



EUROPEAN
COMMISSION

Brussels, XXX
[...] (2025) XXX draft

**COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN
PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL
COMMITTEE AND THE COMMITTEE OF THE REGIONS**

A Strategic Framework for a Competitive and Sustainable EU Bioeconomy

{SWD(2025) xxxxx}

INTRODUCTION

The bioeconomy is a strategic opportunity of the 21st century — a driver at the intersection of green growth, competitiveness and resilience, as recognised in the Competitiveness Compass¹ and the Clean Industrial Deal². It mobilises Europe's biological resources, scientific excellence and industrial base to substitute fossil-based materials and deploy innovative solutions for the economy which have positive impacts on climate, nature and society.

The bioeconomy is defined as the economic activities based on the sustainable use of biological resources. These include goods, services, knowledge and technologies in sectors ranging from agriculture, forestry, fisheries and aquaculture to biomass processing, biomanufacturing and biotechnologies in food, health, industry and to ecosystem services. Biological resources³ include genetic resources, primary and secondary biomass resources, such as by-products and residues, and biogenic carbon captured through innovative technologies.

The EU can build a strategic vision for a thriving bioeconomy on strong foundations: world-class science, cutting-edge biotechnologies, a competitive industrial base, a Single Market of 450 million consumers and 26 million companies⁴, significant biomass production⁵ by EU farmers, foresters and fishers, and a deep commitment to sustainability and circularity.

With a value of up to EUR 2.6 trillion⁶ (when combined with service activities), the EU bioeconomy is a dynamic driver for competitiveness. Biomass demand nearly doubled between 1970 and 2020, highlighting its increasing strategic importance⁷. In 2022, biomass producing and converting activities employed 17.2 million people (8% of EU jobs) and generated EUR 812 billion in value added (5% of EU GDP⁸). Over the past decade, bioeconomy sectors have grown faster than the overall economy.

Innovation and investments are the engines of competitiveness. In 2022, R&D investment in bioeconomy-related sectors reached EUR 20.9 billion (9% of EU business on R&D), while patents in these fields accounted for 5% of total EU filings (2008-2020⁹). The EU has built strong positions in areas such as bioenergy, biomanufacturing, and precision fermentation. Many of these innovations are now ready to move from niche to mainstream. The EU bio-based industries¹⁰ represented in 2022 over 0.5 billion of value added¹¹.

While established bio-based industries (food, beverages, pharmaceuticals, bioenergy, and personal care) are addressed through dedicated EU legislation, this Strategy prioritises emerging lead markets with transformational potential for the European bioeconomy. **Biochemicals, biopolymers, bioplastics, textiles and natural fibres, biobased construction products and biofertilisers/biopesticides** emerge as lead markets with the

highest potential for systemic decarbonisation. **Integrated biorefineries and advanced fermentation** are key enabling technologies.

This Strategy builds on the implementation of the 2012 Bioeconomy Strategy and its comprehensive reviews of 2018¹² and 2022, which confirmed both the economic significance of the European bioeconomy and the imperative to intensify efforts on sustainable production and consumption patterns, particularly through circular, regenerative value chains and prudent resource management.

This Strategy responds to the 2023 Council Conclusions, which called for the mobilisation of rural and coastal areas through the development of new value chains, diversified income opportunities, and innovation, thus creating jobs, ensuring fair transitions, and rooting the bioeconomy in local communities. It also draws directly on the European Council Conclusions of 27 June 2024, adopted under the Strategic Agenda 2024–2029¹³. In these Conclusions, EU leaders committed to boosting the Union’s competitiveness, scaling up clean and bio-based technologies, strengthening food and resource security, and accelerating the transition toward sustainability.

The Strategy draws on extensive input received via several consultation activities such as call for evidence, targeted workshops and high-level stakeholder events, as well as on the results¹⁴ of the public consultation¹⁵. Informed by dialogues with Member States, industry, academia and NGOs, it directly reflects the challenges highlighted by stakeholders: **(1) scaling innovation and investments (2) building lead markets for bio-based materials and technologies, (3) ensuring sustainable biomass supply for the value chains and (4) harnessing global opportunities.**¹⁶

1. BIOECONOMY INNOVATIONS AND INVESTMENTS: FROM LAB TO DEPLOYMENT

The past decade shows the potential of innovation at scale¹⁷. Value added from novel bio-based materials is rising fast in chemicals, construction and textiles¹⁸. By integrating biotechnology¹⁹ with social and business model innovations²⁰, bioeconomy solutions offer transformative opportunities²¹. European innovators can thrive in dynamic ecosystems created by public-private partnerships²⁵, venture instruments²⁶ and regional initiatives supporting specialisation and comparative advantages²⁷. On the other hand, we learn how persistent barriers^{22, 23, 28–29}—regulatory complexity, fragmented markets, fossil cost advantages and financing gaps—are slowing deployment³⁰ and risk diverting innovation to non-EU markets³¹. To maximise the potential of bioeconomy in the EU, such barriers must be dismantled, and the success factors must be replicated and scaled up.

1.1. Removing barriers

Regulatory barriers and authorisations

Regulatory complexity remains a major challenge. The fast pace of innovation—especially in biotechnology—requires an in-built dynamism allowing regulatory frameworks to adapt without constant change. Market entry is often delayed because public authorities are uncertain how to treat novel bio-based products that do not clearly fit within existing legally recognised categories^{24,25}. Divergent national rules and interpretations and conflicting EU rules also result in market fragmentation that increases the cost of doing business, especially for SMEs. A shared definition of bio-based materials, products and technologies is urgently needed.

The Commission will **simplify and accelerate approvals** for high-impact products, tackling regulatory barriers and fragmentation notably in the EU Biotech Act and by simplifying the legal framework applicable to biopesticides.

Biotechnology and biomanufacturing stand to benefit greatly from the **development of industry-wide standards**. To support the development of standards and metrics in these complex and fast-evolving fields, the Commission will adopt a European framework for bioeconomy standards and metrology. The initiative will be bolstered by a network of infrastructures dedicated to testing and refining biological and biodata pre-standard proof-of-concepts in situ, ensuring their practicality and effectiveness across the industry. This should provide a strategic vision and predictability and engage businesses in the development of biotechnology and biomanufacturing standards and metrics to fast-track their development in a coherent manner.

