Supporting Regional Policies and Environmental Sustainability Assessment for Bio-based Sectors to Improve Innovation, Industries, and Inclusivity in Southern Europe: The BioINSouth Project

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1. Introduction

The BioINSouth project aims to support regional policymakers in integrating ecological limits into bioeconomy strategies and roadmaps for circular bio-based activities. By developing guidelines and digital tools within the safe and sustainable by design (SSbD) assessment framework, the project fosters innovative methodologies for assessing environmental impacts across various industrial bio-based systems. This initiative will enhance regional competitiveness, innovation capacity, and contribute to the EU's fair and green transition.

Targeting Southern Mediterranean European regions, particularly those lagging behind such as Cyprus, Slovenia, Greece, and Portugal, BioINSouth will also involve broader participation from Spain, France, Italy, and international cooperation with Türkiye. Leveraging the BIOEAST initiative that focuses on central Europe, BioINSouth will establish QH-based regional Multi-Actor Regional Groups (MARGs) that will lead through co-creation activities in the establishment of eight bioeconomy-oriented regional HUBs in the following regions: Campania (Italy), Peloponnese (Greece), Andalusia and Asturias (Spain), Centro Region (Portugal), Slovenia, Nouvelle-Aquitaine (France), and Cyprus. These HUBs will serve as collaborative platforms to unite stakeholders, promote the exchange of best practices, and foster innovative methodologies for assessing environmental impacts and circularity in bio-based sectors. The project aims to enhance regional competitiveness, innovation capacity, and contribute to the EU's fair and green transition.

2. Background and objectives

In Europe, the **bioeconomy sector** employs almost 10.2–16.9% of the labour force and contributes to 5.0–8.6% of the GDP (EU-27)[1]. There are currently over 2,300 bio-based plants and biorefineries in Europe[2], that generate a turnover of €600 billion[3]. It is estimated that the bioeconomy can create 400,000 **new green jobs** by 2035, in particular in rural and coastal areas if supported and deployed by regional and national strategies[4]. The bioeconomy also provides potential for regional development, as the bioresources, whether at land or at sea, are widely distributed in rural and remote areas where alternative sources of livelihood are usually scarce.

[1] Ronzon, T., Iost, S., & Philippidis, G. (2022) An output-based measurement of EU bioeconomy services: Marrying statistics with policy insight' Structural Change and Economic Dynamics, volume 60, pages 290-301

[2] https://knowledge4policy.ec.europa.eu/visualisation/bio-based-industry-biorefineries-eu_en

[3] Bioeconomy in figures (2013), BIC, 2016

[4] The Strategic Innovation and Research Agenda (SIRA 2030) for a Circular Bio-based Europe Realising a future-fit circular bio-society in Europe

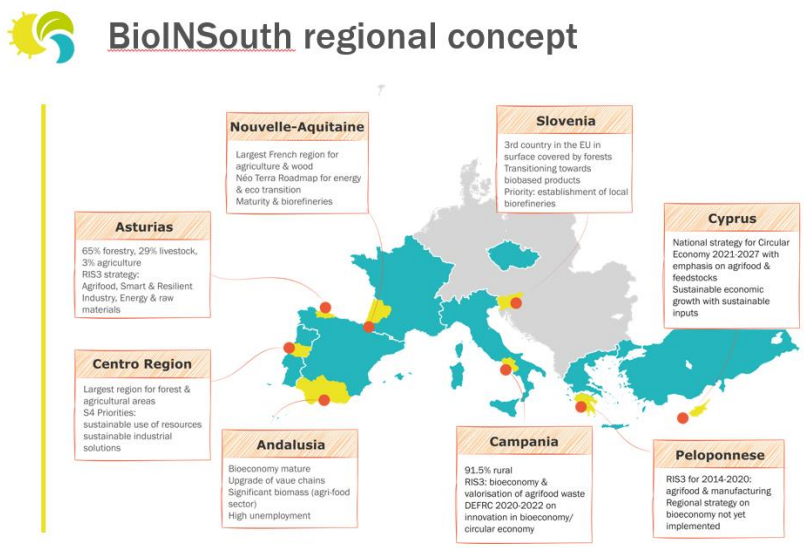
Activities in the bioeconomy sectors heavily rely on **healthy ecosystems** to ensure primary production of biomass. On the other hand, they risk damaging the natural environment and the functioning of its ecosystems. It is therefore necessary to monitor, evaluate and forecast environmental impacts associated with the expansion of bioeconomy sectors and the use of bio-based commodities in order to minimise and manage negative impacts on natural capital, and ensure that the bioeconomy operates within safe ecological limits. For the green and fair transition to sustainable and circular bio-based economy to occur, policy shall support the adoption of analytical approaches, and **adaptive governance grounded** in **environmental sustainability** screening and monitoring, that enable reorientation of **bioeconomy roadmaps** to address nature protection and reverse the degradation of ecosystems, in line with the **EU Biodiversity Strategy** and **EGD objectives**.

