectives will be achieved through careful planning and management of the fellowship. The proposed scientific project is timely and appropriate methodology has been established. Novel and state-of-the-art techniques will be used. The supervisors and the fellow have relevant expertises. Regular progress meetings will be held to ensure progress. The fellow is expected to become an independent researcher by the end of this fellowship.

## **023699- PPCPS-TRANSWATER**

OCCURRENCE, PERSISTENCE AND IMPACT OF  
PHARMACEUTICALS AND PERSONAL CARE PRODUCTS-PPCPs IN  
TRANSITIONAL AND COASTAL WATERS

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 11/14/2005 - 11/13/2007

*EC contribution:* € 159 613

*Policy drivers:* Ecological Status  
Socio-economy

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### **Abstract**

Pharmaceuticals and personal care products (PPCPs) have aroused concern due to their detection, not only in sewage effluents and wastewaters, but also more broadly in environmental waters. Thousands of tonnes of these compounds are used daily and research indicates that many pass through wastewater treatment plants (WWTP/STF) without elimination, contaminating rivers, estuaries and coastal waters. Hence, the widespread uses of these compounds render their presence of, not only the parent compounds but also of their metabolites, widespread. To date, comparatively little information is available, especially with respect to the broad range of personal care products. More information is urgently needed to assess the behaviour of these compounds in transitional waters if we are to understand the potential for ecological impact and to protect our estuarine and marine resources. The proposed laboratory and field work aims to address some of the main concerns regarding PPCPs. Both analytical and environmental components are necessary. Firstly, candidate PPCPs will be selected according to their likely persistence, bioaccumulative and toxicological properties coupled with their relative usage in the area of study. Analytical techniques will be developed to quantify the compounds at appropriate sensitivity and relevant sampling strategies will be designed to investigate their environmental behaviours. Preliminary surveys will be undertaken to screen the occurrence of the selected (and other non-target PPCPs). Secondly, a sampling programme together with laboratory based physico-chemical and toxicology tests will be undertaken to appraise the environmental results. A database (on a one-year basis) will be generated to record environmental occurrence and persistence and will be used to focus directions in monitoring strategies. It will also prove invaluable in risk assessments to develop policy relating to usage of PPCPs

## **255180- PRECISE**

Predicting eutrophication and climate change impacts on shallow lake ecology and biodiversity: disentangling the effects of temperature and nutrients

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 6/1/2010 - 5/31/2012

*EC contribution:* € 205 629

*Policy drivers:* Ecological Status  
Climate Change  
Hydromorphology

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### **Abstract**

Increased nutrient concentrations in freshwater ecosystems have had profound impacts on their biodiversity, perhaps none more so than in shallow lakes. It may be that impacted systems such as these are particularly vulnerable to climate change. Increasing temperature and eutrophication are not only linked, but their impacts are similar and thus it has proven very difficult to disentangle their effects. It may be that analysis of rate of change may elucidate the effects of climate change and nutrient enrichment on shallow lake biodiversity, species turnover and ecosystem function. PRECISE seeks to determine the extent and rate of change in shallow lake biodiversity and ecosystem function resulting from eutrophication and climate change. To do this a longer-term perspective is vital, PRECISE consists of three approaches which encompass distinct combinations of climate and nutrient effects at a range of temporal scales. These are: large-scale mesocosm experiment; contemporary time series analysis; and palaeolimnological analysis. The overarching aim is the determination of the effect of temperature and nutrient concentration on the extent and rate of change in the balance of benthic to pelagic production and biodiversity. This will be achieved by complementing on-going research generating biodiversity data with both direct measurement of algal crop (benthic and pelagic) and the determination of pathways of production by the analysis of stable isotopes. This will be done both in the mesocosm experiment (nutrient and temperature separate) and through time series analysis of observational data (temperature and nutrient together). A meta-analysis of an existing data from sediment cores will compare contemporary change (nutrients and climate together) with change associated with a rapid increase in temperature after the 8.2K cooling (climate alone). These integrated analyses will elucidate on unique climate and nutrient impacts on shallow lake biodiversity and function.

## **517574- PREWARC**

### **STRATEGIC PLAN FOR PREVENTION OF REGIONAL WATER RESOURCES CONTAMINATION FROM MINING AND METALLURGICAL INDUSTRIES IN WESTERN BALKAN COUNTRIES**

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*Funding scheme:* SSA (Specific Support Action), FP6

*Project duration:* 1/1/2006 - 12/31/2007

*EC contribution:* € 110 000

*Policy drivers:* Ecological Status  
Groundwater

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### **Abstract**

The Western Balkan Peninsula is rich in natural mineral resources. Among the most important of them are considered the chromite, bauxite, polymetallic complex sulphide, laterite and coal ore deposits, which are used for the production of steel, ferroalloys, aluminium, nickel, base and precious metals. Exploitation of these ore deposits, one of the most dynamic sectors in the Western Balkan region, along with metal extraction that follows cause severe environmental pollution problems in the area, related to contamination of soil and surface-, groundwater.

This project addresses environmental pollution problems associated with mining and metallurgical activities in two Western Balkan countries, in order to develop an Integrated Strategic Plan including proposals for feasible technological improvements in mining and metallurgical industrial activities in the involved area and viable technologies for the management of the industrial wastes ensuring the protection of the natural water resources.

In order to achieve this objective, the project deals with (i) collection and management of information concerning the major mining and metallurgical industries in the involved Western Balkan countries, as well as the extent of the regional water resources contamination and the risks associated with it, (ii) identification of Best Available Technologies that have to be adopted by the regional mining and metallurgical industries in their production stages, as well as in the related wastes management aiming at waste minimization, prevention of surface-, groundwater contamination and safeguarding the ecosystem of the affected areas (iii) dissemination of the gained knowledge and promotion of the project results.

## **262184- PROMETHEUS**

Treatment of high organic load, high temperature and high salinity industrial waste water containing recalcitrant contaminants

[www.fp7-prometheus.eu/](http://www.fp7-prometheus.eu/)

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*Funding scheme:* BSG-SME (Research for SMEs), FP7

*Project duration:* 11/1/2010 - 10/31/2012

*EC contribution:* € 1 162 055

*Policy drivers:* Ecological Status  
Chemical Aspects

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### **Abstract**

PROMETHEUS aims to treat high organic load high temperature (85°C), and high salinity industrial waste waters containing recalcitrant contaminants originating from injection/extrusion and post-washing processes in aluminium and rubber parts production industries. PROMETHEUS waste water treatment system treats these waste waters obtaining a final effluent meeting discharge requirements plus high purity water and chemicals (demoulding agent used in injection/extrusion processes) recovery for re-use plus a 99% reduction of waste production needing off-site treatment. There is no system in the market allowing for this. There is a competitive opportunity to export a new technology that addresses all these issues. There is pre-existing work done by members of the consortium on a batch system consisting in membrane filtration (UF/NF), reverse osmosis, and innovative evaporator units. The system has worked with waste water from rubber industries producing parts for the automotive industry. There is a need for further development of the system since it has only operated in batch and with one type of waste water. Adaption to other types of waste water will require studies on types of membranes and evaporators. There is also a need for controlling and modelling the system on a continuous mode and a cost-efficiency analysis. PROMETHEUS solution for waste water from injection/extrusion and washing processes in aluminium and rubber parts producing industries treatment results in a 99.5% water recovery for re-use in the plant (high quality water for even cooling towers use) and a 99% decrease in waste produced that needs off-site treatment. These figures result in the obvious environmental and economic (63% cost reduction compared to current waste water treatment systems use in the sectors) positive impacts. Expected benefits of the solution to the industrial waste water treatment sector are estimated to be €84.8 M of sales revenue after year 5 of commercialisation.

## **021425- PROTISTAN DIVERSITY**

The Application of Protistan Diversity and Community Analysis, an integrated approach to Water Quality Assessment

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 3/1/2007 - 2/28/2009

*EC contribution:* € 160 180

*Policy drivers:* Ecological Status

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### **Abstract**

The urgent need for robust, high-throughput method to assess water quality and aquatic biodiversity, as a proxy for environmental health, are clear. This provides an obvious target for initial efforts resolving molecular fingerprints for total diversity and identification of potential indicator organisms. Eukaryotes exhibit a significant level of morphological diversity that has traditionally been used to define Linnean names. Molecular systematics provides a separate and powerful tool for phylogenetic analysis but does not link easily to the system of Linnean names, especially for environmental molecular studies. This project seeks to provide Dr Gong with an array of molecular skills to compliment his expertise in ecology and traditional systematics that will position him to lead a research group to address this problem.

## **510863- PUMPSEA**

Peri-urban mangroves forests as filters and potential phyto-remediators of domestic sewage in East Africa

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*Funding scheme:* STP (Specific Targeted Research Project), FP6

*Project duration:* 2/1/2005 - 7/31/2008

*EC contribution:* € 1 650 000

*Policy drivers:* Ecological Status

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### **Abstract**

Peri-urban coastal areas of the developing world receive extensive amounts of untreated sewage, which is typically discharged into creeks lined by mangrove forests. Mangroves in all probability filter this discharged wastewater, thereby limiting coastal sewage pollution. This project aims to demonstrate this ecosystem service and to examine its ecological and socio-economical effects. It will develop the technology for using constructed mangrove wetlands for secondary treatment of domestic sewage water. It will examine the feasibility of "strategic reforestation and conservation" in sewage hotspot areas, to encourage natural mangrove filtration of discharged wastewater. It will develop an implementation plan for the exploitation of the developed technology and know-how, based on analysis of governance, policy, cost and financing options. The work will take place in peri-urban mangrove areas of Maputo (Mozambique), Dar es Salaam (Tanzania) and Mombasa (Kenya). It will include: socio-economy, condition mapping, biogeochemistry, ecology, modelling, controlled experimentation and experimental optimisation of a trial wetland used for secondary treatment of sewage. Governance analysis and implementation planning will focus on Dar es Salaam, but have reference to Maputo and Mombasa. PUMPSEA addresses INCO research objectives A.2.2 (primarily) and A.2.1 (secondarily), by valuation of coastal ecosystem services, and by supporting policy and management analysis into mitigating the degradation of coastal zones in peri-urban areas. Using constructed mangrove wetlands for sewage treatment could be an innovative solution that complies with the social, economic and environmental contexts of developing countries. Strategic mangrove conservation and reforestation in sewage discharge areas can facilitate natural filtration and may represent cheap and immediately implementable approaches to mitigating coastal sewage pollution.

## **037081- RAMWASS**

INTEGRATED DECISION SUPPORT SYSTEM FOR RISK ASSESSMENT AND MANAGEMENT OF THE WATER-SEDIMENT-SOIL SYSTEM AT RIVER BASIN SCALE IN FLUVIAL ECOSYSTEMS

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*Funding scheme:* STP (Specific Targeted Research Project), FP6

*Project duration:* 9/1/2006 - 2/28/2009

*EC contribution:* € 1 665 040

*Policy drivers:* Ecological Status

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### **Abstract**

The objective of the project is to develop and validate a new DSS for the risk assessment and management for the prevention and/or reduction of the negative impacts caused by global change and human activities on the water/sediment/soil system at river basin scale in fluvial ecosystems. The DSS will combine and integrate environmental and geo-physical data from earth observation systems, in-situ sensors and geo-referenced information, advanced computer simulation and graphical visualisation methods and artificial intelligence tools for generating knowledge contributing to the assessment of the ecological impact and the design of effective response actions maximising the integrity and safety of the ecosystem and human life. The RAMWASS DSS will be the result of the development, integration and validation of the essential technologies provided by the project partners: - Technology for the transfer of high resolution data emanating from earth observation systems and in-situ sensors into classified and usable information to be ingested as input data for the WASS simulation system (CIMNE) - Advanced computational methods for the fast and accurate simulation of different WASS situations and for evaluating the effect of alternative response scenarios (UPC, CIMNE, CISM, U.Hannover, U.Lüneburg) - Innovative ICT tools for the 3D visualisation of the environment hazard simulations (CIMNE) - An artificial neural network (ANN) based decision model educated using innovative Monte Carlo simulation tools developed by CIMNE A crucial activity of the project will be the in-depth calibration, validation and assessment of the performance, scalability and effectiveness of the DSS in its application to at three relevant aquatic and wetland ecosystems adjacent to river basins in Europe: 1) The marsh area of the Doñana Park in Spain; 2) the biosphere reserve Elbe Riverland in the Elbe river valley in Germany and 3) the marshland and lagoons of the Po river delta in Italy.

## **502158- REBECCA**

Relationships between ecological and chemical status of surface waters

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*Funding scheme:* STP (Specific Targeted Research Project), FP6

*Project duration:* 12/1/2003 - 5/31/2007

*EC contribution:* € 3 997 952

*Policy drivers:* Ecological Status  
Chemical aspects

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### **Abstract**

The strategic objective of the REBECCA proposal is to provide relevant scientific support for the implementation of the Water Framework Directive (WFD). The two specific aims of the project are, firstly, to establish links between ecological status of surface waters and physico-chemical quality elements and pressures from different sources, and, secondly, to develop and validate tools that member states can use in the process of classification, in the design of their monitoring programs, and in the design of measures in accordance with the requirements of the WFD. These objectives will be achieved by collating existing knowledge and analyzing knowledge gaps, and using this information as a basis for analyzing the dose-response relationships between pressures and chemical/biological quality elements based on existing data. Furthermore, REBECCA will explore, develop and improve models and statistical tools, which can be used in assessing the links between the ecological and chemical quality elements; or to assess critical/target loads and other objectives for pressures. These tools will be validated in selected test sites. The results of the project will be disseminated throughout the project life-time to stakeholders at EU and national levels, particularly to the Working Groups of the Common Implementation Strategy (CIS) for the WFD, and used to develop a Toolbox containing detailed information of the methods, tools and models.

## **244121- REFRESH**

Adaptive Strategies to Mitigate the Impacts of Climate Change on European Freshwater Ecosystems

[/www.refresh.ucl.ac.uk/](http://www.refresh.ucl.ac.uk/)

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*Funding scheme:* CP (Collaborative Project), FP7

*Project duration:* 2/1/2010 - 1/31/2014

*EC contribution:* € 6 997 746

*Policy drivers:* Ecological Status  
Climate Change

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### **Abstract**

50 million European citizens, 18% of the European population, live in countries affected by water stress problems; forecast variations in rainfall pattern trends, due to global climate change, add to this already serious situation: according to the EEA, 16 to 44 million additional people will suffer water scarcity in Southern Europe by 2070. The importance of the problem is recognised at the European level, as proven by the strong common European position at the recent Fifth World Water Forum (March 2009) and by the 2007 Communication of the European Commission, urging the Parliament and national governments to do more regarding water scarcity issues. Current water supply systems (water pipelines, desalination plants, tank vessels) require permanent infrastructures, high investment costs, high energy consumption, with maintenance issues that could not be easily addressed by small-medium communities and for temporary water supply.

REFRESH aims at realising an innovative green product/service for the transportation of fresh water by sea, by developing a cost effective and energy-efficient solution based on the use of a modular concept of recyclable flexible plastic barge towed by tugboats. The primary application will be in supplying fresh-water to Mediterranean coastal small cities and islands with less than 300.000 inhabitants (a situation which interests about 45 million of European citizens). 65% of these communities, that double in size during summer with tourist presences, are affected by increasing water scarcity due to several factors as climate change, growing urbanisation of coasts, tourism, sea water intrusion in aquifers. For these communities REFRESH will represent the most effective solution for fresh-water supply since traditional technologies as water pipelines, desalination plants and large water vessels are unpractical solutions under technical and economical points of view.

## **253897- RESPIRE**

Climate-driven oxygen limitation in freshwater macroinvertebrates

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 8/1/2010 - 7/31/2012

*EC contribution:* € 180 103

*Policy drivers:* Ecological Status  
Climate Change

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### **Abstract**

To predict future effects of climate change, a comprehensive mechanistic understanding is essential. In marine ecosystems, a mismatch between oxygen demand and oxygen supply to tissues was shown to be the first mechanism to restrict survival at thermal extremes. Here a study is proposed on climate-driven oxygen limitation in freshwater macroinvertebrates. Aquatic invertebrates display a range of adaptations related to respiration and oxygen is a key factor structuring species assemblages in freshwater ecosystems. Therefore, oxygen limitation is likely to play a role. First this research will assess if the thermal limits of species arise due to oxygen limitation. In laboratory experiments the prediction will be tested that a species' thermal window expands under higher oxygen concentrations. A field study will assess if species occupy different thermal niches under high and low oxygen conditions. Experimental work is proposed to characterize the oxygen demand (metabolic rate) of species and relate these to their observed thermal limits. Secondly, this research will assess if and how differences in a species' thermal vulnerability can be predicted from their life-history and physiological traits that relate to oxygen supply and demand (e.g. respiration system, body size, development speed, metabolic rate). The oxygen limitation hypothesis may prove to be a new and important mechanism bringing the fields of physiology and ecology together to explain the effects of climate change on freshwater macroinvertebrates. The proposed research will investigate whether water pollution exacerbates the effects of higher temperatures. Such an insight will help in taking the most effective measures mitigating the effects of climate change.

## **235879- RHIZO**

Rhizospheric biofilms at root-microbe-mineral interfaces: A key to improve productivity, sustainability and CO<sub>2</sub> balance in forests

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 7/1/2010 - 6/30/2012

*EC contribution:* € 218 119

*Policy drivers:* Ecological Status  
Chemical Aspects  
Groundwater

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### **Abstract**

In the past decades, forest productivity was maximized by the use of large quantities of fertilizers and pesticides. These chemicals are produced by complex processes, which consume high levels of energy from fossil fuels and emit large amounts of CO<sub>2</sub>. The secondary effects of the chemicals include increased ground and surface water pollution and soil degradation in all forested ecosystems in Europe and other parts of the world. Part of the problem is a lack of fundamental understanding about mineral-derived nutrient dynamics in forests, their weathering release, storage and transport in soils and roots to maintain high, but sustainable, production of high quality wood products. If practices could be developed to enhance natural processes for nutrient acquisition and transport, pesticide and fertilizer use could be reduced, energy could be saved, CO<sub>2</sub> emission decreased, and environmental sustainability insured. Root-microbe-mineral interactions in the rhizosphere regulate mineral-derived nutrient acquisition and transport to plant roots. I will investigate these interactions to improve understanding of rhizospheric biofilms formed in symbiotic associations. My research so far shows that these biofilms enhance silicates mineral weathering, sequester atmospheric CO<sub>2</sub> in the hydrosphere, and decrease the loss of mineral-derived nutrients to ground and surface water. To expand on this, I will examine the chemical and physical structure of the root-microbe-mineral interface, using state-of-the-art nano-scale techniques combined with microbiological and biogeochemical approaches under natural and controlled growth conditions. I will also characterize the biofilms under elevated CO<sub>2</sub> levels. The science and technology results gained from this project will contribute directly to the scientific community and to the society through improvements in commercial tree production, forest health and sustainability under the increased CO<sub>2</sub> levels.

## **227612- RINEC**

River networks as ecological corridors for biodiversity, populations and waterborne disease (RINEC)

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*Funding scheme:* ERC (ERC Grant), FP7

*Project duration:* 1/1/2009 - 12/31/2012

*EC contribution:* € 1 146 200

*Policy drivers:* Ecological Status  
Hydromorphology

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### **Abstract**

The proposal hinges on the noteworthy scientific perspectives provided by ecohydrological studies of river basins, seen as a natural laboratory for complex system perspectives integrating hydrologic, ecological and geomorphological dynamics. Moving from morphological and functional analyses of dendritic geometries observed in Nature over a wide range of scales, my claim is that essential processes sustaining human life and societies taking place along dendritic structures can be predicted. Population migrations and human settlements historically proceeded along river networks to follow water supply routes. Riparian systems, critically important ecosystems positioned along streams and rivers, play crucial roles in their watersheds, including nutrient filtering, biogeochemical processing, shade and resource provisioning, and stream bank stabilization. Devastating water-borne disease, such as cholera, and invading foreign species spread through water bodies linked by river networks. Although the dynamics of such systems has been extensively studied, existing approaches were mostly within the framework of mean-field or two-dimensional landscapes that ignore directionality of dispersal implied by the network acting as environmental matrix. How does connectivity within a river network affect the emergent spreading of water-borne infections? Does the river basin act as a template for biodiversity? Are there hydrologic controls on the spreading of water-borne disease? To answer such questions, the present proposal addresses the study of biodiversity in the river basin (freshwater fish and riparian vegetation); cholera dynamics and zebra mussel invasions along river networks. Observational data and theoretical models, in a comparative mode, will be analyzed within a unified theoretical framework. This is intended to prove of crucial interest for understanding the functioning of river basins as a whole, including its ecosystem structure and function.

## **032058- SAFEWATER**

Development of a continuous measuring method for adsorbable organically bound halogens AOX in waters

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*Funding scheme:* SME (SMEs-Co-operative research contracts), FP6

*Project duration:* 10/1/2006 - 11/30/2008

*EC contribution:* € 724 462

*Policy drivers:* Ecological Status  
Chemical aspects

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### **Abstract**

AOX Adsorbable Organically bound Halogens are considered to be a very dangerous group of materials in that they produce toxic mutagenic and carcinogenic effects and some of them have a strong bioaccumulation property in fat containing tissues. However, to date no fast automatic device for the monitoring of AOX exists in the market. The present project aims to develop a monitoring technology to keep track of the concentration of adsorbable AOX present in water streams.

Common sources of AOX are industrial processes urban and agricultural activities human activities and even natural phenomena Currently available methods to measure the AOX components in water involve arduous laboratory methods which prove slow and entail difficult and complex procedures Hence such measurement needs to be carried out in specialised laboratories by trained staff rendering any automatic and or continuous measurement of AOX simply unfeasible and drastically reducing the number of analysis performed.

## **501446- SALMOHRID**

Patterns and processes of salmonid diversification in Europe's oldest body of freshwater, Lake Ohrid

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 3/1/2004 - 2/28/2006

*EC contribution:* € 148 262

*Policy drivers:* Ecological Status

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### **Abstract**

Fishes of the family Salmonidae hold the highest economic, ecological and evolutionary interest among all temperate freshwater fishes. While the bulk of European research focuses on a few wide-spread commercially important species like brown trout, Arctic charr and European grayling, little attention has been given to salmonids in the Balkan Peninsula, one of the most important centres for evolutionary radiation of European fauna and flora. The region also contains the most unique yet understudied freshwater habitat in Europe, Lake Ohrid. Lake Ohrid is Europe's oldest lake, believed to have been formed as early as the Tertiary period. As it was never effected by Pleistocene glaciations, it is characterized by highly unique flora and fauna. Such large relict lakes provide superb natural laboratories for studying the evolution of biodiversity. Young pairs of sympatric salmonid species are frequently observed in lake systems and Lake Ohrid is no exception. For example, at least five endemic species of *Salmo* (trout and salmon) have been described though none with modern approaches. This project seeks to comprehensively describe the pattern and ongoing process of salmonid diversification, and the uncertain, unknown, and cryptic diversity within and near Lake Ohrid. Using molecular genetic and morphological tools and accompanying statistical approaches, this diversity will be assessed as well in terms of its underlying historical and contemporary causes. Additional inferences on the modes and mechanisms of lake community diversification will be drawn through comparison with other ancient systems, namely Lake Baikal and Lake Tanganyika. The project will contribute to the objectives of the "Biodiversity and Ecosystems" area (Sustainable development, global change and ecosystems) announced in the 6FP work program.

## **217976- SECUREAU**

Security and decontamination of drinking water distribution systems following a deliberate contamination

[www.secureau.eu/](http://www.secureau.eu/)

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*Funding scheme:* CP (Collaborative Project), FP7

*Project duration:* 2/1/2009 - 1/31/2013

*EC contribution:* € 5 266 871

*Policy drivers:* Ecological Status

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### **Abstract**

Vulnerability of drinking water distribution systems to deliberate attacks, which would have major public health, economic and psychosocial consequences, is one of the main issues of concern to regulatory agencies, and water utilities. Such a network appears very vulnerable and easy to contaminate through reservoirs, back-flow... The main objective of this proposal is to limit the impact on the population of safe water privation because of contaminated networks, and to launch an appropriate response for rapidly restoring the use of the network after a deliberate contamination. Questions that will be addressed for successful coordinated response of water utilities and regulatory agencies to contamination include: •Detection of unexpected changes in water quality which could be in relation with a deliberate contamination event, •Adaptation of known analytical methods to rapidly detect specific CBRN contaminants in water and in biofilms. •Localization of the point sources of contamination and subsequently the contaminated area allowing delimitation of the corrective actions. •Decontamination procedures (efficient and realistic) of the distribution system. •Controlling the efficacy of the corrective actions by analysing the water bulk and especially the pipe walls and the deposits. •Cases studies will give the chance for the practitioners to apply on site in real conditions the selected sensors, methods, remediation technologies... It is a unique occasion to test an emergency procedure on a complicated, inaccessible, and relatively fragile system, to evaluate its feasibility at field scale, and to evaluate the difficulty to apply corrective treatments to the huge water bulk generated by the neutralisation/extraction of contaminants. The SecurEau project will therefore contribute to the European scientific excellence, to the European competitiveness and to the fight against terrorism, in accordance with the guidelines set up by the EC in the last 5 years.

## **273069- SEDSRES**

Quantifying sources and residence time of contaminated sediment in human-impacted river basins: an integrated approach

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 7/11/2011 - 7/10/2013

*EC contribution:* € 202 049

*Policy drivers:* Ecological Status  
Chemical Aspects  
Hydromorphology

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### **Abstract**

The widespread and costly environmental impacts of sediment and associated contaminants on aquatic ecosystems are recognised by scientists, land managers and policy makers worldwide. While considerable effort is being made to reduce sediment and contaminant fluxes in European river basins, longer-term storage of contaminants in sedimentary sinks presents a credible threat to achieving EU water quality targets. Sedimentary sinks could become contaminant sources in the future. In this context, this project aims to develop an integrated approach for quantifying diffuse sources and residence times of contaminated sediment in river basins affected by industrial, mining and agricultural pollution.

Development of the integrated approach will be undertaken in the River Tamar in south-west England, which is a predominantly agricultural basin with an extensive metal mining history. As such it offers a natural laboratory for exploration of key sediment-associated pollutants. The approach utilises fallout radionuclides and other sediment tracers to quantify diffuse sources of sediment and associated contaminants stored in channel deposits and transported in suspension over event and seasonal timescales. Potential sources include different agricultural land uses, mining waste deposits, channel banks, as well as secondary sources, including in-channel deposits and floodplains. The residence time of contaminated sediment in soils and channel sediments will be estimated by application of models which employ fallout radionuclides as chronometers over a range of timescales. Findings from the source and residence time analysis will be synthesized within a sediment budget framework, which can be used to directly underpin management decisions. This will provide river basin managers with a powerful tool to assess the potential impact of sedimentary sinks as secondary sources of water pollution in European rivers, a key requirement to meet the challenges of the Water Framework Directive.

## **247522- SERELAREFA**

SEmillas REd LATina Recuperacion Ecosistemas Fluviales y Acuaticos- (Seeds of a Latin network on fluvial and aquatic ecosystems restoration)

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 9/1/2010 - 8/31/2013

*EC contribution:* € 122 400

*Policy drivers:* Ecological Status

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### **Abstract**

River Restoration (RR) is a relatively new discipline which aims at defending river ecosystems because of both their intrinsic existence value and the services they can provide to humankind. It is a key component for the implementation of the Water Framework Directive (and others). Developing countries like Latin American (LA) can benefit a lot from introducing these idea at an early stage of planning and management because changes are far reaching and very fast. In Europe national centres, like CIRF (I), and European organizations, like the ECRR ([www.ecrr.org](http://www.ecrr.org)), were born which are spreading quickly information and momentum for a broader action, while in LA RR is practically ignored and very few experiences can be found. This project aims at filling this gap , starting from those research institutions which already showed sensitivity to the issue and linking them also to public management bodies in order to share knowledge and create engagement at the same time. A number of researchers and practitioners from Italy (CIRF which is running the secretary of ECRR) and Spain (which has the deepest links with LA and has recently launched a national strategy for RR in Spain) would bring their experience and vision to LA and face local challenges, while LA researchers and managers would mainly visit problems and projects sites in EU to see with their eyes the rationale and benefits of RR. Joint research activity to face selected case studies, site visits, workshops, sharing of publication and information and the set up of a joint web site are the main foreseen activities.

## **231646- SHOAL**

Search and monitoring of Harmful contaminants, Other pollutants And Leaks in vessels in port using a swarm of robotic fish

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*Funding scheme:* CP (Collaborative Project), FP7

*Project duration:* 3/1/2009 - 6/1/2012

*EC contribution:* € 2 750 000

*Policy drivers:* Ecological Status  
Chemical Aspects

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### **Abstract**

We have identified a cutting-edge method for monitoring pollution in ports as specified in EU Directive 2005/35. This monitoring process is currently costing approximately 350 million Euros per year in the EU. SHOAL will develop a shoal of robotic fish to analyse contaminants in water and produce a real-time map of which pollutants are in the water, in what concentrations and where these are on a 3D map of the port. SHOAL will use advanced swarm intelligence techniques to control the robots, utilising hybrid particle swarm/ant colony optimisation techniques in order to coordinate the group efficiently and adapt quickly to changes in the environment. This will benefit not only monitoring operations in ports across the EU, but also lead to important advances in robotics, chemical analysis, underwater communications and robot intelligence. At present there are no fully autonomous systems for monitoring pollution in ports. SHOAL is innovative in that it can analyse chemicals not only on the surface of the water (e.g. oil) but also those that are dissolved in the water (e.g. nitrates). This will allow the fish to find pollution from agriculture as well as leaks from vessels in a port.

SHOAL will build robot fish which will function independently and as part of a larger group to analyse and monitor pollution in a port. These robotic fish will be equipped with chemical sensors to find pollutants in the water and modems to create an ad hoc network for communication within the swarm. This will allow the shoal of robot fish to build up a broad map of the pollutants moving through the port in real time whilst adapting naturally to changes in environmental conditions in the port. Beyond this, due to the design of the robots, they will be able to search underwater rather than simply on the surface, meaning that if a leak is still occurring they will be able to isolate it even if it originates underwater (for example from the hull of a ship or an underwater pipeline).

## **025241- SISOMEN**

Speciated Isotope Labelling Experiments on Organometallic Compounds to Unravel their Chemical and Microbial Fate in the Environment

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 9/1/2005 - 8/31/2007

*EC contribution:* -

*Policy drivers:* Ecological Status

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### **Abstract**

As reflected in the Water Framework Directive (2000/60/EC) and in the Decision 2455/2001/EC the European Union has demonstrated its concern in the field of water policy, particularly in the establishment of a list of the most hazardous pollutants for the aquatic environment. Organometallic species such as tributyltin and its degradation products, Hg and its compounds as well as Pb and its compounds have been already included in this list and qualified as priority pollutants. Unravelling the biogeochemical cycle of organometallic contaminants still remains a difficult and unexplored task and needs to be evaluated through an interdisciplinary research in which the analytical and the environmental chemistry must collaborate with other scientific disciplines.

In this project the great potential provided by the use of stable isotopically enriched species when investigating dynamic environmental processes will be exploited to propose metabolic pathways controlling the transformations and sequestration of organometallic contaminants by bacteria. The investigation of both the reactivity and interaction of organometallic contaminants versus anaerobic microorganisms would help to understand the fate and potential ecotoxicity and to propose strategies for the microbially mediated abatement of these toxic species before being released into the environment. For this purpose the applicant as well as the host institution will collaborate deeply throughout this project with other research groups from the field of microbiology, ecotoxicology and biogeochemistry.

## **514949- SLUDPRESS**

Implications of sludge particles on microbial biofilms and the functionality of human altered streams : Pressure and Impact

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 7/20/2005 - 12/19/2007

*EC contribution:* € 149 396

*Policy drivers:* Ecological Status

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### **Abstract**

In the last decades, the implementation of wastewater treatment plans (WWTP) has substantially diminished sewage emissions on receiving streams and rivers throughout Europe. This is a major step towards the implementation of the WaterFramework Directive 2000/60/EC. However, a largely unresolved question remains about the pressure that WWTP represent for the receiving streams and rivers ecosystems. Virtually nothing is known on the implications of solid emissions from WWTP's into surface waters. In fact, WWTP malfunctioning inducing sludge rising, pin floc formation, slime bulking and diffuse growth causes solid losses into the receiving streams, solid emissions are more frequent than usually admitted. Sludge particles are highly active aggregates that beside their high carbon load can serve as vehicles for allochthonous bacteria, pathogens, contaminants and antibiotics. This proposal aims at studying the transportation fate of sludge particles and their implications on stream microbial biofilms and functions. In a first step, transportation behaviour will be studied on experimentally injected, labelled particles in large-scale streamside flumes, which are unique in Europe. Next, in laboratory experiments, the influence of sludge particles on the structure-function-coupling of stream microbial biofilms will be studied. This microcosm approach will address the question whether sludge particles inhibit or support the metabolic performance of microbial biofilms. Cutting-edge techniques including Confocal Laser Scanning Microscopy, whole-cell fluorescent and microautoradiography will be used.

## **212663- SOILCAM**

Soil Contamination: Advanced integrated characterisation and time-lapse Monitoring

[www.bioforsk.no/ikbViewer/page/prosjekt/tema?p\\_dimension\\_id=19564&p\\_menu\\_id=19572&p\\_sub\\_id=19565&p\\_dim2=19810](http://www.bioforsk.no/ikbViewer/page/prosjekt/tema?p_dimension_id=19564&p_menu_id=19572&p_sub_id=19565&p_dim2=19810)

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*Funding scheme:* CP (Collaborative Project), FP7

*Project duration:* 6/1/2008 - 11/30/2012

*EC contribution:* € 3 177 024

*Policy drivers:* Ecological Status  
Chemical Aspects  
Groundwater

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### **Abstract**

This project is aimed at improving current methods for monitoring contaminant distribution and biodegradation in the subsurface. Currently proven methods (based on invasive sampling of soil, soil water and gaseous phase) are unable to provide sufficiently accurate data with high enough resolution. Resulting in inability to assess of bioremediation progress and quantification of the processes involved in such bioremediation at field sites. Consequently, present assessment strategies to decide on optimal remediation approach, including design of monitoring systems, and evaluation of degradation progress, are severely flawed by uncertainty. Geophysical time-lapse measurements in combination with novel ground truthing methods give the possibility to determine: absolute contamination levels, spatial spreading, and reduced concentrations of contaminants in a heterogeneous environment. Geophysical methods of data acquisition alone are presently unable to provide absolute levels of biodegradable contamination concentrations. We aim to make improvements of fundamental constitutive relations between soil physical and degradation activity parameters and geophysically measurable parameters. Despite current improvements, there is a strong need to test these theories in practical field situations. Our project is dedicated to improving both site contamination assessment and the monitoring of bioremediation processes, and changes in soil environmental conditions. We suggest combining improved conventional soil monitoring techniques with state-of-the-art geophysical approaches. Partners in the project range from microbiologists to geophysicist, all with working experience from contaminated sites. Process studies involving lysimeters, and testing of the combination of technologies at two field sites are the major aims of the project. Focus on practical field situations and strong

communication with stake-holders and SMEs will ensure high relevance for society.

## **501680- SOVEREIGN**

Experimental studies of morphological and physiological variation in *Nitzschia* spp: improving taxon delimitation and determining ecological tolerances for water quality assessment using diatoms

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 2/16/2004 - 2/15/2006

*EC contribution:* € 159 046

*Policy drivers:* Ecological Status

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### **Abstract**

Benthic diatoms are widely used as water quality indicators because they respond rapidly, sensitively and species-specifically to environmental change. However, deducing ecological tolerances from field observations relies on correlations, assumes that the most abundant taxa are growing optimally, and ignores covariance between environmental variables. Only experimental investigations can determine the effect of a particular factor on species growth. Species delimitation in *Nitzschia* species is often problematic. Many species are small, and there is often considerable inherent morphological variation with size change. Other variation may be environmentally induced. Because many *Nitzschia* species are used as indicators of organic pollution in water quality assessments, it is important that they can be identified reliably. Therefore, the objectives of the project are: to clarify the taxonomy of *N. frustulum* and *N. palea* using original material in the NHM; to determine the intrinsic and environmentally-induced morphological variation of *N. frustulum* and *N. palea*; to determine their ecological tolerances and optima, and to refine diatom indices that incorporate these species. Clones will be isolated and grown under a range of controlled conditions to determine intrinsic and environmentally induced variation, and to determine tolerances and optima for salinity, nutrients and organic pollution. Genetic variation between clones (intra- and interspecific) will be assessed using allozyme electrophoresis. Based on the results, species diagnoses and ecological tolerances will be revised. Working at the NHM will provide advanced training in diatom culture techniques, diatom systematics and molecular techniques. My previous research on diatoms has been observational field ecology. Experimental studies can test field hypotheses. I regard this complementarity as essential to developing a more rigorous approach to diatom ecology and to furthering my research career

## **203734- STREPOW**

STRENGTHENING OF RESEARCH CAPACITY FOR POPLAR AND  
WILLOW MULTIPURPOSE PLANTATION GROWING IN SERBIA

[www.strepow.org/](http://www.strepow.org/)

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*Funding scheme:* CSA (Coordination - or networking - action), FP7

*Project duration:* 5/1/2008 - 4/30/2011

*EC contribution:* € 499 994

*Policy drivers:* Ecological Status

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### **Abstract**

The objective of the project is to strengthen the capacities of researchers to successfully participate in research activities at EU level, reinforcement research infrastructure of the Institute of Lowland Forestry and Environment, so that it could become the Center of Excellence in the region of Western Balkan Countries for growing of multi purpose poplar and willow plantations in Serbia, aiming at the production of biomass for energy and the phytoremediation of the contaminated sites by: Sustainable partnership and networking partners from EU countries; sending scientists for short stay in Networking partner institutions to carry out a specific research experiment related to poplar and willow plantations and the production of biomass, and application of these plantations for the phytoremediation of the damaged land and water, and also the preparation of the cooperative activities or joint RTD proposals; hosting the scientist from Networkin partners to organise the training for the researchers of the Institute of Lowland Forestry and Environment; by the improvement of human potential - employment of two young researchers who will direct their activities to the growing of multi-purpose poplar and willow plantations in Serbia; by the acquisition of the laboratory equipment. The exchange and the dissemination of multiannual research results between the institutions, and especially the transfer by EU Networking partners enables and supports the research capacity reinforcement of the Institute of Lowland Forestry and Environment what will have significant effect on the increase of area and the more efficacious establishment of Short rotation plantation in Western Balkan Countries on the less productive agricultural and contaminated soils.

## **022975- SUNDOM**

Solar radiation-driven photochemical modification of dissolved organic matter and its connections to the marine productivity

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 9/1/2005 - 8/31/2007

*EC contribution:* -

*Policy drivers:* Ecological Status

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### **Abstract**

A large part of primary production in ocean is converted to dissolved organic matter (DOM). Rivers and upwelling waters import DOM to the surface waters of coastal and upwelling regions, respectively. DOM provides nutrition to bacterioplankton and supports heterotrophic food webs. Prior to its biological utilization, the majority of DOM requires ectoenzymatic hydrolysis or photochemical cleavage. We hypothesize that the nutrients and energy bound to DOM contribute to the productivity of upwelling and coastal regions, and that solar ultraviolet radiation alters significantly the bioavailability of DOM. The overall objective of the proposed study is to determine the importance of DOM and its photochemical alteration for overall marine productivity. The proposed experiments will focus on DOM with different bioreactivity and functionalities in the coastal and upwelling regions. The proposed study quantifies the photochemical mineralization and the modification of the bioavailability of DOM, and relates these changes to the metabolic activities and community structure of bacterioplankton. Experiments will assess the role of solar radiation-induced photochemical reactions in the remineralization of biologically recalcitrant DOM (the D-enantiomeric fraction of amino acids). The proposed study quantifies also the impact of solar radiation on the activity of extracellular enzymes (e.g., phosphomonoesterase present in <0.2- $\mu\text{m}$  filtered water) and their diversity. The photochemical rates will be related to the absorbed doses of radiation during the experiments to calculate apparent quantum yields for the photochemical reactions (AQY). These modeling parameters (AQYs) allow the determination of the photochemical rates in situ under the variable (or predicted future) environmental conditions. We expect that DOM and photochemical reactions contribute significantly to overall systems productivity, and explain, in part, the high productivity of coastal and upwelling regions.

## 025122- SUREAL

Sorption of urea herbicides to black carbon

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 10/1/2006 - 9/30/2008

*EC contribution:* € 185 156

*Policy drivers:* Ecological Status  
Chemical aspects

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### Abstract

Pyrogenic carbon particles (collectively termed black carbon; BC) are ubiquitously present in sediments and soils and appear to explain fractions of strongly sorbed hydrophobic organic contaminants, thus having implications for the fate, availability and toxicity of these compounds. In common for compound groups exhibiting strong sorption to BC is their (capability of attaining a) planar conformation (e.g., polycyclic aromatic hydrocarbons; PAHs). Strong adsorption to combustion residues is not yet included in the current scientific picture of how pesticides distribute in the environment, although the molecular structure of many pesticides indicates the potential for a high affinity to BC. The overarching objective of the proposed study (SUREAL) is to better understand pesticide sequestration and availability in soils and sediments. The scientific objectives are i) to study the mechanism behind BC sorption for phenyl ureas, ii) to investigate competition between PAHs and phenyl ureas, and iii) to study the in-field relevance of BC sorption for phenyl ureas. Phenyl ureas were selected as model pesticides, because i) strong sorption to burned crop residues was reported, ii) of their largely planar conformation, iii) they are commonly used in Europe, and iv) they were frequently detected in the aqueous environment. Laboratory sorption experiments will be conducted with BC and carefully selected soils and sediments representing different organic matter characteristics, BC and PAH content. SUREAL, contributing to a refined and improved risk assessment of pesticides in the environment, refers in several ways to the European research areas as specified for the sixth framework programme. More specifically, it relates to the European water framework directive, of which one of the main goals is to achieve a good chemical status, partly by applying a list of priority pollutants to be phased out or undergo review, including two of the proposed phenyl ureas.

## **252139- TOPHECOL**

Factors regulating the input of terrestrial material and patterns in food web structure in African inland aquatic systems

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 9/15/2010 - 9/14/2012

*EC contribution:* € 168 800

*Policy drivers:* Ecological Status  
Socio-economy

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### **Abstract**

In many parts of Africa, human populations depend directly or indirectly on rivers and wetlands. Despite this importance, basic ecological aspects of most aquatic communities are still poorly understood and destructive activities such as deforestation and dam construction are in rapid ascent, threatening waterways and their wetlands. It is therefore crucial to improve our understanding on the ecology of these areas, so that the responses of aquatic communities to the different alterations to the natural environment can be predicted and impacts mitigated. This study will investigate the main sources of nutrition and the patterns of food web structure in (sub)tropical East African systems. The specific objectives are: 1) to understand the importance of imported (terrestrial) material for animal communities in freshwater and estuarine systems of (sub)tropical East Africa, 2) describe the food web organisation in these areas, 3) identify trophic processes characteristic of these food webs that can be used as indicators of ecosystem health and 4) determine the main environmental factors regulating the flow of material in these areas. The study will be based on stable isotope analysis and will focus mostly on macroinvertebrates and fish. Three large East African rivers, the Tana (Kenya), Zambezi (Mozambique) and the Betsiboka (Madagascar) will be sampled, along with six artificial reservoirs and two large lakes in Ethiopia. In each system, sites with different environmental conditions and subjected to different impacts will be considered, to multiply the potential to detect general patterns and successfully attribute causalities. Novel techniques to the treatment of stable isotope data will be applied and further developed to maximize the information extracted from the data. Environmental settings such as topography, river-flow and adjacent land use will also be considered, so that results can be linked to differences in environmental conditions, and types of impact.

## **248497- TRIDENT**

Marine Robots and Dexterous Manipulation for Enabling Autonomous Underwater Multipurpose Intervention Missions

[www.irs.uji.es/trident/](http://www.irs.uji.es/trident/)

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*Funding scheme:* CP (Collaborative Project), FP7

*Project duration:* 2/28/2010 - 2/28/2013

*EC contribution:* € 3 247 787

*Policy drivers:* Ecological Status

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### **Abstract**

TRIDENT proposes a new methodology for multipurpose underwater intervention tasks with diverse potential applications like underwater archaeology, oceanography and offshore industries, going beyond present-day methods typically based on manned and / or purpose built systems. A team of two cooperative heterogeneous robots with complementary skills, an Autonomous Surface Craft (ASC) and an Intervention Autonomous Underwater Vehicle (I-AUV) endowed with a dexterous manipulator, will be used to perform underwater manipulation tasks. The proposed methodology is based on two steps. During the first step, the I-AUV is deployed from the ASC to perform a cooperative path following survey, where it gathers optical/acoustic data from the seafloor whilst the ASC provides geo-referenced navigation data as well as communication with the end user. During this phase of the mission the I-AUV will be doing accurate path following and terrain tracking, to maximize bottom coverage and data quality. The motion of the ASC will be coordinated with that of the I-AUV to achieve precise USBL (Ultra Short Base Line) positioning and reliable acoustic communications. After the survey, the I-AUV docks with the ASC and sends the data back to a ground station where a map is set up and a target object is identified by the end user. At the second step, the ASC navigates towards a waypoint near the intervention area where the I-AUV is launched to search for the object. When the object (i.e. the target of the intervention) has been found, the I-AUV switches to free floating navigation mode. The manipulation of the object takes place through a dexterous hand attached to a redundant robot arm and assisted with proper perception. Particular emphasis will be put on the research of the vehicles intelligent control architecture to provide the embedded knowledge representation framework and the high-level reasoning agents required to enable a high degree of autonomy and on-board decision making of the platform. The new methodology will allow the user to specify an intervention task, among a set of predefined ones, to be undertaken with regards to a particular target object selected by the end user by means of

the map previously built. Hence the intervention task is seen as a semi-automatic process where the target is manually selected but then it is automatically recognized and manipulated by the robot in a complete autonomous way. The TRIDENT project brings together research skills specific to marine environments in navigation and mapping for underwater robotics, multi-sensory perception and a range of control techniques relating to intelligent control architectures, vehicle-manipulator systems and dexterous manipulation.

## **225669- UAN**

Underwater Acoustic Network

[www.ua-net.eu/](http://www.ua-net.eu/)

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*Funding scheme:* CP (Collaborative Project), FP7

*Project duration:* 9/30/2008 - 9/30/2011

*EC contribution:* € 2 950 000

*Policy drivers:* Ecological Status

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### **Abstract**

The UAN project aims at conceiving, developing and testing at sea an innovative and operational concept for integrating in a unique system submerged, surface and aerial sensors with the objective of protecting critical infrastructures, such as off-shore platforms and energy plants. The security of such economically vital infrastructures requires an integrated approach involving underwater and land/air sensors and actuators for surveillance, monitoring and deterrence. In particular UAN focuses on a security oriented underwater wireless network infrastructure, realized by hydroacoustic communication. The UAN concept is to gather environmental information during the acoustic transmission and use it to predict the acoustic propagation conditions and the optimal obtainable performance at any given time. This information is used in the communication system for precise tuning. This tuning will take place at two different levels: i) by improving the basic point-to-point connection, by introducing physical and geometric constraints in the channel equalization and optimization process of the communication settings and ii) at the macro network configuration level by adapting node geometric configuration to the acoustic propagation conditions predicted from the environmental observations. This can be done in depth or in range by moving nodes placed on AUVs either to increase the point-to-point communication capacity or by serving as relay nodes to more distant, and at that time, inaccessible fixed nodes. This is a rather new approach that requires a better understanding of the acoustic propagation physics as well as a capacity to include that knowledge into technologically advanced communications modules and algorithms for underwater communications. The UAN project builds on a multidisciplinary consortium of technologically advanced industries, field experienced university labs and governmental agencies, thus grouping the required knowledge and experience.

## **003163- WATERNORM**

Monitoring and mitigation of mine water impact in Upper Silesia region ? increasing of research and development potential in Central Mining Institute

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 9/1/2004 - 8/31/2008

*EC contribution:* € 895 020

*Policy drivers:* Ecological Status  
Groundwater

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### **Abstract**

Water is one of the most important substances for human beings. Therefore, the best possible knowledge about its pollution and mitigation measures is crucial, either to assure the safety of its consumption or to undertake countermeasures in case of exceeded levels for undesired and non-permitted pollutants. Especially in the Central and Eastern Europe (CEE) the environmental heritage of the past activities is enormous due to the past focusing of the economy of these countries on development of heavy industries like mining and smelting, while environmental issues have been left behind. Environmental protection, remediation and reclamation in areas, which are heavy industrialised but also densely populated, has a very big importance. Very specific aspect of the contamination, caused by mining, is technologically enhanced naturally occurring radioactivity (TENORM) of waste materials. Upper Silesia is an example of a densely populated, urban and industrial district in southern Poland. A strong impact of underground mining (mainly coal and metal ores) on the pollution of the natural environment can be clearly seen in the region. Release of saline mine waters from mines, disposal of spoils on surface piles, diffusion of pollutants from settling ponds lead to the contamination of surface waters and groundwater in the region. Central Mining Institute (GIG) is the main institute in Poland, investigating such problems. Despite the experience, gathered by our scientists in past years, the unification with EU became a big challenge. One of the important goals of the WATERNORM project will be to consolidate and advance our knowledge and competence in the environmental science, that are not only essential for the safe use of water resources, but very important in maintaining and management of mining activities. The research will also contribute to the harmonised implementation of the EU regulations in the area of environmental protection.

## **262949- WATPLAN**

Spatial earth observation monitoring for planning and water allocation in the international Incomati Basin

[www.watplan.eu/](http://www.watplan.eu/)

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*Funding scheme:* CP (Collaborative Project), FP7

*Project duration:* 2/1/2010 - 1/31/2014

*EC contribution:* € 491 571

*Policy drivers:* Ecological Status  
Hydromorphology

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### **Abstract**

This project proposal focuses on water resources allocation and the identification of historical and current water use and high resolution monitoring of several water resource indicators on a weekly basis. For this purpose an operational earth observation system will be developed which includes a website with weekly updates of water resource data on water use. This system can be linked to GEOSS (Global Earth Observation System of Systems) in order to make data accessible for multiple users. The main data generated on a weekly basis as a result of this project are:

- Water use and evaporation
- Rainfall
- Land use
- Soil moisture
- Biomass production

These five parameters are the basic inputs for water accounting, which is a relatively new concept that can contribute to better water allocation, verification of water use and sustainable water utilization.

## **212300- WETWIN**

Enhancing the role of wetlands in integrated water resources management for twinned river basins in EU, Africa and South-America in support of EU Water Initiatives

[www.wetwin.net/](http://www.wetwin.net/)

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*Funding scheme:* CP (Collaborative Project), FP7

*Project duration:* 11/1/2008 - 12/31/2011

*EC contribution:* € 2 284 011

*Policy drivers:* Ecological Status

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### **Abstract**

The overall objective of the WETwin project is to enhance the role of wetlands in basin-scale integrated water resources management, with the aim of improving the community service functions while conserving good ecological status. Strategies will be worked out for: • utilizing the drinking water supply and sanitation potentials of wetlands for the benefit of people living in the basin, while maintaining (and improving as much as possible) the ecosystem functions • adapting wetland management to changing environmental conditions • integrating wetlands into river basin management • improving stakeholder participation and capacity building with the aim of supporting sustainable wetland management. The project will work on 'twinned' case study wetlands from Africa, South America and Europe. Management solutions will be worked out for these wetlands with the aim of supporting the achievement of the above objectives. Involvement of local stakeholders into the planning process will play a crucial role. Knowledge and experiences gained from these case studies will be summarized in general guidelines in order to support achieving project objectives on global scale. The project also aims at supporting the global exchange of expertise on wetland management. Stakeholder participation, capacity building and expertise exchange will be supported by a series of stakeholder and 'twinning' workshops.

## **226273- WISER**

Water bodies in Europe: Integrative Systems to assess  
Ecological status and Recovery

[www.wiser.eu/](http://www.wiser.eu/)

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*Funding scheme:* CP (Collaborative Project), FP7

*Project duration:* 3/1/2009 - 2/29/2012

*EC contribution:* € 6 984 092

*Policy drivers:* Ecological Status  
Hydromorphology  
Climate Change

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### **Abstract**

WISER will support the implementation of the Water Framework Directive (WFD) by developing tools for the integrated assessment of the ecological status of European surface waters (with a focus on lakes and coastal/transitional waters), and by evaluating recovery processes in rivers, lakes and coastal/transitional waters under global change constraints. The project will (1) analyse existing data from more than 90 databases compiled in previous and ongoing projects, covering all water categories, Biological Quality Elements (BQEs) and stressor types and (2) perform targeted field-sampling exercises including all relevant BQEs in lakes and in coastal/transitional waters. New assessment systems will be developed and existing systems will be evaluated for lakes and coastal/transitional waters, with special focus on how uncertainty affects classification strength, to complete a set of assessment methodologies for these water categories. Biological recovery processes, in all water categories and in different climatic conditions, will be analysed, with focus on mitigation of hydromorphological and eutrophication pressures. Large-scale data will be used to identify linkages between pressure variables and BQE responses. Specific case studies, using a variety of modelling techniques, will address selected pressure-response relationships and the efficacy of mitigation measures. The responses of different BQEs and different water categories to human-induced degradation and mitigation will be compared, with special focus on response signatures of BQEs within and among water categories. Guidance for the next steps of the intercalibration exercise will be given by comparing different intercalibration approaches. Stakeholders will be included from the outset, by building small teams of stakeholders and project partners responsible for a group of deliverables, to ensure the applicability and swift implementation of results.

## **023215- WQSTRESS**

Biological trace metal stress indicators for the assessment of freshwater ecosystems

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 1/15/2006 - 1/14/2008

*EC contribution:* € 159 046

*Policy drivers:* Ecological Status

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### **Abstract**

The overall objective of this project is to study the response of phytoplankton to metal species, and develop a further understanding of the relationship between trace metal speciation and biouptake processes and ensuing toxicity, including production of intracellular trace metal stress indicators (phytochelatins) and extracellular ligands released (total uronic acid and thiols) and combined effects in metal mixtures. The specific objectives of the project are: To study the relationship between metal speciation, bioavailability and intracellular phytochelatin production in laboratory incubations using single element additions and mixtures of metals (A) and in freshwater phytoplankton through field studies in contrasting freshwater systems. To investigate the importance of phytochelatins for the acclimatisation of freshwater algae to elevated metal exposure and the involvement of phytochelatins in the interspecies differences between phytoplankton to metal stress (C). To study the relationship between trace metal species concentrations and production of specific exudates (thiols and uronic acid) by freshwater microorganisms in laboratory and field studies (D). To investigate the usefulness of intracellular phytochelatins (E) and of trace metal complexing extracellular ligands (F) in freshwater systems as a trace metal stress indicators tool for the WFD. Development of non-empirical definitions and links for chemical status and ecological status of freshwater ecosystems incorporates a range of different practical and theoretical concepts and requires multidisciplinary scientific expertise. The proposed work will provide sophisticated trace metal stress indicators to the WFD for water quality assessment. The project will provide a non-empirical link between metal speciation and biological effects.



# Floods



## **244159- CONHAZ**

Costs of Natural Hazards

[www.conhaz.org/](http://www.conhaz.org/)

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*Funding scheme:* CSA, FP7

*Project duration:* 12/1/2009 - 1/31/2012

*EC contribution:* € 899 487

*Policy drivers:* Floods

Water Scarcity and Droughts

Socio-economy

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### **Abstract**

Cost assessments of damages of natural hazards supply crucial information to policy development in the fields of natural hazard management and adaptation planning to climate change. There exists significant diversity in methodological approaches and terminology in cost assessments of different natural hazards and in different impacted sectors. ConHaz provides insight into cost assessment methods, which is needed for an integrated planning and overall budgeting, and to prioritise policies. To strengthen the role of cost assessments in natural hazard management and adaptation planning, existing approaches and best practices as well as knowledge gaps are identified. ConHaz has three key objectives. The first objective is to compile state-of-the-art methods and terminology as used in European case studies, taking a comprehensive perspective on the costs of natural that includes droughts, floods, storms, and alpine hazards.

ConHaz also considers various impacted economic sectors such as housing, industry and transport, and non-economic sectors such as health and nature. It will consider single and multi-hazards, leading to direct, indirect and intangible costs. ConHaz moreover looks at costs and benefits of risk-prevention and emergency response policies. The second objective of ConHaz is to evaluate the compiled methods. The analysis addresses theoretical issues, such as the principal assumptions that underlie economic valuation of damage types, as well as practical issues, such as the qualifications needed for data collection and quality assurance. ConHaz also looks at the reliability of the end result by considering the accuracy of cost predictions and best-practice-methods of validation. A central issue of the evaluation is to compare available methods with end-user needs. The third objective of ConHaz is to synthesize the results and give recommendations according to current best practice as well as to resulting research needs.

## **244047- CORFU**

Collaborative research on flood resilience in urban areas

[www.corfu-fp7.eu/](http://www.corfu-fp7.eu/)

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*Funding scheme:* CP, FP7

*Project duration:* 4/1/2010 - 3/31/2014

*EC contribution:* € 3 490 000

*Policy drivers:* Floods

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### **Abstract**

Collaborative research on flood resilience in urban areas (CORFU) is an interdisciplinary international project that will look at advanced and novel strategies and provide adequate measures for improved flood management in cities. The differences in urban flooding problems in Asia and in Europe range from levels of economic development, infrastructure age, social systems and decision making processes, to prevailing drainage methods, seasonality of rainfall patterns and climate change trends. Our vision is that this project will use these differences to create synergies that will bring new quality to flood management strategies globally. Through a 4-year collaborative research programme, the latest technological advances will be cross-fertilised with traditional and emerging approaches to living with floods.

The overall aim of CORFU is to enable European and Asian institutions to learn from each other through joint investigation, development, implementation and dissemination of strategies that will enable more scientifically sound management of the consequences of urban flooding in the future. Flood impacts in urban areas potential deaths, damage to infrastructure and health problems and consequent effects on individuals and on communities and possible responses will be assessed by envisaging different scenarios of relevant drivers: urban development, socio-economic trends and climate changes. The cost-effectiveness of resilience measures and integrative and adaptable flood management plans for these scenarios will be quantified. CORFU is structured in six Work Packages. WP1 will look at drivers that impact on urban flooding. WP2 will enhance methodologies and tools for flood hazard assessment based on urban flood modelling. WP3 will improve, extend and integrate modern methods for flood impact assessment. WP4 will aim to assess and enhance existing flood risk management strategies. WP5 will disseminate the outputs. WP6 will co-ordinate the project.

## **515742- CRUE**

Coordination de la Recherche sur la gestion des inondations financie dans l'Union Europeene (Coordination of research financed in the European Union on Flood risk management)

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*Funding scheme:* CA, FP6

*Project duration:* 11/1/2004 - 10/31/2009

*EC contribution:* € 3 000 000

*Policy drivers:* Floods  
Science-policy Interface

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### **Abstract**

The management of flood risk is a critical component of public safety and quality of life. Historically, EU Member and Associated States have promoted their own research to improve the understanding and management of flood risks with no formal coordination between national programmes. The CRUE ERA-NET will introduce, for the first time, structure within this area of European research through an inter-comparison of the process of research programme formulation, implementation and management. This will lead to the consolidation and promotion of best practice and the identification of gaps and opportunities for international collaboration on future programme content. CRUE will also address the pressing need to improve the dissemination of existing research results to derive public benefit from past investment in the generation of knowledge and understanding. An early action in the CRUE is to encourage participation in the Network from other Member States which commission research on flood risk management. The topic area for this structuring activity lies within the Global Change and Ecosystems priority area of FP6 and covers one facet of achieving Sustainable Development. Structuring the European research on this topic should facilitate technologies and strategies for sustainable flood mitigation and defence, recognising the complex interaction between natural bio-physical systems and socio-economic systems, to support spatial and policy planning in the context of global change and societal advance. The vision for the CRUE ERA-NET action on flooding is to develop strategic integration of research at the national funding and policy development levels within Europe to provide knowledge and understanding for the sustainable management of flooding risks at the river basin and coastal process cell scale.

## **031025- FATE-EWS-NILE**

Flood and drought risk Assessment Tools using modelling and Earth observation for Early Warning Systems in the Nile Basin

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*Funding scheme:* STP, FP6

*Project duration:* 1/1/1900 - 12/31/1902

*EC contribution:* € 1 687 931

*Policy drivers:* Floods

Water Scarcity and Droughts

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### **Abstract**

The need for integrated water resources management to alleviate poverty and food insecurity especially in semi-arid Africa cannot be overemphasised. The FATE-EWS-NILE project aims to develop a set of flood and drought risk assessment tools to understand better the impact of land use changes on the hydrological cycle in the Nile Basin. The assessment tools will be developed for two scales – regional and national/international, to provide early warning systems relevant. Remote sensing products will be exploited, together with other products, to update and improve existing spatial databases of river catchment characteristics for selected catchments in the basin (at the regional scale) and the entire Nile Basin (at the national/international scale). The spatial databases will be used with time series rainfall, soil moisture, and runoff data to develop regional hydrological models for gauged and ungauged catchments. Two types of models will be developed – regional drought and flood frequency models and lumped conceptual rainfall-runoff models. The regional drought and flood frequency models, establish the degree of flood and drought risk for gauged catchments. Lumped conceptual rainfall-runoff models are used to simulate total flow, and separate this flow into slow flow (base flow) and quick flow components. The regionalisation of these models is achieved by relating model parameters to catchment attributes. This enables a typology of catchments to be established and validated for non-gauged catchments. The validated lumped conceptual rainfall-runoff model will be further developed into a prototype, near-real time flood and drought simulator based on satellite information. The flood and drought risk assessment tools will be linked with the results of the land use change scenario analysis to develop a decision support tool for end users. A web-based portal shall be developed to host a near real time flood and drought simulation tools for the Nile Basin.

## **211108- FLADAR**

Flood zoning in Southeast Attica using gauge calibrated radar rainfall and advanced modeling techniques

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*Funding scheme:* MC, FP7

*Project duration:* 6/1/2010 - 5/31/2013

*EC contribution:* € 100 000

*Policy drivers:* Floods

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### **Abstract**

The chief objective of the FLADAR project is to combine the main researcher's expertise in flood assessment studies and the technical and personnel support of two major research institutes, the National Technical University of Athens (NTUA) and the National Observatory of Athens (NOA), to produce flood risk zones in selected areas southeast of Athens, Greece. No prior studies of flood risk maps exist for the city of Athens. The absence of flood zones prohibited the implementation of sound flood risk management plans and let people and properties vulnerable to flash floods during significant storm events.

The FLADAR project aims to provide such input to the Competent Authorities by conducting a comprehensive flood study in a currently developing region of Athens, where effective flood management planning may not only mitigate flood impact but also prevent it. The study will use GIS and distributed modeling techniques supported by rain gauge calibrated radar rainfall from the polarimetric radar of the NOA and historical rainfall data from the METEONET gauge network operated by NTUA. During the last 5 years, the main researcher applied advanced modeling techniques in Rice University, Houston TX, to evaluate the impact of land use change and subsidence on urban flooding. For the last 7 months, the researcher is working under contract with NTUA and produced, in cooperation with NOA, a preliminary comparison of radar and rain gauge data in the greater Athens area, that will be presented in the 10th International Conference on Environmental Science and Technology in Cos, Greece. Getting funded for the FLADAR project will enable the researcher to continue the current cooperation and support a floodplain analysis study by purchasing radar rainfall data and advanced software, installing stream flow gauges, acquiring expert opinions, and employing support personnel. The FLADAR project aims to follow the guidelines and satisfy major goals of the proposed EU Flood Directive.

## **39147- FLOODS**

Fate of land-derived organic compounds in the coastal ocean

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*Funding scheme:* MCA, FP6

*Project duration:* 11/1/2006 - 10/31/2008

*EC contribution:* € 157 758

*Policy drivers:* Floods

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### **Abstract**

The main goal of this project is to characterize the sources of organic matter (terrestrial vs. marine) in the coastal zone. We will apply lipid biomarkers in combination with more conventional organic tracers. The innovative aspect of this project rests on the application of a newly developed proxy for terrestrial organic matter characterization to a modern marine environment. For this purpose, the BIT (Branched and Isoprenoid Tetraether) index based on specific organic compounds will be applied to an extensive set of various continental and marine particulate matter and sediment samples from the river-dominated Gulf of Lions (NW Mediterranean). The proposed combination of lipid biomarkers with bulk organic tracers represents a novel approach to discriminate the origin of organic matter in modern marine environments. Moreover, deeper knowledge on the basis of the BIT index and the validation of this proxy is needed to provide the paleoclimate community a simple and robust tool to reconstruct the terrestrial inputs into the marine environment and the hydrological variations on continents and hence to answer many currently unresolved questions about climate change. The results will also contribute to improve our knowledge of sedimentary processes, and sediment transport pathways from continent to deep-sea. The impacts of storms and floods on the distribution and transfer of particulate organic matter in the coastal zones will also be assessed. Finally, broader impacts of this study to the scientific community include a better understanding of the carbon cycle in the coastal ocean and naturally occurring compounds and the processes that determine their fates. This increased knowledge will further serve to improve models for predicting the behaviour of anthropogenic contaminants in marine ecosystems.

## **277183- FLOODSAT**

### **ADVANCEMENT OF SATELLITE RAINFALL APPLICATIONS FOR HYDROLOGIC MODELING WITH EMPHASIS ON FLOOD MONITORING**

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*Funding scheme:* MC, FP7

*Project duration:* 4/1/2011 - 3/31/2014

*EC contribution:* € 75 000

*Policy drivers:* Floods

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#### **Abstract**

Floods are the most widespread and frequent natural disaster responsible for significant loss of lives and property each year. The European Environmental Agency estimated that floods in Europe between 1998 and 2002 caused about 700 deaths, the displacement of about half a million people and at least 25 billion Euros in insured economic losses. As such, one of the four priority areas in FP7 has been identified as triggering factors and forecasting and mitigation strategies for natural hazards.

Flood early warning systems are the most effective way to mitigate flood induced hazards. The reliability of such systems depends on the availability of timely and good-quality rainfall estimates. Although many of the regions in Europe are equipped with dense rain gauge networks, the station density varies greatly from country to country, which can affect the quality of the model simulations. Hence exploiting alternative ways, such as satellite-based products, for estimating rainfall having continuous spatial coverage and short latency will be potentially beneficial for mitigating flood risks.

The overall goal of this project is to 'advance the utility of satellite-based rainfall estimates for hydrologic modeling, specifically for flood monitoring'. The expected outcomes of this research are: 1) a large database of dynamic and static datasets for the Western-Black Sea basin, Turkey, 2) A methodology for adjusting satellite-based rainfall estimates, 3) intercomparison study revealing the degree of agreement between rain gauge and satellite-based rainfall products over the study area before/after the adjustment, 3) A hydrologic model that is implemented for the study basin using rainfall estimates from rain gauges and existing/adjusted satellite rainfall products, 4) An improved methodology for calibration and evaluation of hydrological models, 5) An analysis providing insights into the value of existing/adjusted satellite-based rainfall estimates for streamflow simulations.

## **505420- FLOODSITE**

Integrated flood risk management methodologies

www.floodsite.net

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*Funding scheme:* IP, FP6

*Project duration:* 3/1/2004 - 2/28/2009

*EC contribution:* € 9 680 000

*Policy drivers:* Floods

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### **Abstract**

The management of flood risk is a critical component of public safety and quality of life. The FLOODsite Integrated Project will produce improved understanding of specific flood processes and mechanisms and methodologies for flood risk analysis and management ranging from the high level management of risk at a river-basin, estuary and coastal process cell scale down to the detailed assessment in specific areas. It includes specific actions on the hazard of coastal extremes, coastal morphodynamics and flash flood forecasting, as well as understanding of social vulnerability and flood impacts, which are critical to improving the mitigation of flood risk from all causes. The project seeks to identify technologies and strategies for sustainable flood mitigation and defence, recognising the complex interaction between natural biophysical systems and socio-economic systems, to support spatial and policy planning in the context of global change and societal advance. Several pilot studies are included in FLOOD site. These will identify lessons from recent floods (e.g. Elbe, 2002), and test the proposed operational use of methods on integrated risk management and sustainable flood defence (the Thames and Scheldt Estuaries and the Ebro coastal delta) or new technology for flash flood forecasting (in France and Italy). FLOOD site will also develop common language, guidance and tools for dissemination of the project results and professional training packages. FLOOD site will build upon the previous and current European and national research and practice in river and coastal flood processes and flood risk mitigation methods to promote consistency of approach. Several of the FLOOD site project partners are identified as contributors to proposals for the virtual centre on floods and droughts identified in Para 1.1.6.3.II of the work programme; this virtual centre will complement the activities of the FLOOD site project.

## **037024- HYDRATE**

Hydrometeorological data resources and technologies for effective flash flood forecasting

[www.hydrate.tesaf.unipd.it](http://www.hydrate.tesaf.unipd.it)

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*Funding scheme:* STP, FP6

*Project duration:* 9/1/2006 - 5/31/2010

*EC contribution:* € 2 350 000

*Policy drivers:* Floods

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### **Abstract**

The management of flash flood hazards and risks is a critical component of public safety and quality of life. Flash-floods develop at space and time scales that conventional observation systems are not able to monitor for rainfall and river discharge. Consequently, the atmospheric and hydrological generating mechanisms of flash-floods are poorly understood, leading to highly uncertain forecasts of these events. The HYDRATE objective is to improve the scientific basis of flash flood forecasting by extending the understanding of past flash flood events, advancing and harmonising a European-wide innovative flash flood observation strategy and developing a coherent set of technologies and tools for effective early warning systems. To this end, the project includes actions on the organization of the existing flash flood data patrimony across Europe. The observation strategy proposed in HYDRATE has the objective to collect flash flood data by combining hydrometeorological monitoring and the acquisition of complementary information from post-event surveys. This will involve a network of existing Hydrometeorological Observatories; all placed in high flash flood potential regions. HYDRATE will develop a freely-accessible European Flash Flood Database to make available the collected hydrometeorological data to the international research community. The final aim of HYDRATE is to enhance the capability of flash flood forecasting in ungauged basins by exploiting the extended availability of flash flood data and the improved process understanding. The Partners include nine universities, seven government research centres, and one SME. These represent eight Member States, one Associated Candidate State and three third-countries. Thus the results of HYDRATE will benefit from assembling international knowledge and scientific expertise and lead to advancements in observation strategy for implementation not only in Europe but internationally.

## **226555- IMPRINTS**

IMproving Preparedness and RIsk maNagementT for flash floods and debriS flow events

[www.imprints-fp7.eu/](http://www.imprints-fp7.eu/)

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*Funding scheme:* CP, FP7

*Project duration:* 1/15/2009 - 4/14/2012

*EC contribution:* € 3 280 000

*Policy drivers:* Floods

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### **Abstract**

The aim of IMPRINTS is to contribute to reduce loss of life and economic damage through the improvement of the preparedness and the operational risk management for Flash Flood and Debris Flow [FF/DF] generating events, as well as to contribute to sustainable development through reducing damages to the environment. To achieve this ultimate objective the project is oriented to produce methods and tools to be used by emergency agencies and utility companies responsible for the management of FF/DF risks and associated effects.

Impacts of future changes, including climatic, land use and socioeconomic will be analyzed in order to provide guidelines for mitigation and adaptation measures. Specifically, the consortium will develop an integrated probabilistic forecasting FF/ DF system as well as a probabilistic early warning and a rule-based probabilistic forecasting system adapted to the operational use by practitioners. These systems will be tested on five selected flash flood prone areas, two located in mountainous catchments in the Alps, and three in Mediterranean catchments.

The IMPRINTS practitioner partners, risk management authorities and utility company managers in duty of emergency management in these areas, will supervise these tests. The development of such systems will be carried out using and capitalizing the results of previous and ongoing research on FF/DF forecasting and warning systems, in which several of the partners have played a prominent role. One major result of the project will be a operational prototype including the tools and methodologies developed under the project.

This prototype will be designed under the premise of its ultimate commercialization and use worldwide. The consortium, covering all the actors involved in the complex chain of FF & DF forecasting, has been carefully selected to ensure the achievement of this. Specific actions to exploit and protect the results and the intellectual property of the partners have been also defined.

## **286522- INFLATER**

Development of a universal flood protection tool using the force of the water to protect against floods

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*Funding scheme:* BSG-SME, FP7

*Project duration:* 10/1/2011 - 9/30/2013

*EC contribution:* € 1 100 447

*Policy drivers:* Floods

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### **Abstract**

The flooding of rivers has always been a problem, and thanks to advances in civil engineering humans learnt of methods to keep the river in its bed. In urban areas especially, but in rural areas as well, embankments have been built to keep the river where it belongs. Unfortunately even with embankments flooding occurs as we can see it all over Europe and the World. Due to global warming flooding is becoming more and more common and the water level is getting so high that the presently built embankments cannot cope. At present people use sandbags as the main protection against flooding. The advantage of sandbags is that it is cheap and sand is widely available, but it requires a lot of manpower to fill and place the bags..

The idea of this project would be to design and build a portable dam, which can be placed anywhere quickly, easily and does not require much manpower.

The project would be broken down onto two main sections. The first section includes the mechanical part, which involves the design of the inflatable section. The second section involves the electrical sensor part and wireless communication.

The construction consists of three parts, the floating top section and the inflatable section with a skirt secured by fixing spikes and supporting strings.. The inflatable section is connected to the skirt and secured to the grown with support strings and spikes. As the water level rises it lifts the floating part and the water is let inside the inflatable section. As the inflatable part is filled the strings go tight to support the structure.

To aid the mechanical design, electrical sensors can be introduced. The sensors can be used so INFLATER can monitor itself and the river. INFLATER needs to monitor itself so it can warn if it fails or the water level gets too high It also monitors the river to help predict its behaviour and send warnings to the surrounding areas via wireless communication to help avoid a tragedy.

## **265280- KULTURISK**

Knowledge-based approach to develop a cULTure of Risk prevention

[www.kulturisk.eu/](http://www.kulturisk.eu/)

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*Funding scheme:* CP, FP7

*Project duration:* 1/1/2011 - 12/31/2013

*EC contribution:* € 3 225 616

*Policy drivers:* Floods  
Socio-Economy  
Climate Change

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### **Abstract**

The extreme consequences of recent catastrophic events have highlighted that risk prevention still needs to be improved to reduce human losses and economic damages. The KULTURisk project aims at developing a culture of risk prevention by means of a comprehensive demonstration of the benefits of prevention measures. The development of a culture of risk prevention requires the improvement of our: a) memory and knowledge of past disasters; b) communication and understanding capacity of current and future hazards; c) awareness of risk and d) preparedness for future events. In order to demonstrate the advantages of prevention options, an original methodology will be developed, applied and validated using specific European case studies, including transboundary areas. The benefits of state-of-the-art prevention measures, such as early warning systems, non-structural options (e.g. mapping and planning), risk transfer strategies (e.g. insurance policy), and structural initiatives, will be demonstrated. In particular, the importance of homogenising criteria to create hazard inventories and build memory, efficient risk communication and warning methods as well as active dialogue with and between public and private stakeholders, will be highlighted. Furthermore, the outcomes of the project will be used to efficiently educate the public and train professionals in risk prevention. KULTURisk will first focus on water-related hazards as the likelihood and adverse impacts of water-related catastrophes might increase in the near future because of land-use and/or climate changes. In particular, a variety of case studies characterised by diverse socio-economic contexts, different types of water-related hazards (floods, debris flows and landslides, storm surges) and space-time scales will be utilised. Finally, the applicability of the KULTURisk approach to different types of natural hazards (e.g. earthquakes, forest fires) will also be analysed.

## **014509- MARIE**

Modelling and Assimilation for ROFI Environments.Limits of Predictability

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*Funding scheme:* MCA, FP6

*Project duration:* 3/1/2005 - 2/28/2009

*EC contribution:* € 470 494

*Policy drivers:* Floods

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### **Abstract**

The main aim of this Marie Curie-TOK project is to increase the “marine” forecasting capabilities of two south European Universities. The project is based on the dynamics of two selected river-mouth and adjacent coast areas, representative of the Iberian Peninsula coastline. The focus is on driving terms (such as tidal influence and 3D river discharge boundary condition), model coupling (information flow, feedbacks and interactions) and the predictability limits for the modelling suite. This will allow a structured transfer of knowledge from several top EU research groups (from Belgium, United Kingdom and the Netherlands) towards two Host Institutions with proven knowledge on the dynamics of the selected ROFI (regions of fresh water influence) areas and with enough expertise on partial numerical modelling aspects. The expected advancement in model coupling, forcing terms and predictability limits will serve to address in a more scientific manner the management of ROFI areas. This will help to alleviate the unsustainable development experienced by the selected coastal zones and which is common to many coastal stretches along the Iberian Peninsula. Both the Spanish and Portuguese coastal societies are, thus, expected to benefit from the improved prediction/analysis of wave/current/river plumes. Likewise, the advancement in scientific/technical capabilities achieved by the Host Institutions will improve their research and teaching potential. The expected advancement will also build upon the wealth of field data available from the two field sites and particularly from the online meteo-oceanographic observations from the XIOM network deployed along the Catalan coast. In this sense the project will enhance the benefit and impact of previous European Union and national research projects and will maximize the use of the oceanographic XIOM buoys. All this highlights the social and economic relevance of the proposed improvement in predictability of ROFI dynamics.

## **265138- MATRIX**

New Multi-Hazard and Multi-Risk Assessment MethodS for Europe

[matrix.gpi.kit.edu/](http://matrix.gpi.kit.edu/)

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*Funding scheme:* CP, FP7

*Project duration:* 10/1/2010 - 9/30/2013

*EC contribution:* € 3 395 870

*Policy drivers:* Floods

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### **Abstract**

Across Europe, people suffer losses not just from single hazards, but also from multiple events in combination. In both their occurrence and their consequences, different hazards are often causally related. Classes of interactions include triggered events, cascade effects, and rapid increases of vulnerability during successive hazards. Effective and efficient risk reduction, therefore, often needs to rest on a place-based synoptic view. MATRIX will tackle multiple natural hazards and risks in a common theoretical framework. It will integrate new methods for multi-type assessment, accounting for risk comparability, cascading hazards, and time-dependent vulnerability.

MATRIX will identify the conditions under which the synoptic view provides significantly different and better results or potentially worse results than established methods for single-type hazard and risk analysis. Three test cases (Naples, Cologne and the French West Indies), and a virtual city will provide MATRIX with all characteristic multi-hazard and multi-risk scenarios.