Market access

Bio-based products face cost competition from fossil alternatives. The Commission will strengthen demand by leveraging bio-based content requirements, green procurement, and off-take agreements. The ongoing review of the Product Environmental Footprint (PEF) method will help enhance the assessment, comparability, and market visibility of bio-based products, through revised rules for biogenic carbon accounting and for the modelling of circular economy aspects and agrifood systems. It will also provide high quality data to support such assessments. Additional incentive schemes to stimulate demand for bio-products²⁶ will be explored to create stronger and more reliable market signals.

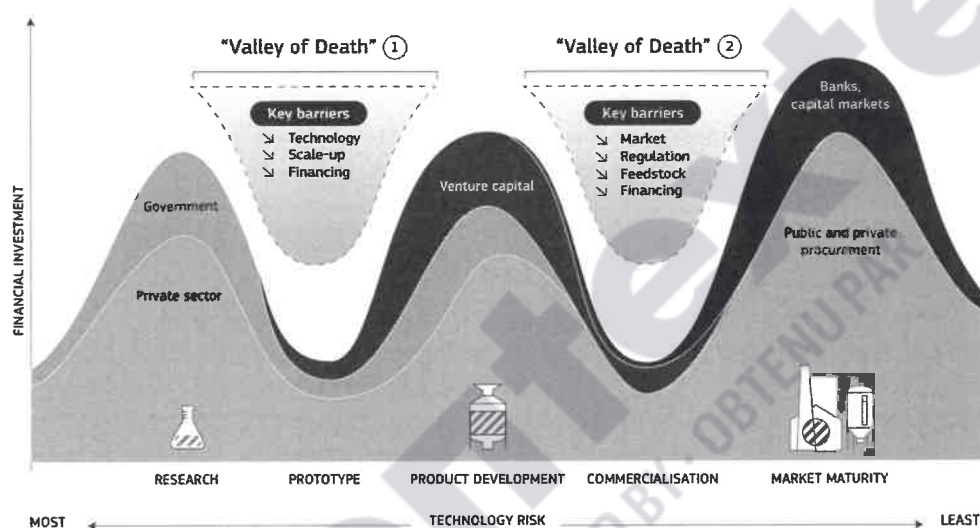
1.2. Stimulating innovation and investments

Scaling-up bioeconomy innovations requires more than scientific excellence and a dynamic community of innovators and entrepreneurs — it requires a robust, coordinated EU financial ecosystem that enables innovators to thrive in Europe. Yet today, financing remains a critical bottleneck and is fragmented across the innovation journey from idea to commercialisation to growth. Bio-based technologies and industrial biotechnology are capital-intensive, requiring substantial upfront investments in R&D, demonstration, and manufacturing infrastructure. Despite support from EU instruments²⁷, early-stage funding for bioeconomy ventures is persistently scarce. Venture capital is limited. It is hindered by lack of awareness about the bioeconomy, the sector's longer development cycles, higher

technical risks than for digital or high-tech sectors²⁸, the wide variation in bio-based raw materials, and a lack of parity with fossil-based alternatives. Start-ups having proven their worth have difficulty finding scale-up funding. Fragmented capital markets, funding gaps across the innovation lifecycle, and a limited pool of specialised investors compound the problem.

The deployment of bio-based innovations faces two critical “valleys of death” where financing gaps threaten scale-up and market entry. The first valley arises between pilot and industrial scale. Here, high capital needs, long investment horizons, and technological risk deter private financing. As a result, many promising innovations fail to advance beyond demonstration, despite strong scientific validation.

Figure: Two valleys of death in scaling bioeconomy in Europe



Source: EC scheme based on the public consultation results and own analysis

Support for pilots and demonstrations

Access to piloting and upscaling infrastructure is limited. The Commission will support demonstration activities through the Circular Biobased Joint Undertaking (CBE JU), by creating clusters of flagship projects and facilitating access to the best available pilots. This will ensure that innovators can test, scale, and bring solutions closer to market.

In addition, the Commission will work with Member States and industrial players to establish an Important Project of Common European Interest (IPCEI) on biotechnology, enabling cross-border cooperation on breakthrough bio-based innovations. This initiative will leverage state aid frameworks to support the industrial scale-up of cutting-edge solutions that enhance Europe’s competitiveness, resilience and strategic autonomy.

De-risking investments in scaling up innovation

The EU needs to reduce investment risks, mobilise blended finance, and strengthen the financial viability of breakthrough bioeconomy solutions²⁹. Access to both early- and late-

stage venture finance will be reinforced, with specific attention to attracting bioeconomy-focused investors and impact-driven funds that can support long-term, capital-heavy projects.

In July 2025, the Commission presented its proposal for the next Multiannual Financial Framework (MFF 2028–2034), anchored in the Competitiveness Compass. Within this framework, the creation of the European Competitiveness Fund (ECF) introduces four dedicated policy windows, including one on health, biotech, agriculture, and the bioeconomy. This “bioeconomy window” is designed to mobilise large-scale investment and de-risk industrial deployment, bridging the gap between research, innovation, and market upscaling. By integrating support for value chains, IPCEIs, and SME participation, it offers a seamless investment journey – from pilot to deployment – for Europe’s sustainable bio-based solutions.

Following the success of the Circular Biobased Joint Undertaking (CBE JU), the Commission will engage from 2026 onwards in updating its governance and, working with the private sector and other stakeholders, will aim to develop and operationalise a new public-private collaboration under the next Multi-Annual Financial Framework (2028-2034) to support and derisk breakthrough close-to-market innovation. In addition, it will increase the budget of the 2027 work programme of CBE JU.

To support innovation and strengthen investor confidence, thereby unlocking private capital and accelerating industrial deployment of bio-based solutions, the Commission will revise the EU Taxonomy to integrate sustainable biomanufacturing and other bio-based economic activities, ensuring their recognition as key enablers of the green transition.

In parallel, the Commission will reinforce the support for innovation ecosystems, streamlining and increasing R&I funding for bioeconomy innovators through Horizon Europe, and — starting in 2028 — mobilising dedicated funding under the European Competitiveness Fund. The European Innovation Council will enhance its support through a dedicated Scale up Fund.

The EU primary producers for biomass, the farmers and forest holders need to engage and invest in innovative market models. The Common Agricultural Policy (CAP)³⁰ offers various support models for cooperation and cooperative investments in bottom-up processing and marketing new value chains, valorising untapped biomass, and rural proofing of R&I investments.

