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CONSULTATION

Biomass and land use in a competitive, resilient and sustainable bioeconomy

Submission to the European Commission consultation “Towards a Circular, Regenerative and Competitive Bioeconomy” — 23 June 2025

Content

1 Main takeaways

1. The current Bioeconomy strategy falls short of contributing to the EU's climate and environmental objectives. A competitive and innovative bioeconomy in Europe relies on a sustainable supply of biomass from agriculture and forestry. However, current projections of the demand for biomass exceed the sustainable supply potential, exacerbating land use trade-offs. The EU will need a robust and comprehensive framework that effectively guides limited biomass resources from primary production to end uses while promoting circularity and fostering ecosystems services.

2. Addressing biomass and land use constraints will require three key actions along the value chains: First, diversifying biomass sources. Second, steering biomass use away from energy and towards materials, while prioritising long-lasting material uses and focusing on hard-to-electrify applications like high-temperature process heat and aviation. And third, promoting sustainable demand for food and feed, including a shift in food consumption towards more plant-rich diets and a reduction and re-use of food waste.

3. The review of the Bioeconomy strategy is an opportunity for Europe to transform key value chains and strengthen its clean technological leadership. Significant potentials can be found in developing a higher level of forest resilience and flexibility of forest management practices and related value chains, lowering the carbon footprint of buildings, moving towards the defossilisation of plastics together with recycling, improving nutrient cycles and the management of greenhouse gas emissions in agriculture.

4. The new Bioeconomy strategy will need to ground its actions in a comprehensive and cross-sectoral assessment of current and future biomass supply and demand. A Biomass roadmap together with a governance framework for biomass and land use will be crucial to coordinate actions at EU, member state, regional and local levels and set the direction and pace towards a competitive, resilient and sustainable bioeconomy. Incentivising synergies between biomass production and provision of ecosystem services, unlocking the untapped potential of food innovation and fostering the material use of biomass will create new economic opportunities in rural areas and support industry in reaching climate neutrality.

2 Why an optimised use of biomass matters for a competitive, resilient and sustainable bioeconomy

The **bioeconomy** encompasses all sectors and systems that rely on biological resources, including crops, wood, animals, microorganisms and derived wastes, as well as their associated functions. The bioeconomy includes: 1) the primary production sectors that use and produce biological resources from land and sea, 2) the industrial sectors using biological resources and processes, and 3) the services provided by land and marine ecosystems.[1] This broad understanding of the bioeconomy, as defined by the European Commission, guides the current submission.

The overall aim of the **2018 EU Bioeconomy strategy** and the accompanying **action plan** is to make better use of limited biomass resources in support of EU policy goals, especially 1) food and nutrition security, 2) sustainable management of natural resources, 3) reducing dependence on non-renewable resources, 4) climate action, and 5) European competitiveness.[2] These objectives remain valid for the planned update of the Bioeconomy strategy, which is the subject of this consultation.

Covering nearly 75% of the EU's land surface, agriculture and forestry are key providers of biomass for the bioeconomy. If used coherently across sectors and produced sustainably, biomass can support a competitive, resilient and sustainable bioeconomy, able to **contribute to key European policy objectives,** including:

- **Global competitiveness,** including the development of innovative products and value chains.
- **Strategic autonomy,** including contributing to resource efficiency through increased circularity and EU-based production.
- **Long-term food security** in the EU and globally, for example, by ensuring sufficient food availability to support nutritionally healthy diets, limiting competition with food production and reducing the EU's virtual global land footprint.
- **Climate neutrality,** including by substituting certain fossil feedstocks and fostering land-based carbon removals.
- **Ecosystem resilience,** for example, by supporting more sustainable biomass production methods that strengthen soil health, biodiversity and water quality and availability.
- **Strengthening rural economies,** such as by creating income opportunities for farmers, forest owners and rural communities through expanded or new bioeconomy value chains and incentives for climate and biodiversity protection.

A competitive and innovative bioeconomy relies on a sustainable supply of biomass. However, **current projections of the demand for biomass exceed the sustainable supply potential.**[3]

The **increasing demand and suboptimal use of biomass exacerbate trade-offs between different societal demands placed on land,** which range from biomass production to the provision of habitats and other ecosystem services, such as carbon sequestration. Aligning multiple policy objectives with a limited

1 European Commission (2018): A sustainable bioeconomy for Europe: strengthening the connection between economy, society and the environment. Updated Bioeconomy Strategy. URL: https://op.europa.eu/en/publication-detail/-/publication/edace3e3-e189-11e8-b690-01aa75ed71a1/language-en

2 European Commission (2018): Bioeconomy: the European way to use our natural resources. Action plan. URL: https://op.europa.eu/en/publication-detail/-/publication/775a2dc7-2a8b-11e9-8d04-01aa75ed71a1

3 Avitabile et al. (2023): Biomass production, supply, uses and flows in the European Union. Publications Office of the European Union, Luxembourg, doi:10.2760/368529, JRC133505. URL: https://op.europa.eu/en/publication-detail/-/publication/993be4a7-b74c-11ed-8912-01aa75ed71a1/language-en

sustainable supply of biomass requires incentivising strategic uses of biomass for food, feed, materials and energy. The concept of **ecological boundaries** and associated scientific research, as referenced in the background document to this consultation, will be important for helping to balance the supply and demand for biomass and land resources.

At the same time, the effects of climate change, such as droughts and flooding, as well as the decline in biodiversity, are impairing the performance of the land use sectors in supplying biomass and delivering ecosystem functions. Significant attention is needed to maintain the **resilience of the land use sectors,** including their robustness, adaptability and transformability in the face of climate and other shocks. Securing and strengthening ecosystem services by enhancing biodiversity and reducing pollution through more sustainable production and management practices, are also central. As an integral building block for the phase-down of fossil fuels, the resilience of the land use sectors becomes increasingly essential for the **resilience of the overall economy,** requiring measures to enhance the flexibility and responsiveness of the economy and society in the face of crises.[4]

The objectives of **circularity** and the sustainable sourcing of biomass within the bioeconomy are inextricably connected. Circularity within production processes reduces waste generation, uses resources efficiently and increases resource value. It includes fostering material over energy use of forest wood, promoting sustainable products with longer life spans, and supporting research and innovation to enhance the recyclability of products and development of new processes and technologies. A circular bioeconomy can reinforce the sustainable supply of bio-based materials while responding to growing demand for circular products. Forest-based value chains, in particular, can benefit from the application of an enhanced cascading principle, which prioritises the sequential and optimised use of biomass to enhance value creation and environmental benefits.