The MATRIX IT-architecture for performing, analysing and visualising relevant scenarios will generate tools to support cost-effective mitigation and adaptation in multi-risk environments.

MATRIX will build extensively on the most recent research on single hazard and risk methodologies carried out (or ongoing) in many national and international research projects, particularly those supported by DG Research of the European Commission.

The MATRIX consortium draws together a wide range of expertise related to many of the most important hazards for Europe (earthquakes, landslides, volcanic eruptions, tsunamis, wildfires, winter storms, and both fluvial and coastal floods), as well as expertise on risk governance and decision-making. With ten leading research institutions (nine European and one Canadian), we also include end-user partners: from industry, and from the European National Platforms for Disaster Reduction.

## **004044- MEDIGRID**

### MEDITERRANEAN GRID OF MULTI-RISK DATA AND MODELS

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*Funding scheme:* STP, FP6

*Project duration:* 11/1/2004 - 10/31/2006

*EC contribution:* € 950 000

*Policy drivers:* Floods

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#### **Abstract**

The MEDIGRID proposal aims to create a distributed framework of multi-risk assessment for post-fire natural disasters. In order to achieve the above strategic objective several parallel tasks must be accomplished and a number of particular objectives to be addressed. The proposal will integrate in the above framework models of forest fire behaviour, soil erosion, vegetation regeneration, flash floods and landslides, developed or elaborated in frame of previous EC projects. These models will be upgraded to web applications in order to run remotely as web services over the internet. A distributed data warehouse with EO and other digital spatial data, combined with field measurements will be created by the project partners. Data sets will refer to countries that have suffered important forest fires during the last summer and where post fire disaster occurrence is considered high for the next years. The data will be defined according to the requirements of the models that will be integrated and tested within MEDIGRID. The data structure and organization will be designed in order to comply with the concept of respective EC initiatives (INSPIRE, EU-MEDIN, ESPON) for data standardisation. These data will be also used by the individual models in the context of a models validation framework. The entire system of models and data will be shaped further as a multi-risk assessment and decision support information platform. A portal will be used as the access point to the risk assesment web services as well as to the data sets of the data warehouse.

## **232140- MICRODRY**

Microwave Drying for the Rapid Remediation of Flooded Buildings

<http://microdry.pera.com/>

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*Funding scheme:* BSG-SME, FP7

*Project duration:* 1/1/2010 - 12/31/2011

*EC contribution:* € 1 031 749

*Policy drivers:* Floods

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### **Abstract**

We will develop microwave technology which will reduce drying times in buildings after flooding events. Our aim is that a single Microdry unit will run off mains electricity and be capable of drying a room in a fraction of the time taken by current technologies.

Current drying operations require up to 8 weeks before remedial work can be undertaken on the building. This extends the time required before a building can revert to normal use with economic and social consequences.

To remedy this situation we need to develop an emitter to direct the microwave energy to target areas without regular human intervention. This will use a feedback system to measure moisture content and actively control microwave power to the emitter. Telecommunications components will provide communication between the unit and operator and comprehensive safety features will ensure that microwave hazards are eliminated.

## **511264- NA.R.AS.**

Natural risks assessment harmonisation of procedures, quantification and information

<http://www.amracenter.com/NARAS/naras.htm>

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*Funding scheme:* SSA, FP6

*Project duration:* 9/1/2004 - 10/31/2006

*EC contribution:* € 240 000

*Policy drivers:* Floods

Science-policy Interface

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### **Abstract**

Mediterranean countries are subject to frequent and different natural catastrophes which pay a high toll in terms of economic loss and human life. Since some tens of years EU countries are trying to mitigate the effects of these events mainly by means of prevention. Scientific progress in natural risk assessment and mitigation has increased the capacity of public administration to cope with high risk deriving from volcanic and hydro-geological events, to use satellites for short term prediction of meteorological events and floods, to work out, refine and enforce seismic EUROCODE 8. Several research project have been supported by EU Framework Programs. In all these cases risk assessment and managing have been approached individually for each risk typology and, often, differently even for a same typology in different countries. The consequence has been that the deliverables produced for different types of hazard are often not comparable and different deliverables for the same hazard types are produced in different countries. The need of harmonisation of terms and procedures has been stressed out in different EU MEDIN and UN Workshops. The aim of this project is to contribute to harmonise the risk assessment procedures and indicate ways to quantitative evaluation of hazard and risk levels through a two years long programmed series of Workshops, seminars, meetings, formation and educational activities which involve scientists, administrators and insurance experts who have been actively working in risk assessment problems in the latest years. Regions of South Italy, Greece and France will be used as test cases. The project is divided into 4 WP, dealing with: (1) Dissemination, comparisons of results and harmonisation, (2) Risk evaluation for land, urban planning and emergency management, (3) Formation and education (4) Publication of results.

## **037110- NEAREST**

### **INTEGRATED OBSERVATIONS FROM NEAR SHORE SOURCES OF TSUNAMIS: TOWARDS AN EARLY WARNING SYSTEM**

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*Funding scheme:* STP, FP6

*Project duration:* 10/1/2006 - 3/31/2010

*EC contribution:* € 2 850 000

*Policy drivers:* Floods

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#### **Abstract**

NEAREST is addressed to the identification and characterisation of large potential tsunami sources located near shore in the Gulf of Cadiz; the improvement of near real-time detection of signals by a multiparameter seafloor observatory for the characterisation of potential tsunamigenic sources to be used in the development of an Early Warning System (EWS) Prototype; the improvement of integrated numerical models enabling more accurate scenarios of tsunami impact and the production of accurate inundation maps in selected areas of the Algarve (SW Portugal), highly hit by the 1755 tsunamis. In this area, highly populated and prone to devastating earthquakes and tsunamis, excellent geological/geophysical knowledge has already been acquired in the last decade. The methodological approach will be based on the cross-checking of multiparameter time series acquired on land by seismic and tide gauge stations, on the seafloor and in the water column by broad band Ocean Bottom Seismometers and a multiparameter deep-sea platform this latter equipped with real-time communication to an onshore warning centre. Land and sea data will be integrated to be used in a prototype of EWS. NEAREST will search for sedimentological evidences of tsunamis records to improve or knowledge on the recurrence time for extreme events and will try to measure the key parameters for the comprehension of the tsunami generation mechanisms. The proposed method can be extended to other near-shore potential tsunamigenic sources, as for instance the Central Mediterranean (Western Ionian Sea), Aegean Arc and Marmara Sea.

## **263400- OPERR**

Operational Pan-European Rive Runoff

[www.smhi.se/en/Research/Research-departments/Oceanography/operr-operational-pan-european-river-runoff-1.16820;jsessionid=4F787F510BF564B003F2AAD38D6151F5](http://www.smhi.se/en/Research/Research-departments/Oceanography/operr-operational-pan-european-river-runoff-1.16820;jsessionid=4F787F510BF564B003F2AAD38D6151F5)

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*Funding scheme:* CP, FP7

*Project duration:* 2/1/2011 - 1/31/2013

*EC contribution:* € 396 031

*Policy drivers:* Floods

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### **Abstract**

The overall objective of the project is twofold, first to turn a pan-European river discharge model into operational use and thereby acting as a downstream service based on earlier developed GMES core services and at the same time stimulating the development and improvement of new downstream services. This objective will be achieved by extending an already running operational river discharge model (HYPER) for the Baltic Sea drainage basin to cover all European rivers. A sustainable operational system will be built up to respond to GMES downstream services like coastal ocean models, regional environmental commissions like HELCOM and OSPAR, regional and national operational institutes, environmental protection agencies, fishery boards, water regulation bodies and SME's working in this area.

The second objective is the validation of observed river discharge and the river discharge estimates produced by the project in applications of shelf sea ocean.

## **218802- SAFER**

Services and Applications For Emergency Response

[http://safer.emergencyresponse.eu/site/FO/scripts/myFO\\_contenu.php?arbo=1&noeu\\_id=31&page\\_id=9&lang=EN](http://safer.emergencyresponse.eu/site/FO/scripts/myFO_contenu.php?arbo=1&noeu_id=31&page_id=9&lang=EN)

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*Funding scheme:* CP, FP7

*Project duration:* 1/1/2009 - 3/31/2012

*EC contribution:* € 26 912 699

*Policy drivers:* Floods  
Ecological Status

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### **Abstract**

SAFER aims at implementing preoperational versions of the Emergency Response Core Service. SAFER will reinforce European capacity to respond to emergency situations: fires, floods, earthquakes, volcanic eruptions, landslides, humanitarian crisis. The main goal is the upgrade of the core service and the validation of its performance with 2 priorities: First priority is the short term improvement of response when crisis occurs, with the rapid mapping capacity after disastrous events, including the relevant preparatory services (reference maps). For validation purposes, the project will deliver as from 2008 services at full scale for real events or during specific exercises.

The main performance criterion is the response time. RTD work addresses technical, operational and organisational issues. The content of this first action is consistent with the definition of the preparatory action recently decided. The second priority is the extension to core service components before and after the crisis. It targets the longer term service evolution, through the provision of thematic products, to be added in the portfolio of services. The main performance criterion is the added-value of products with risk-specific information. In SAFER, thematic products will cover mainly the meteorological and geophysical risks. SAFER includes also some transverse RDT actions, with the objective to increase added-value of the overall service chain.

Users involvement is a key driver and a specific task addresses the federation of the key users, both for interventions in Europe and outside Europe. The emphasis put on quality assurance and validation methodology is reflected in the work plan. The consortium is built around a core team of European service providers, already involved in the former or ongoing projects, in the frame of FP6 or ESA programmes. A wide network of scientific partners and service providers will extend the European dimension, in particular in the new member states.

## **223913- SENSORGRID4ENV**

Semantic Sensor Grids for Rapid Application Development for Environmental Management

[www.sensorgrid4env.eu/](http://www.sensorgrid4env.eu/)

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*Funding scheme:* CP, FP7

*Project duration:* 9/1/2008 - 8/31/2011

*EC contribution:* € 3 192 501

*Policy drivers:* Floods  
Ecological Status

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### **Abstract**

Sensor networks promise to bridge the gap that, for too long, has separated computing applications from the physical world that they model and in which they are ultimately embedded. Sensor networks are and will continue to be important in environmental management. However, many scientific and technological challenges need to be tackled before sensor networks are exploited in their full capacity for aiding decision support for environmental applications.

This project addresses two of these challenges:

- the development of an integrated information space where new sensor networks can be easily discovered and integrated with existing ones and possibly other data sources (e.g., historical databases), and
- the rapid development of flexible and user-centric environmental decision support systems that use data from multiple, autonomous, independently deployed sensor networks and other applications.

To address this challenge, the SensorGrid4Env project will investigate and develop technological infrastructure for the rapid prototyping and development of open, large-scale Semantic Sensor Grids for environmental management. In particular, SensorGrid4Env will enable:

- A semantically-consistent view of several heterogeneous sensor networks as a global Grid data resource;
- Rapid development of Grid services that combine real-world real-time data, coming from autonomous, heterogeneous sensor networks, with legacy historical data;
- Rapid development of open, flexible, contextual knowledge-based thin applications (e.g., mashups) for environmental management.

As more and more sensor networks are independently developed and deployed, the SensorGrid4Env outcomes will leverage their use of sensor networks in environmental management scenarios that were not foreseen or that transcend

their original purpose. To test and demonstrate SemsorGrid4Env results, we propose two environmental monitoring and management use cases.

## **247468- SIM.COAST**

Numerical Simulation Tools for Protection of Coasts against Flooding and Erosion

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*Funding scheme:* MC, FP7

*Project duration:* 4/1/2010 - 3/31/2013

*EC contribution:* € 171 000

*Policy drivers:* Floods

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### **Abstract**

This project aims to provide improved process understanding, new knowledge, methods, new and improved numerical tools, resulting in decision support systems serving decision-making at protection of coasts against flooding and erosion. Project results will contribute to improve reliability of coastal protection structures, and introduce an environmentally friendly approach in coastal protection. The activities will focus on work-out/improve/coordinate numerical model tools that are able to manage interactive data and forecast (by numerical simulations) short term (storm surge, tsunami) and long term (erosion, water level change) phenomena with respect to coastal protection. Project objectives will be pursued by exploring the available experience of the partners, creating complementarities /synergies between them, and using basic preconditions, as follows: - Scientific potential of all partners, the available theoretical knowledge, and expected new findings in the field of coastal hydrodynamics and flooding and - Long-term research cooperation with Chinese partners (dated from 1989) in the field of coastal protection (including some joint model developments, and published papers) - Experience in use of advanced numerical models (MIKE FLOOD, MIKE 21HD/CAMS, SWAN, VOF), as well as GIS data handling abilities, providing links to field observations and related monitoring programs - Well proven expertise in the field of coastal protection & risk management (via EU Coastal protection Projects: EU-FLOWS/FLOODsite/DELOS/CLAS and other - Experience in Environmentally Friendly Coastal Protection, advanced & innovative coastal technologies Project output should finally help decision makers in: - improving co-ordination of coastal erosion and surface water flood risk - strengthening emergency planning arrangements - managing the investment of significant levels of public funding - helping communities adapt to climate change

## **502129- SLIDE2FLOW**

Transition from slow-moving landslides into fast-moving debris-flows. Evaluation of the hazard.

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*Funding scheme:* MCA, FP6

*Project duration:* 4/1/2004 - 3/31/2006

*EC contribution:* € 157 192

*Policy drivers:* Floods

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### **Abstract**

The project deals with the question: &quot;why and how some landslides transform into debris-flows, while most of them stabilize&quot;. Though seldom, debris-flows are a major source of property damage at the European scale, especially in mountain areas. Today the management of debris-flows is quite easily achieved for watersheds where debris-flows result regularly from continuous erosive processes. In the converse case, when debris-flows originate from a landslide, the problematic around the protection alters substantially: a debris-flow activity induced by the landslide transformation can occur suddenly in areas where such an activity has never occurred. There is currently no sound scientific method for properly estimating the probability of landslide fluidization. An unclear point is that not all landslides produce debris-flow. In most cases, the landslide experiences a significant creep behaviour, then decelerates and finally stops moving. However, in a limited number of cases, the landslide accelerates suddenly and gives rise to a debris-flow. This is particularly true for landslides developed in fine soft rocks where excess pore pressures have often been observed. The hypothesis is that local lateral compression of the landslide body occurs during motion and induces undrained loading and excess pore pressures. The aim of the project is to develop a methodology to improve the prediction and prevention of debris-flows arising from landslides in fine-grained, muddy soils. The research is organised around three objectives: (1) Conceptualize and model (with the aid of laboratory tests and field observations) the influence of excess pore pressure on debris-flows initiation; (2) Validate and assess the reliability of the mechanistic model on the laboratory tests and on the field scale of instrumented landslides; (3) Assess critical threshold conditions for the fluidization of complex landslides, through scenario modeling.

## 248767- URBANFLOOD

UrbanFlood

[urbanflood.eu/default.aspx](http://urbanflood.eu/default.aspx)

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*Funding scheme:* CP, FP7

*Project duration:* 12/1/2009 - 11/30/2012

*EC contribution:* € 2 990 544

*Policy drivers:* Floods  
Climate Change

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### Abstract

More than two thirds of European cities are regularly confronted with climate change induced disasters. Early Warning Systems (EWS) play a crucial role in mitigating the effects of such disasters by detecting conditions which forecast the onset of a catastrophe and to compute its impact. EWSs provide alarming, decision support and information services to governments, companies and the general public. The UrbanFlood project creates an internet based hosting platform for EWSs. The EWS platform is run as an Internet service and connects via the Internet to sensor networks, to online sources of information and other EWSs.

The platform is able to host multiple EWSs, corresponding to various hazards and belonging to different organizations. Through the Internet, additional computer resources required by the EWS platform are made available on demand. Artificial intelligence technologies detect alarming conditions in the objects monitored. In an alarming situation, a decision support system, making use of computational models of the physical environmental, informs stakeholders about the developing catastrophe. The core of the EWS hosting platform is a Common Information Space (CIS). The CIS is run as an online service, supports web service technologies and connects via the internet with other CISs.

The EWS is also able to process simulated (data), turning the EWS into a simulator with which disaster mitigation scenarios can be developed and personnel can be trained. UrbanFlood validates the EWS framework in the context of dike failures and ensued flooding in an urban environment. Dikes are equipped with sensor systems and the EWS service is built up from a series of dike failure and flooding specific modules, including 3D/pseudo 4D dike evolution and flood-spreading models. Soon after the start of the project dikes in major European cities will be monitored. UrbanFlood investigates to which extent it is feasible to remotely monitor dikes and floods from other countries and continents.

## **506680- WADE**

### **FLOODWATER RECHARGE OF ALLUVIAL AQUIFERS IN DRYLAND ENVIRONMENTS**

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*Funding scheme:* STP, FP6

*Project duration:* 7/1/2004 - 12/31/2007

*EC contribution:* € 1 700 000

*Policy drivers:* Floods  
Groundwater

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#### **Abstract**

The WADE project aims to assess long-term (decades to centuries) water resources in selected semiarid to hyperarid ephemeral river basins by determining long-term transmission losses from floods and quantifying floodwater recharge into alluvial aquifers. An innovative approach will be applied based on three principal research themes. 1) Palaeoflood hydrology will be used to determine long-term flood magnitude and frequency in order to quantify the frequency of recharging flood events. 2) Surface and sub-surface hydrology will be monitored in order to quantify transmission losses through the river bed into the alluvial aquifers. The combination of these two methodologies will be able to quantify long-term aquifer recharge through flooding. 3) The final research theme focuses on the socio-economic issues related to the use of alluvial aquifer groundwater within the study catchments.

The research will be undertaken in 4 research basins, twinning catchments in Spain and Israel with study catchments in Namibia and South Africa.



# Groundwater



## **212545- AEGOS**

African-European Georesources Observation System

[www.aegos-project.org/index.php](http://www.aegos-project.org/index.php)

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*Funding scheme:* CSA (Coordination - or networking - action), FP7

*Project duration:* 12/1/2008 - 11/30/2011

*EC contribution:* € 1 930 996

*Policy drivers:* Groundwater

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### **Abstract**

Africa, the largest single component of the African Caribbean Pacific (ACP) Group of States, despite its huge potential for development through both human and georesources, suffers in many places from poverty and underdevelopment. The sustainable use of its resources is a key issue, not only for development of the African countries, but also for the world's future. Over the coming decades, these issues are likely to play an ever-increasing role due to the world's growing population, rapid urban development and the rising demand for better infrastructure and services. The sustainable use of georesources requires a knowledge based on data, information and expertise. Thus, the availability, traceability, accessibility and processing using GIS technologies of heterogeneous data from multiple sources is essential. Such processing requires a qualified and experienced personnel and the definition of strategies for capacity building and training. In view of this situation, a recognised need has emerged for a shared, distributed, Internet-linked georesources observation system, based on open standards and interoperability developments, as a contribution to the sustainable development of African countries. The Support Action is the preparatory phase needed to design the African-European Georesource Observation System (AEGOS) capable of hosting and providing access to Africa's geological resources, including groundwater, energy, raw materials and mineral resources. Its objectives are to define: i) operational procedures for data management (Spatial Data Infrastructure, metadata and data specification), ii) user-oriented products and services including the preparation of innovative spin off projects based on AEGOS and an evaluation of the input of Interoperability and interdisciplinary in support of GEOSS iii) the African- European partner network, iv) a geoscience contribution to GEOSS, in the context of INSPIRE.

## **505329- ALERT**

Sustainable Management of Water Resources by Automated Real-Time Monitoring

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*Funding scheme:* STP (Specific Targeted Research Project), FP6

*Project duration:* 6/1/2004 - 12/31/2007

*EC contribution:* € 2 400 000

*Policy drivers:* Groundwater

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### **Abstract**

ALERT aims to develop a radically different strategy for monitoring and managing the impact of climatic change and land-use practice on scarce water resources. Innovative ALERT technology will be designed that will allow the near real-time measurement of geoelectric, hydrology and hydrochemical properties, virtually "on demand", thereby giving early warning of potential threats to ecosystems, and vulnerable water systems. The project will focus primarily on coastal zones where aquifers are under threat from over-exploitation, rising sea levels, anthropogenic pollutants and seawater intrusion. New and proven sensors and data capture devices will be permanently deployed in-situ, within a unified platform (ALERT hydro-station) at a test site in Almería, Spain. The site will be interrogated from the office by novel modem/telemetric and satellite links to provide volumetric images of the subsurface at regular intervals; thereby obviating the need for expensive repeat surveys and manual intervention. New 3D/4D time-lapse image reconstruction algorithms will be developed for distributed buried and borehole arrays. The volumetric electrical images (in space and time) will be transformed into hydrologic properties and processes through the further development of mathematical relationships, derived from controlled laboratory studies. These datasets will be used to constrain a predictive hydrogeological modelling capability. Innovative statistical techniques will be developed to assist up-scaling from the site model to catchment scale. A web-based GIS will be designed with new data fusion, risk analysis and decision support tools to facilitate the sustainable management of water resources in coastal zones. Scenario modelling based on stochastic and Bayesian networks will address the wider societal implications of the proposed work, including the economic, cultural and political issues, in the context of current and planned EU directives.

## **023567- ANAEROBIO-D2**

Diversity of subsoil anaerobic microorganisms and their potential for aromatic hydrocarbons degradation

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 9/1/2005 - 8/31/2007

*EC contribution:* -

*Policy drivers:* Groundwater  
Ecological Status

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### **Abstract**

The steps involved in oil refining can generate accidental spills resulting in hydrocarbon contaminated areas, reaching as far as the subsoil and ground waters. Rehabilitation by microbial methods has been recognised as novel, cleaner and less expensive than physical-chemical techniques. However, low or zero oxygen levels has limited the application of aerobic bacteria in the subsoil. Consequently, anaerobes significance became apparent for subsurface bioremediation. Nevertheless, evaluation of anaerobes diversity and assessment of their biotechnological potentials are meagre. Thus, it is proposed to investigate the community diversity and the potential of indigenous subsoil anaerobes for elimination of aromatic hydrocarbons. On the one hand, it is proposed to analyse the response and evolution of the indigenous population to the presence of hydrocarbons. Within this frame, molecular tools will be used to investigate the subsoil microbial diversity without recurring to cultivation. On the other hand, bacteria with relevance to anaerobic processes are difficult to isolate in laboratory cultures. Therefore, a special effort will be placed to recover anaerobes with hydrocarbon metabolising abilities. Examining the presence and availability of distinct electron acceptors in the subsoil and the use of site-specific pollutants as carbon sources will assist to formulate media for a successful recovery. Subsequent biochemical and genetic analyses will allow establishing the genes involved in biodegradation. Once these are characterised, further understanding on the mechanisms behind anaerobic biodegradation will be available helping to design rational strategies to hasten and improve anoxic bioremediation processes. The project outcomes are expected to significantly increase the scant information on subsoil anaerobes diversity and their biotechnological potential, hence contributing to the advance of scientific knowledge and technological competence in the European Union.

## **505428- AQUATERRA**

Understanding river-sediment-soil-groundwater interactions for support of management of waterbodies (river basin & catchment areas)

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*Funding scheme:* IP (Integrated Project), FP6

*Project duration:* 6/1/2004 - 5/31/2009

*EC contribution:* € 12 999 992

*Policy drivers:* Groundwater

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### **Abstract**

Changes in climatic conditions, land use practices and soil and sediment pollution have large scale adverse impacts on water quantity and quality. The current knowledge base in river basin management is not adequate to deal with these impacts. AquaTerra is both integrating and developing knowledge to resolve this and disseminating it to stakeholders.

In the water cycle, soil is a key element affecting groundwater recharge and the chemical composition of both subsurface and surface waters (the latter is additionally affected by sediments). The proper functioning of the river-sediment-soil-groundwater system is linked to key biogeochemical processes determining the filter, buffer and transformation capacity of soils and sediments. AquaTerra aims at a better understanding of the system as a whole by identifying relevant processes, quantifying the associated parameters and developing numerical models of the groundwater-soil-sediment-river system to identify adverse trends in soil functioning, water quantity and quality. The modelling addresses all relevant scales starting from micro-scale water/solid interactions, the transport of dissolved species, pollutants as well as suspended matter in soil and groundwater systems at the catchment scale, and finally the regional scale, with case studies located in major river basins in Europe. With this integrated modelling system, AquaTerra provides the basis for improved river basin management, enhanced soil and groundwater monitoring programs and the early identification and forecasting of impacts on water quantity and quality during this century. AquaTerra is committed to the dissemination and exploitation of project results through structured workshops, dedicated short courses, and the active participation of consortium partners in national and international conferences. The quality and direction of the project is supervised by a peer review panel.

## 221496- AQUATIC N IN INDIA

Fate of anthropogenic nitrogen in aquatic systems of India

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 5/1/2008 - 12/31/2011

*EC contribution:* € 227 969

*Policy drivers:* Groundwater  
Chemical Aspects

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### Abstract

The Indian Subcontinent occupies <3% of the total land area of the world; however, as much as 22% of the world's human population lives here, in rough proportion to which the region accounts for ~19% (17 million tonnes of N annually) of the global synthetic N fertilizer consumption. Fossil fuel combustion is the other major source of new N introduced to the environment. The fate of the enormous N loading, which has increased by a factor of 50 over the past 4 decades, is largely unknown. Less than 5% of the anthropogenic N appears to reach the sea by river runoff; the rest presumably accumulates in the terrestrial aquatic systems where an unknown fraction may be removed as N<sub>2</sub> or N<sub>2</sub>O through redox transformations, especially in anaerobic environments of the subsurface aquifers and hyperlimnions of stratified reservoirs and lakes. Given the serious health hazards of high nitrate levels in drinking water and the high greenhouse potential of N<sub>2</sub>O, both nitrate accumulation in natural waters and conversion of fixed N to N<sub>2</sub>O are of immense socio-economic significance. The proposed study will, for the first time, investigate N cycle processes in groundwaters and lakes/reservoirs in India. Three man-made reservoirs and one natural lake, and groundwater aquifers of three different types will be seasonally sampled for this purpose. The four major components of the project will be: (a) to study the spatial and temporal variations of various dissolved N species (organic N, nitrate, nitrite, ammonium, N<sub>2</sub>O and N<sub>2</sub>) in relation to organic matter loading and ambient dissolved oxygen levels; (b) to determine rates of redox transformations (denitrification and anaerobic ammonium oxidation) and assess their relative importance in N<sub>2</sub> production; (c) to identify sources of N and understand mechanisms of its transformations through natural N and O isotope abundance measurements; and (d) to characterize through molecular analyses the microbial community involved in redox transformations.

## **035420- AQUATRAIN**

Geogenic chemicals in groundwaters and soils: a research training network

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 1/1/2007 - 12/31/2010

*EC contribution:* € 3 150 000

*Policy drivers:* Groundwater

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### **Abstract**

The AquaTRAIN research training network addresses key research issues underpinning the European Legislative Framework on groundwater and soil protection as highlighted in FP6 sub-priority 1.1.6.3, II 2.2b. The objectives of AquaTRAIN are to provide early stage researchers with (a) analytical, geochemical, microbiological and environmental management training necessary for the technical implementation of EU policies on groundwater and soil protection; (b) exposure to innovative developments in our understanding of (i) the biogeochemical processes controlling the cycling of chemicals in groundwater/soil systems; (ii) novel protection and remediation technologies; (iii) the biochemistry of chemical uptake in humans and in the food chain; and (iv) human health and environmental impacts arising from trace concentrations of chemicals in groundwaters. Geogenic chemicals (i.e. of natural origin) will be the research focus because of the potential for breakthroughs in understanding microbiological controls on their mobility and for developing novel remediation/protection technologies. The objectives will be met by a coherently structured multi-disciplinary team of internationally recognised researchers providing training for early stage researchers through a joint innovative research programme involving individualised training plans, mentoring and network-wide training workshops with international speakers. The RTN will link with existing FP6 research and training projects, notably BRIDGE, AQUATERRA, COST, MOSES and MESPOM. AquaTRAIN will serve the EU by addressing fragmentation and training future scientists who will have a sound multi-disciplinary grounding in the factors required to implement existing and forthcoming EU policy on groundwater protection, as well as having exposure to state-of-the-art technologies and ideas that may inform future developments in EU policy and regulation aimed at protecting a vital and irreplaceable resource for the EU.

## **003027- AUVI**

Autonomous vehicle for underwater inspections

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 3/1/2007 - 2/29/2008

*EC contribution:* € 65 950

*Policy drivers:* Groundwater

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### **Abstract**

This project proposes the research in reactive path planning for mobile robots in real environment using artificial intelligence (AI) techniques. An experimental prototype will be used in a first stage as a testbed for proposals (an autonomous underwater vehicle – AUV). Among the multiple disciplines that converge in the development of a cost effective and useful for inspections AUV, the navigation control as well as the path planning exhibits particular interest. Effectively, although a lot of proposals may be found in the literature since the last decade, there is a lack of a reliable set of tracking and obstacle avoidance systems to allow the vehicle to follow a certain pattern in the seabed. A potential application is pipeline, electric and telephone cables tracking. However, the scopes of this research are not limited to this application (i.e., study of coastal ecosystems). Thus, given the multiple possible scenarios in an underwater world, AI techniques will be used to cope with these unknown situations. To face them it requires safe navigation systems that are not yet available for autonomous operations. The main objective of this project is to design and to develop a cost-efficient technology for autonomous navigation in complex environments. The project includes development of an autonomous tracking and a safe low-altitude navigation for an AUV prototype, which could handle sea trials. The particular objectives are: 1. To develop a software module responsible for providing the desired AUV trajectory, resorting to AI techniques, particularly knowledge-based system; 2. To apply the resulting prototype to subsea pipeline and cable inspections (in 1 and 2 this project is linked to the EU AUTOTRACKER-GRD1-2000-25150); 3. To develop a mobile robot laboratory in the outgoing host institution (Electromechanical Department of the Engineering Faculty at UNCPBA).

## **031127- BIO FE-CLAY BARRIER**

Bacterial reduction of iron in clay barriers: a new technology for the remediation of organic groundwater contaminants

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 10/1/2006 - 9/30/2008

*EC contribution:* € 80 000

*Policy drivers:* Groundwater  
Ecological Status

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### **Abstract**

None of the industrialized or developing countries has adequately protected its aquifers against contaminations and groundwater pollution by domestic, agricultural and industrial chemicals is at an all time high in many parts of the world. The scale and urgency of the problem is largely recognised and several major initiatives have been developed to deal with pollution control and abatement. In Europe, the EC Water Framework Directive require that surface, coastal and underground waters meet; good status; within all the member states by 2015. With only 10 years to go, initiatives to develop cost-effective and sustainable water remediation technologies are crucially needed.

The proposed project aims to demonstrate the feasibility of a novel permeable barrier technology; the Bio Fe-Clay Barrier; which could be a lower-cost and more sustainable alternative to other technologies for the remediation of diverse groundwater contaminations, including pesticides, chlorinate daliphatics and nitroaromatics. The proposed technology is cutting-edge in that, for the first time ever, it will involve the in situ microbial Fe-reduction of barrier clay materials and will take advantage of the unique ability of reduced Fe-clays in promoting the degradation of organic compounds. Feasibility experiments under both laboratory and field-like conditions will be conducted within state-of-the-art facilities, using high-tech equipments and a multi-disciplinary approach, combining mineralogy, microbiology and soil mechanics.

The results are crucially needed to inform the scientific community, policymakers, managers and stakeholders on the relevance of the Bio Fe-Clay Barrier technology. Funding this project will help a young European researcher to develop her promising career in Europe rather than in the USA and attract industrial partners and new research funds while transferring her knowledge, demonstrating her professional maturity and strengthening her international reputation.

## **006538- BRIDGE**

Background cRiteria for the IDentification of Groundwater thrEsholds

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*Funding scheme:* STP (Specific Targeted Research Project), FP6

*Project duration:* 1/1/2005 - 12/31/2006

*EC contribution:* € 1 876 825

*Policy drivers:* Groundwater  
Chemical aspects

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### **Abstract**

The Commission proposal of Groundwater Directive COM(2003)550 developed under Article 17 of the Water Framework Directive (2000/60/EC) sets out criteria for the assessment of the chemical status of groundwater, which is based on existing Community quality standards (nitrates, pesticides and biocides) and on the requirement for Member States to identify pollutants and threshold values that are representative of groundwater bodies found as being at risk, in accordance with the analysis of pressures and impacts carried out under the WFD. In the light of the above, the objectives of BRIDGE are : i) to study and gather scientific outputs which could be used to set out criteria for the assessment of the chemical status of groundwater, ii) to derive a plausible general approach, how to structure relevant criteria appropriately with the aim to set representative groundwater threshold values scientifically sound and defined at national river basin district or groundwater body level, iii) to check the applicability and validity by means of case studies at European scale, iv) to undertake additional research studies to complete the available data, v) and to carry out an environmental impact assessment taking into account the economic and social impacts. The project shall be carried out at European level, involving a range of stakeholders and efficiently linking the scientific and policy-making communities. Considering the requirement of the diary of the Groundwater Daughter Directive proposal, which implies that groundwater pollutants and related threshold values should be identified before December 2005 and listed by June 2006, the duration of the project should be 24 months. In that way the proposed research will contribute to provide research elements that will be indispensable for preparing discussions on further steps of the future Groundwater Directive.

## **231378- CO3 AUVS**

Cooperative Cognitive Control for Autonomous Underwater Vehicles

[robotics.jacobs-university.de/projects/Co3-AUVs/](http://robotics.jacobs-university.de/projects/Co3-AUVs/)

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*Funding scheme:* CP (Collaborative Project), FP7

*Project duration:* 1/31/2009 - 1/31/2012

*EC contribution:* € 2 549 646

*Policy drivers:* Groundwater

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### **Abstract**

Autonomous Underwater Vehicles (AUVs) represent one of the most challenging frontiers for robotics research. AUVs work in an unstructured environment and face unique perception, decision, control and communications difficulties. Currently, the state of the art is dominated by single AUVs limited to open-sea preplanned trajectories with offline postprocessing of the data gathered during the mission. The use of multiple AUVs as propagated in this project is still in a very early research phase. Some of the research issues addressed in this project are even completely uncharted territory, especially the development of functionalities to seamlessly monitor critical underwater infrastructures and to detect anomalous situations (e.g., missions related to harbour safety and security) and the study of advanced AUVs capable of interacting with humans to perform such functions as companion/support platforms during scientific and commercial dives. The aim of the Co3-AUVs project is to develop, implement and test advanced cognitive systems for coordination and cooperative control of multiple AUVs. Several aspects will be investigated including 3D perception and mapping, cooperative situation awareness, deliberation and navigation as well as behavioral control strictly linked with the underwater communication challenges. As a result, the team of AUVs will cooperate in challenging scenarios in the execution of missions where all data is online processed. In doing so, the team will be robust with respect to failures and environmental changes. These key features will be tested in a harbor scenario where additional difficulties with respect to open sea applications arise and in a human diver assistance scenario that also illustrates human robot interaction issues.

## **273049- DILREACT**

Compound-dependent dilution and reactive processes in groundwater

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 10/1/2011 - 9/30/2014

*EC contribution:* € 221 920

*Policy drivers:* Groundwater  
Chemical Aspects

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### **Abstract**

The quantitative understanding of contaminant transport is a fundamental requirement for the protection and management of groundwater resources and for the implementation of natural attenuation and/or engineered remediation technologies. Dilution and mixing processes play a pivotal role for solute transport in porous aquifer systems. In fact, the limited extent of mixing usually controls reactive transport and natural attenuation of contaminant plumes. Laboratory and field investigations have demonstrated the presence of narrow bioactive zones at the fringes of organic contaminant plumes, where reaction partners (i.e. different substrates) are brought into contact by mixing processes. Therefore, the correct quantification of mixing is of utmost importance for an accurate description of reactive transport of contaminants in groundwater. The objective of the present DILREACT project is to deepen and improve the current understanding of mixing and mixing-controlled reactions in the subsurface. The proposed approach is based on a tight coupling between high-resolution data at the laboratory and field scales and mathematical modelling including both the development of theoretical concepts and the use of numerical codes to simulate conservative and reactive transport. Characteristics of dilution and mixing processes such as the recently observed compound-dependency in the transverse component (Chiogna et al., 2010) will be investigated in detail. Appropriate measures able to capture these effects as well as the influence of flow focusing on mixing intensity in complex heterogeneous porous media will be proposed and validated against high-resolution experimental observations. Numerical tools accurately describing mixing processes and their coupling with biogeochemical reactions will be developed and tested in a series of remediation scenarios and in an applied reactive transport modelling study at an aquifer contaminated by petroleum hydrocarbons.

## **275681- EGOMARS**

Land-Ocean Connectivity - from Hydrological to Ecological  
Understanding of Groundwater in the Coastal Zone

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 6/15/2011 - 6/14/2013

*EC contribution:* € 260 975

*Policy drivers:* Groundwater  
Hydromorphology

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### **Abstract**

The coastal zone, where fresh and saltwater meet, hosts some of the most dynamic, diverse and productive ecosystems on Earth. Ecological and hydrological land-ocean connectivity are important drivers of these ecosystems. This study will advance the understanding of hydrological-ecological coupling and connectivity, by studying relationships of key fauna with coastal groundwater hydrology in the tropical realm on the Yucatan Peninsula in Mexico. The use of groundwater proxies embedded in shells of fast-growing molluscs as bio-indicators for hydrological-ecological coupling in the coastal zone will be explored, and the usage pattern of a groundwater-fed coastal inlet by the iconic Queen Conch *Strombus gigas* will be documented. High-resolution sclerochronology in a sessile hydrological sentinel, the bivalve *Isognomon alatus* together with traditional hydrological investigations will be used to document variability of groundwater exposure to resident biota, and shell sclerochronology of the roaming *Strombus gigas* and concurrent acoustic telemetry will explain habitat usage of this endangered and socio-economically important species in the Caribbean Sea on whole-of-life scale.

## **003985- EURODEMO**

European Platform for Demonstration of Efficient Soil and Groundwater Remediation

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*Funding scheme:* CA (Coordination Action), FP6

*Project duration:* 1/1/2005 - 12/31/2007

*EC contribution:* € 988 899

*Policy drivers:* Groundwater

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### **Abstract**

EURODEMO aims to be the principal co-ordination activity concerning technology demonstration in the field of soil and groundwater management in the European Union. EURODEMO aims to achieve more efficiency with regard to funding targeted to technology demonstration, to improve the access to results from demonstration projects and to establish harmonised protocols for the documentation of demonstration results and the verification of demonstrated technology. Key activities will include (i) the co-ordination of scattered co-existing European funding programmes, (ii) the optimisation of demonstration funding by avoiding duplications and overlaps, (iii) the establishment of harmonised protocols for the documentation of demonstration results and for verification of technology efficiency and performance. Key clients benefiting from EURODEMO will be " funding organisations who can target their funds more efficiently by avoiding overlaps, by receiving reliable information on (European/global) demonstration demands, by establishing joint funding programmes, " potential technology demonstrators who can benefit from the better overview of funding opportunities, and " end users by having more confidence in demonstration results due to harmonised verification of and by having better access to demonstration results.

## **223866- FEEDNETBACK**

Feedback design for wireless networked systems

[www.feednetback.eu/webimages/fp7.jpg/view](http://www.feednetback.eu/webimages/fp7.jpg/view)

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*Funding scheme:* CP (Collaborative Project), FP7

*Project duration:* 8/31/2008 - 1/31/2012

*EC contribution:* € 2 900 000

*Policy drivers:* Groundwater

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### **Abstract**

Revolutionary developments in microelectronics over the past decades have led to the production of cheap yet powerful devices that communicate with one another, sense and act on their environment and are deployed in large numbers to deliver an abundance of data. Such devices and the networks they form (wireless sensor networks) bring together communication, computation, sensing and control and have enabled monitoring and automation at an unprecedented scale. Specially challenging in this context are networked control systems, where feedback control loops are closed over networked. To take full advantage of this technology novel design methods are necessary to transcend the traditional borders between disciplines, to apply the principles of feedback to complex, interconnected systems. The objective of the FEEDNETBACK project is to generate precisely such a co-design framework, to integrate architectural constraints and performance trade-offs from control, communication, computation, complexity and energy management. This will allow the development of more efficient, robust and affordable networked control technologies that scale and adapt with changing application demands. By focusing on wirelessly connected networks, we will study networked control from a fundamental point of view. We will extend the current scientific state-of-the-art in networked control and will develop a software tool set to support our co-design framework. To demonstrate and evaluate this framework, we will apply it to two industrial case studies: a smart camera network for surveillance and motion capture, and an underwater inspection system that comprises autonomous surface and underwater vehicles. In addition to the impact in these two application areas, the new technologies in FEEDNETBACK will be disseminated through an ambitious program led by an innovation accelerator company, with the objective of linking the project's research advances to market opportunities.

## **039323- FUEL OXYGENATES SIP**

ASSESSMENT OF IN SITU BIODEGRADATION OF FUEL ADDITIVES (MTBE, ETBE) USING INNOVATIVE CONCEPTS BASED ON STABLE ISOTOPE LABELLED SUBSTRATES

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 12/1/2006 - 11/30/2008

*EC contribution:* € 149 154

*Policy drivers:* Groundwater  
Chemical aspects

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### **Abstract**

Fuel oxygenates were developed in the 1970s as octane enhancers to replace toxic additives like lead, which were phased out of gasoline. Methyl tertiary butyl ether (MTBE) is by far the most commonly used oxygenate worldwide and in Europe, large amounts of MTBE are manufactured and used each year. As a result of this intense use and its physical-chemical properties, MTBE has become one of the most frequently detected volatile organic compounds in groundwater. However, ethyl tertiary butyl ether (ETBE) is becoming a preferred alternative to MTBE in some countries of Europe due to tax incentives for the application of biomass-derived ethanol which is utilized to produce this compound. Some high polluted sites have been identified in Europe in the last years, particularly in Germany, becoming obvious how important knowledge of fuel oxygenates natural attenuation processes is with regard to cost-effective management of contaminated sites and accomplishing the new EU chemical legislation. The main scientific aim of the present project is the assessment of in situ biodegradation of fuel oxygenates (MTBE, ETBE) in gasoline-impacted sites. This purpose will be accomplished by the application of innovative methodologies that combine the use of unique biofilm-sampling systems under in situ conditions with advanced stable isotope and labelling techniques. In this framework, the objectives will be to (1) prove unequivocally the assimilation of fuel oxygenates with formation of biomass by indigenous microorganisms, (2) to use this transformation as a quantitative indicator for in situ biodegradation, (3) identify and compare the microbial community composition with different geochemical conditions and different carbon substrates, (4) link these processes to active organisms and (5) elucidate metabolic diversity.

## **518118- GABARDINE**

Groundwater Artificial recharge Based on Alternative sources of waterR: aDvanced INtegrated technologies and managEment

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*Funding scheme:* STP (Specific Targeted Research Project), FP6

*Project duration:* 11/1/2005 - 4/30/2009

*EC contribution:* € 2 499 770

*Policy drivers:* Groundwater  
Water and Agriculture  
Water Scarcity and Droughts

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### **Abstract**

Aquifers are the main source of water in most semi-arid areas of the Mediterranean basin. As a result of over-exploitation hydrologic deficits of varying acuity prevail in these areas. Seawater intrusion and pollution have been identified as the primary factors for quality degradation. Further deterioration can be expected based on trends in the precipitation regime attributed to climate change. The objective of this project is to identify alternative sources of water and to investigate the feasibility, both environmental and economic of their utilization. Alternative water sources to be artificially recharged comprise: surface water runoff, treated effluent, and imported water. Furthermore, brackish water bodies, present in many aquifers could be utilised after desalination. The project structured into eight work-packages comprehensively addresses all issues related to the problem: expected precipitation rates, recharge and water budgets, identification of potential alternative water sources and technologies for their utilization, development of tools for the management of groundwater resources under artificial recharge conditions, aquifer vulnerability assessment, characterization of the unsaturated zone, and mixing effects. Four test sites have been selected for practical application of the approach. Substantial field testing, integration of technologies and findings to ensure optimal implementations of aquifer recharge alternatives, quantification of socio-economic impacts and development of dissemination platform are planned. Finally a carefully designed project management shall drive and accompany the project execution in order to ascertain consistency and efficiency.

## **226536- GENESIS**

Groundwater and dependent Ecosystems: NEw Scientific basIS on climate change and land-use impacts for the update of the EU Groundwater Directive

[www.bioforsk.no/ikbViewer/page/prosjekt/hovedtema?p\\_dimension\\_id=16858&p\\_menu\\_id=16904&p\\_sub\\_id=16859&p\\_dim2=16860](http://www.bioforsk.no/ikbViewer/page/prosjekt/hovedtema?p_dimension_id=16858&p_menu_id=16904&p_sub_id=16859&p_dim2=16860)

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*Funding scheme:* CP (Collaborative Project), FP7

*Project duration:* 4/1/2009 - 3/31/2014

*EC contribution:* € 6 997 200

*Policy drivers:* Groundwater  
Climate Change

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### **Abstract**

Groundwater resources are facing increasing pressure from consumptive uses (irrigation, water supply, industry) and contamination by diffuse loading (e.g. agriculture) and point sources (e.g. industry). This cause major threat and risks to our most valuable water resource and on ecosystems dependent on groundwater. New information is need on how to better protect groundwaters and groundwater dependent ecosystems (GDE) from intensive land-use and climate change. The impacts of land-use changes and climate changes are difficult to separate as they partly result in similar changes in the ecosystems affected. The effects are highly interwoven and complex. The EU groundwater directive (GWD) and the water framework directive (WFD) provide means to protect groundwater (GW) aquifers from pollution and deterioration. At present, the maximum limits for groundwater pollutant concentrations have been set for nitrate and various pesticides. Also, water of sufficient quality and quantity should be provided to ecosystems dependent on groundwater. The European aquifers differ by their geology, climate, and threats to aquifers. This must be considered when general guidelines for management of these systems are developed. The concept of the present proposal is to base the research on different relevant aquifer sites in various European countries to test scientific issues and find new results to important problems. Seven WP are foreseen: WP1 Case studies on impacts and threats to GWs and GDEs WP2 Groundwater dynamics, re-charge and water balance WP3 Leaching to groundwater aquifers from different land-uses WP4 Groundwater dependent ecosystems: groundwater-surface water interaction WP5 Modelling processes in groundwater systems WP6 Concepts, scenarios and risk assessment WP7 Co-ordination

## **239515- GEOCOM**

Geothermal Communities ? demonstrating the cascading use of geothermal energy for district heating with small scale RES integration and retrofitting measures

[www.geothermalcommunities.eu/about\\_geocom.php](http://www.geothermalcommunities.eu/about_geocom.php)

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*Funding scheme:* CP (Collaborative Project), FP7

*Project duration:* 1/1/2010 - 12/31/2014

*EC contribution:* € 3 513 703

*Policy drivers:* Groundwater

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### **Abstract**

Central-Eastern European countries have exceptional geothermal resources. These resources are either unexploited due to the lack of technological know-how or their utilisation is carried out in an unsustainable way; geothermal district heating projects lack the energy efficiency component and the used thermal water is not reinjected but instead released to surface waters. Geothermal Communities will demonstrate best available technologies in the use of geothermal energy combined with innovative energy-efficiency measures in three different pilot sites (Hungary, Slovakia and Italy). Furthermore the project will integrate a large number of cities as project partners (from Serbia, Romania, Poland and Italy) that either already have ongoing geothermal systems that needs the adoption of new technologies (e.g. Sacueni, Romania) or they would like to implement new systems from scratch with the help of the project partners (e.g. Subotica, Serbia).

## **269233- GLOCOM**

Global contaminated land management

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 12/1/2011 - 11/30/2015

*EC contribution:* € 394 800

*Policy drivers:* Groundwater  
Chemical Aspects  
Ecological Status

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### **Abstract**

Complex hazardous contamination of soil and water are obstructing sustainable re-development of previously industrialized urban land in Europe as well as in China. Although several significant efforts have already been developed, a systematic and integrated approach for the sustainable management of contaminated sites is still lacking.

The main objective of this program is to strengthen the quality of research by developing international collaborations and advance the decision making on complex issues in contaminated land management. Specifically, in this collaboration UNIVE will involve its expertise on multicriteria decision analysis, decision support systems and risk assessment. UmU will bring understanding of mobilization processes for persistent organic and inorganic pollutants in soil and ground water. CRAES will offer its expertise on ecology, risk assessment and management of contaminated site and BNU on environment risk assessment and characteristic of soil pollution.

This will be done by the organization of several exchange activities in the fields of contaminated soil characterization, environmental risk assessment and decision making processes. These exchange activities aim to increase quality and mutual benefit of the transfer of knowledge between the involved researchers from EU and China, in particular through the organization of workshops and training sections and the co-participation to conference and scientific publications. In fact the collaboration is planned with 80 guest stays by experienced and early stage researchers in partner organizations, for a total of 188 months. Each stay will include a series of internal and open workshops and/or training with the purpose of transferring knowledge and identifying common ground for future research.

The primary deliverables will be joint scientific publications, and the developed common research base and contacts made will lay the foundation for strategic collaborations in future research projects.

## **022169- GNOM**

Groundwater-derived Nutrient and Organic Matter: alteration during transit through coastal sediment

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 7/1/2007 - 6/30/2010

*EC contribution:* € 285 633

*Policy drivers:* Groundwater

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### **Abstract**

Serious decline in coastal water quality and ecosystem health have resulted from population growth and agriculture, commercial, and industrial activities in coastal watersheds and from increased loading of anthropogenic wastes (organic and nutrients) originating at localized (sewage, industrial effluent) and diffuse (agricultural run-off) sources. Predicting the response of coastal ecosystems to land use change and eutrophication requires knowledge about all relevant sources of nutrient and organic material. Groundwater is an important, but poorly understood source of nutrients and organic material to coastal waters. We propose to assess the impact of sediment microbial processes on groundwater quality and to also study how groundwater impacts water column processes in the coastal ocean. We will use controlled lab experiments to evaluate how microbial activity influences nutrient and organic matter distributions in groundwater. We will determine how processing in coastal sediments alters groundwater DOM lability and the oxygen demand (OD) of groundwater. The proposed research will answer fundamental questions regarding the alteration of groundwater-derived DOM and inorganic nutrients within coastal marsh, creek bank, and creek bed sediments and will improve our ability to predict fate of these materials in adjacent estuarine waters. As such, our work is important because the impact of allochthonous dissolved organic inputs on coastal ecosystem dynamics is rarely studied and thus is poorly understood.

## **212683- GOODWATER**

### RESEARCH TRAINING FOR GOOD EUROPEAN GROUND WATER RESOURCES

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 9/1/2008 - 8/31/2012

*EC contribution:* € 3 616 822

*Policy drivers:* Groundwater  
Chemical Aspects  
Ecological Status

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### **Abstract**

On 1st January 2007 the Ground Water sub-directive (COM/2003/550) complementing the European Water Framework Directive (COM/2000/60/EC) came into force. These two directives enforce the protection, maintenance and sustainable use of groundwater resources in the European Union. However, today around 750 000 sites are contaminated with substances including hydrocarbons, chlorinated solvents, and diffuse organic contaminants throughout Europe. Microbial processes can play an important role in the remediation and protection of groundwater resources and there is an urgent need for a better integration of microbial process understanding in current management schemes. Groundwater management must take into account different characteristics and degradation capacities for pollutants and sites, and requires a comprehensive understanding of contaminant fate, degradation pathways, and remediation potentials. Today, in Europe there is a shortage of scientists and environmental engineers with the interdisciplinary understanding of groundwater contaminant behaviour required when embarking on the tasks of protecting and sustainably managing groundwater resources, remediating existing contaminations, and performing risk assessment. The aim of the GOODWATER ITN is to educate a new generation of groundwater professionals with targeted multidisciplinary expertise and process understanding, including microbiological, hydrogeological, chemical, and stable isotope aspects. For this purpose, some of Europe's most esteemed groundwater experts from the different fields join forces to guarantee a cutting-edge scientific research training platform. The network will offer individual expert training by research, and network-wide training by workshops, summer schools, and laboratory exchange. Moreover, stakeholders from industry and authorities will be involved as associated partners to steer the project towards socio-economic relevance and tutor relevant complementary skills.

## **220620- GWAT-LCA**

### Revising the Role of Groundwater in Life Cycle Assessment

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 2/15/2008 - 2/14/2010

*EC contribution:* € 178 927

*Policy drivers:* Groundwater

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#### **Abstract**

Life Cycle Assessment (LCA) is the standardised method for assessing the environmental impacts of any product or service. After quantifying all associated emissions and the consumption of resources, this impact is expressed with respect to a few common impact categories. These are supposed to reflect major societal and environmental priorities. Although groundwater is the most extracted raw material in the world, and extraordinarily important for most parts of the EU, it is virtually ignored in LCA. To overcome this deficiency, an interdisciplinary approach is needed. The proposed fellowship integrates a hydrogeologist into a prominent group of LCA experts, in order to develop the initial steps for tackling groundwater quality and quantity issues within an LCA framework. The fellow is offered extensive training on LCA concepts to combine the perspectives of both LCA expert and hydrogeologist. The research work includes a general gradation of threats to groundwater and the development of a competent modelling framework. The latter task is dedicated to the improvement and consistent development of modelling tools. This is to enable a balanced simulation of different hydrogeological threats, and to uniformly account for the spatial variability of environmental conditions. A major focus is placed on the issues of whether, and how, groundwater can be considered a safeguard object within impact assessment, assumed that it represents a separate receptor. The scientific results of this project are expected to be fundamental but still incomplete in achieving a generally valid methodology, which complies with the holistic requirements of LCA practice. However, it will be a necessary starting point for revealing the principal relationships between LCA and hydrogeology and ultimately defining the research needs in this highly timely subject. For the fellow, the profound thematic and social expertise gained will be ideally suited to a novel and ambitious field of science.

## **243450- HEISTT**

High Efficiency In Situ Treatment Technology for Contaminated Groundwater

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*Funding scheme:* BSG-SME (Research for SMEs), FP7

*Project duration:* 10/1/2010 - 9/30/2013

*EC contribution:* € 1 461 606

*Policy drivers:* Groundwater  
Chemical Aspects

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### **Abstract**

The proposed HEISTT solution is the rapid installation of groundwater treatment chemicals as an insitu subsurface remediation technique, brought about by the use of ultrasonic assisted injection technology to create a closely spaced grid of single treatment small diameter wells to a depth of 20m. As part of the boreholing process, remediation chemicals will be introduced in to the ground contained within a geotextile sock. Diffusion of the chemicals (oxygen release compounds, hydrogen release compounds, zero-valent iron or chemical oxidants) occurs through the permeable geotextile material. Injection target cycle time will be  $\leq 5$  mins from hole to hole at 1m spacing. The spacing of these boreholes will be decided by the concentration of contaminant and the required rate of clean-up. This whole system will be passive, i.e. requiring no energy to function after installation or operator maintenance. A range of equipment options are envisaged, from simple attachments for existing excavation plant – which will be the primary focus of HEISTT , enabling rapid take up of the process by SMEs due to the affordability of retrofit - through to dedicated bespoke machinery.

## **273017- HISLA-DR**

### Hydrogen Incorporation in Subducting Lithosphere after Dehydration Reactions

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 7/11/2011 - 7/10/2014

*EC contribution:* € 269 710

*Policy drivers:* Groundwater  
Hydromorphology

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### **Abstract**

Subduction zones play a fundamental role in the deep water cycle making the Earth unique among other terrestrial planets. During subduction dehydration of hydrous minerals produces a fluid phase. A part of this fluid phase will be recycled water back to the Earth's surface through hydrothermal aqueous fluids or through hydrous arc magmas, whereas another part of the water will be transported to the deep mantle by Nominally Anhydrous Minerals (NAMs) such as olivine, pyroxene and garnet. The partitioning of water between these two processes is crucial for the understanding the deep water cycle which has profound implications for the rheology of the upper and lower mantle. However, the transition from hydrous minerals to NAMs has been very little explored and only rough estimations are available.

The main thrusts of the project are (1) to undertake a series of novel experiments with hydrous mantle compositions using high-pressure experimental facilities to constrain the actual water contents that are recycled in NAMs in shallow subduction zones (1.5-5.5 GPa and <900°C) and (2) compare the products with natural assemblages that underwent extensive dehydration during subduction (through antigorite and chlorite high-pressure breakdown reactions). Additionally this project will investigate the link between mechanisms of deformation and mechanism of hydrogen incorporation in NAMs and how they may affect the rheology of the incoming slab and uppermost mantle.

This project will be arranged by assuming two years at Australian National University (outgoing host institution), during which experiments will be performed and natural rocks will be analyzed for trace elements and water contents, and one year at Géosciences Montpellier (Return host institution), where microstructural investigations of natural samples will be carried out.

## **212298- IMVUL**

Towards improved groundwater vulnerability assessment

Title:

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 10/1/2008 - 9/30/2012

*EC contribution:* € 3 221 516

*Policy drivers:* Groundwater  
Chemical Aspects

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### **Abstract**

There has been an increasing realization over the last 30 years that to preserve water quality and quantity in Europe, measures at both European and national levels are needed. Our groundwater resources are at risk from a wide variety of stresses including point and diffuse sources of contamination, over-abstraction and saline intrusion. Minimizing this risk requires a good understanding of the physical, chemical and biological processes involved and the development of tools to assess groundwater vulnerability, aid water management and design protection strategies. To meet the challenges imposed by the new EU Water and Ground Water Framework Directives, the water industry throughout Europe is already significantly expanding, creating an increasing demand for appropriately educated graduates. The proposed ITN network, IMVUL, is aimed at training researchers in the major issues and processes relevant to groundwater vulnerability. The network consists of 8 partners in the United Kingdom, France, Spain, Italy, Israel and Norway and 13 associated partners from the water industry. The research objectives are to increase our understanding of the fundamental processes relevant to groundwater vulnerability and develop improved prediction tools that can contribute to the protection and sustainable use of Europe's groundwater resources. This will be achieved through investigations of case study aquifers and their vulnerability issues, laboratory experiments of contaminant transport in the subsurface, and numerical and analytical modelling of the processes pertinent to groundwater vulnerability. The proposed network will contribute to satisfying a growing skill demand in groundwater research and the water industry by producing graduates with not only a sound knowledge of the scientific basis of groundwater vulnerability, but also good investigatory skills through their research experience and additional training relevant to the water industry.

## **040375- MADUS**

### Modelling Anisotropy and Destructuration in Unsaturated Soils

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 11/20/2007 - 5/19/2009

*EC contribution:* € 169 365

*Policy drivers:* Groundwater

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#### **Abstract**

Unsaturated conditions, where pore in soil are partly filled with water and partly filled with air) occur widely both as natural soils and as fill materials. The hydro-mechanical behaviour of unsaturated soils is considerably more complex than that of saturated soils. Overall, with unsaturated soils, there are problems associated with the testing methodologies, sampling and test duration. Consequently, the understanding of unsaturated soil behaviour lags behind the state-of-the-art of saturated soil mechanics. There is a great need to pull together the existing knowledge and data in a coordinated way. That is one of the key objectives of the EC-funded Marie Curie RTN called MUSE. The hydro-mechanical behaviour of unsaturated soils is of practical importance; examples include damage to structures during wetting (caused by excessive rainfall), the performance of flood protection embankments and earth dams, the nuclear industry (design of underground waste depositories involves using unsaturated bentonite blocks), geohazards engineering (slope instabilities and debris flows) and geo-environmental engineering (pollution migration and containment). These problems are particularly relevant in hot and arid regions, such as the Mediterranean region and South America. The proposed project aims to fund the training of a promising young Brazilian researcher in a multidisciplinary research environment in the UK. The fellow will benefit from the training opportunities offered by the MUSE and AMGISS RTNs that the host institution is involved in. The scientific objective of the project is to develop and implement a new hierarchical model for unsaturated soils that incorporates in a consistent manner the effects of hydraulic hysteresis, anisotropy and the effects of micro-macro structure, including bonding and bond degradation. Aim is to have a robust model in which various features can be switched on and off as required depending on the real engineering problem analysed.

## **222204- MICCS**

Methodology for fast and reliable Investigation and Characterization of Contaminated Sites

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*Funding scheme:* BSG-SME (Research for SMEs), FP7

*Project duration:* 11/1/2008 - 4/30/2011

*EC contribution:* € 1 280 207

*Policy drivers:* Groundwater

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### **Abstract**

There is an increasing understanding that our natural resources should be kept unspoiled, which makes polluted soil and groundwater not acceptable. Therefore, a lot of resources are used for investigating contaminated sites, limiting the damage from pollution and cleaning polluted soil and groundwater. The site investigations are very costly and time consuming. They are normally based on traditional methods where vertical drillings through the soil matrix are used for soil and groundwater sampling and testing for pollution and characterising the geology. A recent development is the use of probes driven down into the soil. The probes can be used for taking out samples of soil, water or air, or direct physical /geotechnical investigation. The sampling method is faster than drilling and can be combined with analytical equipment on the surface, hereby doing online measurements for volatile compounds. The overall aim of the MICCS project is to develop a more advanced in-situ investigation method for identifying and characterising pollution. This will be achieved by integrating more sophisticated sensors (e.g. micro-chips, electrochemical sensors, spectrometry, and optical sensors) into a solid probe intended to drive down through the soil matrix to perform continuous or semi-continuous measurements. The sensor measurements are combined with improved soil radar solutions (GPR) for better positioning and soil structure specification. The combined data are processed in a chemometric system, being able to draw a more precise picture of the contaminated site as a whole. Together, the sensor measurements provide improved and more precise data input through the chemometric analysis as basis for better decision making. Furthermore, the investigation method will be easier and quicker to use, and hence also less costly than current SOA investigation methods.

## **044983- MOD-PRBNA**

Biogeochemical transport modelling of groundwater remediation based on a permeable reactive barrier and natural attenuation

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 10/1/2006 - 7/31/2007

*EC contribution:* € 80 000

*Policy drivers:* Groundwater  
Ecological Status

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### **Abstract**

Remediation of groundwater pollution has traditionally been achieved by energy-intensive and drastic methods such as pump and treat systems. Recently, more economically viable and less invasive methods such as monitored natural attenuation and permeable reactive barriers have been used to clean up a wide variety of groundwater pollutants. These latter techniques rely on in-situ biogeochemical transformations of the pollutants into less harmful components. However, sound application of these techniques requires a solid understanding of the site-specific hydrogeological and biogeochemical conditions, and a predictive assessment of long-term remediation efficiency. The objective of the proposed research is to develop a reactive transport modelling tool that accounts for these complex biogeochemical reactions and allows (1) the interpretation of laboratory and field data from a contaminated industrial site in Belgium, and (2) the prediction and comparison the long-term performance of remediation strategies based on permeable reactive barrier technology and monitored natural attenuation. Results will provide insight into the relative merits of these technologies for groundwater remediation at the study site, and will generate a modelling tool that can be applied to other sites to assess likely success or failure of these alternative remediation techniques.

## **263188- MYWATER**

Merging Hydrologic models and EO data for reliable information on Water

[mywater-fp7.eu/](http://mywater-fp7.eu/)

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*Funding scheme:* CP (Collaborative Project), FP7

*Project duration:* 1/1/2011 - 12/31/2013

*EC contribution:* € 2 273 832

*Policy drivers:* Groundwater  
Hydromorphology  
Water and Agriculture

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### **Abstract**

In the entire world we are experiencing changing water resources needs mainly as a result of changes in land use. In developing countries the occupation of natural areas by agriculture is a major cause; economical reasons pushed by world globalization play also a major role. In both cases further global changes are expected as a result of climate change.

Water availability is essential for socio-economic activities and citizens expect catchment managers to take the necessary measures for assuring quantity and quality for direct and indirect human consumption. The knowledge of the processes determining water fate, actual reserves and the capacity to forecast water consumption are essential for catchment manager's decision making.

Land use change drives the modification of three interdependent global variables of the watershed: evapotranspired water, biomass production and soil organic matter content. The assessment of the consequences of land use changes requires the capacity for studying those global variables on an integrated way. Catchment models can simulate those interactions together with all the processes that determine plant dynamics and are major tools for integrated studies, essential to decision makers.

The MyWater project aims at developing a water management system integrating satellite data, models and in situ data in order to improve knowledge and create the forecasting capabilities necessary to catchment managers, and at the same time optimizing the ratio cost/benefit of water resources monitoring.

The specific products of the project are: 1) A webGIS data tool; 2) Tools for improving operational model exploitation; 3) Training and technological transfer. The MyWater consortium includes representatives of the type of users expected. For that reason the consortium includes European, African and Latin-American teams to work in selected case studies (Portugal, Greece, Netherland's, Mozambique and Brazil).

## **220905- NATARISE**

Natural and Artificially Influenced Swash-Groundwater Interactions Experiments

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 3/1/2009 - 2/28/2011

*EC contribution:* € 158 300

*Policy drivers:* Groundwater

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### **Abstract**

Effective management of coastal erosion is a major stakes for the European Union. In a context of global warming and overpopulation of the coasts, the overall purpose of this project is to improve understanding of the hydrosedimentary processes affecting the instantaneous land-sea interface (the beachface), at the origin of an erosion or accretion of a coast. The objectives are: (1) To study the impact of the various types of marine waves on the swash/beach groundwater/sediment transit interactions, starting from experiments carried out on 4 beaches representative of the Europe's sandy coasts (North Sea, Atlantic and Mediterranean beaches). (2) To investigate the instantaneous effects of the drainage influence over swash in/exfiltration speeds and volume in order to improve the understanding of the operation of an innovative and promising - but still badly understood - method of fight against coastal erosion: the Beach Dewatering Systems. Response to these objectives will be made by the use of innovative experimental field methods (measurement of swash in/exfiltration speeds, use of a BDS for artificially generating erosion/accretion conditions), and by the data processing and analysis within the host institution (Coastal Group - University of Utrecht), highly recognized in the field. The obtained results will allow a better understanding of the physical aspects of the swash infiltration/exfiltration parameters, and to render BDS applicable to the greatest number of sites. Skills and knowledge acquired by Adrien Lambert (the applicant) within the framework of this project as its cooperation with the host (Associate Prof. Gerben Ruessink) will contribute to the quality of the results, like improving and widening the field of expertise of the applicant for his future recruitment. This project will contribute finally to the radiation of European research by allowing a significant advance within the field of soft engineering shoreline stabilization methods.

## **508614- PIPESCAN**

Development of inspection systems for the inspection of metal pipelines buried underground, in concrete in water or covered with coatings (PIPESCAN)

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*Funding scheme:* SME (SMEs-Co-operative research contracts), FP6

*Project duration:* 4/1/2004 - 9/30/2006

*EC contribution:* € 1 035 722

*Policy drivers:* Groundwater

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### **Abstract**

Over 10m kln of pipelines in Europe carry hazardous fluids including oil, oil products, chemicals and gases; they are subjected to corrosion by the environment and contents and, in some cases, mechanical fatigue. Failure to inspect them can result in leakage of hazardous material into the environment and even explosion. Up to 90% of these pipelines are inaccessible for inspection by current inspection methods because these are: (1) Buried under concrete. (2) Buried underground. (3) Underwater or (4) Covered with coatings. Due to undetected leakages, in Europe up to 4m gallons of oil are leaked into the environment per year. The consortium SMEs propose to develop a set of mechanised inspection techniques, sensors and systems for finding defects and corrosion in pipe, which is inaccessible to the operator (ie pipes buried underground, in concrete in water or covered with coatings such as thick paint or insulation) without the need to "dig up" or remove coatings. By developing this technology; the consortium SMEs will access the 250 million Euro per annum, pipeline and pipework inspection budget of World Oil & gas, chemical and electricity plant operator companies, 4 years after project completion. The economic objectives are: (1) A significant reduction in the cost of inspection. Europe wide saving of 200 million Euros is expected 4 years after project completion. (2) A reduction in the number of spillages and subsequent product losses and clean-up costs. (3) Profits from sales of the inspection systems and inspection service (approx 7m Euro over 4 years). The social objectives are: (1) Elimination of hazard due to possible exposure of workers to asbestos used for older pipe insulation. (2) Elimination of hazard due to working on hot surfaces. (3) Elimination of labour intensive and monotonous inspection tasks. The environmental objectives are elimination/reduction of spillages of hazardous fluids and contamination of water supplies and pollution of natural habitat.

## **244232- PREPARED**

PREPARED ?ENABLING CHANGE?

[www.prepared-fp7.eu/](http://www.prepared-fp7.eu/)

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*Funding scheme:* CP (Collaborative Project), FP7

*Project duration:* 2/1/2010 - 1/31/2014

*EC contribution:* € 6 993 815

*Policy drivers:* Groundwater

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### **Abstract**

IPCC climate change scenarios have a global perspective and need to be scaled down to the local level, where decision makers have to balance risks and investment costs. Very high investments might be a waste of money and too little investment could result in unacceptable risk for the local community. PREPARED is industry driven, 12 city utilities are involved in the project and the RDT carried out is based on the impacts of climate change the water supply and sanitation industry has identified as a challenge for the years to come. The result of PREPARED will be an infrastructure for waste water, drinking water and storm water management that will not only be able better cope with new scenarios on climate change but that is also managed in a optimal way. We will have complexes monitoring and sensor systems, better integration and handling of complex data, better exploitation of existing infrastructures through improved real time control, new design concepts and guidelines for more flexible and more robust infrastructures. PREPARED will involve the local community in problem identification and in jointly finding acceptable system solutions, that are supported by all, through active learning processes. Activities and solutions in PREPARED will be based on a risk assessment and risk management approach for the whole urban water cycle, through the development of innovative Water Cycle Safety Plans. Other innovations are sensors and models that will enable faster and better actions on changes and new design rules for more resilient design. We will combine European knowledge with valuable knowledge from Australia and the USA, to make the European Water sector more competitive. This to enable our industrial partners to export the products developed in PREPARED to other regions of the world, thus contributing to the Lisbon Goals but also to the MDGs. To ensure this exploitation the PREPARED consortium consist of more than 50% industrial partners and is demand driven.

## **518074- PROMOTE**

Efficiency control and performance verification of improved approaches for soil-groundwater protection and rehabilitation

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*Funding scheme:* STP (Specific Targeted Research Project), FP6

*Project duration:* 9/1/2005 - 9/30/2008

*EC contribution:* € 1 543 374

*Policy drivers:* Groundwater  
Chemical aspects

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### **Abstract**

The overall aim of PROMOTE is to set up an efficiency control and performance verification (ECV) system for soil-groundwater protection and rehabilitation based on a more generic testing and performance verification concept, in a network of testing centres. This is in direct accordance with the ETAP procedure. A strong impact of PROMOTE is to be expected concerning a faster market introduction of novel techniques hence strengthening the competitiveness of technology developers in Europe. This is guaranteed by an extensive integration of SME's and Eastern European partners. PROMOTE will gain the potential to act as a germ cell of a pre-normative verification system, overcoming implementation barriers and bridging the gap between innovative and standardised techniques. Main scientific-technical objectives are: - Assessment of existing verification tools and identification of demands on techniques to support the implementation of the WFD, the GWD and the evolving Soil Protection Strategy - Elaboration of a generic testing and performance verification concept designed to be basically applicable to a broad range of environmental technologies - ECV system development for remediation and monitoring approaches in soil-groundwater systems - ECV system verification on a reference and a field site - ECV system transfer to related environmental technologies - Establishing a ECV platform by including the "CEN Workshop" tool beyond the project The ECV system set-up is divided in four phases: (1) Organisational phase, (2) Operational phase, (3) Assessment and verification phase and (4) ECV establishment and dissemination strategy, comprises a conceptual review and testing of the ECV applicability, the ECV general validity, comparison of ECV with other systems and stakeholder consultation. Phase (4) includes the ECV transfer to improved remediation technologies, the elaboration of standardisation related issues and the establishment of a common ECV

## **508698- PURILEACH**

Modular purification system for heavily polluted leachate

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*Funding scheme:* SME (SMEs-Co-operative research contracts), FP6

*Project duration:* 2/1/2005 - 1/31/2007

*EC contribution:* € 412 117

*Policy drivers:* Groundwater  
Chemical aspects

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### **Abstract**

European countries use landfill as a disposal method for 60% of their municipal and hazardous waste. One of the main problems associated with landfills is leakage of potentially toxic liquids into soil and groundwater. Biological and chemical wastewater treatment units separately do not achieve high removal efficiency - microbial population is not able to survive in such contaminated environment. There is a need to develop new effective and inexpensive methods, based on both microbial and non-microbial leverage and find the way for safe and efficient landfills' water treatment in accordance with EC Landfill Directive. The leachate is generated in the result of the aerobic and anaerobic decomposition of the landfill waste. Treatment of leachate is a complex task due to its nature. A typical leachate is highly contaminated with ammonia, organic contaminants, halogenated hydrocarbons and heavy metals, also with high concentrations of inorganic salts. This wastewater profile is changing from landfill to landfill as well as with time within the same landfill. The key factors that must be considered and influence treatment facilities design include leachate character and loads, costs and effluent discharge regulations. Research is designed to evaluate optimal leachate treatment technology based on a modular solution and to develop an integral operational system for wastewater analysis and feedback for working regimes optimisation. The novelty of the proposed technology is the flexible modular approach with "smart" feedback for selection of treatment regimes relevant for processing of the varying in composition wastewater. The envisaged on-site adaptive leachate treatment system consists of the specific technological modules with integrated operational system for regime optimisation according wastewater composition and quantity. The envisaged "on-line" system design is based on decision-table and expert systems techniques for knowledge processing.'

## **230947- REACTIVE FLOWS**

Reactive transport in subsurface flows. Imaging the flow organization and predicting solute motion, mixing and reactivity

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 3/1/2009 - 2/29/2012

*EC contribution:* € 45 000

*Policy drivers:* Groundwater

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### **Abstract**

The scientific goal of the project is to develop methods for characterizing and predicting contaminant transport in aquifers. The sustainable management of groundwater has been a topic of greatest interest within the European strategy for improving the environment due to the growing risk of contamination of groundwater resources from a wide variety of stresses including point and diffuse sources of contamination, over-abstraction and saline intrusion. The fate of contaminants in the subsurface is controlled by the complex organization of groundwater flows, due to the existence of heterogeneous geological structures at different scales. It is also determined by (bio) chemical reactions that take place as contaminants travel in the subsurface. However, the effect of the flow heterogeneity is not currently taken into consideration in most existing models and theories, which represent a severe limitation of our predictive capabilities. However, recent theoretical, numerical and experimental developments suggest that significant progresses can be made to image the flow heterogeneity and integrate it into reactive transport models. Thus we propose an original methodology based on : (i) the development of inverse methods for imaging the flow organization in natural media from geophysical, flow and tracer measurements; (ii) the definition of reactive transport models that integrate this flow organization; (iii) the confrontation of models to relevant experimental data and field cases. Since the project results are expected to provide a long missing link between the flow organization and effective reactive transport, it will lead to more realistic, physically based models of transport in aquifers. The project will combine physical, geophysical and (bio) chemical methods. It will form the basis of a long term collaboration between the host group (Géosciences Rennes) and the previous IEF group (UPC Barcelona), that have developed different, yet highly complementary, approaches.

## **018309- RECLAIM WATER**

Water reclamation technologies for safe artificial groundwater recharge

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*Funding scheme:* STP (Specific Targeted Research Project), FP6

*Project duration:* 10/1/2005 - 12/31/2008

*EC contribution:* € 3 560 440

*Policy drivers:* Groundwater  
Water Scarcity and Droughts  
Water and Agriculture

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### **Abstract**

Solutions to global water stress problems are urgently needed yet must be sustainable, economical and safe. The utilisation of alternative water sources like reclaimed municipal wastewater is one of the most obvious and promising options in integrated water management. Among the various beneficial uses of reclaimed wastewater Aquifer Recharge (AR) receives growing attention because it features advantages such as additional natural treatment, storage capacity to buffer seasonal variations of supply and demand as well as mixing with natural water bodies which promotes the acceptance of further uses, particularly indirect potable use. Major concerns about the safety of this exploitation route of an alternative water source are connected to microbial and chemical contaminants occurring in wastewater, among which are emerging trace organics like endocrine disrupters and pharmaceuticals. The strategic objective of this proposal is to develop hazard mitigation technologies for water reclamation providing safe and cost effective routes for artificial groundwater recharge. The proposed work will assess different treatment applications in terms of behaviour of key microbial and chemical contaminants. The knowledge generated in the project and the technologies developed will also be suited to the needs of developing countries, which have a growing need of supplementation of freshwater resources. The participation of partners from China and Australia demonstrate the anticipation of the global dimension of the water reclamation and aquifer recharge issue. The proposed project will strategically support the competitiveness of European technology suppliers and water services in the context of water reclamation and groundwater recharge.

## **023930- SASURU**

Development of simple removal units for the treatment of groundwaters contaminated with arsenic or uranium

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 1/1/2006 - 12/31/2007

*EC contribution:* € 174 966

*Policy drivers:* Groundwater  
Chemical aspects

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### **Abstract**

Groundwater serves as the main source of drinking water in many parts around the world. Increased groundwater utilization has caused several health issues, due to the presence of toxic and carcinogenic inorganic pollutants. Of the most hazardous inorganic pollutants found in ground waters are arsenic and uranium and elevated concentrations of these metals have been detected in several regions in Europe and in the rest of the world. Almost all violations of the maximum admissible concentrations of toxic metals have been observed in small towns with a population less than 1000 people. Several methods have been developed for the removal of arsenic and uranium, however most methods are designed for large municipal treatment systems. The objective of the proposed project is the development of sustainable and economic simple removal units, applicable to household and community level and to establish general criteria for the choice of best treatment options, even under the most difficult cases. Abundant Fe(O) will be used as source of Fe(II), coupled with filter columns with glass or polymer beads and bacteria. In addition to the development of removal units, our aim is to improve the understanding of the removal mechanisms. This will be achieved by investigating the sorption and removal as a function of several physicochemical parameters as well as by the use of modern spectroscopic techniques and computer modelling. Characterisation of affected groundwaters comprises also a goal of our research. In the beginning of the investigations, artificial groundwater will be used. Progressively, the developed methods will be applied to treat groundwaters in affected regions in Northern Greece, where both uranium and arsenic have been detected. The execution of the project, in an Institute optimized to the applicants particular needs will enable him to improve his overall academic skills and would be beneficial for the development of an independent academic career.

