

Scoping paper

Biotechnology IPCEI with focus on bio-based materials

1. DESCRIPTION OF THE INITIATIVE AND SCOPE

The European Union is committed to advancing the bioeconomy as a key component of its strategy for sustainable development, competitiveness and climate neutrality. This initiative enables utilization of sustainable sourced renewable biological raw materials in a feedstock agnostic manner.

The scope of this initiative includes the valorisation of biomass, bio-based waste and recycled raw materials and biogenic CO₂ into high value-added materials and chemicals as well as the integration of bio-based materials into various sectors, including construction materials, packaging, textiles, furniture, cosmetics, bioplastics, and new novel high value-added forest-based sector products. To achieve the earlier mentioned desired outcomes, it will be required to scale up research results from last decade and turn them into profitable business concepts. This will require investments for new breakthrough technologies, which shall include processing methods to secure cost competitiveness and overall sustainability and therefore can include unit operations not limited to biotechnology but including also chemical or mechanical modifications to feedstock to commercialize new bio-based materials. Investments shall not be limited to production processes of bio-based materials but can also be related to support recycling and overall circularity of bio-based or recycled materials. Biotechnology can bring significant valorisation benefits e.g. improve the functionality or recyclability of biomaterials.

Bio-based materials are materials derived from renewable biological sources, where value is generated through processing and refinement. For example, pulp can be transformed into textile fibres, adding significant economic and functional value. In the scope of this specific IPCEI candidate, projects shall be of major innovative nature compared to the state of the art in the sector concerned and/or scale-up pilot facilities bringing batch production to scale based on high innovation and research content as first industrial deployment to facilitate a subsequent mass production of bio-based material, which has significant value addition. These projects can also enable the relocation of manufacturing located outside of the EU and depending on oil-based feedstock to the EU while using more sustainable feedstock and also improving resilience in the EU (for example, bio-based textiles compared to PET textiles).

These materials have major implications for the **forest, textile, furniture, packaging, cosmetic, construction, automotive and chemical industries**, which must renew their business by expanding into new parts of the value chain and downstream industries. Increasing the value of bio-based materials allows these industries to enhance sustainability while improving resource efficiency, maximizing the output from raw materials, including waste and side streams. This can be in line with food security due to the ability to produce multiple products from the same biomass. The urgency of these investments is driven by lack of growth in businesses which are using bio-based raw materials

and possibilities to improve resilience in the EU thanks to using inherent properties of bio-based raw materials for new materials which can both substitute oil-based materials and also materials imported outside of EU.

A key benefit of this shift is increased **resilience in the EU**. Increasingly substituting conventional fossil-based materials with bio-based materials reduces reliance on fossil imports. The goal is to introduce more **sustainable alternatives** e.g. to textile, automotive, packaging, and construction value chains and support the commercialization of innovative products that can replace existing fossil-based materials or other unsustainable materials. Preparing the commercialization of new breakthrough technologies typically involves first industrial deployment projects, which can support to decrease the higher cost compared to existing technologies. This IPCEI candidate can also support integration of new bio-based materials further in value chains and hence improve possibilities to make profitable business and create alignment for regulation to support demand creation e.g. by using public procurement. This however most likely will require new type of processes which are not yet scaled up.

For avoidance of doubts, this IPCEI candidate aims for projects which are mainly utilizing bio-based (defined according to the European standard EN16575:2014) raw materials. Environmental impacts of proposed investment projects should be assessed by using a holistic approach including elements which are typically considered as a part of SSbD assessment but limited to the extend which is regarded feasible. This secures:

- steering the innovation process towards the green and sustainable industrial transition
- substitute or minimise the production and use of substances of concern, in line with, and beyond existing and upcoming regulatory obligations
- minimise the impact on health, climate and the environment during sourcing, production, use and end-of-life of chemicals, materials and products.

It would be also preferable that applicants has carried out lifecycle analysis to verify that innovation can be scaled up in sustainable manner compared to material, which it intends to substitute in future. Application should also elaborate how market engagement shall be created ensuring consumer awareness and trust.