In this submission, we propose main elements of a framework to **guide the bioeconomy** towards an optimised allocation of limited sustainable biomass supplies in support of the aforementioned objectives. In the absence of clear incentives, the bioeconomy could fail to meet expectations, exacerbate trade-offs between policy objectives and undermine its credibility. The current initiative to update the 2018 EU Bioeconomy strategy is well-placed to establish the building blocks and processes for implementing such a framework.

Section 3 outlines the contours and main elements of a future-proof bioeconomy based on existing and ongoing work in the context of Agora Think Tanks. **Section 4** proposes three priorities for the next Bioeconomy strategy.

4 Rudloff (2022): Wirtschaftliche Resilienz: Kompass oder Catchword? Welche Fallstricke und Folgeeffekte die EU im Krisenmanagement beachten muss. SWP Berlin. URL: https://www.swp-berlin.org/10.18449/2022S01/

3 Outlining building blocks for an efficient use of land and sustainable demand for biomass in the bioeconomy

Land and biomass are limited resources and trade-offs exist between different objectives related to their use. To reduce trade-offs and increase synergies, land needs to be used more efficiently and the demand for biomass to be more sustainable than today. The practical application of this approach is illustrated with two complementary pieces of work conducted in the context of Agora Think Tanks.

3.1 A scenario for the use of land and biomass in a climate neutral EU

A quantitative scenario by Agora Agriculture from 2024 shows that by mid-century the EU land use sectors – agriculture and forestry – in the context of the food system and bioeconomy, can make a significant contribution to climate neutrality, healthier and more sustainable food consumption, enhanced biodiversity and increased biomass supply. This while improving animal welfare and the EU becoming a net exporter of virtual agricultural land, reducing pressure on global land resources.[5]

Increasing biomass supply for materials and feedstock is an integral part of the scenario. Three key enabling developments allow this to happen, while simultaneously improving the EU trade balance in agricultural goods, as measured by virtual land trade, and strengthening the forest carbon sink by slightly reducing wood harvests:

1. **A higher demand for material use** drives an increased demand for biomass, while biomass demand for energy use decreases.

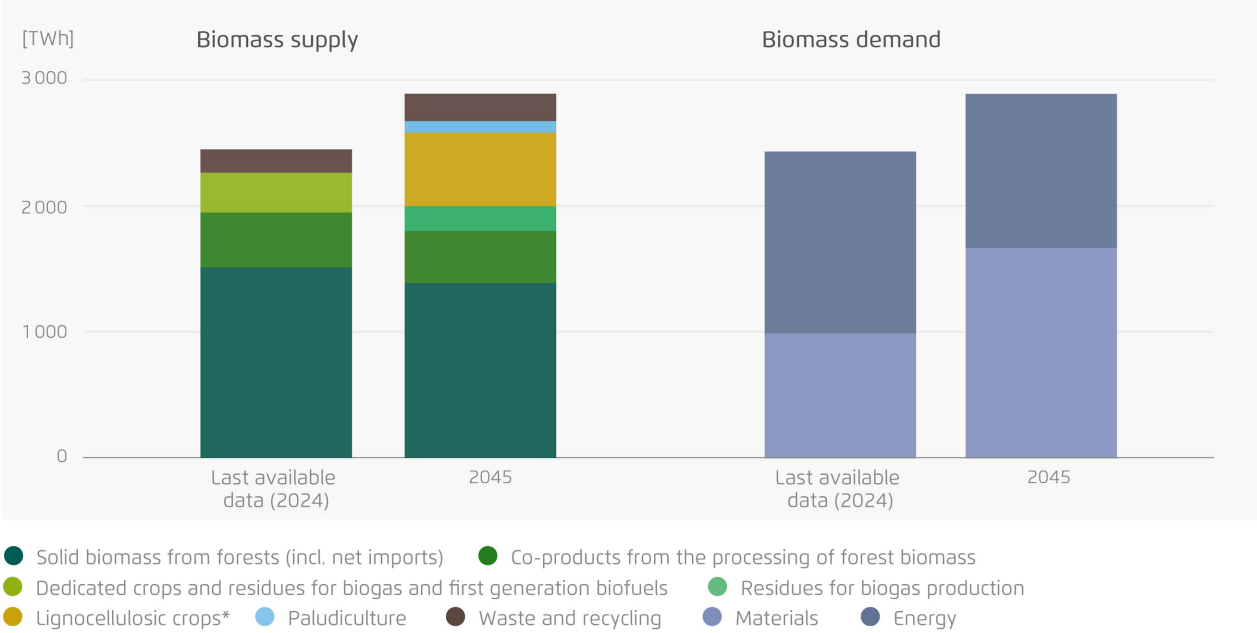
2. Changes towards **more plant-rich diets** reduce the land footprint of EU food consumption and domestic land demand for feed production (up to 50% less arable land needed for feed production).

3. Sources of biomass for other sectors are rebalanced to include **higher shares of woody biomass** produced on agricultural land through the use of biomass from fast-growing trees and paludiculture, as well as residues, while **phasing out annual energy crops.**

5 Agora Agriculture (2024): Agriculture, forestry and food in a climate neutral EU. The land use sectors as part of a sustainable food system and bioeconomy. URL: https://www.agora-agriculture.org/publications/agriculture-forestry-and-food-in-a-climate-neutral-eu.

Demand and supply of biomass in the bioeconomy in the EU

→ Figure 1



Agora Agriculture (2024)[5]; *e.g., short rotation coppices, agroforestry, miscanthus.

The results of the scenario for 2045 are also applicable for 2050. A 20% increase in overall demand for biomass is driven by increased material use (70% increase), while energetic use goes down by 15%.

