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Executive Summary of the Impact Assessment

Accompanying the document

**Proposal for a
COUNCIL REGULATION**

on the Bio-Based Industries Joint Undertaking

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1. PURPOSE AND PROCEDURES OF THE IMPACT ASSESSMENT

This document assesses different policy options for implementing the research and innovation (R&I) programme for bio-based industries under Horizon 2020, the Framework Programme for R&I for the period 2014-2020. Given the challenges these industries are facing, establishing a Public Private Partnership (PPP) on Bio-based Industries was suggested in the European Bioeconomy Strategy and the new Industrial Policy. It is supported by a wide range of other policies.

In preparation of this Impact Assessment (IA), the Commission consulted a wide range of stakeholder groups representing industry, research communities, Member States, Regions and the general public. This was done through events, consultation and the review of relevant publications. A public consultation on the proposed PPP took place from 21 September to 14 December 2012. Almost 87% agreed with the statement that a PPP offers the most effective mechanism to implement Horizon 2020 in the area of bio-based industries.

This IA was prepared by DG RTD with the support of DGs AGRI, BUDG, COMP, CNECT, EMPL, ENER, ENTR, ENV, ESTAT, HR, JRC, MARKT, MOVE, SANCO, SG and the Legal Service. There were also bilateral discussions with DG REGIO. A group of external reviewers assisted the Commission with the data collection and analysis for the IA.

2. PROBLEM DEFINITION

2.1. Bio-based industries as source of green growth for Europe

The European economy heavily relies on petrol and other fossil resources for energy and products. Reducing this dependence is paramount given the depletion of fossil resources and their impact on climate change. It is critical that the EU meets its climate change targets for 2020 and moves towards a competitive low carbon economy in 2050.

Transport, households and industry are the three largest users of fossil resources. Bio-based industries can contribute to changing this by partially substituting fossil resources with renewable ones to produce bio-based products and biofuels. By using industrial biotechnology they can also make production processes more resource efficient and environmentally friendly.

Bio-based industries are a cornerstone of the bioeconomy in generating growth and jobs. Although they currently only represent about 3% of the €2 trillion in annual turnover and 1% of the 22 million jobs generated by the European bioeconomy today, bio-based

industries are expected to grow more rapidly and substantially than more traditional bioeconomy sectors. Europe has the right technology and industry base to exploit this potential.

Box 1: Bio-based industries, food security and ILUC

Bio-based industries process sustainably produced renewable biological resources (e.g. agricultural and forestry residues, bio-waste) into high value-added bio-based products (e.g. chemicals, pharmaceuticals, cosmetics) or biofuels. Production usually takes place in biorefineries and often relies on bio-based processes, which use industrial biotechnology.

The increasing use of renewable biological resources for industrial and energy purposes has raised concerns about the sustainable management of Europe's limited natural resources, indirect land use change (ILUC) and food security. Unlike the on-going promotion of "conventional" feedstock (food crops) elsewhere in the world, Europe is gradually shifting the feedstock base to non-edible biomass between now and 2020. These are converted in so-called "advanced" biorefineries and part of an approach based on life cycle analyses.

Biorefineries have to be close to their sources of biomass to be sustainable and economically viable. Setting up supply chains for biomass and networks of local and regional biorefineries will thus create new jobs and sources of revenue for rural communities.

In view of growing global competition, further investments in research, demonstration and deployment of bio-based industries are needed to further strengthen Europe's competitive position. The EU's shift to "advanced" biorefineries gives other nations the first-mover advantage, since they can build critical mass in "conventional" biorefineries. The EU will therefore need to leapfrog its competitors.

2.2. Technological and innovation challenges of bio-based industries in Europe

Four main technological and innovation challenges curb the potential of bio-based industries in Europe, which should ideally be addressed in a value chain approach:

- **Accessing sufficient sustainable feedstock:** The climate change mitigation potential of bio-based industries is based on the assumption that production infrastructure will be developed in the EU and that a substantial share of the biomass can be locally sourced. New solutions are needed to sustainably increase available biomass (e.g. by using residues, waste). Reliable and cost-competitive supply chains will also need to be developed.
- **Developing efficient conversion processes for advanced biorefineries:** The conversion of non-edible biomass in "advanced" biorefineries is more difficult than for food crops in "conventional" biorefineries, due to its heterogeneous quality and composition. New efficient and cost-competitive processes must be developed. Smart use of biomass, e.g. cascading production approaches, re-using or recycling products, needs to be improved.
- **Demonstrating and deploying advanced biorefineries:** To compete with well-established (petro-)chemical industries, bio-based industries need to bundle innovation efforts and accelerate biorefinery development by promoting rapid

up-scaling. This requires several technological breakthroughs and cross-sectorial industrial synergies.

- **Supporting demand-side actions for the uptake of bio-based products:** R&I can support the uptake of bio-based products in consumer markets and green procurement, e.g. by developing standards, labels and life cycle assessments. Several demand-side actions are also supported by recent bioeconomy-related policy initiatives.