## **511254- SEDBARCAH**

SEDiment bioBARriers for Chlorinated Aliphatic Hydrocarbons in groundwater reaching surface water

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*Funding scheme:* STP (Specific Targeted Research Project), FP6

*Project duration:* 1/1/2005 - 3/31/2007

*EC contribution:* € 1 098 691

*Policy drivers:* Groundwater

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### **Abstract**

Polluted groundwater in urban and industrial areas often represents a continuous source of (diffuse) contamination of surface waters. However, the fate of infiltrating groundwater pollutants might be influenced by the sediment in eutrophic water bodies. Such sediments form an interface between groundwater and surface water and possesses characteristic biological and physico-chemical degradation properties. Knowledge on natural attenuation of passing pollutants and the potential to stimulate and sustain occurring degradation processes are however scarce or non-existent. This is especially due to the lack of appropriate monitoring devices and tools to measure in situ mass balances of pollutants and reactants. In the SEDBARCAH project, we want to investigate the boundaries of the sediment zone as a barrier against the infiltration of chlorinated aliphatic hydrocarbons (CAH) into surface water and how we can turn this zone into a sustainable and efficient (stimulated) biobarrier technology for protection of surface waters from groundwater contamination. We will (i) determine the role of the microbial community present in sediments in the biodegradation of groundwater pollutants infiltrating a river bed; (ii) explore the boundary conditions and the possibility to increase and sustain removal activities in the sediment zone and (iii) select tools to follow such removal activities in situ. Therefore, a thorough investigation both in the field and in the laboratory of the physico-chemical and microbial processes occurring in these sediments will be performed and coupled to the CAH-degradation potential present in the sediment interface of two selected contaminated areas. In addition, methodologies to increase this degradation will be examined. The final goal of SEDBARCAH is to investigate the potentials of these (stimulated) sediment biobarriers as a groundwater remediation technology and a surface water pollution and risk prevention technology.

## **512540- SEWERINSPECT**

Integrated System for Structural Assessment and Upgrading of SEWERS Based on Input from CCTV INSPECTION

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*Funding scheme:* SME (SMEs-Co-operative research contracts), FP6

*Project duration:* 11/1/2004 - 1/31/2007

*EC contribution:* € 829 866

*Policy drivers:* Groundwater

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### **Abstract**

The emphasis on sewerage has nearly always been on serious structural defects. With the new EU legislation that demands sewer watertightness and the need to reduce the costs associated with infiltration, wastewater utilities are now considering in more depth the problem of sewer deterioration. Closed Circuit Television (CCTV) inspection is by far the most common method utilised for the inspection of sewer networks. Existing software on sewer evaluation based on CCTV inspection results include rating systems that do no more than act as a coarse filter for a closer examination of the results of CCTV surveys. The pivotal question in all CCTV surveys is how to translate what is seen into a programme of action. The objective of this work is to develop an integrated Decision-Support-System (DSS) for the rehabilitation planning of sewers that, based on CCTV inspection results, will assess the structural reliability of the inspected sewers as a function of time taking into account sewer deterioration by the various degradation mechanisms (erosion of the surrounding soil, etc.), seismic forces, where relevant, and uncertainties (in loading, etc.), prioritise rehabilitation projects, select the best remedial measures and schedule re-inspection. The proposed work comprises: 1. Development of a model for the assessment of sewer structural reliability as a function of time based on CCTV results. 2. Development of a model for the assessment of rehabilitation priorities taking into account the structural condition of the sewer, blockage, risk of groundwater pollution and the criticality of the sewer in case of failure. 3. Production of an integrated DSS for the rehabilitation planning of sewers that will accept input from CCTV inspection results and will include the models in '1' and '2' and a probabilistic model that optimises rehabilitation and schedules re-inspection. 4. Field evaluation of the DSS by the participating SMEs and the end-user.

## **003219- SNOWMAN**

Sustainable management of soil and groundwater under the pressure of soil pollution and soil contamination

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*Funding scheme:* CA (Coordination Action), FP6

*Project duration:* 1/1/2004 - 6/30/2009

*EC contribution:* € 1 746 032

*Policy drivers:* Groundwater

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### **Abstract**

Aiming at solution and prevention of actual and future environmental problems, EU policy resulted in many Directives concerning water and soil. Moreover, the Commission of the European Communities composed a paper "Toward a Thematic Strategy for Soil Protection" and set up a tight time schedule. Despite of above-mentioned legislative efforts an effective EU-wide approach to the problem of site remediation and groundwater contamination is hindered by a number of problems described by the CLARINET Working Group on "Co-ordination of RTD on an European level". There is little synergy at EU level between national and EU RTD programmes, leading to a serious overlap of research projects and parallel expenditures and less efficient use of limited resources. The broad dissemination of project results through national RTD programmes at an European level is very modest and fragmented. The starting points of SNOWMAN-Era-Net are the questions: "What do we HAVE?" - The consortium will produce a sound overview on programmes and their contents and management in the field specified. "What do we WANT?" - A Vision Paper will define the goal of European research activities in this specific field of environmental research. "How can we GET co-operation NOW?" - Specification of next steps, short- and medium-term, preparing ground in order to implement and conduct a research programme. Suitable tools (evaluation criteria etc.) will be developed. Knowledge dissemination will be supported by a close linkage to other project. SNOWMAN will make available its research results to a wider community through the EUGRIS portal. On interpersonal level, networking with the European Soil Policy Working Group or Cost activities will be maintained. SNOWMAN will also agree on a research agenda, which provides the basis for a first coordinated research call and will lead to the establishment of a SNOWMAN research programme agreed by an enlarged group of national research funding organisations.

## **244118- SOILTREC**

Soil Transformations in European Catchments

[www.soiltrec.eu/index.html](http://www.soiltrec.eu/index.html)

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*Funding scheme:* CP (Collaborative Project), FP7

*Project duration:* 12/1/2009 - 11/30/2014

*EC contribution:* € 6 974 572

*Policy drivers:* Groundwater

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### **Abstract**

SoilTrEC proposes to develop an integrated model of soil processes that describes key soil functions. These functions are defined in the EC Soil Thematic Strategy as essential ecosystem services for the well-being and economic success of the EU. The key science advances are to develop, from first-principles, computational models that integrate soil erosion, solute transport, carbon dynamics and food web dynamics within an open-source modelling framework. This framework will provide the platform, together with existing GIS capacity, for a prototype simulator at EU-scale to assess soil threats and evaluate approaches to mitigation. This physical-based modelling will be integrated with new advances in decision support developed from life cycle and economic assessment methodologies for natural resources. A key conceptual advance of this project is to quantify soil stocks, their formation, loss and functions within the context of the earth's Critical Zone. This encompasses the terrestrial environment from the top of the biosphere's tree canopy to the bedrock delineating the lower bounds of freshwater aquifers. SoilTrEC will link 4 EU field sites that describe key stages within the life cycle of soil formation, its productive use and degradation. Existing data sets will be augmented with targeted process studies in order to provide the data sets to validate the integrated model of soil processes. These process studies will be integrated with results from additional EU, USA and Chinese field sites to compare soil processes and rates as they vary with lithology, climate and land use. These sites and their teams will be integrated through shared results and an international research training programme into a global network of Critical Zone Observatories. This programme of research will engage very actively with stakeholders involved in the practical management of land, and will draw strongly on the advice and guidance of international leaders in soil sustainability.

## **004017- STRESOIL**

### **IN SITU STIMULATION AND REMEDIATION OF CONTAMINATED FRACTURED SOILS**

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*Funding scheme:* STP (Specific Targeted Research Project), FP6

*Project duration:* 6/1/2004 - 11/30/2007

*EC contribution:* € 1 100 000

*Policy drivers:* Groundwater

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#### **Abstract**

This project proposes pre-normative work aiming to design on site soil stimulation techniques for the cost-effective in situ remediation of NAPL-contaminated fractured soils of low permeability. Field-scale studies will be performed on fractured clay till site that has been heavily contaminated by NAPL. Integrated methods of multi-scale characterisation of fractured media will be employed to establish regional and local hydrological/geological models, and quantify the existing fracture networks. Chemical analyses on soil and groundwater samples and predictions of an existing macroscopic simulator of NAPL transport in fractured media (SIMUSCOPP) will set the initial conditions of contamination. The microbiological activity will be identified to evaluate the soil/water capacity for NAPL biodegradation. Hydraulic fracturing on three sites will be made and three soil stimulation scenarios differing with respect to the remediation methodology, will be carried out on all sites. The most adequate strategy will be recommended. From micro-structural properties/hydrodynamic conditions /fluid properties, and using lab-scale techniques/computational methods of the statistical physics of disordered media, the effective transport coefficients of four soil components will be determined: clay till, sand, natural fractures, artificial hydraulic fractures. From the local properties, the up-scaled transport coefficients will be determined and introduced as input data in the SIMUSCOPP simulator. The SIMUSCOPP will be extended to take into account (i) the artificial hydraulic fractures, and (ii) various remediation scenarios. Monitoring of the chemical status of soil and groundwater, and numerical predictions of the updated simulator will form databases which, in combination with cost benefit analysis, will enable us to set the criteria for the selection of the most cost-effective strategy of stimulation/remediation on similar NAPL contaminated sites.

## **242332- SUBCOAST**

A collaborative project aimed at developing a GMES-service for monitoring and forecasting subsidence hazards in coastal areas around Europe

[www.subcoast.eu/](http://www.subcoast.eu/)

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*Funding scheme:* CP (Collaborative Project), FP7

*Project duration:* 4/1/2010 - 3/31/2013

*EC contribution:* € 3 108 688

*Policy drivers:* Groundwater

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### **Abstract**

The objective of SubCoast will be to develop a service for monitoring the extent and impact of subsidence in coastal lowlands and demonstrate its capability in various pilots for a variety of settings around Europe. The service will be designed to appropriately determine the effects of subsidence on current and future floodrisk in coastal lowlands, monitor the integrity of coastal barrier systems and infrastructure and assess the impact of subsidence due to natural or man-made causes (groundwater pumping and oil/gas production) on land use and hydrology. SubCoast will be built on the heritage of GMES Service Element 'TerraFirma' and use the full capability of PS-InSAR as a earth observation technology for large scale subsidence mapping. Necessary R&D will be focused on possible augmentation of datasources and the improvement of retrieval algorithms. Subsequent validation efforts will make full use of the TerraFirma Validation Testsite and other current validation initiatives. A distributed data and information system will be set up which facilitates the accessibility and operability of EO-data, in-situ data (including geoscientific data) and model results for the selected areas. SubCoast will orient its services along existing guidelines established in previous GMES-projects, notably 'TerraFirma', and in line with relevant directives at European Level. End-user involvement will be realised by establishing a user federation which holds the most directly involved regional, national and European stakeholders.

## **265122- TRUST**

Transitions to the Urban Water Services of Tomorrow

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*Funding scheme:* CP (Collaborative Project), FP7

*Project duration:* 5/1/2011 - 4/30/2015

*EC contribution:* € 6 982 781

*Policy drivers:* Groundwater

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### **Abstract**

The European project initiative TRUST will produce knowledge and guidance to support TRansitions to Urban Water Services of Tomorrow, enabling communities to achieve sustainable, low-carbon water futures without compromising service quality. We deliver this ambition through close collaboration with problem owners in ten participating pilot city regions under changing and challenging conditions in Europe and Africa. Our work provides research driven innovations in governance, modelling concepts, technologies, decision support tools, and novel approaches to integrated water, energy, and infrastructure asset management. An extended understanding of the performance of contemporary urban water services will allow detailed exploration of transition pathways. Urban water cycle analysis will include use of an innovative systems metabolism model, derivation of key performance indicators, risk assessment, as well as broad stakeholder involvement and an analysis of public perceptions and governance modes. A number of emerging technologies in water supply, waste and storm water treatment and disposal, in water demand management and in the exploitation of alternative water sources will be analysed in terms of their cost-effectiveness, performance, safety and sustainability. Cross-cutting issues include innovations in urban asset management and water-energy nexus strengthening. The most promising interventions will be demonstrated and legitimised in the urban water systems of the ten participating pilot city regions. TRUST outcomes will be incorporated into planning guidelines and decision support tools, will be subject to life-cycle assessment, and be shaped by regulatory considerations as well as potential environmental, economic and social impacts. Outputs from the project will catalyse transformatory change in both the form and management of urban water services and give utilities increased confidence to specify innovative solutions to a range of pressing challenges.

## **042724- WATER WATCH**

Non-invasive imaging of the water dynamics in a soil plant groundwater system

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 11/1/2006 - 10/31/2010

*EC contribution:* € 301 653

*Policy drivers:* Groundwater

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### **Abstract**

Neutron radiography (NR) is an imaging technique, which records the attenuation of the neutron beam by an object on a film, plate or detector, in this respect similar to X-ray imaging, and is well suited to study the interior structure and dynamics of objects. The big advantage of imaging with neutrons is its high sensitivity to water, opposed to X-ray, while (almost) not caring about gas-liquid phase boundaries, opposed to Magnetic Resonance Imaging. Therefore it is well suited to study water content changes in a partly saturated porous medium like soil. The project shall exploit the rapid advances of neutron radiography, promoted by the development of better image detection devices and more powerful image processing possibilities, to study water flow in soils or similar porous medium. Furthermore, effects of water uptake in the vicinity of plant roots or of the groundwater table shall be considered. The project aims at gathering competence to establish a research group for neutron radiography of soil-plant-groundwater systems in combination with existing X-ray and Magnetic Resonance imaging competences. The objective is to transfer and jointly develop knowledge in the three following fields (1) the design of imaging set-ups from the perspective of neutron radiography requirements, (2) the know-how to perform two-dimensional as well as three-dimensional neutron radiography (NR tomography) of dynamic systems, and (3) image analysis, filtering, and visualization of dynamic NR images. Results of the measurements will be processed with the help of image analysis tools, partly to be developed during the project. Besides visualisation and direct analysis, data sets will be provided that can be fed into existing simulation tools to check conceptual models and determine effective parameters of processes, e.g. related to root water uptake, impact of soil structures on water flow, and water and gas exchange between vadose zone and groundwater.

## **235834- WATERBUGMODEL**

### TRAINING FOR MODELLING THE GROUNDWATER ECOSYSTEM

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 7/1/2009 - 6/30/2011

*EC contribution:* € 163 702

*Policy drivers:* Groundwater  
Ecological Status

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#### **Abstract**

All members of the groundwater biotic community, comprising microorganisms, protozoans, and metazoans, potentially contribute to the natural attenuation of organic matter inputs deriving e.g. from contaminations. Since an increasing proportion of drinking water is won from groundwater, bioremediation is important for public health. Sampling groundwater however is limited compared to other habitats. Therefore modelling takes an important part in increasing conceptual knowledge on the conditions under which microbial colonies, or the protozoans and metazoans grazing on the microbes, function most effectively. Groundwater contaminant biodegradation by microbes has so far only been modelled on the population level. These models have to make average assumptions which do not represent groundwater heterogeneity adequately. Biotic features, such as the adaptive behaviour that individual microbial cells exhibit by e.g. due to changing environmental conditions, have also not been taken into account. For other communities and other environments, such behavioural adaptations have successfully been modelled using the bottom up approach of individual-based models. The research project will therefore bring together an individual-based modeller, a groundwater ecologist and hydrogeological modellers to perform simulations based on exemplary conditions in order to evaluate the biodegradation potential based on the complete ecosystem functioning. The three main aims of this project are: 1) to adapt an existing platform for individual based modelling (IbM) of biofilm, iDynoMiCs, to groundwater conditions; 2) to add further levels of the food web and functional types to this platform, e.g. grazers (belonging both to the protozoans and metazoans), and 3) to couple this platform to a groundwater reactive transport model, in order to conduct evaluations of degradation potential and management options based on groundwater ecosystem functions.

## **036887- WATERPIPE**

Integrated High Resolution Imaging Ground Penetrating Radar and Decision Support System for WATER PIPEline Rehabilitation

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*Funding scheme:* STP (Specific Targeted Research Project), FP6

*Project duration:* 11/1/2006 - 10/31/2009

*EC contribution:* € 2 154 767

*Policy drivers:* Groundwater

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### **Abstract**

Many EU cities are experiencing increasing problems with their water pipeline infrastructure. The cost of replacing these old, worn-out systems, if left to deteriorate beyond repair, is astronomical and clearly beyond the resources of many communities. Replacement, however, is not the only choice as many of these systems can be rehabilitated at 30 to 70 percent of the cost of replacement. Accordingly, resources are now increasingly being allocated to address pipeline rehabilitation management issues. Due to the emphasis on sustainable management, risk-based approaches for the rehabilitation management of the water supply network need to be developed. Rehabilitation decisions should be based, inter alia, on inspection and evaluation of the pipeline conditions. Yet, utilities cannot locate a number of their old pipes and current inspection technologies typically do not provide the needed detailed information on pipeline damage. The objectives of this work are: 1. To develop a novel, high resolution imaging ground penetrating radar for the detection of pipes, leaks and damages and the imaging of the damaged region and evaluate it at a test site. 2. To produce an integrated system that will contain the equipment in "1" and a Decision-Support-System (DSS) for the rehabilitation management of the underground water pipelines that will use input from the inspections to assess, probabilistically, the time-dependent leakage and structural reliability of the pipelines and a risk-based methodology for rehabilitation decisions that considers the overall risk, including financial, social and environmental criteria. 3. To field test the equipment and the DSS.



# Hydromorphology



## **008307- BIOGEOMORPHES**

Biogeomorphodynamic Model of Estuaries for the analysis of effects of human interference

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 1/1/2006 - 12/31/2008

*EC contribution:* € 250 417

*Policy drivers:* Hydromorphology

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### **Abstract**

Estuaries are important for economy and nature. Due to the relatively calm conditions where land meets the water, they are good locations for harbours and are safe havens and feeding grounds for wildlife. These qualities collide in the Western Scheldt. Dredging is required to enable navigation to Antwerp Harbour, but it endangers the stability of the shoals that are important to ecology. The interactions of the bed and the water flow over it shape the estuaries. The bed determines the flow of the water. In turn the water moves sediment resulting in bed changes. Stability analysis has shown that this feedback mechanism allows free instabilities to grow into a channel-shoal system. The essential processes for the morphology of estuaries are identified, but the long term dynamics of can only be modelled in idealised cases. Moreover, the problem is more complex. Sediment with much clay is cohesive; sediments with little clay are cohesive. The differences in stability of the sediment strongly influence the shape of the shoals. Moreover, it has been shown that biology affects the morphology. Some organisms stabilise the bed, others have a destabilising effects. It is unclear yet, how these effects change the morphology of the channels and shoals. Cellular automata are models that combine the essential mechanisms of a system with the freedom of randomness. The equations describing the essential processes make sure that the correct physics are simulated, while the random element allows free instabilities to grow. In this project the cellular automata approach is used to apply the existing knowledge gained by the stability analysis to existing estuaries. For this purpose the model parameters must be set correctly. Since many of the individual processes can not be measured, the model will be tuned to field data of the bathymetry of estuaries and of the occurrence of biological organisms.

## **021827- BIOGEOMORPHESII**

Biogeomorphodynamic modelling of Estuaries for Mangement purposes

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 9/1/2005 - 8/31/2008

*EC contribution:* -

*Policy drivers:* Hydromorphology

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### **Abstract**

Estuaries are important for economy and nature. Due to the relatively calm conditions where land meets the water, they are good locations for harbours and are safe havens and feeding grounds for wildlife. These qualities collide in the Western Scheldt. Dredging is required to enable navigation to Antwerp Harbour, but it endangers the stability of the shoals that are important to ecology. The interactions of the bed and the water flow over it shape the estuaries. The bed determines the flow of the water. In turn the water moves sediment resulting in bed changes. Stability analysis has shown that this feedback mechanism allows free instabilities to grow into a channel-shoal system. The essential processes for the morphology of estuaries are identified, but the long term dynamics of can only be modelled in idealised cases. Moreover, the problem is more complex. Sediment with much clay is cohesive; sediments with little clay are cohesive. The differences in stability of the sediment strongly influence the shape of the shoals. Moreover, it has been shown that biology affects the morphology. Some organisms stabilise the bed, others have a destabilising effects. It is unclear yet, how these effects change the morphology of the channels and shoals. Cellular automata are models that combine the essential mechanisms of a system with the freedom of randomness. The equations describing the essential processes make sure that the correct physics are simulated, while the random element allows free instabilities to grow. In this project the cellular automata approach is used to apply the existing knowledge gained by the stability analysis to existing estuaries. For this purpose the model parameters must be set correctly. Since many of the individual processes can not be measured, the model will be tuned to field data of the bathymetry of estuaries and of the occurrence of biological organisms.

## **036952- BRAHMATWINN**

Twinning European and South Asian river basins to enhance capacity and implement adaptive integrated water resources management approaches

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*Funding scheme:* STP (Specific Targeted Research Project), FP6

*Project duration:* 6/1/2006 - 12/31/2009

*EC contribution:* € 2 871 492

*Policy drivers:* Hydromorphology

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### **Abstract**

BRAHMATWINN will enhance capacity to carry out a harmonised integrated water resources management (IWRM) approach as addressed by the European Water Initiative (EWI) in headwater river systems of alpine mountain massifs already impacted from climate change, and to establish transfer of professional IWRM expertise, approaches and tools based on case studies carried out in twinning European and Asian river basins. With altogether eleven work packages (WP) the project addresses all important IWRM issues in a balanced way, including conflict resolution in the trans-boundary twinning Upper Danube River Basin (UDRB) and the Upper Brahmaputra River Basins (UBRB) in Europe and South Asia respectively. In altogether seventy work tasks of the jointly identified WP social and natural scientists in cooperation with water law experts and local stakeholders will realize the project outcomes: (i) an integrated holistic approach and assessment of the transboundary UDRB and UBRB for sustainable IWRM; (ii) integrated indicators to quantify the natural environment and human dimension, selected to assess IWRM vulnerabilities; (iii) an integrated water resources management system (IWRMS) comprising the DANUBIA hydrological model, the river basin information system (RBIS) and the network analysis, creative modelling decision support system NetSyMod; (iv) a set of what-if? scenarios, evaluated using the DPSIR approach, and associated adaptive IWRM options tested by means of the IWRMS to mitigate impacts of likely climate change; and (v) IWRM action plans based on the stakeholder negotiation and the governance assessment. The project consortium of altogether fifteen partners from Europe (10 partner) and Asia (5 partner) shares the financial grant requested proportionally and will guarantee the generation of the necessary synergism required to represent the complex system component interaction and to carry out the required knowledge transfer between Europe and Asia.

## **13424- CABR I-Volga**

Cooperation Along a Big River: Institutional coordination among stakeholders for environmental risk management in the Volga basin

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*Funding scheme:* CA (Coordination Action), FP6

*Project duration:* 12/1/2004 - 2/28/2007

*EC contribution:* € 1 040 000

*Policy drivers:* Hydromorphology  
Socio-economy  
Science-policy Interface

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### **Abstract**

CABRI-Volga is an international coordination action to facilitate cooperation and to coordinate research in environmental risk management in river basins in the EU, Russia & the NIS. It focuses on the Volga basin for which environmental risk management is fundamental for protecting the environment, improving socio-economic conditions and promoting agricultural and industrial economies as well as the health of the Caspian Sea. Deficiencies in governance and civil society involvement as well as low levels of cooperation between academic and policy-making institutions have led to a situation of significant ecologic, social and economic risks in the basin. CABRI strategic objectives are, inter alia, to mobilise existing, isolated human and institutional resources, increase the research potential on environmental risk management in river basins as well as strengthen links between scientific communities and policy-making processes. A scientifically and institutionally complementary consortium of 18 partners from Russia and the EU is following an elaborated workplan to achieve the project objectives. For three series of parallel working group meetings, Russian and EU experts (~70 per series) from various scientific and institutional backgrounds will be recruited from the extensive network of CABRI stakeholder organisations to discuss and exchange knowledge and expertise in the CABRI thematic areas, namely environmental rehabilitation, vulnerabilities & human security, natural resources & their sustainable use, connecting goods & people (transport and mobility), and institutional coordination & cooperation. CABRI will achieve a number of concrete outcomes to be widely disseminated via the CABRI website, incl. case studies, State-of-the-Art Review, Good Practices Report, Policy Recommendations, Action Plan & Research Agenda, an established networks of experts and stakeholders from Russia/NIS & EU

#### **Objective**

CABRI-Volga is an international coordination action to facilitate cooperation and to coordinate research in environmental risk management in river basins in the

EU, Russia & the NIS. It focuses on the Volga basin for which environmental risk management is fundamental for protecting the environment, improving socio-economic conditions and promoting agricultural and industrial economies as well as the health of the Caspian Sea. Deficiencies in governance and civil society involvement as well as low levels of cooperation between academic and policy-making institutions have led to a situation of significant ecologic, social and economic risks in the basin. CABRI strategic objectives are, inter alia, to mobilise existing, isolated human and institutional resources, increase the research potential on environmental risk management in river basins as well as strengthen links between scientific communities and policy-making processes. A scientifically and institutionally complementary consortium of 18 partners from Russia and the EU is following an elaborated workplan to achieve the project objectives. For three series of parallel working group meetings, Russian and EU experts (~70 per series) from various scientific and institutional backgrounds will be recruited from the extensive network of CABRI stakeholder organisations to discuss and exchange knowledge and expertise in the CABRI thematic areas, namely environmental rehabilitation, vulnerabilities & human security, natural resources & their sustainable use, connecting goods & people (transport and mobility), and institutional coordination & cooperation.

## **212921- CEOP-AEGIS**

Coordinated Asia-European long-term Observing system of Qinghai ? Tibet Plateau hydro-meteorological processes and the Asian-monsoon systEM with Ground satellite Image data and numerical Simulations

[www.ceop-aegis.org/](http://www.ceop-aegis.org/)

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*Funding scheme:* CP (Collaborative Project), FP7

*Project duration:* 5/1/2008 - 4/30/2012

*EC contribution:* € 3 403 076

*Policy drivers:* Hydromorphology

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### **Abstract**

Human life and the entire ecosystem of South East Asia depend upon the monsoon climate and its predictability. More than 40% of the earth's population lives in this region. Droughts and floods associated with the variability of rainfall frequently cause serious damage to ecosystems in these regions and, more importantly, injury and loss of human life. The headwater areas of seven major rivers in SE Asia, i.e. Yellow River, Yangtze, Mekong, Salween, Irrawaddy, Brahmaputra and Ganges, are located in the Tibetan Plateau. Estimates of the Plateau water balance rely on sparse and scarce observations that cannot provide the required accuracy, spatial density and temporal frequency. Fully integrated use of satellite and ground observations is necessary to support water resources management in SE Asia and to clarify the roles of the interactions between the land surface and the atmosphere over the Tibetan Plateau in the Asian monsoon system. The goal of this project is to: 1. Construct out of existing ground measurements and current / future satellites an observing system to determine and monitor the water yield of the Plateau, i.e. how much water is finally going into the seven major rivers of SE Asia; this requires estimating snowfall, rainfall, evapotranspiration and changes in soil moisture; 2. Monitor the evolution of snow, vegetation cover, surface wetness and surface fluxes and analyze the linkage with convective activity, (extreme) precipitation events and the Asian Monsoon; this aims at using monitoring of snow, vegetation and surface fluxes as a precursor of intense precipitation towards improving forecasts of (extreme) precipitations in SE Asia. A series of international efforts initiated in 1996 with the GAME-Tibet project. The effort described in this proposal builds upon 10 years of experimental and modeling research and the consortium includes many key-players and pioneers of this long term research initiative.

## **219870- DYSTEM**

Dynamics and Structure of the Earth's Mantle: a multidisciplinary approach

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 10/1/2008 - 9/30/2010

*EC contribution:* € 259 642

*Policy drivers:* Hydromorphology

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### **Abstract**

We propose a multidisciplinary approach involving mineral physics, geophysics and geodynamics to study the evolution and the current physical conditions of the Earth's mantle. Starting from a mineral physics database, we will jointly invert long-period seismic waveforms and gravity data to infer 3-D thermal and compositional structure of the Earth's mantle. The thermodynamic database used for the inversion will also provide the physical properties for time-dependent mantle convection computations. The reconstruction of the thermal and compositional evolution with most advanced computational techniques will validate the character of the T-C structures obtained from the observations. Moreover, these models will give insights on small-scale heterogeneities that are not resolved from the geophysical observations. The proposed combined procedure has a greater potential for answering questions compared to conventional methods, which use only partial information. We expect to shed a light, for example, on the role and presence of water in the deep interiors, on the scale of mantle heterogeneities and on the presence of compositional stratification in the upper and deep mantle. All the specific results are included within the more general goal of achieving a better understanding of the Earth and planetary dynamics. As a consequence, external phenomena as climate change, volcanic eruptions, earthquakes and plate tectonics, that are intrinsically linked to interior dynamics, will be also better understood.

## **50444- ECO-IMAGINE**

European Conferences and forum for Integrated coastal  
MANagement and Geo-INformation rEsearch

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 1/1/2004 - 12/31/2007

*EC contribution:* € 477 019

*Policy drivers:* Hydromorphology  
Science-policy Interface

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### **Abstract**

ECO-IMAGINE is a group of 8 events on the complementarity between Integrated Coastal Management(ICM) and Geo-information/GIS as support tool. The initiative runs with an interdisciplinary approach in order to better integrate the different coastal aspects; a science based approach, as per the Johannesburg 2002 Summit, is ensured by a state of art employment of GIS. Relevance is given to planning and management of coastal landscape as the meeting point between natural and human features of the coast. 3 Working Groups are foreseen, to address the main features in this field: -Building Coastal Knowledge and GI. Analyses and monitoring of coastal realities exploiting the employment of GIS, as analyses functional to an ICM programme and as assessment tool-Coastal Governance, Planning and Design and GI. ICM programmes evolution and its issues in the GIS perspective. In particular uses of coastal resources, impacts on environment, relations between the actors, assessment methodology, evolution of local policies/ planning toward ICM-The Waterfront Management and GI. Integrated management and planning of waterfront as core areas for the sustainable development of a wider context. In particular will be emphasised the role of GIS in integrating waterfronts into the territorial scale. A 4th cross-cutting working group deals with the technological features of GI and their applications in the various fields of ICM. ECO-IMAGINE consists of: -two general conferences: the initial one to introduce the theme, the objectives and the Working Groups; the last one to make a summary of the events and of the initiative achievements -three thematic conferences focusing issues and state of the art relevant to each Working Group -three Training Courses in order to practically approach the themes discussed. An effective network building and generation of added value is ensured by proper tools as the website and a Virtual Permanent Conference.

## **505586- EUROWET**

Integration of European Wetland research in a sustainable management of water cycle

[www.eurowet.brgm.fr](http://www.eurowet.brgm.fr)

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*Funding scheme:* SSA (Specific Support Action), FP6

*Project duration:* 1/1/2004 - 4/30/2005

*EC contribution:* € 529 958

*Policy drivers:* Hydromorphology

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### **Abstract**

The final goal of the EUROWET project is to integrate the substantial multidisciplinary European research in wetlands to help attain the sustainable management of the water cycle. This will be achieved by the translation of state-of-the-art science developed at both national and European levels, into practical guidance for end-users. This will be achieved by a comprehensive review, expert assessment and a focussed dissemination strategy. There is considerable scientific knowledge and technical experience gained in diverse aspects of wetland science and management including hydrology, biogeochemistry, ecology restoration, socio-economic and policy analysis. However the results of research and management experience are still too fragmentary and not sufficiently orientated to problem-solving or simply inadequately framed to be effectively transferred to, or used by, stakeholders and policy-makers. Simultaneously the general outcome of the scientific research has been increased awareness of the significance of wetlands in delivering goods and services important for human welfare including quality of life, biodiversity conservation and maintenance or enhancement of environment quality. Despite this wetlands continue to be degraded and lost throughout Europe without adequate consideration of the wider benefits to be achieved from this management. The new Water Framework Directive (WFD) promotes a unique opportunity to redress this problem by means of the holistic, integrated approach to water management. There is currently in preparation horizontal guidance on Wetlands as part of the Common Implementation Strategy (CIS) process. There is however work still to be done on providing more specific scientific and technical guidance on the effective implementation of the Directive with respect to wetlands. This is particularly the case in relation to Integrated River Management, the CIS cluster within which wetlands are being considered in the WFD.

## **265113- GMOS**

Global Mercury Observation System

[www.gmos.eu/](http://www.gmos.eu/)

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*Funding scheme:* CP (Collaborative Project), FP7

*Project duration:* 11/1/2010 - 10/31/2015

*EC contribution:* € 6 882 068

*Policy drivers:* Hydromorphology

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### **Abstract**

The overall goal of the proposed project is to develop a coordinated global observation system for mercury able to provide temporal and spatial distributions of mercury concentrations in ambient air and precipitation over land and over surface waters at different altitudes and latitudes around the world. This will then provide high quality data for the validation and application of regional and global scale atmospheric models, to give to governments, national and international organisations and stakeholders a firm basis for future policy development and implementation. Specific objectives of the proposed project are (a) to establish a Global Observation System for Mercury (GMOS) able to provide ambient concentrations and deposition fluxes of mercury species around the world, by combining observations from permanent ground-based stations, and from oceanographic and tropospheric measurement campaigns; (b) to validate regional and global scale atmospheric mercury modelling systems able to predict temporal variations and spatial distributions of atmospheric mercury entering to and re-emitted from terrestrial and aquatic receptors; (c) to evaluate and identify source-receptor relationships at country scale and their temporal trends for current and projected scenarios of mercury emissions from anthropogenic and natural sources; (d) to develop interoperable tools to allow the sharing of observational and models output data produced by GMOS. The overarching goal of GMOS is to support the achievement of goals set by the GEO / GEOSS, and specifically of the GEO Task HE-09-02d and contribute to the advancement of our scientific understanding in the nine Societal Benefit Areas (SBA) established in GEOSS. The proposed project will rely on the results and knowledge acquired in the framework of past EU projects (i.e., MAMCS, MOE, MERCYMS) and international programs (i.e., UNECE TF HTAP; UNEP F&T partnership area).

## **039561- GRAND MARAIS**

Landscape evolution in the Grand Marais of Limagne (Puy-de-Dôme, France), from the Iron Age to modern times. An archaeological and paleoenvironmental study in a long-lasting perspective

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 12/17/2007 - 8/16/2009

*EC contribution:* € 142 866

*Policy drivers:* Hydromorphology

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### **Abstract**

The aim of the project is to reconstruct the landscape evolution of the Grand Marais of Limagne (Puy-de-Dôme, France), a km<sup>2</sup> 100 plain that is located East of the town of Clermont-Ferrand, in the very centre of the region of the Arvernes, one of the most important peoples of ancient Gaul. It is a region that, from the end of the Bronze Age, was interested by a high density of population and for a thriving economy, mainly based on agriculture, whose prosperity was guaranteed by the so-called dark earth (terres noires), legendary for its fertility. Until the end of the 1960s, this area was considerably conditioned by the instability of the river network, as it is attested by the written sources, so that the anthropic exploitation of this region was only possible through an incessant fight against the water. Understanding the form and the aspect of the drainage system implemented from the late Iron Age (III century B.C.), in a long-lasting perspective, is undoubtedly a key to understand the type and the extent of the social interventions carried out on the environment in the different periods, from the Antiquity until today. In order to obtain this result, the existing documentation and the new data both, archaeological/topographical and paleoenvironmental, will be crossed within a GIS (Geographic Information System), in order to distinguish the different chronologies of ancient territorial assessments (cadastre grids), having often different orientation and metric module, and to propose a general pattern of landscape evolution. It is worth mentioning that this project will have further practical outputs. In practice a sort of numeric georeferenced archive of all archaeological and paleoenvironmental data for the Grand Marais area will be created: it is going to become an instrument of great utility to local administrations, in order to assure a territorial planning completely respectful of the Cultural and Natural Heritage.

## **232156- HYDRORAD**

Integrated advanced distributed system for hydro-meteorological monitoring and forecasting using low-cost high-performance X-band mini-radar and cellular network infrastructures

<http://www.himet.it/hydrorad/>.

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*Funding scheme:* BSG-SME (Research for SMEs), FP7

*Project duration:* 9/1/2009 - 11/30/2011

*EC contribution:* € 1 138 250

*Policy drivers:* Hydromorphology  
Floods

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### **Abstract**

Three SMEs from Italy, Greece and Cyprus have formed a consortium, named HYDRORAD, to develop a unique state-of-the-art hydro-meteorological observational-modelling system, based on network of advanced low-cost mini X-band polarimetric radars. HYDRORAD will greatly enhance our ability to observe, measure, and estimate parameters of rainstorms and hailstorms with consequential improvements in the prediction of floods and the management of water resources. The modular and cellular structure of the HYDRORAD radar observation network would facilitate: i) high flexibility in selecting and changing the critical area for hydro-meteorological monitoring and forecasting, civil protection support and agriculture management; and ii) exploitation of existing cellular-phone radio-base station towers as a mean to use those facilities to minimize the impact of new civil constructions for the radar network infrastructure. The objectives of the HYDRORAD proposal are: 1. to optimise X-band mini-radar system characteristics in terms of the best tradeoffs between costs and performances for hydro-meteorological applications and to implement, improve and validate precipitation algorithms to process X-band mini-radar network data measurements; 2. to develop robust techniques for hydrological nowcasting driven by the X-band mini-radar network data and to set up an integrated tool for short-to-medium-range forecasting using coupled hydro-meteorological models and assimilation schemes; 3. to develop protocols and procedures to exploit the network of cellular towers to implement large regional X-band mini-radar network coverage and to test the integrated systems and tools in real-time within social and economical context of a developing country, such as Moldova.

## **207685- IDOR**

Water Resource Data Integration and Model Development for Management and Sustainability of River-Basin Resources

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 10/1/2007 - 9/30/2010

*EC contribution:* € 75 000

*Policy drivers:* Hydromorphology  
Science-policy Interface

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### **Abstract**

The most important directive in terms of research adopted by the EU is the Water Framework Directive (WFD). The recent trend towards sustainable development has imparted renewable resources such as water a more significant role in the river-basin plan of a country. The overall aim of this project is to develop methods and tools in order to strengthen and build capacity to achieve integrated water-resources management to support the development of a river-basin management plan in accordance with the WFD. In this project, we seek to develop a GIS framework that will be used to better assist decision-makers devise strategies for the management and planning of river-basin systems.

The framework will couple the strengths of the Arc Hydro data model, the Hydrological Modeling System (HYMOS) and CYMOS in Cyprus with modeling procedures in a way that economics, environmental impact, sustainability, and planning issues will be integrated in a decision support procedure for economic analysis. The project will be carried out in close cooperation with the Water Development Department and other Cyprus government departments. Key datasets/thematic layers will include: hydrogeology, water level, water quantity, and water quality data, topography, hydrographic and climatic data, streams, drainage areas, channels, surface terrain, rainfall regime, soils, and digital orthophotography. GIS will be used as the primary environment for analysis including pre- and post-processing of data for modeling exercises, data integration, management, investigation and visualization.

## **247608- IGIT**

Integrated geo-spatial information technology and its application to resource and environmental management towards the GEOSS

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 1/20/2011 - 1/19/2015

*EC contribution:* € 410 400

*Policy drivers:* Hydromorphology  
Ecological Status  
Climate Change

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### **Abstract**

The IGIT project aims at developing a prototype system for data collection, analysis and dissemination for informed decision making; a step towards the goals of GEOSS. This staff exchange programme embraces a broad palette of research centres in China and Europe to streamline their activities towards the complex prototype system with the following main function: integrated geo-spatial information acquisition and management in various application fields. Eight leading institutions of different disciplines participate in the mobility programme, which facilitates data and information exchange and joint research work. This way, different fields of ongoing activities are linked together for building the complex system. The following elements will be developed in individual work packages: - New image processing techniques for remote sensing - Integrated geo-spatial information and its application to agriculture and forestry - Integrated geo-spatial information and its application to land and environment monitoring - Spatial data engineering and internet-based information sharing and service in water resources management - Design and implementation and application of a WebGIS - Distributed computing and geographical knowledge grid - Geographical process modeling and analysis - Integrated geo-spatial information and its application to climate change and carbon cycle - Integrated geo-spatial information and its application to coastal zone management The researcher mobility between the European and Chinese partners provides the link among the institutions and the work packages. Scientific results are to be published in peer reviewed articles written by the cooperating. Workshops are organized as mile stones for information and result exchange. The prototype system is presented on a summary conference. It is envisaged that the personal and institutional interactions will have a multiplicative effect on the results, for the mutual benefit of Europe and China.

## **230915- IGSEA**

Integrated Nonseismic Geophysical Studies to Assess the Site Effect of the EUROSEISTEST Area in Northern Greece

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 1/1/2009 - 12/31/2011

*EC contribution:* € 45 000

*Policy drivers:* Hydromorphology

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### **Abstract**

IGSEA addresses primarily topics out of the main scientific area ENV such as Geophysics, Tectonics, and Seismology in combination with Earthquake Engineering, Engineering Seismology and building-soil & soil-water processes through the interaction between geophysicists and civil engineers. This project aims to assess site effects in the surrounding area of the EUROSEISTEST site by means of low-cost integrated nonseismic geophysical methods that are capable of detecting vertical geotectonic boundaries and fault zones with high accuracy and are able to confine and improve one of the first 3D resistivity inversion models of the area. The project will benefit from the use of state of the art devices and techniques which allow for a comprehensive view inside the inner structure of the basin. Through the implementation of hydrogeophysical and hydrogeological aspects we believe to significantly support the waveguide propagation modelling process of researcher and civil engineers in Greece and Europe who are working on strong motion data.

## **251720- INBUCOC**

### Interacting Buoyant Coastal Currents

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 6/7/2010 - 11/28/2011

*EC contribution:* € 114 876

*Policy drivers:* Hydromorphology  
Ecological Status

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### **Abstract**

Buoyant coastal currents strongly influence coastal circulation and ecosystems and, on a global scale, the redistribution of freshwater. The interaction of buoyant currents from different river sources is a common phenomenon; for example, the western Adriatic Sea coastal current. The manner in which buoyant currents interact will influence the downstream coastal distribution of waterborne materials contained in individual currents, with ecological and societal importance. While clearly an important phenomenon on many coasts, the dynamics of interacting buoyant coastal currents, and the impacts of such interactions, remain poorly understood. As researchers, we are interested in investigating the dynamics of buoyant current interactions in a series of idealized and process oriented analytical studies and laboratory experiments. The principle objective of this study is to determine the details of the cross-shore and vertical structure of buoyancy and velocity within two interacting buoyant coastal currents and their dependence on control parameters including density anomaly, current transport, bottom slope, and rotation rate. Both surface-trapped currents, which do not feel the bottom, and slope-controlled currents, which are steered by the action of the bottom boundary layer, will be examined. Analytical studies will look at the structure of coupled, geostrophically-adjusted currents. Rotating tank experiments will be conducted to track the interaction of two buoyant currents, and to test the predictions of the analytical model. The laboratory and analytical studies will complement each other allowing for a robust assessment of the final results. This study will lead to a greatly improved understanding of the dynamics of buoyant coastal currents and their interaction, and will advance our capability of modeling buoyant currents. In addition, this project will allow the transfer of extensive experience, knowledge, and expertise of Dr. Cenedese to the host institution.

## **043784- INTREPID**

### Integrated Trans-boundary River Management Policy Development

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*Funding scheme:* SSA (Specific Support Action), FP6

*Project duration:* 4/1/2007 - 6/30/2008

*EC contribution:* € 148 850

*Policy drivers:* Hydromorphology

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#### **Abstract**

Livelihoods in semi-arid areas depend upon a biological resource base underpinned by access to water. With increasing human populations and water stress come pressures to harness water resources for 'higher economic value' uses, instead of an integrated approach that includes provisions for ecosystem conservation and livelihood sustainability. Nowhere is this lack of integration more prevalent than in the semi-arid regions of Africa. The linkages between Integrated Water Resource Management (IWRM), Sustainable Livelihoods (SL) and Biodiversity Conservation (BC) are poorly known. River basin management, biodiversity conservation and livelihood programmes in Africa have evolved independently, with often overlapping and/or conflicting goals and responsibilities. The result has been persistent intra- and trans-boundary conflicts; leading to increasing poverty and declines in biological diversity. This proposal will address this disparity by recognising that IWRM, BC and SL are irremediably linked and that water management and policy initiatives focusing on individual aspects are likely to fail. It will aim, therefore, to resolve this gap by initiating and promoting inter-disciplinary and international collaboration to integrate sustainable water resource management, biodiversity conservation and livelihoods using the Mara river basin as a case study. It will provide a platform for policy makers, practitioners and researchers to consolidate expertise on African IWRM systems and draw on experiences from the implementation of the EU-Water Framework Directive to promote and reinforce the vital synergies between IWRM, BC and SL. The Mara river basin system in Kenya and Tanzania will form the case study for this project and it is envisaged that the principles and

outcomes derived from this SSA could provide an integrated framework for future policy development and research covering other vulnerable river basins throughout the semi-arid Africa.

## **502885- MERSEA**

Marine Environment and security for the European Area  
(MERSEA)

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*Funding scheme:* IP (Integrated Project), FP6

*Project duration:* 4/1/2004 - 9/30/2008

*EC contribution:* € 13 997 699

*Policy drivers:* Hydromorphology  
Science-policy Interface

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### **Abstract**

MERSEA aims to develop a European system for operational monitoring and forecasting on global and regional scales of the ocean physics, biogeochemistry and ecosystems. The prediction time scales of interest extend from days to months. This integrated system will be the Ocean component of the future GMES system. At the core of the system is the collection, validation and assimilation of remote sensed and in situ data into ocean circulation models that allow for the self consistent merging of the data types, interpolation in time and space for uniform coverage, nowcasting (i.e. data synthesis in real-time), forecasting, and hindcasting, and delivery of information products. The project will develop Marine Applications addressing the needs of both intermediate and end-users, whether institutional or from the private sector, with the objective to improve the safety and efficiency of maritime transport and naval operations ; to enable the sustainable exploitation and management of ocean resources (offshore oil and gas industry, fisheries) ; to more efficiently mitigate the effects of environmental hazards and pollution crisis (oil spills, harmful algal blooms) ; to improve contribution to ocean climate variability studies and seasonal climate prediction and its effects on coastal populations ; to improve national security and reduce public health risks ; and to advance marine research with the aim to better understand the global climate, the ocean and its ecosystems. The project will lead to a single high-resolution global ocean forecasting system shared by European partners together with a coordinated network of regional systems for European waters which will provide the platform required for coastal forecasting systems. During the project the main preoperational systems will be transitioned towards operational status and three of the centres will converge on a single ocean model framework suitable for both the deep ocean and shelf-seas.

## **014502- MODELLING COMPETENCE**

Improving competence in integrated hydrological modelling by gaining innovative uncertainty analysis skills and software engineering capabilities

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 1/1/2005 - 12/31/2008

*EC contribution:* € 327 891

*Policy drivers:* Hydromorphology

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### **Abstract**

Due to increased demands on river basin management, especially concerning legal requirements based on the Water Framework Directive, integrated river basin models have become an essential tool for practical concerns and decision-making. The research group, consisting of the Department Hydrological Modelling and associated members of the Department Soil science, has gained expertise in application of integrated river basin models. The increased use of such models has made new challenges to integrated modelling: i) River basin research projects are increasingly designed according to the needs of the specific research or decision-making-process and new tools enabling the coupling of model components are needed. ii) The associated uncertainty of model results has become a key-information for decision-making. The intended ToK shall enable the researchers to extend their modelling competence by addressing uncertainty issues and to develop new analysis tools and model components according to their research in an interdisciplinary environment. The knowledge transfer shall be implemented by two researchers with a) a background in computer science and b) mathematics/stochastics. They shall be integrated into a project aiming at the further development of an object oriented modelling tool and the assessment of predictive uncertainty in river basin modelling with respect to data uncertainty and model complexity and different spatial scales. The knowledge transfer will be achieved by a mixture of workshops and practical work in the research group. Gaining competence in informatics and uncertainty analysis will offer excellent opportunities to increase the long term research capacity of the hydrological modelling group and to meet the new demands. The proposed ToK will also build synergies on a European level and strengthens international collaborations of the modelling group.

## **252374- MORPHSWASH**

Morphodynamic of the Swash zone: Experimental and numerical modelling

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 1/1/2011 - 12/31/2012

*EC contribution:* € 165 458

*Policy drivers:* Hydromorphology

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### **Abstract**

One of the major shortcomings of Coastal Sediment Transport Models is the poor definition of the shoreward boundary of the fluid domain or, more specifically, of the Swash Zone (SZ). Following this assumption, the present project aims to provide both major advances in the knowledge of SZ processes and major improvements in the modelling capability of the SZ dynamics. Focus will, first, be in increasing the current knowledge of SZ dynamics and in implementing some of the recent advances in a new Lagrangian, intra-wave model, especially designed for the SZ flows. The model is such to take into account the time history of water particles when predicting the sediment transport at a given location. Previous studies suggest that Lagrangian methods offer many advantages in representing the complex processes occurring in the SZ. The next task to be undertaken in the course of the project is the inclusion of dynamical SZ mechanisms (evolving at the intra-wave time scale) in wave-averaged nearshore circulation models by using new Shoreline Boundary Conditions (SBCs). This fundamental piece of modelling has been the object of various recent implementation attempts made within the international research community. Experimental measurements of SZ flows, sediment concentration and intra-wave information of bed changes, outcome of an ongoing experimental EU project in which both the candidate and the host institution are involved, will be made available to help the modelling. Further experiments, aimed to validate the codes to be implemented, are also planned to be carried out at the host institution. The proposing research team, having available both extensive experience in SZ measurement and leading capabilities in SZ numerical modelling, is ideally positioned for implementing the complete version of SBCs in a nearshore circulation model which would, for the first time, enable proper computations of nearshore flows and morphodynamics.

## **267116- NWFV**

Nonlinear studies of water flows with vorticity

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*Funding scheme:* ERC (ERC Grant), FP7

*Project duration:* 4/1/2011 - 3/31/2016

*EC contribution:* € 1 324 797

*Policy drivers:* Hydromorphology  
Floods

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### **Abstract**

The aim of the project is to build and promote a team of excellence in the mathematical theory of water flows, with emphasis on nonlinear aspects. Our aim is to advance the state-of-the-art of water flows with vorticity. Flows within a fixed fluid domain as well as free surface flows will be considered and we strive to provide an accurate description of the entire flow; for example, the flow beneath a water wave and not just a description of the water wave profile. Problems of this type are currently of great interest, for example in the context of wave-current interactions and for a better understanding of tsunami waves. In addition to methods from the theory of partial differential equations to investigate the governing equations for water waves, the use of simplified models with a rich structure (e.g. integrable systems arising in the shallow water regime) will identify and highlight qualitative features. Numerical simulation in conjunction with experimental feedback and the gathering of field data will be of great support. Provision is made for consultation and collaboration with research groups in engineering and physics. Due to the interest of the general public in tsunamis, one of the objectives is to have a positive impact on the perception of science by society and on the raising of scientific interest of the younger generation through public lectures and contacts with high-schools.

## **012290- PEARL**

Port EnvironmentAI infoRmation colLector

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*Funding scheme:* STP (Specific Targeted Research Project), FP6

*Project duration:* 1/1/2006 - 12/31/2008

*EC contribution:* € 890 000

*Policy drivers:* Hydromorphology  
Science-policy Interface  
Climate Change

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### **Abstract**

Ports are highly affected by ocean conditions and pollution events near the Port. Moreover, European legislation is also requesting better information. A remote and continuous monitoring of a wider geographical area is a key aspect for improving the understanding port environment phenomena, as well as anticipating risk situations that will affect the port. There are a large number of systems in place to gather relevant geo-information data, mainly meteorological, water quality, oceanographic and pollution related. However, it is clear that the systems used presently are in-situ sensors and are mainly used to gather specific data within or near the port area. Improving information flow by increasing the number of in-situ sensors deployed is a costly investment strategy. Space data is seriously underused by Port Authorities due to different obstacles, although it space data is becoming more and more available appears that EO data is able to provide valuable information in areas near the coastline. At the same time, projects such as the FP6 IP MERSEA focus on the delivery of oceanographic products exploiting space data and model innovation. These data products are very relevant to Ports. PEARL will seek to address the above issues by developing a Port Environmental Management System enabling the optimal exploitation of space and in situ data products. Pearl aims at providing, for the first time, a platform focusing on Ports and their environmental problems for user friendly access of in situ and space data and models, and their efficient combination. Pearl aims at educating the user community on the information content available from space and in-situ instruments, as well as on current limitations.

## **038331- PREWEC**

Advancing the predictability of water cycle through an improved understanding of land surface and coastal water processes and optimal integration of models with observational data

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 1/1/2007 - 12/31/2010

*EC contribution:* € 138 4870

*Policy drivers:* Hydromorphology

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### **Abstract**

The Hellenic Centre for Marine Research (HCMR) and team leader Prof. Emmanouil Anagnostou (returning from USA) propose to establish a research team aimed at advancing predictability of water cycle and coastal ecosystem/pollution and improving the consistency of climate change simulations and consequently of our understanding in terms of impacts on water resources. The research team will focus on three major thrust areas: (1) hydro-meteorology/water cycle where the team will seek to address deficiencies in predictability by building an integrative data-modeling system for the simulation of hydrologic quantities and characterizing their uncertainty; (2) coastal ecosystem/pollution where the team will research innovative approaches connecting the water cycle predictions with soil erosion, wetland discharges, terrestrial inputs of inorganic and organic matter in coastal areas, water pollution, and effects on coastal ecosystem structure and dynamics; and (3) climate change where the team will seek to enhance the ability of Global Climate Models (GCM) to simulate vegetation-atmosphere water flux exchanges, thus improve GCMs' skill to predict the impact of surface hydrological processes on the Earth's climate system. We anticipate that successful implementation of the proposed research will yield significant advances and breakthroughs in the predictability of continental hydrologic parameters and climate change science. HCMR puts special emphasis on this proposal, which is considered key to facilitating the successful re-integration of Prof. Anagnostou in Europe through the establishment of an excellence team within HCMR researching advanced concepts on Water Cycle and Climate Change. In support of this proposal, HCMR commits resources to both facilitate and absorb the research work to be initiated in the proposed project.

## **282656- REFORM**

REstoring rivers FOR effective catchment Management

[www.deltares.com/en/news/news-item/item/13592/reform?highlight=reform](http://www.deltares.com/en/news/news-item/item/13592/reform?highlight=reform)

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*Funding scheme:* CP (Collaborative Project), FP7

*Project duration:* 11/1/2011 - 10/31/2015

*EC contribution:* € 6 997 605

*Policy drivers:* Hydromorphology  
Ecological Status

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### **Abstract**

REFORM is targeted towards development of guidance and tools to make river restoration and mitigation measures more cost-effective and to support the 2nd and future River Basin Management Plans (RBMPs) for the WFD. Aims of REFORM are (1) to provide a framework for improving the success of hydromorphological restoration measures and (2) to assess more effectively the state of rivers, floodplains and connected groundwater systems. The restoration framework addresses the relevance of dynamic processes at various spatial and temporal scales, the need for setting end-points, analysis of risks and benefits, integration with other societal demands (e.g. flood protection and water supply), and resilience to climate change.

The consortium comprises scientists and practitioners covering a wide range of disciplines (hydrology, hydraulics and geomorphology, ecology, socio-economics). The workplan is organized in three modules: (1) natural processes, (2) degradation, (3) restoration. Data from monitoring programmes and restoration projects will be pooled and linked with landscape-scale hydromorphological and physiographic data and catchment models. Targeted field and experimental studies using common protocols will fill data gaps on the role of scale in restoration success. A wide range of statistical modeling approaches will improve indicators for hydromorphological change and factors determining restoration success. All work packages are multidisciplinary and will feed into products for application in river basin management, e.g. guidelines for successful restoration and a web-based tool for exchanging experiences with river restoration measures facilitated and enhanced through consultation with stakeholders.

In addition to its impact on the RBMPs, REFORM will provide guidance to other EU directives (groundwater, floods, energy from renewable resources, habitats) to integrate their objectives into conservation and restoration of rivers as sustainable ecosystems

## **028292- RESTRAT**

### Investigation of the Effects of Thermal Stratification on Hydrodynamics of a Reservoir

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 1/1/2006 - 12/31/2007

*EC contribution:* € 80 000

*Policy drivers:* Hydromorphology  
Ecological Status

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### **Abstract**

Understanding the lake hydrodynamics is important for the management of water resources and thermal stratification is of great importance for the pattern of mixing in lakes and reservoirs. This study will investigate the structure of the thermal stratification, its relation to wind and flow conditions, and its effects on vertical velocity profiles, suspended sediment concentrations and water quality parameters. In lakes and reservoirs, the effects of thermal stratification on velocity profiles and subsequently on water quality parameters are not completely understood. At the end of this study, simple relationships between stratification and velocity profiles, stratification and suspended sediment concentrations, stratification and water quality parameters will be established. The numerical model that will be applied to the reservoir is a 3-D hydrodynamic model necessary for simulating both the horizontal circulation in the reservoir due to wind effect and inflows/outflows and vertical circulation in the water column required for assessing the effects of stratification. Existing studies on the topic lack extensive field measurements required for validation of numerical models applied to the water systems. The proposed study will deliver simple relationships based on numerical modelling validated by field measurements filling this gap. Climate change is among one of the three main priorities of the Sixth Environmental Action Programme. In this study, the researcher will use a comprehensive numerical model validated by a series of field measurements to model hydrodynamics in a reservoir. Then, the possible scenarios of climate change will be determined by the application of widely accepted climate models. Investigation of the sensitivity of water quality parameters to the changes in temperature as anticipated by the existing climate change models will guide policy makers for the sustainable management of water resources in the future.

## **014905- RSFLUX**

Monitoring suspended matter fluxes in coastal waters using ocean color remote sensing and transport modelling. An integrated approach.

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 8/1/2005 - 7/31/2006

*EC contribution:* € 40 000

*Policy drivers:* Hydromorphology  
Ecological Status

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### **Abstract**

The project aims to develop an operational monitoring system for turbid estuarine and coastal waters. The system combines in-situ observations, ocean colour remote sensing measurements and numerical transport modelling. In-situ and remote sensing (satellite and/or airborne) observations are directly integrated into a sediment transport model. This integration approach is used to calibrate the model and calculate sedimentary fluxes. The integrity of new quantification algorithms for ocean colour remote sensing sensors is first assessed in two European estuarine environments. These algorithms include recently developed atmospheric correction methods and suspended particulate matter (SPM) quantification relationships. The integrity assessment is based on multiple match-ups (simultaneous remote sensing and in-situ measurements). Once assessed, algorithms are routinely applied to multi-scale satellite data in order to observe the tidal and seasonal movements of surface SPM concentrations in a selected study area. The retrieved concentrations are associated to a quantified percentage of error. Remote sensing observations are complemented by numerous in-situ measurements providing information on the continuous variations and vertical profiles of turbidity. The generated database covers one full year and provides information on the tidal and seasonal SPM dynamics. Data (SPM concentrations) are integrated into a three-dimensional sediment transport model. In-situ and remote sensing data are first integrated separately to assess their respective influence in terms of model calibration (calibration of the empirical parameters used in the sediment transport model). The full dataset is then integrated. The final product (sediment transport model with data-integration) is used to obtain a better understanding of hydrodynamic/transport processes and quantify tidal/seasonal sedimentary fluxes.

## **024713- SPERT**

Hydrogeophysics: Joint inversion of self-potential and electrical resistivity data to characterize subsurface flow

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 1/1/2006 - 8/31/2006

*EC contribution:* € 159 046

*Policy drivers:* Hydromorphology

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### **Abstract**

An alternative approach to characterize groundwater flow is to use minimally invasive, rapid and cost-effective geophysical methods in complement to `classical hydraulic and geochemical methods. The Electrical Resistivity Tomography (ERT) and the Self-Potential (SP) methods offer such a possibility because these methods are sensitive to pore water saturation and groundwater flow. The ERT is an active method used to obtain the distribution of the electrical resistivity in the subsoil. The SP method consists in passive of the natural electric field associated with polarisation mechanisms occurring at depth, which reflect hydraulic gradients and chemical potential gradients. These anomalies can be analysed to characterize qualitatively and quantitatively the dynamic of the groundwater flow. However, there is a lack in robust data inversion techniques. Therefore, as there is pressing demand for deriving new interpretation schemes of SP-signals in terms of groundwater flow, we propose in this proposal to generalise standard SP-analysis methods by combining self-potential and electrical resistivity data in a joint inversion (SPERT). Incorporation of the subsurface resistivity distribution is a new and necessary step in SP inversion in order to characterise the electrical field source parameters, which are essential for quantitative analysis of groundwater bodies. We propose to utilise the recent developments in SP analysis carried out by the applicant in combination with expertise at the host institutions in ERT and SP modelling and in field experiments.

## **018436- TWINLATIN**

Twining European and Latin-American River Basins for  
Research Enabling Sustainable Water Resources Management

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*Funding scheme:* STP (Specific Targeted Research Project), FP6

*Project duration:* 9/1/2005 - 12/31/2008

*EC contribution:* € 1 999 855

*Policy drivers:* Hydromorphology  
Science-policy Interface  
Ecological Status

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### **Abstract**

The Latin American and Caribbean region is highly heterogeneous in terms of climate zones, hydro-ecology, socio-political systems etc. Numerous problems in relation to water quality and water availability arise. Flooding occurs frequently and erosion and pollution pressures have also become major problems. Management strategies, legal framework and stakeholder involvement needs to be improved. Activities and research tasks will be conducted within several fields of IWRM; hydrology, modelling of pollution flow, impact assessment, socio-economic impacts, climate change effects, scenario analysis and action efficiency. The river basins selected are: Baker (Chile-Argentina), Catamayo-Chira (Peru-Ecuador), Cauca (Colombia), Lago de Nicaragua (Nicaragua), and Quarai/Cuareim (Uruguay-Brazil). The European river basins are Thames (UK) and Norrström (Sweden). The project addresses the goals of the EU Water for Life, and builds on the methods and guidelines developed for the EU WFD. Interfaces with international organisations have been established. The proposal is designed to enable and facilitate twinning in all fields of activity in order to fill gaps in knowledge. The strong component of public participation and stakeholder involvement will ensure that each component has local ownership. The river basins selected represent a wide variety of conditions, addressing also transboundary water problems. Thus, the applicability of the WFD approach will vary for the third country basins, and methodology applied will be a modification of the WFD process. The final step will be development of tools for the implementation and identification of priority actions analysed in terms of physical/chemical efficiency as well as socio-economic effects. Priority actions are an essential part of an RBMP, and will be a crucial input and an encouragement to the Latin American end-users of TWINLATIN to develop full RBMPs following the finalisation of the project.

## **256426- WANDLAND**

Effects of wetting and drying cycles on landslide activity

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 6/1/2010 - 5/31/2013

*EC contribution:* € 45 000

*Policy drivers:* Hydromorphology  
Floods

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### **Abstract**

The project aims to improve the capabilities to predict the occurrence of landslide crisis episodes. The research activities focus on the changes in the stability conditions of natural slopes when subjected to wet/dry cycling. Soil properties can undergo strong modifications as a consequence of cyclic variations in the degree of saturation, which can lead to a reduction of the available shearing resistance in the long term. The project involves three main research activities. The first phase deals with study of the evolution of natural soil fabrics as a consequence of imposed weathering processes; modern technologies will be applied to analyse those changes at a microscopic level. This analysis is expected to provide a better understanding of the involved physical processes. During the second phase, the effects of cyclic wetting and drying episodes on natural soil samples will be quantified at a macroscale by an extensive laboratory testing programme. The experimental programme involves the use of advanced testing facilities, available at the host institute, which are necessary to control the pore water pressure of the soil in unsaturated states. A new apparatus will also be developed to measure the shearing resistance of the soil after imposing cyclic changes in the degree of saturation using controlled suction. In the third phase, the results from the experimental work will be used to validate a constitutive model for unsaturated soils. This model will take into account the effects of the changes in the degree of saturation on the mechanical response. Finally, the model will be used in a finite element framework to simulate and forecast the behaviours in selected case studies.

## **517581- X-FLOOD**

Advancing Quantitative Precipitation Estimation and Short-to-Medium Range Forecasting on the Basis of Remotely Sensed Data Assimilation.

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 4/15/2005 - 4/14/2007

*EC contribution:* € 80 000

*Policy drivers:* Hydromorphology  
Floods

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### **Abstract**

This Marie Curie proposal aims at facilitating an efficient re-integration of Professor Emmanouil Anagnostou in the Institute of Oceanography of the Hellenic Center for Marine Research (HCMR). Specifically, our research objectives are to establish and quantitatively validate physically-based algorithms for optimal assimilation of precipitation observations and lightning data into the HCMR POSEIDON regional weather forecast system by: (1) Researching optimal methods for combining, quantifying and validating the retrieval of precipitation parameters (rain type, distribution, area, vertical structure) from an array of remote and in situ observations including long-range lightning network observations, underwater acoustic rain gauge data deployable in the POSEIDON buoy system, and other more traditional measures of precipitation structure collected from ground radar and satellite passive microwave radiometers; (2) Combining space/ground-based instrument and cloud resolving modeling systems to study the 4-D structural characteristics of convective systems over southern Europe that includes the mixed land/sea Mediterranean regime; (3) On the basis of the above knowledge, develop and test new algorithms for assimilation of long-range lightning measurements and multi-sensor rainfall retrievals over remote complex terrain and deep-sea regions of the Mediterranean for use in numerical forecast models such as the non-hydrostatic Eta model used in POSEIDON system. The Institute of Oceanography with the consensus of the President of HCMR (Prof. George Chronis) is committed to absorb the research initiated in the proposed project by offering permanent research scientist appointment to Prof. Anagnostou.



## **Science-policy Interface**



## **518066- AFRICAN WATER**

Action to promote involvement of African water researchers in the Framework Programme

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*Funding scheme:* SSA (Specific Support Action), FP6

*Project duration:* 7/1/2005 - 12/31/2007

*EC contribution:* € 231 600

*Policy drivers:* Science-policy Interface  
Ecological Status

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### **Abstract**

The "African Water" SSA will take immediate action, and establish a framework, for long term improvement in the involvement of African researchers in the water research components of the Framework Programme. The "African Water" SSA is a vital component in the delivery of major EU and member state political commitments to strengthen African water research capacity. This SSA underpins the delivery of water specific commitments made at the Johannesburg WSSD and UN 12th Commission on Sustainable Development (New York 2004). In particular this SSA is an integral part of the EU Water Initiative, to deliver research capacity building in Africa. The "African Water" SSA will undertake a range of actions, developed by and in partnership with, African researchers. The SSA will bring together information, key researchers and research administrators in a targeted programme to provide African researchers with the knowledge and tools to more actively participate in all aspects of the Framework Programme. A key output of this SSA will be for Africans to define their own research priorities and to feed these topics through to the FP7 programme. This SSA will have the catalytic effect of increasing African involvement in other research programmes (member states, international agencies, etc). Actions to be undertaken as part of this SSA will include : information dissemination through workshops, conference presentations, publicity actions, email bulletins, focussed explanatory guidance documents. All will be made accessible through the web and as hard copy. Actions will also be taken to increase European awareness of African research capacity in order to foster outreach to Africa from EU researchers. The "African Water" SSA will increase cost effectiveness by working in partnership with complementary action being undertaken by donors, international agencies, NGO's, charitable foundations and the private sector.

## **229599- AMAROUT**

AMAROUT Europe

[amarout.imdea.org/](http://amarout.imdea.org/)

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 3/2/2009 - 3/1/2013

*EC contribution:* € 3 827 061

*Policy drivers:* Science-policy Interface

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### **Abstract**

AMAROUT Europe is a Project built by the IMDEA institutes with a clear double purpose, on one hand contributing to the development of the European researchers labor market and fostering and consolidating the European Research Area, and on the other turning Madrid into one of the top knowledge generation regions in Europe. The approach foreseen is directed to lead researcher's career through long learning training and career development under an individual driven perspective. The project will be driven by a consortium of eight IMDEA institutes (Institute for Advanced Studies) offering individual researchers the opportunity to propose research fellowships within some of the most promising research areas: water, food science, energy, mathematics, material science, nanotechnologies, networks and software. Within its four years funding period the project will offer to more than 120 fellows the opportunity to join one of these institutes (incoming, reintegration) and receive top level training and research opportunities. It is intended to provide the project with a much longer life. The selection process will strictly follow the European Code of conduct for the recruitment of researches and the Charter for researchers, and will be implemented through 8 international panels constituted by well-known scientist and ad-hoc selected specialists in the 8 research areas. The project will be supported by, main universities and research centers in the region, offering interaction and high renowned research teams, and by private companies from the Board of trustees. In conclusion the AMAROUT Europe fellowship programme will play a key role in the strategic plans of IMDEA for the next ten years to foster the international mobility of 200 internationally recognized researchers and 400 young researchers. This initiative is regarded by the regional government as key programme towards turning Madrid into a world-class centre of science and excellence in the knowledge society.

## **510897- ASEM WATERNET**

Multi-stakeholder Platform for ASEM S&T cooperation on sustainable water use

<http://www.asemwaternet.org.pt/>

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*Funding scheme:* CA (Coordination Action), FP6

*Project duration:* 9/1/2005 - 11/30/2009

*EC contribution:* € 1 500 000

*Policy drivers:* Science-policy Interface

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### **Abstract**

Water is a driving force for sustainable development. The main objective of the Coordination Action ASEMWaterNet is to contribute to the commitments of the EU Water Initiative and the Millennium Development Goals by building and promoting a multi-stakeholder and scientific platform on water resources management. The platform will mobilise the individual strengths of 18 ASEM (Asia Europe Meeting) partner countries, interact with existing networks, and promote interdisciplinary activities between public authorities, scientific community, private sector and civil society.

Through several types of coordinating activities, the 53\* participating organisations will gather their experiences on five priority areas, defined during a first workshop in 2002, namely 1) river basin approach, 2) water use efficiency in agriculture, 3) erosion, flash floods and floods, 4) pollution and water quality and 5) water governance. These joint activities will lead to identify new solutions for improved water use, protection and reduction of risks (pollution, depletion, erosion, flood...). Through the organisation of workshops and conferences, they will furthermore boost and promote exchanges between the scientific community and the industrial and political representatives. The spirit of the ASEM process, built on a framework of respectful and open cooperation between equal partners, will therefore be promoted on water management issues.

\*During the revision of the DoW in 2008, the number of participating organisations became 58.

## **238273- ATWARM**

Advanced Technologies for Water Resource Management

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 12/1/2009 - 11/30/2013

*EC contribution:* € 3 497 503

*Policy drivers:* Science-policy Interface

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### **Abstract**

Technology gaps exist within the EU that prohibit compliance with the Water Framework Directive in providing an integrated water resource management strategy that will secure both water quality and quantity. The fundamental objective of the ATWARM ITN is to enhance the career prospects of 16 young researchers by providing them with greatly enhanced multidisciplinary skills and business aptitudes that will enable them to address these technology gaps. The two scientific objectives of the ATWARM proposal are: (i) To develop advanced technologies for enhancing the performance and/or sustainability of water and wastewater treatment plants, and (ii) To develop advanced technologies for enhancing water quality, including advanced technologies for analysis and monitoring. 14 ESR and 2 ER will participate in an integrated research programme. Each will be located within specific host organisations and will be seconded to other sites to improve their multidisciplinary skills and their knowledge of ATWARM as a whole. They will receive specific in-lab training plus general S&T training at 3 Summer Schools and other relevant training events. Complementary training (involving external participants) structured to accommodate the personal career needs of each Fellow will also be provided. The ATWARM network will involve seven host organisations located in UK, Ireland and Germany. These organisations (four academic, one research and two industrial partners) have distinct but complementary research foci and, due to their involvement in an existing network, are already collaborating effectively. Participation in ATWARM will foster relationships between the partners and ensure the long term sustainability of the network. ATWARM will be coordinated by Queen's University Belfast (which is experienced in the management and administration of large FP research projects) and will be managed by a Supervisory Board to ensure that all Fellows receive the same high standard of training.

## **226456- AWARE**

How to achieve sustainable water ecosystems management connecting research, people and policy makers in Europe

[www.aware-eu.net/](http://www.aware-eu.net/)

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*Funding scheme:* CSA (Coordination - or networking - action), FP7

*Project duration:* 6/1/2009 - 11/30/2011

*EC contribution:* € 1 497 356

*Policy drivers:* Science-policy Interface

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### **Abstract**

The issue of concern of the AWARE project is the anthropogenic deterioration of water ecosystems, in particular in coastal areas. The new approach proposed by the AWARE project to enhance connectivity between research and policy-making exploit the concept of integrated adaptive ecosystem management, engaging scientists, policy makers and the public (the latter including both stakeholders and lay citizens/water users) into comparable case studies of participatory scenario-building. The emphasis given to the role of the public enlarges the concept of organisational learning to the wider concept of social learning. The specific objectives and WPs of the AWARE project will include therefore: WP1: to design and prepare the pilot experiments of participatory scenario-building; WP2: to perform three case studies of participatory-scenario building in different coastal regions of Europe; WP3: to make an evaluation and assessment of the pilot case studies and of the proposed approach; WP4: to foster networking between science institutions, policy authorities and stakeholders in the case study areas and at EU level, and disseminate the approach elsewhere in Europe. The AWARE consortium includes 14 partners of complementary expertise in the field of aquatic ecosystems studies (UU, UPMC, ULB, UNIPR), social sciences (ADELPHI, ICCR, Missions Publiques), system analysis (ISIS, JRC-IES, UNISI) and integrated water management (BIOFORSK, POLIEDRA), plus the Environmental Service from the Provincial Administration of Ferrara and the Baltic Environmental Forum (BEF). The consortium will be complemented by an advisory group of 10 policy makers and stakeholders.

## **266609- CB-WR-MED**

Capacity Building for Direct Water Reuse in the Mediterranean Area

[www.cbwrmed.eu/](http://www.cbwrmed.eu/)

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*Funding scheme:* CSA (Coordination - or networking - action), FP7

*Project duration:* 11/1/2010 - 4/30/2013

*EC contribution:* € 490 665

*Policy drivers:* Science-policy Interface

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### **Abstract**

In the Mediterranean region the pressure on water resources is high, so there is no water to “waste”. Water is becoming a limiting factor for agricultural, and even for industrial development. Treated wastewater is part of the community’s water resources and one component of sustainable water management approach. The direct reuse, instead of wastewater discharge in the network, reduces costs of treatment and throwing of biological recalcitrant compounds into a water stream. To reach this purpose, water treatment should target (i) pollutants degradation, (ii) multi-purpose water use and (iii) sustainability of the technologies. Reinforcement of cooperation between EU and ENP countries is necessary to implement sustainable water management.

The project proposes to use the frame of FP7 programme (ERA-WIDE) for the reinforcement of cooperation capacities of Tunisian research centre “Centre of Water Researches and Technologies, CERTE” in specific items which CERTE has already an expertise to build on competency and capacity. The topic “Wastewater treatment for elimination of recalcitrant compounds allowing multiuse of the water and direct recycling and avoiding pollution of water system” is considered the leitmotiv for this proposal.

The objective of this project is to reinforce the R&D capacities of CERTE and its regional and international impact with the ultimate goal that R&D activities lead to a fruitful cooperation with the UE for sustainable water management in accordance with the national and European strategies.

There is much effort needed to build cooperation to develop appropriate sustainable water management. Still, high attention is given to capacity building on EC cooperation and scientific research through workshops, trainings, technical visits and pilot plants upgrading. Networking and dissemination to bring the results of these efforts to effective cooperation include construction of a web platform, network and international conference.

## **217745- CEECEC**

CSO Engagement with Ecological Economics

[www.ceecec.net/](http://www.ceecec.net/)

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*Funding scheme:* CSA (Coordination - or networking - action), FP7

*Project duration:* 4/1/2008 - 9/30/2010

*EC contribution:* € 730 011

*Policy drivers:* Science-policy Interface

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### **Abstract**

Ecological economics (EE) and, in general, sustainability sciences make important contributions to the analyses of sustainability policies in Europe and worldwide. EE develops physical indicators and indices, provides economic valuation of environmental services and negative externalities, applies tools of multi-criteria evaluation to resource use, and promotes environmental policy instruments such as eco-taxes and marketable permits. To provide policy makers with high quality, relevant research, increased collaboration between ecological economists and CSOs is needed. Many CSOs already have a large stock of environmental knowledge but need increased capacity in EE to give an analytical foundation to activism and policy making. The social and disciplinary divide between CSO and academic research poses significant challenges. At the same time, there are real-world demands from CSOs for knowledge of EE – for instance, to assess the liability of companies in oil extraction conflicts, to evaluate plans for palm oil plantations for biofuel exports, or to establish alternative energy plans at the regional level. This project addresses CSO capacity weakness in EE through a number of coordinated activities. The focus is not on theory but on case study learning. Joint working groups will identify and report on key issues for research in water management, mining, energy, forestry and agriculture, based on CSO needs and interests. Previous cooperative research activities will be reviewed and assessed in terms of their effectiveness in meeting CSO needs, and documented and disseminated. In addition, options for future research cooperation will be explored in order to apply EE methods, tools and indicators to CSO work. Findings will be presented and enhanced at symposia embedded in the 2008 EE world conference in Nairobi (with UNEP) and the 2009 conference of the European Society for EE. A website will disseminate the project's work and continue the capacity building process.

## **236059- CHEEM**

Improvement of SQGs through the incorporation of chronic exposure-effect model

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 7/1/2009 - 6/30/2012

*EC contribution:* € 228 338

*Policy drivers:* Science-policy Interface  
Ecological Status

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### **Abstract**

Sediments are extremely important to the food web and serve as the ultimate repository and source of most of the contaminants, including metals. For this reason, it is appropriate that regulatory attention addresses the ecological risks that these sediment contaminants might pose. So much so that, the need to understand the impacts of contaminated sediments on aquatic environmental quality is implicit in the text of the Water Framework Directive (2000/60/EC), and in the Directive on Environmental Quality Standards in the field of water policy, different metals have been included in the group of substance identified as priority on account of the substantial risk they pose to or via the aquatic environment. Currently, the first tool to assess metal sediment quality is the use of Sediment Quality Guidelines (SQGs). The SQGs represent an important tool for flagging potentially toxic metal levels in sediments, indicating which sediments may be of no concern and those which merit a closer-look. However, the level of protection offered by current SQGs is far from being totally efficacious. Significantly more research is required into the chronic and sub-lethal effects of dissolved metals and the metal exposures from dietary sources (e.g. food and sediment ingestion). The purpose of this project is to develop an environmental exposure-effect model to predict copper chronic effects in order to improve the effectiveness of the SQGs. This project addresses directly the Community policy established by Water Framework Directive 2000/60/EC and enhances furthermore the development of ecotoxicological tools to prevent the pollution.