Biomass supply is increased by diversifying the supply base to include much more woody biomass produced on agricultural land, paludiculture biomass, and residues:

- The lignocellulosic crops (e.g. agroforestry with fast-growing trees and other short rotation coppices) planted on around 8% of agricultural land (equivalent to 4% of the combined EU agriculture and forest land) close the gap caused by a 30% increase in demand for woody biomass and a 10% decrease in forest harvest in the scenario.
- From the 2% of the EU agricultural area that consist of drained peatlands, 80% are rewetted, with 80% of that area dedicated to paludiculture biomass production (e.g. reed or cattail). The remaining 20% is allocated for solar photovoltaics and biodiversity.

Forests cover approximately 160 million hectares in the EU, up from 150 million hectares in the 1990s. The scenario aims to maintain and enhance **forest services, including wood harvests, carbon removals and biodiversity functions.** The forest area expands by 5 million hectares by mid-century. A significant part of this trend stems from the abandonment of agricultural land. With significant increases in forest disturbances over the last two decades, including windstorms, fire and bark beetle outbreaks, enhanced action is needed to strengthen forests' multifunctionality and contribute to climate targets, including:

- Adapting forests towards resilient stands on about one-third of the total forest area in Europe, including greater diversity of species composition and adoption of closer-to-nature management.
- Temporarily delaying harvests in resilient forest stands (10-20 years), combined with the production of additional woody biomass outside forests to avoid leakage effects.

– Increasing active afforestation on abandoned land with well-designed afforestation strategies.

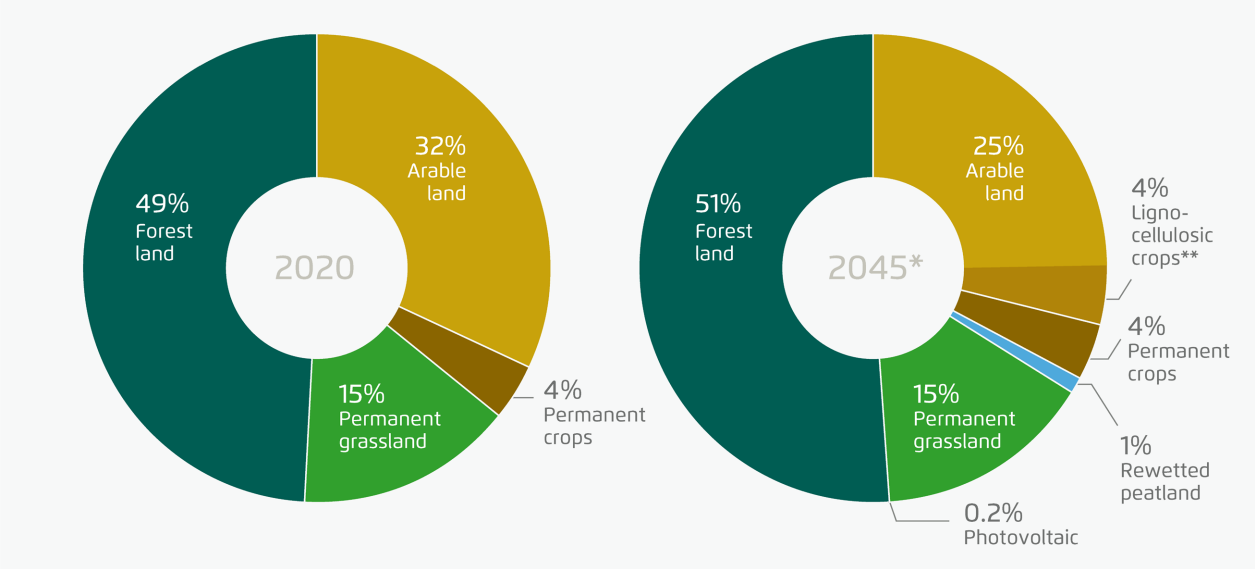
For the production of **food and feed,** high land productivity is balanced with the provision of species-rich habitats and improved animal welfare:

– A reduction in livestock numbers is accompanied by improved husbandry conditions.
– A higher share of forage (grassland biomass) is used as feed for ruminants, while the agricultural area under permanent grassland remains stable, reducing land competition with arable crops and supporting ecosystem services.
– The share of agricultural by-products and food waste in non-ruminant feed increases, enhancing circularity.
– Agricultural landscapes are more multifunctional and structurally diverse, including 20% semi-natural landscape features (e.g. flower strips or agroforestry), smaller cropping units and diversified crop rotations.
– The risk of plant protection products is reduced, and their use goes down by 50%.
– Nitrogen balance surpluses are reduced by 50%.

The scenario envisions **biogas plants** to become biomass platforms integrated in a sustainable land use. Anaerobic digestion can treat a wide range of substrates, sometimes with no viable alternative use, allowing to valorise residues, such as different kinds of straw, failed crops and perished agricultural products, improve the profitability of catch and cover crops, and help maintain environmentally valuable permanent grassland and leys. It partly mitigates methane emissions from manure storage and nitrous oxide emissions from catch and cover crops that would otherwise be left on the field. Moreover, anaerobic digestion is used to recycle nutrients and make them available again for agriculture.

Land use in the EU agricultural and forestry sectors

→ Figure 2



Agora Agriculture (2024)[5] based on CAPRI results. *due to rounding figures add up to more than 100%; **e.g., short rotation coppices, agroforestry, miscanthus on arable land.

The results of the scenario for 2045 are also applicable for 2050.