Actions	Timeline
(SANTE, ENV, GROW) Define bio-based materials and products under the forthcoming Biotech Act	3Q2026
(RTD, GROW, ENV) Propose a European strategic framework for bioeconomy standards and metrology	2Q2027
(COMP, ENV, GROW, AGRI) Partner with Member States and industry to establish an Important Project of Common European Interest (IPCEI) on Biotech	4Q2025
(ENV) Revised Recommendation on the use of Environmental Footprint (EF) methods and provision of data	XQ2026

(ENV, FISMA, GROW, EIB) Revise the EU Taxonomy to include sustainable biomanufacturing and other bio-based economic activities and align them with the EIB eligibility criteria	4Q2025
(RTD, GROW, ENV) Update the governance and strategic agenda of the Circular Biobased Joint Undertaking	2Q2026
(AGRI) Support co-operation of primary producers to drive joint investments in innovative bio-based value chains through rural network (under the CAP)	XQ2026
KPI 1: Number of EU-funded scale-up bio-based projects reaching industrial deployment (TRL 8–9) KPI – Volume of private capital leveraged by EU bioeconomy instruments (EUR/year)	

2. DEVELOPING LEAD BIOECONOMY MARKETS

2.1. Materials and technologies

To continue developing the bioeconomy it is essential to identify and promote lead markets where bio-based innovations have the highest potential for economic growth, environmental impact, circularity and scalability. Without targeted support and strategic investments, these markets are at risk of growing at a pace below the GDP average, limiting their transformative potential. These lead markets can be divided in two areas: *materials* for the manufacturing of bio-based goods and *technologies* that convert biomass into intermediate materials.

Materials

- **Bio-based plastics and polymers** replace fossil-based materials with materials based on renewable biomass sources (e.g. starch, lignin or microorganisms). The volumes of these feedstocks are expected to increase in the coming years, enabling the continuous growth of this sector: biopolymer production is expected to double by 2040. In terms of potential, bio-based plastics and polymers can be used in packaging, automotive parts and many other material uses, as initial technical limitations such as mechanical or thermal resistance are constantly being improved through innovations, often supported by AI-powered research³¹. Biomass for this sector can be sourced from primary sources, from secondary sources agricultural or forestry by-products and waste, algae, or even fungi and microorganisms, which enables diverse solutions to adapt production to the availability of local biomass, providing additional revenue sources for farmers and foresters. However, high production costs, low demand, lack of harmonised technical standards and biodegradability testing methodologies, together with unclear end-of-life management guidelines have led to market fragmentation. This confuses both producers and consumers, leaving room for misleading claims or greenwashing.

Measures under the **Circular Economy Act** will address feedstock availability by improving collection and addressing inconsistent waste classification, which hinders availability of secondary raw materials.

The Commission will explore ways to increase biopolymers production volumes and improve their competitiveness through greater economies of scale. Measures will include establishing a clear definition for bio-based materials (**Biotech Act**), harmonizing

certifications, and extended producer responsibility and take-back schemes which will contribute also to the circularity of such materials.

Furthermore, under the **Packaging and Packaging Waste Regulation**, the Commission is required to review by February 2028 the state of technological development and environmental performance of biobased plastic packaging and, if appropriate, will bring forward sustainability requirements and targets for such plastics, as well as the recognition of novel bio-based materials which meet these requirements. It will do so with a view to increasing the uptake of such materials in complementarity with recycled content. The sustainability requirements will be designed with a view to allow congruent policy measures for biobased plastics for uses beyond the packaging applications.

- **Bio-based fibres** for use in textiles encompass the production, processing, and commercialisation of applications derived from natural renewable resources as well as innovative bio-based alternatives developed from agricultural by-products, cellulose, or biopolymers. Natural fibres like cotton, flax, hemp, and wool – as well as man-made cellulosic fibres (e.g. viscose, lyocell) – are renewable and increasingly in demand. The EU leads in flax and hemp production yet faces bottlenecks in processing and spinning capacity. Additionally, natural fibres are at a competitive disadvantage with synthetic fibres due to higher production costs and traceability requirements for key raw materials such as wood and wood pulp (EU Deforestation Regulation), which are not in place for fossil-based textiles.

Bio-based textiles present a strategic opportunity to revitalise a historical manufacturing sector in the EU while reducing microplastic pollution. Eco-design requirements for textiles, due to be presented by the Commission in 2027, will support this transition by increasing market demand.

A dedicated focus group (under the Common Agriculture Policy Network) is working on reinforcing the EU wool value chain, providing new income sources to farmers through waste valorisation strategies and developing the necessary processing infrastructure.

- **Bio-based chemicals** are chemicals derived from renewable biological resources, such as plants, algae, and agricultural waste, as opposed to traditional petroleum-based feedstocks. This sector includes the development and commercialisation of biochemicals used in a wide range of industries, including plastics, pharmaceuticals, food and beverages, textiles, and personal care products. As acknowledged by the Chemical Industry Action Plan³², the sector plays a key role in the transition to a circular bioeconomy. Biochemical production is projected to nearly double by 2040, reaching ~15% market share, with policy support boosting the trade balance potential. Identified barriers for upscaling include 2-3 times longer authorisation processes than other jurisdictions (e.g. US), and high feedstock prices due to competition with energy uses.

The Commission will examine as a priority, including in the context of the **Biotech Act**, the measures required to accelerate the authorisation processes for bio-based chemicals.

- **Bio-based construction materials** involve the development, production, and application of building materials derived from resources such as wood, bamboo, straw, hemp, mycelium, and other plant-based or organic materials. This sector emphasises sustainable construction practices by reducing reliance on fossil-based materials, lowering carbon footprints, enhancing energy efficiency, and promoting circularity and biodegradability within the built environment. The climate benefits of replacing energy-intensive products (e.g. concrete) by bio-based alternatives are further enhanced by the carbon sequestration potential of these materials. The wood industry, as the main material provider, is set to continue the progressive growth trajectory of the last decades, supported by improved standardisation, circular innovations, and trade balance gains. Novel technologies such as bio-carbon fibres promise even higher climate change mitigation potential. The technical barriers identified for increasing the commercial adoption of these solutions relate to the lack of processing infrastructure for innovative products such as hemp-based concrete, which often require special equipment (e.g. decortication) or different conditions (e.g. lower melting points of bio-resin vs traditional cement). In addition, bio-based construction products suffer as well from lower visibility due to the lack of demonstration projects.