## **266851- CHEMWATER**

Coordinating European Strategies on Sustainable Materials, Processes and Emerging Technologies Development in Chemical Process and Water Industry across Technology Platforms

[www.chemwater.eu/](http://www.chemwater.eu/)

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*Funding scheme:* CSA (Coordination - or networking - action), FP7

*Project duration:* 5/1/2011 - 10/31/2013

*EC contribution:* € 949 296

*Policy drivers:* Science-policy Interface  
Chemical Aspects

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### **Abstract**

Europe must use water more efficiently to avoid the anticipated impacts of water shortage driven by a range of dynamics incl. climate change.

Nanotechnologies, materials and process innovations (NMP) are key enabling technologies for efficient industrial water management. The chemical industry has a unique role as major water user AND a key solution provider for the development of future water technologies.

ChemWater will coordinate EU strategies across and beyond ETPs on sustainable materials, technologies and process development in the chemical and water industries, with the final objective to integrating and exploiting NMP knowledge and technologies addressing the emerging global challenge of sustainable industrial water management. The ChemWater workplan will deliver:

Cross-sectoral synergies between key stakeholders (i.e. ETPs, NoEs, ERA-NETs) drawing on knowledge from chemical processes and water technologies.

A long term 2050 vision and strategy on technologies and process developments enabling efficient industrial water management that integrates across sectors disciplines and engages the necessary resources and relevant stakeholders.

A Joint implementation Action Plan addressing NMP research needs, skills needs, business development opportunities.

Specification of those elements and mechanisms required to ensure the rapid uptake and commercialization of enhanced materials, and processes contributing to optimized industrial water management.

Establishment and implementation of an effective dissemination strategy to ensure the communication not only of the project objectives and action plans but also best practices, methodologies and common long term strategies.

ChemWater provides an opportunity, to promote progressive science-based industry, foster a sustainable European supply industry, contributing to meet the

water needs of society and having the potential to provide Europe with a leading position in the growing global NMP-Water market.

## **269153- CHILTURPOL2**

Innovative materials and methods for water treatment

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 6/1/2011 - 5/31/2014

*EC contribution:* € 197 400

*Policy drivers:* Science-policy Interface

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### **Abstract**

WHO reports annular death of 5 million people caused by the use of contaminated water. To reduce this number more effective purification technologies and grow of ecological consciousness should be introduced. Both of them are considered in the project by the following objectives: to bring together some international research teams,

- to focus their invention on a search for new materials to be used in water treatment,

- to merge the students curricula,

- to open the double supervising issue.

The exchange supports some collaboration programs among the European partners (TUBITAK, MEDRC, NATO projects) and refreshes it with new Chilean input. The project makes more strengthen ties between two European and one of leading Chilean universities that is initiated by common project of the Chilean National Commission for Scientific and Technological Research. Two European institutions are participating:

-Wroclaw University of Technology, Faculty of Chemistry, Poland,

-Ege University, Faculty of Engineering, Turkey, and one Chilean university:

-Concepcion University, Center for Research on Advanced Polymers.

The project is scheduled for 3 years and envisages exchange of 8 researchers from Europe and 3 from Conception University. Researchers of each partner university will participate in 2 workshops together with participants of a hosting institution. The main point of the exchange program is to expand an overseas collaboration and to deliver the most relevant state-of-the-art on nanostructured materials and innovative technologies for water purification.

The long term goals of the research are as follows:

-to develop scientific relationship between Europe and Chile related to water treatment,

-to promote new market for innovative materials and technologies,

-to modify teaching programs and put them in line with scientific, industrial and social challenges.

## **266887- COCOPS**

Coordinating for Cohesion in the Public Sector of the Future

[www.cocops.eu/](http://www.cocops.eu/)

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*Funding scheme:* CP (Collaborative Project), FP7

*Project duration:* 1/1/2011 - 6/30/2014

*EC contribution:* € 2 698 927

*Policy drivers:* Science-policy Interface

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### **Abstract**

The COCOPS project (Coordinating for Cohesion in the Public Sector of the Future) seeks to comparatively and quantitatively assess the impact of New Public Management-style (NPM) reforms in European countries, drawing on a team of leading European public administration scholars. This evidence-based project focuses on the national level and the important policy domains of health and employment services, and the utilities of water, energy and transport. It will analyse the impact of reforms in public management and public services that address citizens' service needs and social cohesion in Europe. Evaluating the extent and consequences of NPM's alleged fragmenting tendencies and the resulting need for coordination is a key part of assessing these impacts. Subsequently, COCOPS will map and analyse innovative mechanisms in the public sector to improve policy coordination and its associated effects on economic competition, public sector performance, social cohesion and societal outcomes.

The proposed research will contribute to our understanding of the impact of NPM by integrating sectoral and national analyses and to the development of future public sector reform strategies by drawing lessons from past experience, exploring trends and studying emerging public sector coordination practices. Drawing on existing large-scale datasets and innovative data collection in ten countries, the project intends to provide a comprehensive picture of the challenges facing the European public sector of the future. The empirical investigation will result in a transfer of innovative best practices across European member states and a futures study outlining key scenarios for the public sector of the future. It will contribute to maximal policy learning through the involvement of expert practitioner groups and other key stakeholders.

## **514081- COEVOLVE-WATER**

Coevolutionary processes and water management

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 2/1/2005 - 1/31/2008

*EC contribution:* € 232 046

*Policy drivers:* Science-policy Interface

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### **Abstract**

The project aims to establish the applicant an international expert and leader on the theory of socio-natural coevolution and its application to water resource studies. Training will consist of selected courses' attendance, tutoring and joint research work with the originator of the theory, Pr R. Norgaard, at UCB. Complementary skills' training will be provided in qualitative social research methods, writing for publications and teaching. The applicant will also increase his international expertise on water policy working on the case of California, benefiting from access to the California Water Resources Archives and the several relevant colloquia at UCB. Research during the fellowship will work on improving the theory of socio-natural coevolution, develop a conceptual coevolutionary model for the analysis of complex water management systems and apply it on two diverse empirical cases. The policy implications of a coevolutionary perspective will be sought and linked to on-going debates on EU water policy. Knowledge acquired in the outgoing period will be re-integrated in DPRD/UTHES through the development of a related long-term research programme and group, and the establishment of related advanced courses. This will contribute to the upgrading of research and curriculum in a vibrant yet new department, in a less favoured EU region. The project is the first stage in a longer-term collaboration between the two host institutes including plans for a regular exchange of students, researchers and teaching staff as well as development of a joint research programme on coevolution. The project will be integrated in relevant European research consortiums and it will contribute to the development of a network of excellence on coevolutionary natural resource studies, thus promoting scientific excellence in the European Research Area

## **283025- COROADO**

Technologies for Water Recycling and Reuse in Latin American Context: Assessment, Decision Tools and Implementable Strategies under an Uncertain Future

[www.coroado-project.eu/](http://www.coroado-project.eu/)

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*Funding scheme:* CP (Collaborative Project), FP7

*Project duration:* 10/1/2011 - 9/30/2015

*EC contribution:* € 3 411 507

*Policy drivers:* Science-policy Interface

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### **Abstract**

In order to be able to maximize the benefits from reuse and recycling technologies projects a larger systemic analysis of the environment is needed, an enlargement of the traditional narrow planning and management approaches, and a growing sensitivity to decision-making associated with multi-objective, multi-purpose actions and multi uses parameters. However, the problem is not centered on the lack of treatment techniques and technologies, but rather on how such schemes may become more efficient and implementable. COROADO will both develop new and adapt existing concepts and operational frameworks and produce a web-based toolbox for reuse and recycling technologies in the context of integrated water resources management, taking into account long-lasting changes, and at the same time addressing environmental and ecosystem integrity. Climate change and water scarcity in relation with the pertinent technologies will also be addressed. Thus, COROADO would focus on: a) Developing tools for analyzing reuse and recycling technologies and trade-offs b) Addressing non-linearity and resilience c) Promoting and organizing active participation of stakeholders and capacity building efforts. The web based Communication, Capacity Building and Research Tool will present a richer menu of options from assessment and planning to implementation, monitoring and evaluation The system will be designed so as to present critical information in an interesting and efficient manner, offering an engaging learning experience. The project will include deliberate efforts to ensure knowledge and capacity exchanges between the project sites, and among Latin American, European and other parts of the world facing similar conditions, by introducing exchanges based on research in the four study sites and generated outcomes with a strong emphasis in dissemination. The effort may develop an understanding of needed transitions of governance and policy systems in order to mainstream such water reuse and recycling technologies implementation, providing a continuous and appropriate set of guidelines, and

manuals so that policy relevant standards may be applied by end users and policy makers and after the completion of COROADO, without any further support.

## **510905- DIM-SUM**

Innovative Decision Making for Sustainable Water Management in Developing Countries

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*Funding scheme:* STP (Specific Targeted Research Project), FP6

*Project duration:* 1/1/2005 - 6/30/2009

*EC contribution:* € 1 699 999

*Policy drivers:* Science-policy Interface

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### **Abstract**

Innovative decision making for sustainable management of water aims at providing tools needed if any integrated and participatory management of water should be carried out. Management refers in this context to its core element, the decision making process (DMP).

Focusing on water supply and sanitation (as there the need is paramount), DIM-SUM will carry out one case study in one river basin in each participating partner country, Indonesia, Maharashtra-India, Malaysia and Nepal, in order to evaluate and develop these tools. They will on the one hand encompass tools to generate, assess and compare technical scenarios, ranging from argumentative to computational, and fragmented to integrated methods, and on the other, tools to enhance a participatory decision making, including information & communication technologies and hybrid methods.

The most innovative deliverable of DIM-SUM will be recommendations for a sustainable DMP encompassing an adaptive tool box (comprised of several tools, where the user can select those fitting to her/his needs), guidelines and policy recommendations, which will enable local decision makers to carry out an assessment of technical scenarios at an appropriate level of integration and participation.

In particular, facing impairing quality and quantity of natural resources, an integrated and participatory DMP becomes vital. Environmental resource efficiency has to be balanced with the risks of technical systems (technical, economic, social, environmental risks), and many other aspects.

DIM-SUM is motivated by the fact that such exercises are usually carried out in a superficial way only, despite the international call for an integrated water management. Therefore, DIM-SUM will involve a wide range of stakeholders in the project, ranging from NGOs to governmental and international organisations.

## **282769- DROUGHT-R&SPI**

Fostering European Drought Research and Science-Policy  
Interfacing

[www.eu-drought.org/](http://www.eu-drought.org/)

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*Funding scheme:* CP (Collaborative Project), FP7

*Project duration:* 10/1/2011 - 9/30/2014

*EC contribution:* € 3 439 952

*Policy drivers:* Science-policy Interface  
Water Scarcity and Droughts

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### **Abstract**

The project will reduce future Europe's vulnerability and risk to drought by innovative in-depth studies that combine drought investigations in six case study areas in water-stressed regions (river basin and national scale) with drought analyses at the pan-European scale. Knowledge transfer across these scales is paramount because vulnerability is context-specific (e.g. physical, environmental, socio-economic, cultural, legal, institutional), which requires analyses on detailed scales, whereas international policies and drought-generating climate drivers and land surface processes are operating on large scales. The project will adopt Science-Policy Interfacing at the various scales, by establishing Case Study Dialogue Fora and a pan-Europe Dialogue Forum, which will ensure that the research will be well integrated into the policy-making from the start of the project onwards. The study will foster a better understanding of past droughts (e.g. underlying processes, occurrences, environmental and socio-economic impacts, past responses), which then will contribute to the assessment of drought hazards and potential vulnerabilities in the 21st C. An innovative methodology for early drought warning at the pan-European scale will be developed, which will improve on the forecasting and a suite of interlinked physical and impact indicators. This will help to increase drought preparedness, and to identify and implement appropriate Disaster Risk Reduction measures (along the lines of the UN/ISDR HFA). The project will lead through the combined drought studies at different scales to the identification of drought-sensitive regions and sectors across Europe and a more thorough implementation of the EU Water Framework Directive, particularly by further developing of methodologies for Drought Management Plans at different scales (incl. EU level). The work will be linked with the European Drought Centre ensuring that the outcome will be consolidated beyond the project' lifetime.

## **011688- DSS GUIDE**

Developing Guidelines for the Successful Application and Implementation of Decision Support Systems in Water Resource Management

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 1/1/2005 - 12/31/2005

*EC contribution:* € 40 000

*Policy drivers:* Science-policy Interface

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### **Abstract**

The proposed project seeks to increase acceptance of Decision Support Systems (DSS) in water resource management as the EU Water Framework Directive (WFD) is implemented. The main project objective is to develop guidelines which facilitate the application and implementation of Decision Support Systems in specific cases and in the specific organisational context of water river authorities. By focusing on the successful and appropriate use of DSSs, these guidelines will complement efforts made by working groups under the Common Implementation Strategy, especially the guidelines on performing economic analysis of water uses and selecting a programme of measures to achieve the WFD's objectives. The proposed project will render the application of DSSs more operational and raise the likelihood of its outputs being accepted. The project is designed to achieve the following objectives: (i) to perform an inventory of the DSSs which have been developed for water resource management problems, especially those aimed at facilitating the implementation of the Water Framework Directive; (ii) to establish a methodology to assess the appropriateness of DSSs in frequently encountered water resource management problems depending on the institutional set-up of water resource management and the means available for solving the problem; and (iii) to further develop a set of exploratory case studies previously developed under research projects carried out by the host institution or myself. These case studies are based on close partnerships with river basin authorities. The aim of these studies is to test the established methodology for DSS evaluation; and to deliver a set of well-documented cases of DSS implementation and application in specific cases. Especially the risk of DSSs failing to be embraced as tools supporting the implementation of the WFD will be monitored in real-world situations.

## **265240- ECLISE**

Enabling CLimate Information Services for Europe - ECLISE

[www.eclise-project.eu/](http://www.eclise-project.eu/)

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*Funding scheme:* CP (Collaborative Project), FP7

*Project duration:* 2/1/2011 - 1/31/2014

*EC contribution:* € 3 408 670

*Policy drivers:* Science-policy Interface  
Climate Change

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### **Abstract**

Climate and climate change has high impact on society. Better understanding and improved prediction skills of future weather and climate is vital to protect lives, goods and infrastructures. Different sectors of society and infrastructure are more or less designed to accommodate the current level of climate variability. The prospect of a changing climate necessitates adapting these designs. To prevent high costs, it is of paramount importance that the most reliable and accurate climate information is used to underpin the development of new adaptation strategies.

In response to this need, climate scientists, in close cooperation with climate impact specialists, have started to generate and provide information on future climate projections, aimed at supporting adaptation policies. These efforts are often organized at a national level and, at present, differ considerably in the methods used and the level of user involvement. It has been recognized (WMO-WCC3, EU White paper on Adaptation) that coordination of climate services at an international level would greatly advance the benefits of climate science for adaptation policies. This effort must find a way to deal with the strong local nature of climate impacts and adaptation needs.

The central objective of ECLISE is to take the first step towards the realisation of a European Climate Service. ECLISE is a European effort in which researchers, in close cooperation with users, develop and demonstrate local climate services to support climate adaption policies. It does so by providing climate services for several climate-vulnerable regions in Europe, organized at a sectorial level: coastal defence, cities, water resources and energy production. Furthermore, ECLISE will define, in conceptual terms, how a pan-European Climate Service could be developed in the future, based on experiences from the aforementioned local services and the involvement of a broader set of European decision makers and stakeholders.

## **264465- ECOFINDERS**

Ecological Function and Biodiversity Indicators in European Soils  
ecofinders.dmu.dk/

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*Funding scheme:* CP (Collaborative Project), FP7

*Project duration:* 1/1/2011 - 12/31/2014

*EC contribution:* € 6 999 930

*Policy drivers:* Science-policy Interface  
Ecological Status

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### **Abstract**

The strategic goal of EcoFINDERS is to provide the EC with tools to design and implement soil strategies aimed at ensuring sustainable use of soils, including: i) Characterisation of European soil biodiversity; ii) Determination of relations between soil biodiversity, soil functions and ecosystem services; iii) Design of policy-relevant and cost-effective indicators for monitoring soil biodiversity. The project will: i) Develop and standardise tools and procedures to measure microbial and faunal diversity; ii) Describe the diversity of soil organisms (microbes and fauna), iii) Decipher the interactions among soil organisms and with plants through foodwebs and iv) Determine the role played by soil organisms in soils ecosystem services (nutrient cycling, carbon storage, water retention, soil structure regulation, resistance to pests and diseases, and regulation of above-ground diversity); iii) Establish cost-effective bioindicators for measuring sustainability of the microbial and faunal diversity and their associated functions (using a combination of metrics and meta-analysis); iv) Evaluate the economic value of ecosystem services, the added value of these bioindicators; v) Develop and implement effective communication strategies to engage the European public around issues associated with the sustainability of soil biodiversity. The overall concept of the project is to develop and integrate the following activities: i) Decipher the links between soil biodiversity, activities, functioning and ecosystem services; ii) Combine three types of approach: observation, experimentation, and computation; iii) Assess the impact of environmental conditions; iv) Integrate information on microbes, fauna and plant communities and analyse how these compartments interact. The general hypotheses are: changes in soil biodiversity indicate the direction and rate of changes in soil functions and associated ecosystem services; application of cost-effective bioindicators brings an economic added value to sustainable soil management.

## **263859- EDGE**

Evaluating the Delivery Of Participatory Environmental Governance using an Evidence-based Research Design

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*Funding scheme:* ERC (ERC Grant), FP7

*Project duration:* 4/1/2011 - 3/31/2016

*EC contribution:* € 900 000

*Policy drivers:* Science-policy Interface

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### **Abstract**

Participation of citizens and stakeholders in environmental governance is widely believed to enhance environmental policy outcomes. This claim has, however, been challenged both on theoretical grounds and with respect to a lack of reliable evidence. EDGE uses an evidence-based approach: By combining case survey, comparative case studies and field experimentation, the project draws on complementary methods with a high natural variety and thus external validity (case survey) and those with a higher controllability and thus higher internal validity (experimentation).

Case survey: Numerous single case studies are available across Europe and North America, providing a rich, but scattered and yet untapped resource of data. A sample of c.200 cases will be precisely coded and systematically compared based on a theoretical framework that provides relevant context, process and outcome variables.

A sample of around 10 comparative case studies on governance processes in the course of the implementation of the EU Water Framework Directive (WFD) will be conducted.

EDGE will perform one of the first field experiments in governance research. Field experiments are highly promising, yet controversially debated and in practice challenging. Around 10 cases of ongoing local WFD implementation processes will be subject to random selection of a participatory or non-participatory governance design.

Data from all three sources will be stringently analysed using the same analytical scheme. Results will be analysed with statistical and set-theoretic methods.

EDGE thus aims to drastically improve the scientific knowledge on whether and under what conditions participation actually improves policy delivery in environmental governance, thus radically informing scholarly research and political practice.

## **211816- EMSO**

### European Multidisciplinary Seafloor Observation

www.emso-

eu.org/management/index.php?option=com\_frontpage&Itemid=121

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*Funding scheme:* CSA (Coordination - or networking - action), FP7

*Project duration:* 4/1/2008 - 3/31/2012

*EC contribution:* € 3 900 000

*Policy drivers:* Science-policy Interface

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### **Abstract**

The European Multidisciplinary Seafloor Observation - Preparatory Phase (EMSO-PP) is a 4-year project with the main objective of establishing the legal and governance framework for EMSO, an infrastructure servicing scientists and other stakeholders in Europe and outside Europe for long-term deep water observation and investigation. The Preparatory Phase will handle all further actions towards the actual realisation of the infrastructure and its long-term management. Moreover, it will promote the catalytic process and synergic effort at EC and national levels, coordinating and harmonising all the resources made available, in link with the Network of Excellence ESONET. One peculiarity of the EMSO infrastructure, among the ones indicated within ESFRI, is that it is geographically distributed around European waters from the Arctic to the Mediterranean Sea. EMSO cabled deep-sea observatories deployed on specific sites will allow – as a basic scientific objective – to make real-time long-term monitoring of environmental processes in the geosphere, biosphere and hydrosphere of European seas. The observatories will be organised in a unique management structure at European level which is part of an international endeavour in seafloor observatories. A pan-European Core Legal Entity (CLE) and several Regional Legal Entities (RLEs) will be defined and founded. The responsibilities of CLE and RLEs, with respect to their internal decision-making processes, as well as their external relations (to stakeholders, users, etc.) will be established. In the project, 9 work packages are envisaged to manage all the activities (including legal, governance, logistical, financial, strategic, and technical work). EMSO-PP will constitute a breakthrough towards a large scale European infrastructure progressing the scientific knowledge and technologies. It will provide an innovative mean for environmental monitoring and geo-hazard impact mitigation.

## **510739- EPIC FORCE**

EVIDENCE-BASED POLICY FOR INTEGRATED CONTROL OF FORESTED RIVER CATCHMENTS IN EXTREME RAINFALL AND SNOWMELT

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*Funding scheme:* STP (Specific Targeted Research Project), FP6

*Project duration:* 2/1/2005 - 4/30/2008

*EC contribution:* € 1 700 000

*Policy drivers:* Science-policy Interface

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### **Abstract**

The impact of forest management on extreme floods is an area in which there is considerable scientific uncertainty as well as poorly conceived policy. EPIC FORCE aims to improve the integrated management of forest and water resources at the river basin scale through the development of policies based on sound science, focusing on extreme rainfall/snowmelt events. It will link scientific, management and policy research by: 1) developing a generic model for the impact of management practices on basin response to extreme rainfall; 2) developing improved strategies for integrated forest and water management relevant to extreme events; 3) developing evidence-based policy recommendations for national agencies and for the EU and World Bank. The focus areas are four Latin American countries, which represent a range of humid forest and rainfall/snowmelt regimes with major flood and erosion problems and which suffer from a lack of integrated water and forest policies. The generic model will be derived using existing advanced modelling technology and data from the focus areas: it will examine the hypothesis that, as the size of the flood peak increases, the effect of land use becomes less important. The improved management strategies will be developed from reviews of current management and of best practice, from model scenario applications and from field studies. The policy recommendations will be developed by proposing improvements to the basis of existing national policies in the focus countries in the light of the modelling and management studies. Crucial participants will be the national forest and water resource agencies, which will receive the project technologies. EPIC FORCE will improve our understanding of forest ecosystem dynamics (for extreme rainfall events) under human pressure (from logging and forest conversion), allowing a more sustainable use of water and forest resources. It will support the efficient and well-directed use of limited development resources.

## **046161- ESWG 2007-2010**

European Sustainable Water Goals 2007-2010

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 2/1/2007 - 1/31/2011

*EC contribution:* € 316 213

*Policy drivers:* Science-policy Interface

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### **Abstract**

ESWG 2007-2010 is a conference programme on sustainable water management which pays special attention to European water policies. The topic is important because: 1) Europe is positioning itself as advocate of new approaches towards sustainable uses of water in order to preserve this limited resource for future generations; 2) Water supply for human purposes, irrigated agriculture, and energy, require urgent institutional reforms at national and local level; 3) Recent EU policies (WFD 2000/06) develop new models of water management for producing substantial shifts on national policies; 4) The implementation of the WFD requires training opportunities in MSs for developing integrated approaches with regard to surface, water and groundwater. With 4 conferences, ESWG addresses the need for training researchers on the implementation of the WFD in connection to other European policies, as the EU Green Book on Energy and the Common Agricultural Policy 2007-2013. The University of Venice will provide the scientific and logistical coordination. A Steering Committee ensures the high scientific quality of conferences. ESWG is developed in conjunction with the JRC of Ispra, the EC organisation in charge for the WFD implementation. The Steering Committee acts in close coordination with the JRC. ESWG supports the training by providing an international scientific platform, and helping to develop careers and mobility. Researchers are selected not only for passive participation but for active interactions with keynote speakers. The Steering Committee ensures a balanced representation of researchers from all EU countries. Networking activities and scientific interactions will continue after the conferences, also by means of a dedicated web site. Very high scientific impact can be expected from this exchange between scholars. The ESWG shows a very high relevance to the objectives of MC action and is aimed to contribute substantially to the building of the European Research Area.

## **257093- EUCLID**

Strengthening EU-India collaboration in networked monitoring and control systems technologies

[www.euclid-india.eu/index.php](http://www.euclid-india.eu/index.php)

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*Funding scheme:* CSA (Coordination - or networking - action), FP7

*Project duration:* 5/31/2010 - 5/31/2012

*EC contribution:* € 400 000

*Policy drivers:* Science-policy Interface

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### **Abstract**

India and the European Union face common timely challenges in the very important and potential field of networked monitoring and control system technologies, which create a favorable environment for strategic collaboration. Consequently, the main aim of EUCLID is to increase co-operation in this field between Indian and European R&D specialists, ensuring mutual benefits.

The two-year project will start its analysis from industrial needs in 4 application domains - (1) transportation; (2) energy management; (3) industrial automation; (4) water supply / treatment. In parallel, industrial needs in the relevant application domains in Europe will be identified as well, and cross-mapped with the findings in India, paving way to further strengthen R&D collaboration.

The international Expert Group – 10 high level specialists – will work jointly with the consortium and will provide their expertise to project implementation and assistance to the development of long term EU-Indian monitoring and control collaborations.

The EUCLID project will map Indian monitoring and control competences, will compare them with the identified industrial needs both in India and in Europe and European research priorities, and will map potential collaboration opportunities. As a result, Catalogue of Indian R&D organisations will be prepared. The EUCLID project team will assess EU-India collaboration potential and will prepare an Opportunity Report and a roadmap for EU-Indian collaboration in the field of networked monitoring and control system technologies. The project plans to implement two awareness raising events, and a Delegation tour in India. It will aim to strengthen the industrial competitiveness in both India and the EU and to increase skills of R&D specialists. The mutual actions between EU and India will contribute to the interdisciplinary excellence in control systems technologies.

## **244165- EUGENE**

Improving coordination, visibility and impact of European GEOSS contributions by establishing a European GEoss NETwork (EUGENE)

[www.eugene-fp7.eu/](http://www.eugene-fp7.eu/)

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*Funding scheme:* CSA (Coordination - or networking - action), FP7

*Project duration:* 10/1/2009 - 9/30/2011

*EC contribution:* € 735 038

*Policy drivers:* Science-policy Interface

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### **Abstract**

The EUGENE project aims at improving cooperation among European institutions active in the domain of Earth observations and intensifying the coordination of contributions from national and European programmes to building GEOSS. EUGENE will initiate a process that should lead to a more coordinated planning and acting of the relevant European actors in the future. Specifically, the project will analyze the status quo in the European Earth observation for three of the nine GEO Societal Benefit Areas (SBA), namely disasters, water, and climate. For each of these SBA a report will be prepared to describe the current situation in Europe, including the main initiatives and activities. The main actors will be engaged for preparing these reports. Three thematic workshops will be organized on the basis of these reports. They will discuss potential activities for improvement and develop recommendations for a targeted, strategic participation of Europe in building GEOSS. The project results are aimed at supporting the European Commission and other European GEO Members and GEO Participating Organizations in their participation in GEO. The project will also be active in preparing the European positions for the 2010 GEO Summit.

## **036268- EUWI - ERA - NET**

EUROPEAN WATER INITIATIVE - ERA-NET; Coordination of Member State research programmes in water science and technology for the developing world

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*Funding scheme:* CA (Coordination Action), FP6

*Project duration:* 1/1/2007 - 12/31/2011

*EC contribution:* € 2 752 860

*Policy drivers:* Science-policy Interface

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### **Abstract**

The EUWI-ERA-NET is a consortium of 16 ministries, funding agencies and national RTD authorities from 11 European countries. The ERA-NET will establish a framework for long term communication, collaboration and coordination of member state research programmes on water issues in developing countries, helping to establish EU leadership in harmonisation and alignment of donor actions with developing country partners. This ERA-NET underpins the delivery of commitments made at the Johannesburg WSSD, in particular the research coordination outlined in the EU Water Initiative. Water strongly affects many development issues (health, industrial growth, agriculture, disasters, energy, gender, etc) so the EUWI-ERA-NET is expected to encourage ERA-NET actions on other development issues. An SSA instrument has so far built consensus and a shared vision of what may practically be achieved, respecting national interests and resources. EUWI-ERA-NET will: -Establish a Consortium framework using adaptive management, providing for the integration of new partners during the life of the CA -Engage the main developing country partners and the research community -Collate and share knowledge from European water research for developing countries -Improve research and impact management practices - Transform knowledge into appropriate practice through consultation, building capacity and informing policy -Develop joint activities and programmes between national RTD programmes and other partners -Contribute to real improvements in the living conditions for the worlds poor The EUWI-ERA-NET will work with other ERA-NET's in related fields as one of the building blocks in the process of preparing the Art 169 action focusing on infrastructure research (water, energy, transport) in international development. The EUWI-ERA-NET is an important component in the Implementation Plan of the Water Supply and Sanitation Technology Platform, in particular in working with industry towards MDG delivery

## **265287- FOODLINKS**

Knowledge brokerage to promote sustainable food consumption and production: linking scientists, policymakers and civil society organisations

[www.foodlinkscommunity.net/](http://www.foodlinkscommunity.net/)

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*Funding scheme:* CP (Collaborative Project), FP7

*Project duration:* 1/1/2011 - 12/31/2013

*EC contribution:* € 1 495 263

*Policy drivers:* Science-policy Interface

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### **Abstract**

The policy issue central to this project is food as many of today's sustainability problems (e.g. water shortage, GHG emissions, pollution of soil and water, decrease of biodiversity, urban waste) are related to the prevailing pattern of food production and consumption (including processing and distribution). Hence, developing more sustainable food production and consumption patterns will have a significant impact on sustainable development in general. This project aims to develop and experiment with new integrative modalities of linking research to policy-making in the field of sustainable food consumption and production, thereby contributing to the establishment of new policy-relevant communities of researchers, policy makers & CSOs and enhancing the use of research insights in policies to promote sustainable food systems. Three different Communities of Practice will be developed, focusing on different dimensions of a newly emerging integrated territorial food geography: a) short food supply chains, b) sustainable public food procurement, and c) urban food strategies. Like the FOODLINKS consortium, each CoP will consist of researchers, policymakers and CSO representatives. In this project we will monitor and evaluate the knowledge brokerage activities in the CoPs, in order to propose new ways of linking research and policymaking in the food domain as well as in other public domains.

## **022793- FORESCENE**

Development of a Forecasting Framework and Scenarios to Support the EU Sustainable Development Strategy

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*Funding scheme:* STP (Specific Targeted Research Project), FP6

*Project duration:* 12/1/2005 - 11/30/2008

*EC contribution:* € 790 810

*Policy drivers:* Science-policy Interface

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### **Abstract**

FORESCENE will develop an analytical framework for consistent environmental sustainability scenario building (forecasting, backcasting, simulation) in areas such as water, soil, biodiversity, waste and natural resources. Problem issues and priority policy fields such as agriculture, infrastructures/land use, industry/economy will be selected in close contact with the EU Commission. The project will focus on backcasting, to identify different scenarios leading to the achievement of future targets. FORESCENE will (1) describe the chosen environmental problems, review policy objectives and indicators, and determine the cross-cutting driving forces; (2) develop core elements of integrated sustainability scenarios (goal definition); (3) determine measures and processes to be considered for change (pre-backcasting); (4) address quantitative and qualitative parameters for measurement (parameterization); (5) develop a Business-As-Usual (BAU) scenario framework and example projections (forecasting); (6) develop alternative scenarios (incl. backcasting); (7) check the options for modelling, and (8) work out conclusions. To integrate the eight steps FORESCENE will organize a series of workshops to involve DG's and stakeholders, to integrate knowledge on (a) cross-cutting drivers of various environmental problems and priority policy fields, and (b) to define essentials for integrated sustainability scenarios in terms of goals and cross-cutting policy measures. Further experts will be involved at various stages of the project. The project will result in recommendations for future policy development with regard to the EU's sustainability strategy and the framework for Impact Assessments and concrete proposals for the use and extension of existing simulation models.

## **502871- GEOLAND**

geoland - GMES products & services, integrating EO monitoring capacities, to support the implementation of European directives and policies related to "land cover and vegetation"

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*Funding scheme:* IP (Integrated Project), FP6

*Project duration:* 1/1/2004 - 3/31/2007

*EC contribution:* € 9 990 989

*Policy drivers:* Science-policy Interface  
Ecological Status

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### **Abstract**

The geoland products and services aim at the monitoring of land cover and vegetation addressing the GMES priorities "Land Cover Change in Europe", "Environmental Stress in Europe", and "Global Vegetation Monitoring". geoland integrates 56 partners comprising user organisations, private and public service providers and researchers from 15 European member and accession states. The project is organised into nine sub-tasks comprising -Regional services focussed on the implementation of newly established European Directives structured into -a Nature Protection Observatory (Habitats and Bird Directive, Ramsar Convention, Convention on Biological Diversity); -a Water and Soil Observatory (Thematic Strategy for Soil Protection, Water Framework Directive), -a Spatial Planning Observatory (European Spatial Development Perspective, European Spatial Observatory Network), -a Core Service Land Cover supporting the Observatories with land cover and land cover change products. -All activities take into account the 6th Environmental Action Programme, the Sustainable Development Strategy, the Environmental Impact Assessment Directive, the Strategic Environmental Assessment Directive, INSPIRE, and ESDI. -Global services directed towards the support of Policies addressing Global Change and Sustainable Development structured into -a Natural Carbon Fluxes Observatory (UN Framework Convention on Climate Change), -a Global Land Cover and Forest Change Observatory (UN Forum on Forest, Forest and Development Communication of the Commission), -a Food Security and Crop Monitoring Observatory (council regulations on Food Aid Policy, Environmental Measure in Developing Countries), -a Core Service Bio-geophysical Parametres supporting the Observatories. -Operational Scenario development including service infrastructure design and implementation planning. The geoland products and services will be designed to provide sustainability, availability, reliability and cost efficiency.

## **035536- GOVERNAT**

Multi-level Governance of Natural Resources: Tools and Processes for Water and Biodiversity Governance in Europe

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 10/1/2006 - 9/30/2010

*EC contribution:* € 2 409 548

*Policy drivers:* Science-policy Interface

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### **Abstract**

The overall objective of GoverNat is to enable decision makers to better handle questions of multi-level environmental governance in an enlarged EU. Therefore it brings together a unique network of research institutes with SMEs, administrations and NGOs dealing with environmental governance. The partners jointly mentor the fellows, safeguard the practical relevance of their research, and ensure the appropriateness of the results and of their presentation for scientists and non-scientists outside the consortium. Theoretical and empirical elements of research will dynamically build on each other. GoverNat will systematically analyse multi-level water and biodiversity governance (such as the implementation of Water Framework Directive and Natura 2000) in several European countries in order to allow for generalisations for the governance of natural resources. We will test the methodical hypothesis that a combined use of analytical decision tools and participatory processes is particularly useful for improving multi-level environmental governance. Therefore, we evaluate the instrumental, normative, and substantive roles of participation and of analytical decision tools in decision processes. We then develop appropriate contextualisations of participatory and analytical processes in case studies and evaluate them. This contextualisation helps bridging the science/policy and public/policy gaps in multi-level environmental governance. The central training objective is to give scientists an in-depth scientific and practical training in the main aspects of European environmental governance: understanding of political processes, actors and arenas, institutional settings with their associated transaction costs, European and national legal regulations, philosophical reflections on legitimacy and good governance, and the highly important policy/science interface with the appropriate integration of results from natural and social sciences in decision processes.

## **213015- HIGHARCS**

Highland aquatic resources conservation and sustainable development

[www.higharcs.org/](http://www.higharcs.org/)

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*Funding scheme:* CP (Collaborative Project), FP7

*Project duration:* 1/1/2009 - 12/31/2012

*EC contribution:* € 1 455 676

*Policy drivers:* Science-policy Interface  
Ecological Status

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### **Abstract**

Project partner will complete a detailed multidisciplinary situation analysis of highland aquatic resources, focused on values, livelihoods, conservation issues and wise-use options at five sites in Asia (Guangdong, China; Uttarakhand and West Bengal, India and northern and central Vietnam). Factors assessed will include biodiversity and ecosystem services, including provisioning, regulating, supporting and cultural services. Livelihood strategies of households dependent on ecosystem services derived from highland aquatic resources, in particular poor, food-insecure and vulnerable people, will be assessed within a sustainable livelihoods framework and opportunities to enhance such livelihoods assessed. Institutional features, including local, national and international policy and legislation, trajectories of change, stakeholder values associated with highland aquatic resources and areas of conflict will be assessed. Stakeholder participation will be critical to ensure new knowledge is accessible for collective decision-making and development of policies for the equitable use and conservation; methods and indicators for participatory monitoring and evaluation of ecosystem services and biodiversity will be developed. Action plans will then be formulated with stakeholders to: monitor the health of highland aquatic resources; develop and promote wise-use, and where necessary livelihoods diversification, to enhance poor livelihoods and conservation; integrate sustainable and wise-use, livelihoods diversification and conservation with watershed management priorities throughout the region. Action plans will be implemented by stakeholders at four sites displaying high biodiversity in Asia and the ecosystem, livelihoods and institutional impacts assessed through participatory monitoring and evaluation. Best practices aimed at conserving biodiversity and sustaining ecosystem services will be communicated to potential users to promote uptake and enhanced policy formulation.

## **014997- INREP**

Institutions and REsearch in the Pantanal: towards a bioregional research agenda to support Policy Institutions, Legal Frameworks and Social Action

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*Funding scheme:* SSA (Specific Support Action), FP6

*Project duration:* 11/1/2005 - 4/30/2007

*EC contribution:* € 165 000

*Policy drivers:* Science-policy Interface

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### **Abstract**

The main objective is, in order to develop sustainable water management at river-basin scale and efficiency in water use in the Pantanal, to strengthen the cooperation between policy makers, stakeholders and scientific institutions in Brazil, Bolivia and Paraguay and to stimulate the cooperation between these three countries, the European science community and NGO's working in the region. European environmental research groups from different countries have long-term research ongoing in the area in different but related fields, but they do not yet cooperate nor is there an established linkage with authorities. NGOs work in the region, but do not yet cooperate closely with European research. The project proposes to build an agenda for an international research area in which Brazil, Bolivia and Paraguay, the European Union and others can cooperate. The objective consists of two parts: - Developing insight in the scientific, political and social-economic actions, problems and solutions in the sustainable management of the Pantanal and the Upper Paraguay River Basin (UPRB); - Strengthening institutional and scientific cooperation at national and international levels for the region. To obtain these general objectives, the following working objectives have been formulated: - Realisation of preparatory workshops and a biregional symposium (Latin-America-Europe); - Development of a Research Agenda for the Pantanal; - Report to the Brazilian, Bolivian and Paraguayan governments and the European Commission.

## **018385- INTARESE**

Integrated Assessment of Health Risks from Environmental Stressors in Europe

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*Funding scheme:* IP (Integrated Project), FP6

*Project duration:* 11/1/2005 - 1/31/2011

*EC contribution:* € 12 379 832

*Policy drivers:* Science-policy Interface

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### **Abstract**

This study is designed to support implementation of the European Environment and Health Action Plan, by providing the methods and tools that are essential to enable integrated assessment of environmental health risks. Drawing upon the large range of studies carried out in Europe over recent years (many led by the study partners) and the advances made in specific areas of toxicology and epidemiology (especially air pollution), and in close collaboration with users, it will develop a methodological framework and set of tools and indicators for integrated assessment that can be applied across different environmental stressors (including pollutants and physical hazards), exposure pathways (air, water, soil, food) and policy areas. It will review, bring together and enhance the monitoring systems needed to support such analyses, including routine environmental monitoring (ground-based and Earth observation), biomonitoring and health surveillance. The framework, tools and data will be tested and demonstrated through integrated assessments of exposures and health risks in a number of specific policy areas, including transport, housing, agriculture, water, wastes, household chemicals and climate. Results from these will be used both to refine the assessment methods and to provide specific information on health implications of current, and potential future, policies. Based on the results, a toolbox for integrated environmental health risk assessment will be developed, which will be further tested and demonstrated through a series of higher level policy analyses. Particular attention will be given throughout to issues of uncertainty, sensitive or susceptible groups, and possible interactive and cumulative effects of different stressors. Deliverables will include new, integrated methods and indicators for environmental health risk assessment and monitoring, an operational assessment toolbox, and a set of validated assessments that can directly inform policy.

## **003223- IWRM.NET**

"Towards a European-wide Exchange Network for improving dissemination of integrated Resources Management Research Outcomes"

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*Funding scheme:* SSA (Specific Support Action), FP6

*Project duration:* 12/1/2003 - 8/31/2004

*EC contribution:* € 178 240

*Policy drivers:* Science-policy Interface

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### **Abstract**

The objective of the proposed Specific Support Action (SSA) is to check the feasibility of a ERA-Net project on Integrated Water Resources Management (IWRM) at a European scale (including candidate countries), from the point of view of the implementation of the Water Framework Directive (WFD); with a further possible openness to other countries (in particular NIS and Africa) within the framework of the European Water Initiative (EUWI) to be also examined (or a connection to a ERA-Net proposal from the ad hoc European working group).

The proposed SSA will consist with :

- identify and describe all the national programmes in the concerned countries, which have a relationship to IWRM
- locate the sources of information on recent and current projects
- identify and contact the persons-in-charge for these programs
- organise a workshop of these programme managers to prepare the basis of a long-term collaboration, as a base for the ERA-Net proposal
- propose new ways of reinforcing the dialogue with stakeholders, in order to develop a more demand-driven research, and a better dissemination of outputs
- in order to formalise a CA proposal

In each country, a specialised consultant will be commissioned to prepare a monograph according to a common framework, defined by a Steering Committee made up of INBO members, progressively open to national or local persons-in-charge of the identified research programmes.

The workshop will join together around fifty invited research programme managers (1 to 3 per country), to improve and validate proposals for action prepared by the Steering Committee from an holistic analysis of the country reports ; this creativity workshop will define working rules of a future exchange network ready to support synergies between programmes and a better valorisation of their outcomes at practitioners level.

## **026025- IWRM.NET-CA**

Towards a European-wide exchange Network

for integrating research efforts on Integrated Water Resources Management

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*Funding scheme:* CA (Coordination Action), FP6

*Project duration:* 1/1/2006 - 12/31/2010

*EC contribution:* € 2 808 001

*Policy drivers:* Science-policy Interface

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### **Abstract**

Integrated Water Resources Management (IWRM) is among today's core environmental policies in all European countries when transposing the Water Framework Directive - WFD. An analysis of 60 research programmes (ERA-Net SSA n° 003223), carried out in 13 EU countries, shows that, since 2000, transposing the Directive has considerably changed the content of national or regional government-funded research programmes. Identifying IWRM issues / research needs in the short and long term, improving social understanding about research, promoting interdisciplinary research works, constitute some of the main working axes of IWRM.Net network, in order to help the programme managers to enhance their practices. The 17 partners, from 16 European MS, agree on a shared Vision of what should be IWRM.Net by 2010 : 1. THE source for knowledge about IWRM-research being undertaken in Europe, with a focus on the WFD 2. A forum for prospective and co-ordination of research needs and programmes on related issues in different countries, including accession states and EU neighbours 3. The facilitator between research and water policy makers and managers to bridge the communication gap 4. A facilitator for bringing together researchers and funders from different countries to work on joint projects 5. A forum for exchanging best practices on administrating research programmes across Europe. Activities will include a Knowledge Management tool (WP1), analysis of research needs (short-term WP2 and long-term WP3), development of joint and trans-national activities (WP4), intensive linking with related initiatives and actors (WP5), and dissemination of outcomes to the stakeholders (WP6). The duration of the project is 5 years ; workshops will be organised for production, and 3 conferences will be scheduled for dissemination of results to potential users. The partnership will be open to new programme managers after 3 years. Stakeholders will be closely associated to the works of the network.

## **004059- MATISSE**

### Methods and Tools for Integrated Sustainability Assessment (MATISSE)

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*Funding scheme:* IP (Integrated Project), FP6

*Project duration:* 4/1/2005 - 3/31/2008

*EC contribution:* € 5 300 000

*Policy drivers:* Science-policy Interface

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#### **Abstract**

The objective of MATISSE is to achieve a step-wise advance in the science and application of Integrated Sustainability Assessment (ISA) of EU policies. In order to reach this objective the core activity of the MATISSE project is to improve the tool kit available for conducting Integrated Sustainability Assessments, resulting in four main project activities: 1. A common conceptual framework for ISA development, implementation and evaluation will be developed. This will be related to the assessment of the current status of ISA and its pattern of use in relation to different domains and contexts. 2. MATISSE will deliver a future tool portfolio for ISA. It will improve and interlink existing tools and methods for ISA with the focus on quantitative tools. In addition, new methods and tools will be developed that capture the multi-domain, multi-level and multi-actor complexity of ISA. 3. In four case studies the improved and new ISA tools will be applied and tested. The case studies are designed to cover the broad spectrum of domains and contexts of ISA in the EU. The themes are: i) agriculture, forestry and land-use, ii) resource use, waste and dematerialisation, iii) water, and, iv) sustainable environmental technology development. 4. The involvement and engagement of stakeholders and policy makers will be secured throughout all activities of the project. This covers crosscutting capacity-building, communications and outreach tasks. To this purpose, external guidelines for ISA will be developed that will support the future use and application of tools and methods for ISA across a wide range of contexts. The resulting improved tools portfolio and ISA Guidelines will form the primary deliverables of the project. The major focus will be on ISA-modelling tools in relation to ISA-participatory methods, which will be made suitable for use by the European Commission and other actors that seek to apply ISA through a comprehensive dissemination programme.

## **502453- MED-REUNET II**

SUPPORT PROGRAMME FOR STRENGTHENING THE CAPACITY BUILDING OF WASTEWATER RECLAMATION PROFESSIONALS IN THE CONTEXT OF THE MED-REUNET NETWORK

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*Funding scheme:* SSA (Specific Support Action), FP6

*Project duration:* 4/1/2004 - 5/31/2005

*EC contribution:* € 90 000

*Policy drivers:* Science-policy Interface  
Socio-economy

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### **Abstract**

Med-Reunet II continues the main objective of the Med-Reunet project (ICA3-CT-2002 -50002) of consolidating a highly experienced working group in the Mediterranean basin in order to enhance co-operation between European and Mediterranean authorities, National and local institutions, policy makers, academic experts, professionals, end users, and others involved in the waste water reclamation and reuse with the aim of: "Strengthening Med-Reunet network capacities "Exchanging information and know-how "Transfer of scientific and technological knowledge "Awareness raising on waste water reclamation and reuse Amongst the different foreseen initiatives to implement the project, Med-Reunet II has developed a Support Programme for Strengthening the Capacity Building of Wastewater Reclamation Professionals. The purpose of this initiative is to support Med-Reunet members to pursue advanced research works in wastewater reuse and to encourage meaningful contributions to the collective body of knowledge about this subject. In particular, the Med-Reunet Support Programme pursues a series of specific objectives: "The creation of a dossier containing collection methodologies of the data and information available on water recycling "The reviewing of the existing relevant information and technologies worldwide "The collection and evaluation of the scientific information available in the Mediterranean countries in this subject "The development of standards and/or guidelines of water recycling and reuse in Mediterranean countries "The development of a methodology and training material and tools for target groups involved on wastewater and reuse scenarios. The Med-Reunet Support Programme will be implemented through different financial aids to the members of the Med-Reunet network interested in carrying out advanced research works in European or Third Mediterranean institutions involved in this field.

## **517612- MELIA**

Mediterranean dialogue on integrated water management

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*Funding scheme:* CA (Coordination Action), FP6

*Project duration:* 9/1/2006 - 8/31/2011

*EC contribution:* € 2 000 000

*Policy drivers:* Science-policy Interface

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### **Abstract**

Despite the important number of research projects in the water management, monitoring of water resources and water related technology, performed at local, regional or Euro-Mediterranean scale, there exist a general perception that water management models are still constructed from points of view that ignores contributions from all the key stake-holders, specially users and citizens, determinant for the impact on the territory of water schemes and the satisfaction of the water demand, specially from the sustainability point of view. Another general perception in the Mediterranean area is the lack of visibility of the important role that Science and Technology play in the sustainable development of the region.

Part of these problems are due to communication gaps between political and administrative institutions, scientists, cultural workers, lawyers, economist, end-users and citizens. The Coordinated Action MELIA aims at structuring a dialogue among the key stakeholders concerned and affected by water use and management, such as scientists and professionals, decision makers, policy makers, water providers, citizens. This dialogue aims at creating a Forum where water players can share knowledge, find consensus and propose new perspectives on the emerging needs and appropriate integration of knowledge for water management, in a region of scarce resources such as all the Mediterranean basin.

The main MELIA targets are:

- Building a knowledgebase for integrated water management planning, based on integrating contributions from the wider spectra of perspectives
- Develop a Mediterranean-wide awareness of the social (cultural and participatory), economic and technological issues related to water management
- Propose participatory mechanisms and prevention tools to avoid conflicts between regions, states and different waters users
- Provides legislative and administrative bodies with criteria and arguments to support sustainable water policies and economy

## **511179- NEWATER**

New Approaches to Adaptive Water Management under Uncertainty

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*Funding scheme:* IP (Integrated Project), FP6

*Project duration:* 1/1/2005 - 2/28/2009

*EC contribution:* € 11 999 961

*Policy drivers:* Science-policy Interface

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### **Abstract**

The central tenet of the NeWater project is a transition from currently prevailing regimes of river basin water management into more adaptive regimes in the future. This transition calls for a highly integrated water resources management concept. NeWater identifies key typical elements of the current water management system and focuses its research on processes of transition of these elements to adaptive IWRM. Each key element is studied by novel approaches. Key IWRM areas where NeWater is expected to deliver breakthrough results include:

1. governance in water management (methods to arrive at polycentric, horizontal broad stakeholder participation in IWRM)
  2. sectoral integration (integration of IWRM and spatial planning; integration with climate change adaptation strategies, cross-sectoral optimization and cost-benefit analysis)
  3. scales of analysis in IWRM (methods to resolve resource use conflicts; transboundary issues)
  4. information management (multi stakeholder dialogue, multi-agent systems modelling; role of games in decision making; novel monitoring systems for decision systems in water management)
  5. infrastructure (innovative methods for river basin buffering capacity; role of storage in adaptation to climate variability and climate extremes)
  6. finances and risk mitigation strategies in water management (new instruments, role of public-private arrangements in risk-sharing)
  7. stakeholder participation; promoting new ways of bridging between science, policy and implementation
- The development of concepts and tools that guide an integrated analysis and support a stepwise process of change in water management is the corner-stone of research activities in the NeWater project. To achieve its objectives the project is structured into six work blocks, and it adopts a management structure that allows effective exchange between innovative and cutting edge research on integrative water management concepts
- 6/05/2012

## **509158- NOSTRUM-DSS**

Network on Governance, Science and Technology for Sustainable Water Resource management in the Mediterranean

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*Funding scheme:* CA (Coordination Action), FP6

*Project duration:* 8/1/2004 - 1/31/2008

*EC contribution:* € 1 010 000

*Policy drivers:* Science-policy Interface  
Socio-economy

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### **Abstract**

The Mediterranean basin is characterised by a strong heterogeneity of cultures, economies and societies which often implied problematic interactions. It is one of the areas where water resource scarcity and conflicts between different water users are more dramatic. The need and relevance for sustainable integrated water management strategies is therefore clear.

DSS tools have an enormous potential for the identification of water management regimes in different environmental situations. They can help manage socio-political conflicts over competing demands for water uses. Yet, their potential is often not exploited for various reasons, as lack of communication between scientists and policy makers. A need for reorientation of science to support policy making and for the adoption of multisectoral and multidisciplinary approaches integrating socio-economic and environmental considerations is evident. NOSTRUM-DSS will address this gap by fostering mediation between policy makers and scientists and between policy objectives and scientific knowledge to create an enabling environment for a more equitable and efficient water resource management in the basin. Aim is to contribute to bridge the gap between policy makers and researchers with respect to the use of DSS tools as instruments for improving governance of water resources in the Mediterranean. Main objectives are:

1. promote the development of suitable DSS tools built upon real needs of policy making in IWRM;
2. improve scientific knowledge and applied methodologies in IWRM;
3. establish durable links between scientific institutions, governments, NGOs, SMEs and other stakeholders and improve public awareness on water management.

Expected outcome is improved governance and planning in sustainable water management, as a result of fostering active involvement of the relevant stakeholders in the different stages and through dissemination of Best Practices Guidelines for useful DSS tools for IWRM in the Mediterranean.

## **244170- PEGASO**

People for Ecosystem Based Governance in Assessing Sustainable Development of Ocean and Coast

[www.pegasoproject.eu/](http://www.pegasoproject.eu/)

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*Funding scheme:* SICA (Large-scale integrating project for specific cooperation actions dedicated to international cooperation partner countries), FP6

*Project duration:* 2/1/2010 - 1/31/2014

*EC contribution:* € 6 999 005

*Policy drivers:* Science-policy Interface  
Ecological Status  
Hydromorphology

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### **Abstract**

Many efforts have been deployed for developing Integrated Coastal Zone Management (ICZM) in the Mediterranean and the Black Sea. Both basins have, and continue to suffer severe environmental degradation. In many areas this has led to unsustainable trends which have impacted on economic activities and human well-being. An important progress has been made with the launch of the ICZM Protocol for the Mediterranean Sea in January 2008. The ICZM Protocol offers, for the first time in the Mediterranean, an opportunity to work in a new way, and a model that can be used as a basis for solving similar problems elsewhere, such as in the Black Sea. The aim of PEGASO is to build on existing capacities and develop common novel approaches to support integrated policies for the coastal, marine and maritime realms of the Mediterranean and Black Sea Basins in ways that are consistent with and relevant to the implementation of the ICZM Protocol for the Mediterranean.

PEGASO will use the model of the existing ICZM Protocol for the Mediterranean and adjust it to the needs of the Black Sea through three innovative actions: - Constructing an ICZM governance platform as a bridge between scientist and end-user communities, going far beyond a conventional bridging. The building of a shared scientific and end users platform is at the heart of our proposal linked with new models of governance. -Refining and further developing efficient and easy to use tools for making sustainability assessments in the coastal zone (indicators, accounting methods and models, scenarios, socio-economic valuations, etc).

They will be tested and validated in 9 sites (CASES) and by the ICZM Platform, using a multi-scale approach for integrated regional assessment.

- Implementing a Spatial Data Infrastructure (SDI), following INSPIRE Directive, to organize local geonodes and standardize spatial data to support information sharing on an interactive visor, to make it available to the ICZM Platform, and to disseminate all results of the project to all interested parties and beyond.
- Enhancing regional networks of scientists and stakeholders in ICPC countries, supported by capacity building, to implement the PEGASO tools and lessons learned, to assess the state and trends for coast and sea in both basins, identifying present and future main threats agreeing on responses to be done at different scales in an integrated approach, including trans-disciplinar and trans-boundary long-term collaborations.

## **266605- PERA**

Palestine for European Research Area

[www.pera-project.eu/](http://www.pera-project.eu/)

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*Funding scheme:* CSA (Coordination - or networking - action), FP7

*Project duration:* 4/1/2011 - 3/31/2013

*EC contribution:* € 454 614

*Policy drivers:* Science-policy Interface

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### **Abstract**

The PERA project is aiming at strengthening capacities of the Palestine Technical University – Kadoorie (PTUK) while realizing it as an international centre of excellence, and reinforcing the cooperation capacities and research activities in Palestinian's water and energy sectors by defining water and energy research priorities to respond to socio-economic needs, facilitating participation in European water and energy research initiatives and inclusion in European Research Area.

The specific objectives of PERA project are:

- Better Coordination Between Policy, Research and Business in Palestine
- Enabling Better Participation in Framework Programmes
- Setting Up Palestine's Environmental NCP
- Enhancement of EU-PS S&T Partnerships in Energy and Water Research
- Capacity Building for Solving Specific Energy and Water Issues
- PTUK's Strengthening and Cooperation Capacities Reinforcement
- Energy and Water Research Results Dissemination

The project thus addresses current Work Programme for International Cooperation to reinforce the cooperation capacities of research centres located in the ENP countries and contributes to the European international co-operation in S&T strategy implementation, while strengthening the international dimension of the ERA and improving the framework conditions for international S&T cooperation.

The main impact of PERA will be increased capacities of the PTUK centre and the structuring and enhancement of the existing EU-Palestinian Territories support landscape in Energy and Water S&T cooperation through a threefold way: (i) by supporting the participation of Palestine in the FP7, (ii) knitting together all relevant support schemes, and (iii) facilitating both the uptake of water and energy research areas and the monitoring of the performance and impacts of this cooperation.

The PERA consortium brings together 4 Palestinian and EU organisations representing a well-defined mix of competencies and expertise.

Project duration is 24 months.

## **226814- PRIMUS**

Policies and Research for an Integrated Management of Urban Sustainability

[www.iclei-europe.org/informed-cities](http://www.iclei-europe.org/informed-cities)

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*Funding scheme:* CSA (Coordination - or networking - action), FP7

*Project duration:* 5/1/2009 - 4/30/2012

*EC contribution:* € 1 221 545

*Policy drivers:* Science-policy Interface

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### **Abstract**

The PRIMUS project has been designed to bridge the gap between research on the European level on one hand, and policy-making at (and for) the local level on the other hand. The theme chosen for this 36-months coordination action is 'sustainable urban management', thus covering the way how the various policy areas of urban development (energy/water/waste, transport, planning and design, social inclusion, etc) are integrated, rather than one of these themes in particular. This focus is based on the assumption that the decoupling of environmental degradation and economic growth can only be achieved through a better management and governance of the largely inter-dependent issues of urban development. Indicators and information systems, efficient and effective policy processes, and innovative public participation are the main instruments to set ambitious targets, gain wide acceptance, and implement behavioural changes in society. The project is built around a series of events of different nature - so-called Connection Fora, Linkage Fora and Implementation Fora - linking into and building upon each other. They convene local governments from across Europe, researchers in the field of urban sustainability management, and national ministries and agencies dealing with sustainability policies directed at the local level in their respective Member States. A pilot dimension of the project is the 'explorative application' of two selected research-based tools for sustainable urban management by some 100 local governments throughout Europe. This application should explore the connectivity between research and policy-making and deliver criteria for its general enhancement in other thematic areas and in the future. With the European Report on Urban Sustainability - the first of its kind and derived from this explorative application - PRIMUS will demonstrate the fascinating potential of a better connectivity between research and policy-making.

## **245026- PRO-TECH NATURE**

Protecting from natural hazards using new technologies. The role of the researcher

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*Funding scheme:* CSA (Coordination - or networking - action), FP7

*Project duration:* 6/15/2009 - 12/14/2009

*EC contribution:* € 25 000

*Policy drivers:* Science-policy Interface

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### **Abstract**

Natural hazards are atmospheric, earth or water processes that may damage people, property or other parts of the environment. Many of the effects of existing and predicted natural hazards are made worse by the location of human settlement. Communities spring up on plains, terraces and dune systems that have been created by natural hazards such as floods, earthquake faulting, wave action and changes in sea level. The main natural hazards met in Greece are: coastal flooding, earthquakes, river flooding, rural fires, landslides, erosion, weather (wind and rainfall), disasters caused by climate change. A researcher's mission is to advance and communicate knowledge on hazards mitigation and disaster preparedness, response, and recovery. Using an all-hazards and interdisciplinary framework, Universities foster information exchange and integration of activities among researchers, practitioners, and policy makers from around the world. They support and conduct research, and provide educational opportunities for the next generation of hazards scholars and professionals. The main aim of all events corresponded to the project "Pro-Tech Nature" is to enhance public recognition of researchers and their role in society and to encourage young people in Greece to embark on scientific career.

## **226915- PSI-CONNECT**

Policy Science Interactions: connecting science and policy through innovative knowledge brokering

[www.psiconnect.eu/](http://www.psiconnect.eu/)

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*Funding scheme:* CP (Collaborative Project), FP7

*Project duration:* 5/1/2009 - 4/30/2012

*EC contribution:* € 1 373 082

*Policy drivers:* Science-policy Interface

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### **Abstract**

European policy makers and researchers recognise the large policy potential of research in the field of sustainable development, but the potential is not fully used. PSI-connect wants to contribute to bridging the gap between science and policy in the field of the impacts of climate change on water management. The decoupling challenge from the EU Sustainable Development Strategy implies that impacts of climate change on the river basin system should be diminished. This is a policy issue of contemporary urgency and it is a topic where large quantities of high quality knowledge ('untapped potential') are available. The consortium partners are all involved in different EU-projects with high relevance and have excellent contacts with relevant national research programs and easy access to national and regional policy makers. PSI-connect will experiment with and develop innovative knowledge brokering instruments in the field of impacts of climate change impacts on river systems. These instruments will be developed from available candidates such as Communities of Practice, games, group model building, and scenario workshops. We will develop and test these instruments in six case studies: • Working group Climate Change and Water of the CIS of the WFD; • Committee on Climate Change of the EU Parliament; • German Ministry of Environment; • Dutch Ministry of Traffic, Public Works and Water management; • River basin Community Elbe (Germany) • Water Board Rivierenland (the Netherlands); The final results of PSI-connect will be tested knowledge brokering instruments for different policy levels. Furthermore, 'knowledge brokerage communities' will be established that act as learning communities and have the capacity to maintain European leadership in this field beyond the lifetime of the PSI-connect project itself. Results will be disseminated to the relevant audiences through summer schools, a web-site and a final conference.

## **036938- RISK-BASE**

Coordination Action on Risk Based Management of River Basins

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*Funding scheme:* CA (Coordination Action), FP6

*Project duration:* 9/1/2006 - 12/31/2009

*EC contribution:* € 1 612 298

*Policy drivers:* Science-policy Interface

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### **Abstract**

In RISKBASE leading European scientists and representatives of major, European stakeholder groups will review and synthesise the outcome of EC RTD Framework Program projects, and other major initiatives, related to integrated risk assessment-based management of the water/sediment/soil system at the river-basin scale. The synthesis leads to the development of integrated risk assessment-based management approaches enabling the prevention and/or reduction of the negative impacts caused by human activities on that system. RISKBASE delivers: 1) An overarching concept, generic approach and guiding principles to integrated risk based management of river basins; 2) Recommendations towards evolution and implementation of risk based management in national and community policies and towards implementation in management and 3) A proposal for the European research agenda related to risk based management.

Based upon ample experience in previous EC CAs, Thematic Networks and/or Accompanying Measures, a simple project structure is chosen, with only a minimum number of Work Packages (WP). Each WP is managed by one WP-leader, supported by a few other partners (contractors) in the project. The WPs organise several workshops dedicated to specific issues related to risk based management at the river-basin scale. Furthermore, RISKBASE annually organises a General Assembly (GA) and makes use of EUGRIS as web-based information exchange structure. The workshops, GA and the website are open to all who are interested and willing to contribute to achieve the RISKBASE goals and objectives.

Furthermore, during the project, each WP selects core-team members to assist the WP-leader in reviewing, synthesising and then reporting of the outcome of WP-workshops. Thus an open, transparent and flexible structure is created ensuring the integration of all essential knowledge, expertise and experience in order to make RISKBASE a success.

## **037025- ROSA**

Resource-Oriented Sanitation concepts for peri-urban areas in Africa

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*Funding scheme:* STP (Specific Targeted Research Project), FP6

*Project duration:* 10/1/2006 - 3/31/2010

*EC contribution:* € 2 900 000

*Policy drivers:* Science-policy Interface  
Socio-economy

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### **Abstract**

The UN Millennium Development Goals (MDGs, target 10) call for halving the proportion of people without access to safe drinking water and basic sanitation by 2015. ROSA promotes resource-oriented sanitation concepts as a route to sustainable and ecologically sound sanitation in order to meet the MDGs. These concepts shall be applied in four cities in East-Africa, namely Arbaminch (Ethiopia), Nakuru (Kenya), Arusha (Tanzania) and Kitgum (Uganda). The consortium comprises 2 partners from each of these countries, a university and an end-user. For the model cities strategic sanitation & waste plans (SSWPs) will be developed for the whole city area. These SSWPs will come up with the best solution for the city combining several techniques (resulting in hybrid systems) according to the local requirements.

Within the project a part of the SSWPs will be developed in peri-urban areas, where there is a lot of research need for resource-oriented sanitation. Research topics addressed within ROSA are targeting the gaps for the implementation of these concepts in peri-urban areas. They include e.g. an implementation study of the updated WHO-guidelines for use of waste and excreta, the improvement/adaptation of resource-oriented sanitation technologies and the development of community based operation and management strategies. For the implementation of the complete SSWPs the ROSA consortium will develop possibilities for financing. This will be facilitated by the already existing international network of the consortium and the strong link of the activities to on-going programmes/projects in East Africa (e.g. the "Lake Victoria Initiative" of the UN Habitat, the WSP of the Worldbank, the Dutch ISSUE Programme, the Swedish EcoSanRes Programme, etc.).

Dissemination activities will be focused on establishing the local East African network between universities, end-users, etc. This network will ensure the consolidation and the replication of the knowledge gained within the region.

## **245159- SIRRIMED**

### **SUSTAINABLE USE OF IRRIGATION WATER IN THE MEDITERRANEAN REGION**

[www.sirrimed.org/index.php?seccion=proyecto](http://www.sirrimed.org/index.php?seccion=proyecto)

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*Funding scheme:* CP (Collaborative Project), FP7

*Project duration:* 7/1/2010 - 12/31/2013

*EC contribution:* € 2 999 078

*Policy drivers:* Science-policy Interface  
Water and Agriculture

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### **Abstract**

SIRRIMED project will address issues related to sustainable use of water in Mediterranean irrigated agricultural systems, with the overall aim of optimizing irrigation water use. The approach proposed in SIRRIMED for reaching this goal will be based in an Integrated Water Irrigation Management (IWIM) where the improving water use efficiency will be considered at farm, irrigation district and watershed scales. This strategy implies the innovation of more efficient irrigation techniques improving water productivity that permit savings in water consumption. SIRRIMED will consider the development, test and validation of new deficit irrigation strategies, the sustainable use of poor quality waters and the improvement of precise irrigation scheduling using plant sensors. These new techniques will be integrated with suitable husbandry irrigation practices. At the district scale, efforts should be directed towards an integrated policy of water allocation which accounts for the characteristics and specificity of each farm, requiring the availability of data bases and management tools (decision support systems) specifically designed to fulfil the objectives of maximizing water use efficiency. At the watershed scale, priority should be devoted to the assessment of new models of water governance, and the definition of strategies and policies aimed at promoting a more responsible use of irrigation water. Finally, SIRRIMED will establish a sound dissemination strategy for transfer of knowledge towards the end users, with a very important participatory approach to facilitate an adequate involvement of stakeholders (farmers, association of irrigation users, water authorities and SMEs)

## **029674- SMART-KARST**

International KARSTological school "Sustainable MAnagement of natural Resources on karST"

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 12/1/2005 - 11/30/2009

*EC contribution:* € 235 472

*Policy drivers:* Science-policy Interface  
Socio-economy

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### **Abstract**

Karst is a landscape on water-soluble rocks, which cover around 35 % of Europe. It provides unique habitat to rare animals. About 25 % of the world's population drinks water from karst aquifers, and karst is also rich in other natural resources. Karst phenomena are an attraction for tourists. Therefore karst is also of a great economic significance. But due to specific characteristics it is very vulnerable and any human activity might be a potential threat to it. For its conservation and sensible planning of life in it Europe needs experts with comprehensive knowledge on karst and karst processes. Karstology as a multidisciplinary/interdisciplinary science covers a very wide field of interests, which are usually on universities not integrated in a unified study programme and most researchers stay specialised within their particular topic. Additional training, especially of younger researchers is therefore necessary in order to strengthen the European leadership in karst research. The main objective of the proposed events is to bring together researchers of karst from different basic scientific disciplines as well as managers and public officials, and especially to facilitate and advance the transfer of knowledge from experienced to early-stage researchers. A comprehensive review on the important topics of the thematic area Sustainable development, global change and ecosystems will be given by renowned experts through keynote lectures and field work, with the emphasis on the combination of theoretical principles and practical applications. Young researchers will also have the opportunity to present and discuss the results of their research work. Created new bonds between researchers will be a good foundation for further co-operation on European and also world level. Slovenia as a host country is the area of classical karst. KRI as a proposer has a long tradition in multidisciplinary karstological research and experiences in organising scientific meetings and courses.

## **044357- SPI-WATER**

Science-Policy Interfacing in support of the Water Framework Directive implementation

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*Funding scheme:* STP (Specific Targeted Research Project), FP6

*Project duration:* 11/1/2006 - 10/31/2008

*EC contribution:* € 1 070 000

*Policy drivers:* Science-policy Interface

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### **Abstract**

Many current water-related RTD projects have already established operational links with practitioners, in several catchments / river basins, which allow the needs of policymakers to be taken into account. However, experience has shown that this interrelationship is not as efficient as it could / should be. Often, RTD results are not easily available to policy oriented implementer (policymakers) and, vice versa, research scientists may lack insight in the needs of policymakers. SPI-water proposes a number of concrete actions to bridge these gaps in communication by developing and implementing a 'science-policy interface', focusing on setting up a mechanism to enhance the use of RTD results in the Water Framework Directive (WFD) implementation.

As a first action, existing science-policy links will be investigated. RTD and LIFE projects that are of direct relevance for the implementation of the WFD will be identified and analysed. The results of these projects will be extracted, 'translated' and synthesised in a way that can efficiently feed the WFD implementation. Secondly, an information system (WISE-RTD Web Portal) will be further developed to cater for an efficient and easy to use tool for dissemination as well as retrieval of RTD results. The Web Portal will be tested in 4 selected river basins to better tune the 'product' to the needs of WFD stakeholders, policymakers and scientists. In parallel, the Web Portal will be disseminated to WFD stakeholders. This dissemination will focus on how to better access and use the RTD results and practical experiences. As third action, this science-policy interfacing of WFD related topics will be extended to non-EU countries taking into account their specific needs. An assessment of recent practices and needs of non-EU countries, together with an in-depth analysis of the operational needs in two Mediterranean pilot river basins, will allow to prepare recommendations for an efficient transfer of knowledge.

## **265308- STEP-WISE**

Science, Technology and Policy interfacing using WISE-RTD

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*Funding scheme:* CSA (Coordination - or networking - action), FP7

*Project duration:* 1/1/2011 - 12/31/2012

*EC contribution:* € 899 947

*Policy drivers:* Science-policy Interface

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### **Abstract**

The aim of STEP-WISE is to promote and increase the use of FP environmental RTD results in the sector of environmental technologies focusing on water by diverse stakeholders: policy, scientists and industry.

The WISE-RTD Web Portal ([www.wise-rtd.info](http://www.wise-rtd.info)) has already been implemented to serve as a dissemination tool, linking diverse EC Water Framework Directive policy aspects to FP RTD (and LIFE) results, thus bridging the science policy gap in information exchange. Amendment of WISE-RTD to include also other (EC) Directives that relate to water policies will expand the current set of intricate algorithms that define science-policy interactions. In addition, the WISE-RTD structure will be expanded with environmental technologies focusing on water (WISE-RTD+ Web Portal).

FP (and LIFE) funded environmental research projects and results with high EU added value will be identified and selected using preset criteria. By uploading these projects/RTD results using a dedicated tool WPIS (Web Portal Input System) to the WISE-RTD+ Web Portal, the information automatically become linked to the diverse sets of policy instruments (i.c. Directives).

The WISE-RTD+ Web Portal will be used to evaluate whether policy questions have been answered by the RTD outcome (top down, scientific support to policy), and whether needs from identified stakeholders, e.g. from the environmental water technologies sector, are covered by policy issues (bottom-up). Merging of these two approaches will form the gap-analysis, recommendations towards a better uptake of FP environmental RTD results with tangible impact on economic growth and social welfare.

The policy and science related contents of WISE-RTD+, and the two-way gap analyses will form the basis for dissemination using different user-friendly media. Innovative dissemination tools and activities will direct to different audiences/stakeholders at targeted national and/or international level including policy makers, researchers and industries.

## **265309- STREAM**

Sustainable Technologies and Research for European Aquatic Management

[www.stream-project.eu/](http://www.stream-project.eu/)

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*Funding scheme:* CSA (Coordination - or networking - action), FP7

*Project duration:* 1/1/2011 - 12/31/2012

*EC contribution:* € 589 999

*Policy drivers:* Science-policy Interface

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### **Abstract**

The EU has invested considerable resources over the last decade to support the development of water technologies. As it often is the case with innovative technologies, there are currently few resources to pursue this process in the needed scale, and the uptake potential of water technologies and other environmental technologies resulting from EU-funded research seems limited due to insufficient awareness of their developments and the opportunities they offer. Raising awareness among researchers, policy makers, businessmen and industries, as well as the large public, young people in particular is paramount to the full exploitation of these technologies which are able to boost economic growth and social welfare.

The STREAM project intends to tackle this issue by bringing water technologies to the interest of potential uptakers through a diversified series of dissemination and communication actions tailored to the needs of the different categories of stakeholders. These include Policy Seminars to be held in 3 different countries and also streamed online, a Final Symposium at the European Parliament in Brussels, 2 Summer Schools, e-learning courses, audiovisual materials, including videos and interviews, webinars for research events and participation in sectorial events. A web platform will be set up from the very start of the project serving as a repository for all its activities and for the updated documentation material on latest research and policy progress in the field of water.

A group of highly qualified actors need to be involved in such an ambitious proposal to perform all variety of activities foreseen: STREAM consortium gathers partners with specific capabilities and backgrounds and established relations in the field, like specialists in water issues, experts in communicating science and carrying out innovative dissemination activities to transfer the knowledge gathered to the target audiences.

## **037141- STRIVER**

Strategy and methodology for improved IWRM - An Integrated Interdisciplinary Assessment in Four Twinning River Basins in Europe and Asia

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*Funding scheme:* STP (Specific Targeted Research Project), FP6

*Project duration:* 7/1/2006 - 6/30/2009

*EC contribution:* € 2 489 650

*Policy drivers:* Science-policy Interface

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### **Abstract**

The point of departure for STRIVER is the lack of clear methodologies and problems in operationalisation of IWRM as pointed out by both the scientific and management communities. STRIVER will develop interdisciplinary methods to assess and implement IWRM. Based on the development of a multidisciplinary knowledge base assessment in all case studies (policy, social and natural sciences) and an early stage development of IWRM conceptual framework, the project will undertake IWRM in the four selected twinned catchments covering six countries in Europe and Asia. Twinning activities based on a problem-based approach will be performed in four case river basins: â?¢Tunga Bahdra (2 states in India), â?¢Sesan (Vietnam/Cambodia), â?¢Glomma (Norway), â?¢Tejo/Tagus (Spain/Portugal) Under the IWRM framework, the problems to be covered are (i) water regimes in transboundary regulated rivers, (ii) environmental flow, (iii) land and water use interaction, and (iv) pollution. The research will use sub-basins of each river basin in all cases to allow more detailed studies and easier integration of all stakeholders, for transferability purposes. STRIVER will contribute towards improved interdisciplinary IWRM, based on the coupling and balancing of ecological, social-economic and policy variables in all the four case-basins by twinning activities. To that end, the project will: â?¢develop guidelines for interdisciplinary methods to assess and implement IWRM â?¢assess the transferability of case study results â?¢enhance the dialogue between decision-makers, stakeholders and scientists â?¢disseminate data and information to stakeholders to promote participatory planning and integrated decision-making, taking adequate account of the rights of poor people and gender roles â?¢ensure that project results will benefit all parties also after the end of the project

## **043536- SWAP**

### **MEDITERRANEAN DIALOGUE ON FRAMING SUSTAINABILITY IN WATER POLICY EVALUATION**

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*Funding scheme:* SSA (Specific Support Action), FP6

*Project duration:* 7/1/2007 - 12/31/2009

*EC contribution:* € 216 414

*Policy drivers:* Science-policy Interface  
Water and Agriculture

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### **Abstract**

Water policies and management of water resources are important issues in the sustainable development of many areas in the Mediterranean, with particular regard to agricultural sector. The project intends to stimulate communication and dialogue on the problem of policy evaluation in the Mediterranean agricultural water sector and the need of developing a regional and generalised frame of variables and indicators for participatory policy evaluation to enhance sustainable development of the water sector in the entire region. The main objective of the project is to contribute to the strengthening of knowledge and assessment capability in water policy making and implementation in a Mediterranean context in order to better orient policy development towards sustainability. The specific project objectives are enhancing a participatory discourse on policy sustainability assessing achievement of sustainability objectives as stated in the Mediterranean Strategy for Sustainable Development framing and integrating Mediterranean water policy development (local and regional level) in a common perspective of Sustainable Development. The project is centred on the following main activities conveying stakeholders and citizens in a multi-stakeholder Forum in three selected case studies activate a local public discourse on policy evaluation within the multi-stakeholder Fora elaborate a frame of variables and indicators, as a base for a common methodology for policy analysis guide the Fora in policy evaluation disseminate results at high policy level convey the Fora and results achieved in a final international conference on water policy evaluation.

## **026199- SYR DARYA**

Co-ordination of scientific activities towards elaboration of common strategy for environmental protection and sustainable management in Syr Darya River Basin, in Uzbekistan and Kazakhstan

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*Funding scheme:* SSA (Specific Support Action), FP6

*Project duration:* 5/1/2006 - 10/31/2007

*EC contribution:* € 69 000

*Policy drivers:* Science-policy Interface

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### **Abstract**

The project is designed to consolidate complex and fundamental information and co-operation in fields of Syr Darya River Basin investigation. The investigation and monitoring of the Syr Darya River Basin is currently carried out by a number of institutions from Kazakhstan and Uzbekistan. They are either studying individual industrial objects or are dealing with narrow and strictly specialized ecological problems. These investigations are being carried out without any coordinator because of estrangement of the investigations and a shortage of funds. In the former USSR, a high percentage of river water resources were used for irrigation. Such agricultural policy together with the usage of huge amount of pesticides have resulted in soil salinization and contamination with different chemical substances, which resulted not only in crop yield, but also affected biodiversity and human health.

The realization of this project is based on the work of scientific teams from 4 countries and will provide multidisciplinary and comprehensive ecosystem studies of the Syr Darya River Basin. The project proposes coordination of scientific activities (changes in landscapes, pollution, biodiversity, restoration and agricultural implications) towards protection and sustainable management in different habitat types in the arid and semi-arid zones. The authors will examine how land-use transformations of this region have affected the ecological processes in several agricultural, natural and industrial areas of Kazakhstan and Uzbekistan. The principle objectives of this project are:

1. to develop procedures for the coordination of all pro-ecological activities as well as for development of ecological education and knowledge of Uzbek and Kazakh societies
2. to propose practical tools to help science and protection policy makers to decide between future ecological options
3. to produce general predictions of biodiversity protection and management across both countries.