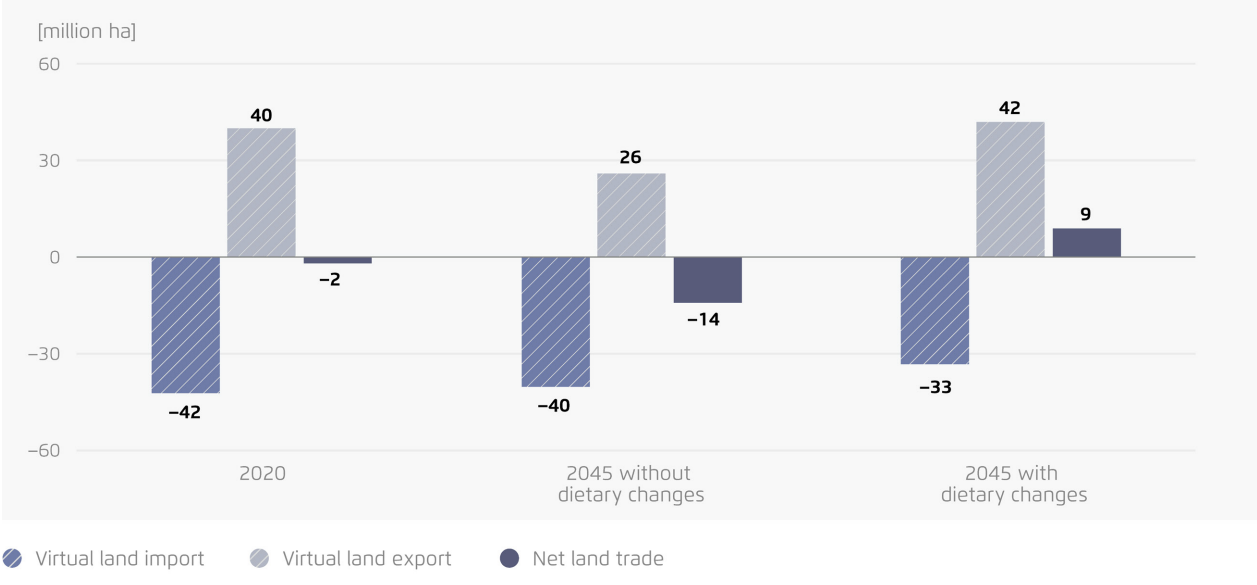
The scenario estimates the following **contributions to climate neutrality** by 2045/2050:

- **60% reduction in EU greenhouse gas emissions** from agriculture and agricultural peatlands compared to 2020.
- **348 $MtCO_2eq$ potential net carbon removals** from forests, afforestation and harvested wood products (an estimate with high levels of uncertainty).
- **Removals of 35 $MtCO_2$/yr on agricultural land** in the period 2025–2045 through the establishment of woody features and agroforestry systems.
- **Emissions reduction of 70 $MtCO_2eq$/yr** by rewetting 80% of agricultural peatlands.
- **59 MtCO2eq fewer agricultural greenhouse gas emissions** outside the EU.

A **shift in food demand** is a crucial factor enabling the scenario. The scenario envisions an **increase in plant-based foods** in relation to animal-based foods in the average diet, accompanied by a **halving in food waste.** The share of plant-based proteins in average food consumption increases from 30% to 62%, while the share of animal-based proteins declines from 70% to 38%. The land and climate footprint of consumption patterns is significantly reduced, while sufficient food is available in the EU to meet nutritional needs. **Fair food environments** enhance the availability, affordability, appeal and information on foods contributing to a healthy and sustainable diet.

The combination of more sustainable demand for food, feed and other biomass and an efficient use of land allows the EU to become a **net exporter of virtual agricultural land and stabilise its trade balance in woody biomass.** By reducing pressure on global land resources and increasing virtual net exports of land, the EU can contribute to global food security.

EU net virtual land trade based on world average yields → Figure 3



Agora Agriculture (2024)[5] based on CAPRI results.

The results of the scenario for 2045 are also applicable for 2050.

The scenario enhances the resilience of the food system and bioeconomy by reducing the EU's reliance on biomass imports and through measures that improve the climate adaptation of agriculture and forestry, such as adapting forest species composition and management, as well as introducing agroforestry systems into agricultural landscapes.

The scenario also implies a range of **economic opportunities** related to the growing demand for a broader range of products and services from the agricultural and forestry sectors. This includes, in particular, opportunities in the bioeconomy, such as the growing demand for biomass for bio-based materials, new food demands, such as for fruits and vegetables, and demands for biodiversity protection, climate adaptation, and carbon sequestration, which need to be linked with appropriate incentive mechanisms.

3.2 Steering biomass use in support of a competitive, resilient and sustainable bioeconomy – preliminary findings from an ongoing project

Agora Energiewende is in the process of developing a **Biomass Use Allocation Guide** with a more granular assessment to help **steer the use of biomass towards applications and sectors that provide the most value added** towards climate neutrality, in synergy with other policy objectives.

The Guide reflects an attempt to balance out different European social, economic, technological, environmental and climate objectives over time for the use of biomass across main product categories and sectors. It is based on the following principles:

- Favour **long-lasting material use** over combustion and enhance the application of the **wood cascading principle**.
- Consider the **use of resources in terms of material and energy efficiency,** greenhouse gas emissions, temporary carbon sinks and environmental impacts (e.g. biodiversity, water and air quality).
- Consider **technological alternatives** at product as well as sector levels, such as the electrification of applications or processes.
- Aim for an efficient **use of land,** in line with main EU policy goals and international commitments (e.g. Sustainable Development Goals, Paris Agreement).

An allocation of use per main product categories can offer useful guidance for stakeholder dialogues and decision-making processes at all governance levels, including local, regional, national, and European.

Below we outline a **set of preliminary and non-exhaustive findings** from the Guide for different sectors and applications.

3.2.1 Construction sector

Using wood from forests in construction, together with wood and fibres from paludiculture, lignocellulosic crops and other biomass, can contribute to lowering the carbon footprint of buildings or structures through material substitution and provide for temporary carbon sinks in long-lasting products.

The use of sustainable biomass in the construction sector has significant potential to:

- Lower the carbon footprint of buildings by reducing its embodied carbon emissions (ECE), e.g. through substituting fossil-based materials by wood and other bio-based materials that can contribute to temporarily storing biogenic carbon in building materials.

- Meet circularity objectives by stimulating the use of long-lasting, resource-efficient and recyclable products from forest and agricultural wood and other bio-based materials.
- Integrate environmental co-benefits of sustainable biomass production into demand-side policy instruments to strengthen ecosystems resilience (e.g. biodiversity, soil health, water quality and availability).

Enhancing the implementation of the cascading principle for wood use and supporting the recovery and recycling of forest and agricultural wood and other bio-based materials is essential to meet sustainably the growing demand for low-carbon building materials and develop innovations in the construction sector along the value chain. A constrained wood supply requires to put in place effective recycling systems for optimising resource recovery from wood and wood-based products for re-use and recycling at the end-of-life of the construction, and as waste for energy generation from combustion as a last resort.