2.3. Underlying problem drivers and need for public intervention

Several market failures are causing lack of investment in R&I for bio-based industries:

- **High risk and cost of demonstration and deployment:** The EU's focus on "advanced" biorefineries makes it difficult for stakeholders to build critical mass and first-mover advantage based on "conventional" biorefineries. The high costs for demonstration and deployment activities make it hard for a single industry or company to manage this risk independently.
- **Knowledge spill-overs:** Many of the innovations required for developing bio-based industries will be difficult to protect and exploit. As a consequence, the private sector will allocate fewer resources to this type of R&I activities.
- **Nascent and fragmented industrial sector:** Mobilising the necessary R&I resources is difficult for a nascent and fragmented industrial sector, such as bio-based industries. Many industrial sectors are involved in bio-based industries, but there are hardly any big players with large and fully dedicated R&I budget.
- **Transaction cost:** Working together in complex multi-party R&I collaboration models implies many research interfaces and high transactions costs for the companies involved. Many have not worked together closely in the past or have no tradition of conducting in-house R&I.
- **Policy framework:** Bio-based industries are subject to a wide range of policies at EU, national and regional level, leading to a complex and sometimes fragmented policy environment. Many of these policies are favourable to bio-based industries, yet there are no firm targets or incentives.
- **Uncertainty around resource availability:** Lack of reliable data on the availability of and demand for sustainable biomass in Europe for industrial and energy purposes is hampering solid forecasting of a realistic scope and scale for bio-based industries.

2.4. Need for EU intervention

Member States and Regions have supported R&I for bio-based industries with a wide range of bioeconomy initiatives. Cross-border collaborations have been explored, but not to a sufficient extent to attain the critical mass needed to attract more private investment, promote R&I along whole value chains, avoid fragmentation and duplication, or improve coordination.

Horizon 2020 is the ideal framework for enhanced EU level action in support of bio-based industries. It can facilitate the cross-border, cross-sector, interdisciplinary R&I required to establish the value chains for bio-based industries.

A strong EU level push will be critical to securing long-term investments, mitigating risks and reaching critical mass needed to bring the right partners to the table and resolve

the technological and innovation problems bio-based industries face, particularly in the areas of demonstration and deployment. Over 100 relevant projects have been funded through Collaborative Research under the EU Seventh Framework Programme for Research and Technological Development (FP7), including a few large and integrated biorefinery projects with a value chain approach. However, the impact of these projects could have been even better if they had been part of an integrated long-term strategy for bio-based industries and if more support had been given to demonstration and deployment.

A PPP at EU level could provide the strategic framework and critical mass needed to overcome the limitations bio-based industries currently face. PPPs have been used successfully to leverage private investment under FP7.

The fact that not only a group of companies but also several regional initiatives and clusters have come together in the light of a possible new EU initiative demonstrates that many actors "in the field" endorse the need for decisive EU action. The relevance and timeliness of such an initiative is also supported by the strong response to the Public Consultation on a Bio-based PPP. It received 638 replies, and the fact that 94.3% (strongly) agreed with the need for EU intervention.

3. OBJECTIVES

Bio-based industries can significantly contribute to achieving smart, sustainable and inclusive growth in Europe by 2020 and making the transition towards a low-carbon economy by 2050. In particular, the broader use of biorefineries can reduce the dependence of the European economy on fossil resources and contribute to the EU's climate change and energy targets.

The strong growth potential of bio-based industries could lead to significant economic growth and job creation by 2020 and beyond, if Europe succeeds in maintaining and enhancing its competitiveness in this area. Based on the potential impact bio-based industries could have for Europe in environmental, economic and social terms, the objectives are to:

- Contribute to a more resource efficient and sustainable low-carbon economy and to increasing economic growth and employment, particularly in rural areas, by developing sustainable and competitive bio-based industries in Europe based on advanced biorefineries that source their biomass sustainably, and in particular to:
- Demonstrate technologies that enable new chemical building blocks, new materials, and new consumer products from European biomass and which replace the need for fossil based inputs;
- Develop business models that integrate economic actors along the whole value chain from supply of biomass to biorefinery plants to consumers of bio-based materials, chemicals and fuels, including through creating new cross-sector interconnections and supporting cross-industry clusters; and
- Set up flagship biorefinery plants that deploy the technologies and business models for bio-based materials, chemicals and fuels and demonstrate cost and performance improvements to levels that are competitive with fossil based alternatives.

4. POLICY OPTIONS

This IA discusses three policy options for organising R&I on bio-based industries under Horizon 2020. The option "no EU action" has not been included in the IA, because the Horizon 2020 proposal already envisages relevant activities under the pillars "Societal Challenges" and "Leadership in Enabling and Industrial Technologies". The policy options are:

The "**Business as Usual**" (**BAU**) option is based on standard Horizon 2020 instruments only. This implies continuing the Collaborative Research model applicable under FP7, integrating Horizon 2020 improvements (e.g. more emphasis on demonstration).