In the above concept and under the particularities of the South European/Mediterranean region affecting the advancement of the bioeconomy sector (strong population growth, urbanisation, the scarcity and fragility of natural resources, intense effects of climate change, diversification of consumption patterns, structural unemployment, weak competitiveness), BioINSouth was designed to:

- **SO1:** Identify and engage stakeholders such as public authorities, policymakers, regional research support agencies, civil society, expert voices, farmers, farmers' associations, and market operators. Develop a stakeholder engagement strategy using an online management platform and Multi-Actor Regional Groups (MARGs).
- **SO2:** Create regional HUBs in each partner's region, develop guidelines for HUB coordinators, and support the creation of action plans for these HUBs to facilitate collaboration and innovation.
- **SO3:** Enhance existing methodologies and digital tools for assessing environmental impacts and circularity of bio-based systems. Focus on market growth projections, biomass availability, and impacts on food security, land use, biodiversity, and ecosystem integrity.
- **SO4:** Develop a regional monitoring system applicable to various bioeconomy sectors in Southern Europe to ensure a broader geographical impact of project results.
- **SO5:** Validate and improve methodologies and tools for environmental impact and circularity assessment through feedback from HUB stakeholders. Perform analyses at regional HUBs level and assess regional policies.
- **SO6:** Gather and evaluate the best available industrial bio-based systems within the EU. Organize forums for exchanging best practices, providing an inclusive platform for all stakeholders.
- **SO7:** Develop policy recommendations for sustainability and circularity in industrial bio-based systems. Support the integration of tools and methodologies into regional bioeconomy strategies.
- **SO8:** Promote the visibility and replication of BioINSouth project results throughout Europe. Collaborate with similar initiatives under Horizon Europe and beyond.

3. Methodology

BioINSouth begins with the set-up of a framework for the multi-actor stakeholders' approach, to map all the relevant stakeholders, to develop an effective engagement strategy and set up stable Quadruple Helix (QH) – based Multi-Actor Regional Groups (MARGs), supporting, with data and information, the development of co-creation within the project. Upon the eight MARGs, equivalent regional bioeconomy HUBs will be created, presenting an appealing offer for stakeholders to interconnect and develop their bioeconomy or potentially bio-based value chains. In parallel, methodologies and digital tools will be developed to perform environmental and sustainability assessments based on ISO standards 14040 and 14044, the latest recommendations at EU level such as The International Reference Life Cycle Data System Handbook of

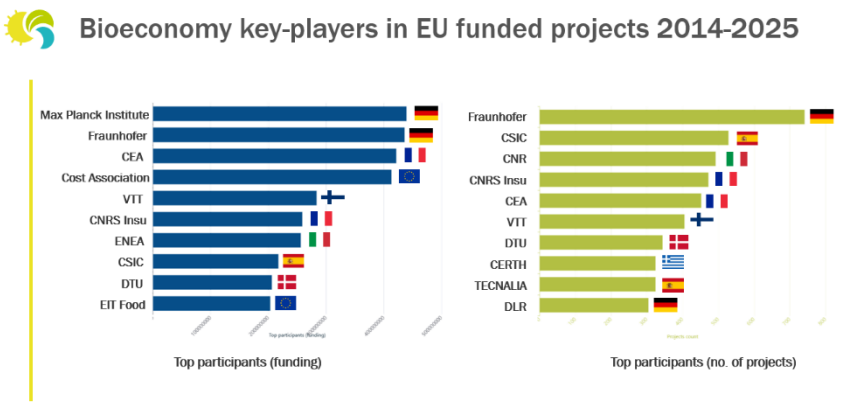


European Platform on Life Cycle Assessment and the Product Environmental Footprint (PEF) Guidelines, and the methodology will also take into account the safe-and- sustainable-by-design (SSbD) framework. Growth scenarios, impacts estimations on Land Use, Land Use Change and Forestry, and biodiversity and ecosystems integrity assessment, will be ultimately incorporated into the BioINSouth Toolkit, that will be demonstrated in each regional HUB. HUBs play a critical role in this by providing a platform for dialogue between stakeholders and policymakers, connecting various regional actors, creating a robust network that supports collaborative efforts.