Because sustainable biomass is a renewable yet limited resource, ongoing support for research and innovation is needed to:

- Improve the material efficiency of products made from wood, pulp, and other bio-based materials.
- Develop novel uses of wood, pulp and other bio-based materials, enhance reuse and recycling, and incentivise their market uptake.
- Introduce circular thinking and actions throughout the value chain, from sustainable sourcing and eco-design to material production and use covering all stages of processing and service life in the product systems.
- Increase manufacturers' capabilities to bring secondary materials back into the production process, reduce waste and minimise emissions.

Further, the use of wood in the construction industry needs to be closely assessed and monitored to ensure:

- The climate and environmental footprint of the use of wood in construction remains beneficial, as it may change over time (cf. deteriorating forests carbon sink; evolving carbon and environmental footprints of e.g. the steel and cement industries).
- The demand for construction wood does not exceed the sustainable potential of forests over the short, medium (2050) and long term (2100), considering imports and virtual land use demands.

Finally, fostering stakeholder dialogues across the value chain to:

- Identify enablers and bottlenecks, share best practices to accelerate the adoption of sustainable practices throughout the value chain, and reconcile business cycles with differing time horizon.
- Elaborate targeted policy measures to promote sustainable practices from biomass sourcing to end of life.
- Streamline, harmonise, and simplify construction codes and standards, including embodied carbon requirements for buildings.

3.2.2 Electricity generation, industrial process heat and space heat

Woody biomass from forests is to be used primarily as a material and its combustion reduced. To make the most out of its forest resources, Europe needs to move away from the use of biomass for electricity and heat generation:

- Reduce electricity generation based on biomass to back-up generation units.

- Shift low temperatures (up to 500°C) industrial process heat to electrification via heat pumps and e-boilers, away from biomass use.
- Transition space heating based on biomass to heat pumps and district heating (dense urban areas). Heat pumps offer the advantage to also provide for cooling.

3.2.3 Chemicals

The use of biomass as feedstock can contribute to the chemical industry's transformation on its way to climate neutrality in combination with other measures, as follows:

- In terms of categories, focus on platform chemicals and polymers-for-plastics as chemicals' biggest share (ca 75%)
- In terms of recycling, focus on plastics and lubricants as recycling rate potentials are high (75%-86% and 25% respectively by 2050) allowing to minimise the need for virgin feedstock and foster carbon loops.
- Regarding plastics:
  a. Reduce final demand by optimising material substitution, efficiency and re-use,
  b. Reduce demand for virgin feedstock and intermediary products with eco-design standards, re-use, upcycling, maximising mechanical recycling and complementary chemical recycling as adequate per intermediary and end-product along the value-chain.
- Rely primarily on biomass-based waste and residues. For additional feedstocks beyond the waste and residue potentials, favour lignocellulosic feedstocks from catch crops (incurring no land use change) and short rotation coppices (SRCs). Agroforestry cultivated in stripes on arable land presents the highest environmental benefits.
- Steer the use of oil and starch/sugar crops to niche applications.[6]
- Incentivise the use of lignocellulosic feedstock, especially to produce polymers for plastics.
- Support technological innovation and biorefinery-related developments.
- Account for the land use of imported biomass feedstocks, including potential indirect land use change (iLUC), and ensure their sustainability while preventing fraudulent practices across supply chains crossing borders.
- Foster international partnerships to develop verifiable sustainable value chains for biomass feedstocks and bio-based intermediate products (e.g. biomethanol).
- Condition support to the chemical industry transformation to its transparent, measurable and verifiable contributions towards climate neutrality, higher material efficiency and circularity, healthier and more environment-friendly chemical processes and products as well as its ability to create sustainable carbon loops.

3.2.4 Transport

Making the most out of the electrification potential of road transport is crucial to steer a limited volume of sustainable biofuels towards applications where it is most needed.

- Shift the use of biofuels away from road transport and favour of electrification without delays. The strict application of the tailpipe principle, as part of revised Regulation (EU) 2019/631[7] for light-duty vehicles and Regulation (EU) 2019/1242[8] for new heavy-duty vehicles, is critical.

6 Environmental impacts differ greatly between oil vs starch/sugar vs lignocellulosic crops. This stems from differences in negative and positive externalities of the production process as well as the different land demand affecting the risk of indirect land use change (iLUC). These environmental impacts need to be accounted for when steering demand towards certain types of biomass.
7 https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A02019R0631-20250101
8 https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A02019R1242-20240701

- Support hydrogen-based e-fuels for aviation and shipping, as well as electric ships and aircrafts for short hauls, in parallel.
- Phase out conventional crop- and feed-based biofuels as soon as possible and latest by 2030.
- Steer the remaining limited amount of waste oils such as used cooking oils (UCO) and animal fats to aviation fuels and to material applications (e.g. chemicals):
  a. Given the limited UCO potential in and outside of the EU, ensure UCO are waste (combat fraud, improve the certification system) and phase out their imports,
  b. UCO and animal fats need no advanced techniques for biofuel production and are to be considered as "conventional fuel' under the Renewable Energy Directive.
- Palm oil mill effluent (POME) and oily industrial waste (or 'brown grease') are also to be regarded as critical due to likely fraudulent practices. As UCO, no advanced technology is required for biofuel production from these wastes, which need to be considered as "conventional fuels" under the Renewable Energy Directive. Consequently, the category of waste called 'Biomass fraction of industrial use' (Annex IX A (d)) would benefit from being further specified and split on transparency and sustainability grounds.
- Encourage contrails avoidance and the use of low-aromatic e- and bio-sustainable aviation fuels (SAF) on routes with the biggest contrail abatement potential to minimise the climate impacts from contrails.