The "**Contractual PPP**" (**c-PPP**) option is based on a contractual agreement between the European Commission and industry and does not involve a dedicated Community body. It gives a strong advisory role to the private partners. Standard Horizon 2020 rules apply. The c-PPP does not allow for a large-scale multi-annual cash contribution from the EU, nor does it permit the setting of a long-term strategic agenda.

The "**Institutional PPP**" (**i-PPP**) option involves creating a Joint Technology Initiative (JTI), as foreseen under Horizon 2020 when justified by the scope of the objectives pursued and the scale of the resources required. The JTI has a dedicated structure with a governance system of its own and provides greater scope for industry to make financial contributions. It allows for a long term EU and industrial budget commitment and the definition of a long-term strategic innovation and research agenda (SIRA). It is the only option including a legally binding commitment on industry. A newly created JTI would take on board lessons learnt from the JTIs operating under FP7.

5. ANALYSING THE IMPACTS OF THE POLICY OPTIONS

5.1. Assessment criteria and comparative impact analysis

A comparison of the impact of policy options was carried out on the basis of a number of criteria defined in line with those set for PPPs under Horizon 2020. They are based on the assumption that € 1 000 million will be allocated to R&I activities for bio-based industries under Horizon 2020.

The results of the comparative impact analysis and rating per criterion are summarised in the table below:

Criteria		BAU	c-PPP	i-PPP
Input parameters	Critical mass of resources and leverage effect on R&I	=	+	++
	Critical mass of participants and overcoming fragmentation	=	+	++
	Innovation impacts	=	+	++
	Efficiency of governance structure	=	=	+
	Coherence with Member State and regional programmes	=	=	+
Output parameters	Environmental impact	=	+	++
	Economic impact	=	+	++
	Social impact	=	+	++
	Addressing the technological and innovation challenges	=	+	++

5.2. Preferred option

As illustrated in the above table, i-PPP offers clear benefits over c-PPP on all criteria, which in turn has a certain advantage over BAU.

i-PPP's strong position is based on its capacity to mobilise greater project resources due to the significant contribution by industry. It would provide a stable framework with long-term guarantees that is essential to mitigate risk and incite industry commitments, not only in terms of R&I resources but also for investments in expensive demonstration activities and infrastructure. The conditions offered by i-PPP have motivated industry to match the EU contribution of € 1 000 million for R&I activities and to leverage an additional indicative €1 800 million for demonstration and flagship biorefinery plants.

i-PPP incites much higher industry participation rates than BAU or c-PPP. Its structure would help overcome fragmentation by facilitating cross-sectorial and pan-European linkages along whole value chains, which will particularly benefit SMEs. Such linkages are required to successfully implement new technologies and resolve innovation problems. The scope for taking technologies to high technology readiness levels is clearly greater under i-PPP than under the other two options due to strong industry commitment. i-PPP thus contributes much more effectively to bridging the innovation gap than BAU or c-PPP.

i-PPP also offers a moderate advantage in terms of efficiency of the governance structure. It will also have a positive influence on coherence with Member State and regional programmes by involving them in its Advisory Committee and consulting them on deployment.

Altogether, the advantages of i-PPP on the above-mentioned criteria give it a strong advantage in terms of addressing the technological and innovation challenges bio-based industries face and will result in a larger expected scale of technology deployment and shorter time to market. Since the positive environmental, economic and social impacts of bio-based industries strongly depend on their deployment, i-PPP will most significantly contribute to achieving the Europe 2020 objectives of smart, sustainable and inclusive growth. Impacts include the development of new cost-effective and efficient value chains that transform sustainably sourced biomass into value added bio-based products and biofuels through resource efficient and environmental processes, generating benefits for all involved market players and consumers.

6. MONITORING AND EVALUATION

Progress and efficiency of the JTI under i-PPP will be closely monitored, based on three levels of Key Performance Indicators (KPIs) for measuring the progress of implementing the objectives outlined under Section 3 at different points in time, as well as KPIs relating to effectiveness, efficiency and Horizon 2020.

Good governance of the JTI will be monitored with regard to: openness and transparency of procedures, avoidance of conflicts of interest, and financial auditing. The results of the internal monitoring will be published in an annual activity report.

The nature and the level of the industry contribution will be monitored by the Commission on an annual basis, in order to ensure that the R&I budget receives the necessary support both from the public and private partners. If required, corrective measures will be applied. A mid-term and an end-of-term evaluation (as customary with JTIs) will take

place as well as two additional evaluations respectively 3 and 6 years after the completion the JTI term.

Monitoring is likely to be supported by the activities of the Bioeconomy Observatory that is currently being set up in the framework of the European Bioeconomy Strategy.