EU initiatives to overcome these obstacles include dedicated projects (e.g. Circular Reno) and revising related policies to facilitate standardisation and certifications (Construction Products Regulation).

- **Biofertilisers and biopesticides** include microorganisms or organic compounds that improve soil fertility and promote plant growth through processes like nitrogen fixation and nutrient solubilisation, and natural substances (such as microbes, plant extracts, and other biologically active compounds) that manage pest populations and reduce crop damage. Substituting mineral with circular bio-based fertilisers reduces gas dependency, lowers carbon footprints, and strengthens EU strategic autonomy while turning local organic waste into economic value for farmers. Biopesticides contribute as well to reducing the environmental impacts associated with synthetic chemicals. The current regulatory framework involves 2-3 longer authorisation times in the EU compared to other markets, which not only hinders this transition, but also benefits larger companies as SMEs lack financial resources to accompany these lengthy processes. Consequently, there has been a net loss on biocontrol active substances in the EU over the last years³³. Projections indicate that the market share of bio-based fertilisers and pesticides significantly increase by 2040 with an adequate framework that includes streamlined licensing, incentives, and greater product visibility and farmers awareness.

To address existing challenges and seize these opportunities, the *EU Vision for Agriculture and Food* is focusing on accelerating access-to-market times for biopesticides. In parallel, the CAP Development Network is promoting the use of agricultural waste and animal by-products to further enhance farmers familiarity and uptake rates of biofertilizers.

Technologies

- **Biorefineries** involve the processing and conversion of biomass—particularly biowaste—into a range of valuable products including biofuels, biochemicals, biomaterials, and energy. This sector integrates advanced technologies to optimise

biomass transformation, co-generation of energy and materials, as well as nutrient recycling. Biorefineries are vital for improving the efficient and circular use of locally and regionally available biomass and reducing import dependencies. However, these tend to be large-scale infrastructures that require significant capital expenditure and undergo complex permitting procedures, whilst suffering from higher production costs than fossil-based counterparts that undermine their competitiveness in price-sensitive markets.

Strengthened industrial symbiosis would be a key enabler for this sector to secure stable feedstocks supplies and preventing biomass scarcity that undermine investors' confidence. In addition, the EU will continue exploring paths to increase investments in biorefineries with the support of the European Investment Bank³⁴, which would further contribute to de-risking investment in these infrastructures.

- **Advanced fermentation** uses innovative, high-performance microbial fermentation processes to produce a wide range of materials and bioenergy, offering significant potential for waste valorisation, which can enable new income sources for primary producers and the waste management sector. These fermentations often involve AI-powered genetic engineering and metabolic pathway optimisation, as well as other innovative techniques to enhance efficiency, scalability, and product yield. The barriers for the development of this sector include infrastructure gaps and the large capital expenditures required for upscaling activities, high market fragmentation, or low technological maturity.

The establishment of Industrial Symbiosis Valleys will improve feedstock availability forecasts together with investments on R&I and infrastructure development. The Biotech Act will create an enabling environment to accelerate piloting, testing and access to market for fermentation products (amongst other), including food and non-food uses. This will help companies refine products faster and build consumer acceptance, which will facilitate a stronger demand that allows for greater economies of scale, reducing production costs and obtaining competitive prices.

The EU must also identify and tap into new sources of biomass such as those offered by the blue economy. There is potential in valorising side-streams from fisheries and aquaculture, such as by-products (e.g. trimmings from fish, shells from molluscs, and sludge from fish farming), which are often discarded. This biomass can provide alternative and sustainable ingredients and raw materials to many industrial sectors (e.g. fertilisers, feed, construction, and pharmaceuticals). The future EU Blue bioeconomy innovation initiative aims at putting together all the relevant actors to untap the large potential of renewable aquatic biological resources to help build these value chains across the EU. Moreover, the EU4Algae platform already gathers 1200 actors around algae production and use.

To accompany these changes, the Commission will launch the '*BioMade Europe Alliance*' (EBMA), a voluntary initiative of leading EU companies committing to collectively purchase of EUR 10 billion value in bio-based materials, products and applications by 2030. The alliance will build early market demand for sustainable biomaterials, focussing on lead markets and their supply chains. Anchored in the successful CBE JU and cooperating with the Biobased Industries Consortium (BIC), the EBMA will gather legally

sound, measurable corporate commitments in a dedicated digital platform that will track progress, ensure traceability, and mobilise private investments.

The Commission will explore, within the recast of the Public Procurement Directive, how to promote bio-based materials and products holding resilience, climate and environmental benefits compared to their fossil-based alternatives.

2.2. Levelling the playing field between competing biomass uses

In 2022 biomass use in Europe was dominated by animal feed (38%), followed by energy (28%), materials (26%), and food (9%)³⁵. Over the last 10 years, biomass used for energy increased by 11%, surpassing other uses such as materials. Competing demands for biomass are expected to increase. Biomass should therefore be directed where it delivers the highest value to decouple growth in the bioeconomy from demand for biological resources, ensuring resilient bio-based value chains and lessening pressure on ecosystems.

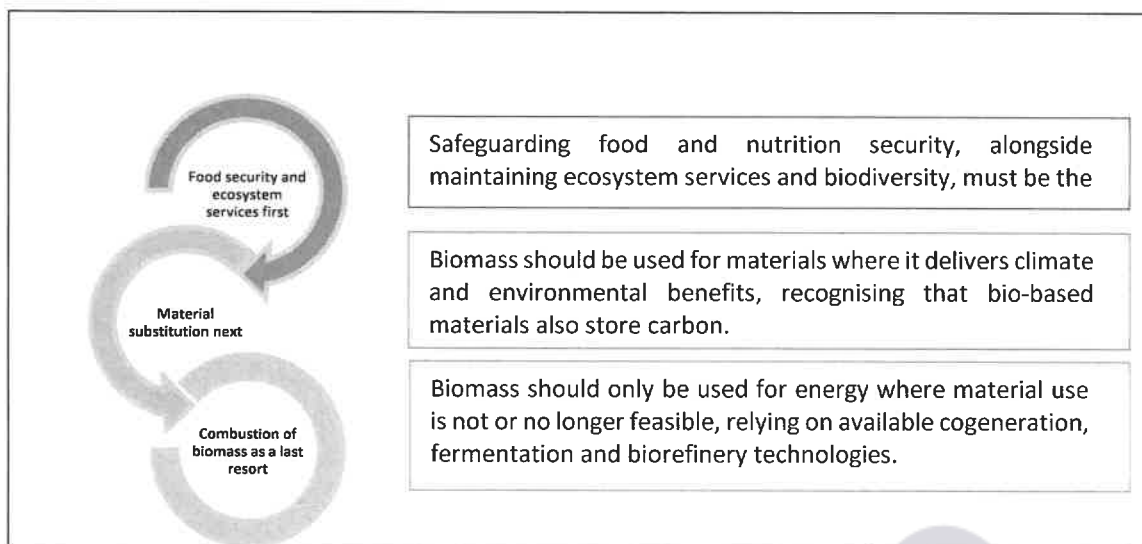
The Renewable Energy Directive³⁶ mandates that biomass be used where it provides the greatest environmental and economic benefits and limits the support of energy use to biomass sourced in line with this so called “cascading principle”.