The link between bio-based chemicals, bio-based materials and food and feed ingredients:

Bio-based resources are considered as scarce resource and therefore utilization of bio-based resources should be always done in a resource-efficient manner especially when considering new investments and be based on a local availability assessment that take in account sustainable management practices and a decent income for biomass producers. Outcomes from biotechnology IPCEI candidate for bio-based chemicals provide building blocks for bio-based materials, carbon handprint improves, processing value for materials increases. Similarly, bio-based materials provide building blocks for the IPCEI candidate for key components for food and feed. Respecting cascade use of biomass, each fraction of biomass should be valorised to the form which provides highest value addition to the owners of bio-based raw materials in an industrial symbiosis logic, whereby one industrial process, apart from the core output provides side streams or by products which can become an input for another industrial process. As an example of new state of the art food biorefineries, industrial symbiosis facilities in their nature, are capable to fractionate bio-based raw material into three separate streams: cellulose, hemi-cellulose and lignin. Cellulose can be valorised to both biobased materials and to biobased chemicals. Hemi-cellulose can be valorised to biobased chemicals and lignin is typically valorised to material applications. Such a state-of-the-art

biorefineries can enable in future e.g. following biomass contains C6 sugars which can be valorised to bio-based chemicals, C5 sugars which can be converted by using biomass fermentation to food and feed ingredients, and lignin which thanks to thermal conversion to bio-based materials such as active carbon for air purification or hard carbon to be used in battery materials. There is growing recognition of the need to align bioenergy policies with the principle of the cascading use of biomass. The cascading use of biomass should serve as a guiding principle in proposed projects. Integrated biorefineries that co-produce food, feed, materials, and chemicals from shared inputs maximise resource efficiency and economic and environmental value. Such a principle aims to achieve the resource efficiency of biomass use by prioritising, wherever possible, the material use of biomass over its energy use, thus increasing the amount of biomass available within the system, in a sustainable way. Such an alignment is intended to ensure fair access to the biomass raw material market for the development of innovative, high value-added bio-based solutions and a sustainable circular bioeconomy.

Processing/industrial deployment of technologies stage is where the support would be most needed for all three sub groups: bio-based chemicals, bio-based materials and food and feed ingredients, offering an opening for possible various end products.

2. POLICY OBJECTIVES

The primary objectives of this policy are:

Enhancing Reindustrialization: Promote local feedstock and production to increase sovereignty and reduce dependence on fossil resources and critical raw materials to improve resiliency.

Fostering Innovation: As an example, encourage the development of innovative construction solutions using bio-based materials with excellent insulation, hydroscopic, and self-healing properties with a focus on industrial scale-up enabling technologies.

Circular Economy: Support the transformation of non-residual biological resources into higher value recyclable or reusable products and the efficient production of renewable biological resources.

Supporting Carbon Storage: Utilize bio-based materials as long-lasting biogenic carbon storage to reduce carbon footprint and support biodiversity

Ensuring sustainability of biomass systems: the prioritization of the material use of biomass over its energetic uses fosters the development of sustainable biomass-growing practices, to achieve longer-lasting and higher quality biomaterials.

The IPCEI candidate can contribute to the following EU strategies and policies:

- **“Competitiveness Compass”**, to regain competitiveness, secure sustainable prosperity and close the innovation gap

- **“Clean Industrial Deal”**, which aims to increase sustainable and resilient production in the EU while reducing carbon emissions through decarbonization and the move away from fossil-fuel based materials
- **"Open Strategic Autonomy"**, part of the EU’s approach to reducing dependency on external resources while maintaining global trade relationships.
- **Upcoming “Biotech Act”**, which will strengthen value chains from R&D to end-users, simplify regulatory and market pathway, and ensure legislative coherence.
- **Upcoming "EU Circular Economy Act"**, which will standardize end of waste criteria to transition waste into valuable secondary raw materials. Large-scale valorization technologies are essential for converting agro-industrial, forestry, and marine residues into high-value products. Strengthening this area will advance the circular bioeconomy, reduce dependence on fossil-based resources, and foster regional industrial capacity across Europe.
- **"EU Bioeconomy Strategy"**
 - Improve **resource efficiency**.
 - Leverage **bio-based materials to replace fossil-based ones and boost related industries**.
 - Reduce reliance on imported raw materials through a **new bioeconomy sectoral plan**
 - **prioritizing biomaterial manufacturing and usage** to retain them longer in the economy.

3. CONCLUSION OF SCOPING PHASE

Based on the above, which takes on board the consultation with stakeholders at EU level, the working group considers that a possible IPCEI candidate on biobased materials may be suitable.

It is therefore proposed to enter an in-depth phase analysis to confirm the suitability, desirability and feasibility of a possible IPCEI candidate on biobased materials.

DISCLAIMER

This scoping paper was drafted by the Working Group for **Biotechnology** of the Joint European Forum for Important Projects of Common European Interest (JEF-IPCEI). The objective of this document is to contribute to pre-screening of whether certain technologies, infrastructures, value chains or sectors could be suitable candidates for potential new IPCEIs. It should facilitate exchanges with representatives of industries and/or academia about potential IPCEIs in the pre-screened technology and/or infrastructure areas. This exchange does not prejudice whether an IPCEI will subsequently be pursued. It does not indicate a commitment, or approval by the participating Member States or by the European Commission on certain technologies, infrastructures or value chains, or an available budget and it does not bind any participant in this exchange.

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