



LIFE BIOREFORMED **POLICY BRIEF**

BIOREFINERIES AS LOCAL SECTOR CATALYSERS

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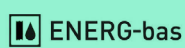


This policy brief summarizes **LIFE BIOREFFORMED's** results on different Mediterranean forest areas, the potential socio-economic impact of the use of forest biomass in biorefineries, the impact on forest productivity, resilience and employment and how **biorefineries** as **local forest sector catalysers** could be of value in the development of EU policy.

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Partners



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Aim of this brief

The aim of this policy brief is to increase awareness among **policymakers** and the public about the importance of biorefineries as local forest sector catalysers. LIFE BIOREFORMED's main objective is to **boost the sustainable Mediterranean-forest management** by upgrading an existing **biorefinery** using **torrefaction and pyrolysis** to produce renewable chemicals (**antioxidants, sugars, acids, aromas**), **phenolic resins, biostimulants** and **biofuels** from forest biomass. This project strongly contributes to the development of the bioeconomy helping to accelerate progress towards a circular and low-carbon economy in line with the **EU Bioeconomy** and **Circular Economy** strategies, by improving the use of renewable resources like **biomass**. It has the potential to enhance sustainable Mediterranean forest management, reducing the dependence on non-renewable resources and mitigating **climate change**, improving environmental ecosystem services and biodiversity, creating jobs and maintaining **EU competitiveness**.

Key Takeaways:


- **Mediterranean forest management:** Mediterranean forests areas are characterized by difficult orography, making its necessary management difficult and **costly**.
- **Pyrolysis:** Pyrolysis transforms biomass into useful products like **biochar** and **bio-oil**.
- **Biochar** can be used as a **biostimulant** source and a **soil structuring** agent, which improves **water retention**, enhancing soil health and as a biofuel. These can help companies and institutions to meet **carbon reduction** targets.
- **Bio-oil** can be used in the synthesis of **resins** or further processed into value-added chemicals like **antioxidants, sugars, acids and aromas** using **biorefinery** techniques.



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Context of the project

- Primary forest biomass is a **renewable** product with high potential to contribute to the transition towards an inclusive bioeconomy, which at the same time increases the **resilience of agroforestry landscapes**. Within the possible uses of forest biomass, obtaining chemical components for different **industries**, through **biorefinery** processes, is seen as an increasingly viable alternative to replace compounds that are today derived from petroleum.
- On the other hand, Mediterranean forests are in a moment of **transition**: the vulnerability of many forests to climate change and its effects (**droughts, pests, gusts, fires**, etc.) is becoming more and more recurrent. To deal with it, there are several forestry actions that can reduce its **vulnerability**, present and future, or **restore** its productive, social and environmental function. But these actions involve an **economic investment**, with zero or low return in the short term.
- In this project different **stands** have been defined and studied, which are representative of the management of mediterranean forests for their adaptation or restoration throughout the territory. These stands can be scaled up to a wide area with a **global impact**.
- This project falls into the topics included in the **Roadmap to a Resource Efficient Europe**, since it develops a **local circular economy biorefinery** converting biomass, some of which currently has no market value, into resources and **value-added products**.
- Regarding the **social impact**, the adaptation and restoration treatments of Mediterranean forests could improve the local economy of the territory and the future **ecosystem services** to be provided.
- Another important point is that forest management is accompanied by the valorisation of the **historical socio-ecological heritage** (tangible and intangible), linked to that forest can promote the **Cultural Ecosystem Services** offered by the forest estates. In this sense, actions such as the maintenance of oral expressions or **traditional knowledge** about the forest and its management encourage the transmission of knowledge, which is at the same time a **resilience strategy**.



In each territory and for the different existing forest types, the impact of the implementation of a local biorefinery should be analysed from an environmental, economic and social point of view, looking for the best forest management proposal adapted to the needs of each area.