This strategy includes an important set of actions to support material use of biomass, thereby further encouraging use of biomass to higher value uses.

The hierarchy of uses should be systematically mirrored across EU, national and regional policy and financial instruments, while allowing flexibility for local conditions and market realities. Going forward, the allocation of public funding and the identification policy priorities in tools such as CAP Strategic Plans, National Energy and Climate Plans, Cohesion Policies and national and regional Bioeconomy Strategies should direct state aid and subsidy frameworks to avoid prioritising biomass combustion over material use. Where energy use is prioritised, it should primarily be in high-efficiency combined heat and power systems or as a last step after material use, reflecting circularity and security of supply in rural areas. To further support market players in using biomass where it provides the greatest environmental and economic benefits, the Commission will strengthen the robustness and coherence of already set reporting and monitoring mechanisms and will create through the Bioeconomy Knowledge Centre a community of practice facilitating exchanges and examples on how the cascading principle can be applied.

³⁵ In 2022, biomass in Europe was primarily used for animal feed (38%), energy (28%), materials (26%), and food (9%)

³⁶ Directive (EU) 2023/2413 of the European Parliament and of the Council of 18 October 2023, amending Directive (EU) 2018/2001 and related legal acts — adopted as RED III



The planned evaluation by 2027 of Article 3(3) of the Renewable Energy Directive will provide an opportunity to adapt the cascading principle to reflect the latest scientific evidence³⁷. In addition, thanks to electrification and the development of hybrid renewable energy systems by 2030, the Commission will work towards **disincentivising inefficient biomass combustion** and substitute it with other types of renewable energy thus freeing-up additional biological resources for the bioeconomy.

Actions	Timeline
	XQ2027
(MARE) Launch of the Blue Bioeconomy Innovation Initiative	2026
(ENV) Launch of 'BioMade Europe' (EBMA) voluntary alliance	1Q2026
(GROW, ENV) Promote innovative bio-based solutions through public procurement	Rolling
Avoid prioritising biomass combustion over material use in EU policies and funding	As of 2026
(JRC, RTD, ENV) Develop good practice examples on implementation of cascading principle and exchanges within a community of practitioners within the Bioeconomy Knowledge Center 2026 – 2027	As of 2026
(ENER) Assessment of the impact of European and national biomass energy support schemes (Article 3(3) and article 29 of the Renewable Energy Directive)	XQ2027
(ENER) Support the development of hybrid renewable energy systems to ensure a more efficient use of biomass for energy	2030

³⁷ The ability of biomass to replace unsustainable or critical feedstocks is well-documented, delivering benefits for carbon reduction and environmental performance (the European biomass puzzle, EEA Report 08/2023 The European Biomass Puzzle | European Environment Agency's home page; Analysing environmental potential impacts of substituting conventional products with bioeconomy innovations: a Life Cycle Assessment perspective-

3. SECURING THE LONG-TERM PROSPECTS OF BIOECONOMY: SUSTAINABLY SOURCED BIOMASS SUPPLY

The EU is largely self-sufficient (around 90%) in biomass supply^{38[OBJ]39[OBJ]}. It has all the means to remain so, provided coherent long term measures are implemented. Should domestic biomass availability decline, the European Commission will prioritise demand reduction through circularity, efficiency gains and cascading use, and secure diversified and sustainable imports from reliable partners to safeguard critical value chains.

3.1. Towards an optimised, coherent and lean sustainability framework

Biomass availability projections⁴⁰ indicate that while primary production will increase, the share dedicated to food, animal feed, seeds and material uses will also grow. Sustainable farming practices are expected to allow for a smarter use of biomass without putting at risk food security, providing new sources of income to farmers while considering ecosystem boundaries.

As referred in section 2 of this strategy, these new biomass sourcing systems open new opportunities for sustainable biobased materials, supporting the development of the lead markets in the EU bioeconomy.

To ensure these new opportunities are taken up in the longer term, the sources of primary biomass must be sustainable and the pressure on ecosystems must be considerably reduced.

With demand of competing uses of biomass expected to increase, it is of outmost importance to be able to understand the biomass flows in the economy, the limits of ecosystems and to reduce and mitigate the impacts of material and energy uses. The Commission will improve methodologies and modelling for assessing sustainably sourced biomass availability and **the cumulative impact of different biomass uses and non-use⁴¹ for the provision of ecosystem services**. The Commission will also explore how to ensure greater coherence and effectiveness of existing sustainability criteria across different biomass sources and uses⁴².

When developing EU-wide sustainability criteria, existing national systems and long-standing sustainable forest management practices should be fully recognised. Sustainability requirements must remain proportionate, practical and tailored to regional ecological and socio-economic conditions, including areas with fragmented small-scale private forest ownership. Rather than duplicating or replacing well-functioning national frameworks, EU criteria should build on and mutually recognise them, ensuring that they support innovation and competitiveness while maintaining high environmental ambition.

³⁸ 2025 JRC study on Biomass

³⁹ SOER 2025

⁴⁰ Draft citation (report not published yet – full details not available): JRC - The EU bioeconomy towards 2040 – an exploratory baseline with a whole-economy, an agricultural and a bio-based industry model.

⁴¹ Non-use of biomass refers here to leaving biomass un-harvested and non-extracted to enable ecosystems the long-term provision of regulating and cultural ecosystem services that underpin Europe's economy, society, and environment.

