POLICY BRIEF

ENHANCING PROPER ACCOUNTING AND IMPROVEMENT OF LIFE CYCLE SUSTAINABILITY PERFORMANCE OF BIO-BASED INDUSTRIES IN EUROPE.

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IMPROVING BIO-BASED INDUSTRIES LIFE CYCLE SUSTAINABILITY

CONTEXT

In the context of today's global challenges, the concept of sustainable development has become imperative. The transition towards an environmentally, economically, and socially sustainable economy is not merely an option but a necessity. This transition entails reimagining renewable and circular economic systems, promoting inclusive and equitable growth, and implementing policies that safeguard our planet's ecological balance. In this policy brief, we explore the pivotal steps and policy recommendations that can improve the correct assessment of life cycle sustainability performance of bio-based industries in Europe. In its commitment to sustainability and innovation, Europe is making substantial investments in research and development through Horizon Europe. This flagship program is set to bolster the continent's leadership in addressing global challenges. By providing substantial funding for cutting-edge research initiatives, Horizon Europe catalyses innovation and fosters groundbreaking solutions to pressing environmental and societal issues, including initiatives to substitute fossil-based resources by bio-based alternatives.

Relevant legislation

Europe, driven by its ambitious Green Deal initiative, stands at the forefront of global efforts to combat the urgent challenge of sustainability. Central to this initiative is an unwavering commitment to assess and mitigate the environmental impacts across the entire life cycle of products and services. The Green Deal enhances sustainable production and consumption, emphasizing the imperative of reducing resource depletion, waste, and greenhouse gas emissions while fostering circular economy practices. Within the comprehensive framework the Green Deal, a range of pivotal policies and initiatives have been established, which include:
Key Policies:

- Circular economy action plan (European Commission, 2020a): Promoting circularity to minimize waste and resource consumption.
- EU Action Plan: 'Towards Zero Pollution for Air, Water and Soil' (European Commission, 2021): Striving to create cleaner air, water, and soil ecosystems.
- Biodiversity Strategy for 2030 (European Commission, 2020c): Committing to biodiversity conservation and restoration.
- 2030 Climate Target Plan (European Commission, 2020d): Setting ambitious climate targets for the coming decade.
- Taxonomy Regulation (European Commission, 2020b): Defining criteria for environmentally sustainable economic activities.
- EU Corporate Sustainability Directive (European Commission, 2022a): Mandating corporate sustainability reporting.
- Sustainable Product Initiative (European Commission, 2022b): Promoting greener and more durable products.
- EU Green Claims Directive proposal (European Commission, 2023b): Regulating environmental claims made by businesses.
- Ecodesign for Sustainable Products Regulation (ESPR) (European Commission, 2022c): Enhancing product energy and resource efficiency.
- Official Recommendation to Measure Environmental Footprint of Products and Organizations (PEF Guide) (Zampori & Pant, 2019): Providing guidance for environmental assessment.
- Renovation Wave (European Commission, 2023c): Aiming to improve energy efficiency, boost the economy and deliver better living-standards for Europeans.
- EU policy roadmap towards climate neutral building and construction (European Commission, 2023a).

In the framework of these policies, exceptional initiatives have been implemented to contribute to different sustainability-related goals.

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This document, prepared by the consortium of Calimero, is inspired by those initiatives related to construction, textiles, chemicals, construction and woodworking bio-based industries and life cycle sustainability assessment.

Relevant Initiatives:

• Horizon Europe (European Commission, 2023d): Funding for research and innovation projects.
• Circular Bio-based Europe: Joint Undertaking (CBE, 2023): partnership between the European Union and the Bio-based Industries Consortium (BIC) that funds projects advancing competitive circular bio-based industries under Horizon Europe
• Safe and Sustainable by Design (SSbD Framework) (Caldeira et al., 2022): Promoting safer and sustainable chemicals design and production.

These policies and initiatives collectively demonstrate Europe's commitment to not only combat environmental challenges but also lead the way in sustainable practices on a global scale.

Policy challenges

While the aforementioned policies and initiatives address various sustainability challenges, some obstacles are associated with these and future policies to ensure the measurements produce the expected impact.
The main policy challenge addressed in this document is the following:
• The lack of scientifically sound, harmonized, holistic, robust and applicable Life Cycle Sustainability Assessment (LCSA) methodologies to evaluate and compare the sustainability performance of innovative bio-based systems with their alternatives. Moreover, most of innovations related to bio-economy are researched and developed with European funding in European R&D schemes.

In consequence, policies based on results of these projects may incentive or penalize initiatives with an incorrect understanding of the sustainability performance or trade-offs.

Goal of this policy brief

The policy recommendations addressed in this document are formulated with the goal of supporting the following objective:

• Developing harmonized, holistic, complete, robust and applicable LCSA methodology (including socio-economic indicators) to conduct lifecycle environmental or sustainability assessments of innovative bio-based products or industrial processes under development in R&D projects and allow comparison of the results with current alternatives.

Policy recommendations

To achieve the previous goal, the following recommendations are suggested to be considered in future European policies and initiatives:
• Support the development of a “PSF” (Product Sustainability Footprint), following the approach of a LCSA, which covers also social (Social-LCA) and economic (life cycle costing) dimensions, alongside LCA.
•Define non mandatory LCSA methodology for R&D projects developing bio-based products to evaluate their performance and compare them to current alternatives based on PEF guide: “R&D Sustainability Footprint (R&D-SF) guide”. However, few developments and specifications are required to adapt PEF to the needs of bio-based systems. The ones with higher priority are listed below.
• Support development of prospective LCA methodologies
• Inclusion of more impact assessment methods or characteristics in the evaluation of sustainability issues in innovative bio-based initiatives, including:

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1. Impact assessment methods:

- EF current impact categories
- Climate change with temporal consideration
- Biodiversity
- Ecosystem services
- Criticality
- Occupational health and safety in industry (workers)
- Job Creation potential (as 1 of 5 objectives from Bioeconomy Strategy)

2. Characteristics to be included

- Circularity
- Trade-offs
- Competition of land and biomass

3. Adaptation of hotspot analysis in the interpretation of LCA and LCSA results in the framework of R&D projects focused on bio-based technological/process developments:

- Most relevant impact categories
- Most relevant life cycle stages (include production stage always)

4. Most relevant unit processes (always include specific technology under development)

- Most relevant processes/activities of categories
- Most relevant processes of unitary process /technology under development
- Most relevant elementary flows (following PEF instructions)

5. Most relevant elementary flows of unitary process / technology under development

In projects where the innovation is not in the production process but in the product design or value chain, usual hotspot analysis should be used in the interpretation phase.

- Guidelines to introduce littering impacts (biodegradability, toxicity) for specific products with higher probability to be littered. In consequence, an extensive list of products with higher littering rates should be developed,
- Address challenges with PEF, in particular circular footprint formula, and align with other standards
- Initiate establishment of a parallel consequential EU LC(S)A approach to cover more adequately consumer & policy interest in environmental consequences of product-related choices (e.g. purchase)
- "Rights for the future generations" principle
- Allow fair comparison of lifecycle sustainability performance of bio-based products, manufacturing processes and technologies under development in Horizon Europe funded projects with current alternatives. This comparison currently presents high levels of complexity due to the use of different methodologies and guides. In addition, the use of PEF guide does not include specifications on how to assess low-TRL products and processes, socio-economic indicators or key impact categories to be evaluated in the comparison of fossil and bio-based products.
- The inclusion of the time dimension when evaluating life cycle environmental impacts, in particular when evaluating the carbon footprint. This may lead to incorrect climate targets and values for performance indicators at long term.

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