## **029922- TAQC-WFD**

Training courses on Analytical Quality Control and method validation in support to the Water Framework Directive & TAQC-WFD

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 2/1/2006 - 1/31/2008

*EC contribution:* € 294 601

*Policy drivers:* Science-policy Interface

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### **Abstract**

The reliability (Quality Control) and comparability of measurements is a key issue and requires not only the availability of suitable quality control (QC) tools, but also their correct implementation and use in an harmonized way both within and beyond Community level. Recently, the European Commission has approved the new Water Framework Directive(WFD) (Directive 2000/60/EC), and funded the SWIFT-WFD project with the main objective of providing support to the successful implementation of the WFD. This depends on the improvement of the already existing laboratory staff that will be one of the main outputs of the project, but also on creating a 'correct' culture in the younger generation for the future application of WFD and its implementation. The hereby presented project - TAQC-WFD - aims the development of a 'correct culture' of analytical quality in the young generation. It addresses the training of Early Stage Researchers from all the EU Countries and from some third countries. In addition, it will also support the future implementation of the global EU Water Initiative that has a strategic importance with regard to sustainable development; contributes to the improvement of the quality of life through the improvement of measurements quality and the enhancement of measurement capabilities. The project envisages the organization of a series of events in an harmonized way. In particular, five training courses with the same format (based on the transfer of the same, high quality knowledge established by experts of high reputation) shall be organized in different regions of Europe to allow the participation of young researchers from 41 countries of Europe and the non-European Mediterranean Countries. With the practical part of the courses (proficiency testing scheme, and the construction and maintenance of QC charts) the project aims to train the young researchers in the practical and correct implementation of QC tools in the analytical laboratories.

## **513781- TERESEN**

Advanced Teaching and Research in Environmental Microbiology / Biotechnology

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 10/1/2004 - 9/30/2007

*EC contribution:* € 208 346

*Policy drivers:* Science-policy Interface

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### **Abstract**

The 6th Frame Programme of the EC opens a way for EU Member States and Associated Candidate Countries to establish collaborative activities in a broad spectrum of science. The aim of the proposed Marie Curie Chair is to make a contribution to this goal by sharing the chair holder's experience in Environmental Microbiology/Biotechnology with scientists, students, NGOs and other interested audience in the Czech Republic in order to establish this important curriculum in a country which urgently needs to improve the quality of air, water and soil by applying advanced technologies currently used in the EU. Basically, the Chair's activity will be focused on the following research priorities defined by the EC: (a) Sustainable Development, Global Change and Ecosystems (b) Life Science, Biotechnology for Health. Professor Z. Filip (Germany) as a proposed Chair Holder was holding a post of Director & Professor at the German Federal Environmental Agency, and a Professorship in Environmental Microbiology at the Institute of Technology (TU) Berlin till June 30, 2003. He shall teach graduate classes and post-graduate courses and supervise PhD Theses at the Institute of Chemical Technology Prague (ICTP) in the Czech Republic. The ICTP has four faculties and represents the larger institution of higher education in the Central Europe in the above field. For this reason it will be an optimum host for the proposed Marie Curie Chair that in a joint effort with Prof. Filip could guarantee for the spreading of the advanced teaching and research in Environmental Microbiology/Biotechnology not only in the Czech Republic but also in other Associated Candidate Countries.'

## **505287- TWINBAS**

Twinning European and third countries river basins for development of integrated water resources management methods

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*Funding scheme:* STP (Specific Targeted Research Project), FP6

*Project duration:* 12/1/2003 - 4/30/2007

*EC contribution:* € 1 389 893

*Policy drivers:* Science-policy Interface  
Socio-economy

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### **Abstract**

Strategic objectives: 1. To fill gaps in knowledge and methods in order to enable implementation of a harmonised IWRM approach that addresses the European Water Initiative, in five river basins. 2. To enable and perform assessment of vulnerability to climate change and anthropogenic development, and produce integrated river basin management plans, that includes optimal combinations of actions. To reach the strategic objectives of TWINBAS, a number of research tasks on hydrology, modelling of pollution flow, impact assessment, socio-economics, scenario analyses and action efficiency have to be carried through. For all these activity areas, the goal is to bring knowledge to a level where IWRM can be implemented for the five twinned river basins; Okavango (Botswana), Nura (Kazakhstan), Bio Bio (Chile) Thames (UK) and Norrstrom (Sweden). TWINBAS will have an important strategic impact by creating the practical means for implementing the EU Water Initiative 'Water for Life'. The nature and width of the gaps in knowledge vary between the different case study rivers, and therefore the research required differs between the river basins. The research and the IWRM components of TWINBAS are organised according to the EU Water Framework Directive (WFD) so that the WFD guideline documents can be utilised. The proposal also addresses the EU Water Initiative, which promotes development that is demand led from the less developed countries. The strong component of public participation and stakeholder involvement will ensure that each component has local ownership and addresses priorities identified within the region. The river basins selected represent a wide variety of water use problems, and a variety of political and societal systems. Thus, the applicability of the WFD approach will vary for the third country basins, and methodology applied will be a modification of the WFD process. TWINBAS aims at enabling development of water management action plans'

## **266200- WASHTECH**

Water, Sanitation and Hygiene Technologies

[washtechafrika.wordpress.com/](http://washtechafrika.wordpress.com/)

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*Funding scheme:* CP (Collaborative Project), FP7

*Project duration:* 1/1/2011 - 12/31/2013

*EC contribution:* € 1 587 847

*Policy drivers:* Science-policy Interface

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### **Abstract**

The water and sanitation sector is not short of new and emerging technologies, but hardly any have been adopted into national strategies in Sub-Saharan Africa, nor have they been widely taken up by private enterprise. The contribution of new technologies to MDG targets appears therefore to have been minimal in the last 20 years. A key constraint to reaching the sector targets therefore appears to be the lack of systems to assess the potential of a technology and lack of ability to take new appropriate technologies to scale effectively. WASHTech seeks to address the problem through research on an innovatory process for assessing the potential and sustainability of a wide range of new technologies, and for designing successful strategies for scaling up.

The overall development objective is for more effective investment in new technologies to achieve MDG targets. The project (WASHTECH) objective is to strengthen sector capacity to make effective investment in new technologies, through development of a framework which assesses the potential of new technologies introduced into innovative de-centralised systems.

The project objective would be achieved through research producing two levels of outputs. The first level of outputs will consist of a widely applicable Technology Assessment Framework (TAF) and process that will provide a simple system and criteria for evaluating new technologies and their performance, identifying sustainability issues, and analysing approaches to introduction, innovation, diffusion and scaling up, including establishing of the required capacities in the three countries; Burkina Faso, Ghana and Uganda. The second level of outputs depends on the TAF development and capacity building. They define strategies for innovation and scaling up, and the time-span and process needed to achieve successful up-take and sustainability. These outputs are both of direct use to the sector and are also an indication of the value and application of the framework.

## **265167- WATERDISS2.0**

Dissemination and uptake of FP water research results

[www.waterdiss.eu/](http://www.waterdiss.eu/)

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*Funding scheme:* CSA (Coordination - or networking - action), FP7

*Project duration:* 1/1/2011 - 12/31/2013

*EC contribution:* € 928 412

*Policy drivers:* Science-policy Interface

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### **Abstract**

The implementation of the Water Framework Directive is not a “Business-as-usual approach”, and needs new knowledge and know-how, but it is demonstrated that the actual connection between research and policy is not efficient.

The concept of the project is to add an intermediate step after research, like a marketing team in the industry.

This “step-further” will be developed closely with the stakeholders, by involving them within a social network, the European Water Community, for promoting exchanges; the project will develop a process tailored to every typology of target groups, which are

- the practitioners, with decision-makers (basin authorities, municipalities), and “doers”, (suppliers of technologies, consultancies, operators) ;it is needed to convince both the ones who accept to “host innovation”, and those who take the risk to develop innovative processes.
- the researchers, as individual knowledge holders, and as members of European consortiums, and the research funding bodies, at national level.

The project will collect information on about 60 water-related FP6/FP7 research projects outputs, analyse their potential future in close collaboration with the research teams, design for each of them an Individualised Dissemination Strategy, and then support their transfer to the targeted stakeholders, with the support of Web 2.0 features, together with events designed for specific audiences.

The e-infrastructure is a mix of social networking tools, to support a community of practices among the stakeholders, virtual seminars, and a permanent virtual fair of results.

The project includes social events to help stakeholders to meet and share ideas, and future actions: brokerage events, seminars, summer schools.

The consortium gather institutes from FR, DE, PL, RO, UK, IT, SP to do dissemination at EU scale.

## **003780- WFD-SEE**

Institutional Benchmarking for the Implementation of the Water Framework Directive and Integrated Water Resources Management in South Eastern Europe

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 8/1/2004 - 7/31/2006

*EC contribution:* € 80 000

*Policy drivers:* Science-policy Interface

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### **Abstract**

This study deals with the problem of implementation of the Water Framework Directive (WFD) in South Eastern European (SEE) countries. The problem of implementation of environmental legislation is of paramount importance to the Community today. In order to implement the Water Framework Directive member countries need to establish by December 2003 the appropriate administrative structures. Candidate countries must absorb the acquis communautaire and third countries that desire to join the Union must be on their way to Integrated Water Resources Management (IWRM). The study answers the following questions: are the structures established or to be established in the SEE countries properly designed to foster implementation, enforcement and public participation? If these institutional structures are not properly designed what are the changes needed to bolster the implementation of the WFD? The institutional reform recommended in this study is based on a benchmarking analysis. Such analysis involves: understanding of causes of success in similar institutions all over the world; prescribing indicators of success; evaluating the institutional structures in SEE states; benchmarking based on indicators of success; recommendations for reform. The study concentrates on a priority thematic area of the FP6 Program that of "Sustainable Development, global change and ecosystems." It is also in accordance with the broader goals of the FP6 program that support transnational programs of an interdisciplinary character. In addition it deals with an issue that has haunted the Community since its inception: that of implementation of the law on the ground. The execution of this study and the support of the European Public Law Center (EPLC) would be essential for the reintegration of the researcher in her country of origin namely Greece.

## **018379- WSSTP**

### **WATER SUPPLY AND SANITATION TECHNOLOGY PLATFORM**

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*Funding scheme:* SSA (Specific Support Action), FP6

*Project duration:* 11/1/2004 - 5/31/2006

*EC contribution:* € 670 000

*Policy drivers:* Science-policy Interface

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#### **Abstract**

This Specific Support Action concerns the Water Supply and Sanitation Technology Platform. The SSA will provide the organisational, management and scientific support necessary to facilitate the process of the Technology Platform in order to produce the deliverables: Vision Document, Strategic Research Agenda and an implementation plan for the water sector in Europe. This is done by the Secretariat a delegation of members of the WSSTP Board, together with and on behalf of the Board. The three deliverables will be used as input for FP7. The mission of the WSSTP is to strengthen the competitiveness and the potential for technological innovation of the European water industry, of water professionals and research institutions through the development of a strategic science and research agenda, to meet global challenges and regional demands of ensuring safe, secure and sustainable water supply for human societies and for the environment and sanitation services, within the framework of the available water resources. The WSSTP will contribute to the MDGs of the Johannesburg Summit and the European Union Water Initiative, through active participation of developing countries and of organisations that work in developing countries in the platform. The joint focus of the production of the three main is a very unique process of bringing together the various groups of stakeholders. The Water Supply and Sanitation Technology Platform will have a number of important measurable objectives, to which this SSA will contribute significantly: The production of the abovementioned documents. Contributing to the European industry competitiveness, by providing a multi-stakeholder framework. Wide spread consultation on and dissemination of the results of the platform.



## **Socio-economy**



## **265063- ADVOCATE**

Advancing Sustainable In Situ Remediation for Contaminated Land and Groundwater

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 4/1/2011 - 3/31/2015

*EC contribution:* € 3 445 531

*Policy drivers:* Socio-economy  
Groundwater

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### **Abstract**

This project will develop innovative in situ remediation concepts for the sustainable management of contaminated land and groundwater, as required by the WFD. The proposal has 18 academic and industry partners, with expertise in groundwater remediation issues, ranging from pore-scale processes to field-scale application, as well as technology development, water management/treatment, regulation and policy. The research links lab-scale studies of processes with field-scale evaluation and demonstration of novel technology applications, using state-of-the-art methods. It will develop new scientific understanding, performance assessment tools and decision-making frameworks which advance the use of sustainable in situ remediation for contaminated land and groundwater. The network is supported by comprehensive knowledge transfer activities. The aim is for more sustainable treatment, to optimise resource investment in environmental restoration, considering technical, social and economic factors. The network will create a comprehensive training environment for early career scientists and engineers in this field. Each academic institution, in cooperation with the industry partners, is well positioned to support the training and professional development of fellows, through existing research training packages and new activities proposed herein. In addition to formal graduate-level instruction and directed research, an innovative package of training initiatives is offered. These include workshops, summer schools, web-based sharing of research and key outputs across the network, complementary training at partner institutions, practical work secondments with industry partners, and participation at national and international conferences. Graduating fellows will benefit from interdisciplinary cooperation and interaction with all sectors of the environmental management community, providing them with the best preparation for a successful career in either academia or industry.

## **268208- ALL-GAS**

Industrial scale demonstration of sustainable algae cultures for biofuel production

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*Funding scheme:* CP (Collaborative Project), FP7

*Project duration:* 5/1/2011 - 4/30/2016

*EC contribution:* € 7 106 680

*Policy drivers:* Socio-economy

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### **Abstract**

This project will demonstrate on large scale the sustainable production of bio-fuels based on low-cost microalgae cultures. The full chain of processes from algal ponds to biomass separation, processing for oil and other chemicals extraction, and downstream biofuel production, as well as the use in vehicles, will be implemented on a 10 ha site.

Depending on the methodology chosen during the research phase of the project, and the sustainability analysis, the most suitable site for the objectives will be selected, among a number of selected locations in the South of Spain (Chiclana, Almeria, Sevilla, Arcos, Canary Islands) Wastewater influent and nutrients will be re-used to stimulate algae growth. The extracted oils will be processed at an existing biodiesel plant (capacity 6000 t/yr of used oils), designed by a consortium partner, which can be converted at reasonable cost.

The specified algae yield of 100 t/ha/yr will be obtained by integrating and up-scaling innovative systems to double algal yields. With a net oil content of 20 %, enough biodiesel yearly to run close to 200 cars is expected. The residual algae will be digested together with the wastewater solids in order to produce biogas and CO<sub>2</sub>. The biogas will be purified and compressed to serve as vehicle fuel for a number of cars equivalent or superior to the ones fuelled by liquids.

To reach the enhanced algal yield, additional CO<sub>2</sub> will be obtained by the thermal transformation of external biomass (i.e, sludge from a wastewater treatment plant located in the area), together with internal biomass( digestate from residual algae and wastewater solids), to generate flue-gas as heating source for drying the biomass previous to Combustion. The options to transform the excess thermal energy generated into electricity to power the systems will be analysed for financial and technical viability.

As some key process elements have not yet been proven on industrial scale, the technical risks will be limited by an initial prototype phase. During these initial 2 -3 years, the whole chain will be built and operated with each unit in its maximum size for instance, two ponds systems of 1000 to 2000 m<sup>2</sup> linked to the respective harvesting, processing and digestion.

The prototype as well as the future full-scale facility will be investigated for environmental and social impacts in order to maximize sustainability. These results and specific diffusion efforts will allow extrapolation to other sites.

## **908448- AMWRUC**

modelling of integrated water systems under uncertainty for aquatic environment rehabilitation in rapidly urbanised catchments

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 9/1/2011 - 8/31/2012

*EC contribution:* € 15 000

*Policy drivers:* Socio-economy  
Ecological Status

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### **Abstract**

Many catchments in developing countries are undergoing rapid urbanization, in which water systems become a fusion of natural water bodies, rivers, and man-made water networks. It has also been widely recognized that rehabilitation of the aquatic environment is essential in maintaining the system's ecological and hydrological balance, especially under rapid urbanisation. There have been a number of EU projects, e.g. NeWater and AquaStress, on adaptive and integrated modelling of catchments, but very few have investigated adaptive measures necessary for rapidly developing countries. Modeling of these water systems poses a significant challenge and requires a change in thought paradigm in order to deal with rapid spatial-temporal changes in the physical elements and the associated catchment responses. Two case studies from Southern China, Maozhou river catchment and Shenzhen river catchment, would be carried out to demonstrate the reliability and effectiveness of the approach. The two catchments are both located in rapidly urbanised area of China but have different urbanisation level. Aquatic environments in the two catchments have been severely damaged due to tempestuous disturbances of human activities. The adaptive modelling approach would be applied to support decision making for aquatic environment rehabilitation in the catchments. The objective of the project is to develop a novel framework of adaptive approach to model the integrated water systems, which is subjected to rapid changes over a relatively short period of time, effectively. It is envisaged that within the proposal framework, various simulation models, optimisation techniques and uncertainty analysis methods are integrated on a common platform to build up the fully integrated model of water system. This adaptive framework would allow decision makers to investigate the feasibility of different catchment rehabilitation measures within a common platform for better comparison and sound judgments.

## **036954- ANTINOMOS**

A knowledge Network for solving real-life water problems in developing countries: Bridging contrasts

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*Funding scheme:* CA (Coordination Action), FP6

*Project duration:* 4/1/2007 - 12/31/2010

*EC contribution:* € 1 149 000

*Policy drivers:* Socio-economy

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### **Abstract**

The proposal aims at contributing to global and local knowledge networks for solving real life water supply and sanitation (WSS) problems in developing countries in view of reaching the MDGs. Based on an account of failures of WSS interventions in the last decades, ANTINOMOS aims at making an impact through bridging contrasts (between conceptual approaches, or between perceptions of global and local knowledge networks) and knowledge gaps (between knowledge areas which have only recently been recognized by decision makers as a key issue in reaching the MDGs). The core part of the proposal will be devoted to try to bridge these contrasts and knowledge gaps. For this purpose, special attention will be devoted to link state-of-the-art technological advancement in WSS with local resources and grassroots innovations, in order to enable context-specific learning opportunities for more sustainable solutions to real water problems.

First, based on a systems approach, a number of technological systems and practices for WSS will be studied and analysed. Both technological systems based on a??outside knowledgea??, i.e. a??expert knowledgea?? as well as systems based on a??insidea??, i.e. a??indigenous knowledgea??, will be studied.

Then, special learning devices and knowledge management tools will be developed (where feasible in cooperation with international and local knowledge networks) and applied, in order to foster cross-fertilization between knowledge frames and global-local interaction.

Involvement of key decision-makers and change agents at the local level will be a key step to facilitate uptake and integration of solutions in real life. In this perspective, the two primary objectives of the proposal will be:

1. Bridging contrasts and antinomies through the development of learning spaces across individual disciplines
2. Support both international and local knowledge networks through the generation of new knowledge and the development of innovative knowledge manage

## **026350- AQUA SOLIS**

Innovative Applications of Solar Trough Concentration for Quality Fresh Water Production and Waste Water Treatment by Solar Distillation

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*Funding scheme:* SSA (Specific Support Action), FP6

*Project duration:* 7/1/2006 - 4/30/2007

*EC contribution:* € 45 000

*Policy drivers:* Socio-economy

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### **Abstract**

This Specific Support Action starts from the realisation that trough type solar concentration plants are a mature technology which deserves to be diffused throughout the European Union and in the partner countries. This concept is shared by the European Commission which has approved in 2005, among others, the FP6-INCO-MPC project REACT (Self-sufficient Renewable Energy Air-Conditioning system for Mediterranean countries) dedicated to solar trough concentrators for the generation of heat and refrigeration in Mediterranean countries. This project aims to demonstrate that the technology is mature enough to be applied in relatively low technology countries. The present SSA is proposed by one of the group partners of the REACT project, with the approval and the encouragement of the REACT coordinator and the other partners. The idea is to find applications of the REACT system beyond heat and refrigeration. At the present stage, a number of possibilities have been identified; the main ones which will be considered here are related to clean water production by processes such as solar distillation, atmospheric condensation, and waste processing. The aim of this SSA is to investigate the possible applications of the REACT system in these areas, performing a complete feasibility study. Although the technical feasibility of the proposed applications is not in discussion, before attempting to put such applications into practice, it is essential to quantitatively assess their potential economical and environmental benefits in comparison to existing solutions. The results of the feasibility studies will be disseminate in the scientific and entrepreneurial community within the EU and Mediterranean partner countries and discussed in a conference to be held in one of the partner countries at the end of the project. Every feasibility study will be grounded by climatic and socioeconomic data gathered in one of the target country of the SSA project: Lebanon, Jordan and Morocco

## **262040- AQUACELL**

An innovative technology platform for the enhanced treatment of industrial wastewaters achieving cost reductions, electricity generation and enabling water reuse for non-potable applications.

[www.fp7-aquacell.eu/](http://www.fp7-aquacell.eu/)

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*Funding scheme:* BSG-SME (Research for SMEs), FP7

*Project duration:* 12/1/2010 - 11/30/2012

*EC contribution:* € 1 160 430

*Policy drivers:* Socio-economy  
Chemical Aspects

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### **Abstract**

Major water using and discharging industries are of significant European economic importance, generating >€1500 billion turnover and employing >7.5 million people in 220,000 companies (90% SMEs). With continued European growth in demand for water, finite reservoirs of readily-treatable water, rising energy costs and increased environmental legislation, EU industry is experiencing significant competitive threats with regard to cost-efficient supply and treatment of water.

Microbial Fuel Cells (MFCs) utilise electrochemically-active microbes to convert the inherent energy of organic chemical bonds to electrical energy. MFCs encompass unique features that offer advantages for the treatment of wastewater, including: efficient electricity generation; minimal sludge formation; operation at low temperature; and modular cell design, enabling operation at small scale and customisation to specific end-user requirements. A core group of SMEs have identified a unique opportunity to advance MFC technology for industrial wastewater treatment, thereby generating sustainable and competitive business growth. Key innovations include MFC integration with photocatalytic advanced oxidation and a membraneless MFC air cathode design; and a scalable cost-efficient MFC and architecture design incorporating innovative process monitoring & control strategies. System features and benefits include:

- Capital cost equivalence with existing aerobic treatment solutions
- Significant operational cost savings, realised through:
  - Recovery of organic content as electrical energy & achieving system sustainability (self-powering);
  - Enhanced treatment efficiency enabling water reuse for on-site non-potable applications;

- Significant cost reductions for sludge disposal and treated wastewater discharge to sewer
- Flexible design and operation customised to specific end-user (sector) requirements and enabling treatment of wastewaters of varying composition and containing hazardous micropollutants

The project will result in a pilot-scale MFC system demonstrated for a target industrial wastewater. AquaCell will generate ~€40 million business growth for its SMEs within a 3-year period creating 94 jobs; and has the potential to benefit >29,700 major water using SMEs within the wider European manufacturing sector.

## **286900- AQUACONSERVER**

A Novel and combined domestic grey water treatment and heat recovery system suitable for cost effective installation in 90% of European households

[www.aquaconserver.eu/](http://www.aquaconserver.eu/)

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*Funding scheme:* BSG-SME (Research for SMEs), FP7

*Project duration:* 12/1/2011 - 5/31/2014

*EC contribution:* € 1 415 828

*Policy drivers:* Socio-economy

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### **Abstract**

AquaConserver concept addresses the twin problems of energy and water conservation faced by all citizens of the EU27 and offer us, as Europe's leading SME Plumber, equipment suppliers and consulting Associations, at this specific time, an opportunity to bring a new demand-led, offering to our customers, requiring high levels of expertise and training to install correctly and efficiently. Our concept involves the development of a low cost, retro-fittable to 90% of domestic dwellings, water recycling system that is capable of the re-use of showering and bathing water thereby saving up to 50% of personal washing water usage and >50% of the associated heating energy usage AND that is capable of re-using filtered grey water from bathing/showering for toilet flushing thereby saving up to 35% of overall household water usage'. The key issue and barriers to large scale uptake of these systems is their high installed cost, decades pay-back periods and their ongoing maintenance issues and that they are so large and require internal locations or are fitted in outside pits that they are not suitable for most consumers houses/flats. We believe that we as the Associations that represent the majority of installers can develop a low cost, low maintenance AquaConserver grey water recycling and heat recovery system that can be affordably installed in 90% of all domestic households and therefore become the market leader.

## **019155- AWARE:ECO-HEALTH**

Raising awareness amongst (young) people on the importance of research on aquatic ecosystems and pollution and the impact on food and health

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*Funding scheme:* SSA (Specific Support Action), FP6

*Project duration:* 5/1/2005 - 12/31/2005

*EC contribution:* € 81 390

*Policy drivers:* Socio-economy  
Ecological Status

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### **Abstract**

The project of the partnership between KATHO-HIVB (Higher Institute for nursing and biotechnology, Belgium) and the DDNI (Danube Delta National Institute for Research and Development, Romania) has two main objectives namely stimulating young people to study (life)sciences and to communicate the importance of scientific research to the public at large. The project is situated in three FP6 thematic priorities: 1) the life sciences in particular the field of biotechnology and eco-toxicology, 2) food quality and safety and 3) sustainable management of ecosystems. The objectives will be achieved through various initiatives such as 'scientist for a day' activities in which young people will perform experiments in schools or in the partners Institutes. In these experiments various aspects will be addressed such as fragile aquatic ecosystems (eg the Donau delta in Romania and the Yser area in Flanders Belgium), biodiversity, pollution and the impact on food quality and human health. The importance of innovative biotechnological techniques (toxicity experiments with different model systems, GMOs as bioremediation, water treatment and phytoplankton experiments, ...) will be stressed. Some aspects of gender issue (giving preference to schools with a minimum of 50% female students) and ethical issues (the use of cell cultures instead of animals for toxicity tests) will be incorporated. Other activities programmed are workshops with young people and the public, "meet and greet" activities and the making of the short movie 'Life of a scientist'. The activities fit well in the framework of the Researchers in Europe Initiative 2005 and the project will contribute to a better understanding of the researchers profession amongst young people and the public. The expertise of both institutes is complementary and exchange of know-how, didactic material and good educational practice will take place according to the main principle of the Human Research and Mobility programme.'

## **244443- CLICO**

Climate Change, Hydro-conflicts and Human Security

[www.clico.org/](http://www.clico.org/)

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*Funding scheme:* CP (Collaborative Project), FP7

*Project duration:* 1/1/2010 - 12/31/2012

*EC contribution:* € 2 991 352

*Policy drivers:* Socio-economy

Water Scarcity and Droughts

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### **Abstract**

Media headlines are dominated by the prospect of regional water wars. Clearly, climate change poses several threats to human security; in particular, hydro-climatic hazards such as droughts and floods have a considerable capacity to exacerbate social tensions, intra- and inter-state conflict. Still, cooperation often trumps conflict. There are surprisingly few peer-reviewed studies rigorously addressing links between climate change, hydrological systems, conflict and security. CLICO will fill this gap in knowledge over the social dimensions of climate change, by looking whether hydro-climatic hazards intensify social tensions and conflicts in the Mediterranean, Middle East and Sahel, or if they provide a catalyst for cooperation and peace. It will examine why some countries and communities are more vulnerable to droughts, floods and related conflict, and what types of policies and institutions are necessary to ensure adaptation, security and peace in the face of global and regional hydro-climatic change. The project will mobilize 13 research teams from Europe, North Africa, Sahel and the Middle East and will bring together for the first time some of the world's leading researchers in water resource, vulnerability, and peace and security studies. Ten cases of hydro-conflicts will be studied ranging from Niger, Sudan, the Jordan and Nile basins to Cyprus, Italy and the Sinai desert. A large dataset – the first of its kind – of hydro-conflicts in the Mediterranean, Middle East and Sahel will be regressed against climatic, hydrological and socio-economic variables. Policies and institutions at the national, international and transboundary levels will be investigated and their ability to face climate change and ensure human security will be assessed. Project results will be synthesised in a report that will identify potential security hotspots in the region and provide fresh policy ideas for promoting peace and security under changing hydro-climatic conditions.

## **224766- COOPWEM**

Cooperative Water and Renewable Energies Management

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 4/1/2008 - 3/31/2011

*EC contribution:* € 45 000

*Policy drivers:* Socio-economy

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### **Abstract**

COOPWEM directly goes back to the research needs identified during the implementation of the Marie-Curie project MTKD-CT-2004-014312 that has been implemented in CEIFA mostly under the scientific coordination of Mrs Suhita Osório-Peters. She was one of the guest researchers who joined our institution with a Marie-Curie stipend (Sept 2005 – Aug 2007). Before, she had more than 10 years full-time experience as a researcher in Germany. Her academic background is economics with a post-graduation in environmental sciences. She has excellent communication, coordination and leadership skills, and she really ‘thinks’ interdisciplinary. Our experience with her was excellent. Now, we jointly apply for a reintegration grant, in order to promote the framework conditions that ensure long-term job stability to Mrs Osório-Peters in our institution. COOPWEM is a research project with a duration of three years that addresses very topical issues and emphasizes an integrated approach of three complementary research areas: a) new instruments for the management of natural resources, b) local innovation systems and c) solidarity economy. By means of participatory approaches, it addresses the hypotheses that institutions based on cooperative arrangements are key elements of local innovation systems; still, the economic benefit of community based institutions is particularly important in the management of natural resources. It will focus on the analysis of the framework conditions that promote (or hinder) the implementation of new instruments in the field of natural resources management in Portugal. In particular, it will analyse the role of water users’ associations (WUA), as well as that of small scaled energy producers’ cooperatives, for sustainable regional development. Since CEIFA wants to enlarge its service offer into the areas of water and renewable energies management, COOPWEM perfectly links Mrs Osório-Peters own career development plan with the strategic goals of our enterprise.

## **256295- DRYCLOSET**

New biocide dry toilet with improved hygienic functionalities

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*Funding scheme:* BSG-SME (Research for SMEs), FP7

*Project duration:* 12/1/2010 - 11/30/2012

*EC contribution:* € 1 020 907

*Policy drivers:* Socio-economy

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### **Abstract**

Water is essential for life. This element supposes also a determinant factor in the economy and ecology of the different regions. But water not only has influence in the human life, humans also affect to water cycle. The human activity is responsible of the climate change by which the Mediterranean region is being affected by drought and water shortage. Water shortage in Mediterranean countries is becoming an essential question.

The domestic sector accounted for about 24 percent of total water withdrawn in Europe in 2000, which is about 7,320,00ML. In fact, toilet flushing supposes 30% of the domestic use of urban water. The consume of such amount of water could be avoided using dry toilets, it is calculated saving of 50L/cap/day. In addition, it is estimated more than 20 million citizens without access to a safe sanitation in Europe. This situation is critical in rural areas of eastern European, where the most common system in these areas usually consist of pit latrines and septic tanks. Dry toilets are common in Nordic countries but their rustic technology makes them unacceptable in urban or large communities.

At present dry toilets implies several factors, such as unpleasant odours and the manual manipulation of the latrine waste, which makes them unviable in most of urban environments. Also, there are other problems of drytoilets such as struvite formation on pipe connections. But this situation can be changed by applying the technical innovations that will be developed in this project. In addition, the project's success will allow the possibility to save important drinking water (1,875L/cap/year). This will be of essential importance in the Mediterranean countries, where the drought menace is each time more obvious. The use of dry toilets in rural areas with poor infrastructure will have safe sanitation systems to citizens DRYCLOSET project will develop a new dry toilet with a biocide toilet, low bad odours emissions and low maintenance.

## **003715- ECOMANAGE**

Integrated Ecological Coastal Zone Management System

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*Funding scheme:* STP (Specific Targeted Research Project), FP6

*Project duration:* 12/1/2004 - 5/31/2008

*EC contribution:* € 1 400 000

*Policy drivers:* Socio-economy

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### **Abstract**

Ecologists and social scientists have only recently realized that in order to fulfil the requirements for sustainable development, human beings have to be explicitly incorporated as structural components of ecosystems. Indeed, the clear distinction between natural and managed ecosystems is slowly fading-away, leaving us with the task of re-writing ecological theory in order to incorporate anthropogenic pressure.

New concepts, necessary to understand these eco-social systems, will be assessed in this project, based on a modular approach to ecosystem modelling. This approach comprises physical and ecological models for computing transport and biological activity in the aquatic system. Anthropogenic influence on the drainage basins, determined by satellite data and models for ground and surface waters, will be translated through boundary fluxes to the aquatic system. These tools will cover problems and key issues identified in study areas. Environmental state and impacts will be translated into indexes to be incorporated on a spatial decision support system backed in the DIPSR decision framework. Local stakeholders will help establishing study scenarios and indexes for social-economic analyses.

The project will focus on three different coastal zones. These sites include an estuary with mangroves in Brazil, a fiord in Chile and a large estuary with wide intertidal areas in Argentina. These systems host very important economical activities (including two important ports) and have been studied by major universities and/or research institutes in the respective countries.

The major products of the project are: a knowledge base on estuarine and basin management, for answering basic to intermediate level questions, and a spatial decision support system to provide guidelines for restoration and sustainable development of these ecosystems. Technologies similar to those recommended by EU Urban Waste Water Directive will be set up.

## **500345- ECOTARGET**

New and innovative processes for radical changes of the European pulp and paper industry

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*Funding scheme:* IP (Integrated Project), FP6

*Project duration:* 11/1/2004 - 12/31/2008

*EC contribution:* € 10 000 000

*Policy drivers:* Socio-economy

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### **Abstract**

The overall objective of ECOTARGET is to enhance the competitiveness of the pulp and paper sector (including its suppliers) of Europe while at the same time improving the eco-efficiency. This IP intends to achieve major improvements in processing and do it in a way that facilitates efficient deployment of results. It will seek to develop significant improvements by applying a broad multidisciplinary approach. The work will be based on a set of selected novel ideas: reduction of the energy consumption in mechanical pulping, improving raw-material efficiency by using separation of fibre flows in the process, improvement of product properties by producing layered paper sheets and elimination of bottlenecks in the use of recycled fibres. The goals, besides improving product quality and production economy, are to achieve for each breakthrough idea improvements by at least 20% in at least one of the factors energy consumption, raw material utilization, fresh water consumption, waste production and emission measured per unit of production. The work planned means performing a series of subprojects of high potential and high risk directed to an industry of high complexity and high capital intensity. It is therefore necessary to join all the best and relevant resources in research. In order to maximize the chance of success it is essential to have breadth in the partnership and thus high degree of multidisciplinary, including basic scientific as well as applied engineering disciplines. It is also necessary to work in consort with relevant university departments, research institutes and companies. The partnership involves leading industrial companies producing pulp and paper as well as companies supplying this industry with machinery, chemicals etc. The partnership also involves the major European research institutes and leading universities active in fields of relevance. The partnership thus allows work from fundamental scientific #

## **282882- ECOWATER**

Meso-level eco-efficiency indicators to assess technologies and their uptake in water use sectors

[environ.chemeng.ntua.gr/ecowater/Default.aspx?t=221](http://environ.chemeng.ntua.gr/ecowater/Default.aspx?t=221)

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*Funding scheme:* CP (Collaborative Project), FP7

*Project duration:* 11/1/2011 - 10/31/2014

*EC contribution:* € 2 499 489

*Policy drivers:* Socio-economy

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### **Abstract**

EcoWater will address the development of meso-level eco-efficiency indicators for technology assessment through a systems' approach. The effort will focus on enhancing the understanding of the interrelations of innovative technology uptake in water use systems, and their economic and environmental impacts. Research will address the selection of indicators appropriate for assessing system-wide eco-efficiency improvements, the integration of existing tools and assessment methods in a coherent modelling environment, and the analysis and characterisation of existing structures and policies. The development of an analytical framework is foreseen, to support: (i) Systemic environmental impact assessments, (ii) Economic assessments, (iii) Analysis of value chains and actor interactions, and (iv) Technology implementation and uptake scenarios. Eight Case Studies will be developed, in different systems and sectors of high economic relevance and environmental impact, addressing water use in agricultural, urban and industrial sectors. Two Case Studies will focus on shifts from rainfed to irrigated agriculture and innovations that can reduce water and energy footprints and production inputs. Two Case Studies will address sustainable and economically efficient water supply and wastewater management in urban areas. Four Case Studies will concern meso-level eco-efficiency improvements from innovative technologies in water systems for the textile industry, for energy production, for dairy production and in the automotive industry. The main outputs include a validated and tested methodological framework, an integrated toolbox for systems' eco-efficiency analysis, and policy recommendations for technology uptake and implementation. For ensuring wide dissemination and applicability, the project foresees activities to address different target audiences and to develop operational science-industry-policy links at the level of Case Studies and at wider EU and international scale.

## **233758- E-FREIGHT**

European e-freight capabilities for co-modal transport

[www.efreightproject.eu/](http://www.efreightproject.eu/)

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*Funding scheme:* CP (Collaborative Project), FP7

*Project duration:* 1/1/2010 - 6/30/2013

*EC contribution:* € 8 389 250

*Policy drivers:* Socio-economy

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### **Abstract**

The key issues that will be addressed in e-Freight are:

1. Intra-European trade is complicated due to disconnected logistic chains. This hindrance conflicts with the legitimate ambition of achieving a European maritime transport space without barriers. Linked to these issues is the broader need for simplification and harmonisation of regulatory requirements and accelerated development of EU and National Single Windows to streamline traffic and cargo reporting to authorities particularly in the context of co-modal transport. Further, safety and security issues need special attention, particularly in establishing efficient collaboration between authorities and transportation stakeholders to improve the development of capabilities for proactive and remedial measures to protect the environment as well as the security of freight transport networks.
2. Optimisation of road, rail, and waterborne transportation resources to achieve co-modality requires improved ways for transport stakeholders to establish co-ope

## **015410- ELMAA**

Integrated water management of Mediterranean phosphate mining and local agricultural systems

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*Funding scheme:* STP (Specific Targeted Research Project), FP6

*Project duration:* 9/1/2005 - 4/30/2009

*EC contribution:* € 1 600 000

*Policy drivers:* Socio-economy  
Water Scarcity and Droughts

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### **Abstract**

The phosphate industry is a major contributor to the economy of some Medit. countries (Morocco, Jordan, Tunisia, etc). Large volumes of water are required by the mining industry from areas where water resources are scarce or limited. Water scarcity may be worsened by a degradation of the water quality after phosphate processing.

The pressure on water is liable to hamper the development of phosphate industry and results in competition with other water reliant economic sectors such as agriculture or tourism. The El'Maa project meets this strategic need: to reduce tensions on water resources (quantity and quality) at regional scale; to consolidate the sustainable development of the phosphate mining industry. El'Maa will focus in priority on the interface between the mining and agricultural sectors, given the economic and social importance of the latter sector. The general objective of El'Maa is to provide the phosphate industry and the water managers with a methodology for the integrated management of water resources in the zone of influence of the mine sites and supply technological innovations to reduce the pressure on water resources, in mining (e.g. use of municipal wastewater in phosphate process) and agricultural practices (e.g. use of phosphate process water). This methodology will integrate a customised Decision Support System with a realistic representation of water management system, integrating technical, economic, social and environmental dimensions. El'Maa DSS will serve i) to identify and rank the factors controlling water management and sharing; ii) to optimize the water consumption and re-use; iii) to measure the potential impact of changes in the mining and agricultural practices related to technological innovation or evolutions in the institutional or regulatory framework. It is accordingly possible for the phosphate industry as well as the institutional players to rank the actions to be initiated and hence to propose action plans.

## **029483- EUROMEMBRANES**

European Conferences and Training in Membrane Technology

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 4/1/2006 - 3/31/2010

*EC contribution:* € 261 700

*Policy drivers:* Socio-economy

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### **Abstract**

This proposal plans a series of 5 events on Membrane Technology. Membranes have established applications in the food, petrochemical and pharmaceutical industry, water desalination, medical processes like hemodialysis and has gain an increasing relevance in the field of renewable energy. 1. Conference 'New Materials for Membranes' (to be organised by GKSS research centre in 2007). The idea is to integrate new advanced materials in the membrane technology, bringing new breakthroughs in the field. Three summer schools are planned with the character of training, enabling young scientists to benefit from the experience of leading researchers: 2. Summer School 'Smart Materials' (to be organized by IMC/ICT Prague in 2006) will give an insight on fundamental aspects of membrane preparation using self-assembly, nanocomposites and other new materials for separation techniques and energy. 3. Summer School 'Membranes for reactive processes' (to be organized by the University of Genoa 2007) will include membrane preparation, characterization and application in fuel cells and catalytic membrane reactors. 4. Summer School 'Solvent resistant membranes' (to be organized by the Catholic University of Leuven in 2008) will focus on applications in the chemical and pharmaceutical industry. 5. Workshop 'Advances in Membrane Technology' (to be organized by GKSS in 2008) will focus on different aspects of membrane technology, presented mainly by highly qualified women scientists in the membrane field, stimulating the participation of young female students. The workshop will have a practical part with technical machines for membrane preparation and characterization, module manufacture, etc and will offer lectures on how to develop skills in communication, meeting moderation, project preparation. The coordination will be in charge of GKSS and will have a narrow interaction with the Network of Excellence NanoMemPro and the European Membrane Society for publicity and selection.

## **020188- FREIGHTWISE**

Freightwise - Management Framework for Intelligent Intermodal Transport

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*Funding scheme:* IP (Integrated Project), FP6

*Project duration:* 11/1/2006 - 4/30/2010

*EC contribution:* € 7 930 133

*Policy drivers:* Socio-economy

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### **Abstract**

FREIGHTWISE's overall objective is to support the modal shift of cargo flows from road towards intermodal transport using short sea shipping, inland waterways and rail; facilitated by improved management and exchange of information between large and small stakeholders across all business sectors, transport modes and administrations. The project aims to show that using the project results and concepts (based on the use of open, interoperable systems), competitive intermodal transport operations may effectively be implemented and operated.

Based on extensive experience from development and operation, a harmonised framework (covering managerial and technical aspects) will be established as a basis for development and integration of the relevant, low cost ICT components and associated services supporting competitive intermodal solutions with safe, secure and environmentally friendly transport. FREIGHTWISE is user driven and the development will be based on real business cases across Europe.

## **223996- GENESIS**

GENERIC European Sustainable Information Space for Environment

[www.genesis-fp7.eu/](http://www.genesis-fp7.eu/)

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*Funding scheme:* CP (Collaborative Project), FP7

*Project duration:* 8/31/2008 - 8/31/2011

*EC contribution:* € 8 898 432

*Policy drivers:* Socio-economy  
Ecological Status

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### **Abstract**

The GENESIS Project has the objective of providing Environment management and Health actors with an innovative solution based on advanced ICT. Relying on interoperability standards and harmonization process, GENESIS helps to constitute complex information networks, by combining benefits of various information systems with a collaborative systems approach. The proposed generic solution allows easy deployment and customization to thematic needs on a wide range of applications, at regional, national or Europe levels for various thematic fields. The main benefits of GENESIS solution are two-fold :-to improve and facilitate actors daily practices in relation with the management of environmental data; -to perform an essential step in the deployment of the Single Information Space for the environment in Europe. The GENESIS solution will be validated through dedicated scenarios addressing thematic fields of Air Quality, Water Quality and their impact on Health. For the final benefits and information of European citizens, the needs of Environment and Health stakeholders are covered through fundamental services like : -environment monitoring, -multi-criteria finding of the information; -visualization and combination of static or near-real-time information; -fusion of various sources of environmental data; -correlation between environmental with health data; -support of decision making processes; -support of the risk management and response to crisis; -near-real-time information of citizens. The GENESIS generic solution is open and sustainable as based on de facto and emerging standards (OGC, OASIS, INSPIRE,...). Moreover, the GENESIS project development integrates current state of the art and innovative researches of major EC or ESA projects. GENESIS project represents an important step in operational environmental management in Europe thus paving the way to an effective wide deployment of the solution as part of the future Single European Information Space for Environment.

## **517696- GEWAMED**

### **MAINSTREAMING GENDER DIMENSIONS INTO WATER RESOURCES DEVELOPMENT AND MANAGEMENT IN THE MEDITERRANEAN REGION**

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*Funding scheme:* CA (Coordination Action), FP6

*Project duration:* 2/15/2006 - 8/14/2011

*EC contribution:* € 1 249 365

*Policy drivers:* Socio-economy

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#### **Abstract**

The project plans to build an extensive knowledge base for mainstreaming gender dimensions into IWRM. To achieve this objective the project will build a regional network and establish 6 national ones using Internet technology in, at least 6, countries of the South East Mediterranean Region (SEMR). The regional network will be essentially a mean for exchanging experiences, disseminate results and allow for enhanced coordination among national projects' activities and participants. The project will improve the cooperation and dialogue among partners and external organizations interested in this subject through the participation in 3 regional workshops and an International Conference that will be held at the end of project life. The project will interact with other MPC projects, like MELIA, INECO and WADI, that also focus on information, knowledge management to promote coordination and exchange of experiences.

It is also expected that the project will contribute to improve the coordination of gender activities in an IWRM context and to disseminate information, particularly in the rural areas. For this purpose GEWAMED will establish a National Central Focal Points in each SEMR country that will interact with the other collaborating institutions involved in the water sector. This will be not only a coordination mechanism but also an important mean to collect and disseminate gender information spread among many institutions. One of the most distinctive feature of GEWAMED is precisely the establishment of a knowledge base for acquiring and disseminating gender information at national level.

The project may also contribute to the adoption of national policies and other related instruments (strategies, approaches, guidelines, incentives and legislation) by involving decision makers and politicians in the processes of mainstreaming gender dimensions in IWRM. For this purpose the project will organize at least one national policy seminar in each SEMR country.

## **232501- HYCON**

Hygienic and Energy Optimized Conveyor Belt for the Slaughtering Industry

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*Funding scheme:* BSG-SME (Research for SMEs), FP7

*Project duration:* 10/1/2009 - 3/31/2012

*EC contribution:* € 1 320 783

*Policy drivers:* Socio-economy

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### **Abstract**

The HYCON proposal aims at developing a hygienic and energy optimized conveying system with a validated automated cleaning procedure. This will significantly increase conveyor hygiene in the foodstuff sector and especially so in the meat- and poultry-industry. The hygienic goals will be achieved by designing the system based in hygienic design guidelines and by developing a new, superior belt material which combines with an automated cleaning system for significant increases in hygiene and foodsafety. The belt will see improvements to state-of-the-art in impact and cut resistance and at least 50% improved durability and antifouling properties as compared to conventional belts. Furthermore the developed system will focus on decreasing use of energy, water and detergents by innovations in selected conveyor components: optimized drum motor design and an automated transportable cleaning system (CIP system). The market opportunity for the SME consortium - group of European suppliers of conveying solutions and components to the conveying industry - lies in the provision of a new and hygienically optimized conveying system and its components making for a product that is significantly better than the state-of-art solutions currently available. The major innovation and point of market differentiation of the HYCON product will be considerably better hygiene and downtime in combination with reductions in use of energy, water and detergents, a combination not seen in current SOA conveying technology or products. For the meat and poultry industry the developed system presents major benefits in terms of lowering the time needed for cleaning by up to 33% and the cost needed for this by 50%. This makes for a more efficient conveying system since the downtime for cleaning is minimized and production time is increased accordingly.

## **286551- HYDRACDEM**

Demonstration of Low-Energy Water Hydraulic Actuator System for Valves in the Sanitary Industry

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*Funding scheme:* CP (Collaborative Project), FP7

*Project duration:* 6/1/2011 - 5/31/2013

*EC contribution:* € 1 108 390

*Policy drivers:* Socio-economy

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### **Abstract**

The HYDRACDEM project will demonstrate the energy savings and cost effectiveness of switching from pneumatic actuators to water-based hydraulic actuator systems in the sanitary industry. The project represents a major technological breakthrough in the development and use of actuators in the sanitary industry in particular, but could even revolutionize the use of actuators in the entire processing industry. A water hydraulic actuator and remote control system represents a game-changing product in the sanitary industry and the hydraulic actuator system clearly goes beyond current state of the art in the area.

The HYDRACDEM project will demonstrate immense positive end-users impact in the sanitary Industry through capital expenditure savings and reduced energy costs. In addition the demonstration will show that the hydraulic actuator system can be fitted to standard valves in the sanitary industry and perform to end-user specifications and in accordance with existing regulations and safety norms (including sterility).

In a wider perspective, the EU at large will benefit through the pursuit of large energy savings and reductions in CO<sub>2</sub>.

In addition the hydraulic actuator system to be demonstrated in the HYDRACDEM project will increase work safety and processing facility by eliminating the hazards associated with pneumatic valves.

Finally, the project contributes to the innovation and product developments in four European SMEs who utilizes each other strength and know how to push the boundary within the manufacturing industry - an industry which is otherwise under extreme pressure from globalization and China in particular.

The HYDRACDEM project is a continuation of the HYDRAC project (project no. 222313 co-funded by the EU through the 2007 Research for SME Call).

## **212423- HYLOW**

Hydropower converters with very low head differences

[www.hylow.eu/](http://www.hylow.eu/)

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*Funding scheme:* CP (Collaborative Project), FP7

*Project duration:* 3/1/2008 - 2/29/2012

*EC contribution:* € 3 633 013

*Policy drivers:* Socio-economy

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### **Abstract**

Small hydropower with very low head or pressure differences below 2.5 m and hydraulic power ratings of 50 to 1000 kW is a significant renewable resource, with an estimated unused potential in rivers alone of e.g. 600 to 1000 MW in the UK and more than 500 MW in Germany. The economically and ecologically efficient utilisation of this hydropower bracket still constitutes an unsolved problem since conventional turbines (Kaplan or Cross flow) are not cost effective, and since they are considered to have a negative ecological impact. In order to open up this hydropower bracket for exploitation, an innovative solution - the hydrostatic pressure turbine - was developed. This novel hydraulic machine utilises differential hydrostatic pressures; with theory and initial model tests indicating high theoretical efficiencies for low head differences. It rotates at slow speeds and operates under atmospheric pressure with a continuous bed, thus minimising negative impact on fish and allowing for unhindered sediment and fish passage. Initial work indicated significant development potential, whilst the expected structural simplicity promises increased cost effectiveness. Three configurations will be investigated for different applications in rivers with a head difference, for free stream situations and for energy generation in water supply systems. The configurations will be optimised using a combination of small and large scale model tests, theoretical and numerical modelling. The ecological impact will be assessed at every step of development, and fed back into the R/D process to achieve an ecologically effective design. In the absence of appropriate testing facilities, large scale tests will be conducted in natural rivers scenarios, adding to the realism of environmental impact assessment. The project is expected to develop, and prove, novel economically and ecologically effective hydropower converters for applications with head differences below 2.5 m.

## **266514- IJERA**

Integrating Jordan into the European Research Area

[www.eu-jordannet.eu/](http://www.eu-jordannet.eu/)

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*Funding scheme:* CSA (Coordination - or networking - action), FP7

*Project duration:* 1/1/2011 - 12/31/2012

*EC contribution:* € 498 544

*Policy drivers:* Socio-economy

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### **Abstract**

The IJERA project is aiming at strengthening capacities of the Environment Monitoring and Research Central Unit at The Royal Scientific Society (EMARCU/RSS) in Jordan while realizing it as an international centre of excellence, and reinforcing the cooperation capacities and research activities in Jordan's water sector by defining water research priorities to respond to socio-economic needs, facilitating participation in European water research initiatives and inclusion in Euro-Mediterranean Research and Innovation Area. The specific objectives of IJERA project are:

☐EMARCU's Cooperation Capacities Reinforcement, ☐ Water-Related Research Results Dissemination, ☐ Internationalization and Coordination between Research and Business Sectors,☐ Enhancement of EU-Jordan S&T Partnerships in Water Research,Capacity Building for Solving Specific Water Issues,☐ EMARCU's Strengthening,Setting Up Jordan's Environmental NCP

The project thus addresses current Work Programme for International Cooperation to reinforce the cooperation capacities of research centres located in the ENP countries and contributes to the European international co-operation in science and technology strategy implementation, while strengthening the international dimension of the ERA and improving the framework conditions for international S&T cooperation. The main impact of IJERA will be increased capacities of the EMARCU centre and the structuring and enhancement of the existing EU-JO support landscape in the domain of Water S&T cooperation through a threefold way: (i) by supporting the participation of Jordan in the FP7 in water research area, (ii) knitting together all relevant support schemes, and (iii) facilitating both the uptake of common identified water research areas and the monitoring of the performance and impacts of this cooperation. The IJERA consortium brings together 4 Jordanian and EU organisations representing a well-defined mix of competencies and expertise.

## **515248- INDIAPROPERTYRIGHTS**

Property rights theory and reform of public infrastructure (electricity, water) in developing countries Private-public Partnerships and creation of property rights

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 12/1/2004 - 11/30/2006

*EC contribution:* € 151 675

*Policy drivers:* Socio-economy

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### **Abstract**

In the continuity of our earlier works, we propose to deepen the analysis of the theoretical link between property rights (especially control rights) and the informational structure in public infrastructure organizations in developing countries. The analysis will revolve around the concepts of « good of unknown value" (Victor Goldberg) and of "creation (rather than allocation) of property rights". This allows specifying the current analysis (mostly based on incentives) of public-private partnerships (PPP). For this, we study infrastructure organisations (utilities of electricity, as well as water and sanitation) of developing countries. Those organisations are generally deficient in terms of definition of property rights, linked with an informational deficiency. We focus on two practical issues, mutually linked: -Which type of private information (and securing of the latter) does the various modes of PPP generate? For which effect on the value creation/valuation of infrastructure organisations/utilities? In an analytical framework built around the dialectics creation of information/creation of rights, how do PPPs improve the central issue pertaining to productive efficiency: the coordination between infrastructure development and management? A direct practical application will focus on water distribution in metropolitan areas of India. Improved coordination necessitates re-defining the control rights of the various organisations in charge, but also clarifying some common property rights, which is a rarely underlined dimension of this problem for developing countries: in India, even in Delhi or Calcutta, share of locally extracted underground water is superior to 20%; this figure peaks at 60% for Madras. Theoretical analysis will link up modelling with real options and valuation after implementation of property right sand information systems to secure these rights.

## **515919- INDUWASTE**

Management and remediation of hazardous industrial wastes in the Western Balkan Countries

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*Funding scheme:* SSA (Specific Support Action), FP6

*Project duration:* 7/1/2005 - 12/31/2006

*EC contribution:* € 180 000

*Policy drivers:* Socio-economy

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### **Abstract**

The project aims at proposing management and remediation practices for hazardous industrial wastes in the 5 targeted Western Balkan Countries (WBC) considering their effects on the environment and on human health. It concerns principally wastes from coal mining and coal processing plants, aluminium industry, and phosphate industry. The primary ore for these industries contains toxic substances that are concentrated in the industrial wastes. The harmful elements from industrial wastes may come in contact with the general public when they are dispersed in air or water, when they are dispersed on cultivated soils, or when they are used for concrete building products, or as disposal in engineered surface impoundments and landfills.

The project will consider the environmental and the health risk resulting from the wastes and their by-products in their immediate neighbourhood - as it was a common use in the centralized economy to build living areas close to the plants - , the risk from dispersal in the environment particularly through surface and groundwater, up to the absorption of toxic substances by agricultural and animal products and the contamination of the ecological chain.

The project will propose management and remediation practices, aiming at minimizing risk at waste disposal sites, in accordance with EU legislation, as well as an adapted legislation for waste management and environmental protection in the WBC, referring to the existing Directives of the European Union.

The results of the project will be distributed a.o. through: a project website on the Internet, the organisation of a short course on waste management practices, by making risk assessment methodology and best practices available to students, civil servants and the society, by promoting the establishment of an environmental network in the WBC, initially comprising the project partners, later extended to additional partners.

## **517673- INECO**

Institutional and Economic Instruments for Sustainable Water Management in the Mediterranean Region

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*Funding scheme:* CA (Coordination Action), FP6

*Project duration:* 7/1/2006 - 6/30/2009

*EC contribution:* € 739 987

*Policy drivers:* Socio-economy

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### **Abstract**

The objective of INECO is to establish a Mediterranean network of research institutes, public authorities and stakeholders for coordinating research and analysing decision making practices on the application of institutional changes in the water sector. INECO encompasses a series of coordination activities aiming to: a) Promote the exchange of good practices, information and research between participating institutes regarding the role of institutional and economic instruments in sustainable and efficient water use; b) Enhance synergies between the partners of the consortium and other stakeholders through the performance of studies and the organisation of participatory workshops for assessing the efficiency of currently applied water management practices and validating alternative governance structures, economic tools and policies, and c) Formulate guidelines for alternative institutional arrangements, able to promote IWRM through the application of appropriate and socially acceptable economic instruments. The adaptive guidelines will be integrated in a web toolbox, able to support the network beyond the lifetime of the project.

## **514969- INTEGRATION 4 WATER**

Initiative 4 Facilitating integration of Research Potential from the Accession Candidate countries with the Potential of the Member States in the Area of Water Cycle including Soil Related Issues of t

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*Funding scheme:* SSA (Specific Support Action), FP6

*Project duration:* 5/1/2005 - 12/31/2006

*EC contribution:* € 246 015

*Policy drivers:* Socio-economy

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### **Abstract**

The project is aimed at supporting integration of ACC and MS research teams in ERA through facilitating participation of ACC research organizations in FP projects in the area Water cycle including soil-related aspects and actively support implementation of the workprogramme of sub-priority 1.6.3. The goals will be achieved through: development of a multifunctional, internet-based information service aimed as a "one-stop-shop" for dissemination and exchange of information on water research conducted by ACC and MS organizations and for project dissemination, database of ACC organizations incl. SMEs active in water research, structured for FP projects development needs and combined with a dedicated partner search engine accessible through the service web page; 3day event comprising 3 concurrent workshops with panel sessions addressing 3 topics from the area Water Cycle including soil related aspects: hydrology and climate change, ecological impact of global change, soil functioning and water quality, integrated management strategies and mitigation technologies. Specific topics and number of panel sessions will be tailored to the 4 call of priority 1.1.6.3. The event is aimed at training ACC researchers in the strategy of developing proposals (especially IP/NoE) with ACC potential integrated as contribution and forming ACC/MS Topical Expert Groups as project subconsortia capable to contribute to and/or develop FP proposals on selected panel sessions topics. Workshops participants will be 117 representatives of ACC organizations selected from the proposed database. Moderators will be selected 9 ACC and 9 MS researchers - recognized European leaders in water research. Project direct outcomes: an internet service and ACC organizations database are designed as sustainable mechanisms and will be maintained upon project completion together with the Expert Groups and the dedicated web pages set-up for them as platform to sustain ACC/MS Groups integration.

## **035253- INTERRISK**

Interoperable GMES Services for Environmental Risk Management in Marine and Coastal Areas of Europe

<http://interrisk.nersc.no/>

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*Funding scheme:* STP (Specific Targeted Research Project), FP6

*Project duration:* 9/1/2006 - 8/31/2009

*EC contribution:* € 2 462 000

*Policy drivers:* Socio-economy

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### **Abstract**

The overall objective is to develop a pilot system for interoperable GMES monitoring and forecasting services for environmental risk and crisis management in European marine and coastal areas. This pilot, the InterRisk system, will consist of a web portal offering access to all services, a suite of components for registration, maintenance and discovery of services, and a network of services in Norwegian, UK/Irish, French, German, Polish and Italian coastal waters. The consortium will capture and analyse users' and service providers' requirements for sustainable GMES services, and design an open system architecture to accommodate the identified needs, based on established GIS and web services protocols, and compliant with INSPIRE recommendations. Ontologies and application schemas for the targeted application domains, monitoring and forecasting of oil spills, harmful algal blooms, eutrophication and environmental degradation, will be developed to enable data and metadata harmonisation between different service providers. Services will be implemented by a group of service providers in the consortium and integrated in the InterRisk system. The services will be based on satellite data, in situ data and numerical models needed to monitor and forecast marine environmental degradation and crisis events. Both basic services, such as satellite data processing, in situ data delivery, model simulations, metadata catalogues, and complex services that will use several of the basic services, will be developed. Examples of complex services are oil spill fate prediction and water quality monitoring. The network of InterRisk services will be embedded in the ESA Service Support Environment (SSE), which will provide the underlying infrastructure for the InterRisk system. Incremental development of services and SSE components will be used to facilitate rapid feedback from users and service providers, leading to improved products and services that can be sustained after the project.

## **211873- ISSOWAMA**

Integrated Sustainable Solid Waste Management in Asia

[www.issowama.net/](http://www.issowama.net/)

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*Funding scheme:* CSA (Coordination - or networking - action), FP7

*Project duration:* 1/1/2009 - 6/30/2011

*EC contribution:* € 989 522

*Policy drivers:* Socio-economy

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### **Abstract**

The general inadequate, when existing, methods of collection and disposal of solid waste in most Asian cities are causing important environmental and social harms, as human diseases spreading, environmental pollution and ground and water pollution. In order to raise awareness, promote an adequate waste collection and treatment system and the economic growth of this activity sector in a technological efficient and sustainable way, new waste management systems must be established, which also take into account the informal sector. This integrated approach should comprise technical, environmental, legal, socio-economic and financial aspects, involving the key actors at different levels to ensure an effective implementation. The proposed project aims to bring together experts and stakeholders in the field of solid waste management in Asian developing countries and Europe. The project will promote international cooperation between research organisations, universities, and social and governmental stakeholders in a European and Asian context (local waste processors, local municipalities and policy makers, local NGOs representatives, etc). A solid waste management expert and research co-ordination platform, and an expertise network, will be established in order to co-ordinate, assess and guide suitable research and strategic activities with the aim of identifying aspects like cost-effective treatment and sorting technologies, environmental impacts, gaps in technical knowledge and socio-economic and policy barriers to further execution. The network will also propose directions for futures research and for local implementation. The general aim of the proposed network will be to develop a variety of innovative, adaptable and replicable approaches to a more efficient solid waste management, integrating appropriate low-cost and efficient technologies with community-based management and their relevant governance, institutional frameworks and socio-economic constraints.

## **223925- LENVIS**

Localised environmental and health information services for all:  
User-centric collaborative decision support network for water  
and air quality management

[www.lenvis.eu/](http://www.lenvis.eu/)

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*Funding scheme:* CP (Collaborative Project), FP7

*Project duration:* 8/31/2008 - 1/31/2012

*EC contribution:* € 2 232 223

*Policy drivers:* Socio-economy  
Science-policy Interface

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### **Abstract**

From 2008-09-01 to 2012-01-31 The main goal of the LENVIS project is to develop an innovative collaborative decision support network for exchange of location-based environmental and health services between all stakeholders, for enhanced capacity to assess population exposure and health risks and better management of the concerned ecosystems. LENVIS will include health indicators as integral part of the environmental management... (+)

#### **Objective**

The main goal of the LENVIS project is to develop an innovative collaborative decision support network for exchange of location-based environmental and health services between all stakeholders, for enhanced capacity to assess population exposure and health risks and better management of the concerned ecosystems. LENVIS will include health indicators as integral part of the environmental management.

There is a growing demand for real time and integrated environmental and health risk information. Provision of such location-based services linked to the state of the environment at particular geographical locations (addresses) is necessary for improving the quality of life of all people. This is essential for mitigation of environmental-related health threats associated to water quantity and quality, and outdoor air pollutions.

LENVIS project aims to fill the existing gap between environmental management and the health management systems. This will be done by developing a generic ICT solution that combines service-oriented-architecture (SOA) and user-centric approach (peer-to-peer network, P2P) by fusion of location-based environmental and health data, information and modelling services. This novel collaborative peer-to-peer network, as an integral part of the Single Information Space for the Environment in Europe, will be validated through test cases on

fresh surface water and outdoor air quality in the Netherlands, Portugal and Italy.

LENVIS project will facilitate collaboration between different stakeholders, such as environmental protection agencies, health institutions and service providers, policy makers, citizens in general and environmental communities in Europe.

## **003717- LOGO WATER**

Towards effective involvement of local government in Integrated Water Resources Management (IWRM) in river basins of the Southern African Development Community (SADC) region

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*Funding scheme:* CA (Coordination Action), FP6

*Project duration:* 1/1/2005 - 3/31/2008

*EC contribution:* € 1 148 852

*Policy drivers:* Socio-economy

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### **Abstract**

Following the wide recognition of local government as a key actor in Integrated Water Resources Management (IWRM) LoGo Water aims at pooling the latest research available on IWRM in river basins of the SADC region for developing a strategy local governments can apply to effectively engage in IWRM.

To this end, a Consortium of leading African and European researchers and major stakeholders in IWRM will examine existing scientific findings and practical experiences regarding local government involvement in IWRM and further build on this knowledge in consultation with additional partners. Here, focus will be on the actual end-users of the project results: the local governments. The Consortium will therefore enter into a special project relationship with eight selected cities, towns or communities in the Limpopo river basin, the model region for the project. Main deliveries of the project will be: (1) a strategy through which local government can become an effective player in IWRM; (2) self-instruction material providing local governments with the necessary knowledge and know-how to advance in IWRM; (3) detailed proposals for pilot projects by and for the eight associated local governments (4) an implementation workshop for further outreach; (4) policy options for future research; (5) a set of recommendations to major IWRM stakeholders concerning the necessary frameworks for improving the local government's role in IWRM .In addition to distributing the project results via a website and printed material, an international seminar will be dedicated to create further awareness among relevant multipliers in the SADC region. LoGo Water contributes to 'Integrating and Strengthening the European Research Area' as part of the INCO Work Programme by enhancing the co-operation of leading European research institutions with their counterparts in Southern Africa as well as with a range of other major institutions relevant to reaffirming the importance of IWRM in this region

## **213824- MED-CSD**

Combined solar power and desalination plants: technico-economic potential in Mediterranean Partner countries

[www.med-csd-ec.eu/eng/](http://www.med-csd-ec.eu/eng/)

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*Funding scheme:* CSA (Coordination - or networking - action), FP7

*Project duration:* 6/1/2008 - 5/31/2010

*EC contribution:* € 999 960

*Policy drivers:* Socio-economy

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### **Abstract**

The growing economies in the southern and eastern Mediterranean area increasingly need affordable and efficient energy and water for sustainable development. Hybrid solar/fossil thermal power plants with combined sea water desalination based on concentrating solar power technology (CSP) offer a unique, cost efficient solution to the growing energy and water demand. Hybrid solar/fossil operation offers a smooth transition from the fossil fuel to a solar economy and provides firm power capacity to the grid with up to 8000 full load operating hours per year. The main objective of the MED CSD project is the assessment of the technico-economic potential of CSP for electricity and desalination in Mediterranean region, particularly the Mediterranean Partners Countries (MPCs) (WP3) based on a technology review and considering the results of past and on-going studies and projects (Aqaba project as a reference) (WP1) and attained through the realization of feasibility studies in Mediterranean countries and an impact assessment analysis (WP2). WP1 is the selection of CSP and desalination configurations suitable for application in the Southern and Eastern Mediterranean region, using information on state of the art of CSP and desalination, specifically engineering performed for Aqaba hybrid CSP desalination plant, and taking into consideration the specific situation and needs where the feasibility studies will be performed. In WP2, a generic feasibility study will be defined and applied to Algeria, Italian Island, Egypt, Morocco and PNA including an impact assessment analysis for a broad dissemination. WP3 will relate to the assessment of the technico-economic potential of CSP for electricity and desalination in Mediterranean Partner Countries (MPCs). It will be followed by an Action Plan and dissemination of the results (WP4).

## **509112- MEDITATE**

MEDiteranean Development of Innovative Technologies for intergAted waTer managEment

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*Funding scheme:* STP (Specific Targeted Research Project), FP6

*Project duration:* 5/1/2004 - 10/31/2007

*EC contribution:* € 1 646 546

*Policy drivers:* Socio-economy  
Water Scarcity and Droughts

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### **Abstract**

MEDITATE aims at the development of a water management support system at the Mediterranean catchment level, integrating the use of alternative water resources such as karst submarine springs, seawater or brackish water desalination and water reuse, for water scarcity management. Innovative technologies for submarine springs, from survey using an autonomous underwater vehicle, monitoring at the spring level till capture prototype, will be developed mainly in this project.

Economical and environmental study of submarine springs will be conducted and taken into consideration. Submarine springs study will also be used to determine the real water resource potential at the coastal karst aquifers in three Mediterranean catchments. The submarine springs could represent important alternative water resource as it has been reported during the last 30 years, but without serious scientific arguments. New technology for characterising the submarine springs will help to infirm or confirm this hypothesis. Low cost and low energy desalination plants for temporary use and salinity variability of submarine springs water will not be developed within MEDITATE, but designed based on feasibility analysis. A general analysis of desalination cost for various conditions will be taken into account in the socio-economic analysis for the management system. In the same manner, a review of water reuse will be carried out, taking into consideration environmental and health problems, technical and cost problems in order to have serious data to be considered in water management scenarios. The water management support system will bring stakeholders in a decision making process considering water visions for 2025. The WMSS will provide set of scenarios, giving safe water yield, based on the characterisation and hydrological modelling of four catchments. This WMSS will allow integrating different types of knowledge inclusive all social actors, in a decision-making process.

## **042609- MICRO-GMAP**

Multipurpose Tuneable Microwave Plasma Source of Germicidal Modified Atmospheric Packaging for Food Industries

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 10/1/2006 - 3/31/2009

*EC contribution:* € 349 232

*Policy drivers:* Socio-economy

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### **Abstract**

Food and drink is the major industrial sector in the EU, dominated by SMEs and threatened by erosion of world markets and slowing growth. Continued wealth creation requires innovation built on a strong scientific and engineering base for training, new knowledge and innovation to support the sector. Collaboration and knowledge transfer between engineering and microbiology are required for rapid progress. The two year, interdisciplinary Micro-GMAP at Liverpool John Moores University will create new competencies on the interface of engineering and microbiology. The MICRO-GMAP project will involve the development and testing of a novel microwave plasma UV and ozone source operating at various frequencies from 2.45 to 18 GHz and its application to new food packaging and waste water technologies. The microwave plasma UV/O<sub>3</sub> source differs significantly from conventional UV lamps. It has no warm up time, it is tuneable in wavelength and can operate in continuous and pulse mode with an intensity higher than the conventional system by factor of 10. Optimisation and evaluation of microbiocidal activity will be essential to guide engineering design. This high efficiency UV/O<sub>3</sub> source will be key to technologies to improve the safety and shelf-life of food products, especially in the largest added-value convenience and ready-prepared meal market. The adoption of the new technology will require evidence of careful quality control so that applications of both culture and newer non-culture methods to detect food-borne pathogens and food spoilage organisms will be developed. The final stage of the project will use facilities at local SMEs to test the prototype demonstrator in the real world. Knowledge will be transferred to staff and students at the Liverpool John Moores University. A programme of written documentation, protocols, and projects with students, seminars and Open Days will ensure transfer to a population of young scientists and engineers.

## **042444- MUWS**

### Microbiology of Urban Water Systems

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 12/20/2006 - 12/19/2010

*EC contribution:* € 575 543

*Policy drivers:* Socio-economy  
Chemical aspects

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### **Abstract**

Urban water systems are important for millions of EU citizens living in urban areas. They have a major impact on their quality of life by preventing serious illness and disease, protecting and enhancing the environment and enabling economic and social development. A key achievement of the EU has been to ensure the provision of sewerage and water services whilst protecting and enhancing the environment. However, urban water systems throughout Europe face significant new challenges due to the impact of longer-term changes in climate and increases in economic activity. Urban water systems are a major component of the water cycle and present unique challenges; the systems are large, highly interconnected and dynamic and their overall performance is controlled by the interaction between physical, chemical and biological processes. There is strong evidence to suggest that sewer flow and water quality is strongly influenced by microbiological activity. The Pennine Water Group (PWG) is the leading UK research group with regard to Urban Water Systems, but its scientific expertise is mainly understanding physical and chemical, rather than microbiological, processes. Through the recruitment of 3 fellows, each specialising in a different type of microbiological technique and environmental application, the knowledge transfer in this programme will allow the PWG to apply microbiological techniques in the context of urban water environments and to combine this new knowledge with existing field and laboratory-based studies. The addition of core skills in molecular microbiology of urban environments will provide significant impact to the PWG through the acquisition of new tools and knowledge, new research and networking opportunities as well as training and education. The knowledge developed from this project will provide the fundamental research necessary to be able to develop innovative tools that have the potential to develop innovative ways of managing urban water systems.

## **245460- NOVIWAM**

Novel Integrated Water Management Systems for Southern European Regions

[www.noviwam.eu/](http://www.noviwam.eu/)

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*Funding scheme:* CSA (Coordination - or networking - action), FP7

*Project duration:* 2/1/2010 - 1/31/2013

*EC contribution:* € 2 559 533

*Policy drivers:* Socio-economy  
Ecological Status

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### **Abstract**

Most countries in European Union are suffering severe water scarcity caused by a negative balance between water resources and water demands. A sustainable management of hydrological resources results totally necessary, as it is established by the European Water Framework Directive (60/2000/EC), which makes compulsory for every water management authority in EU to prepare a river basin management plan by the end of this year 2009. In order to fulfil these obligations and considering the complexity of water bodies control and the undefined future scenario provided by climate change, there is an imperative demand of the use of integrated management tools and methods, such as computerized models. Thus, integrated Water Resources Management must be faced from a multisectorial point of view, involving scientific research, social and economic aspects and administrative proceedings. The NOVIWAM project will tackle these challenges by synthesizing the different perspectives of research institutions, authorities and entrepreneurs, introducing them into promotion of interregional co-operation. Based on several top level research results in water management and led by a consolidated cluster managed by a regional authority with exclusive competences on a major European river, the project will establish an European network to strengthen synergies between regional, national and EU initiatives addressing the Integrated Management RTD and innovation challenges. NOVIWAM aims to establish long-lasting links between clusters throughout the regions, and allow the triple-helix components to benefit from the scale economies deriving from this multilevel and interregional co-operation. Mentoring activities are strongly considered, as specific needs of clusters from a candidate country (Albania) and insularity problems (Cyprus), have been included. NOVIWAM will produce a Joint Action Plan (JAP) at European level with specific measures and calendar beyond the end of the project.

## **509091- OPTIMA**

### Optimisation for Sustainable Water Management

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*Funding scheme:* STP (Specific Targeted Research Project), FP6

*Project duration:* 7/1/2004 - 6/30/2007

*EC contribution:* € 1 499 997

*Policy drivers:* Socio-economy

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#### **Abstract**

Water is a key resource in the Mediterranean region, and efficient use and allocation are paramount to sustainable development, in particular in the coastal zone of the South and East, undergoing fast economic development, land use and demographic change.

The overall aim of OPTIMA is to develop, implement, test, critically evaluate, and exploit an innovative, scientifically rigorous yet practical approach to water resources management intended to increase efficiencies and to reconcile conflicting demands. Based on the European Water Framework Directive (2000/60/EC) the approach equally considers economic efficiency, environmental compatibility, and social equity as the pillars of sustainable development.

The proposed methodology will extend classical optimisation and mathematical programming methodology, in several respects, by: "Using a full-featured dynamic and distributed simulation model and genetic programming as the core to generate feasible and non-dominated alternatives. Water technology alternatives including their cost structure, and up-to-date remote-sensing derived land use information are primary inputs; "Extending the set of objectives, criteria and constraints through expert systems technology to include difficult to quantify environmental and social dimensions; "Putting specific emphasis on local acceptance and implementation through the inclusion of stake-holders in an interactive, participatory decision making process carefully embedded in institutional structures, using a discrete multi-criteria reference point methodology; "Comparative evaluation and benchmarking across the set of local and regional case studies in 12 countries, namely Italy, Greece, Cyprus, Malta, Turkey, Syria, Lebanon, Jordan, Palestine, Tunisia and Morocco around the Southern and Eastern Mediterranean.

The project also aims at building a wide dissemination network of expertise and knowledge exchange sharing its findings and generic data.

## **511678- ORCHESTRA**

Open architecture and spatial data

<http://www.eu-orchestra.org/>

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*Funding scheme:* IP (Integrated Project), FP6

*Project duration:* 9/1/2004 - 8/31/2004

*EC contribution:* € 8 199 978

*Policy drivers:* Socio-economy

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### **Abstract**

Risk Management activities involve a range of different organisations at various administrative levels with their own systems and services. However, the sharing of relevant information that is required for dealing with risks is often limited to a raw data exchange with all the syntactical and semantical conversion problems. Thus, true efficiency, in most cases, is hindered by administrative and legal boundaries as well as a lack of interoperability on the technical side.

Furthermore, the application of numerous and different policies, procedures, data standards and systems, results in co-ordination problems with respect to data analysis, information delivery and resource management, all critical elements of Risk Management. The aim of ORCHESTRA is to improve the efficiency in dealing with risks by developing an open service architecture for risk management that is based on de-facto and de-jure standards. Emerging specifications out of the INSPIRE and GMES activities will be incorporated.

Software adhering to the ORCHESTRA architecture will be able to interoperate, to a certain extent even at a semantic level, and organisations will be able to cooperate much more efficiently as it is currently possible. More specifically the goals of ORCHESTRA are: ?To design an open service-oriented architecture for risk management ?To develop the software infrastructure for enabling risk management services ?To deliver an infrastructure integrating spatial and non-spatial services for risk management ?To validate the ORCHESTRA results in a multi-risk scenario ?To provide software standards for risk management applications Two types of users will benefit from the ORCHESTRA solutions: 1.System-users: Providers of data and application services that are used for risk management 2 End-users: Civil protection agencies and private companies involved in risk management.

## **031773- PROMEMBRANE**

Promotion and focussing of current research activities of Membrane Technology in Water Treatment in the Mediterranean Region

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*Funding scheme:* SSA (Specific Support Action), FP6

*Project duration:* 8/15/2006 - 8/14/2008

*EC contribution:* € 249 885

*Policy drivers:* Socio-economy

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### **Abstract**

The complex dimensions of the Mediterranean freshwater resources, their fragility and their scarcity have been highlighted and have received considerable attention as a primary priority issue politically, technically and scientifically. Membrane technology, with its different applications in water treatment (desalination, potable water treatment, wastewater treatment and reuse) has showed to be a powerful tool to abate the water crisis in the Mediterranean region. During the last five years, this technology has received a lot of attention, resulting in an improvement of membrane materials and techniques, which provide higher fluxes, longer lifetime, partly improving the fouling and high costs. Although there are several national and international membrane research activities, lack of cooperation, very limited know-how exchange and an uncoordinated use of resources leads to parallel and ineffective R&D activities. The primary objective of PROMEMBRANE is to support the current research and development activities in membrane technology focussed on water treatment in the Mediterranean area, providing an international stage to local research organisations and universities devoted to the development of membrane technologies in the following areas: municipal and industrial wastewater treatment, surface water purification and brackish and sea water treatment for drinking purpose. The first stage of the project will cover the identification, mapping and evaluation of the on-going research, in order to propose future research and cooperation strategies. The second stage, will be the diffusion and dissemination of successful experiences and research activities being currently carried out, through the organisation of the two regional contests 'PROMEMBRANE Young Scientist Award' along the frame of the two regional Fairs in Egypt and Syria and an international conference in Tunisia, encouraging and promoting further research activities in membrane technologies.