⁴² Building on the Joint Research Centre's modelling frameworks, including on "Integrated Bioeconomy Land Use Assessment" (IBLUA, see https://knowledge4policy.ec.europa.eu/projects-activities/integrated-bioeconomy-land-use-assessment_en#latest-knowledge) and on LCA assessments to compare environmental potential impacts of substituting conventional products with bioeconomy innovations (see JRC (2025): Substituting conventional products with bioeconomy innovations: analysis of potential environmental impacts using a Life Cycle Assessment perspective) [Link].

Future sustainability criteria should also integrate water efficiency and resilience considerations, in line with the EU Water Resilience Strategy, to ensure that bioeconomy growth does not exacerbate water stress.

The Commission will also work with Member States to improve the monitoring and assessment of sustainable biomass availability, biomass markets, ecosystem limits for biomass extraction. This will be helped by integrating ecosystem accounting, land-use data, and ecological indicators—enabled by the EU Space Programme, Copernicus, and the Soil Monitoring Law—into economic and policy planning – (e.g. ‘biomass balance sheets’). Drawing on data from the Soil Monitoring Law, the Commission will improve monitoring of agricultural land loss and its implications for the bioeconomy.

Recognising that no EU Member State is the same, the bioeconomy must build on Europe’s territorial diversity. Member States differ widely in biomass availability, industrial capacity, innovation ecosystems, and market maturity. The Strategy will therefore promote tailored pathways reflecting these distinct starting points and comparative advantages. Member States will be encouraged to define their national bioeconomy specialisation profiles, for example as primary biomass producers, high-value processors, blue bioeconomy frontrunners, or bio-based innovation hubs and to integrate them into their CAPs and NECPs.

The planned EU Bioeconomy Dialogues will facilitate the co-creation of national and macro-regional bioeconomy roadmaps aligned with this Strategy, enabling targeted investments. Funding allocations and performance monitoring will take into account regional specificities. This place-based approach will ensure that the European bioeconomy grows inclusively, strengthens cohesion, and unlocks the full potential of each and every Member State.

In parallel, the Commission will continue building consensus through voluntary, bottom-up approaches across value chains by developing a voluntary benchmarking system for on-farm sustainability assessments in the EU, as announced in the *Vision for Agriculture and Food*

3.2. Primary biomass supply

Production systems that maintain or enhance supply of biomass while simultaneously restoring and maintaining ecosystem health are to become mainstream in agriculture, forestry, fisheries and aquaculture. These approaches also open new income streams for primary producers and support food security, biodiversity, and climate adaptation and mitigation.

As set out in the *Vision for Agriculture and Food*⁴³, the future Common Agricultural Policy will play a catalytic role by supporting farmers that adopt bioeconomy innovation, sustainability practices, diversify sources of income, and contribute to emerging bioeconomy value chains. Greater simplification, flexibility, and cooperation across farmers, who are also entrepreneurs and providers of both food and public goods, will be critical to drive uptake. The new CAP will also mobilise investments for the deployment of technologies that enable local and regional valorisation of agricultural and forestry by-

⁴³ Reference needed.

products, residues, and biomass waste. Other EU existing instruments, including Cohesion and Innovation policies, will support new models of shared infrastructure, investment and market integration.

In the forestry sector, biomass production and supply must be balanced with ecological constraints. Resilience should be built by enhancing sustainable forest management, mixed-species management, restoring degraded areas, and implementing low-impact harvesting methods. Adapting value chains and securing European capacity to process future mixed-species and diverse timber supply, with increased focus on broadleaved species, should go hand in hand. Additionally, there are important synergies with wildfire prevention objectives that more active forest management offers, especially in vulnerable ecosystems of Southern Europe.

Marine biological resources can meet the rising demand of sustainable biomass and boost the competitiveness and livelihoods of coastal communities. The Strategic guidelines for a more sustainable and competitive EU aquaculture⁴⁴ and the EU Algae initiative⁴⁵ will promote the sustainable production and valorisation of this type of aquaculture as algae and bivalve molluscs offer, in addition to food and ingredients for feed, valuable ingredients and raw materials for sustainable solutions for other industries (e.g. bioplastics, fertilisers, pharmaceuticals, construction). The Ocean Pact⁴⁶ also announces a 'blue' bioeconomy partnership on innovative business models for marine ecosystem restoration and preservation.

Water is essential for all aspects of the bioeconomy. In the face of growing competition over increasingly scarce water resources, integrated water management and water resilience are vital to achieving bioeconomy goals and should be integrated into business and investment decisions, promoting water efficiency and reflecting long-term climate scenarios as outlined in the water resilience strategy.

Interest among producers in regenerative practices and ecosystem service markets is growing, yet business models and incentives remain underdeveloped. To address this, the Commission will support the uptake of regenerative practices and ecosystem service markets, which also will provide additional income to land managers, by developing on-farm sustainability benchmarking and methodologies for quantifying and certifying nature-positive outcomes in agriculture and forestry. These tools—outlined in the Vision for Agriculture and Food, and the Commission's Communication on Nature Credits⁴⁷—will guide investments in emerging carbon and nature markets and underpin the creation of a European market for nature credits.

To equip land, forest and water managers with the right knowledge and skills, the Commission will develop an EU-wide knowledge repository with practical, locally adapted guidance on sustainable soil management.

3.3. Reducing the need for primary biomass: secondary feedstocks and circularity

Over 80% of the EU biological resources demand is sourced mainly from agriculture and forestry (primary biomass) while only 18% of this demand comes from secondary or

⁴⁴ Reference needed.

⁴⁵ Reference needed.

⁴⁶ Reference and explanation of what the Pact is.

⁴⁷ Reference needed.

recycled sources. In addition, two thirds of the bio-waste produced in Europe ends up in landfills or incinerators⁴⁸ or is not even being collected. This indicates that we are not using biomass in the economic cycle to its full potential.

With a circularity rate stagnant around 11.8% since 2015⁴⁹, the EU must become **smarter** in how to use the existing secondary biomass streams entailing by-products and organic waste, fostering innovative business models, thus reducing dependency on primary biomass and aligning production with planetary boundaries.

A well-functioning EU Single Market for the valorisation of biological byproducts and residues is needed. Currently, the price of the secondary biological feedstock is often higher while the need for additional technological treatment increased, making use of bio-waste less attractive on the market.

