An aerial photograph of a two-lane asphalt road winding through a dense, lush green forest. The road curves from the bottom right towards the top right. A small blue car is visible on the road, moving away from the viewer. The forest is composed of tall, thin trees with vibrant green foliage. The overall scene conveys a sense of nature and sustainability.

POSITION PAPER ON SUSTAINABLE BIOMASS SUPPLY

Biomass in the Energy System

Bioenergy is projected to remain a key pillar of the global energy transition, particularly in hard-to-electrify sectors such as aviation, shipping, and industrial processes. The IEA's Net Zero Emissions by 2050 scenario, expects bioenergy demand to grow from 60 EJ today to around 100 EJ by 2050¹⁻².

In the European Union, biomass continues to be a dominant renewable energy source, accounting for ~60% of total renewable energy consumption in 2023³. It plays a significant role in electricity generation, heating, and transport fuels, with solid biofuels representing nearly 70% of bioenergy supply⁴. Germany leads as the EU's largest producer of solid biomass, while biomass-based distributed heat contributes 12% to the EU's total heat supply and biomass electricity accounts for 6% of total power generation⁵.

Key Contributions of Bioenergy to EU Targets and related Regulations include:

- Renewable Energy Targets (RED – EU 2023/2413): The EU aims for at least 42.5% renewable energy by 2030, with bioenergy⁶ expected to remain a major contributor⁷.
- Decarbonization Goals: Bioenergy supports the EU's net-zero emissions target by 2050, particularly in transport, industry, and heating⁸.
- Energy Security: Biomass, biofuels, biogas, and biomethane help reduce reliance on imported fossil fuels, strengthening energy independence⁹.
- REPowerEU Initiative: Aims to increase renewable energy use for heating, electricity, and transport, with a target of 35 bcm biomethane and renewable methane production by 2030¹⁰⁻¹¹.
- REFuelEU Aviation for 2030: Sets blending targets for Sustainable Aviation Fuel (SAF) at 5% in fossil kerosene¹².
- FuelEU Maritime for 2030: Establishes a 6.5% renewable fuel target for the marine sector¹³.
- Circular Economy & Rural Development: Bioenergy promotes sustainable land use, supports rural economies, and enhances waste-to-energy solutions¹⁴.

1. <https://www.iea.org/articles/what-does-net-zero-emissions-by-2050-mean-for-bioenergy-and-land-use>

2. https://www.ieabioenergy.com/wp-content/uploads/2025/01/Commentary_RoleBioenergy_Dec2024I.pdf

3. https://energy.ec.europa.eu/topics/renewable-energy/bioenergy/biomass_en

4. https://www.ieabioenergy.com/wp-content/uploads/2025/01/CountryReport2024_EU27_final_v2.pdf

5. https://www.ren21.net/gsr-2023/modules/energy_supply/02_market_developments/01_bioenergy/

6. Bioenergy includes solid, liquid and gaseous bioenergy carriers

7. https://energy.ec.europa.eu/topics/renewable-energy/renewable-energy-directive-targets-and-rules/renewable-energy-targets_en

8. [Diversity of biomass usage pathways to achieve emissions targets in the European energy system | Nature Energy](https://energy.ec.europa.eu/news/bioenergy-report-outlines-progress-being-made-across-eu-2023-10-27_en)

9. https://energy.ec.europa.eu/news/bioenergy-report-outlines-progress-being-made-across-eu-2023-10-27_en

10. https://hyfuelup.eu/wp-content/uploads/2025/02/State_of_play_of_Biogas_and_Biomethane_in_Europe.pdf

11. https://energy.ec.europa.eu/topics/renewable-energy/bioenergy/biomethane_en

12. https://transport.ec.europa.eu/transport-modes/air/environment/refueu-aviation_en

13. https://transport.ec.europa.eu/transport-modes/maritime/decarbonising-maritime-transport-fueu-maritime_en

14. <https://www.mdpi.com/2071-1050/15/3/2139>

Debating sustainable biomass supply

The debate on sustainable biomass supply has persisted for nearly two decades, with strong arguments on both sides. When sustainably sourced, biomass plays a pivotal role in advancing the transition of hard to abate sectors and industries¹⁵ as well as the bio-based circular economy by providing renewable raw materials, enhancing rural development and farm income diversification, strengthening energy security, and contributing to decarbonization. Conversely, critics highlight environmental risks, particularly concerning land and water resources and broader planetary boundaries. The scientific community has actively engaged in this discussion, leading to expanded knowledge and improved sustainability assessments through local, national, and global initiatives. Nevertheless, there is a consensus among experts to prioritise the reduction of green-house gas emissions among environmental criteria, and revitalization of rural areas among social criteria¹⁶.

Careful management and traceability are essential to balance carbon sinks, ecosystem services, and long-term sustainability. In response, the EU has implemented stricter sustainability criteria to ensure biomass production aligns with climate neutrality and biodiversity protection.

What is at stake with biomass sustainability?

Biomass sustainability is a complex issue, touching on environmental, social, economic, and geopolitical dimensions.

Key issues include:

- **Environmental Impact:** Sustainable biomass sourcing is critical to avoiding deforestation, biodiversity loss, and soil fertility reduction. The EU has introduced stricter sustainability criteria to ensure biomass production aligns with climate neutrality and biodiversity goals.
- **Social Considerations:** While biomass can support rural economies and job creation, concerns remain about land competition, food security, and the broader cultural impacts of large-scale biomass production.
- **Local vs. Imported Biomass:** The EU aims to prioritize European biomass over imports to enhance energy security and reduce reliance on external sources.
- **International Role:** Europe has a responsibility to support sustainable biomass practices globally, particularly in developing countries where traditional biomass use contributes to deforestation and health risks.
- **Shifting Focus:** There is a growing emphasis on using residues and waste rather than primary biomass, ensuring a more circular and efficient approach to bioenergy.
- **Cascading Use of Biomass:** The EU is increasingly promoting the cascading principle, prioritizing biomass for higher-value applications before energy use. While some advocate for making this mandatory, it remains a controversial topic.
- **Geopolitical Considerations:** Recent global events have heightened concerns about energy security, making sustainable biomass supply a key component of Europe's long-term strategy.