## **228596- RECARE**

### Researchers in Cyprus Care About the Environment

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*Funding scheme:* CSA (Coordination - or networking - action), FP7

*Project duration:* 5/1/2008 - 10/31/2008

*EC contribution:* € 70 000

*Policy drivers:* Socio-economy

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#### **Abstract**

The Research Promotion Foundation has been organising the Researchers' Night events in Cyprus since 2006. The main objective of the proposed RE-CARE project taking place on the 26 September 2008 is to attract a large number of people from various age groups, giving them the opportunity to meet with the researchers in person, to understand what researchers do for their living and how their "job" affects our lives. This year's event organised will be dedicated to the Environment and it will aim at highlighting the importance of environmentally related research and the main actors behind it – the Cypriot researchers from various scientific backgrounds. The geographical position, the morphology and the history of the island of Cyprus underline the importance of the environmentally related research that is currently conducted by various research organisations, both in the private and in the public sector. The project will be coordinated by the Research Promotion Foundation and it will involve the participation of researchers from a number of interested public authorities as well as universities and research centres covering the areas of environment, energy, water resources, fisheries and sea, forestry, etc. The activities taking place during the night will focus on the interaction between researchers and the wider public in a pleasant environment and will include the following: (1) Research Exhibition – Hands on Experiments, (2) Award Ceremony, (3) Photo Competition "Portrait of a Researcher" Exhibition, (4) European Corner, (5) Music Entertainment (DJ and Live Music Concert of the Tat- Tnabar Group, (6) Stars Observation Unit, (7) "Fotinos Pantognostis" Game and (8) Technology and Innovation in Education Competition Exhibition. The success of the proposed project will be assisted by a sound awareness campaign and by the commitment of both the people and the organisations that will be involved in order to ensure the European visibility of Researchers' Night events.

## **009022- RESES**

Modelling the dynamics of resilience in coupled social-ecological systems

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 1/1/2006 - 12/31/2007

*EC contribution:* € 161 209

*Policy drivers:* Socio-economy

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### **Abstract**

The challenges and uncertainties of global change and the complexity and unpredictability of the dynamics of complex social - ecological systems demand for new approaches to ecosystem and resources management. Strategies for adaptive management aim to strengthen the flexibility and resilience of the system to enhance its capacity to cope with unexpected change. Resilience is the potential of a system to remain in a particular configuration, to maintain its feedbacks and functions and to reorganise following disturbance driven change. The dynamics of coupled social-ecological systems and factors determining their resilience are still largely unknown. The importance of feedbacks, self-organisation, structural characteristics, such as diversity, redundancy etc., have been recognized, but their integrated analysis and understanding needs further research. The aim of the proposed research is to investigate system properties and processes that build and maintain a system's resilience. Special emphasis will be put on the analysis of the dynamics of resilience in coupled social-ecological systems (SEs) to provide a basis for adaptive ecosystem and resources management. This shall be achieved through cross-system analysis and the development of coupled models of ecological and social systems. Simulation models will be used to investigate the role of organisational structure, of processes at different scales, positive and negative feedbacks, information flow, level of interaction, and other factors for the resilience of the coupled system. The project will focus on systems where people and ecosystems share a common resource, e.g. water, or where an ecosystem is managed by the people benefiting from its services. The integrated human - nature system is treated as a complex adaptive system and tools and methods from complex systems research will be applied to study its dynamics and stability properties.

## **510931- RESTORPEAT**

Restoration of tropical peatland to promote sustainable use of renewable natural resources

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*Funding scheme:* STP (Specific Targeted Research Project), FP6

*Project duration:* 11/1/2004 - 6/30/2008

*EC contribution:* € 1 450 000

*Policy drivers:* Socio-economy

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### **Abstract**

RESTORPEAT will coordinate the activities of 14 international partners in Europe and Southeast Asia to address global and regional issues of carbon balance, water management, biodiversity and poverty alleviation related to restoration and sustainable management of tropical peatland renewable natural resources. It will facilitate access to existing knowledge and expertise and conduct targeted research on the restoration of tropical peatland in order to promote sustainable livelihoods for local communities. It will also provide a scientific and technological framework for knowledge transfer and human capacity development related to restoration of tropical peatland to the benefit of the EC and DCs. In order to achieve these aims the problems of fire and inappropriate land use planning will be addressed by developing a model fire hazard warning and control system based upon remote sensing and operated by local communities through promotion of fire awareness, prevention and suppression. Stakeholder platforms and skills transfer to the DCs will be focal activities to provide ownership of the project outputs to the bottom levels and, through partnership with local governments, empower local people to become guardians of their own environment and its resources. Implementation of the project will involve a range of measures including, blocking of channels and drains, restoration of hydrology and ecological functions, rehabilitation of peat swamp forest and its biodiversity, identification of alternative funding mechanisms to promote sustainable livelihoods and formulation of guidelines for sustainable agriculture and forestry. These will be linked to a better understanding of the socio-economic base of local people and their communities by determining the nature and degree of their dependence on renewable natural resources and how this has been affected by major land development projects and fire. Project outputs will be transferred to local governments.

## **011948- RESYSPRODESAL**

Systems Analysis Environment for the Integration of Renewable Energy with De-central Water and Power Production in Mediterranean Partner Countries

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*Funding scheme:* SSA (Specific Support Action), FP6

*Project duration:* 7/1/2005 - 12/31/2006

*EC contribution:* € 120 000

*Policy drivers:* Socio-economy

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### **Abstract**

In MPC a large deficit of well equipped and reliably operated de-central Integrated Water and Power Points (IWPP) for villages and in rural areas is seen. Water and power authorities supported by regional R&TD institutions in MPC could reduce such deficits if they developed their own capacity for flexible, innovative, fast and cost-effective assessment of technically and socio-economically appropriate solutions.

Based on the experience from earlier community R&TD and projects of the Middle East Desalination Research Center (MEDRC) on the use of RE for de-central water and power, the Consortium proposes an SSA on the RE and water supply related topics in SP1-10

Objectives B 1.3 and B 1.5.

The main SSA objective is the transfer and dissemination of know how and tools for systems analysis on the appropriate integration of RE technologies with de-central water and power services under local conditions of MPC. The action scope comprises:

- 1: exemplary studies on the integration of (hybrid) RE conversion with combined water and power supply to villages and rural areas
- 2: identification of opportunities and conditions for economically and socially sustainable deployment of hybrid RE technologies in MPC,
- 3: training and capacity building in MPC institutions for IWPP assessment services under local socio-economic conditions,
- 4: dissemination of results through the networks of the European Desalination Society (EDS) and MEDRC covering the MENA region.

The capacity building shall be oriented to planning and assessment services and will include training of the MPC participants in using RESYSproDESAL for exemplary case studies in their countries.

The SSA concept is open for later extension to the participation of R&TD institutions and water and power authorities from other MPC not yet represented by the Consortium.

## **218589- RISING**

RIS Services for Improving the Integration of Inland Waterway  
Transports into Intermodal Chains

[www.rising.eu/web/guest/home](http://www.rising.eu/web/guest/home)

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*Funding scheme:* CP (Collaborative Project), FP7

*Project duration:* 2/1/2009 - 1/31/2012

*EC contribution:* € 5 279 859

*Policy drivers:* Socio-economy  
Hydromorphology

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### **Abstract**

River Information Services (RIS) are operational in European waterway corridors in a variety of sophistication levels. Their major objective is to collect and distribute river related information in order to support not only public waterways authorities, but also commercial operators in the Inland Waterway Transport (IWT) sector.

The use of such information for logistics purposes is still quite under-exploited. RISING will investigate how such information can lead to useful solutions and services supporting complete transport chains involving inland waterways transport.

For this purpose, existing RIS will be equipped with additional intelligent software modules. In addition, transport operators' chain planning, execution and monitoring systems will gain the ability to implement such information into their planning and monitoring processes. On top of improved tracking and tracing capabilities, new concepts, such as Supply Chain Event Management (SCEM), will be used to facilitate automated chain monitoring.

## **505401- RIVERTWIN**

A Regional Model for Integrated Water Management in Twinned River Basins

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*Funding scheme:* STP (Specific Targeted Research Project), FP6

*Project duration:* 3/1/2004 - 2/28/2007

*EC contribution:* € 2 460 160

*Policy drivers:* Socio-economy

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### **Abstract**

The project "RIVERTWIN" aims in adjusting, testing and implementing an integrated regional model for the strategic planning of water resources management in twinned river basins under contrasting ecological, social and economic conditions. The regional model will take into account the impacts of demographic trends, economic and technological development, the effects of global climate and land use changes on the availability and quality of water bodies in humid temperate, subhumid tropical as well as semiarid regions. The existing integration framework will be first tested in a European river basin with high data availability and data density. The Transferability of the model to other regions with different economic level, ecological standards and with low data availability will be jointly tested by the project team and river basin organisations in two river basins in Westafrica and Uzbekistan. Here, the problem of adequate human resources and the uncertainties of input data for the implementation of computer based decision support tools will be addressed. Capacity building through training of end users supports the transfer of the research results into application. In cooperation with stakeholders and potential users integrated scenarios of economic growth, land use and climate change will be developed and the model will be used to assess the implications for water management under the respective scenario assumptions. The twinning of river basins will promote mutual transfer of know-how and technology between European and Third countries. Based on the results, river basin management plans can be prepared. Through its holistic basin wide approach, the project contributes to the EU water directive, the Millennium Goals defined by the WSSD and the EU water initiative for Africa and Newly Independent States.

## **267521- SAFECON**

New Computational Methods for Predicting the Safety of Constructions to Water Hazards accounting for Fluid-Soil-Structure Interactions

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*Funding scheme:* ERC (ERC Grant), FP7

*Project duration:* 1/1/2011 - 12/31/2015

*EC contribution:* € 2 487 734

*Policy drivers:* Socio-economy

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### **Abstract**

The objective of this research project is the development and experimental validation of a new generation of mathematical and computational methods allowing the solution of practical fluid-solid structure interaction (FSSI) problems of interest for predictive safety of civil constructions to water-induced hazards. These constructions include: buildings, bridges, harbours, dams, dykes, breakwaters, and similar infrastructures in water hazard scenarios such as flooding, large sea waves, tsunamis and water spills due to the collapse of dams, dykes and reservoirs, among others.

The specific research aims of the SAFECON project are: a) development, integration and validation of a next generation of predictive methods based on new mathematical models and efficient computational procedures integrating a new particle-based method, the discrete element method and the finite element method for estimating accurately the dynamics of three dimensional (3D) free surface multiscale heterogeneous flows and their interaction with constructions accounting for FSSI effects. b) Extension and validation of the new particle-discrete-finite element method (PDFEM) for solving 3D FSSI problems allowing for failure mechanisms in the structure and the soil, and c) application of the new computational method (the PDFEM) for predicting the risk of failure in selected civil constructions under the effect of water forces.

The ultimate outputs of SAFECON will be: a) new mathematical models and numerical techniques for analysis of multiscale free surface heterogeneous flows and their interaction with soils and structures and b) new validated computational methods and software for enhanced design and risk assessment of engineering constructions to protect human populations and civil infrastructure in presence of water-induced hazards.

## **232274- SANBOX**

Development of an innovative sanitation and wastewater treatment system for remote located tourist facilities

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*Funding scheme:* BSG-SME (Research for SMEs), FP7

*Project duration:* 4/1/2009 - 6/30/2011

*EC contribution:* € 1 155 452

*Policy drivers:* Socio-economy  
Ecological Status

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### **Abstract**

In the proposed SANBOX project a group of 5 European SMEs, all active in the market for decentralised wastewater systems, intends to develop an innovative, compact wastewater treatment system to serve the growing market for upgraded sanitation facilities for remote located tourist facilities such as mountain lodges or buildings in sensitive coastal and carst areas. The increasing interest of potential customers as Alpine Clubs, agro-tourism or hotels arise from more demanding regulations, the tourists' increasing comfort expectations and the enterprises own interest in protecting and keeping the local environment attractive for tourists. To meet this demand the SMEs came up with a vision of a compact, low energy consuming, source separating and high performance wastewater treatment and handling system that is adapted to the specific end-user requirements. Due to limited own resources for research and innovation the SMEs intend to subcontract 4 highly qualified RTD performers to perform the needed research to develop the technical components of the system. The new system (SANBOX) includes innovative modules for blackwater and greywater treatment and an evapotranspiration system. In the final stage of the project three specific SANBOX prototypes tailored for three different target markets will be assembled and tested.. The prototype testing involves two end-users the Swiss Alpine Club and the Soline at Piran Saline Natural Park in Slovenia. The Swiss Alpine Club is one of the main operators of high mountain lodges in the Alps and aims to reduce potential emissions into the highly vulnerable alpine environment. Soline is a company with the a goal to start a sustainable tourism business around the Piran saline flats on the Mediterranean coast in Slovenia. This project provides the end-users an expected "zero-emission" solution regarding blackwater effluents and swimming water quality regarding greywater effluents, while the SMEs receive important research base as well as and user feedback for the development of the commercial product and dissemination of the results. The goal is to demonstrate that near "zero emission" of wastewater constituents is no longer science fiction.

## **509160- SARIB**

Sava River Basin: Sustainable Use, Management and Protection of Resources

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*Funding scheme:* STP (Specific Targeted Research Project), FP6

*Project duration:* 8/1/2004 - 7/31/2007

*EC contribution:* € 1 200 000

*Policy drivers:* Socio-economy

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### **Abstract**

The Sava River (945 km) is the biggest tributary to the Danube River and has 95551 km<sup>2</sup> large catchment. It extends over four countries, Slovenia, Croatia, Bosnia and Herzegovina and Serbia and Montenegro. In the development of the river basin management plan all countries are already collaborating under the International Commission for the Protection of the Danube River (ICPDR) guidance. Until 1991, the methodological bases for data collection have been reasonably unified over the catchment, but lacking a lot of today's important aspects such are ecological character of the river and its tributaries, inventory of pollution sources, dangerous substances, socio-economic parameters, cost and benefit implications and similar. For the later period a lot of data are missing due to insufficient monitoring (financing, recent warfare) and weak institutional and legal control over use of water and land resources of the Sava River catchment. Many aspects of the river quality need scientific investigations. Furthermore, there is a need to link the knowledge of river quality state and environmental and health risk with pressures and their driving forces to propose efficient and beneficiary actions and measures for protection. In the project specific tools based on combination of chemical analysis and biological effect methods will be developed and validated for the pollution of sediments and impact on water biota. Geographical distribution of pollution will be identified and historical trends defined. Integrated prediction model about the behaviour of hazardous chemical substances will be integrated with the socio-economic prediction model to serve as a base for the elaboration of scenario, remediation measures and best practice techniques. For that purpose an expert data and information management system will be developed.'

## 042036- SMARTNANOTUBES

Synthesis of smart materials: Functionalizing nanotubes with molecular switches

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 9/1/2006 - 8/31/2007

*EC contribution:* € 40 000

*Policy drivers:* Socio-economy

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### Abstract

"The ability to miniaturise devices has completely changed our society and modern technology is constantly pushing towards smaller and lighter devices with enhanced and more diverse functionalities. Future technologies will increasingly rely on materials that respond to their environment in a manner that suggests a degree of "intelligence" and nanoscience may offer many of the tools and opportunities that are required in order to build a foundation for the next scientific revolution.

The design of a library of carbon nanotubes functionalized with task-oriented molecules for the development of responsive, i.e. "smart" nanomaterials is the main focus of this interdisciplinary research program.

The nanodevice itself will be composed of a carbon nanotube because it offers biocompatibility as well as the necessary structural scaffolding. In order to render the vehicle soluble and stable in water, the nanotube will be suitably functionalised on the surface. In order to make this into a smart material, a molecular switch will be covalently attached to the vehicle. The role of the switch is to activate the drug delivery system or to function as a sensor. Once the switch is triggered by the external stimulus (such as light, heat, chemicals or changes in pH) it will undergo a conformational change that can release biologically active ions and molecules in a controlled manner. Alternatively, the switch can be constructed such that it responds to specific chemical inputs (such as different metal ions or amino acids). Finally, the possibility of using the nanotube (which has excellent thermal conductivity) as a light/heat-absorbing antenna that can transmit energy directly to the attached switch will be explored. If near-IR radiation could be used as input/trigger for this kind of delivery/sensing vehicle it would represent a major breakthrough because such radiation is of low energy and relatively harmless to human tissue and biotic systems."

## **217809- SMILES**

Sustainable Measures for Industrial Laundry Expansion  
Strategies: SMART LAUNDRY-2015

[www.smile-fp7.eu/](http://www.smile-fp7.eu/)

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*Funding scheme:* BSG-SME (Research for SMEs), FP7

*Project duration:* 9/1/2008 - 11/30/2011

*EC contribution:* € 2 376 000

*Policy drivers:* Socio-economy

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### **Abstract**

The EU-27 industrial laundry sector, with 11.000 establishments (more than 90% SMEs), washes 2,7 billion kg of soiled textiles per year (wet weight) employing 168.000 workers and utilizing 42 million m<sup>3</sup> of wash water and 60 PJ of energy per year. It generates similar quantities of waste water, to be treated, and substantial CO<sub>2</sub> emissions (3,8 million tons CO<sub>2</sub>/year). The annual turnover of the sector is 5,1 billion euro, which can be doubled if all disposable textile articles were replaced by environmentally friendly reusable items. Focused and coordinated research to develop and improve innovative technologies can greatly enhance the performance of the sector. The conventional laundry processes are characterized by large enthalpy destructions and resource inefficiencies. It is the purpose of the project to design the SMART LAUNDRY-2015 through research, further development and adaptation of 16 key technologies (combined for green sites or individual for existing plant augmentation). These include water reduction, energy savings, green fuel substitutions for CO<sub>2</sub> reductions, new energy systems and improved sequencing of the processes, greater textile hygiene. Full implementation of the SMART LAUNDRY-2015 will reduce the annual water consumptions by at least 10,4 million m<sup>3</sup> (30%), the energy consumptions by 27,5 PJ (45%) and the overall CO<sub>2</sub> emissions by 2,3 million tons CO<sub>2</sub> per year (60% reduction) at 100% market penetration in the year 2015. Improved laundry services with the 16 key technologies and practices will enhance reusable textiles and reduce the throwaways and disposables by 20%. The 16 key technologies will be investigated at pilot scale level and subsequently integrated in a unified design. A parallel benchmarking and innovation monitoring will validate both the actual energy demand and the potential of energy savings of the future innovations. Future economic gains from SMILES are projected at 1020 million EUR in the next 10 years. An important component of project SMILES is the educational effort and training of key staff members and hand-on workers to assist in the introduction of the Smart Laundry-2015. The project also encompasses the

writing, production and dissemination of key materials by a special website ([smartlaundry2015.com](http://smartlaundry2015.com)) to national associations and to all SMEs in the sector. Finally the resource reductions are assured by an automated energy management system controlling and monitoring input and output savings. SMILES has 6 WPs: WP1 Water reduction, WP2 Energy/CO2 reduction, WP3 Chemicals reduction, WP4 Quality improvement/Risk analysis, WP5 Integration/Transfer and WP6 Project management. The project has a well-planned management structure for the cooperation between 5 SME-AGs, 2 SMEs and 8 RTDs from 7 EU countries.

## **510603- SOLARSAFEWATER**

### EMERGING TECHNOLOGIES TO ADDRESS WATER TREATMENT IN DEVELOPING COUNTRIES

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*Funding scheme:* SSA (Specific Support Action), FP6

*Project duration:* 9/1/2004 - 11/30/2005

*EC contribution:* € 84 249

*Policy drivers:* Socio-economy

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#### **Abstract**

To address the subject of Emerging Technologies to Address Water Treatment Problems in Developing Countries, it is proposed to organise the Course Possibilities for Safe Water Provision Using New Technologies and the Symposium The Challenge of Safe Drinking Water Provision: Technologies for the Latin American Region, in coincidence with the Final Meeting of the ongoing INCO Project: Cost Effective Solar Photocatalytic Technology to Water Decontamination and Disinfection in Rural Areas of Developing Countries (SOLWATER), Contract: ICA4-CT-2002-10001. Both events are also addressed to strongly reinforce the dissemination of results of the SOLWATER project. The proposed date is October 14-19, 2005, were the SOLWATER meeting will take place. The Symposium, addressed to scientists and engineers working in the subject, will be a 3-days event to discuss the state of the art of the photocatalytic technology for water purification and to disseminate the capabilities of available technologies among potential users and Small or Medium Sized Enterprises and top Officers of the nearby countries. The full participation of partners of the SOLWATER Project is foreseen. The Symposium will also promote the transfer and exploitation of the results of the SOLWATER Project and would serve to explore further possible future research activities, including pilot actions on the developed solar photocatalytic technology. The Course is a two-days event that includes technical lectures on the characteristics of available technologies, directed to young scientists and engineers. The estimated audience includes 50 attendees from nearly all Latin American countries. Lectures will be mainly given by the partners of the SOLWATER Project. Registration shall be open to further participants, on the basis of adequate qualifications and payment of the costs of the course. The Course will contribute to the training of scientists and engineers in the technology

## **286658- SOLNOWAT**

Development of a competitive 0 GWP dry process to reduce the dramatic water consumption in the ever-expanding solar cells manufacturing industry.

nines-pv.com/solnowat/

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*Funding scheme:* BSG-SME (Research for SMEs), FP7

*Project duration:* 9/1/2011 - 8/31/2013

*EC contribution:* € 1 189 386

*Policy drivers:* Socio-economy

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### **Abstract**

The proposed project (SOLNOWAT) aims to develop a dry route alternative for the solar cell industry that will eliminate the very high water consumption and GWP emissions of current process while meeting all production requirements. This project will clearly outline the environmental impact, cost and efficiency of the new process and equipment required, and include dissemination to cell manufacturers.

#### **BENEFITS**

- Dramatic reduction of water usage\*
- Very low-environmental-impact processing \*
- Advance process control, real time monitoring\*
- High-throughput, high-yield, integrated industrial processing (inline)\*
- Devices with increased efficiency\*
- Enabling thin wafer processing\* and surface decoupling (single sided).
- Smaller footprint
- Low cost of ownership\*
- Reviewed by a panel of cell manufacturers

Most of these benefits(\*) are fundamental criteria outlined by the European Photovoltaic Technology Platform in its Strategic Research Agenda for Photovoltaic Solar Energy Technology, in order to meet the sector's ambitions for technology implementation and industry competitiveness.

The SMEs involved believe that by cooperating together through this R&D program, they will be able to achieve significant results. The consortium is composed of 5 SMEs and 3 RTD performers located in 5 different EU countries. The R&D work will propose and develop a novel process replacing wet chemical steps by 0 GWP dry process steps. The successful development will lead to a cleaner, highly controllable, and potentially cheaper process that will deliver more efficient solar cell products with far less environmental impact. The

process will meet the current high throughput demand from the industry and show its potential to meet the PV market growth demand.

## **505899- SOPHIED**

Novel sustainable bioprocesses for the European colour industries

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*Funding scheme:* IP (Integrated Project), FP6

*Project duration:* 7/1/2004 - 9/30/2008

*EC contribution:* € 6 258 000

*Policy drivers:* Socio-economy

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### **Abstract**

The traditional colour industry was an important activity in Europe until the end of 20th century. It suffers now displacement to the developing world due to high labour costs as well as increasing production related environmental costs in Europe. As an answer to their problems (economics, lack of innovation, toxicity to human, non environmentally -friendly, non worker-friendly processes), an integrated process is proposed. This flagship project consists of a biotechnological approach covering three parallel objectives: > To develop new bioremediation technology to detoxify coloured wastewaters. > To develop new safe enzyme-assisted processes for the production of existing dyes. > To create new molecules of dyes which are less toxic and synthesised biotechnologically for high added value markets. To face those breakthroughs, "SOPHIED" project establishes a partnership among 17 SMEs, 7 Universities and 3 Research Centres from 10 countries (total EC budget of 6 258 000 ? and a total effort of 2641 person-months) with a financial networking plan deep rooted into regional and national funding. The project is led by a high-technology SME, Wetlands Engineering, under the strong administrative support of the coordinator, the Catholic University of Louvain. The four years project is based on a multidisciplinary approach that encompasses the value chain from the industrial needs, development of biotechnological processes, engineering, up to technology transfer. Besides research activities, a strong structure is developed to manage innovation related activities, dissemination, demonstration activities, mobility, and training. New production models "based on knowledge" to replace "trial-error" will be proposed to low-RTD sectors in the value chain. It is expected that this will lead to a concrete evolution of the traditional colour industries towards high tech SMEs, which will become more competitive, innovative and sustainable.

## **043613- SOWAMED**

Network for the exchange of methodologies and expertise on sustainable water management and land husbandry in the Mediterranean

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*Funding scheme:* SSA (Specific Support Action), FP6

*Project duration:* 4/1/2007 - 6/30/2009

*EC contribution:* € 253 800

*Policy drivers:* Socio-economy

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### **Abstract**

The global objective of SOWAMED proposal is to establish a methodology exchange network and build an expertise capacity between partners in several research projects (STREP and/or CA) of the INCO-MED Program under the 4th, 5th, and 6th PCRD in the domain of sustainable land and water resource management and the prevention of risks on cultivated and inhabited watersheds. The first step will be to identify and analyse, data, models and DSS available for soil and water management in the semi arid Mediterranean areas. It will base on the results produced by the INCO MED projects during the ten last years. The second step will be to test and discuss the availability of data, models or DSS set for particular conditions. The definition of their areas of competence and limits will help to make available to all users the range of methods and available tools for proposing solutions to questions of sustainable water management and land husbandry. The third step consists in reinforcing capacities of expertise and dissemination of data and methods. These objectives will be achieved through regional workshops focusing on three specific issues the management of cultivated watersheds in mountains and hills (water conservation management and land husbandry) the management of traditional irrigated perimeters (small and medium hydraulic works SMH) and intensive irrigation systems and the management of water and land uses especially in peri-urban agricultural perimeters (competition for land and the use of non-conventional water resources). The project will associate 3 EU and 5 MPC partners for duration of 24 months.

## **032433- SPILLREC**

Enhanced Design and Manufacturing of Waterborne Spills Recovery Systems

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*Funding scheme:* SME (SMEs-Co-operative research contracts), FP6

*Project duration:* 9/1/2006 - 8/31/2008

*EC contribution:* € 1 094 500

*Policy drivers:* Socio-economy

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### **Abstract**

SPILLREC project aims at enhancing competitiveness of European SMEs and RTD organizations in the area of waterborne spill response by innovating on design, computer analysis, materials, and manufacture of spill recovery structures and systems. The project will design, produce and test a new spill response structural system, the SPILLREC System and an Open Source code for multi-physical modelling and simulation of fluid-structure interaction in spill recovery systems, the SPILLREC Application.

## **006669- STRESSADAPT**

Stress adaptation in plants - A molecular approach of socio-economic interest

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 10/1/2005 - 9/30/2008

*EC contribution:* € 445 144

*Policy drivers:* Socio-economy  
Chemical aspects

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### **Abstract**

The capability of plants to adapt to unfavourable environmental conditions will enable reduced inputs for plant protection and nutrition during plant production. Research of the proposal on molecular tolerance mechanisms will help to establish new directions in plant breeding, thus supporting strategies, to protect soil, natural mineral resources and water as well as to improve food quality and health care. Functional analysis and phylogenetic studies will contribute to initiate functional marker strategies for breeding on general plant tolerance as an alternative to transgene approaches and indirect marker - assisted selection strategies. The proposal aims to complement existing excellency at the University of Évora in research and teaching in the areas Plant Diseases and Pathogen Diagnosis, Plant Breeding and Biotechnology as well as Soil Conservation by a Chair for research and teaching on Molecular Plant Reactions on Environmental Stress. The Chair will contribute to establish a center of multidisciplinary competence on sustainable and healthy plant production. The associated groups will be dedicated in joint actions, to transmit interdisciplinary knowledge as well as the potential of science to students and the literate public. A special focus of the Chair on mobility management as well as on training for project and career development in Europe, and finally, the organisation of a Large Conference committed to the research topics of the proposal are assigned to enhance international networking and the force of European Research. The Chair Holder returned from a mobility action in a third country, reintegrated in her native land, and was invited for a short-term stay as Visiting Professor at the Host Institution. To strengthen international networking, the Host decided to ask jointly with the Chair Holder for a Marie Curie Chair.

## **029644- SUSRES**

Sustainable Functional Molecules from Renewable Resources via Green Chemistry

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 8/1/2006 - 7/31/2009

*EC contribution:* € 825 737

*Policy drivers:* Socio-economy

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### **Abstract**

The Fast Moving Consumer Goods (FMCG) industry is, in a fundamental sense, a truly consumerist industry. While it improves the quality of life, it places heavy demands on resources and significant burdens on the environment. A societal, economic and industrial analysis has revealed significant business and scientific opportunities for innovation in the area of Sustainability Research, especially when coupled with responsible green chemistry practices. The FMCG industry needs to find alternative raw materials and greener manufacturing methods for the production of goods. Although so far the focus has mostly been on biodegradability of packaging, an increasingly stronger drive for a sustainable chemical industry is beginning to emerge. A sustainability research philosophy, which in part focuses on the manufacture of materials from renewable resources and the use of green production methods, is beginning to permeate the sector. The structural building blocks of valuable chemical products, including polymers, are available as sustainable and biodegradable products from biomass. Some dicarboxylic acids and polyols are readily available in one or two steps from abundant bio-feedstocks. Appropriate selection of platform molecules should enable us to prepare a large and diverse range of platform molecules such as polymers including water-soluble materials.

## **018530- SWITCH**

Sustainable Water management Improves Tomorrow's  
Cities'Health

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*Funding scheme:* IP (Integrated Project), FP6

*Project duration:* 2/1/2006 - 4/30/2011

*EC contribution:* € 14 749 996

*Policy drivers:* Socio-economy

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### **Abstract**

Context: With increasing global change pressures, and due to existing limitations, and un-sustainability factors and risks of conventional urban water management (UWM), cities experience difficulties in efficiently managing the ever scarcer water resources, their uses/services, and their after-use disposal, without creating environmental, social and/or economic damage. In order to meet these challenges, SWITCH calls for a paradigm shift in UWM. There is a need to convert ad-hoc actions (problem/incident driven) into a coherent and consolidated approach (sustainability driven). This calls for an IP Approach. Research concept SWITCH therefore proposes an action research project which has as a main objective: The development, application and demonstration of a range of tested scientific, technological and socio-economic solutions and approaches that contribute to the achievement of sustainable and effective UWM schemes in 'The City of the future'. The project will be implemented by different combinations of consortium partners, along the lines of seven complementary and interactive themes. The research approach is innovative for the combination of: action research: address problems through innovation based upon involvement of users. learning alliances: to link up stakeholders to interact productively and to create win-win solutions along the water chain; multiple-way learning: European cities learn from each other and from developing countries, and vice versa. multiple-level or integrated approach: to consider the urban water system and its components (city level) in relation to its impacts on, and dependency of, the natural environment in the river basin (river basin level), and in relation to Global Change pressures (global level). Instruments and scope An IP with 30 partners, their resources, and a total budget of 25,191,396 EURO including budget for demonstration activities in 9 Cities in Europe and developing countries.

## **244061- SYNER-G**

Systemic Seismic Vulnerability and Risk Analysis for Buildings, Lifeline Networks and Infrastructures Safety Gain

[www.vce.at/SYNER-G/files/project/proj-overview.html](http://www.vce.at/SYNER-G/files/project/proj-overview.html)

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*Funding scheme:* CP (Collaborative Project), FP7

*Project duration:* 11/1/2009 - 10/31/2012

*EC contribution:* € 3 500 000

*Policy drivers:* Socio-economy

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### **Abstract**

SYNER-G is research project which has the following main goals: (1) To elaborate appropriate, in the European context, fragility relationships for the vulnerability analysis and loss estimation of all elements at risk, for buildings, building aggregates, utility networks (water, waste water, energy, gas), transportation systems (road, railways, harbors) as well as complex medical care facilities (hospitals) and fire-fighting systems. (2) To develop social and economic vulnerability relationships for quantifying the impact of earthquakes. (3) To develop a unified methodology, and tools, for systemic vulnerability assessment accounting for all components (structural and socio-economic) exposed to seismic hazard, considering interdependencies within a system unit and between systems, in order to capture the increased loss impact due to the interdependencies and the interactions among systems and systems of systems. The methodology and the proposed fragility functions will be validated in selected sites (urban scale) and systems and it will implemented in an appropriate open source and unrestricted access software tool. Guidelines will be prepared and the results and outputs will be disseminated in Europe and world wide with appropriate dissemination schemes. SYNER-G is integrated across different disciplines with an internationally recognized partnership from Europe, USA and Japan. The objectives and the deliverables are focused to the needs of the administration and local authorities, which are responsible for the management of seismic risk, as well as the needs of the construction and insurance industry. URL: <http://www.vce.at/SYNER-G>

## **018311- TESTNET**

Towards European Sectorial Testing Networks for Environmental Technologies

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*Funding scheme:* STP (Specific Targeted Research Project), FP6

*Project duration:* 9/1/2005 - 9/30/2008

*EC contribution:* € 1 562 357

*Policy drivers:* Socio-economy

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### **Abstract**

Given that the market for environmentally sound technologies (EsTs) is an international one and that the verification and testing of these technologies occur only to a limited extent, there is an urgent need to set up verification and testing centres for EsTs. TESTNET aims to enhance the application of EsTs through the development of a European structure for the production of reliable and independent performance data for EsTs. TESTNET will cover two technology areas: "water technologies" and "clean production", while environmental monitoring will be included in these technologies. The strategic objective of TESTNET will be met through:

- the identification of promising EsTs and innovative solutions for verification;
- the design of a system for testing and verifying new and existing EsTs;
- validation of the functionality of the verification system for the selected technology areas and for different types of organisational solutions;
- a sustainable follow-up of the verification system and networks, including a financially sound and reliable structure and organisation as well as the involvement of relevant stakeholders in the networks.

TESTNET will provide a powerful boost to the execution of the actual Environmental Technologies Action Plan (ETAP), in which one of the priorities is to launch testing networks for EsTs. The European Commission is currently examining the best concept for a European EsT testing programme. The outcome of this study will be analysed and used as input in TESTNET. Lessons learned from the EPA Environmental Technology Verification programme in the United States will also be incorporated in the project. A consortium of European sector organisations and leading research institutes in the field of EsTs has been composed to ensure that the tasks of TESTNET are completed. The consortium spans the EU-25, including representation from the new member states, and has considerable participation among SME's (26%).

018311\_TESTNET\_26082005.cpf

## **509177- TRABOREMA**

Concepts for integrated transboundary water management and sustainable socio-economic development in the cross border region of Albania, Former Yugoslav Republic of Macedonia (FYROM) and Greece

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*Funding scheme:* STP (Specific Targeted Research Project), FP6

*Project duration:* 6/1/2004 - 5/31/2007

*EC contribution:* € 1 000 000

*Policy drivers:* Socio-economy

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### **Abstract**

The TRABOREMA Project will stabilise and reinforce research potential in the field of integrated management of regional water resources planning and policy in a transboundary lake region between Albania, FYROM and Greece. Using the EU Water Framework Directive as a guideline, the Consortium, which also includes universities specialised in environmental issues from Austria and Spain, will design and implement a monitoring system in the catchment to Lake Prespa. Together they will research upstream/downstream water user demands to determine environmental pressures and impacts in terms of ecological quality ratios (EQR) for the target region. This data will be modelled and simulated using state of the art computer applications to make predictions and perform scenarios. The results will be analysed and used as a basis for transboundary policy recommendations for integrated management of the water resources and sustainable socio economic development of the region. The strategic objectives of the TRABOREMA Project are: 1. Form successful and enduring partnerships within the consortium and to interested parties such as authorities, policy makers and public participants within countries of the target region and to EU member states to help settle political and social situation in the Western Balkans. 2. Communicate the importance of integrated water management (which incorporates waste and energy) as a theme of common interest to contribute to sustainable development in the Western Balkans. 3. Develop methodologies for implementation of transboundary integrated water management in Lake Prespa and associated river basin as a pilot region, which can then be transferred to other regions. 4. Implement a monitoring system to deliver data for development and verification of ecological quality ratios (EQR) and computer-based modelling and simulation for the target region. 5. Make recommendations for sustainable development policy.

## **021405- TRANSBOUNDARY WATERS**

Optimal Institutional Arrangements for the Management of Transboundary Water Resources

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 9/1/2005 - 8/31/2008

*EC contribution:* -

*Policy drivers:* Socio-economy

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### **Abstract**

The development and evaluation of alternative institutional arrangements for managing international water resources must be at the top of any research list as nearly two thirds of the world's transboundary water resources still lack any type of co-operative management framework. With respect to economic research on transboundary water resources the need for analysing arrangements by (1) integrating beside water quantity also aspects of water quality, (2) integrating efficiency aspects and including organisational transaction costs, and (3) considering the stochastic nature of water resources have to be stated. The proposed project aims to address these desiderata by applying in a first step econometric tools to quantify such transaction costs. These are then linked to (stochastic) models of quantitative efficiency analysis. Results (cost as well as efficiency estimates) should be integrated into the players' pay-off matrices of models based on (stochastic) coalitional game theory. To adequately model the stochastic resource conditions Bayesian estimation techniques will be tested with respect to the efficiency models and the modelling of transaction costs. With respect to possible data limitations adequate simulation and sample generation tools (bootstrapping etc.) should be used. Finally the need for interdisciplinary modelling should be considered by linking GIS-based variables and relations to the socioeconomic models of costs and efficiency. Throughout the modelling efforts strict adherence to the underlying implications of microeconomic theory with respect to theoretical consistency, functional flexibility and form should be assured. The proposed project aims at combining different state-of-the-art methodological tools, considers interdisciplinary modelling possibilities and applies the resulting framework to a high ranked topic on the international political agenda: the design of efficient and stable international environmental agreements (IEA).

## **226571- TWIN2GO**

Coordinating Twinning partnerships towards more adaptive Governance in river basins

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*Funding scheme:* CSA (Coordination - or networking - action), FP7

*Project duration:* 6/1/2009 - 9/30/2011

*EC contribution:* € 999 021

*Policy drivers:* Socio-economy

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### **Abstract**

Over the past years, the EU has funded several projects that undertook research on specific integrated water resources management (IWRM) issues in case studies carried out on twinned river basins from Europe and from developing countries. The aim of Twin2Go now is to review, assess, synthesize and consolidate the outcomes of these projects in order to make them transferable and applicable to other basins, and to disseminate the project results effectively to relevant authorities, stakeholders and end-users. This will contribute to the overall goal to underpin the implementation of IWRM in line with the targets of the EU Water Initiative. In order to achieve this aim, Twin2Go will elaborate a methodology that allows comparative analysis and synthesis of the outcomes of the diverse projects. The consolidated outcomes will feed into best practice guidelines for the adoption and implementation of sustainable water resources management plans. To ensure up-take of the research results in water resources management practice and political decision making, all synthesis activities will involve stakeholders from the projects and basins and synthesis results will be effectively disseminated to all relevant levels of target groups including high level decision makers in water policy. In its effort, Twin2Go will focus its activities on the thematic priority 'adaptive water governance in the context of climate change' and cluster past and ongoing twinning projects along their target regions (Latin America, Africa, NIS, South and South East Asia). Through its co-ordinating activities, Twin2Go will bring together participants and lead partners from past and ongoing projects as well as international water networks. This will allow increasing the output and benefit of ongoing research by consolidating results, exploiting synergies and thus build up the critical mass that will promote uptake of research results and reaching audiences at a higher level of decision making.

## **001450- TWINBASINXN**

TWINBASINXN : Promoting Twinning of River Basins for Developing Integrated Water Resources Management Practices

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*Funding scheme:* CA (Coordination Action), FP6

*Project duration:* 1/1/2004 - 12/31/2007

*EC contribution:* € 900 000

*Policy drivers:* Socio-economy  
hydromorphology

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### **Abstract**

A Basin Organisation is generally regarded as one of the best solutions to adopt for developing an Integrated Water Resources Management (IWRM) at a catchment level.

There have then been many types of BO, some of them existing for several decades, and a lot in a development process ; they present a great diversity of legal statutes and economic schemes.

None of these examples can be regarded as a model ; but, by facilitating direct exchanges on best practices, and as well on failed experiments, twinning can help Basin Organisations to improve their effectiveness : BO can profit from peers, regarding administrative, technical and institutional matters, or a quicker diffusion of the research outputs in the real life.

The main goal of TWINBASINXN is to support effective use of research and development in the field of IWRM by promoting twinning of BO. This will be achieved by creating a world-wide forum dedicated to identifying and sharing knowledge and best practices.

A Memorandum of Understanding (MoU) takes the form of a co-operation framework signed by a wide range of organisations, both public and private, which have an interest in the deployment of IWRM practices ; it is a voluntary agreement, entered into by organisations, prepared to be active participants in developing consensus on issues of common interest, and who are willing to commit both human and financial resources for this purpose, by participating in the operation of Specific Interest Groups (SIGs).

This MoU implies public commitments from signatories, from which : to co-operate in the production of recommendations and guidelines for developing twinning and related services by co-operating in the specification of twinning activities - exchange of information, exchange of personnel - and of common knowledge representation systems and dissemination practices.

The project will support staff mobility between twinned BO, for enhancing peer-to-peer exchanges and hands-on periods (0,5 to 2 months).

## **021028- WASTEWATERRESOURCE**

Play with Water: Introducing Ecological Engineering to Primary Schools to Increase Interest and Understanding of Natural Sciences.

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*Funding scheme:* CA (Coordination Action), FP6

*Project duration:* 11/1/2005 - 6/30/2008

*EC contribution:* € 264 000

*Policy drivers:* Socio-economy

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### **Abstract**

The aim of this Coordination-Action is to assemble and assess comprehensive teaching and demonstration material which should enable all primary school children (ISCED 1 Level of Education according to UNESCO) to discover basic concepts of ecology and obtain hands-on experience in cycling of elements in nature, and thus the potential of wastewater as a resource. Due to the universal appeal of nature to children these systems have a great potential to integrate both sexes as well as "disadvantaged and underperforming" groups such as immigrant children. These classroom systems will result from ongoing research in nature-oriented systems, and will reflect today's best available technology. The contributions of the network partners will help to disseminate best available technology from different regions of Europe. The systems developed by the partners represent not only a way to handle waste and wastewater or to reuse nutrients; they are also highly suitable to demonstrate the paths of waste in nature and their influence on the ecosystem. The classroom systems will be designed to be low cost and easy to assemble and maintain by the children. They will serve as motivation tools to ask questions about nature, to experiment with ecosystems, measure and interpret data and thus explore the natural processes and even, in a first moderate step, to experience hypothesis driven research.

## **003664- WATERBENCH-1**

Benchmarking of Water Supply and Sanitation services in the NIS preparatory phase

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*Funding scheme:* SSA (Specific Support Action), FP6

*Project duration:* 1/31/2004 - 1/30/2005

*EC contribution:* € 96 554

*Policy drivers:* Socio-economy

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### **Abstract**

The severe deterioration of the water supply and sanitation services in the Newly Independent States of Eastern Europe, Caucasus and Central Asia (NIS) results from a long period of under-investment. This is why sustainable financing is the driver of the municipal reform that has been engaged by national and local authorities in most countries of that region. An appropriate set of benchmarking indicators is a pre-requisite for sound financial decision-making and for evaluation purposes. It is also a key to improving local governance practices. Sustainable water financing is also the priority of the EU Water Initiative for the NIS, presented at the 3rd World Water Forum in Kyoto (March 2003). In the framework of the Environmental Action Programme Task Force, co-chaired by the EC and the OECD, the collection and analysis of performance data has been initiated for Russia and 7 other NIS. This process needs to be strengthened and extended, taking into account in particular the experience of the accession countries of central Europe. The indicators must be critically assessed with regard to their reliability and relevance in the various regional and operational contexts. Furthermore, this benchmarking set can be developed into a financial decision-making assistance tool. This development is the main objective of an envisaged subsequent research initiative.

In this perspective, the preparatory (SSA) phase aims at:

- Taking stock of the benchmarking practice in the water sector, in the NIS, accession countries, the EU and other regions;
- Carrying out a cross-sector analysis of benchmarking models, with specific attention dedicated to Environmental, Sanitary and Service Quality indicators.

## **507259- WATERTOOL**

An Innovative Tool for multi-element analysis of ground and surface water (WATERTOOL)

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*Funding scheme:* SME (SMEs-Co-operative research contracts), FP6

*Project duration:* 1/15/2004 - 1/14/2006

*EC contribution:* € 916 848

*Policy drivers:* Socio-economy  
Water and Agriculture

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### **Abstract**

Ground and surface water resources are essential for human health, economic productivity and social development. They are a recyclable but finite resource, and with careful use and treatment can be managed in a sustainable manner. Increased groundwater pumping, due to the development of agricultural and industrial activities as well as increasing population pressures, result into the dramatic decrease of water resources, in addition to the associated deterioration of water quality. . Effective water resource management depends on high quality data from different sources, of which water quality analysis is one of the most important. In general, water quality instrumentation has failed to keep pace with the technological advances of the 1990's. The SMEs in this project have been working together to develop a new, multi-variable analysis tool, which would be capable of giving a water quality analysis in situ at a glance, at a substantially lower cost compared to traditional monitoring techniques. This project will use as a starting point the experience developed by SMEs in water analysis, water management and equipment development, complemented by the essential input of the RTD performers. This CRAFT project aims at the development of an integrated water monitoring tool, in the form of a probe which can be inserted in boreholes, to measure and monitor up to 15 parameters simultaneously. The device will also be able to be used for long term monitoring at selected sites. The proposed technology is non-invasive, with very low environmental impact. Especially difficult-to-access locations such as deep well environments are an ideal application for this latest innovation. The data output from this device will be of use to a wide range of end users, from water suppliers, pisciculture and agriculture associations' managers, local and national authorities and environmental Organisations, and also for engineering groups involved in water treatment and sewage

## **509163- WATERWEB**

Water Resource Strategies and Drought Alleviation in Western Balkan Agriculture

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*Funding scheme:* STP (Specific Targeted Research Project), FP6

*Project duration:* 4/1/2004 - 1/31/2008

*EC contribution:* € 1 200 000

*Policy drivers:* Socio-economy

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### **Abstract**

4 EU and 3 WB partners will provide strategies for managing water resources for WB by combining modern technologies from a river basin through to single plant, taking account of environmental, socio-economic and health implications, studying: -river flow, evaporation, rainfall patterns, runoff, water availability, using geographical information systems to categorise 3 areas, -water quality and nutrient use in relation to eutrophication, microbiological hazards and ecotoxicology on the farm, -micrometeorological studies to monitor, model and predict water/nutrient use in the field, -irrigation techniques for improving plant/crop WUE, -the commerciality of quinoa, -socio-economic parameters analysing different management strategies and implications for irrigation, reducing crop water demands, and an alternative crop. A Land-Water-Economic Information System will be created and applied to 3 river basins to represent local and regional water sources, sources of contaminated runoff, agricultural water use, and likely impacts of farmer uptake of new water use/treatment technology. Modelling results and trials on water/nutrient use with a various crops will be tested on local farms. Workpackages are Water quantity, Water quality, Crop water use, Socio-economics and Dissemination. The project will deliver procedures for strategic water management, models of water/nutrient use, irrigation methods, confidence in GIS construction/usage, and outreach of modelling resources for WB.

## **517620- WEMED**

Evaluation of the Water use Efficiency indicators in the Mediterranean Region

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*Funding scheme:* SSA (Specific Support Action), FP6

*Project duration:* 4/1/2006 - 3/31/2008

*EC contribution:* € 145 000

*Policy drivers:* Socio-economy

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### **Abstract**

In most of Mediterranean developing countries, although a number of research projects has been developed for increasing the crop water use efficiency (WUE), the results were not translated in practice both for the difficulties in the spreading of the ideas and for the inadequacy of the issues to the Mediterranean agriculture reality. Also the knowledge coming from research remains confined in the research world and is not shared by the final users. Therefore, the target of this project is to establish a net of research institutions, farmers and stakeholder organisations in Mediterranean and southern Europe countries, for studying new methodology of evaluation the water use efficiency in order to improve the water management at regional scale. The project workplan has been designed and structured in order to meet with the above target, through the organisation and implementation of two major events: (1) the Euro-Mediterranean workshop and (2) two post-workshop seminars of training of trainers to booster dissemination of workshop results. In addition, the overall workplan includes building a common and regional knowledge regarding development of research results, and the creation of a common reference frame for collecting the data needed for the evaluation of the indicators of WUE in Mediterranean area. A new WEB site devoted to the WUE at Mediterranean scale will be the favourite way to link all the actors of the water management at regional scale: decision makers, stakeholders, farmers, technician and end users. The participants to this project have been chosen in order to assure a rational coordination (URACA-Bari, Italy, a research institute of southern Europe), a good knowledge of the Mediterranean reality (USEK Lebanon and INRA

Morocco) and an excellent spreading of the results both at Mediterranean scale (IAM Bari, Italy) and southern Europe (ITAL-ICID Rome, Italy).

## **024106- WETLANDMODEL**

Modelling wetland hydrology and the impact of human interference on its hydrological processes

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 1/1/2006 - 9/30/2007

*EC contribution:* € 168 231

*Policy drivers:* Socio-economy  
Hydromorphology

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### **Abstract**

Wetlands have an important ecological and economic function as water resource and regulation areas. However, this function is very fragile for human interference. Land use changes and climate change may have a large impact on the hydrological processes occurring in wetland soils. This proposal aims at a description of the changes in soil structure and hydraulic properties in wetland soils triggered by human interference. Both an experimental and a modelling approach are foreseen. In a first phase, field experiments will be set up for a quantitative description of the hydraulic properties of wetland soils and the impact of human interference. Laboratory experiments are planned to assess the impact of changing environmental conditions such as temperature and moisture conditions on the soil hydraulic properties. Based on these data, algorithms will be developed that accurately describe the observed processes. Using data from hill slope scale experiments and runoff measurements, these processes are upscaled from pedon scale to a fully functional hydrological model. Modelling hydrological processes in wetland soils is particularly challenging, as many classical soil-water interaction concepts cannot be applied. Swell and shrink properties, preferential flow paths and non-Darcian flow occur much more regularly than in mineral soils. As a result, non-rigid soil theories have to be incorporated in the hydrological model. Finally, the developed model will be used to carry out a scenario analysis which assesses the impact of future changes in climate and land use on the hydrology of wetlands. The results of this analysis are indispensable for future sustainable wetlands management. The study also has a strong interdisciplinary aspect, combining soil physics with advanced computational techniques, geographical information systems and land management. As a result, it is necessary to establish a strong and multidisciplinary research network.

## **224168- WIDE**

Decentralized and Wireless Control of Large-Scale Systems

[ist-wide.dii.unisi.it/](http://ist-wide.dii.unisi.it/)

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*Funding scheme:* CP (Collaborative Project), FP7

*Project duration:* 8/31/2008 - 8/31/2011

*EC contribution:* € 1 799 989

*Policy drivers:* Socio-economy

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### **Abstract**

Increased global competition and an urgent need to address sustainability and resource-efficiency of operations force European industries and large-scale infrastructure operators to look for efficient real-time decision-making systems that allow them to react rapidly, consistently and effectively to a continually changing economical and environmental landscape. Advances in optimization tools and the emergence of new highly pervasive, cheap, and reconfigurable wireless sensing technologies now motivate the research for novel distributed layers of plant management that are highly coordinated through the plant-wide circulation of information. The WIDE project aims at developing a rigorous framework for advanced control and real-time optimization of truly large-scale and spatially distributed processes, based on the integrated use of distributed model predictive control and wireless sensor feedback.

While the technologies and methodologies investigated in WIDE are general enough for many contexts, the project employs its unique access to an operational European city water distribution network to prove the effectiveness of the new concept in real practice.

The objectives of WIDE are aligned with Objective ICT-2007.3.7 “Networked Embedded and Control Systems”, target outcome (c) “Control of large-scale complex distributed systems” as (i) it envisions a generic modelling and control design method for large-scale distributed systems such as manufacturing and process plants and large scale infrastructures; (ii) it proposes a new engineering approach to the design of scalable distributed model predictive controllers that optimize operational efficiency under resource and safety constraints while ensuring robustness to component and communication failures; (iii) it enables the use of wide-area wireless sensor networks for closing the control loop.

## **286753- WIMBEX**

Remote wireless water meter reading solution based on the EN 13757 standard, providing high autonomy, interoperability and range.

[www.wimbex.com/](http://www.wimbex.com/)

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*Funding scheme:* BSG-SME (Research for SMEs), FP7

*Project duration:* 12/1/2011 - 11/30/2013

*EC contribution:* € 1 123 380

*Policy drivers:* Socio-economy

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### **Abstract**

Meter reading is the backbone of the home water billing system. If meters are read incorrectly or not read at all, it will cause a chain reaction of added events that add unnecessary expense and create customer dissatisfaction. Consortium SMEs have identified a clear need to develop a smart wireless water metering system based on the European Standard EN 13757 "Communication systems for meters and remote reading of meters".

The system will be suitable for use in a variety of water metering scenarios, will require no maintenance and will provide authenticable and secure data transmission as well as timely and accurate recording of the consumption of water which will help in identifying any leakages through the analysis of the actual quantity supplied and recorded by the meters.

The commercial objective is to develop a powerful set of new features to the SME wireless EN 13757 platforms, to enable the products and services of consortium SMEs to keep pace, and even surpass the future needs (high autonomy, interoperability and long radio range) of the emergent Automatic Water Meter Reading (AWMR) market in Europe. The project also aims to exploit aspects of the EN 13757 standard, which are not fully exploited as yet, and in this manner to add value to a European standard.

### **Partners**



# Water and Agriculture



## **232331- ALGATEC**

Biotechnological recycle of olive mills washing water by microalgae

www.algatec.net

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*Funding scheme:* BSG-SME (Research for SMEs), FP7

*Project duration:* 4/15/2009 - 8/14/2011

*EC contribution:* € 1 070 162

*Policy drivers:* Water and Agriculture  
Chemical Aspects

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### **Abstract**

The EU is the most important producer of olives in the world, from 2001-2007, 2,2 million tonnes of olive oil were produced in about 12.000 olive mills, which accounts for the 80% of the world production. These producers are mainly SMEs placed in the basin of the Mediterranean Sea, being Spain, Italy and Greece the biggest producers. Olive oil consumption is growing worldwide thanks to the acknowledgement of its benefits on health. Although the EU is the main olive oil consumer, the demand in countries like USA and Syria has increased significantly in recent years. On the other hand, non-European countries like Turkey, Syria and Tunisia enter the market and harden competition, threatening EU producers' dominant position. Besides the market expansion, the olive oil sector in the EU will have to solve some long-standing environmental problems to keep its predominant situation. During the olive processing, large amounts of highly pollutant liquid wastes are generated. This poses serious problems to olive oil mills since waste management involves additional costs and logistical problems, especially for the SMEs. About 50 litres of drinkable water are required to wash 100 kg of olives. Hence, an enormous amount of drinkable water in Mediterranean countries is consumed by this process (about 5 billions of litres a year). Such huge amount of water is mostly required in rural areas which, in contrast, very often exhibit serious shortage of water. The main objective of ALGATEC project is the treatment and reuse of WW generated in small olive oil mills, with high pollutant content, by means of an affordable and compact photobioreactor using microalgae, capable to recover and recycle the majority of the drinkable water used in the process of olives washing. Furthermore, their problem of the disposal of wastewater will be reduced because the reutilisation of the WW will diminish the overall volume of wastewater, with both economical and environmental benefits.

## **251821- AQUABAC**

The use of potentially protective bacteria in aquaculture against fish pathogenic *Flavobacterium* spp.

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 5/1/2010 - 4/30/2012

*EC contribution:* € 173 240

*Policy drivers:* Water and Agriculture  
Chemical Aspects

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### **Abstract**

*Flavobacterium psychrophilum* and *F. columnare* cause high mortalities in salmonid culture as the cause of various surface and systemic infections. Traditionally, *Flavobacterium* infections have been treated with antibiotics, but this is an emotive issue because of the perceived problems associated with tissue residues and the development and spread of antibiotic-resistant bacteria. Indeed the high susceptibility of *Flavobacterium* for the antibiotics commonly used in EU fish farms has been recorded. Alternative methods of disease control are needed for which the use of bacteria as probiotics and/or water treatments is gaining attention. Thus, the role of the beneficial bacteria is to exclude pathogens and promote the good indigenous microbial flora in fish. The aim of this research is to optimize protective bacteria which work as biological control agents against *Flavobacterium* infections.

The research will focus on three bacterial cultures which have been highlighted in preliminary *in vitro* and *in vivo* work by the researcher, to determine their mode of action for disease control in salmonid culture. As *Flavobacterium* usually affects the host through external surfaces, it is proposed to study how the beneficial bacteria exclude the pathogen from these surfaces. Furthermore, the role of bacterial subcellular components will be investigated by means of immunoproteomics. Although immunoproteomics is extensively used in vaccine production, their use here would lead to more precise information about the nature of similar or shared antigens between the protective bacteria and pathogenic *Flavobacterium*. Apart from enabling research on a topic of relevance to European aquaculture, this Fellowship would be greatly advantageous to the researcher's career development, by the provision of training and a personalized research programme with high quality outputs in the laboratories of well known and respected academics in the Institute of Aquaculture at the University of Stirling.

## **032917- AQUADEGAS**

Development of cost effective reliable robust flexible compact and efficient degassing and aeration method for intensive aquaculture

<http://www.aquaetreat.org/>

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*Funding scheme:* SME (SMEs-Co-operative research contracts), FP6

*Project duration:* 1/15/2007 - 7/14/2009

*EC contribution:* € 722 157

*Policy drivers:* Water and Agriculture  
Ecological Status

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### **Abstract**

Land based fish farming is the critical success factor in intensive aquaculture since land based fish farms are the start of a very complicated value chain representing a prerequisite in order to have competitive sea farms as well as being an important. Stool in order to develop and commercialise fish farming of new species. The aquaculture tank represents a production unit with the primary objective of creating a managed volume where the fish in the spawn and growth phase can be fed in an optimal water quality for cost efficient production of fish. Water quality is one of the most critical factors in aquaculture. Optimum water quality is essential for survival rate as well growth rate of fish in the different phases of the life cycle and hence the productivity per m<sup>3</sup> effective tank volume. The fish in the production units consume oxygen from the water. In addition there is a considerable discharge of food spill faeces and gases in water all of which do represent harmful effects on the biomass. With increasing reuse and recirculation of water degassing of water becomes more prerequisite. The project idea is to develop a cost effective reliable robust flexible compact and efficient degassing method which meets the needs of the aquaculture sector for removing oversaturated harmful gases i.e. carbon dioxide, nitrogen and argon through development and application of ejector and nozzle technique for formation of micro bubbles for effective gas exchange in water integrated with sensor and control technology. The European aquaculture sector has increased substantially over the last decades. However overall production growth in Europe over the period 1994-2003 was 5.5 less than the global trend over the same period. The overall price trend was negative 0.5 APR vs positive global development and this sector has experienced increasing competition from non EU countries making it imperative to increase research and development in this sector.

## **013325- AQUALABS**

AQUALABS - Advanced Laboratory Training Courses in Aquaculture for Early-Stage Researchers

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 12/1/2004 - 11/30/2006

*EC contribution:* € 535 641

*Policy drivers:* Water and Agriculture

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### **Abstract**

AQUALABS consists of seven events, six state-of-the-art advanced courses for early-stage researchers emphasising the acquisition of practical skills and incorporating a substantial element of hands-on laboratory and field experience, with the seventh event being an innovative multidisciplinary workshop. Each training course is a collaborative effort between four or more European universities, facilitating up to 30 participants at centres recognised for expertise. Training course titles: (1) Quality of Fish Products, (2) Molecular Biology and Ecology, (3) Design and Operation of Recirculation Technologies, (4) Aquatic Animal Disease Diagnostics, (5) Freshwater Aquaculture and the Environment, (6) Fish Welfare. The series of events will conclude with the "Early-Stage Researchers Workshop", held in conjunction with the largest European Aquaculture industry tradeshow and conference for added value. The workshop aims will be three-fold: 1. Examine scientific content (relative to course title), prediction of future needs 2. Review of current and potential future research issues 3. Acquisition of non-research competencies. The workshop will enable researchers to develop synergies, collaborate and, in particular, allow early-stage researchers to engage in debates regarding the sustainable and ethical development of the sector whilst developing complimentary skills required for a successful research career. Coordination by AquaTT, a European network for education and training, will ensure cost effective, efficient management, publicity and dissemination. AQUALABS targets early-stage researchers working in aquaculture; however, the multidisciplinary nature of the courses will appeal to scientists from related fields. Each course will consist of three periods: 1. Preparation: centralised internet-based system 2. Training: 5 to 7 days of intensive training (lectures, practical experience, field trips) 3. Sustainability: tutorial support; online assessment

## **286601- AQUALITY**

On-line industrial water quality analysis system for rapid and accurate detection of pathogens

[aqualityproject.com/](http://aqualityproject.com/)

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*Funding scheme:* BSG-SME (Research for SMEs), FP7

*Project duration:* 12/1/2011 - 11/30/2013

*EC contribution:* € 1 164 090

*Policy drivers:* Water and Agriculture

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### **Abstract**

Currently the identification and quantification of pollutants in water are mostly carried out manually through sampling and subsequent laboratory analysis (off-line analysis), with methodologies of work that involve some significant costs in terms of displacement to sampling points, reagents and specialized personnel dedicated to the operation, leading to time consuming and economically challenging approaches, causing the number of analyses performed to be kept at the bare minimum. The industry therefore is calling for novel, cost-effective solutions to meet these new challenges: we propose to develop an online water monitoring device for microbiological contamination analysis, that allows industries and environmental protection agencies to replace the routine activities of sampling and laboratory testing of pathogens. The new system, which will be produced in two versions, both for online and for offline measurements, will be able to real time monitor the quality of industrial process water and effluents basing on an opto-ultrasonic device and on a lipid-based diagnostic kit. The novelty of our approach is the use of engineered liposomes for detecting bacteria in water: these are nanoparticles formed by a lipid bilayer enclosing an aqueous compartment displaying features that can be different (pH, ionic strength, composition) with respect to the bulk. We will load liposomes with a chromophore and will engineer them in order to make them specifically react with one target bacteria; this is the simple operating system of the AQUALITY system, which is completed by an ultrasonic unit to concentrate bacteria and an optical unit for detecting the sample colour change following to the interaction between liposomes and bacteria.

## **022723- AQUAMONEY**

Development and Testing of Practical Guidelines for the Assessment of Environmental and Resource Costs and Benefits in the WFD

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*Funding scheme:* STP (Specific Targeted Research Project), FP6

*Project duration:* 4/1/2006 - 9/30/2009

*EC contribution:* € 1 672 023

*Policy drivers:* Water and Agriculture  
Socio-economy

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### **Abstract**

The concept of environmental and resource costs plays a central role in the economic analysis of the European Water Framework Directive (WFD). However, there are no methodological guidelines regarding their practical assessment. The main objective of this project is to develop and test such practical and policy relevant guidelines. This will be achieved through the development of standard procedures and a protocol for good practice in decision appraisal for the WFD. These guidelines will then be tested via a series of case studies of selected, representative European river basins. Outcomes of these case studies will be used in two ways. First, this information will be used to refine the guidelines for good practice in WFD decision appraisal. Second, the common design of case studies will permit investigation of techniques for transferring economic values of environmental and resource costs and benefits from water body level to national and international river basin level and vice versa. As part of this exercise we will also investigate the use of geographical information systems (GIS) to synthesise data from the case studies with available physical environment and census data so as to generate a Europe-wide map of expected benefits of improved water quality due to WFD implementation. The proposed project is highly policy focussed, being driven from the outset by the direct involvement of a Europe-wide Steering Committee of policy-makers and other stakeholders directly involved in the implementation of the WFD.

## **269175- AQUAPHAGE**

Network for the development of phage therapy in aquaculture

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 3/10/2011 - 3/9/2015

*EC contribution:* € 358 700

*Policy drivers:* Water and Agriculture  
Chemical Aspects

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### **Abstract**

AQUAPHAGE aims to the formation of a strong network for the development of phage therapy in aquaculture through a well balanced research staff exchange program. The platform for the implementation of this initiative is a common project focused on the identification and exploitation of phages specific for bacterial pathogens that constitute serious threats for both freshwater and marine aquaculture. The target bacteria are *Listonella anguillarum* and *V. harveyi*, pathogens of Mediterranean aquaculture species (European sea bass and gilthead sea bream), *Flavobacterium psychrophilum*, serious pathogen of trout and *Aeromonas salmonicida*, obligate bacterial pathogen of Atlantic salmon. The capacities and synergies of the partners will be exploited towards these goals. Aquaculture facilities owned by the partners can provide the necessary materials for the isolation of a wide variety of phages. Enzyme Biotechnology, Molecular Biology and Genomics will provide strong background information for the most efficient selection of lytic phages. Enhancement of lytic activity using bacterial strains from the collections of the participating institutes will lead to the development of a final product with increased efficacy against these pathogens. Modern bioindicator system will be used for the assessment of disease treatment impact on the environment. The formation of this research partnership with partners owing expertise and excellence in their field will provide possibilities for inter-disciplinary exchanges and will constitute a technological and scientific platform for further cooperation in the field of Phage Therapy in Aquaculture.

## **285854- CARBGROWTH**

Maximisation of greenhouse horticulture production with low quality irrigation waters

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*Funding scheme:* BSG-SME (Research for SMEs), FP7

*Project duration:* 12/1/2011 - 11/30/2014

*EC contribution:* € 1 864 944

*Policy drivers:* Water and Agriculture

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### **Abstract**

Agriculture in the European Union faces some serious challenges in the coming decades: competition for water resources, rising costs, competition for international markets, changes in climate and uncertainties in the effectiveness of current European policies as adaptation strategies. Greenhouse production appears as an alternative to face some of the upcoming challenges. In 2009, the surface dedicated to greenhouse production at worldwide level was up to 800kha, from which 20% belongs to Europe. This production is characterised by a climate conditions associated to fourth climate regions, which allows for diversity in technologies and practices used for greenhouse vegetable production. On the other hand, The EU is the main export destination with almost one-half of the world's imports. In the period 2002-2008, fruit and vegetables imports have experienced a constantly growth (up to 39% for this period). Therefore, in order to ensure their competitiveness against producers from other Non-European countries with lower labour costs as Morocco, or Israel, European growers need to adopt new agricultural technologies to improve net production, ensure quality and reduce production costs. On the other hand, European aquaculture represents 20% of the total fish production. Major environmental impacts of aquaculture have been associated mainly with high-output of wastewater of intensive systems. In 2009, the Commission proposed a strategy for the future of the European aquaculture which includes new wastewater management strategies. In order to satisfy the needs of this two different sectors, Carbgrowth aims to: (1) increase net production and tolerance to salinity through CO<sub>2</sub> injection (2) recover CO<sub>2</sub> for injection by photocatalysis (3) reusing industrial wastewater for irrigation purposes and reducing the cost associated to water supply, (4) reduce charge loses in irrigation systems. (5) Develop process control to optimise irrigation, CO<sub>2</sub> injection and greenhouse climate control.

## **009388- CLAWS**

Corn Leaf Acclimation to Water Stress: Towards uncovering the molecular network that controls cell division and expansion in the growth zone with an emphasis on the role of Reactive Oxygen Species

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 9/15/2004 - 9/14/2006

*EC contribution:* € 152 753

*Policy drivers:* Water and Agriculture  
Ecological Status

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### **Abstract**

The aim of this project is to study the global changes of gene expression controlling the growth processes (cell division and cell expansion) of maize leaves in response to water-stress with a specific focus on the role of reactive oxygen species (ROS) and redox homeostasis. Using Computational Biology and Bioinformatics, the results will serve to: i) construct a physical map of gene expression of maize leaves; ii) test the hypothesis that ROS are major players in the observed leaf growth inhibition under water stress; iii) contribute to the building of a model of the gene regulatory networks responsible for the coordination of cell cycle and cell expansion under non-limiting growth condition and in response to the environmental perturbation; iv) enhance the knowledge of maize gene function through the comparison with gene databases of model species (rice, *Arabidopsis thaliana*), whose sequencing has been completed. To achieve this, an analysis of transcript profiles (microarrays) under control and water-stress conditions will be combined with a detailed spatial and temporal framework provided by a kinematic analysis of leaf growth, with cell cycle molecular status, and with ROS and antioxidants profiles along growing leaves. These will constitute the principal data inputs to the model and will be integrated with public domain (gene and protein) expression data and with maps of metabolic pathways to help establishing causal relationships within the regulatory network.

## **243529- COTTONBLEACH**

Improved Novel Eco-Friendly Bleaching System for Cotton Using Enzyme and Ultrasound Processes

[cottonbleach.cric-projects.com/](http://cottonbleach.cric-projects.com/)

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*Funding scheme:* BSG-SME (Research for SMEs), FP7

*Project duration:* 1/1/2010 - 12/31/2012

*EC contribution:* € 2 369 600

*Policy drivers:* Water and Agriculture

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### **Abstract**

Cotton textiles --the main natural-fibre textile used worldwide-- undergo a toxic and costly bleaching process that weighs heavily on the quality, cost and environmental impact of textile manufacture. CottonBleach proposes the development of an improved cotton bleaching technology, more respectful with the textiles and the environment, to improve the competitive edge of European textile SMEs. Current bleaching methods use hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>) and sodium hypochlorite (NaClO, aka bleach), resulting in fabric damage, formation of toxic by-products and large amounts of water and energy to remove these chemicals. The proposed CottonBleach technology offers a non-toxic Totally Chlorine Free (TCF) bleaching technology using a combination of sequential enzymatic techniques enhanced through the use of ultrasound technology. This innovative technology will maintain the natural strength of the cotton fibre, providing significantly improved bleaching effectiveness with minimal fibre damage. The scientific objective of CottonBleach is to further investigate the use of ultrasound-enhanced enzymatic bleaching on an industrial scale of development, as manifested by recently published economic analysis which consider the use of enzymes as “cost effective for textile mills to adopt”. This proposal also fulfils the objectives of FP7 collective research in that it will expand the knowledge base of large communities of SMEs and develop innovative technology that has potential applications in the broader bleaching industry.

## **217647- CREPE**

Co-operative Research on Environmental Problems in Europe

[crepeweb.net/](http://crepeweb.net/)

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*Funding scheme:* CP (Collaborative Project), FP7

*Project duration:* 5/1/2008 - 11/30/2010

*EC contribution:* € 798 130

*Policy drivers:* Water and Agriculture  
Water Scarcity and Droughts

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### **Abstract**

Overall aim: The CRÊPE project will empower and resource civil society organisations (CSOs) to participate in co-operative research on agri-environmental issues, as a means to achieve these subsidiary aims: 1. Capabilities: To strengthen CSOs' capacity to participate in research, while engaging with diverse perspectives and expertise, thus facilitating co-operation between researchers and non-researchers. 2. Co-operative research methods: To design, implement, evaluate retrospectively and thus test the methods used for co-operative research in this project, as a basis to inform future efforts. 3. Agri-environmental issues: To analyse diverse accounts of 'the environment' in relation to agricultural methods, technologies, innovations and alternatives. 4. Priority-setting: To relate research more closely to societal needs, as a means to inform policy debate and research priorities for Europe as a 'Knowledge-Based Society'. 5. Solutions: To suggest alternative solutions related to different understandings of societal problems, agri-environmental issues and sustainable development. A CSO partner will lead the study of a specific topic, as follows: WP1: Agrofuel production in Europe and the global South WP2: CSO participation in agbiotech issues WP3: Water scarcity and its virtual export from Spain to the UK WP4: Local agri-food networks and their environmental effects Other partners will lead studies of generic agri-environmental issues: WP5: CSOs' interventions into agri-environmental research WP6: European Research Area (ERA): agri-environmental priorities WP7: Innovation narratives in EU-funded research WP8: Co-operative research processes in this project A draft Executive Summary will be presented at an EU-level workshop. The project website will be used for several purposes: participants' networking, dissemination of results, and public comment.

## **043526- CROPWAT**

A Centre for Sustainable Crop-Water management

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*Funding scheme:* SSA (Specific Support Action), FP6

*Project duration:* 4/1/2007 - 3/31/2010

*EC contribution:* € 324 960

*Policy drivers:* Water and Agriculture

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### **Abstract**

Faculty of Agriculture is the only expert institution in Western Balkan region specifically targeting the problems of water saving in agricultural production using a multidisciplinary approach. The CROPWAT project intends to contribute to development of Serbia and Western Balkan region agriculture by reinforcing this existing expertise. The proposal builds on complementary collaborations in several existing international projects and aims to increase human potential and expertise in new analytical methods that allow the production of safe food and crops grown with less water and water of controlled quality. Expertise will be developed in new methods for detection and removal of microbial and chemical contaminants in the system of irrigation water/soil/irrigated crops. This expertise will also help in implementation of EU standards for control of quality of water for irrigation and irrigated crops. Human potential of the FoA and its sustainability will be increased by training young scientists in EU laboratories. New water saving irrigation techniques are based on crop-monitoring systems and, therefore, FA will also develop its expertise in crop stress physiology, anatomy and molecular biology. These methods are also missing in Serbia and whole region, but are essential if we intend to diminish the effects of drought on agricultural crops. The acquisition and transfer of new knowledge will be done through training young researchers and students, exchange visit of experts, stakeholder meetings, presentation activity and preparing national and international research projects. This will ensure long-term sustainability of the FA as the only research unit in Western Balkan region with expertise and networking in crop water saving technologies. In years to come CROPWAT will help in implementation of EU policy in quality and safety standards in both agricultural and environmental areas.

## **509087- DIMAS**

### Deficit Irrigation for Mediterranean Agricultural Systems

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*Funding scheme:* STP (Specific Targeted Research Project), FP6

*Project duration:* 9/1/2004 - 5/31/2008

*EC contribution:* € 1 015 000

*Policy drivers:* Water and Agriculture

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#### **Abstract**

Irrigation uses about 80% of all water diverted for various uses in the Mediterranean. Nevertheless, increased demand for other uses coupled with water scarcity is putting unprecedented pressures on reducing the share of freshwater used in irrigation. Given the degree of scarcity in many areas of the Basin, if irrigation water use could be reduced, it could become a major water source, thus releasing resources for alternative use. The objective of this project is to evaluate the concept of deficit irrigation (DI) as a means of reducing irrigation water use while maintaining or increasing farmers profits. The DI concept will be the subject of multidisciplinary research at different scales, geographic locations, and with different perennial and annual crops. The objective will be to develop a workable, comprehensive set of irrigation (DI) strategies that can be disseminated quickly among the various agricultural systems of the Mediterranean Region. The project addresses directly the first topic of the INCO-2002-B1.2 specific measure, 'research on sustainable irrigation, including deficit irrigation'. Eleven partners from seven different countries (Greece, Italy, Jordan, Morocco, Spain, Tunisia and Turkey), including research and water association institutions will work for three years on the project. Their main activities will be: a) the development of a general summary model of crop yield as a function of water supply, b) the validation of the model for the main irrigated annual (wheat, sunflower, cotton,) and perennial crops (olive, pistachio, citrus), using common research protocols, c) a survey on physical, socio-economic and cultural conditions for each crop and irrigated area, and d) scaling up by combining the yield model with economic optimization modules that will generate optimum DI strategies compatible with the specific socio-economic characteristics of each area under study.

## **265471- EAU4Food**

European Union and African Union cooperative research to increase Food production in irrigated farming systems in Africa

[www.eau4food.info/index.php/home](http://www.eau4food.info/index.php/home)

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*Funding scheme:* SICA (Large-scale integrating project for specific cooperation actions dedicated to international cooperation partner countries), FP7

*Project duration:* 7/1/2011 - 6/30/2015

*EC contribution:* € 3 994 856

*Policy drivers:* Water and Agriculture

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### **Abstract**

EAU4Food seeks to address the need for new approaches to increase food production in irrigated areas in Africa, while ensuring healthy and resilient environments. Potential pitfalls of introducing innovations in local farming systems, like limited adoption by farmers and trade-off effects to other (environmental) systems are overcome by, respectively, i) utilizing a true trans-disciplinary approach, which involves the active participation of all stakeholders in all relevant disciplines, and ii) by determining and respecting so called sustainable production thresholds. EAU4Food is executed in four irrigated areas in Africa, viz. Southern Africa (Mozambique and South-Africa), Tunisia, Mali and Ethiopia to fully benefit from the potential of cross distributing promising strategies and innovations. At each site, key indicators, risk factors, farm strategies and biophysical parameters are monitored for identification of current constraints to food production and to evaluate agro-ecological and socio-economic impacts of improved practices and/or innovations after implementation. Results of EAU4Food are distilled into tailor made support tables and guidelines for different user groups. These support tables and guidelines support decision making processes at local level by overseeing short-term and long-term effects of alternative practices and improved strategies. EAU4Food is expected to have significant positive impacts on agricultural production at farm level for many years to come, and on wider policy processes at national and trans-national levels. To enlarge and maintain the impact of EAU4Food, capacity building programmes are developed at different levels, going from farmer to farmer exchange up to exchange of scientific personnel. Moreover, further exploitation of the results of EAU4Food is supported via other mediums such as songs of success, documentaries, school programmes, policy briefs, fact-books and scientific publications and presentations.