3.2.5 Biogas

Biogas production can contribute to both energy and environmental goals depending on the choice of substrates, its effect (or lack of) on land use, the way organic fertilisers are applied and nitrogen managed, and whether methane leakages are addressed. Reaping the full benefits of this technology involves:

- Ensuring biogas feedstocks come first from waste such as manure and last intercrops, without altering land use (the main/annual crop remains cultivated).
- For intercrops, considering the climate proofing of crop types over time and regions, as well as the environmental benefits they offer.
- Supporting the development of the collection, transport and pre-treatment of agricultural residues.
- Ensuring the production of biogas is coupled with good practices in organic fertilizer field application.
- Addressing biogas/methane leakages in biogas and biomethane production.
- Supporting the local use of biogas in areas isolated from energy networks.
- Encouraging the recovery of excess carbon from biomethane production for usage as feedstock in industry.

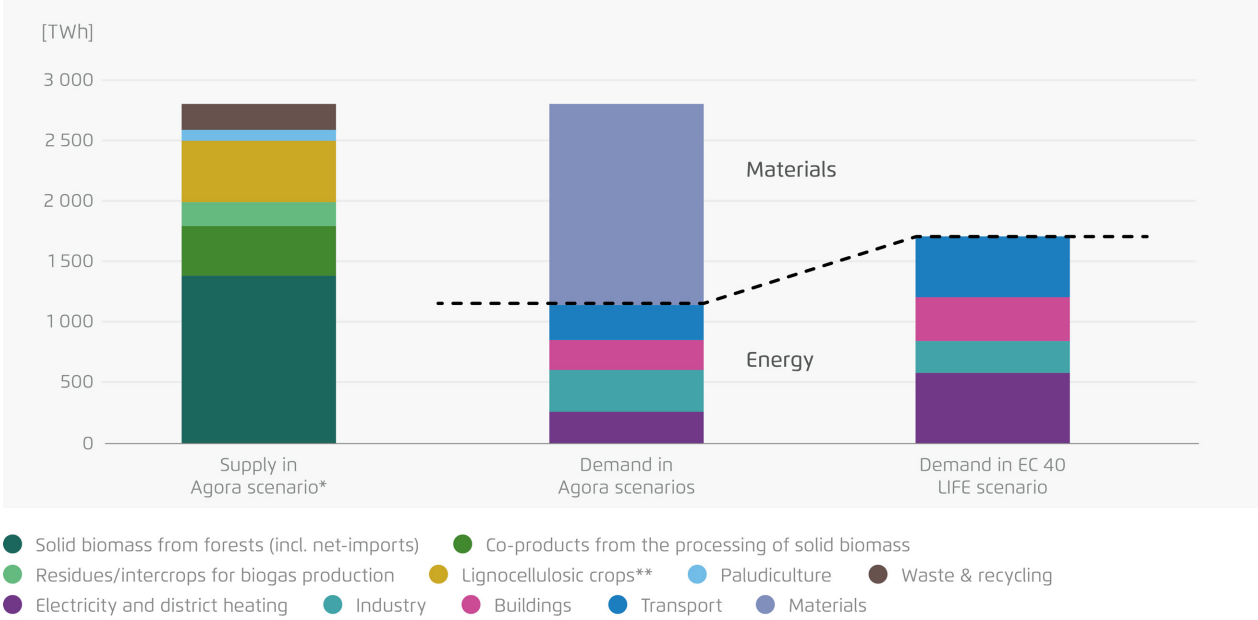
The full exploitation of the substrates potential for biogas production is limited due to yield and land use change issues (competition with food and feed). However, straw residues and catch crops not suitable for biogas production could be used as ligneous feedstocks for other applications, such as in the chemical sector.

4 Priorities for the new EU Bioeconomy strategy

4.1 Make biomass and land use constraints a key dimension of EU policy impact assessment

Currently, European policy impact assessments and their underlying **quantitative scenarios pay limited attention to the scarcity of biomass resources** and do not adequately reflect the cumulative land use effects of different policy options. As a result, the potential trade-offs related to existing and possible future policy objectives remain under-evaluated.

EU biomass supply and demand in 2050 → Figure 4



Agora Think Tanks based on Agora Agriculture (2024)[5], Agora Energiewende (2023)[9], European Commission (2024)[10].

*adapted from 2045 scenario by adjusting lignocellulosic crops; **e.g. short rotation coppices, agroforestry, miscanthus

Conducting comprehensive biomass analyses covering forestry, agriculture and biomass and integrating them with policy scenarios would improve the knowledge-base and enable better policymaking. This requires updated modelling tools and filling certain data gaps.

9 Agora Energiewende (2023): Breaking free from fossil gas. A new path to a climate-neutral Europe. URL: https://www.agora-energiewende.org/publications/breaking-free-from-fossil-gas.

10 European Commission (2024): Commission Staff Working Document Impact Assessment Report. Securing our future: Europe's 2040 climate target and path to climate neutrality by 2050 building a sustainable, just and prosperous society. URL: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52024SC0063.

Several types of analytical activities can be considered in this context:

- Identify, under different land use assumptions, the sustainable biomass supply and demand potentials across sectors, categorised by types of biomass, while explicitly considering potential trade-offs regarding climate change mitigation and adaptation, biodiversity, land use, food security and global impacts.
- Analyse the relative advantages and disadvantages of different uses of biomass relative to alternative climate change mitigation options, taking into account the technological readiness of various applications, their system costs and subsequently, the substitution potential of biomass.
- Assess the direct and indirect impacts of EU legislation and policies on the investment and management decisions of land users, the supply of biomass, the demand and efficient use of biomass and on biomass imports and exports. This especially in view of apparent incoherences between elements of the Renewable Energy Directive, RePowerEU and the Net Zero Industry Act on the one hand, and policy objectives related to climate, nature restoration and land use on the other, including the Land Use, Land-Use Change and Forestry (LULUCF) Regulation and Nature Restoration Law.[11]
- Evaluate the international trade dimension of EU biomass supply and demand and identify safeguards against carbon, water and land leakage and the offshoring of other adverse environmental and social effects of EU biomass systems.

4.2 Create an enabling policy environment for a competitive, resilient and sustainable bioeconomy

4.2.1 Steer biomass use away from energy and towards materials, favouring long-lasting materials and hard-to-electrify applications

Steering biomass use towards long-lasting materials and applications that are hard to electrify is essential to optimise its contribution to climate mitigation and resilience. The current EU policy framework on biomass use for energy and materials reveals significant and costly trade-offs, particularly in relation to the sustainable management of natural resources and climate change mitigation.