4. Enhance Stakeholder Engagement and Collaboration

The objective of fostering active participation and collaboration among a broad range of stakeholders, including policymakers, public authorities, market actors (especially SMEs), and civil society, is crucial for advancing bioeconomy, and it is a sign of more advanced bioeconomy landscapes as the macro-region of North Europe. The 2018 update of the Bioeconomy Strategy[5] and its 2022 progress. report[6] that highlights the necessity for improved policy coordination and stakeholder involvement to tackle environmental challenges and enhance resource efficiency. Furthermore, both the EU Bioeconomy Strategy and the European Green Deal[7] emphasise the need for inclusive stakeholder engagement to achieve sustainability goals and stimulate innovation.

A key component of the BioINSouth project is the stakeholder mapping and analysis, especially in regional HUB level, for providing a tank of potentially interested stakeholders to engage in bioeconomy practices. We used the digital tool Wheesbee, developed by Innovation Engineering (PNO Group), for the determination of bioeconomy technologies and top innovators as portrayed by their participation in funded projects over the last 10 years. This advanced tool helped us map the involved stakeholders, focusing on the BioINSouth HUBs regions, and complementing with national and EU insights. Keywords for determining the stakeholders and projects related to bioeconomy, were customised to reflect the bioeconomy value chains predominant in the south, while key players in European level were determined both in project acquisition and funding. More importantly, insights on the status of the HUBs' regions were extracted, revealing a more mature bioeconomy profile for regions such as Andalusia (Spain) and Centro (Portugal), and regions that are for the moment under development, such as Peloponnese (Greece).



Understanding the interests, objectives, and relationships of local actors is important for developing effective bioeconomy strategies. By engaging diverse stakeholders, including policymakers, public authorities, market operators, civil society, and research organizations, the project ensures that the developed methodologies and tools are tailored to regional needs and challenges. This stakeholder analysis helps identify opportunities and barriers, enabling targeted interventions that drive sustainable bioeconomy practices.

5. Support and Rethink Regional Bioeconomy Strategies and Roadmaps

Each HUB region faces distinct ecological, economic, and social challenges, requiring tailored approaches for effective outcomes in the development of bioeconomy. Supporting regional strategies ensures local policies align with EU objectives, facilitating better policy coordination and addressing environmental challenges. Regions could potentially capitalise on unique bio-resources and strengths, nevertheless many of the BioINSouth regions lack official bioeconomy strategies, thus hindering the adoption of policies. This is attributed in many cases to a vicious circle of not so efficient interactions between regional authorities, industrial, and research stakeholders, driven by the lack of funding schemes and incentives for the adoption of

[5] A sustainable bioeconomy for Europe https://data.europa.eu/doi/10.2777/792130
[6] https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52022DC0283
[7] https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal/delivering-european-green-deal_en

bioeconomy principles in practice. In the case of Peloponnese and Greece, as visualised from the Bioeconomy Country Dashboard[8], there is no dedicated national Bioeconomy Strategy, while relevant to bioeconomy policies are currently covered by other related policies (e.g. National Energy and Climate Plan, Smart Specialization Strategy[9], National Strategic Framework for Research and Innovation, etc), that potentially weaken the shifting of the country's production potential to consider seriously the environmental aspects of their value chains, while retaining their position in the market. BioINSouth aims to ensure **long-term impact and sustainability, by s**upporting and aligning with regional/national policies, contribute to the adoption of bioeconomy strategies in lagging regions and secure alignment with EU objectives, facilitating better policy coordination and addressing environmental challenges.

6. Conclusion

The overall methodology of BioINSouth promotes collaboration and the exchange of best practices within a macro-regional network, along with collaboration with non-EU countries. BioINSouth project underscores the importance of regional policies in driving sustainable bioeconomy practices and fostering inclusive growth, especially in .lagging regions and widening countries. Our methodology demonstrated in eight regions through the respective MARGs and HUBs, aims to prove the concept transferable and replicable throughout other Southern European regions and beyond, ensuring sustainability and circularity in bio-based sectors.

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9 https://ec.europa.eu/regional_policy/sources/policy/communities-and-networks/s3-community-of-practice/PolicyBrief_full_240419.pdf