## **218467- ECOBUG**

Development of an Innovative Industrial Bioreacting and Fermentation Process producing an Organic Insect Repellent-Fertilizer for Ecological farming

[www.ecobug.eu/about-the-project](http://www.ecobug.eu/about-the-project)

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*Funding scheme:* BSG-SME (Research for SMEs), FP7

*Project duration:* 12/1/2008 - 1/31/2012

*EC contribution:* € 2 311 319

*Policy drivers:* Water and Agriculture

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### **Abstract**

Our idea is to develop an “all-in-one” organic smell-free fertilizer and insecticide to increase yield of eco-crops, reduce costs, and reduce emissions to air & water that are common while using inorganic pesticides and fertilizers or fresh manure. The production of smell free fertilizer will be based on anaerobic fermenting of manure in a bioreactor. The insecticide production will be based on growing specific cyanobacteria proven to be insect repellent to cabbage root fly in a fermentation reactor for subsequent drying to a flake state. The final stage will consist of mixing the solid fertilizer with the small amounts of cyanobacterial flakes (1-10 kg flakes/100 ton fertilizer) to produce granules by protrusion technology with the moisture content of 5-10%. No industrial process can currently manufacture this combined insect repellent-fertilizer product due to lack of carrier substance for the insect repellent that also will add fertilizing value and delayed release. There exist currently no efficient organic product to control adult cabbage root fly. The following novel and innovative features will be developed:

- Development of a drying technology for the cyanobacteria biomass to flakes with humidity 15-20%
- Production of smell-free solid organic fertilizer from manure in <math>\leq 2</math> weeks/batch, humidity 20-30%
- Development of an innovative and novel extruder chamber with an in-line humidity sensor feedback controlled heating and with vacuum drying of mixed fertilizer/insecticide to ensure rapid drying from ~20% down to  $8 \pm 2\%$  before entering the compression zone of the extruder allowing a controlled co-extrusion with starch obtaining a fixed coating thickness with <math>\leq 10\%</math> variance
- Development of a co-extrusion process to produce starch-coated pellets with a moisture content of  $8 \pm 2\%$  ensuring even coating thickness of the total pellet surface that can be sold cost-effectively for €50/ton
- Obtain €190 Mn in repellent-fertilizer; equipment sales for Year5

## **204792- ECOMYCORRHIZA**

The effects of agronomic practices conducive to organic agriculture on the diversity and function of arbuscular mycorrhizal fungi

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 10/1/2007 - 9/30/2010

*EC contribution:* € 75 000

*Policy drivers:* Water and Agriculture

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### **Abstract**

Arbuscular mycorrhizal fungi (AMF) extensively form symbiotic relations with most plants which in most cases result in benefits to the plant including improved nutrition, amelioration of drought stress, improved soil structure, and protection from soil pathogens. AMF are considered key microbial players in low-input agricultural systems like organic farms. Selected efficient AMF could be used as soil inoculum in organic agriculture to benefit plant growth. Crop protection in such organic farms relies on pesticides of biological origin like azadirachtin or *Quillaja saponaria*, the use of non-chemical soil disinfection methods like soil solarization or biofumigation. The application of by-products of local agricultural industry like olive mill wastewaters (OMWs) might suppress soil plant pathogens and/or improve soil fertility. Although all the above practices are conducive or already used in organic farms there are no data regarding their effects on AMF and fungal community. The current proposal aims to investigate possible effects of crop protection and fertilization practices, conducive to organic farming fundamentals on the community and activity of AMF and other soil fungi. An initial survey will investigate the AMF status, diversity and function in organic farms. Selected AMF from the initial survey will be propagated at pure cultures and community cultures in order to be used in further experiments. Subsequent pot experiments will provide initial evidence of possible effects of the previously mentioned agronomic practices on the function and activity of AMF and fungi. Pot experiment results will be verified at replicated field experiments which allow the evaluation of the effects of these practices under realistic conditions. The proposed project will facilitate the integration of the applicant in EU, provide scientific expertise on mycorrhizal research for the host institution and guarantee training of the applicant to novel molecular fingerprinting methods.

## **273403- ELITE**

Mapping quantitative trait loci for water use efficiency in potato (*Solanum tuberosum*).

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* -

*EC contribution:* € 210 092

*Policy drivers:* Water and Agriculture  
Water Scarcity and Droughts

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### **Abstract**

A great challenge for potato production in the coming decades is to maintain or increase food production with a reduced availability of water. This can be achieved by understanding mechanisms for adaptation to water stress conditions and exploiting the existing variation in the crop and wild relatives. The specific objectives of this project include (a) to understand physiological mechanisms of adaptation to water stress and drought tolerance, and to improve water use (b) to assess the impact of water stress, rainfall variability and climatic change on yield, and other physiological parameters and develop a knowledge base about crop water productivity under different water stress and management practices and identify Quantitative Trait Loci (QTL) (c) to capture and identify naturally occurring variation for adaption to water stress conditions and identify genetic regions of interest associated with water stress tolerance and yield under stress by using trait gene correlations aiming at associations due to several years of recombination in potato germplasm (d) to prepare crop models from G×E information available on yield and physiological parameters from multi-year trials which will help predict better performing genotypes under prevailing climatic conditions and (e) to link the phenotypic parameters to candidate genes by using information from model plant studies and cereal crops. These objective will be achieved by developing knowledge and tools for breeding for Water Use Efficiency (WUE) which involves: physiological parameter measurements, eco-physiological approaches and agronomical practices in crop production and development of molecular marker resources to map QTL's for environmentally sustainable traits.

## **275597- ENDOPHYTES**

Molecular basis of beneficial plant-endophyte interaction - sustainable agriculture from within

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 8/1/2011 - 7/31/2013

*EC contribution:* € 174 047

*Policy drivers:* Water and Agriculture

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### **Abstract**

In today's world, there is a growing need for biomass for food, feed and fuel. The search for a suite of strategies for sustainable production of biomass is of great scientific, technological and societal interest, and there is a pressing need to identify novel targets that can be manipulated for designing new strategies to enable sustainable crop production at higher intensities with limited water supply and to reduce our dependency on synthetic pesticides. Microbial endosymbionts, endophytes, represent alternative sources of biocontrol agents as they can enhance growth and tolerance to a variety of biotic and abiotic stresses. The objectives of the proposed research project are to uncover the molecular mechanisms of beneficial interaction between the endophytes and the host plant. Specifically, to dissect the mechanism of their interaction by characterizing the mechanisms of initial colonization of the root surfaces, early infection, adaptation inside the hosts, and impacts on host innate immunity and growth. The outcome will generate valuable new knowledge to identify the key functions in plant growth promotion and plant protection. These findings will be useful to develop strategies to increase plant establishment and biomass production, for improved sustainable agriculture, bioenergy feedstock production on marginal lands, or fight desertification of arid areas. The project is novel and ambitious with the state-of-the-art knowledge and methodologies in microbial biofilm, plant cell wall biology and innate immunity in world leading research institutions in microbial biofilm research in USA and in integrated plant research in Denmark.

## **265269- END-O-SLUDG**

Marketable sludge derivatives from sustainable processing of wastewater in a highly integrated treatment plant

[www.end-o-sludg.eu/](http://www.end-o-sludg.eu/)

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*Funding scheme:* CP (Collaborative Project), FP7

*Project duration:* 1/1/2011 - 12/31/2013

*EC contribution:* € 3 456 872

*Policy drivers:* Water and Agriculture

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### **Abstract**

This project researches, develops and demonstrates a toolkit of novel processes together with market development for advanced sludge-derived products and integration methodologies that can be applied to a range of wastewater treatment plants based on a typical municipal scenario. Supporting economic and life cycle assessment of the resulting gains in energy efficiency and conversion of renewable carbon, together with an implementation strategy based on a product mix with optimal value, will inform step changes that contribute to achieving more secure and sustainable sludge treatment and management practices in Europe while reducing pressure on natural resources and reliance on manufactured fertilisers. Addressing key sludge management issues in the context of EU climate change mitigation and energy policies, the project concentrates on novel processes for sludge volume reduction, more efficient treatment and downstream processing for high quality sludge derivatives together with application protocols and assessment of the pathogen risk and long term soil impact for greater public confidence. Using an integrated approach with emphasis on the whole wastewater treatment system, the project promises innovative system solutions that have the potential to achieve up to 20% annual carbon savings for the water industry by 2020 and ultimately could deliver up to 15,791,131 tCO<sub>2</sub>e pa savings for Europe. Composing of 14 partners including 7 SMEs from industry, academia and Government establishments, the Consortium is a balanced mix of highly qualified and committed individuals that are well-placed to tackle the technical challenges, disseminate the results and to exploit the €17.5 billion market for new environmental equipment that will be opened up by the project.

## **265213- EPI-WATER**

Evaluating Economic Policy Instruments for Sustainable Water Management in Europe

[www.feem-project.net/epiwater/index.html](http://www.feem-project.net/epiwater/index.html)

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*Funding scheme:* CP (Collaborative Project), FP7

*Project duration:* 1/1/2011 - 12/31/2013

*EC contribution:* € 3 472 438

*Policy drivers:* Water and Agriculture  
Socio-economy

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### **Abstract**

Economic policy instruments (EPI) have received widespread attention over the last three decades, and have increasingly been implemented to achieve environmental policy objectives. However, whereas EPI have been successfully applied in some policy domains (such as climate, energy and air quality), their application to tackle water management issues (drought/water scarcity, floods, water quality control) are beset by many practical difficulties. EPI-Water sets to assess the effectiveness and the efficiency of Economic Policy Instruments in achieving water policy goals, and to identify the preconditions under which they complement or perform better than alternative (e.g. regulatory or voluntary) policy instruments.

Using a common multi-dimensional assessment framework, the project will compare the performance of single economic instruments or their apposite combinations with the performance otherwise achievable with regulatory (command & control) interventions (such as water restriction/rationing, licensing or permitting), persuasive instruments or voluntary commitments. Furthermore the project will identify remaining research and methodological issues that need to be addressed, in particular with regards to the further development and use of national accounting, for supporting the design, implementation and evaluation of EPI in the field of water management.

## **222331- ETOILE**

### **BIOETHANOL PRODUCTION VIA LIGNOCELLULOSIC FERMENTATION OF OLIVE OIL RESIDUES**

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*Funding scheme:* BSG-SME (Research for SMEs), FP7

*Project duration:* 11/1/2008 - 1/31/2011

*EC contribution:* € 885 077

*Policy drivers:* Water and Agriculture

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#### **Abstract**

Bioethanol has been increasingly becoming the renewable energy source that could reduce the oil dependence of the developed countries. Biorefineries can use the locally grown agriculture to produce ethanol. However, food chain supply is beginning to suffer the effects of the ethanol massive production raising major ethical concerns. Cellulosic ethanol can overcome the environmental risks that accompany the surge of harvest biomass feedstocks and thus can represent a real and pursuable technology for the future. According to the US DOE life-cycle analysis, ethanol from cellulose reduces greenhouse gas emissions by 90% compared to gasoline. Cellulosic biomass is the most abundant biomaterial on earth it is available almost in any country. Vegetal residues (wheat and rice straw, olive oils residues, etc.) can constitute a renewable source of raw materials for cellulosic ethanol production plants. Currently only a few pilot plants are producing bioethanol from lignocellulosic feedstock using an enzymatic hydrolysis process. Olive oil residues can constitute a valuable resource as a low cost feedstock for cellulosic ethanol production. At least 2 million tonnes of cellulose are discarded on the Mediterranean area every year, representing both an environmental problem and a waste of a valuable resource. The ETOILE project intends to develop a new integrated process where olive mill waste water from traditional three-phase centrifugation process is purified and at the same time cellulase enzymes are obtained. These enzymes are then used onto the solid olive oil residues, such as olive pulp and husks, to obtain ethanol. The research envisaged will thus provide a viable alternative to the growing bioethanol industry seeking for new cost-effective production processes competitive with oil industry.

## **211457- EUPHOROS**

### **EFFICIENT USE OF INPUT IN PROTECTED HORTICULTURE**

[www.euphoros.wur.nl/UK/](http://www.euphoros.wur.nl/UK/)

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*Funding scheme:* CP (Collaborative Project), FP7

*Project duration:* 3/1/2008 - 2/29/2012

*EC contribution:* € 2 995 408

*Policy drivers:* Water and Agriculture

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### **Abstract**

The four-years project EUPHOROS aims at developing a sustainable greenhouse system that: does not need any fossil energy && minimizes carbon footprint of equipment; with no waste of water nor emission of fertilizers and full recycling of the substrate; with minimal need of plant protective chemicals yet with high productivity and resource use efficiency. Three commodity-based work packages (WP) will develop a diversity of innovative tools and systems to reduce energy, water, fertilisers, pesticide consumption and waste. Another WP optimizes the growing environment, developing innovative but robust monitoring tools for performance assessment, early detection and response management. The balance between environment and economy is addressed in a dedicated WP, which will quantify the reduction of resource input and carbon footprint delivered by each component of this project, together with the financial/economic consequences. Even an incremental adoption by the growers of the project results will increase competitiveness while reducing resource use of the European greenhouse production. A truly continental impact will be achieved by developing systems that are anchored in the local speciality of greenhouse industries and which are seen to respond to the diversity of climatic, economic and environmental constraints across Europe. This will be ensured by installing, testing, fine-tuning and evaluating locally relevant combinations of crops (tomato and/or rose), equipment, covering materials, cultivation techniques, monitoring and control systems in The Netherlands, Spain and Hungary. The participation of 5 commercial partners and a big growers' organization guarantees fast implementation of the most promising results. The involvement of local stakeholders to give feed-back, and extended dissemination activities, like national && international workshops and a training course, are included to ensure the convergence of project results with market expectations and acceptance.

## **512951- FISHTANKRECIRC**

Development of electro-coagulation technique for optimal cleaning efficiency and maximum reuse of water in land based fish farming

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*Funding scheme:* SME (SMEs-Co-operative research contracts), FP6

*Project duration:* 9/1/2006 - 8/31/2008

*EC contribution:* € 655 841

*Policy drivers:* Water and Agriculture

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### **Abstract**

European aquaculture production has increased substantially over the last decades. However, overall production growth in Europe over the period 1994-2001 was 6.3% APR, 5.5% less than the global trend over the same period. The overall price trend was negative (-0.5% APR) vs positive global development. This sector has experienced increasing competition from non-EU countries, especially Asia and South America has made it imperative to increase research and development in this sector. Land based fish farming is the critical success factor in intensive aquaculture since land based fish farms are the start of a very complicated value chain representing a prerequisite in order to have competitive sea farms. Further, land based fish farms is the most important "tool" in order to develop and commercialise fish farming of new species since control with water quality is essential. Further developments of land based fish farms are therefore crucial for the aquacultural sector and its service and technology providers. Water is one of the most critical input factors, and control of water quality is therefore essential for optimal growth. Our idea is to develop a water treatment system based on electro-coagulation technique to fulfil the need of European aquaculture for rearing inland fish through intensive recirculation of water with cost effective and reliable technology. The treatment system addresses the challenges of the European aquaculture towards increased competition, scarcity of water resources, environmental degradation and customer demand. To achieve these objectives, we will need to develop a novel reactor configuration for an electrocoagulator, able to remove the organic particles, phosphates, nitrates, ammonia as well as soluble organics at the rate necessary to increase the water quality and associated growth rates of the fish. To create this technological capability, new knowledge will be acquired and applied to specific development routes.

## **036958- FLOW-AID**

Farm Level Optimal Water Management: Assistant for Irrigation under Deficit

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*Funding scheme:* STP (Specific Targeted Research Project), FP6

*Project duration:* 10/1/2006 - 12/31/2009

*EC contribution:* € 1 021 000

*Policy drivers:* Water and Agriculture

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### **Abstract**

The objective of FLOW-AID is to contribute to sustainability of irrigated agriculture by developing, testing in relevant conditions, and fine-tuning through feed-back, an irrigation management system that can be used at farm level insituations where there is a limited water supply and water quality. The project integrates innovative sensor technologies into a DSS for irrigation management, taking into consideration relevant factors in a number of third country partners. The specific objectives are to develop and test new and innovative, but simple and affordable, technical concepts (hardware and software) for irrigation under deficit at farms in a large variety of set-ups and constraints, particularly a maintenance free tensiometer; wireless, low-power data networks; an expert system to assist farm zoning and crop planning, in view of expected water availability (amount and quality); a short-term irrigation scheduling module thatallocates available water among several plots and schedules irrigation for each one. The scientific results from the research will be evaluated in four test-sites, three of them located in Mediterranean Party Countries (Turkey, Lebanon and Jordan), where the large future market for deficit irrigation systems will be. The test-sites are chosen in such a way that they differ in the type of constraints, irrigation structures, crop types, local water supplies, availability of water and water sources in amount and quality, the local goals, and their complexity. The SME partners will take up research results and build prototypes, which will be installed at the test-sites. In close co-operation all partners will adapt the general concepts of water management to the local situation, by using appropriate parts of it, based upon the test-results. The SME involvement will ensure that the results will be implemented in a short time into adequate and appropriate products for the end-user irrigation market.

## **220407- FUNRESO**

FUNctional-structural plant models for improved estimation of crop and soil status based on REmote Sensing Observations

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 8/22/2008 - 8/21/2009

*EC contribution:* € 117 432

*Policy drivers:* Water and Agriculture

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### **Abstract**

The present proposal aims at developing a novel approach for improving the accuracy of estimation of crop and soil variables from remote sensing, which is today limiting for a number of applications as in precision agriculture. The approach is based on the coupling of a dynamic functional crop model to a 3-D canopy structure model. This will allow to take explicitly into account the 3-D architecture of plants while including the effects of water and nitrogen stress and to assimilate directly the reflectance data into the 4-D (3-D plus time) model. Improvements in remote sensing information retrieval accuracy are expected by a) implicit and explicit inclusion of prior knowledge of vegetation parameters, allowing attenuation of problems due to the ill-posed nature of information retrieval from remote sensing and b) better accuracy of canopy reflectance simulations due to the improved realism of such models as compared to classical turbid medium approaches. The research work will be carried out at one of the leading research groups in the world in this sector, the INRA CSE Unit in Avignon (France), and will take advantage of the existing functional structural 4-D models available at the host institution as well as model inversion procedures and experimental results and databases developed by the CSE team.

## **500501- HBTPOLARCH**

Climatic and anthropogenic drivers in the Holocene vegetation development of two large European river basins: the Maritsa Valley in Bulgaria and NW Turkey and the Tisza Valley in E Hungary

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 5/1/2004 - 4/30/2006

*EC contribution:* € 169 366

*Policy drivers:* Water and Agriculture

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### **Abstract**

While the Maritsa River Basin in SE Bulgaria and NW Turkey, and the Tisza Lowland in E Hungary are key areas in respect of the spread of farming in Europe, their environmental history and the human impacts on their landscapes remain unknown. In 2002, four sediment cores with well-preserved pollen and plant macrofossils were recovered from lakes in these areas all in close proximity to key archaeological sites. The prime objective of this research is to investigate the palaeo-environmental record of Late Glacial and Holocene landscape transformations brought about by agriculture and pastoralism using a multi-disciplinary approach, in which a wide-range Quaternary palaeo-ecological techniques (pollen-, plant macrofossil-, microcharcoal analyses, AMS radiocarbon and tephro-chronological dating) are combined with archaeology. The principal hypothesis to be tested states that despite the existence of long-lived settlements and a large quantity of domesticated plants and animals there was little human impact by farmers in SE Europe until the Bronze Age. Most of the pollen sites on the bases of which this hypothesis was formulated are however located at relatively large distance from key early farming sites. Our sites, in contrast, lie next to well-documented prehistoric settlements; accordingly the scale at which early farming was practiced can be dependably resolved. The second aim is to define and explain regional changes in palaeoclimate, particularly in water-balance at centennial to millennial scale. An important research question is whether the pollen records from the Bulgarian and Turkish sites show a contrasting Early Holocene cooling and increased humidity characteristic for the Eastern Mediterranean pollen-based palaeoclimate reconstructions but not detectable in the related marine records. Finally, we would like to compare our palaeoclimate reconstructions along a SE-NW transect to see what were the main differences between Asia & C. Europe.

## **261562- HELM**

Harmonised European Land Monitoring

[www.fp7helm.eu/](http://www.fp7helm.eu/)

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*Funding scheme:* CSA (Coordination - or networking - action), FP7

*Project duration:* 1/1/2011 - 12/31/2013

*EC contribution:* € 1 000 000

*Policy drivers:* Water and Agriculture  
Ecological Status

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### **Abstract**

The land surface is a decisive factor regarding the state of the environment and human well-being. To manage it well, regularly obtained up to date information on land use and land cover is needed. Land monitoring provides this information through thematic maps based on the interpretation of areal photography, satellite imagery and further sources. These maps aid spatial planning, nature protection, agricultural policy, forestry, water catchment area management, etc. In spite of its importance, land monitoring in Europe is quite inefficient owing to lacking coordination between the national, sub-national, and European levels. Efforts are duplicated and given opportunities for mutual support are not utilised which means a substantial waste of resources.

HELM is a network of authorities concerned with land monitoring across Europe. It will initiate a move to increase the maturity of European land monitoring along five sequential steps: (1) mutual interest in achieving reciprocal knowledge, (2) shared visions and planning for the future, (3) joint activities by taking on tasks collectively, (4) alignment of national systems involving the mutual adaptation of data interpretation methods and of the timing of data gathering, (5) lasting integration and combining data across all administrative levels.

HELM envisions a coherent European land monitoring system characterised by high quality data and efficient productivity. This system will combine the broad range of specific expertise and resources of relevant authorities in the member states. Their work will be supported through targeted centrally supplied measures fulfilling common requirements for raw data and data processing. Through a continuous flow of knowledge from the local to the European scale and the other way round, future information needs regarding land use and land cover will be met as an essential basis for managing the land surface in the framework of European sustainable development.

## **252196- IMPRESS**

IMaging of Plant Responses to Environmental Stress

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 6/1/2010 - 5/31/2012

*EC contribution:* € 239 282

*Policy drivers:* Water and Agriculture  
Ecological Status

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### **Abstract**

The need to meet the EU's demand for food and other plant products while preserving natural environments for recreation and conservation of biodiversity in the face of increased population and climatic pressures, has led to an unprecedented demand for an improved understanding of resource capture and utilisation by plants, and of how abiotic stress impacts on plant performance. Imaging techniques are currently being applied in biomedicine to enhance spatial and temporal detection of physiological processes at a range of scales. In plant sciences the potential of imaging techniques in both fundamental and applied research has as yet to be widely exploited. We propose to combine thermal infra-red and chlorophyll fluorescence imaging to investigate the impacts of abiotic stress on photosynthesis and transpiration, at the level of the leaf, plant, and crop. The techniques will be applied to detecting spatial and temporal responses to a range of environmental stresses in photosynthetic reactions and stomatal conductance of leaves of transgenic plants with altered capacity to scavenge reactive oxygen species. Additionally, the techniques will be applied to detection of genotypic variation in rye grass (a model monocot crop) and food crops (wheat, potato) in photosynthetic reactions and stomatal conductance under diverse types, durations, and degrees of environmental stress. Genotypes with different physiological behaviour will be characterised to improve our understanding of stress responses of these crops. Finally, whole crops will be imaged to rapidly determine the impacts of different agronomic practices on carbon dioxide and water fluxes.

## **517728- INNOVA-MED**

Innovative processes and practices for wastewater treatment and re-use in the Mediterranean region

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*Funding scheme:* CA (Coordination Action), FP6

*Project duration:* 1/1/2007 - 5/31/2010

*EC contribution:* € 480 000

*Policy drivers:* Water and Agriculture

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### **Abstract**

The need to introduce remediation and treatment technologies in the water cycle was recognized by the European Commission under the 5th and 6th Framework Programme and several research projects aiming at 'improving WW treatment techniques through process optimisation to minimise environmental impacts from WW treatment' were funded. In parallel various initiatives are being conducted at the national level, both in the EU and Mediterranean Partner Countries (MPC). However, the communication gaps still existing among scientists and local communities (and water users) and the lack of networking among different Mediterranean countries are the main obstacles to more efficient use of the gained knowledge. The INNOVA-MED Coordination Action will include 7 EC funded projects (P-THREE, CADOX, EMCO, AQUACAT, EmWATER, WATERBENCH and HOLIWAST), dealing with wastewater treatment and water management: 2 from the EESD programme (5th FP); subprogramme area: Waste water treatment and re-use, 3 from the INCO programme (for Western Balkan Countries and Developing countries and Newly Industrialized States), one from Policy-orientated research programme - Scientific Support to Policies (SSP) (Scientific Support to Policies) programme and one project from the EU-MEDA programme. The main objective is to explore the synergies of the research carried out within different programmes and countries (eg. ED, WBC, DEV, NIS, MCP), to coordinate the research activities of ongoing EU and national projects dealing with development of innovative technologies for wastewater treatment and treatment and disposal of sludges and with application of innovative practices for re-use of reclaimed water and to facilitate the communication with researchers and national and regional institutions from the MPC and allow a broad dissemination and transfer of the knowledge/technology/practice to the Mediterranean area.'

## **235618- INTRA PATH**

Molecular Characterisation of the INTRAcellular Plant Aquaporin Trafficking and Hetero-oligomerisation

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 4/1/2009 - 3/31/2011

*EC contribution:* € 158 989

*Policy drivers:* Water and Agriculture

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### **Abstract**

In plants, the movement of water and small neutral solutes across the plasma membrane (PM) is dependent on the number and activity of water channels, named aquaporins (AQP). Little is known about mechanisms by which AQPs reach their final destination. Recent studies have shown that PIP (Plasma membrane Intrinsic Protein) aquaporins belonging to two subgroups, PIP1 and PIP2, physically interact to regulate their trafficking and the cell membrane water permeability. Therefore, this mechanism might play a pivotal role for the regulation of PIP functions. The main objective of the project is to generate detailed knowledge about the mechanisms regulating the intracellular trafficking of PIP1 and PIP2 aquaporins and the implication of their mutual interaction. To achieve this goal, 4 work packages have been defined. 1) We will characterise protein motifs responsible for ER retention of PIP1s and PM trafficking of PIP2s. 2) The amino acid residues responsible for the physical interaction between PIP1 and PIP2 isoforms will be determined. 3) We will investigate the transport capacity and selectivity of PIP hetero-oligomers. 4) Mechanisms governing subcellular PIP redistribution and dynamics upon specific stimuli will be characterised. The project represents a fundamental scientific approach providing valuable insights into hetero-oligomer formation, sorting and spatial redistribution of PIPs and will clearly advance the “state of the art” of the plant AQP research. It will generate a highly relevant basis for the uncovering of specific AQP functions in cells, tissues and thus in the metabolism of plants. Furthermore, these data will be crucial for the use of AQPs in biotechnological or plant breeding strategies aiming at a modulated water or solute transport leading to a higher drought resistance or an improved nutrient uptake or distribution in plants. Such traits demand a precise localisation of AQPs rather than a spatially uncontrolled modulation of AQP expression.

## **023120- IRRIQUAL**

Sustainable orchard irrigation for improving fruit quality and safety

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*Funding scheme:* STP (Specific Targeted Research Project), FP6

*Project duration:* 7/1/2006 - 12/31/2009

*EC contribution:* € 2 249 693

*Policy drivers:* Water and Agriculture

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### **Abstract**

European countries, especially in the Mediterranean area, need to encourage sustainable agriculture practices, reducing inputs, especially of water, and minimising any negative impact on fruit safety and quality. One of the most promising ways to improve the sustainability of irrigated agrosystems is to develop and optimise the orchard water management, adjusting water application for improved crop quality and assuring crop safety. In this sense, the topic of interest of IRRIQUAL project deal with the valuation of new irrigation practices (including water doses implementation, water quality use and fertigation management). The research methodology will be based on the combination of experiments, field surveys and modelling tools aimed toward prediction of a given irrigation practice on the relevant inputs (water, fertilizers) and outputs (yield, fruit quality and safety) of several Mediterranean fruit trees species (Peach, Olive, Almond, Citrus). Previously to the establishment of such practices, a better knowledge of the effects of different irrigation strategies on crop physiological response, crop quality and crop safety are required. The resulting recommendations on irrigation design and practices will be transferred to farmers by the elaboration of Irrigation Best Management Practices for each crop and localization. The resulting data will be transferred also to the irrigation industries by the development of new irrigation technology (including hardware and software components for an automated irrigation equipment), and the optimisation of the irrigation water disinfection using ultrasound.

## **262937- ISAC**

Information Service on Agricultural Change

[www.gmes-isac.info/index.html](http://www.gmes-isac.info/index.html)

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*Funding scheme:* CP (Collaborative Project), FP7

*Project duration:* 1/1/2011 - 6/30/2013

*EC contribution:* € 1 250 757

*Policy drivers:* Water and Agriculture  
Water Scarcity and Droughts

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### **Abstract**

Agricultural resources are in high demand to sustain the world's growing population. In Europe, agriculture is regulated and monitored through the CAP and agricultural insurances are increasing in importance as an instrument for risk management. In the developing world droughts and other natural disasters impact vulnerable populations and lead to famines and starvation. The EC development policy and its emergency response mechanisms address these issues through actions that aim at reducing the occurrence and impacts.

Agriculture and environment are both priorities for Europe's GMES initiative. Satellite images with a high temporal frequency (daily) but low spatial resolution (>250m) are frequently used for agricultural monitoring. However, since the early 2000, new high frequency, high resolution (<30m) wide swath sensors have become available. The ISAC proposal intends to explore improvements of current Agricultural Services based upon such high frequency, high resolution data. It intends to expand the capabilities of LMCS and ERCS for what concerns the agro-environment.

ISAC proposes to develop and test feasibility of 3 services:

1. Core Mapping Service (CMS) on High Resolution Biophysical Parameters (ABP-CMS)
2. Core Information Service (CIS) on Drought stress (DS-CIS)
3. Core Information Service (CIS) on Agricultural change (AC-CIS).

Purpose of the ABP-CMS, in analogy to the BIOPAR-CMS of the LMCS, is to produce vegetation parameters (NDVI, fAPAR,') with much greater spatial detail based on sensors like DMC. Purpose of the DS-CIS is to build synergy between vegetation indicators of high and low spatial detail in order to enhance the current capabilities of satellite-based drought information systems. Purpose of the AC-CIS is to analyse agricultural change taking global seasonal climate forecasts as well as satellite data into account. ISAC services will be demonstrated and validated in East-Africa, Spain and Belgium.

## **505582- KASSA**

Integrating and strengthening the European Research Area

<http://kassa.cirad.fr/>

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*Funding scheme:* SSA (Specific Support Action), FP6

*Project duration:* 9/1/2004 - 2/28/2006

*EC contribution:* € 750 000

*Policy drivers:* Water and Agriculture  
Science-policy Interface

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### **Abstract**

Conventional agriculture encompasses about half of the agricultural land territory of the UE countries; its negative impacts on the environment and the basic natural resources are recognised. Growing concerns of the society related to the environment deterioration such as water and food contaminations, livestock epidemics... compel to explore new ways able to improve the sustainability of the current farming systems. Alternative agricultural practices, technologies and approaches in support of sustainable agriculture have already been researched, developed, tested and implemented during the second half of the 20th century, in Europe but mainly in North and South America and Australia; they span million hectares. Learning from the results of theses experiences and researches and sharing lessons will undoubtedly contribute to define ways and tools able to orient European policy on sustainable agriculture development. KASSA proposal intends to build up a comprehensive knowledge base on sustainable agricultural practices, approaches and systems in support of European stakeholders: farmers and professionals, researchers and policy makers at local, national, European and global level. KASSA involves a critical mass of skilled partners dispatched up into four platforms: Europe, the Mediterranean, Asia and Latin America. It will be achieved through successive work sequences starting with a comprehensive inventory of existing results then continuing with a progressive refinement of the findings that alternate critical analysis and sharing of the results of each platform.

## **043513- KASWARMI**

Knowledge Assessment on Sustainable Water Resources Management for Irrigation

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*Funding scheme:* SSA (Specific Support Action), FP6

*Project duration:* 3/1/2007 - 8/31/2008

*EC contribution:* € 335 862

*Policy drivers:* Water and Agriculture

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### **Abstract**

KASWARMI's main aim is to deliver fundamentals for future research activities by improving the sustainability of irrigated agriculture in LA. In many developing countries the socio-economical pressure to increase agricultural production is in conflict with the preservation of the environment and with other users of the natural resources. The intensification of the agricultural production in arid and semiarid regions includes activities such as irrigation and fertilisation, often associated with inadequate management and lack of knowledge, which produce serious contamination problems. European experiences (EU: Germany, Spain, Hungary: [3 partners]) with approaches to sustainable agriculture and the Water Framework Directive can support the specific regional experiences in Latin America (LA: Chile, Argentina, Bolivia, Brazil: [6 p.]). KASWARMI fosters such EU-LA cooperation regarding the interdisciplinary approach and the specific regional socio-economic, ecological, and technical (s-e,e,t) conditions.

The specific objectives of KASWARMI are:

- To develop a comprehensive knowledge base in sustainable water resources management for irrigation and an interdisciplinary scientific network;
  - To carry out an integral multi-stakeholder analysis of different (s-e,e,t) situations in selected irrigation areas in LA;
  - To build up and intensify direct contact to stakeholders (farmers, other water users, policy makers), schools and civil society organisations; and
  - To detect the stakeholders' needs for research.
- In this context research strategies and a concept for future joint research based on requirements of the stakeholders will be developed.

The dissemination will be achieved through strategies for future RTD activities, publications, brief informative bulletins (LA, local), the final KASWARMI report, workshops, a final seminar, presentations at national /international conferences, an Internet page, press conferences, and teaching courses at the universities.

## **238084- LEANGREENFOOD**

Enzyme technology for Lean and Green food processing

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 10/1/2009 - 9/30/2013

*EC contribution:* € 3 427 528

*Policy drivers:* Water and Agriculture

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### **Abstract**

Plant material, including industrial wastes from grain production and the juice and vegetable oil industry, is a rich source for valuable functional ingredients for processed foods. Processing of relevant agricultural waste and product refinery needs, however, rethinking, as it often depends on use of chemical reagents of environmental concern and of harsh reaction conditions with high energy demands. Large requirement of process water adds further to the environmental load. The LeanGreenFood Initial Training Network will focus on solutions to reduce consumption of water and energy, both scarce resources in the future. Carbohydrate and peptide processing to yield value-added food ingredients will be based on the use of mono-component enzymes and on technology developed for highly concentrated solution systems. The LeanGreenFood.network will train 13 ESR's and 4 ER's to develop and implement new enzyme-based technology for future development of a more sustainable production. The training will include development and use of specific on-line analytical methods for process monitoring. The use of mechanical treatment and high-pressure tuning of enzymes for process optimization will open up for further process control. The training programme and conferences will be open for participants from outside the Network with the perspective of training a new generation of food scientists.

## **236111- LEVADAS**

Irrigation and Society: "levadas da Madeira"

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 9/1/2009 - 8/31/2011

*EC contribution:* € 128 611

*Policy drivers:* Water and Agriculture

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### **Abstract**

Overall objective: The present project aims at analyzing the historical construction and development of irrigations systems by a society. It emphasizes the role of technology and institutions for construction, water management and control. The research examines how irrigation organization has been crafted over the time, until today and how the present governance system reflects historical transformations within the society and its segments. Addressing the relations of a particular society to irrigation the project contributes to enlarge the existing knowledge of these relationships in different world contexts. The context of the project is the island of Madeira in relation to its fragile resource: The set of ancient and modern systems of canal irrigation called "levadas", is the main scene where this research has to be implemented. The network of irrigation channels is impressive. Through the Mediterranean, there is no situation where exists such density of watercourses. Madeira provides an ideal position to interrogate universal social theories in irrigation, while at the same time contributing to the regional history and anthropology of irrigation agriculture. The project fixes as milestones the following goals: a) The production of a technological geography of irrigation systems b) An interpretive anthropological study of selected irrigation systems c) An interpretation of the modern water governance d) In addition a portrait of some of the irrigation cultural patterns of Madeira society. These objectives will be achieved by means of an innovative strategy to investigate irrigation technology and institutions in 'their context'. Results: Assessment of social history and organisation of Madeira irrigation will be produced. In addition, the research project through the diffusion of its results may participate to water debate in Madeira. The project by its multidisciplinary approach contributes to scientific excellence expected in Marie Curie actions.

## **236901- LOWASRICE**

Breeding for low grain arsenic rice

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 10/29/2009 - 6/28/2011

*EC contribution:* € 246 983

*Policy drivers:* Water and Agriculture  
Chemical Aspects

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### **Abstract**

High levels of arsenic in rice grains threaten the health of millions of people particularly in the Ganges delta of India and Bangladesh where arsenic-contaminated irrigation water is used for rice cultivation. It is of global importance that this problem is tackled and that Indian scientists are able to contribute to the solution. In this application it is proposed that an advanced backcross breeding approach be used to both map quantitative loci (QTLs) for low grain arsenic and to incorporate these QTLs into farmer preferred varieties by marker-assisted selection (MAS). Hybrids between locally adapted arsenic tolerant variety and Azucena have already been made in Calcutta University. These hybrids will be utilized for raising backcross populations. Two approaches will be employed to identify QTLs for low arsenic. For one population, QTL for low grain arsenic will be identified by conventional QTL analysis. For the other population, a new method of bulk segregant analysis linked to feature polymorphism of an Affymetrix microarray will be used. Feature polymorphisms between the parents and which also segregate in the segregant pools will be linked to the rice sequence by bioinformatics and the genomic regions responsible for the trait identified. All results obtained will be compared to those obtained in the UK-funded project to allow meta-QTL analysis. Identify the markers will be used to breed low arsenic varieties suited to West Bengal and the MAS breeding will be forwarded in the second year of the project exploiting ability to get 3 generations per year in West Bengal. The final steps of the breeding will be completed in the return phase where workshops will be deployed to transfer knowledge gained on the advanced genetic and bioinformatic techniques.

## **509235- NAGREF+PPO**

Sustainable fertigation techniques for vegetable production in Greece

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 7/15/2004 - 11/14/2005

*EC contribution:* € 103 334

*Policy drivers:* Water and Agriculture

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### **Abstract**

Vegetable production constitutes one of the most important farming activities in Greece and has the potential to develop further. However optimal levels of vegetable production require high water inputs, especially under Mediterranean conditions. Fertigation (which means the combination of fertilisation and irrigation) is a tool for analysing and achieving optimal levels of water and fertiliser use. A system has been developed by PPO (Applied Plant Research - Division Glass; part of the Wageningen-University - Research, the Netherlands) in the sixties and has been constantly evolving since then. Soils analysed by a 1:2 volume water extract. Based on this salt and nutrient analysis, fertiliser and irrigation are advised to the growers. In total about 5000 growers, both in the Netherlands and abroad, are using the system. New elements have to be introduced into this system to make it appropriate for the Mediterranean situation. The work plan consists of evaluation of the Greek situation, workshops, contacts with laboratories agricultural universities, agricultural extension services, growers association, on-farm demonstrations, trials and introducing the system into a (private) laboratories and extension services. An experienced researcher of NAGREF will be trained at PPO during 3 months. A more experienced researcher of PPO will be hosted by NAGREF during 10 months and will provide training to partner organisations. The project management structure will consist of a Project Committee and a Project Management Team. The Project Committee will include these two researchers together with: the director of NAGREF, the director of Olive and Horticultural Crops at the Institute of Kalamata, a representative of an agricultural educational institutes, of (one or more) private laboratories, extension services and growers association. The Project Management Team will be responsible for project planning, monitoring progress of the project and monitoring the budget.

## **227156- N-TOOLBOX**

Toolbox of cost-effective strategies for on-farm reductions in N losses to water

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*Funding scheme:* CSA (Coordination - or networking - action), FP7

*Project duration:* 3/1/2009 - 8/31/2012

*EC contribution:* € 993 997

*Policy drivers:* Water and Agriculture

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### **Abstract**

The aim of this supporting action is to develop a “toolbox” of cost-effective technologies to be implemented at the farm level to protect water from nitrate pollution. The project will bring together four partners with expertise in farm level N management in their regions. The first component of the toolbox will be a catalogue of technologies for reducing N losses on the farm produced using previous research results and local experience. Technologies will be prioritized based on their cost-effectiveness and efficiency at reducing N losses. They will be listed according to region and production-system to enable easy identification of the best management option for specific local conditions. The second toolbox component will be an enhanced decision support tool (NDICEA) which can be used at the farm level to illustrate options for improved N management, and assist farmers in reaching their goals of compliance with the Nitrates Directive. NDICEA was developed by LBI, and will be enhanced using outputs from ongoing and previous projects at partners UAa and UNEW. The toolbox will be implemented on case study farms and the results documented in a “blueprint” for implementing water protection policy at the farm level across the EU. Project results will be widely available via the project website, and through links with the WFD-CIRCA Information Exchange Platform and the Water Information System for Europe (WISE)-RTD webportal. A stakeholder workshop will be conducted at the end of the project to transfer technology to key user groups (farmers, advisors, water protection policy makers). N-TOOLBOX will serve as a centralized resource that can be expanded as new measures and tools are developed. In this way N-TOOLBOX will lay the foundations for improved implementation of water protection policy at the farm level across the EU.

## **286772- OPTIFERT**

Development of an automatic irrigation and fertilization system

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*Funding scheme:* BSG-SME (Research for SMEs), FP7

*Project duration:* 12/1/2011 - 11/30/2013

*EC contribution:* € 1 428 454

*Policy drivers:* Water and Agriculture

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### **Abstract**

Due to climate related changes, longer dry periods for European farmers and without irrigation the risk of a volatile harvests will rise, that is the reason for a tendency across Europe to irrigate fields. The need for innovative irrigated systems is to minimize water consumption and costs. Also in times of limited water the project will be lucrative.

There are more and more increasing cost pressures like costs of water, energy and fertilizer, environmental legislation and requirements, cuts of subsidies, high personal costs etc. The project will help to save a huge amount of money by reducing the mentioned investments.

The tendency to automatic systems in the agriculture is rising and in future farmers will do most of their regulating by a computer. The system will support the farmers to realize their work by modern technology.

Furthermore the project minimizes the pollution of groundwater by reducing fertilizer to a limit and concerns of eutrophication will be decreased.

The aim of the project is to develop a fully automatic irrigation and fertilisation system (with needs based fertilizer spreading) in order to help farmers to monitor and control their water and fertilizer consumption. That basically means we want to combine the irrigation and fertilization in one step. Furthermore, the system will diagnose the need of the plants with the help of sensors and the interpretation of terrestrial meteorological data. The system consists of a combined sensor-detector-dosage system, which includes a monitoring, control and distribution unit which enables the dosing and distribution of the water and the fertilizer.

## **015460- OPTIWHEAT**

### **IMPROVING THE YIELD STABILITY OF DURUM WHEAT UNDER MEDITERRANEAN CONDITIONS**

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*Funding scheme:* STP (Specific Targeted Research Project), FP6

*Project duration:* 7/1/2006 - 6/30/2011

*EC contribution:* € 1 800 000

*Policy drivers:* Water and Agriculture  
Water Scarcity and Droughts

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#### **Abstract**

Water is essential to sustaining human and environmental health but is already at scarcity level in some Eastern and Southern Mediterranean countries. Agriculture is by far the largest user of water resources accounting for around 75% of consumption, but never the less water remains a major determinant of crop yield. Under rain-fed conditions, characterised by low and uncertain rainfall, Durum wheat is one of the most widely cultivated crops. This project seeks to use a powerful systems-biology approach combining genomics, crop physiology and agronomy to generate Durum wheat cultivars that have higher and more stable yields under Mediterranean drought conditions. The central thrust of the project is to both identify existing variation in Durum wheat germplasm and to generate novel genetic variation for the stability of yield under drought stress (SYDS) in Durum wheat. The project will generate a novel mutant population and use these lines to establish TILLING for the first time in Durum wheat. This population will be used for forward and reverse genetic approaches to identify lines with enhanced SYDS and to understand how the structure and expression of specific genes contribute to the variation of yield trait components under Mediterranean conditions.

## **221150- PATCE**

Policy analysis through community engagement

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 7/28/2008 - 7/27/2009

*EC contribution:* € 85 921

*Policy drivers:* Water and Agriculture  
Science-policy Interface

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### **Abstract**

The Water Framework Directive (WFD) calls for improvement in water bodies across Europe by 2015 (European Parliament, 2000). The Directive measures in terms of 'ecological quality', requiring reductions in non-point source pollutants, which are primarily produced through agricultural activities (Bateman et al, 2006). Policies such as reductions in nitrogen application and in stocking rates will be necessary to meet WDF requirement. Bateman et al. (2006) have designed and built a GIS model in an attempt to better understand how farmers will respond to potential policy interventions. The model takes into account the differing characteristics of farming districts such as style and intensity of farming, soil type and structure, topography and rainfall, and the economics of farming. The model outputs include projections about farmer responses to different policy interventions. This project is designed to 'ground truth' the projections produced by the model. Set at the community level, and relying on farmer interviews and surveying, the ground truthing will be based on the Australasian developed and tested I3 Response Framework (Murdoch et al., 2006). In accordance with the I3 Response Framework methodology, qualitative information on farmer preferences will be gathered through individual interviews and analysed in relation to the framework quadrants. Utilising the information from interviews, a survey tool will be constructed to test farmer responses to policy interventions under the WDF. A stratified sampling technique will ensure representation across the range of farming businesses. The quantitative and qualitative responses derived from the survey will provide an in-depth understanding of farmer actions across the range of farm businesses, and provide data for comparison with the model results.

## **014501- PATHMEDA**

Pathogens and parasites in Mediterranean aquaculture

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 11/1/2005 - 10/31/2009

*EC contribution:* € 400 770

*Policy drivers:* Water and Agriculture

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### **Abstract**

Research on pathogens and parasites in Mediterranean finfish aquaculture is less well advanced than in Atlantic waters. A shorter tradition of industrial aquaculture and usually weaker RTD structures in Mediterranean countries are factors probably accounting for this unbalance. Efforts to diversify Mediterranean aquaculture involve the use of new finfish species whose pathogens and parasites are still poorly known. In order to improve the knowledge of these organisms, this ToK Fellowship will develop a research programme on diagnosis and fish immune response to pathogens and parasites in Mediterranean finfish aquaculture. The objective of this ToK Fellowship is to improve the research capability of the host organization in two aspects: diagnosis and typing techniques of pathogens, particularly molecular-based, and techniques to evaluate the immune response to pathogens and parasites of finfish species of interests to Mediterranean aquaculture. The ToK Fellowship envisages a knowledge-acquisition phase where staff of the host organization will be trained at two partner organizations in diagnosis techniques, molecular typing and immunology for assessment of fish responses to pathogens and parasites. After this phase, the ToK Fellowship will develop a research programme at the host organization, where the knowledge acquired at the partner organizations will be adapted to Mediterranean finfish species. Research at the host organization will focus on developing molecular diagnosis techniques of emergent pathogens, optimising diagnosis protocols for designated pathogens and parasites, molecular typing of fish bacteria, and immunostimulation and assessment of immune responses of Mediterranean fish species against selected pathogens and parasites. The ToK Fellowship will endeavour to promote synergies with the local aquaculture sector and to ensure that the results of the project reach potential end users: fish farmers, managers of natural resources, NGOs, and consumers.

## **232267- PLASMANURE**

Novel plasma-catalyst reactor for the total conversion of the ammonia contained in pig manure into environmental neutral products

[www.plasmanure.eu](http://www.plasmanure.eu)

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*Funding scheme:* BSG-SME (Research for SMEs), FP7

*Project duration:* 2/1/2010 - 4/30/2012

*EC contribution:* € 950 240

*Policy drivers:* Water and Agriculture  
Ecological Status  
Chemical Aspects

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### **Abstract**

## **037095- PLEIADES**

Participatory multi-Level EO-assisted tools for Irrigation water management and Agricultural Decision-Support

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*Funding scheme:* STP (Specific Targeted Research Project), FP6

*Project duration:* 9/15/2006 - 11/14/2009

*EC contribution:* € 2 697 000

*Policy drivers:* Water and Agriculture

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### **Abstract**

This project addresses the efficient and sustainable use of water for food production in water-scarce environments. It aims at improving the technical, environmental and economic performance irrigation schemes by means of a range of measures. Major technical innovation is made possible by the comprehensive space-time coverage of Earth observation (EO) data and the interactive networking/connecting capabilities of Information and Communication Technologies (ICT). Therefore, a key feature will be a set of EO- and ICT-assisted integrated systems and services which are the fundament for integrated water resources management of river basins, irrigation schemes, and farms. It also is the basis for technical and social learning that enables farmers to act responsibly by fine-tuning their on-farm irrigation management in accordance with the river-basin water status and management decisions. We consider the economic, environmental, technical, social, and political dimensions and pursue a synergy of leading-edge technological innovation (that facilitates active participation) with participatory approaches (that require distributed spatial information and networking technology). A set of pilot Case Studies has been selected to represent a sample of the wide range of conditions found in the European and Southern Mediterranean and in Latin America, covering Portugal, Spain, Italy, Greece, Turkey, Morocco, Mexico, Peru, and Brazil. We will benchmark the technical, environmental, and economic performance of irrigation systems in our pilot river-basins, conduct trial campaigns with EO- and ICT-assisted products in a participatory evaluation with stakeholders, and assess the effect of the new tools on water productivity and performance of our pilot irrigation systems.

## **015031- QUALIWATER**

Diagnosis and Control of Salinity and Nitrate Pollution in Mediterranean Irrigated Agriculture

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*Funding scheme:* STP (Specific Targeted Research Project), FP6

*Project duration:* 1/1/2006 - 10/31/2010

*EC contribution:* € 1 450 000

*Policy drivers:* Water and Agriculture

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### **Abstract**

Agricultural intensification may be constrained by limited water resources and increased environmental pollution of soils and waters in the Mediterranean region. In particular irrigated agriculture may induce negative impacts on the quantity and quality of natural resources such as land degradation by salinization and sodification ("on-site" impacts) and increased salt and nitrate loads in irrigation return flows (IRF) and receiving water bodies ("off-site" impacts). An environment-integrated management of these constrained water and soil resources is essential. Thus, the EU Water Framework Directive should implement water-pollution regulatory standards and policies regulating the discharge and quality of IRF. The aim of this project is to provide scientific, technical and socio-economic information on salt and Nitrogen contamination, and on pollution control measures in Medit. irrigated agriculture. The project addresses the INCO-MPC call in activities B.1.1 (Comprehensive water policy and integrated planning) and, particularly, B.1.2 (Improving the water consumption efficiency and effectiveness by users and uses). Seven research partners from 6 different countries (Algeria, Morocco, Spain, Tunisia, Turkey and the United Kingdom) will participate for the four years of the project. The main activities of the project are: 1) input-output irrigation-district mass balances and assessment of salt and nitrogen pollution effects of present agricultural management 2) model simulation studies analysing best management strategies for pollution control 3) evaluation of these strategies in selected pilot field trials (4) socio-economic analysis of present agricultural management and of source-sink pollution control management alternatives, and 5) dissemination of results to water users and policy makers. Feedback with project end-users will take place via the participation of nine stakeholders, thus ensuring that all relevant issues are properly addressed.

## **265721- RADAR**

Rationally Designed Aquatic Receptors integrated in label-free biosensor platforms for remote surveillance of toxins and pollutants

[www.fp7-radar.eu/](http://www.fp7-radar.eu/)

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*Funding scheme:* CP (Collaborative Project), FP7

*Project duration:* 1/1/2011 - 12/31/2014

*EC contribution:* € 2 926 127

*Policy drivers:* Water and Agriculture  
Ecological Status

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### **Abstract**

RADAR is a 7-member consortium that aims to develop a robust, sensitive, and versatile label-free, biosensor platform for spot measurements and on-line monitoring of toxins and pollutants in food production processes and in the aquatic environment.

Specificity towards chemical pollutants and toxins is achieved by using recombinant receptors (namely the estrogen receptor and the aryl hydrocarbon receptor) whose amino acid sequences have been rationally designed based on genomic and functional information from aquatic organisms.

Sensitivity of the biosensor is increased by the unique combination of isotachophoretic pre-concentration step, and surface nanostructuring & chemical modification.

The integration of the label-free detection sensors with an on-line automated sample handling and a wireless communication system will yield a best-in-class biosensor platform for robust, specific and sensitive detection of EDCs and PAHs in difficult operating conditions.

To validate the RADAR biosensor the consortium will test the biosensors in fresh and marine water, in fish farms, and in food products such as fish, fruit juices, and milk. Through their contacts in these industries, the partners will evaluate the performance of the biosensors in such environments, analyzing a representative number of samples and reporting on the stability, ruggedness and accuracy of the sensors used under laboratory and real test conditions.

This project is expected to have a high economic impact, since our cost-effective sensor could find a worldwide distribution in most food production and water testing lines as supported by Agilent Technologies Inc.

## **502054- RESCAD**

Modelling the impact of soil redistribution on carbon sequestration in agricultural ecosystems

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 6/1/2004 - 5/31/2006

*EC contribution:* € 161 428

*Policy drivers:* Water and Agriculture

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### **Abstract**

The influence of soil redistribution within the landscape on the global terrestrial C budget is poorly understood. Recent studies estimate that between 0.6-1.5 Gt C year<sup>-1</sup> are sequestered due to burial of soil particles in depositional areas. Despite the advances in understanding that have been made, large information gaps concerning rates and locations of terrestrial sedimentation remain. The uncertainties mainly relate to the lack of information about C storage in terrestrial ecosystems and the lack of adequate simulation models that allow the fate of the eroded carbon to be predicted. The main objective of this project is to increase our understanding of carbon dynamics in agricultural ecosystems by developing the necessary modelling tools. This will be achieved by combining current generation soil redistribution models with models of carbon dynamics. The benefits of this approach arise from the use of spatially distributed models of water and tillage soil redistribution that allow simulation of the pathways of eroded carbon within the landscape and in the soil profile. The implementation of the CENTURY carbon model will allow accurate estimation of carbon budgets and assessment of the magnitude of the sink associated with soil redistribution. The model will be tested and validated by means of detailed data on radionuclides distributions for three agricultural fields in contrasting environments within the European Union. Additional validation will be carried out by using complementary data on carbon distributions. The proposed research project fits within the priorities of the 6th Framework Programme of the European Community, more specifically under theme 6.3 - Global change and Ecosystems. The project proposal addresses the issues of thematic priority 1.1 - Carbon and Nitrogen cycles : sources and sinks - by focussing on human induced disturbances of ecosystems (soil redistribution on agricultural land)

## **040400- ROLE OF STRUCTURE**

Cellular and extracellular pathways for sap flow: their anatomy and physiological significance

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 6/1/2007 - 11/28/2010

*EC contribution:* € 368 975

*Policy drivers:* Water and Agriculture

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### **Abstract**

Better understanding of plant-water relations is essential for appropriate management of forest and agricultural ecosystems in the face of global climate change. In spite of water's importance, there are surprising gaps in our knowledge of how water moves in trees. Moreover, the variation in wood tissue design of different taxa and habitats is enormous. This research will further our knowledge of wood structure and water-transport physiology in stems of woody plants, showing the actual anatomical pathways through which water moves. New information has cast doubt on the old paradigm that water ascends directly from one vessel to another; this view ignores the contribution of other cells and structures and that water must move radially in spite of no known apoplastic pathways in the radial direction, that  $\frac{1}{4}$  of all vessels are gas-filled (rather than water saturated), and that vessels form networks some of which are interconnected, and others which are separated. Both the microcasting method (production of casts of the wood voids) and confocal microscopy allow three-dimensional visualization of cell structure, vessel networks, and the spaces between cells (features not or little seen before). These techniques will be combined with ecophysiological experiments on sap flow, stain movement, and vulnerability to embolism to help develop a new understanding of water transport. The work will be done in plants with contrasting ecological and wood structural patterns, and in taxa with wide geographic distribution, to further our abilities to infer function. This combination of modern techniques from the fields of anatomy and ecophysiology will help elucidate the structure, the functional significance, and the ecological adaptation of different patterns of hydraulic architecture of woody plant stems.

## 265156- ROUTES

Novel processing routes for effective sewage sludge management

[www.eu-routes.org/](http://www.eu-routes.org/)

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*Funding scheme:* CP (Collaborative Project), FP7

*Project duration:* 5/1/2011 - 4/30/2014

*EC contribution:* € 3 364 600

*Policy drivers:* Water and Agriculture  
Chemical Aspects

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### Abstract

The Routes project is addressed to discover new routes in wastewater and sludge treatment which allow:

- a) to prepare sludge for agricultural utilization by transforming it in a very clean and stabilized product regarding the presence of organic micropollutants (conventional and emerging ones) and of heavy metals, and with respect to hygienic aspects and to phytotoxicity;
- b) to minimize sludge production by innovative solutions which can be based on different approaches, i.e.: i) metabolic uncoupling where the free energy released by electrons transport is dissipated in heat, in the activation of alternative metabolic routes or in the accumulation of polymeric products, ii) the use of microbial fuel cells, iii) the use of sequencing batch bio-filter granular reactor (SBBGR), iiiii) the integration of a side-stream process in membrane bioreactors;
- c) to promote recovery of valuable materials from anaerobic digestion, i.e. biopolymers as polyhydroxyalkanoates and fertilizers;
- e) to set up and prove at practical scale a novel technique for sludge disposal (wet oxidation) as sustainable alternative to nowadays the most used incineration;
- f) to minimize energy pumping by adjusting solid concentration, on a practical installation where sludge is pumped from the production site to a centralized plant.

The general objective of the Routes proposal is therefore to set up a panel of different solutions to be applied in different conditions and circumstances, strictly following the waste hierarchy of the Directive 08/98 on waste. The above solutions will be studied either in laboratory or at practical scale, depending on the maturity of the technology, in order to provide to the Commission and the technical and scientific community applicable solutions and new routes for

sludge management, also based on the best integration between the water and sludge treatment lines.

## **023168- SAFIR**

Safe and High Quality Food Production using Poor Quality Waters and Improved Irrigation Systems and Management

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*Funding scheme:* STP (Specific Targeted Research Project), FP6

*Project duration:* 10/1/2005 - 9/30/2009

*EC contribution:* € 4 740 000

*Policy drivers:* Water and Agriculture  
Water Scarcity and Droughts

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### **Abstract**

The present proposal addresses two fundamental problems that over the past decade increasingly have become concerns of the general public: the one problem being the jeopardizing of safety and quality of our food products, while the other being the increasing competition for clean fresh water. The proposed project has a multi-disciplinary approach, which integrates the European as well as the global dimension of the EU-policy on food quality and safety. The main driving force behind the project idea is new research results that demonstrate irrigation pattern can increase the water use efficiency as well as the quality of vegetable crops. Furthermore, have recent innovations in the water treatment and irrigation industry shown potential for the use of low quality water resources, such as rivers and other surface water, for irrigation of vegetable crops without jeopardizing food safety or quality. The proposal includes three components: 1) The technological development of water saving irrigation systems and management for use of low quality water resources. Technological advances will be made in the field of cost effective tertiary water treatment technology for on-farm use. Irrigation equipment for sub-surface irrigation systems will be tested in the field and developed to facilitate a new water saving strategy, PRD-irrigation, which improves water use efficiency and the quality of the produce. 2) Impact of the technology on product quality and safety, production system and the environment as well as a risk assessment from farm to fork. 3) A component concerning the feasibility and application of the system. The financial and economic aspects will be investigated and institutional and consumer barriers will be identified. Decision Support System will be developed for the on-farm management of water resources. A range of dissemination activities addressing national and EU authorities, commercial stakeholders from the food sector, and farmers' organizations is included.

## **502116- SENSOIL**

An Integrated Ground Penetrating Radar Based Approach for Remotely Sensing the Soil Physical Properties to Support Precision Agricultural and Environmental Management

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 1/1/2004 - 12/31/2005

*EC contribution:* € 148 142

*Policy drivers:* Water and Agriculture

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### **Abstract**

The principal objective of this research project is to optimize and to prototype an integrated nearby remote sensing method, supporting the characterization of the within field variability of the soil moisture and salinity within a context of precision agricultural and environmental management. Based on ground penetrating radar (GPR) technology, the project specifically aims to: (i) optimize radar antennas for shallow subsurface sounding of soil moisture and salinity by means of a monostatic stepped frequency GPR system; (ii) improve signal analysis based on the improvements of advanced forward modeling of electromagnetic wave propagation in soils and the inversion of the GPR signature by the inclusion of prior information from hydrodynamic and petrophysical knowledge; and (iii) improve the understanding of the relationships between geophysical parameters (conductivity and permittivity) and the important soil functional variables (soil water content and salinity). The project applicant will be hosted by a centre of excellence in the area of GPR technology development, namely, the Applied Earth Science Department at TU Delft (The Netherlands). Specialized equipment, facilities and expertise will allow to conduct the research programme effectively and train the applicant in the multidisciplinary research domain of interest. The high level international scientific environment of the host, the innovative scientific and technical aspects of the project, and the relevance of the project as regards to the Community needs, will lead to durable international collaborations, the creation of international multipartner projects, the ensurance of European leadership in the domain of interest; and the implementation of activities supporting the the priorities defined in the thematic areas &quot;Food quality and safety&quot; and &quot;Sustainable development, global change and ecosystems.

## **509110- SHADUF**

"Traditional Water Techniques: Cultural Heritage for a Sustainable Future"

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*Funding scheme:* STP (Specific Targeted Research Project), FP6

*Project duration:* 7/1/2004 - 9/30/2007

*EC contribution:* € 1 109 880

*Policy drivers:* Water and Agriculture

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### **Abstract**

Ancient practices of water harvesting, catchment and distribution had guaranteed for years water supplying to the countries and the towns all over the Mediterranean area. These techniques rooted into the society and the environment, thus becoming as a part of the local knowledge able to create the identity and the harmonious management of landscape. An articulated variety of water systems, such as the foggaras, the qanats, the khattaras -drainage tunnels -, the shadufs - wells with a balance bar, the filter cisterns, the terracing, the drainages, the stone barrows, the harvesting soils and the diversion dikes, shaped in time the Mediterranean landscape, thus acting on its functionality and on its beauty as well. Nowadays, the risk of water shortage, desertification and degradation of soils depending on the global warming, the increase of urbanization and the agricultural industrialization is high. As consequence of this, the reuse of the traditional water systems is on one hand a fundamental contribution to the water resource management based on the local sustainability and on the other hand the recovery of aesthetical values of the monuments which are a further resource for people. The cases of study the consortium focused on are the leading examples for a methodology which could be suitable also in other situations.'

## **262902- SIRIUS**

Sustainable irrigation Water Management and River-basin governance: implementing User-driven services

[www.sirius-gmes.es/](http://www.sirius-gmes.es/)

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*Funding scheme:* CP (Collaborative Project), FP7

*Project duration:* 10/1/2010 - 9/30/2013

*EC contribution:* € 2 500 000

*Policy drivers:* Water and Agriculture

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### **Abstract**

SIRIUS addresses efficient water resource management in water-scarce environments. It focuses in particular on water for food production with the perspective of a sustainable agriculture in the context of integrated river-basin management, including drought management. It aims at developing innovative and new GMES service capacities for the user community of irrigation water management and sustainable food production, in accordance with the vision of bridging and integrating sustainable development and economic competitiveness.

SIRIUS merges two previously separate strands of activities, those under the umbrella of GMES, related to land products and services (which address water to some extent), and those conducted under FP5/6-Environment and national programs, related to EO-assisted user-driven products and services for the water and irrigation community.

As such, it will draw on existing GMES Core Services as much as possible, by integrating these products into some of the required input for the new water management services. It also makes direct use of the EO-assisted systems and services developed in the FP6 project PLEIADeS and its precursor EU or national projects, like DEMETER, IRRIMED, ERMOT, MONIDRI, AGRASER, all addressing the irrigation water and food production sectors, some of which have resulted in sustainable system implementation since 2005.

SIRIUS addresses users (water managers and food producers) at scales ranging from farm, over irrigation scheme or aquifer, to river-basins. It will provide them with maps of irrigation water requirements, crop water consumption and a range of further products for sustainable irrigation water use and management under conditions of water scarcity and drought, integrated in leading-edge participatory spatial online Decision-support systems. The SIRIUS service concept considers the economic, environmental, technical, social, and political dimensions in an integrated way.

## **262241- SMART TANK**

Farm and Agriculture Stabilised Thermophilic Anaerobic Digestion

[www.smart-tank.eu/](http://www.smart-tank.eu/)

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*Funding scheme:* BSG-SME (Research for SMEs), FP7

*Project duration:* 12/1/2010 - 11/30/2012

*EC contribution:* € 865 988

*Policy drivers:* Water and Agriculture

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### **Abstract**

EU farmers face significant costs related to the management and disposal of on-farm organic waste arisings such as manures and slurries through having to comply with specific EU legislation such as the Nitrates Directive and the Landfill Directive. Rising waste disposal costs have been cited as a contributing factor to the estimated closure of 7,000 EU farms per annum. Our consortium consists of five SMEs who manufacture and supply a range of equipment for anaerobic digestion (AD) systems in agricultural, wastewater treatment and municipal waste management markets. Whilst AD-based markets are growing and are expected to continue to grow over the next 5 years and beyond, they are dominated by larger enterprises - eight companies provide 80% of the municipal solid waste market in the EU - which makes competition on a cost basis difficult. Existing technologies for the anaerobic digestion of agricultural waste at the farm-scale are based on mesophilic processes and have a number of associated limitations, such as the requirement for codigestion with a high percentage of energy crops, a high capital equipment cost and a long payback period. The Smart-Tank project will develop a reliable thermophilic AD system with closed-loop control that will give us a clear technology differentiated product and offer the following benefits to farmers: • Standalone operation. • Demonstrate minimum biogas production levels of 90m<sup>3</sup> per tonne feedstock from codigestion with a minimum manure or slurry content of 60%. • Have a payback period of less than 6 years. The development of the Smart-Tank system will allow our SME consortium to compete in the growing market in Germany, France and the UK for agricultural AD technology and the estimated €2.13Bn EU market for the AD of municipal solid waste.

## **269240- SMART-CEA**

Smart Controlled Environment Agriculture Systems

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 10/1/2011 - 9/30/2014

*EC contribution:* € 210 000

*Policy drivers:* Water and Agriculture

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### **Abstract**

Half of the European Union's land is farmed. This fact alone highlights the importance of farming for the EU's economy, employment, energy use and environment. In recent years several factors (climate change, unpredictably outside weather conditions, water shortage, energy crisis, environmental pollution) lead to an increase of agriculture production under controlled environments, (CEA) such as greenhouse and livestock buildings. In greenhouse and livestock production, growth practises, techniques, technologies and methodologies should be addressed to the achievement of stated objectives by modifying and improving the relationship of factors involved in the productive process. However the importance of certain objectives can change over time. Currently, several research groups in Europe are engaged in the areas related to the proposed action, but the information and knowledge obtained is dispersed. Moreover, considerable work was carried out in other countries outside from Europe which faced similar problems probably long time ago before the problems become evident in Europe. Many projects, currently being performed in isolation through national funding, will benefit significantly through the action, since it will eliminate overlaps, facilitate collaboration, and make more efficient use of resources, and thus amplify the value of the research for all European stakeholders. The proposed action brings together an international and interdisciplinary group of research teams from Europe, USA & Korea and relative SMEs for the purpose of forming an excellent centre of synergy in research, innovation and technology transfer in the area of agriculture production in greenhouse and livestock buildings aiming to remove the barriers that presently impede a fluent diffusion and actualization of the knowledge and know-how available in the field of new technologies applied to the CEA sector. Focus will be given on climate change, energy, environment and food safety and quality.

## **285861- SMART-PADDY**

Smart on-line water salinity measurement network to manage and protect rice fields

[www.smartpaddy.eu/](http://www.smartpaddy.eu/)

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*Funding scheme:* BSG-SME (Research for SMEs), FP7

*Project duration:* 11/1/2011 - 10/31/2013

*EC contribution:* € 1 096 142

*Policy drivers:* Water and Agriculture

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### **Abstract**

Rice is the main crop in wet areas such as river deltas and is an essential tool in Europe in managing protected ecosystems. Irrigation water is a key factor in the production of rice and water quality has a major impact on crop yield as a result of tolerance of rice to factors such as dissolved salts. Rice is more water consuming than many other crops: in continuous flooding cultivation it takes about 6 times the water required by wheat. Due to increased water use in coastal areas, the sea intrudes the water table and seawater floods nearby fields during storms in the Mediterranean area. The result is increased water salinity, which reduces yield in rice crops and increases soil salinity. Nowadays, water condition is for the most part assessed by visual inspection of the crops and, when excess water salinity is suspected, fields are irrigated by flooding them. In areas where water salinity is endemic, rice paddies are continuously irrigated with river water to reduce water salinity. This is a remedial solution that requires enormous volumes of water and considerable energy to pump water. Water salinity can be accurately determined by measuring its electrical conductivity (EC). Measuring EC at the water inlet and outlet of each paddy field can help in monitoring the “washing” effect of irrigation. Moreover, measuring EC at points far from water inlets and outlets can help in assessing water salinity in a given paddy field and at different depths in drainage channels can help in managing water salinity in larger areas. This project will develop a wireless sensor network comprised of low-cost EC measurement nodes and an autonomous power supply based on energy harvesting, that will be capable of transmitting readings in real-time to a central server. This data will enable cultivators to effectively manage and protect of their paddy fields and greatly reduce flood water consumption.

## **510524- SOIL EVAPORATION MOD**

Modelling soil evaporation in horticultural orchards in semi-arid regions of Southern Europe for optimisation of the use of water

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 1/1/2004 - 12/31/2004

*EC contribution:* € 31 887

*Policy drivers:* Water and Agriculture  
Water Scarcity and Droughts

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### **Abstract**

Fruit tree orchards grown in semi-arid conditions in the south of Europe require an improvement in their water use efficiency and management. Among the most affected crops are: olives, almonds, peaches, vineyard, plums and oranges. In this project we will focus on olive orchards, but the approach used and most of the conclusions drawn will be applicable to the other crops mentioned above. Olive trees have traditionally been grown under dry farming conditions. However, during the last years the area of irrigated olive orchards has increased considerably, motivated by the spectacular improvements in the yield when irrigated. The objective of the project is to improve our understanding of the water use of the cropping system consisting of olive orchards in the south of Spain. A comprehensive model (SVAT model, Soil Vegetation Atmosphere Transfer) that is able to predict the behaviour of this particular system will be developed. This kind of SVAT model is considered to be a key tool when trying to understand the functioning of ecosystems and to identify the main parameters and variables driving them. In addition, such a model can be employed as practical tools for assessment for farmers and natural resources managers. In this proposal special attention will be paid to model the soil evaporation component in the context of a SVAT model. The development of high precision weighing lysimeters during the Marie Curie fellowship for the last two years in United Kingdom and the interest in a scientific cooperation between both Institutions will allow applying that technology in this project. The project will allow us to gain more insights into the modelling of evapotranspiration and its partitioning between transpiration and soil evaporation in sparse vegetation ecosystems in semi-arid regions.

## **245405- STINNO**

Sustainable Innovations and Treatment in Industrial Waste Water Clusters

[www.kalmar.regionforbund.se/stinno/](http://www.kalmar.regionforbund.se/stinno/)

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*Funding scheme:* CSA (Coordination - or networking - action), FP7

*Project duration:* 12/1/2009 - 11/30/2012

*EC contribution:* € 1 023 783

*Policy drivers:* Water and Agriculture

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### **Abstract**

The STInno project introduces 3 research driven clusters and 12 partners from 5 European countries. The regions of Päijät-Häme, Kalmar and Western Greece have a common objective to strengthen RTD resources in industrial wastewater treatment and become world leaders in sustainable, cost and energy efficient methods. The regions have clear focus on clean technologies and complement each other as they are in different stage in their cluster development, RTD policies, disciplines and sustainability. Together with expertise of the RTD partners (Helsinki Univ. of Technology, Lappeenranta Univ. of Technology, Univ. of Kalmar, Foundation for Research and Technology Hellas, International Association of Mediterranean Agro-Industrial Waste, Lancaster Environment Centre), enormous amount of knowledge on wastewater treatment, methods and techniques involved is generated. Finland, Sweden and Greece rely not on huge quantities of RTD activities and companies, but as small economies, on developing niche sectors of RTD. For niche economies value-added networks are the solutions. This mindset can also be seen in STInno. Concerning the participating regions, only Western Greece has actively taken advantage of direct EC funding. The whole industrial wastewater treatment sector is evaluated, thus more specific development activities will be carried out in olive mill wastewater sector. The reason for this particular focus are the enormous environmental problems the untreated olive mill wastewaters are causing. The overall objective of STInno project is to strengthen the internationally acting regional clusters via strengthening their regional innovation systems; to create value-added networks; and develop platforms for technology solution developers. The consortium has a strong triple-helix approach but at the same time wants to look the problems from the demand and offer point of view. Integration of end user concerns is a crucial part of the project concept and objectives.

## **218472- SUSTAVINO**

Integrated Approaches for Sustainable European Wine Production

[www.sustavino.eu/](http://www.sustavino.eu/)

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*Funding scheme:* BSG-SME (Research for SMEs), FP7

*Project duration:* 2/1/2009 - 3/31/2012

*EC contribution:* € 1 100 836

*Policy drivers:* Water and Agriculture

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### **Abstract**

About 65% of the world's wine production is managed by European winegrowers. Wine production in Europe is traditionally performed by small and medium sized, family owned companies and co-operatives. Solid and liquid residues are not treated in an appropriate way what has a serious impact on the environment. Wine production is known to produce high amounts of wastewater with sometimes extremely high organic loads (COD 2.500-67.000 mg/L). This leads to shock loads to municipal wastewater treatment plants or to serious impacts on rivers and lakes, in case the vineyard is not connected to a sewer system at all. In addition, solid residues are also not handled properly, being in many cases deposited in vineyards as compost or fertilizer, whose degradation leads to odour formation and ground water contamination and infectious diseases. These treatment systems have been proven to be ineffective in complying with the legislative environmental requirements, disposal regulations, and safety restrictions for solid re-use. Moreover, the tremendous potential of the remaining high-value, biologically active substances and valorisation activities are generally unused or unknown. In addition, environmental legislations and quality regulations become stricter and force vineyards to take measures to improve the environmental situation in wine production. The associations are aware of this situation and want to initiate necessary R&D activities to offer technical assistance to their member SMEs. To cope with this challenge the wine producers need technical support. Therefore SUSTAVINO intends to help the European wine producers, to meet environmental regulations by providing an Environmental Quality Strategy for Sustainable Wine production (EQSW), which will encompass integrated approaches for treating and valorising wastes in a cost-effective and ecological way, and carrying out comprehensive training and capacity building to the SMEs and SME-AGs.

## **266504- SUWARESA**

Capacity and knowledge building on the Sustainable Use of  
WATER RESOURCES in Syrian Agriculture

[www.syrianagriculture.org/](http://www.syrianagriculture.org/)

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*Funding scheme:* CSA (Coordination - or networking - action), FP7

*Project duration:* 1/1/2011 - 12/31/2013

*EC contribution:* € 499 904

*Policy drivers:* Water and Agriculture

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### **Abstract**

SUWARESA main objective is to reinforce scientific and research cooperation capacities of MAAR-GCSAR-ANRR in the sustainable management of water resources in Syrian agriculture and to increase its competency and fund rising skills for a successful participation in the EU Research Framework Programme. The specific objectives of SUWARESA are: Setting-up of the research/cooperation priorities between Syria and the EU in the field of agricultural water management; Capacity building and human resources development for scientific research and research cooperation in the Syrian agricultural water management sector; Promoting networking, joint research themes and exchange of knowledge on specific topics of agricultural water management; Setting- up the ANRR research and cooperation strategy on the short and long-term basis; and Disseminating the results of activities by using different tools. SUWARESA will be carried out in close collaboration with two well reputed regional partners (CIHEAM-IAMB and CSIC), and with the involvement of local stakeholders and recognized, external, international S&T policy experts and from the other (neighbouring) European Neighbourhood Policy (ENP) countries.

## **212337- SWUP-MED**

Sustainable water use securing food production in dry areas of the Mediterranean region

[www.swup-med.dk/](http://www.swup-med.dk/)

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*Funding scheme:* CP (Collaborative Project), FP7

*Project duration:* 7/1/2008 - 6/30/2012

*EC contribution:* € 2 728 104

*Policy drivers:* Water and Agriculture

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### **Abstract**

The strategic objective of the project is to improve food crop production in the Mediterranean region, influenced by multiple abiotic stresses. These stresses are becoming even more pronounced under changing climate, predicted to result in drier conditions, increasing temperatures, and greater variability, causing desertification. The project will work mainly in farmers' communities to improve farming systems, by strengthening a diversified crop rotation and using marginal-quality water for supplemental irrigation, aiming at:

- Introduce and test new climate-proof crops and cultivars with improved stress tolerance, selecting promising varieties of cereals, grain legumes and new crops. Climate-proof traits will be identified for breeding programmes using advanced physiological and biochemical screening tools. Supplemental irrigation will be performed as deficit irrigation by different sources of water.
- Investigate the sustainable field applicability of the farming systems, such as environmental effects related to irrigation water quality assessed by monitoring groundwater and soil quality. Financial implications for the farmer and economic costs and benefits in the food sector will be analysed.
- Develop a research synthesis in dialogue with food sector, based on experimental results and advanced simulation modelling to improve farming systems management, utilizing dynamic tools that ease adaptation to the effects of a variable and changing climate. The approach is participatory, involving the farmer's community and the market and political level. The expected outcome is improved productivity and sustainable use of agricultural lands by developing a more diverse farming system, supporting economic development in non-European Mediterranean countries while ensuring mutual interest and benefit with the EU. It will accelerate adoption of improved agricultural practices and technologies to meet future constraints imposed by climate changes.

## **006942- TRACE**

Tracing Food Commodities in Europe

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*Funding scheme:* IP (Integrated Project), FP6

*Project duration:* 1/1/2005 - 12/31/2009

*EC contribution:* € 12 217 399

*Policy drivers:* Water and Agriculture

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### **Abstract**

TRACE will develop generic and commodity specific traceability systems that will enable the objective verification of the origin of food and animal feed. Natural tracers such as trace elements, ratios of heavy (geo) and light (bio) isotopes and genetic markers will be measured to determine geographical, species and production origin. Geo and bioclimatic mapping will be undertaken to extrapolate geographical origin and reduce the need for commodity specific data bases. Post genomic technology will create rapid and sensitive methods for species identification. Profiling methods will be used to identify markers, to characterise food products and facilitate cost effective screening methods. The project will focus on meat, cereals, honey, olive oil and mineral water. Particular attention will be paid to commodities labelled as "Designated Origin" and "Organic". The European Virtual Institute for Chemometrics will develop novel specifications obtained from analytical data which will characterise these foods.

TRACE will develop and draft standardised XML 'request-response' schemes for coding and electronic information exchange and establish "Good Traceability Practice". An electronic information platform incorporating verifiable specifications and thresholds will be developed. This will permit objective verification of origin and enable rapid and cost effective product withdrawal. The new systems will be demonstrated and benchmarked in the 5 chosen chains, and the cost/benefit determined. Consumer scientists will investigate perceptions and attitudes towards the "ability-to-trace food" through a pan European consumer study. A multi-tiered interactive information system will be developed for communication both within the project and for external use by industry, consumers and regulatory bodies.