Certain safeguards, such as the cascading principle and no-go areas for forest biomass, exist. However, these appear insufficient to incentivise a balanced biomass supply and demand in the context of long-term policy objectives. The projected scarcity of biomass resources and limited resilience of forest ecosystems are at odds with several policy objectives in current and forthcoming legislation, including the Renewable Energy Directive, the LULUCF Regulation, the Nature Restoration Law and upcoming measures of the Clean Industrial Deal. Given the constraints on biomass availability, policy adjustments are necessary to steer the limited biomass supply for energy, materials, and feedstock towards:

- **Long-lasting and circular uses** of biomass for materials and products.
- **Sectors and applications where bioenergy brings the most value added** because they are harder to electrify, especially high-temperature heat in industry and aviation.

11 Agora Energiewende (2024): EU policies for climate neutrality in the decisive decade: 20 initiatives to advance solidarity, competitiveness and sovereignty. URL: https://www.agora-energiewende.org/publications/eu-policies-for-climate-neutrality-in-the-decisive-decade

This involves **advancing the following set of policy developments** over time:

- Enhance action on implementing the cascading principle, by further developing bio-based value chains, incentivising carbon storage in products and services, and supporting forest owners in access to new markets.
- Introduce targets for bio-based products to create demand and spur product innovation in certain key sectors, including materials in construction and polymers for plastics in chemicals.
- Improve the monitoring, reporting, and verification framework for emissions from the combustion of biomass, including emissions from biomass imports.
- Review the practice of categorising forest biomass as a zero-emissions energy source in the EU emissions trading system (ETS), by taking into account net-emissions from burning biomass, incl. the carbon debt incurred by wood harvesting as well as its effects on forest growth.
- Phase out food and feed crops from biofuels under the Renewable Energy Directive. Steers the remaining limited amount of waste oils such as used cooking oils (UCO) and animal fats to aviation fuels and to material applications (e.g. chemicals). Refine and specify further the category 'Biomass fraction of industrial use' (Annex IX A (d)) on transparency and sustainability grounds.
- Ensure that the legislated fuel mandates for e-fuels in shipping and aviation can be fulfilled by overcoming current financing hurdles for e-fuel projects which are yet to reach final investment decisions (FIDs). This includes targeted public funding mechanisms to reduce financing risks and facilitate offtake agreements.
- Develop provisions for biomethane leakage under the Methane Regulation and explore alternatives for the increasingly complex sustainability certifications, such as demand side limitations and capping permits for new bioenergy installations.
- Assess different policy instruments for transforming the chemicals industry, focusing on plastics, towards the use of sustainable biomass feedstock:
  - Prioritise material substitution away from plastics and optimised material use to lower the demand for plastics.
  - Boost the recovery, sorting and recycling of plastics to minimise the need for virgin feedstock over time.
  - Steer the use of bio-based feedstocks away from oil and starch or sugar towards ligneous biomass over time, favouring waste and residue streams.
  - Build transparency and improve data availability regarding bio-based chemicals along the value chain, incl. feedstock sourcing to enable monitoring and the tracking of progress.
- Develop a strong sustainability framework for biogenic carbon capture and storage (BECCS or other Bio-CCS)) that incentivises carbon removal from sustainable biomass.
- Develop an 'EU Industrial Direct Electrification Action Plan' that includes favouring the use of biomass-based fuel for high temperature heat (>500 degrees Celsius) and require Member States to develop industrial heat plans as part of their National Energy and Climate Plans (NECPs).

4.2.2 Establish new bioeconomy value chains, with a strong focus on sustainable demand

Today, a lack of confidence prevails that a bioeconomy in support of climate neutrality will deliver real economic opportunities for land users and rural areas. To incentivise a balanced demand and supply of biomass, the **production of diverse biomass types** is necessary to prevent scarcity, meet different sectoral requirements for biomass products and produce without compromising ecosystem resilience.

At the same time, the **creation of new or the expansion of existing bioeconomy value chains can strengthen rural economies** by creating new income opportunities for farmers, forest owners and rural communities. Scaling-up bioeconomy value chains, with a special focus on shifting and generating production and demand

for sustainable bioeconomy applications, requires a reliable long-term policy environment with appropriate financing mechanisms.

- A suitable **mix of policy instruments** can strengthen demand for sustainable circular and climate-friendly materials and scale up bioeconomy value chains, for example in the construction but also in other sectors including the automotive sector. The introduction of quotas for bio-based insulation materials, sustainable or green public procurement and setting CO_2 requirements for products can be effective policy instruments to kick-start the demand for specific biomass types, such as paludiculture biomass or agricultural residues.

- Alongside demand creation, adequate **financing** is required for the establishment of future-proof bioeconomy value chains. Depending on the maturity of the value chain, opportunities would need to be targeted at different stages of value chain development, ranging from research and innovation to marketing and scaling. Connecting key actors across the public and private sectors will be essential to succeed at creating strategic decisions at scale. In the context of the current and next EU Multiannual Financial Framework (MFF) it is therefore worth considering a **budgetary mechanism** that would establish a process to help prioritise strategic investments in future-proof food and bioeconomy value chains and create synergies between European, national and private funding, including from the European Investment Bank.[12]

- **Innovation and technology** are key in driving the development of a sustainable bioeconomy. The development and scaling of new applications of biomass (feedstock for chemicals, textiles, new construction materials, among others) require innovation to valorise waste and residues, improve conversion ratios, reduce costs, and enhance product properties, among other goals. The production process of biomass for the bioeconomy can also be optimised through technological progress, including via plant breeding or innovative machinery for planting and harvesting of paludiculture biomass on rewetted peatlands. Innovation in food products and processing technologies can help bring new, more sustainable and tasteful products to the market.

4.2.3 Incentivise land-based ecosystem services

Activities that provide land-based carbon removals, biodiversity and climate adaptation are an integral part of the bioeconomy. Important **synergies can be achieved between biomass production and the provision of ecosystem services,** for example, through agroforestry, paludiculture and lower intensity pasture-based livestock systems. Creating viable business models for farmers and forest owners to engage in such management practices will be critical. Trade-offs with other incentives for the use of land and biomass will have to be understood and carefully managed in this context.