15. <https://op.europa.eu/en/publication-detail/-/publication/23d054d0-c4e3-11ee-95d9-01aa75ed71a1/language-en>

16. <https://doi.org/10.1016/j.jclepro.2023.140075>

Can more¹⁷ biomass be sustainably sourced in the EU?

The estimated potential for biomass in the European Union by 2030 varies depending on sustainability considerations and mobilisation scenarios.

Targeted studies^{18–19–20–21}, providing insights on potential futures of biomass availability in the European Union, indicate that there are sufficient domestic biomass resources to meet the 2030 targets described above (Figure 1). This availability varies spatially and temporally, requiring efficient mobilisation and valorisation of sustainably sourced feedstocks to maximize their potential²².

unmanaged, which can reduce their long-term value²⁶.

Strategies to Enhance Sustainable Biomass Supply

To ensure a scalable and sustainable biomass supply, several key strategies must be implemented:

Policy related

- Integration into Energy Security & Circular Economy Policies: Biomass should be incorporated into national and EU-wide energy security and circular economy strategies, with tailored roadmaps for each country based on local resources.

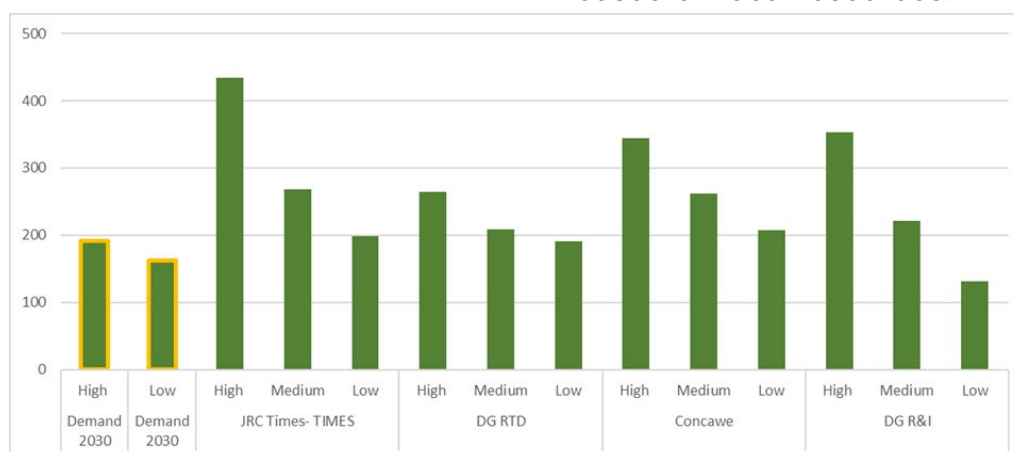


Figure 1. Demand and estimated supply in the European Union in 2030 (Mtoe)

A key challenge is the mobilisation of underutilized raw materials, such as agricultural residues, forestry by-products, and organic waste^{23–24}.

Engaging primary producers, farmers, and forest owners is essential to promote active and timely management practices through an effective implementation of sustainable forest operations practices²⁵, ensuring that biomass resources are effectively utilised rather than left

- Strengthening the Circular Bio-Based Economy: Establishing a clear link between biomass and the circular economy will maximise resource efficiency and minimise waste.
- Leveraging Synergies Across Biomass Sectors: Optimising regulatory interactions between bioenergy, biofuels, and bioproducts can enhance efficiency and sustainability.

17. Than is currently used

18. [Sustainable biomass availability in the EU, to 2050 - Concawe](https://op.europa.eu/en/publication-detail/-/publication/bae246b8-c4da-11ee-95d9-01aa75ed71a1/language-en)

19. <https://doi.org/10.1016/j.esr.2019.100379>

20. Research and innovation perspective of the mid-and long-term potential for advanced biofuels in Europe - Publications Office of the EU (europa.eu)

21. <https://op.europa.eu/en/publication-detail/-/publication/bae246b8-c4da-11ee-95d9-01aa75ed71a1/language-en>

22. <https://doi.org/10.5194/essd-16-59-2024>

23. <https://www.mdpi.com/2071-1050/16/9/3617>

24. <https://task43.ieabioenergy.com/wp-content/uploads/sites/38/2017/06/TR2017-01-F.pdf>

25. <https://doi.org/10.1016/j.scitotenv.2018.04.084>

26. <https://link.springer.com/article/10.1007/s43621-024-00309-z>

Stakeholders & community engagement

Engaging Farmers & Foresters: Encouraging participation from primary producers is crucial. Farmers can contribute by providing agricultural residues (e.g., straw left on fields) or growing intermediate and cover crops. Incentives such as carbon credits for energy producers using local biomass or co-participation in bioeconomy business models²⁷ could further promote sustainable sourcing.

Mobilising Biomass from Marginal, Underutilized, and Contaminated (MUC)

Lands: These lands hold significant potential, but require political and financial support to overcome additional costs associated with mobilisation and rehabilitation.

Enhancing Communication & Awareness: Increasing public and industry awareness about biomass sustainability will foster greater acceptance and participation.

Strengthening Cooperation Across the Value Chain: Collaboration among stakeholders, policymakers, and industry players is essential to achieving common sustainable mobilisation goals.

27. Viaggi, D. et al. (2018). Business models for the bioeconomy: A European perspective. Sustainability, 10(6), 1691.

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