Research workers, control agencies and industry will be educated in the new methods, procedures and systems via short term secondments, workshops.

## **509136- TRITIMED**

Exploiting the wheat genome to optimise water use in Mediterranean ecosystems

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*Funding scheme:* STP (Specific Targeted Research Project), FP6

*Project duration:* 9/1/2004 - 8/31/2009

*EC contribution:* € 1 320 000

*Policy drivers:* Water and Agriculture

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### **Abstract**

Water is a major determinant of yield for farming wheat in the Mediterranean basin. Wheat is mainly grown under rainfed conditions often characterized by relatively low and uncertain rainfall. The projected change in global climate towards even drier conditions in the Mediterranean basin will further compound this problem. Durum wheat farming faces continuous fluctuations in production and bread wheat is imported, to a relatively large extent, in many countries. Therefore, there is an urgent economic need to improve the water use and water use efficiency in wheat production. This proposal aims to identify crop traits and genetic ideotypes, in wheat, that impart stable yield under Mediterranean drought conditions. This shall be realised by using an integrated approach combining genomics, quantitative genetics and crop physiology. We shall evaluate a range of different genotypes of durum and bread wheat for WUE, integrative morpho- physiological traits, yield and quality under Mediterranean field conditions ranging in water availability. We shall select best durum and bread wheat lines evaluated under field conditions for integration into breeding programmes. We shall detect QTLs from a durum mapping population grown under Mediterranean field conditions and new molecular markers. We will design and build a new custom wheat chip for the study of gene expression in select genotypes evaluated under field conditions in the Mediterranean. We shall develop the experience and knowledge of young scientists from WANA countries in the latest molecular and physiological techniques. We shall conduct a socio-economic study on wheat farming and new technology in Mediterranean countries. The project fully complies with the main and strategic objectives of this call: Development of improved plant crop germoplasm more adapted to drought through multidisciplinary approaches combining physiology, breeding and biotechnology expertise.

## **286608- VINTAGE**

A user friendly Decision Support System for an integrated vineyard management, for addressing quality and quantity production variability optimising the use of resources

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*Funding scheme:* BSG-SME (Research for SMEs), FP7

*Project duration:* 12/1/2011 - 11/30/2014

*EC contribution:* € 2 156 500

*Policy drivers:* Water and Agriculture

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### **Abstract**

The objective of this project is to offer to the SMEs Associations the first integrated management solution for supporting vine growers throughout vineyard life cycle, from planting to harvesting, aiming at addressing quality and production variability issues by means of an advanced Decision Support System (DSS). This DSS will be based on the output of well established and consolidated models applied to viticulture, and will assist the users in day to day management procedures, thanks to a user friendly web interface, assessing for instance the unique watering needs of each single parcel, controlling the growth phase of the grape, along with its vigour and maturity, optimizing at the same time the usage of fertilizers and parasiticides and limiting operators intervention on the soil and on the plant. With the application of information technologies it will be possible to fine tune wine production within the vineyard, maximising the oenological potential of the

vineyards, and providing the vine-growers with the following, continuously up to date information: 1)Indication on the type of grape to be grown in the vineyard, being able to differentiate the production in case several zones of the vineyard present different agronomical features;2)Indication of the ripeness of the grapes; 3)Real time indication, through micro-meteorological stations, of the soil properties, weather forecasts, and other parameters (fertilizing, irrigation, etc.)that can influence both yield but most importantly quality of the harvesting. 4)Indication of soil variability, which is one of the key factors that can affect vine growth fruit development, quality and yield; 5)indications of the zone at risk of fungi or parasites attack; 6) understanding and managing the dynamics of soil, water and phenological stages.

## **213154- VIVACE**

Vital and viable services for natural resource management in Latin America

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*Funding scheme:* CSA (Coordination - or networking - action), FP7

*Project duration:* 3/1/2009 - 8/31/2012

*EC contribution:* € 850 000

*Policy drivers:* Water and Agriculture  
Socio-economy

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### **Abstract**

VIVACE is based on two conceptual pillars: on the one side innovative technical concepts for vital and viable services, and on the other, integrated analytical approaches and decision support tools. These two pillars are based on the emerging concepts for natural resource management emphasising reuse and recycling. They will be centred on peri-urban water management, but will include organic solid waste management, and agricultural water management. The “restricted biosphere” where VIVACE will test their tools is represented by rapidly developing urban or small town areas in Latin America, together with their rural/natural surroundings. The systems boundaries will be set on a case specific basis in such a way that the mutual impacts of water extraction and wastewater/waste disposal can be assessed. In each case study, VIVACE will analyse the impact of existing resource management practices (within the considered sectors) on the economic development in the region. This will allow the evaluation of the potential of proposed innovative concepts for safeguarding and or fostering economic development in a restricted biosphere. Integrated analytical approaches for decision support and strategic planning will then be developed and tested, with particular focus on tools for integrated and participatory assessment of these aspects. In this perspective, the two primary objectives of VIVACE will be: 1. To explore the existing potential and constraints of integrated resource planning, thereby contributing to the implementation of the Framework Programmes and the preparation of future Community research and technological development policy. 2. To interact with a wide range of societal actors (SMEs, civil society organisations and their networks, small research teams and research centres) in the activities of the thematic areas of the Cooperation programme.

## **512877- WACOSYS**

Monitoring and Control System for Wastewater irrigated Energy Plantations

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*Funding scheme:* SME (SMEs-Co-operative research contracts), FP6

*Project duration:* 10/1/2004 - 12/31/2006

*EC contribution:* € 571 490

*Policy drivers:* Water and Agriculture

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### **Abstract**

A main objective of the European Commissions energy policy is to raise the amount of renewable energies from currently about 6% up to 12% from total energy generation until 2010. Therefore a huge potential is seen in the application of biomass, which is competitive, storable, CO<sub>2</sub>-neutral and in connection with wastewater an extreme low-cost fuel for heat and power generation. The current main biomass sources like forest-wood, recycle-wood and biogas can not meet the future demand for heat and power generation in Europe. Therefore, it is necessary to develop high efficient and low-cost biomass production systems. Wastewater irrigated Short Rotation Plantations (SRP) can contribute to meet these requirements because they use the advantages of communal wastewater as a source for cheap fertilisation and irrigation for the cultivation of fast growing combustible energy crops (e.g. willows, poplars). Due to this procedure these SRP's also can contribute to a low-cost and environmentally safe biological wastewater treatment for about 25.000 small communities in Europe (135 million citizen) which are not yet connected to central wastewater treatment systems but soon have to fulfil new EU environmental legislation. The aim of the WACOSYS-project is to develop, test and optimise a monitoring and control system (WACOSYS-system) for wastewater irrigation of SRP's which guarantees SRP-operators a safe and more efficient production in their plantations. The WACOSYS-System consists of a combined sensor-detector-dosage system which includes a monitoring, control and distribution unit which enables the dosing and distribution of the wastewater in accordance to the plantations demand for optimum plant growth and maximum uptake rates while observing critical loads in the effluent to avoid environmental pollution.

## **015226- WADI**

Sustainable management of Mediterranean coastal fresh and transitional water bodies: a socio-economic and environmental analysis of changes and trends to enhance and sustain stakeholders benefits

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*Funding scheme:* STP (Specific Targeted Research Project), FP6

*Project duration:* 1/1/2006 - 12/31/2008

*EC contribution:* € 1 820 000

*Policy drivers:* Water and Agriculture

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### **Abstract**

Management decisions of fresh water resource are generally driven by the urgency of recent changes in the human (globalisation) and natural (climatic changes) contexts. However, the local context, which is most sensitive to human impact, is often neglected, resulting in conflict. The project aims at encouraging the rational and sustainable use of fresh and transitional water resources within the Mediterranean coastal area, which experiences freshwater scarcity, through participatory approaches. Fresh water bodies in coastal areas, essentially where large demographic concentrations occur, are particularly at risk of negative impacts, risks and threats, both natural and anthropogenic.

Water management measures may affect ecosystem viability and sustainable resource production, which in turn may have a negative influence on Mediterranean human populations, sustained economic growth and development.

A number of significant case studies throughout the Mediterranean have been selected for assessment and subsequent analysis. The socio-cultural and environmental contexts will be considered holistically, through an ecosystem approach, to avoid the risk of emphasising specific features or underestimating the needs of fragile components within the system.

The assessment of impacts and indicators thereof will result in the development of alternative case-study scenarios, based upon sustainable management strategies, for the potential use by stakeholders. Tangibly, these management plans may subsequently be utilised by stakeholders within the study site environs, as also in the wider context of the Mediterranean, whereby the project case-studies may be extrapolated to other scenarios within the Basin. The specific role of women as end-users of water will be a main focus and special attention will be given to their involvement in the local dissemination of the project findings and results.

## **265570- WAHARA**

Water Harvesting for Rainfed Africa: investing in dryland agriculture for growth and resilience

[www.wahara.eu/](http://www.wahara.eu/)

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*Funding scheme:* CP (Collaborative Project), FP7

*Project duration:* 3/1/2011 - 2/29/2016

*EC contribution:* € 1 999 312

*Policy drivers:* Water and Agriculture  
Water Scarcity and Droughts

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### **Abstract**

WAHARA will take a transdisciplinary approach to develop innovative, locally adapted water harvesting solutions with wider relevance for rainfed Africa. Water harvesting technologies play a key role in bringing about an urgently needed increase in agricultural productivity, and to improve food and water security in rural areas. Water harvesting technologies enhance water buffering capacity, contributing to the resilience of African drylands to climate variability and climate change, as well as to socio-economic changes such as population growth and urbanisation. To ensure the continental relevance of project results, research will concentrate on four geographically dispersed study sites in Tunisia, Burkina Faso, Ethiopia and Zambia, covering diverse socio-economic conditions and a range from arid to sub-humid climates. The project emphasizes: i) participatory technology design, i.e. selecting and adapting technologies that have synergies with existing farming systems and that are preferred by local stakeholders, yet tap from a global repertoire of innovative options; ii) sustainable impact, i.e. technologies that combine multiple uses of water, green and blue water management, and integrated water and nutrient management. Using models, water harvesting systems will be designed for maximum impact without compromising downstream water-users, contributing to sustainable regional development; iii) integration and adaptability, i.e. paying attention to the generic lessons to be learned from local experiences, and developing guidelines on how technologies can be adapted to different conditions; and iv) learning and action, i.e. a strategy will be developed to enable learning and action from successes achieved locally: a. within a region, to upscale from water harvesting technologies to water harvesting systems, and b. across regions, promoting knowledge exchange at continental scale.

## **516731- WATER REUSE**

### **SUSTAINABLE WASTE WATER RECYCLING TECHNOLOGIES FOR IRRIGATED LAND IN NIS AND SOUTHERN EUROPEAN STATES**

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*Funding scheme:* STP (Specific Targeted Research Project), FP6

*Project duration:* 9/1/2005 - 5/31/2010

*EC contribution:* € 1 180 000

*Policy drivers:* Water and Agriculture

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#### **Abstract**

In irrigated areas in the NIS and Southern European States, inefficient use of conventional water resources occurs through incomplete wetting of soils, which causes accelerated runoff and preferential flow, and also through excessive evaporation associated with unhindered capillary rise. Furthermore, a largely unexploited potential exists to save conventional irrigation water by supplementation with organic-rich waste water, which, if used appropriately, can also lead to improvements to soil physical properties and soil nutrient and organic matter content. This project aims to (a) reduce irrigation water losses by developing, evaluating and promoting techniques that improve the wetting properties of soils, and (b) investigate the use of organic-rich waste water as a non-conventional water resource in irrigation and, in addition, as a tool in improving soil physical properties and soil nutrient and organic matter content. Key activities include (i) identifying, for the NIS and Southern European States, the soil type/land use combinations, for which the above approaches are expected to be most effective and their implementation most feasible, and (ii) examining the water saving potential, physical, biological and chemical effects on soils of the above approaches, and their impact on performance. This will be carried out using field trials in NIS and Southern European States and, where applicable, under more tightly controllable laboratory conditions. Expected outputs include techniques for sustainable improvements in soil wettability management as a novel approach in water saving, detailed evaluation of the prospects and effects of using supplemental organic-rich waste waters in irrigation, an advanced process-based numerical hydrological model adapted to quantify and upscale resulting water savings and nutrient and potential contaminant fluxes, and identification of suitable areas in the NIS and Southern European States.

## **222440- WATER-BEE**

Low cost, easy to use Intelligent Irrigation Scheduling System

[www.waterbee.eu/](http://www.waterbee.eu/)

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*Funding scheme:* BSG-SME (Research for SMEs), FP7

*Project duration:* 10/1/2008 - 9/30/2010

*EC contribution:* € 1 107 614

*Policy drivers:* Water and Agriculture  
Water Scarcity and Droughts

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### **Abstract**

Agriculture, the largest industry in the world, is also the biggest threat to the environment. According to the WWF, agriculture wastes 60% or 1,500 trillion litres, of the 2,500 trillion litres of water it uses each year - which is 70% of the world's accessible water. One of the main culprits is inefficient water irrigation systems. Looking at the European context, 65% of total water consumption, irrigated agriculture now constitutes the biggest water consumer in the Mediterranean, where drought is becoming an increasing problem. If water is not managed more wisely, drought will become chronic and people will suffer more as water for other basics such as drinking, hygiene and cooking will become scarce. And this is not a problem that is merely confined to the Mediterranean region of Europe, as there are increasing reports of water shortages and drought in such regions as South East England, Germany and many other parts of Europe. Drought is currently having a devastating effect on the European economy, costing about €11 billion in Europe in 2003. In summer 2005, in Spain alone the agricultural sector lost more than €2 billion as a result of drought. In light of a real need to improve the efficiency of irrigation systems and prevent the misuse of water, the overall aim of this project is to develop an intelligent irrigation scheduling system which will enable irrigation farmers to optimise the use of water and only irrigate where and when need for as long as needed. The system will integrate innovations in the field of low cost wireless sensor networks, soil sensor technology, intelligent software in order to arrive at a solution that will be easy to use for farmers and that will be flexible and robust enough for its use in farm environments. Such an intelligent irrigation scheduling system would have a major impact in terms of water and cost savings and environmental protection.

## **283638- WATERBEE DA**

WaterBee Smart Irrigation Systems Demonstration Action

[www.waterbee.eu/](http://www.waterbee.eu/)

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*Funding scheme:* CP (Collaborative Project), FP7

*Project duration:* 7/1/2011 - 6/30/2013

*EC contribution:* € 1 138 076

*Policy drivers:* Water and Agriculture

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### **Abstract**

The WaterBee Smart Irrigation Demonstration Action is the follow-on phase from the very successful FP7-SME-007-1 WaterBee “Research for SMEs” project (222440) that ended in September 2010, & very convincingly researched, developed & proved the concept of the WaterBee Prototype to provide an unique scientific soil-moisture model that automatically adapts to each installation & crop with a distributed Web-based Wireless Sensor Networked (WSN) Smart Irrigation system to optimise Water Use Efficiency (WUE) in irrigation. There is a pressing need & excellent commercial opportunity for such a system in Agriculture, which is the largest industry in the world & (according to the WWF), wastes 60% of the 2,500 trillion litres of water it uses each year - which is 70% of the world's accessible water – a huge threat to the environment. A major culprit is inefficient water irrigation systems. In Europe irrigated agriculture is the biggest water consumer (over 60%) in the Mediterranean, where drought is an increasing problem. To bridge the gap from the very successful Research project, & enable its SMEs to be able to address this significant market opportunity, WaterBee will be scaled up to a full reliable operational field prototype service, that will be demonstrated & validated over a 15 month period with complete growing cycles of various crops in 6 contrasting sites across Europe, in Estonia, Italy, Malta, Sweden, Spain & UK, to quantify profitable operation of the WaterBee service for Growers, with water savings of 40% while enhancing crop quality in each site. The project will quantify the market & identify potential users of a commercial WaterBee Service. Based on these & ongoing feedback from the demonstration sites the project will disseminate the WaterBee service to potential customers & business partners through various media & 2 specific events, & develop/validate a Business Plan for the SMEs to commercially develop & exploit the service after this Demo Action ends.

## **031694- WATERMAN**

Dissemination of research results in semi-arid and arid ecosystems with a focus on sustainable water resource management in Ethiopia

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*Funding scheme:* SSA (Specific Support Action), FP6

*Project duration:* 10/1/2006 - 3/31/2008

*EC contribution:* € 270 000

*Policy drivers:* Water and Agriculture  
Water Scarcity and Droughts

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### **Abstract**

This SSA focuses on analysis and dissemination of research results in sustainable, integrated water resource management at river-basin scale within Ethiopia.

WATERMAN is a resubmission of a proposal submitted in the last call (INCO-DEV Sept. 2004) which was rated as being "highly relevant" and passed all thresholds, but was not retained for funding because of budgetary restrictions. In accordance to the overall remarks made in the Evaluation Summary Report, the following changes have been adopted in the new proposal:

- o Extension of the consortium to include two more relevant European partners
- o More detail and a new topic concerning participatory approaches has been added to the list of sub-topics dealt with in the project. To stress the importance of this issue, it will be the central theme at first Kick-off meeting.
- o Two new African partners have been added to the consortium to increase the dissemination and impact of the SSA results,
  - both nationally and internationally.

The 18-month project activities include; three workshops at each of the Ethiopian universities, a scientific Project Plan Award and an international symposium. All activities focus on strategies and actions for enhanced and sustainable economic productivity with four sub-topics:

1. Use of participatory approaches to integrate socio-economic, ethical and gender issues into research and dissemination to
  - shorten impact times and increase broad uptake
2. Integrated water supply and resource management (innovative, multi-purpose utilisation, competing demands)
3. Agriculture and irrigation (recycling, reuse, prevent erosion at source)
4. Salinity, water logging and soil fertility

## **266360- WHATER**

Water Harvesting Technologies Revisited: Potentials for Innovations, Improvements and Upscaling in Sub-Saharan Africa

[www.whater.eu/](http://www.whater.eu/)

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*Funding scheme:* CP (Collaborative Project), FP7

*Project duration:* 1/1/2011 - 12/31/2014

*EC contribution:* € 1 999 930

*Policy drivers:* Water and Agriculture  
Water Scarcity and Droughts

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### **Abstract**

The WHaTeR project aims to contribute to the development of appropriate water harvesting techniques (WHTs). These WHTs should be sustainable under dynamic global and regional pressure, and strengthen rainfed agriculture, improve rural livelihood and increase food production and security in Sub-Saharan Africa. In total 3 European and 5 African organisations will be involved; namely VU University Amsterdam (The Netherlands), Newcastle University (United Kingdom), Stockholm Resilience Centre (Sweden), University of Kwazulu Natal (South Africa), Sokoine University (Tanzania), Southern and Eastern Africa Rainwater Network (Kenya), National Institute for Environment and Agricultural Research (Burkina Faso) and Arba Minch University (Ethiopia). Project activities will be divided over 14 Work Packages. The first Work Package covers project management and the second comprises a situation analysis - through revisits to water harvesting sites in 15 African countries studied previously by participating organisations. The next four Work Packages focus on detailed research and technology development activities on cross-cutting themes (environmental sustainability; technology development; livelihood improvement; uptake and upscaling; and global and regional impact) and will be conducted together with four country-based Work Packages (in Burkina Faso, Ethiopia, South Africa and Tanzania). One Work Package will concentrate on stakeholder communication and outreaching activities, and the final Work Packages consists of synthesis and dissemination of project results, including production of guidelines for WHTs. The project will spend an estimated 74% of the budget on RTD, 13% on other costs related to stakeholder workshops and outreaching and 13% on project management. The expected impacts of the project comprise technology support for farmers, development of stakeholder communication networks, innovative water harvesting systems, tools for impact assessment, upstream-downstream land use, and policy support for integrated water management and adaptation

to climate change to promote EU and African strategies on strengthening rainfed agriculture, food security and livelihoods.

## **515941- WUEMED**

Improving water use efficiency in Mediterranean agriculture :  
what limits the adoption of new technologies?

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*Funding scheme:* SSA (Specific Support Action), FP6

*Project duration:* 4/15/2005 - 10/14/2006

*EC contribution:* € 80 000

*Policy drivers:* Water and Agriculture

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### **Abstract**

The International Congress InterDrought-II (ID-2), to be held at FAO, Rome, in September 2005 will attract the best researchers on water use efficiency and agriculture from all around the world. ID-2 will provide a unique opportunity to present and discuss the most recent scientific and technological advances on how to mitigate the effects of drought on crop productivity.

In such context, the WUEMED workshop herein proposed, will be held at the end of ID-2, and workshop participants will interact with ID-2 participants through different activities. The objective of WUEMED is to build up a multidisciplinary forum (with researchers, policy makers and end users) where to discuss how the knowledge and technology generated through the past and ongoing INCO-MED projects together with the scientific evidence presented in ID-2 may be transferred to technical improvements and from that to Mediterranean agriculture. The participants will eventually identify what are the promising techniques and practices to improve water use efficiency and sustainability of Mediterranean agriculture, and the miscellaneous constraints that limit their adoption for the end users.



## **Water Scarcity and Droughts**



## **272584- ACTIWATE**

Advanced concentrate treatment for integrated membrane based water reuse systems

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 10/1/2011 - 9/30/2014

*EC contribution:* € 369 327

*Policy drivers:* Water Scarcity and Droughts  
Chemical Aspects

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### **Abstract**

Drought and water scarcity are major global challenges increasingly having a significant impact on countries of the EU. The Commission estimated the economic impacts of drought events in the last 30 last years to be 100 billion € at EU level. In particular Mediterranean countries are heavily affected and now prioritise water reuse. High quality water reuse based on dense membrane treatment is expected to be progressively applied to provide the additional water resources required. However environmental concerns and the high costs associated with membrane concentrate management limit its application, especially in inland locations. "ACTIWATE - Advanced concentrate treatment for integrated membrane based water reuse systems" aims at the investigation of integrated RO and NF concentrate treatment concepts with minimized costs and environmental impact. Applying the sustainable Zero Liquid Discharge principle, it combines methods for the removal of bulk and trace organics with a subsequent desalting system based on electrodialysis or forward osmosis to further concentrate the brine and then precipitate the salts or use WAIV for salinity removal. The focus will be on the optimum removal of micropollutants and foulants to allow a complete recycle of the concentrate. The 3-year project will be executed at the University of Technology Sydney, Australia (outgoing host) and the University of Applied Sciences Northwestern Switzerland (return host) offering the research fellow excellent opportunities to further develop his scientific skills in cutting edge technologies and analytical methods. Executed in two countries severely hit by recurring droughts and where substantial investment in inland reclamation plants will be made, he will gain first hand knowledge of water reuse and other adaptive measures of the water industry. The research will contribute to the EU Strategic Research Agenda, in a research area that is recognised as being of the highest importance for the EU research community.

## **004089- AMMA**

### African Monsoon Multidisciplinary Analysis

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*Funding scheme:* IP (Integrated Project), FP6

*Project duration:* 1/1/2005 - 12/31/2009

*EC contribution:* € 12 951 960

*Policy drivers:* Water Scarcity and Droughts  
Climate Change

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### **Abstract**

The dramatic change in the region of the West African monsoon (WAM) from wet conditions in the 50s and 60s to much drier conditions from the 70s to the 90s represents one of the strongest inter-decadal signals on the planet in the 20th century. Marked inter-annual variations in recent decades have resulted in extremely dry years with devastating environmental and socio-economic impacts. The abrupt decrease of water resources in the Sahel divided by two the cattle population and some exportation cultures disappeared. Vulnerability of West African societies to climate variability is likely to increase in the next decades as demands on resources increase due to the rapidly growing population. The situation may be exacerbated by the effects of climate change, land degradation caused by the growing population and water pollution. Motivated by the need to develop strategies to reduce the socioeconomic impacts of climate variability and change in WAM we aim : i) To improve our ability to predict the WAM and its impacts on intra-seasonal to decadal timescales, ii) To improve our ability to predict the consequences of climate change on WAM variability and its impacts. These objectives will be achieved in the African Monsoon Multidisciplinary/ Analysis (AMMA) project by re-enforcing the regional environmental monitoring systems and conducting intensive field campaigns. This will lead to a better understanding of the mechanisms involved and in-fine improve our models and their predictive skills. The observational system will cover the regional water cycle, the atmospheric dynamics and chemistry, the land-surface and oceanic conditions. It will cover 3 time scales : i) a long term monitoring, ii) an enhanced observing period of two years and iii) a special observing periods over one rainy season. In order to monitor the human dimension of the West African monsoon variability crop yields, water resources and health will be monitored with the same strategy.

## **511231- AQUASTRESS**

Mitigation of Water Stress through new Approaches to Integrating Management, Technical, Economic and Institutional Instruments

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*Funding scheme:* IP (Integrated Project), FP6

*Project duration:* 2/1/2005 - 1/31/2009

*EC contribution:* € 10 300 000

*Policy drivers:* Water Scarcity and Droughts  
Socio-economy  
Water and Agriculture

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### **Abstract**

Water stress is a global problem with far-reaching economic and social implications.

The mitigation of water stress at regional scale depends not just on technological innovations, but also on the development of new integrated water management tools and decision-making practices.

The AquaStress IP delivers enhanced interdisciplinary methodologies enabling actors at different levels of involvement and at different stages of the planning process to mitigate water stress problems. This IP draws on both academic and practitioner skills to generate knowledge in technological, operational management, policy, socio-economic, and environmental domains.

Contributions come from 36 renowned organizations from 17 Countries, including 6 SMEs.

The IP will generate scientific innovations to improve the understanding of water stress from an integrated multisectoral perspective to support:

- diagnosis and characterisation of sources and causes of water stress
- assessment of the effectiveness of water stress management measures and development of new tailored options
- development of supporting methods and tools to evaluate different mitigation options and their potential interactions
- development and dissemination of guidelines, protocols, and policies
- development of a participatory process to implement solutions tailored to environmental, cultural, economic and institutional settings
- identification of barriers to policy mechanism implementation
- continuous involvement of citizens and institutions within a social learning process that promotes new forms of water culture and nurtures long-term change and social adaptivity.

The IP adopts a Case Study stakeholder driven approach and is organised in three phases; (i) characterisation of selected reference sites and relative water

stress problems, (ii) collaborative identification of preferred solution options, (iii) testing of solutions according to stakeholder interests and expectations.

## **207276- C3, C4 AND DROUGHT**

Water use and carbon budget associated with adaptation and competition of C3 and C4 grasses during drought stress

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 6/1/2008 - 5/31/2011

*EC contribution:* € 75 000

*Policy drivers:* Water Scarcity and Droughts

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### **Abstract**

Water availability is a major abiotic factor limiting plant growth and productivity. Grasses are major contributors to global primary productivity. Many C3 and C4 grass species are intolerant to drought stress and are often limited by water availability in terms of their distribution and productivity. However, Some C3 and C4 grass species, such as *Festuca arundinacea* (C3) and *Cynodon dactylon* (C4) are adapted to a wide range of climatic zones in Israel, with an annual rainfall of 30 to 1000 mm. The overall goal of the proposed research is to examine mechanisms of adaptation to drought stress of dryland C3 and C4 grasses. The specific objectives of the study are: 1) to compare drought tolerance between ecotypes of C3 and C4 grass species collected from different climatic zones; 2) to determine mechanisms regulating drought survival of dryland perennial C3, C4 and C3-C4 intermediate grasses in terms of water use and carbon budget and to link between water and carbon relations; 3) to create a wide germplasm bank of drought-tolerant grasses for future research and breeding;. C3, C4 and C3-C4 intermediate grasses will be collected from a wide range of climatic zones and studied for drought tolerance. A number of physiological parameters, including growth rate and photosynthetic rate, will be measured and compared for the evaluation of drought adaptability. Carbon metabolism and water use characteristics will be examined to determine drought tolerance strategies of dryland C3 and C4 grass species. Carbon benefits and costs associated with water relations will be assessed for different grass species adapted to different climatic conditions. Examination of C3 and C4 mechanisms that link water use and carbon expenditure will provide further insights into plant adaptation to long-term drought stress and is expected to contribute significantly to key areas such as sustainable agriculture, desertification, C3/C4 competition and global carbon cycle under drought.

## **032539- CAMINAR**

### **CATCHMENT MANAGEMENT AND MINING IMPACTS IN ARID AND SEMI-ARID SOUTH AMERICA**

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*Funding scheme:* STP (Specific Targeted Research Project), FP6

*Project duration:* 2/1/2007 - 1/31/2010

*EC contribution:* € 1 799 645

*Policy drivers:* Water Scarcity and Droughts

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#### **Abstract**

More than 25% of South America is arid or semi-arid. A general lack of rational water management systems hinders the sustenance / recovery of ecosystems and human communities in these areas. The twin scourges of erosion and salinisation are prone to exacerbation by various human activities. Mining is the sector with the highest environmental impact, yet it contributes more to legal export earnings in the region than any other sector. There is clearly a need to rigorously review the effectiveness of existing policies, and to develop new approaches to river-basin management to ensure that such vital economic activity can be carried out in a manner which does not permanently damage fragile ecosystems and water resources upon which human communities depend in arid / semi-arid areas. CAMINAR has the general aim of contributing to the establishment of policy options, management strategies and technologies for the sustainable management of ecosystems in those river-basins of arid and semi-arid South America which are subject to impacts from mining. This aim will be achieved, using Peru, Bolivia and Chile as demonstration countries, through realisation of the following objectives: establish forums for dialogue on the ecological and water resources impacts of mining in arid / semi-arid river basins (at both national and regional levels); critically evaluate the effectiveness of existing regulatory strategies for mining in arid / semi-arid areas through studies of selected river-basins in the demonstration countries; develop guidelines for integrated water resources and ecosystem management in arid / semi-arid zones of South America with particular emphasis on mining impacts; develop decision support tools to facilitate participatory water management planning; and derive a set of principles for future policy development and implementation to protect fragile ecosystems and dependant human communities in arid / semi-arid regions.

## **015468- CEDROME**

Developing drought-resistant cereals to support efficient water use in the Mediterranean area

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*Funding scheme:* STP (Specific Targeted Research Project), FP6

*Project duration:* 1/1/2006 - 10/31/2009

*EC contribution:* € 1 700 000

*Policy drivers:* Water Scarcity and Droughts  
Water and Agriculture

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### **Abstract**

Limited water resources are now a major challenge to World food security esp. in many developing countries such as those in the Mediterranean basin. Cereal cultivation, including rice and wheat, requires a tremendous amount of water, and any deficiency can severely affect yield. CEDROME aims to develop drought resistant cereals to support the efficient use of water supplies in the Mediterranean area. Additionally, development of drought resistant cereals will also facilitate increased agricultural production by making use of large areas of yet underdeveloped dry lands. With the available genomic sequence, the well-defined genetic maps and large collection of mutation and insertion lines, rice is the obvious model for this research. The knowledge obtained and functional genes identified from rice can be extrapolated in the improvement of other cereal crops such as wheat, barley and sorghum since they are closely related. This multi-disciplinary project combines European and MPC expertise in classical breeding, plant physiology and cereal crop biotechnology to assist the development of a new generation of wheat and upland rice varieties with enhanced drought resistance. 2 Chinese partners in this project provide expertise in cereal biotechnology, as well as valuable breeding tools and materials. Molecular markers will be used to identify drought-related loci. Conventional breeding will be used to combine drought resistance genes in new cultivars and new candidate drought resistance genes will be identified. Constructs will be made with these new and existing putative drought resistance genes and transgenic rice and wheat plants will be evaluated in various countries under different growing conditions. In addition genetic approaches will be taken to identify new genes from different mutagenized populations. Results of this project will support sustainable development in the Mediterranean area and will also be applicable to other cereal-growing countries.

## **252191- CERAMEM**

Novel tailored ceramic membranes for water treatment applications

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 9/15/2010 - 9/14/2012

*EC contribution:* € 225 385

*Policy drivers:* Water Scarcity and Droughts

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### **Abstract**

This project addresses an acute and relevant worldwide problem: The scarcity of fresh water. The current solutions to this problem are based on desalination of sea water and on wastewater treatment. In both cases, the state-of-the-art uses reverse-osmosis membrane technology that employs polymer membranes. The problem is that these membranes are sensitive to fouling and degradation, and although they are relatively inexpensive their frequent replacement is costly and labor-intensive. Here we propose using a new type of hybrid ceramic membranes, developed in our group, as pre-treatment filters (ultra-filtration) in the purification process. Ultimately, we also envisage a one-stage reverse osmosis water purification process using only the hybrid ceramic membranes. These novel membranes are extremely stable, and are easily tailored to specific applications. The project will boost the career of the applicant, Dr. Vitaly Gitis. He will be trained in the synthesis of these new hybrid materials, enabling him to transfer the knowledge to his home university and apply it in his research group. Combined with his considerable experience of water purification processes, the new knowledge will give him a research edge that will make him a leader in the field. Moreover, the additional soft skills training that he will receive, plus the international and interdisciplinary experience, will cement his position in his home country. Finally, the host institution will also benefit substantially from the project, as the applicant will transfer his own knowledge and experience to the hosting group and to the institute.

## **226919- COMENVIR**

Communicating environmental impacts on water quality, availability and use

[www.eusem.com/main/CE/comenvir](http://www.eusem.com/main/CE/comenvir)

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*Funding scheme:* CSA (Coordination - or networking - action), FP7

*Project duration:* 5/1/2009 - 4/30/2013

*EC contribution:* € 871 620

*Policy drivers:* Water Scarcity and Droughts  
Climate Change

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### **Abstract**

The ComEnvir project aims to narrow the gap between EU sponsored environmental research and European citizens. Water (resources, quality, pollution and biodiversity issues) has been chosen as a common theme to be addressed by the project. It will cover environmental stressors, waste treatment, health effects, biodiversity, risks and therefore the role of water quality in its different environmental locations (fresh water, marine, soil, air). The project will last 48 months. The project will communicate results and activities of EU environmental research with two specific target groups. The primary target group are teachers and students. The second target group is the general public. The overall project objectives are to: • empower the European citizens to constructively engage in scientific dialogue and debate • inform European consumers of the latest scientific advances in the food sector • strengthen science education in classrooms and • promote scientific curiosity among the youth The ComEnvir project will achieve its set objectives through a number of innovative approaches and strategies that have already been piloted in 2006 and 2007. These approaches centre around three key elements: • creation of knowledge packages on EU environmental research and will include films, film clips, FAQs, news, background reading materials, a glossary and links • effective dissemination measures (broadcast media, DVDs and internet) and • thorough evaluation of on-going project deliverables The nine project members, located in Denmark, France, Germany, Italy, The Netherlands, Norway and the UK possess complementary expertise that assures successful project outcome. The project will last 48 months.

## **031697- CYCLER-SUPPORT**

Supporting the implementation of FP6 research activities related to waste water use and recycling by using new generation greenhouse systems, adapted to the requirements of the MED partner countries

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*Funding scheme:* SSA (Specific Support Action), FP6

*Project duration:* 11/1/2006 - 10/31/2008

*EC contribution:* € 369 994

*Policy drivers:* Water Scarcity and Droughts

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### **Abstract**

Mediterranean Countries struggle with serious water problems like rising water competition between agriculture, households and industry, but limited and/or salt-affected water resources, irregular rainfall, escalating dehydration of landscape; and with inefficient wastewater treatment systems leading to pollution of surface- and groundwater. There are different research activities accomplished under the FP5/FP6, showing very promising approaches to re-use and to recycle conventional and unconventional irrigation water in greenhouses, with the potential to up-grade and to re-use wastewater as non-conventional water resources, to extremely reduce the pressure on freshwater resources and the pollution of surface- and groundwater, to make greenhouse cultivation almost independent from drought and irregular rainfall, to add value to otherwise unproductive land, and to improve the water consumption efficiency and effectiveness in agriculture. However, these research activities have not been implemented in the Mediterranean Partner Countries so far. Main reasons are too high costs for the special water cycling greenhouse architecture and technology, insufficient studies about MPC's wastewater collection systems and about the socio-economical benefits and risks to upgrade wastewater by greenhouse irrigation, and insufficient studies about the market value of useful crops which can be used in combination with greenhouse internal wastewater treatment. In this context, the objectives of this project are to collect the missing information by accomplishing a detailed CYCLER-SUPPORT study, to disseminate the existing know-how of accomplished research activities and the completed study results mainly by a final CYCLER-SUPPORT-WORKSHOP, to give a clear view over further needed research activities to related stakeholders, to strengthen the exchange of know-how and co-operation between EU and MPC scientists, and to support the establishment of sustainable business-relations.

## **017928- DESOL**

Low cost low energy technology to desalinate water into potable water

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*Funding scheme:* SME (SMEs-Co-operative research contracts), FP6

*Project duration:* 12/1/2005 - 8/31/2008

*EC contribution:* € 527 655

*Policy drivers:* Water Scarcity and Droughts

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### **Abstract**

In South of EU tourism is a main business on which up to 90% of employment depends on. Tourism requires ca. 300 Litres/pers./day of drinking water. The areas where most of the hotel resorts and secondary facilities are located scarce on potable water. The available source of water is sea and groundwater which has to be desalinated too. Hotels and restaurants are mainly local SME business. Due to the high demand of potable water there is a threat to this increasing industry. SoA technology to desalinate water is Reverse Osmosis, which is expensive in invest and operation and due to the high electrical energy consumption not environmental friendly. The proposing SMEs have come together to develop DeSol as innovative, environmental friendly and efficient process that desalinates water using thermal energy at a low level which will be provided by solar collectors. The low temperature level of evaporation could be achieved through processing at vacuum pressure. Vacuum is generated through the water column in the effluent formed by the gravity of the condensed water. DeSol will be a highly competitive product with significant technological features: Evaporation at temperature of 60deg.C in a vacuum atmosphere generated by the gravity of effluent water column; Raw water charged by a maintenance free pump combining a piston pump with a directly coupled Stirling motor; Modular design for flexible adaptation to low or high capacities required by customers; Control and adjustment by hydro-thermo-mechanical systems to achieve energy efficiency of up to 92%. The system will be cost-efficient, save investment and energy, easy to be operated and designed for low maintenance efforts at a long life time.

## **265454- DEWFORA**

Improved Drought Early Warning and FORecasting to strengthen preparedness and adaptation to droughts in Africa

[www.dewfora.net/Projects?lang=en](http://www.dewfora.net/Projects?lang=en)

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*Funding scheme:* CP (Collaborative Project), FP7

*Project duration:* 1/1/2011 - 12/31/2013

*EC contribution:* € 3 490 000

*Policy drivers:* Water Scarcity and Droughts

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### **Abstract**

The principal aim of the DEWFORA proposal is to develop a framework for the provision of early warning and response to mitigate the impact of droughts in Africa. The proposal has been built to achieve three key targets:

1. Improved monitoring: by improving knowledge on drought forecasting, warning and mitigation, and advancing the understanding of climate related vulnerability to drought - both in the current and in the projected future climate.
2. Prototype operational forecasting: by bringing advances made in the project to the pre-operational stage through development of prototype systems and piloting methods in operational drought monitoring and forecasting agencies.
3. Knowledge dissemination: through a stakeholders platform that includes national and regional drought monitoring and forecasting agencies, as well as NGO's and IGO's, and through capacity building programmes to help embed the knowledge gained in the community of African practitioners and researchers.

To achieve these targets, the DEWFORA consortium brings together leading research institutes and universities; institutes that excel in application of state-of-the-art science in the operational domain; operational agencies responsible for meteorological forecasting, drought monitoring and famine warning; and established knowledge networks in Africa. The consortium provides an excellent regional balance, and the skilled coordinator and several partners have worked together in (European) research projects, implementation projects and capacity building programmes, thus building efficiently on previous and ongoing projects in Europe and Africa.

The main impact of DEWFORA will be to increase the effectiveness of drought forecasting, warning and response. DEWFORA will provide guidance on how and where drought preparedness and adaptation should be targeted to contribute to increased resilience and improved effectiveness of drought mitigation measures.

## **244374- DROPS**

Drought-tolerant yielding plants

[www.drops-project.eu/](http://www.drops-project.eu/)

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*Funding scheme:* CP (Collaborative Project), FP7

*Project duration:* 7/1/2010 - 6/30/2015

*EC contribution:* € 5 999 866

*Policy drivers:* Water Scarcity and Droughts

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### **Abstract**

DROPS will develop novel methods and strategies aimed at yield maintenance under fluctuating water deficit and at enhanced plant water-use efficiency. We deal with high genotype x environment interaction in the field (any trait can have positive, negative or no effect depending on drought scenarios) with an approach combining Physiology, Genetics, field testing and Ecophysiological modelling. The project targets four traits : seed abortion, vegetative growth maintenance, root system architecture and transpiration efficiency. It deals with maize and durum wheat, plus bread wheat and sorghum for specific tasks. DROPS will: - Develop new screens for identifying drought tolerant genotypes, from phenotyping platforms to the field with indicators which are (i) stable characteristics of genotypes with high heritability in phenotyping platforms (ii) based on novel knowledge (e.g. combinations of metabolite concentrations, sensitivity parameters of models or hormonal balances) (iii) genetically related to target traits and able to predict genotype performance in the field via simulation and/or statistical models. - Explore the natural variation of the four target traits by (i) linking the target traits to physiological pathways, genes or genomic regions (ii) assessing the effects of a large allelic diversity for the four target traits via association genetics. - Support crop improvement strategies by developing methods for estimating the comparative advantages of relevant alleles and traits in fields with contrasting drought scenarios. This will be performed via field experiments and by developing a new generation of crop model able to estimate the effects of alleles on crop growth, yield and water-use efficiency Results and methods will be diffused (i) to breeders via the participation of seed companies and a partnership with a breeder association, (ii) to scientists and students via academic publications, and via practical courses and virtual courses in its website.

## **026064- DRYLAND RESEARCH SSA**

The Jacob Blaustein Institutes for Desert Research Ben-Gurion University of the Negev Drylands Research Specific Support Action - SSA

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 2/1/2006 - 1/31/2011

*EC contribution:* € 674 590

*Policy drivers:* Water Scarcity and Droughts

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### **Abstract**

The Dryland Research SSA will support visits of European scientists to the Jacob Blaustein Institutes for Desert Research (BIDR) to conduct research on drylands-related issues under the Transnational Access Program. Located in the heart of the Negev dryland of Israel, BIDR offers a rare combination of an easily accessible dryland environment with all the logistics required for conducting modern multidisciplinary research. An integral part of Ben-Gurion University of the Negev, BIDR is composed of 6 research departments: Man in the Desert, Desert Ecology, Water Research, Solar Energy & Environmental Physics, Dryland Agriculture, and Dryland Biotechnologies. The mission of BIDR is to study and disseminate knowledge of the desert environment, based on basic and applied research, in order to: (1) explore potentials for utilizing national, regional and global drylands; (2) develop means to combat desertification; (3) develop means for sustainable development of populated drylands. The unique merit of BIDR, Multidisciplinary approach to drylands research, is the reason for proposing the entire BIDR as an SSA program. BIDR has 8 regional research stations and farms in the Negev dryland. These offer a wide range of climatic and landscape characteristics (rocky, sandy and loessial watersheds); altitudes 100-900 m above sea level; mean annual rainfall (20-300 mm); dryland types (hyper-arid, arid, semi-arid); biota (African, Asian, Mediterranean); farming type (intensive dryland agricultural farms as well as extensive agriculture and pastoralism); and other land uses (water resource development projects, nature reserves and ecotourism). All institutional facilities and field sites will be available to SSA guests. The infrastructure caters to visiting scientists, postdoctoral fellows and research students. The proposal will allow approximately 58 new SSA users to benefit from BIDR infrastructure for periods averaging 38 user days (total 2200 user days ) over 4 years.

## **032387- EULACIAS**

Breaking the spiral of unsustainability in arid and semi-arid areas in Latin America using an ecosystems approach for co-innovation of farm livelihoods

[www.eulacias.org/](http://www.eulacias.org/)

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*Funding scheme:* STP (Specific Targeted Research Project), FP6

*Project duration:* 2/1/2007 - 7/31/2010

*EC contribution:* € 1 799 917

*Policy drivers:* Water Scarcity and Droughts

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### **Abstract**

In many arid and semi-arid environments in Latin America misguided agricultural intensification and specialization in response to decreasing farm margins threatens farm livelihoods and puts a burden on natural resources. Over- and under- use of water, soil nutrients, mining of soil organic matter, high levels of soil-borne pests and erosion have implications beyond the farm scale. At the same time off-farm sources of income are scarce under current economic conditions, and cities cannot absorb rural workers. The rapid changes in the socio-economic environment require adaptation of agro- ecosystems as a whole, and cannot be addressed by changes in one component alone. Experience shows that to arrive at such complex system innovations rural stakeholders and researchers need to engage in collective learning processes. To date quantitative systems approaches have only occasionally been used in such processes. Primary aim of this proposal is to identify opportunities and trade-offs for income generation and sustainable use of natural resources by linking quantitative systems approaches to participatory learning processes with researchers, farmers, advisers and local policy makers as participants. A co-innovation approach will be developed based on locally available and best-bet participatory approaches, structured along concepts of social learning and action research. A quantitative ecosystem toolkit which mobilizes databases and models for ecosystem diagnosis and design will be integrated in the co-innovation approach. Four case study areas will be chosen as pilots across the continent, representing gradients of human activity pressure and stage of co-innovation while similar in their systems perspective. This enables sharing of approaches and in-depth comparative analysis. Capacity building in ecosystems analysis will be a key element, aimed at creating critical mass for dissemination of the ecosystem co-innovation approach throughout Latin America.

## **226487- EUROGEOSS**

European approach to GEOSS  
www.eurogeoss.eu

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*Funding scheme:* IA (Large-scale integrating project), FP7

*Project duration:* 5/1/2009 - 4/30/2012

*EC contribution:* € 6 035 566

*Policy drivers:* Water Scarcity and Droughts  
Ecological Status

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### **Abstract**

EuroGEOSS demonstrates the added value to the scientific community and society of making existing systems and applications interoperable and used within the GEOSS and INSPIRE frameworks.

The project will build an initial operating capacity for a European Environment Earth Observation System in the three strategic areas of Drought, Forestry and Biodiversity. It will then undertake the research necessary to develop this further into an advanced operating capacity that provides access not just to data but also to analytical models made understandable and useable by scientists from different disciplinary domains. This concept of inter-disciplinary interoperability requires research in advanced modelling from multi-scale heterogeneous data sources, expressing models as workflows of geo-processing components reusable by other communities, and ability to use natural language to interface with the models.

The extension of INSPIRE and GEOSS components with concepts emerging in the Web 2.0 communities in respect to user interactions and resource discovery, also supports the wider engagement of the scientific community with GEOSS as a powerful means to improve the scientific understanding of the complex mechanisms driving the changes that affect our planet.

## **514391- FOCX**

Fog induced carbon dioxide fluxes in Biological Soil Crust dominated desert ecosystems

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 10/24/2005 - 10/23/2008

*EC contribution:* € 148 659

*Policy drivers:* Water Scarcity and Droughts

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### **Abstract**

The terrestrial carbon cycle and land-atmosphere carbon dioxide fluxes are central issues of recent political and scientific efforts to understand and compete with the potential hazards of uncontrolled anthropogenic impacts on the Earth's climate. A global network has been established to investigate the carbon dioxide fluxes in ecosystems, which are prominent regarding their carbon stocks in biomass and/or soil organic carbon. Arid land ecosystems are not well represented in the global network because of their low net ecosystem productivity (NEP) that includes a minor contribution to the annual carbon dioxide fluxes. Though the whole arid land ecosystems comprise only of 2% of the total carbon stored in biomass, they cover about a third of the entire land surface, and keep about 10% of the global soil carbon stock buried. Since recently, there is a growing awareness that disturbance in ecosystems can be associated with a significant emission of carbon dioxide from the oxidation of soil organic carbon. In arid land ecosystems the land cover with higher plants ranges from non-continuous growth over the year, to patchy growth and up to the presence of individual specimen. Biological Soil Crusts take over to cover and stabilize soil surfaces with proportionally growing importance along the gradient of increasing water deficit. The proposed research aims to implement carbon dioxide flux measurements in Biological Soil Crust (BSC) dominated ecosystems. The results would be useful to (1) assess the contribution of BSC to carbon dioxide fluxes in different arid land ecosystems, (2) evaluate the profit gained with BSC growth relative to the conservation of soil carbon stocks as compared with disturbed arid lands, (3) and finally to provide improved information for policy and land use management with respect to a growing population in arid lands.

## **37063- GEO-BENE**

Global earth observation - benefit estimation: now, next and emerging

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*Funding scheme:* STP (Specific Targeted Research Project), FP6

*Project duration:* 7/1/2006 - 6/30/2009

*EC contribution:* € 2 499 583

*Policy drivers:* Water Scarcity and Droughts  
Ecological Status  
Science-policy Interface

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### **Abstract**

Global Earth Observations are instrumental to attain sustainable development goals and are major drivers of how the society - technology - environment system is managed. An integrated economic, social and environmental assessment of the nine benefit areas of GEO has not yet been carried out. These benefit areas are: Disaster, Health, Energy, Climate, Water, Weather, Ecosystems, Agriculture and Biodiversity. In order to support the international negotiation processes connected to these areas and for the development of good policies the "Global Earth Observation - Benefit Estimation: Now, Next and Emerging" (GEO-BENE) project's objective is to develop methodologies and analytical tools to assess societal benefits of GEO.

The assessment will be carried out using quantitative and qualitative information. Benefit assessment tools are centered on spatially explicit information applying deterministic and stochastic approaches. The various model structures will be applied to global data sets assessing benefit functions using harmonized socio-economic and technology scenarios. Concise policy conclusions from the modeling exercise will aim at supporting the implementation of international agreements. In the proposal we advocate a spatially explicit approach for benefit estimation motivated by the fact that activities underlying the nine benefit areas of GEO are by their very nature spatial entities and aggregate non-spatial treatment could, according to our experience, lead to serious biases in the assessment.

We propose a simple and easily tractable static and deterministic approach for the aggregate benefit calculation and also more comprehensive, dynamic, and uncertainty augmented assessment. We believe that such a multi-dimensional approach is necessary since the underlying processes of the benefits areas are complex and consistency across a variety of decision rules should guarantee robustness of the final aggregate benefits.

## **262255- GLOWASIS**

A collaborative project aimed at pre-validation of a GMES Global Water Scarcity Information Service

[www.glowasis.eu/](http://www.glowasis.eu/)

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*Funding scheme:* CP (Collaborative Project), FP7

*Project duration:* 1/1/2011 - 12/31/2012

*EC contribution:* € 2 320 000

*Policy drivers:* Water Scarcity and Droughts

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### **Abstract**

The main objective of the proposed project GLOWASIS is to pre-validate a GMES Global Service for Water Scarcity Information. In European and global pilots on the scale of river catchments, it will combine in-situ and satellite derived water cycle information and more government ruled statistical water demand data in order to create an information portal on water scarcity. This portal will be made interoperable with the WISE-RTD portal. More awareness for the complexity of the water scarcity problem will be created and additional capabilities of satellite-measured water cycle parameters can be promoted, but also directly matched to user requirements. By creating the user-scientist community, GLOWASIS will guide earth observation scientists to efficient innovation for the specific purpose of water scarcity assessment and forecasting.

By linking water demand and supply in three pilot studies with existing systems (EDO and PCR-GLOBWB) for medium- and long-term forecasting in Europe, Africa and worldwide, GLOWASIS' information will contribute both in near-real time reporting for emerging drought events as well as in provision of climate change time series. By combining complex water cycle variables, governmental issues and economic relations with respect to water demand, GLOWASIS will aim for the needed streamlining of the wide variety of important water scarcity information. Infrastructure is set up for dissemination and inclusion of current and future innovative and integrated multi-purpose products for research & operational applications.

The service will use data from GMES Core Services LMCS Geoland2 and Marine Core Service MyOcean (e.g. land use, soil moisture, soil sealing, sea level), in-situ data from GEWEX' initiatives (i.e. International Soil Moisture network), agricultural and industrial water use and demand (statistical – AQUASTAT, SEEAW and modelled) and additional water-cycle information from existing global satellite services.

## 274085- INPUT-DROUGHT

Increasing the potential of economically valuable tree species to survive drought

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 5/1/2011 - 4/30/2013

*EC contribution:* € 176 685

*Policy drivers:* Water Scarcity and Droughts  
Climate Change  
Ecological Status

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### Abstract

Climate change is confronting forestry with new challenges. The ideal future forest would consist of species coping well with increasing drought and concurrently provide timber of high economic value. Common beech and Douglas-fir are economically valuable species, but whether they will cope with increasing drought remains unclear.

Yet, eco(physio)logical studies to assess plasticity of species in growth response and adaptation to drought often concern trees from the distribution border, leading to the formulation of climate envelopes for different species.

A more straightforward approach to assess growth response to drought, which is largely neglected up to now, is studying growth performance of different provenances of a species. The establishment of large provenance trials with beech and Douglas-fir in the context of the Cost Action E52 and IUFRO programs offers an unique opportunity to study provenance performance under various environmental conditions throughout Europe.

The proposed study aims to designating provenances of beech and Douglas-fir that perform well under drought. Indicators for performance are radial growth dynamics, wood anatomy and water-conducting capacity. To do so, the growth response to drought of 5 provenances per species will be studied at different locations in Europe by evaluating tree growth, wood structure and technological properties. To link wood anatomy and eco-physiology water-transport capacity is measured using NMR imaging.

The approach of combining tree growth analysis, enabling retrospective analyses on the growth dynamics under drought with advanced NMR imaging to assess physiological implications of drought on tree vitality on different provenances of beech and Douglas-fir is unprecedented. Besides adding the variable 'genetics' to dendro-sciences, it will have practical implication if it comes to the selection of suitable plant material to guarantee sustainable ecological and economical performance in a drier future climate.

## **509153- IRRISEASOIL**

### **A CHEAP EASY-TO-HANDLE DESALINATION APPROACH FOR CROP IRRIGATION UNDER MEDITERRANEAN CONDITIONS**

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*Funding scheme:* STP (Specific Targeted Research Project), FP6

*Project duration:* 4/1/2004 - 12/31/2007

*EC contribution:* € 1 250 000

*Policy drivers:* Water Scarcity and Droughts  
Water and Agriculture

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#### **Abstract**

Considering that (i) one of the most serious problems facing the Mediterranean Region is related with water due to the limited amount of natural water resources and the fact that neither the increase in population of this region nor the foreseen climatic changes are going to contribute favourably to improve the regional situation as far as water is concerned and (ii) improving the water consumption by users and uses and plant breeding for efficient water and nutrient use is one of the areas addressed in the Call (INCO-2002-B. 1.2) together with water treatment (INCO-2002-B. 1.3) the objectives of this Proposal are:

(i) The development of selective polymeric materials (cheap to produce) for desalination of seawater, post-irrigation water and soil with the aim of developing a most effective technological approach than the existing ones.

(ii) The use of biotechnological modes and means for promoting efficient and nutrient use of water by plants, improving their immunity and resistance towards diseases and droughts.

To achieve these objectives the following steps are to be undertaken.

Step 1. Selection of main strategic cultures of three Mediterranean Countries as Pilot sources for vegetation experiments based on socio-economic importance, crops quality and structure, agronomical, agrochemical and climatic conditions of their cultivation.

Step 2. Synthesis, characterisation of calixchitin polymers for desalination of seawater, post-irrigation water and soil, followed by their application at Laboratory and Pilot Plant scale.

Step 3. Qualitative and quantitative assessment of the industrial potential desorption solutions resulting from sea, post-irrigation waters and soil.

Step 4. Design of material phenylpropanoid polymeric derivatives with the capability to function as a plant growth regulatory, fertilizers, quality enhancers for the protection of crop quality and productivity under drought conditions.

## **032397- MAI-TAI**

Managing water scarcity: Intelligent Tools And cooperative strategies

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*Funding scheme:* CA (Coordination Action), FP6

*Project duration:* 3/1/2007 - 2/29/2012

*EC contribution:* € 800 000

*Policy drivers:* Water Scarcity and Droughts

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### **Abstract**

MAI-TAI deals with integrated water resources management. It is designed as a 3 year coordination action of leading research and innovation operators, aiming at developing a coherent set of innovative, relevant and cooperative policy options and management strategies. Regionally it works with partners from China and India, and the work will focus around one river basin in each country. The proposal features the following core coordination activities:

1. Enabling a dialogue between researchers and practitioners promoting state of the art and indigenous technologies & practices: The consortium believes that modern systems alone are not capable of solving the water needs of the people in many developing countries, and there is a strong need of generating innovative options through cross fertilization between both "worlds". This "cross-fertilization" will be enabled by methods and rich experiences of user innovations research.

2. Based on (1), innovative policy options and management strategies will be compiled. Then, a multi-stakeholder interaction in order to evaluate these options and strategies will be carried out, supported by intelligent knowledge management tools: In the presence of a variety of actors (institutions, organisations, individuals) each with specific forms of knowledge with respect to scale, topic, reasoning processes, and a large number of information expected to be generated through the multi-stakeholder interaction, the issue of learning and knowledge management is of paramount importance.

A strong impact of the coordination action is ensured by a highly inter- and transdisciplinary team, (in total 13 project partners) encompassing internationally reputable scientific institutions as well as strong governmental partners and NGOs. The latter two will considerably facilitate a wide and in particular meaningful stakeholder dialogue throughout the project.

## **036986- MEDESOL**

Seawater desalination by innovative solar-powered membrane-distillation system

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*Funding scheme:* STP (Specific Targeted Research Project), FP6

*Project duration:* 10/1/2006 - 5/31/2010

*EC contribution:* € 1 170 000

*Policy drivers:* Water Scarcity and Droughts  
Chemical aspects

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### **Abstract**

Despite the advantages of solar membrane distillation (MD) systems very few experimental systems have been developed as opposed to the mature technologies solar PV-driven RO and solar distillation. Therefore, main objective of MEDESOL Project is the development of an environmentally friendly improved-cost desalination technology to fresh water supply in arid and semi-arid regions in EU and Third Countries based on solar MD. The layout involves the innovative concept of multistage MD in order to minimize specific energy and membrane area required and also to substantially reduce the brine generation. The aim of this work was to evaluate the technical feasibility of producing potable water from seawater by integrating several membrane distillation modules (Multi-step Membrane Distillation System). The aim is to develop systems for a capacity ranging from 0.5 to 50 m<sup>3</sup>/day. Technical simplicity, long maintenance-free operation periods and high-quality potable water output are the very important aims which will enable successful application of the systems that are based in membrane distillation. The heat source will proceed from an advanced compound parabolic solar concentrator, developed to the specific concentration ratio to achieve the specific needed range of temperatures (90Å°C) and the seawater heater will include the development of an advanced non-fouling surface coatings to avoid the deposit formation (i.e. scaling) at such temperature. Laboratory tests under defined testing conditions of all components are very important for the preparation of successful field tests under real conditions.

## **041542- PLANT AQUAPORINS**

Regulation of aquaporins in maize roots in response to water stress

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 2/25/2008 - 2/24/2010

*EC contribution:* € 152 185

*Policy drivers:* Water Scarcity and Droughts

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### **Abstract**

Diminished crop water consumption is important to reduce the need for irrigation especially within areas where resources of clean water are scarce. Therefore, expert scientists with strong expertise in plant water relations is needed to address this new agricultural challenge. Aquaporins (AQPs) are channel proteins present in almost all living organisms that facilitate the rapid and passive transport of water across cell membranes. Whereas general features of AQP molecular structure have been described, the integrated function and regulation in higher organisms, particularly in plants, still remain to be explored. Our project aims at investigating the integrated function and regulation of AQPs in maize roots in response to water stress (drought and salinity) combining molecular/biochemical approaches and physiological/biophysical techniques. Practically, we will first establish the growth and stress conditions for WT maize lines but also for lines deregulated in AQP gene expression. We will then monitor AQP gene and protein expression using quantitative RT-PCR and immunological approaches. Since AQP phosphorylation increases their water channel activity, we will detect any variation of the AQP phosphorylation status in response to water stress. In addition, other post-translational modifications such as methylation, acetylation etc. will be investigated using biochemical approaches and mass spectrometry. Finally, the water transport in roots of the different maize lines under water stress will be analyzed using biophysical techniques. The proposal represents a unique combination of expertises (molecular/biochemistry and physiology/biophysics) and will favour a transfer of knowledge between the host institution and the applicant. The latter will learn molecular/biochemical approaches from the host institution specialised in molecular/biochemistry. The applicant will introduce the physiological/biophysical techniques acquired during his PhD to the host laboratory.

## **015449- PURATREAT**

New Energy Efficient approach to the operation of Membrane Bioreactors for Decentralised Wastewater Treatment

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*Funding scheme:* STP (Specific Targeted Research Project), FP6

*Project duration:* 1/1/2006 - 6/30/2009

*EC contribution:* € 899 986

*Policy drivers:* Water Scarcity and Droughts

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### **Abstract**

The Mediterranean basin is one of the poorest regions in the world in terms of water resources. An increased water consumption rate for irrigation purposes along with a high urban population growth, have had an adverse effect on water resources. Thus most groundwater resources in the Mediterranean area are at risk of being exhausted through overexploitation. With limited renewable water resources, most countries of the area have been driven to reuse their wastewaters. However, specially in the east and northern Mediterranean regions, wastewaters are inefficiently treated or even re-used directly without treatment for irrigation or sanitary purposes, serving as a carrier for diseases or causing water pollution when discharged to water bodies. In the last decade, several water treatment technologies have been used in the region with little success on pathogens removal. Membrane bioreactor technology is a very promising alternative to those conventional water treatments for membranes act as a barrier against bacteria and viruses achieving a high degree of water depuration. However, most membrane bioreactors currently in use have very high running costs because of the high-pressure drop and high air-flushing rate required for their operation. The objective of this project is to study a new approach to the operation of membrane bioreactors. This study will include a comparison of the three leading hollow membrane technologies. The operating procedure to be studied is expected to yield very low energy consumption and reduced maintenance costs. These characteristics would make the bioreactors working in these conditions suitable to be operated in peri-urban areas of the Mediterranean basin, where expenditure in public services is a critical factor.

## **262494- REFRESH**

Green technology for fresh water sea-transportation based on a flexible containers system

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*Funding scheme:* BSG-SME (Research for SMEs), FP7

*Project duration:* 11/1/2010 - 10/31/2012

*EC contribution:* € 945 161

*Policy drivers:* Water Scarcity and Droughts

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### **Abstract**

Understanding how freshwater ecosystems will respond to future climate change is essential for the development of policies and implementation strategies needed to protect aquatic and riparian ecosystems. The future status of freshwater ecosystems is however, also dependent on changes in land-use, pollution loading and water demand. In addition the measures that need to be taken to restore freshwater ecosystems to good ecological health or to sustain priority species as required by EU Directives need to be designed either to adapt to future climate change or to mitigate the effects of climate change in the context of changing land-use. Generating the scientific understanding that enables such measures to be implemented successfully is the principal focus of REFRESH. It is concerned with the development of a system that will enable water managers to design cost-effective restoration programmes for freshwater ecosystems at the local and catchment scales that account for the expected future impacts of climate change and land-use change in the context of the WFD and Habitats Directive. At its centre is a process-based evaluation of the specific adaptive measures that might be taken to minimise the consequences of climate change on freshwater quantity, quality and biodiversity. The focus is on three principal climate-related and interacting pressures, increasing temperature, changes in water levels and flow regimes and excess nutrients, primarily with respect to lowland rivers, lakes and wetlands because these often pose the most difficult problems in meeting both the requirements of the WFD and Habitats Directive. REFRESH will advance our fundamental and applied science in 5 key areas: i) understanding how the functioning of freshwater ecosystems is affected by climate change; ii) new indicators of functional response and tools for assessing vulnerability; iii) modelling ecological processes; iv) integrated modelling; and v) adaptive management.

## **009949- ROSEORCHIDEE**

The Response of Evapotranspiration and Streamflow to Global Land Cover Transformation: Numerical Experiments with ORCHIDEE Land Surface Model

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 1/1/2005 - 6/30/2006

*EC contribution:* € 117 814

*Policy drivers:* Water Scarcity and Droughts

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### **Abstract**

More than one billion people are forced to drink water from sources contaminated with human waste, devastating floods have resulted in loss of lives, untold material and economic damage, and blistering droughts have resulted in the shortage of available drinking water and rising food insecurity. Our proposed work investigates how this global water crisis is affected by human-caused land cover change. We propose to examine the impact of the present extent of land cover change on the water cycle, in particular on evapotranspiration and streamflow, through numerical experiments with the ORCHIDEE land surface model. We will characterise land cover change by assembling and modifying existing global-scale maps of land cover change, producing a map of potential land cover, the land cover expected in the present climate had no human intervention occurred ("potential"), and a map of the present extent of human transformed land ("actual"). To see how the land cover change impacts the water cycle, we will input the maps into ROSEORCHIDEE and run 50-year "potential" and "actual" simulations of the land surface and energy fluxes, forced by a 50-year atmospheric forcing data set. We will check the reliability of the results by comparing simulated streamflow with selected observed streamflow records. We will examine differences in the two simulations and will produce a global-scale map which will highlight "hotspots", locations with the greatest change in streamflow and evapotranspiration, caused by the land cover change. The "hotspots" will be examined for their hydrologic sensitivity, for example, whether they are located in arid regions, or if the rivers have existing water shortage or flooding problems. In this way, the results of the study will provide information to scientists governments and international organizations to aid the identification of the areas in the globe that are undergoing a water crisis that may be caused or exacerbated by land cover

## **282911- SAPH PANI**

Enhancement of natural water systems and treatment methods for safe and sustainable water supply in India

[www.saphpani.eu/](http://www.saphpani.eu/)

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*Funding scheme:* CP (Collaborative Project), FP7

*Project duration:* 10/1/2011 - 9/30/2014

*EC contribution:* € 3 499 620

*Policy drivers:* Water Scarcity and Droughts  
Socio-economy

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### **Abstract**

Saph Pani addresses the improvement of natural water treatment systems such as river bank filtration (RBF), managed aquifer recharge (MAR) and wetlands in India building on a combination of local and international expertise. The project aims at enhancing water resources and water supply particularly in water stressed urban and peri-urban areas in different parts of the sub-continent. The objective is to strengthen the scientific understanding of the performance-determining processes occurring in the root, soil and aquifer zones of the relevant processes considering the removal and fate of important water quality parameters such as pathogenic microorganisms and respective indicators, organic substances and metals.

Moreover the hydrologic characteristics (infiltration and storage capacity) and the eco-system function will be investigated along with the integral importance in the local or regional water resources management concept (e.g. by providing underground buffering of seasonal variations in supply and demand). The socio-economic value of the enhanced utilisation of the attenuation and storage capacity will be evaluated taking into account long-term sustainability issues and a comprehensive risk management.

The project focuses on a set of case study areas in India covering various regional, climatic, and hydrogeological conditions as well as different treatment technologies. The site investigations will include hydrological and geochemical characterisation and, depending on the degree of site development, water quality monitoring or pre-feasibility studies for new treatment schemes. Besides the actual natural treatment component the investigation may encompass also appropriate pre- and post treatment steps to potabilise the water or avoid clogging of the sub-surface structures. The experimental and conceptual studies will be complemented by modelling activities which help to support the transferability of results.

## **031650- SODISWATER**

Solar disinfection as an appropriate Household Water Treatment and Storage (HWTS) intervention against childhood diarrhoeal disease in developing countries or emergency situations

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*Funding scheme:* STP (Specific Targeted Research Project), FP6

*Project duration:* 9/1/2006 - 2/28/2010

*EC contribution:* € 1 900 000

*Policy drivers:* Water Scarcity and Droughts

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### **Abstract**

In Sub-Saharan Africa 769000 children (~ 2 Asian Tsunami) under 5 years of age, died annually from diarrhoeal diseases in 2000-2003. Solar Disinfection (SODIS) is a technique for making contaminated drinking water safe where transparent bottles are filled with contaminated water and placed in direct sunlight for 6 hours. SODIS reduces fecal contamination levels from 1 million bacteria per ml to zero in < 1.5 hours and is completely effective against the pathogens responsible for cholera, dysentery, typhoid, salmonella, gastroenteritis, cryptosporidiosis, giardiasis and polio. The only clinical trial to-date showed that children under 5 years using SODIS were 7-times less likely to contract cholera than children who had not.

The WHO approved SODIS in Jan 2005 after the Asian Tsunami however many relief organisations are reluctant to use the technique. They see a need for further Health Impact Assessments other regions before promoting the technique. The only stake-holders interested in solving this problem are those that face it on a daily basis. These are key-partners in SODISWATER. The aim of SODISWATER is to prove that SODIS of drinking water is an effective intervention against a range of waterborne diarrhoeal diseases at household level and as emergency relief in the aftermath of natural or man-made disasters. Research outcomes will be disseminated to the end users (local communities and relief agency coordinators) through the WHO Household Water Treatment & Storage Network and local NGOs.

Other intervention technologies require funds beyond the finances of the communities that need them most. SODIS is a sustainable zero-cost technology requiring only plastic bottles and sunlight. The Development Assistance Committee of the OECD has identified provision of safe water as one of the key policy areas for 'Pro-Poor Health'. The SODISWATER project will help the EU meet its commitments under the Millennium Development Goals and the EU Water Initiative.

## **245427- SWAM**

Increasing the regional competitiveness and economic growth through the R&TD&I on sustainable water management

[www.swam-project.eu/](http://www.swam-project.eu/)

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*Funding scheme:* CSA (Coordination - or networking - action), FP7

*Project duration:* 3/1/2010 - 6/30/2012

*EC contribution:* € 1 310 100

*Policy drivers:* Water Scarcity and Droughts

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### **Abstract**

The availability of water resources is a key contributory factor to economic and social development, as well as being an essential pillar of environmental preservation. The most of the Mediterranean regions, with a semi-arid climate, has historically suffered from water scarcity. This has led in many cases to a strong culture in the efficient use of water and development of innovative policies and techniques relating to sustainable water management. Within this context, some Mediterranean regions have developed effective research-driven clusters focused on sustainable and efficient management of water, and dedicate considerable resources to research, technical development and innovation (R&TD&I) activities in this field. The SWAM Project is proposed to supply preconditions for further economic growth and global competitiveness of Murcia, Eastern-Galilee and Western Greece regions having high potential in the Water Technologies (Water-Tech) sector. The Project will develop an Action Plan (JAP) with the collaboration of these three regions, through mutual understanding of the respective research systems, coordinating their science policies as well as sharing the best practices and experiences in order to draw a pathway regarding: - Integration of synergies among these clusters, strengthening their internal capabilities and joining efforts in water technologies R&TD&I in order to develop world-wide this leading market. - Overcoming the current financial crisis as much as possible, by mobilizing other financial possibilities afforded by national/regional authorities, the private sector and by Community programmes. The project offers a cross-cutting effect over the participants' regional economies, since water technologies are applied to all economic and productive sectors. There is also an innovative approach behind the idea which supports these clusters: to increase the regional economy growth and competitiveness matched with environmental preservation.

## **256555- URBEN**

Linking urban design and health issues: an interdisciplinary approach

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*Funding scheme:* MC (Marie Curie actions), FP7

*Project duration:* 5/2/2011 - 5/1/2015

*EC contribution:* € 100 000

*Policy drivers:* Water Scarcity and Droughts  
Socio-economy  
Science-policy Interface

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### **Abstract**

Darchen in Tibet is a small town situated at the foot of the holy mountain Kailas, which lies near the source of five of Asia's most significant rivers. The town has been expanding steadily over the last decade through the growing influx of pilgrims and tourists, which is expected to increase exponentially in the next few years. Concomitant economic growth is causing significant lifestyle changes for the population of Darchen. However, the town, situated in a semi-arid region, is already facing serious environmental issues due to a lack of water and sanitation infrastructure. Problems include inadequate supply of drinking water, water pollution, lack of waste water and solid waste management, rubbish dumping, etc. Further, the inhabitants of the town face a number of health issues, which may be partially related to inadequacy and pollution of drinking water. The aim of this study is to analyze the relation between water management and health issues, and to identify urban design solutions which may be appropriate to tackling the water management problem. The premise is that an analysis of health issues may visualize to policy and decision makers the advantages of urban infrastructure investment enabling adequate and clean drinking water supply in Darchen. Further, the research can serve to inform Eco-town models for the future development of other towns in the same region.

## **265972- WATERBIOTECH**

Biotechnology for Africa's sustainable water supply

[www.waterbiotech.eu/](http://www.waterbiotech.eu/)

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*Funding scheme:* CSA (Coordination - or networking - action), FP7

*Project duration:* 8/1/2011 - 1/31/2014

*EC contribution:* € 999 533

*Policy drivers:* Water Scarcity and Droughts  
Socio-economy

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### **Abstract**

More than water scarcity, diseases and civil wars, Africa is also the least wealthy continent, in terms of economic and financial resources. These combined and tightly linked problems have led to a restricted range of choices, affordable for African countries, to deal particularly with the water issue, as a major topic.

Polluted water treatment before use has been their almost unique solution to deal with a growing water scarcity. The treatment of water and elimination of pollutants, mainly pathogenic organisms, xenobiotics and heavy metals, although itself presents significant challenges, is crucial for human health and environmental considerations. However, most regions in developing countries cannot afford the costs of advanced and specialized systems.

Numerous water cleaning methods are based in natural, plants or micro-organisms, biochemical processes. Biotechnology is a useful tool that is delivering improved products and process for environmental sustainability, and promises a range of benefits to manage the industrial WW economically and effectively around the world. Some biotechnological techniques are quite sophisticated but others are simple, cost effective and adapted to local conditions and resources of developing countries.

These natural biological treatment systems include lagooning, land treatment, phytodepuration, or constructed wetlands systems. They can be applied as secondary or tertiary purification treatment, allowing the removal of pathogenic microorganisms and the degradation of the organic pollutants, so that waste water can be recycled for irrigation and domestic use and hence reduce the pressure on the hydric resources. Other biotechnological techniques to be taken into account within this proposal are biofiltration, membrane bioreactors and algae and other aquatic crops' application for wastewater purification.

## **211837- XEROCHORE**

An Exercise to Assess Research Needs and Policy Choices in Areas of Drought

[www.feem-project.net/xerochore/](http://www.feem-project.net/xerochore/)

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*Funding scheme:* CSA (Coordination - or networking - action), FP7

*Project duration:* 5/1/2008 - 4/30/2010

*EC contribution:* € 1 500 889

*Policy drivers:* Water Scarcity and Droughts

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### **Abstract**

In recent years large parts of Europe suffered from extreme drought, a phenomenon that likely will become more frequent and more severe, as predicted by the climate models. This will lead to significant socio-economic and environmental impacts and associated damages. There is therefore an urgent need to develop a roadmap toward a European Drought Policy, in accordance with the EU-Water Framework Directive (WFD) and related EU Legislation and Actions. The aim is to mitigate and to adapt to droughts, and hence reduce the risks they pose in Europe. XEROCHORE SA compiles a roadmap that comprises of: 1) a state-of-the-art review and identification of the research gaps in the natural system, in impact assessment, in policy-making and in integrated water resources management, and 2) an assessment of the possible impacts of droughts and guidance on appropriate responses for stakeholders. An extended network of experts will gather inputs for the roadmap through focussed workshops, round table discussions, which integrate the various aspects, and a concluding conference. A Core Group will guide and facilitate the discussion and synthesis process, and eventually write the integrated roadmap. The project network consists of over 80 organizations including research institutes, universities, ministries, water management organizations, stakeholders, consultants, international organizations and programmes. It includes key members of the European Drought Centre and the WFD-CIS Working Group on Water Scarcity and Drought and representatives from overseas and neighbourhood countries, in particular around the Mediterranean Basin. The large number of organizations covering different aspects and geographic regions guarantee that all drought aspects will be covered. The drought network will be embedded in the already-existing European Drought Centre to reach the wider scientific and to provide research advice and policy support to the EC beyond the lifetime of this action.

## **041762- XYLODIMENS**

Regulating plant quality by controlling xylem vessel dimensions during xylogenesis (XyloDimens).

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*Funding scheme:* MCA (Marie Curie actions), FP6

*Project duration:* 2/18/2007 - 11/17/2008

*EC contribution:* € 187 557

*Policy drivers:* Water Scarcity and Droughts

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### **Abstract**

Many quality aspects of plants and plant products directly or indirectly depend on integrated import of assimilates and water during growth. Besides dry matter production and partitioning within a plant, plant-water relationships strongly influence growth, plant form and various quality aspects of plant products. Plant water relations are strongly influenced by the hydraulic properties of the vascular xylem, which are directly related to the dimensions of xylem vessels. Crucial quality aspects, such as for instance the ability of cut flowers to recover from embolisms in the vascular system at the start of their post-harvest vase-life are directly linked to the properties of xylem vessels. Dimensions of xylem vessels may differ with genetic background and are influenced by environmental conditions during growth. Xylem dimensions are therefore important for production and quality control. However, vascular patterns are robust once they are formed. Therefore actual control of xylem properties should take place during vessel formation (xylogenesis). Control (or manipulation) of xylem vessel dimensions by environmental factors during growth could be a way to improve quality of e.g tomatoes or flowers. The final step in formation of tracheary elements (TEs) formation is programmed cell death (PCD, which can be regarded as a decision point determining vessel dimensions. PCD is an active process in which a cell suicide pathway is activated resulting in controlled disassembly of the cell. Most studies on cell death during xylogenesis have been done in *Zinnia elegans*. Cell death in *Zinnia* is precisely timed. At a specific time during formation of the secondary wall, the large central vacuole ruptures releasing a blend of hydrolytic enzymes into the cytoplasm. We will investigate the mechanism of PCD during xylogenesis and we will study the effects of manipulation of the timing of cell death on the dimensions of TEs in vitro and xylem vessels in vivo.





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As an essential resource for life, sustainable growth and healthy ecosystems, water has been high on the European research agenda since the early years of the EU Framework Programmes for Research and Technological Development (FPs). Coping with unbalances between water demand and availability, while developing a resource-efficient economy and sustaining the essential functions of our natural ecosystems, requires a vast multidisciplinary expertise and collaborative efforts in research, technological development and innovation.

This publication provides you with a snapshot of a significant part of water-related research projects funded under FP6 and FP7 (2002-2011). The projects are presented according the following main policy-relevant topics: climate change, ecological status, floods, groundwater, hydro-morphology, science-policy interface, socio-economy, water and agriculture, water scarcity and droughts.

## Project information