- **Carbon removals** are key to helping achieve climate neutrality and, in the longer term, for withdrawing CO_2 from the atmosphere. To date, nearly all removals in the EU result from land-based ecosystem services, especially forestry. The EU is currently not on track to meet the net removal target of 310 $MtCO_2eq$ for 2030 under the LULUCF Regulation. This signals a strong need to scale up incentive mechanisms that reward farmers and forest owners for carbon farming, especially for the more robust options such as afforestation and agroforestry, as well as long-lasting harvested wood products.

  Designing a climate policy for the land use sectors, including an adjusted EU target for land-based removals and measures to enhance the resilience of forest ecosystems, can provide a long-term perspective and

12 Agora Agriculture (2025): Enhancing budgetary performance: The future of agricultural spending in a streamlined EU budget. URL: https://www.agora-agriculture.org/publications/enhancing-budgetary-performance-the-future-of-agricultural-spending-in-a-streamlined-eu-budget

generate certainty and strong incentives.[5] The Carbon Removals and Carbon Farming (CRCF) Regulation can facilitate these processes if based on credible certification methods and if sufficiently strong demand for purchasing credits is ensured, including through tax breaks for companies that buy removal certificates to enhance their climate contribution.

– Rewarding farmers for the provision of **biodiversity-related public goods,** such as introducing and maintaining semi-natural landscape features, as well as incentivising climate adaptation measures, is key for enhancing ecosystem services in the bioeconomy and strengthening the resilience of the land use system. The Common Agricultural Policy (CAP) has a big role to play in this. The CAP's performance in delivering on these objectives will be improved if basic income support is gradually phased out in favour of more effective spending focused predominantly on rewarding the provision of public goods. Furthermore, changes in production practices that enhance the agricultural sector's ability to adapt and transform for greater resilience could be supported by transition funding instruments.[12]

– The concept and use of **"nature credits"** requires further exploration in the context of forestry and farming to strengthen the synergies between the Nature Restoration Law as well as other EU environmental legislation, and the bioeconomy. Such credits will need to be based on a solid methodology and significant attention is needed to creating a business case for their use.

4.2.4 Reduce the land footprint of food and feed production through changes in food demand

Changes in food demand towards **healthier, more plant-rich food consumption patterns** and a **reduction in food waste** are key building blocks of a competitive, resilient and future-proof bioeconomy. By **reducing the land footprint of food and feed production,** it allows to increase biomass supply for materials, feedstock and energy, while avoiding an expansion in the EU's global land footprint, allowing to secure the forest carbon sink and reducing agriculture-related greenhouse gas emissions.

– The introduction of **demand-side food policies** presents an untapped opportunity to facilitate more sustainable and plant-rich food consumption patterns. Demand-side policies focused on creating fair food environments improve the availability, affordability, appeal and information on foods that contribute to healthier and more sustainable diets, making the healthy and sustainable choice easier for consumers. National integrated food strategies and action plans supported by an enabling European policy environment can serve as an important policy vehicle.[13]

– **Reducing food waste and directing the remaining waste for use in the bioeconomy** improves resource efficiency and reduces the land and environmental footprint of the food system. Despite political commitments made at the EU and national levels, action taken so far by member states has not led to a significant reduction in food waste levels. Actions to be taken include adopting EU-wide legally binding food waste reduction targets, incorporating food loss and waste in primary production into these reduction targets and improving the robustness of food waste data measurement. Moreover, permitting safe methods for utilising catering waste as feed for non-ruminants would contribute to the circularity of the food system.

13 Agora Agriculture and IDDRI (2025): Towards food policies that support healthy and sustainable consumption. Country case studies and the role of EU food policy. URL: https://www.agora-agriculture.org/publications/towards-food-policies-that-support-healthy-and-sustainable-consumption

4.3 Introduce effective governance mechanisms

In recognition of the scope and complexity of the bioeconomy, the background document for this consultation mentions that "many key challenges, barriers and trade-offs in relation to production, processing and use of natural resources and biomass" are better addressed or coordinated at an EU level. It also refers to the need to introduce an "enabling framework" for important cross-cutting measures.[14]

This requires a **reflection on how the implementation of the updated Bioeconomy strategy will be governed** and to consider ways to facilitate alignment and coherence between the bioeconomy and other EU policies and related national implementing instruments. These include the National Energy and Climate Plans, National Restoration Plans and CAP Strategic Plans.

Two aspects of an effective governance of the new EU Bioeconomy strategy can be considered:

- **Establish a coordination framework for biomass and land use in the bioeconomy.** Such a framework could help establish a long-term perspective for the bioeconomy through an evidence-driven and consultative process. It would support an understanding of the trade-offs and synergies related to biomass and land use and by outlining key definitions, objectives and principles, guide future policy efforts, including EU-wide and national ones. It could also establish an institutional process to enhance policy coordination for key cross-cutting topics and support policy coherence across different bioeconomy-related policies.

- **Introduce a Biomass road map for the Bioeconomy strategy.** This can serve as a mechanism for setting strategic priorities and identifying, in a coherent and sequenced manner, the milestones and actions required in the coming months and years for the effort to balance the demand and supply for biomass as part of a competitive, resilient, and sustainable bioeconomy. Apart from guiding EU policy development, such a road map could also strengthen (ongoing) policy processes at national and regional levels. A regularly updated biomass dashboard can help monitor and identify trade-offs in a timely manner and provide a tool for involving member states, experts, and other stakeholders in deliberations on effective policies for the bioeconomy.

14 European Commission (2025): Call for evidence for an initiative without impact assessment. Towards a Circular, Regenerative and Competitive Bioeconomy. Ref. Ares(2025)2559560. URL: https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/14555-Towards-a-circular-regenerative-and-competitive-bioeconomy_en

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Agora Energiewende, Agora Industry and Agora Agriculture develop scientifically sound and politically feasible strategies for a successful transformation to climate neutrality – in Germany, Europe and internationally. The organisations which are part of the Agora Think Tanks work independently of economic and partisan interests.

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