Under the Ecodesign for Sustainable Products Regulation, the Commission is called to set design, performance and information requirements that increase product longevity, reusability, and recyclability of products. It commits to include in the formulation of the policy interventions materials and products made from biological resources—starting with high impact sectors such as textiles and furniture.

The potential for increased recycling of bio-waste is considerable. Some 138 million tons of bio-waste are produced each year in the EU, out of which only about 42% is exploited economically⁵⁰. Separate collection of bio-waste could permit greater exploitation for instance, as a soil fertiliser (through composting) or to produce renewable energy (typically, through its anaerobic digestion). In addition, the Commission will support the valorisation of digestate for production of biogas and biomethane through Tripartite Agreements⁵¹.

The valorisation of agricultural non-edible residues represents a significant opportunity in the circular bioeconomy. For instance, wool-based value chains offer innovative use markets beyond the traditional use in textiles. Exchanges of best practices for local circular use cases, which are already legally possible, will be organised and supported under the CAP rural development network.

Over one billion tons of manure from farmed animals were produced annually in the period 2016–2019 in the EU27 and UK⁵². Manure circularity, particularly through initiatives like ‘Renure’ demonstrates a high potential in closing nutrient loops in agricultural systems while reducing external input dependencies. Co-benefits for nitrogen waste reduction targets will be ensured by establishing an expert group to assess best bioeconomy practices and innovations to increase nitrogen use efficiencies in bioeconomy systems and value networks. Recovery and circularity of nutrients such as phosphorus or nitrogen from

⁴⁸ Bio-waste generation in the EU: Current capture levels and future potential, 2024, [biconsortium.eu/sites/biconsortium.eu/files/publications/Bio-waste generation in the EU Current capture levels and future potential 2024 0.pdf](https://biconsortium.eu/sites/biconsortium.eu/files/publications/Bio-waste%20generation%20in%20the%20EU%20Current%20capture%20levels%20and%20future%20potential%202024%200.pdf)

⁴⁹ Europe’s circular economy in facts and figures, EEA, 2024, [Europe’s circular economy in facts and figures | European Environment Agency's home page](https://www.eea.europa.eu/en/press/2024/04/europe-s-circular-economy-in-facts-and-figures)

⁵⁰ [Bio-Waste in Europe - European Compost Network](#)

⁵¹ Tripartite Agreements usually refer to formal cooperation frameworks between three key parties—most often: the European Commission (representing the EU as a whole), a Member State (or group of Member States), and a third country or an external energy actor

⁵² [Glossary:Fertiliser - Statistics Explained](#)

sewage sludge are essential economic opportunities for which the Commission will work towards setting minimum recycling and reuse targets.

To build the basis of a future service bioeconomy, the Commission will engage in transitioning traditional bioeconomy business models to Circular Business Models (CBMs) and identify virtuous practices for a more effective use of biological resources. Building on successful applications from EU funded projects, the Commission will generate usable step-by-step analysis and targeted recommendations fostering the adoption of CBMs.

At local level, the creation of **industrial symbiosis valleys** should facilitate the valorisation of by-product and waste streams in existing production processes. This measure would aim to better understand biomass flows and interconnections between value chains within a local ecosystem and help organise producers to reach the needed economies. The Commission will establish Biomass Hubs within the Horizon Europe funding actions. The Commission will also support, at the request of interested Member States and regions partnerships on industrial symbiosis for biological resources in the framework of the existing Smart Specialisation thematic platforms (e.g. agrifood and blue bioeconomy).

Actions	Timeline
Flagship: (JRC, RTD) Improve methodologies and modelling for assessing sustainably sourced biomass availability and sustainability across its uses and non-use	As of 2025
(ENV) Strengthen use of existing frameworks and mutual recognition of national systems	As of 2026
Flagship: (ENV, JRC, RTD, GROW, AGRI) Methodology for improved coherence and effectiveness of sustainability criteria across different biomass sources and uses	XQ2026
(AGRI) Development of a voluntary benchmarking system for on-farm sustainability assessments	XQ2026
	2026-27
Flagship (DEFIS, JRC, ENV) Integration of indicators enabled by the EU Space Programme, Copernicus, and the Soil Monitoring Law	XQ2026
(ENV) Develop an EU-wide knowledge repository with practical, locally adapted guidance on sustainable soil management to support farmers, foresters, and land managers in improving biomass productivity, resilience to extreme weather, and delivery of ecosystem services	XQ2026
(ENV) Guidance on Circular Business Models	2027
(ENV) ESPR Delegated Acts on eco-design requirements for textiles and furniture, as announced by the first ESPR working plan ⁵³	2027-2028
(AGRI) Exchanges of good practices for local circular uses of animal byproducts, where legally possible, supported under the CAP rural development network	XQ2027
(ENER) Valorise the use of digestate for biogas and biomethane production through tripartite agreements	2026
(RTD, GROW, REGIO tbc) Set up of Industrial Symbiosis Valleys to establish bioeconomy hubs through R&I funding	2026

4. PROMOTING EU'S INTERESTS AND VISION GLOBALLY

Across the world, the bioeconomy is gaining momentum. Over 50 countries have adopted bioeconomy strategies⁵⁴, and its relevance is rising in multilateral forums⁵⁵. In a context of accelerating decarbonisation and intensifying competition for biomass, it is important to increase the global alignment on what constitutes a sustainable bioeconomy. On this basis, the global bioeconomy can live up to its full potential. Europe should – based on this bioeconomy strategy – actively contribute to finding an ambitious global convergence that will allow continued trade in sustainable biomass, bio-based materials, technologies and solutions.

The bioeconomy strategy has two objectives in this regard. First, to support European companies to increase access to global markets for sustainable bio-based technologies, innovations, biomaterials and applications. This can be achieved by building on Europe's strengths to advance a sustainable bioeconomy globally and by fostering collaboration with key international partners to explore new avenues of actions where more progress needs to be done. Secondly, to shape an inclusive global agenda by promoting internationally defined criteria for a sustainable bioeconomy that facilitates international trade.

4.1. Facilitate wider access to global markets for the EU's bio-based technologies, innovations, biomaterials and applications

The economic potential of bioeconomy is significant. Bioeconomy sectors are valued at approximately USD 4.5 trillion globally, with projections reaching USD 30 trillion by 2050, potentially representing one-third of global GDP⁵⁶. The EU is currently one of the frontrunners. Its biotechnology sector—an engine for bioeconomy solutions—was valued at EUR 720 billion in 2021, growing at over 18% annually^{57,58}.