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EU policy context

LIFE BIOREFORMED contains a multipurpose delivery mechanism to create synergies with other EU policies such as the EU Bioeconomy Strategy and the EU Circular Economy Package, European Green Deal, Fit for 55 Package; Renewable Energy Directive (RED II and RED III); Sustainable Forest Management (SFM); Energy Efficiency Directive; EU Biodiversity Strategy for 2030, Waste Framework Directive, Water Framework Directive, Landfill Directive, IPPC Directive, the 7th Environment action program, the Clean Energy Strategies, the Land Use, Land Use Change, and Forestry (LULUCF) Regulation, among others.



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Economic and Environmental Impact

Economic Opportunities

- **Job Creation and Regional Economic Development:**
 - o Woody biomass utilization supports the **rural economy**, creating jobs in forestry management, biomass transport and processing, and biorefinery facilities.
 - o Businesses in sectors like agriculture, energy, and biorefineries benefit from a **reliable supply of locally sourced biomass**.



- **Diversification of Revenue Streams:**
 - o **Value-added chemicals** production, such as antioxidants, sugars, acids, biostimulants and resins offers businesses the opportunity to diversify into the renewable energy market.
 - o Selling **biochar** as a biofuel or soil amendment or a carbon sequestration tool provides an additional income stream while addressing sustainability goals.

Environmental Benefits

- **Boosting sustainable forest management:**
 - o The use of a biorefinery allows the output of different species and types of biomasses that are difficult to place in the current market. Some examples of these are:
 - **Scrub or small trees** with bark and leaves from seedling or thinning, such as strawberry tree and heather.
 - **Aged cork oaks** and hairy cork from selective thinning in cork oak groves.
 - Mixed wood of different species and characteristics from **post-disturbance** actions, **pine** species, **dead** chestnut wood, etc.



- **Carbon footprint reduction:**

- o **Biochar** is recognized for its potential **to store carbon in soils** for centuries, helping with climate change mitigation and contributing to the decarbonization of some industries.
- o **Biostimulants** can be produced from biochar, **replacing** the current commercial **fossil-based source** (leonardite).
- o Life cycle analysis indicated that the obtention of **bioproducts** from wood through the biorefinery process has an average overall impact within the entire system is 0.56 kg CO₂ eq per kg of biomass feed. This has **3,7 times less environmental impact** than the combined production of the same products through the nowadays conventional industry.

Policy Recommendations and socio-economic impact of forest biomass in biorefinery uses

Recommended forest policy actions

- To integrate multiobjective forest management in the general forest planning and policies for climate change adaptation and nature restoration.
- To integrate the cost of fire prevention actions into the final cost of biomass, increasing its economic feasibility.
- To allocate more resources regarding research and innovation to develop forest machinery adapted to the Mediterranean forest and forestry treatments.
- To develop more resilient forests to climate change policies should take into account environmental and cultural ecosystem services.

General biorefinery policy actions

- To include forestry residues as a feedstock for biorefineries, since it should be considered as a resource instead of a residue.
- To promote a decentralized model to implement biorefineries across the rural regions, to decrease depopulation and create rural jobs.
- To promote strategies to link biorefineries promoting synergies and industrial symbiosis.
- To encourage cascade-related decision-making for the use of forest biomass into biorefineries.
- Multifeedstock and multiproduct biorefineries such as the one presented in the LIFE BIOREFORMED project offers more flexibility in terms of biomass availability.
- To increase awareness in relation to the Green Deal policies, biorefineries and bioeconomy topics.
- To facilitate policy instruments to implement pilot biorefineries in regions. In each territory and for the different forest typologies it would be necessary to analyse the impact of the implementation of a local biorefinery, from the environmental, economic and social point of view, looking for the best proposal of forest management adapted to the needs of the territory.
- To establish clear guidelines for the obtained chemical products to enter the current chemical industries market.
- To favour mechanisms to help industries that use biorefineries' final products.



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Conclusion

The transformation of woody biomass into bioproducts and biofuels through biorefinery processes presents a **great opportunity** for businesses and forest owners to align with evolving energy and environmental policies. By investing in this renewable technology, it is possible to reduce the carbon footprint, tap into new **revenue streams**, and create a more **circular economy** within **bioeconomy**. For this reason, plans and policies should encourage and support this transition.



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More information