According to the projections made by the Joint Research Centre (JRC) on the EU bioeconomy towards 2040⁵⁹, the growth of textiles, wearing apparel, and leather as well as paper is considerably more sluggish than in the rest of the world due to an assumed slower rate of economic growth in the EU. However, Europe has opportunities to scale up exports of bio-based technologies, materials, applications, and circular innovations—from construction materials and textiles to renewable chemicals to advanced biomaterials. The EU is competing with other lead countries and continents for biomass on the world market. In securing the biomass we need, it will be important to avoid dependencies on imports from third countries which can lead to price volatility, and difficulty in traceability and verification of biomass sourcing. Scaling up European exports will require a level playing field in terms of market access conditions and bioeconomy standards with our main trading partners, and, in parallel, monitoring and acting upon exports that could increase a biomass gap.

⁵⁴ Bioeconomy national strategies in the G20 and OECD countries: Sharing experiences and comparing existing policies - ScienceDirect

⁵⁵ Such as FAO, CBD, UNFCCC, UNEA and UN General Assembly.

⁵⁶ Financing a Sustainable Global Bioeconomy, World Bioeconomy Forum, September 2024

⁵⁷ Biotechnology Market Size to Worth Around US\$ 3.44 Trillion by 2030 - BioSpace

⁵⁸ The global biotechnology market is led by the United States, which accounts for approximately 60% of its total value. It is followed by the European Union, contributing around 12%, and China, with about 11%.

⁵⁹ Draft citation (report not published yet – full details not available): JRC – The EU bioeconomy towards 2040 – an exploratory baseline with a whole-economy, an agricultural and a bio-based industry model

At the same time, Europe must strategically ensure access to imports of sustainable biomass and intermediate bio-based products from reliable partners, embedding diversification, transparency, and reciprocity in trade relations. Imports need to respect EU standards to ensure a level playing field.

Through free trade and partnership agreements, regulatory dialogues, and diplomatic engagement, the EU can partner up with third countries to enhance diversification of imports of raw materials for bioeconomy and a boost in exports of biotechnology and biobased products.

The EU goal is to scale investments in sustainable and resilient supply chains, innovation ecosystems, and promote policy convergence through the Clean Trade and Investment Partnerships and the Global Gateway. These alliances will help in creating the favourable conditions to develop new markets, create green jobs, and promote sustainable development.

4.2. Shape the global sustainable bioeconomy agenda and actions

Reflecting its economic potential, the bioeconomy is actively debated in a range of international forums. A common understanding between the EU and its main international and trading partners is important to ensure the global consensus develops in a manner conducive to private investment, cooperation on research and innovation as well as regulatory convergence.

The EU should therefore step up its engagement in the main international fora where the international playing field for the bioeconomy is defined and its rules and principles are developed: Food and Agriculture Organization (FAO), World Trade Organization (WTO), Convention on Biological Diversity (CBD), United Nations Framework Convention on Climate Change (UNFCCC), United Nations Environment Programme (UNEP), Group of 20 (G20), the Organization for Economic Cooperation and Development (OECD), the Global Forum for Food and Agriculture (GFFA), the International Bioeconomy Forum (IBF) and the Global Bioeconomy Summits (GBS). Streamlining the current international governance should be a clear objective to avoid costly duplication of forums.

The EU will launch a flagship research and innovation initiative focused on deploying sustainable bioeconomy solutions in high-potential regions. This initiative will mobilise capital, strengthen industrial ecosystems beyond EU borders, and ensure that all efforts are underpinned by robust environmental and social safeguards.

Actions	Timeline
(TRADE) Use the EU Free Trade Agreements and other partnerships and forums to advance cooperation and market access to sustainable solutions. Identify and address regulatory and technical trade barriers to support investment in bio-based sectors.	
(RTD, INTPA, TRADE) Launch EU Bioeconomy Business Missions to partner countries to promote European innovation and build strategic partnerships and facilitate investments, including through the Clean Trade and Investment Partnerships and the Global Gateways	XQ202X
(EEAS, SG, RTD, ENV, AGRI) Streamline global governance on bioeconomy to advance global cooperation.	Rolling

5. JOINING FORCES FOR DELIVERY: MEMBER STATES, INDUSTRY, INVESTORS AND CIVIL SOCIETY

Member States are key partners in translating the EU Bioeconomy Strategy into actions and creating synergies with regional and national strategies. Industry, investors – both private and public – and civil society will be closely associated to the implementation process. This EU Bioeconomy Strategy constitutes a policy framework which must deliver through the concrete actions and interventions that it identifies. At the same time, it must develop into a policy framework within which a gradual convergence of the Member States' policies and actions is achieved during this political cycle.

The Commission will support this process through EU bioeconomy dialogues with Member States, building on the European Bioeconomy Policy Forum⁶⁰, supported by the Bioeconomy Policy Support Hub⁶¹. The Circular Economy Stakeholders Platform⁶² and the future Bioeconomy Stakeholders Platform⁶³ will unite their efforts to gather industry, investors and civil society. The trusted investors network of the European Innovation Council will have a key role to play in that respect. The Commission will also reinforce youth dialogue through the EU Bioeconomy Youth Ambassadors programme⁶⁴.

Actions	Timeline
(ENV) EU Bioeconomy dialogues with Member States on the implementation of the EU Bioeconomy Strategy, mobilisation of the Circular Economy and Bioeconomy Stakeholders Platforms and EU Bioeconomy Young Ambassadors Programme.	As of Q1Q2026

⁶⁰ See https://research-and-innovation.ec.europa.eu/research-area/environment/bioeconomy/european-bioeconomy-policy-forum_en

⁶¹ The Bioeconomy Policy Support Hub will kick-start in 2027 based on Horizon Work Programme in 2026.

⁶² [Homepage | European Circular Economy Stakeholder Platform](#)

⁶³ To kickstart in 2026 under the Work Programme 2025 of Horizon Europe.

⁶⁴ See [Link to be added]. See also the Bioeconomy Youth Vision of the 1st EU Bioeconomy Youth Ambassadors cohort (2022-2024) https://youth.europa.eu/get-involved/sustainable-development/whats-youth-vision-bioeconomy_en