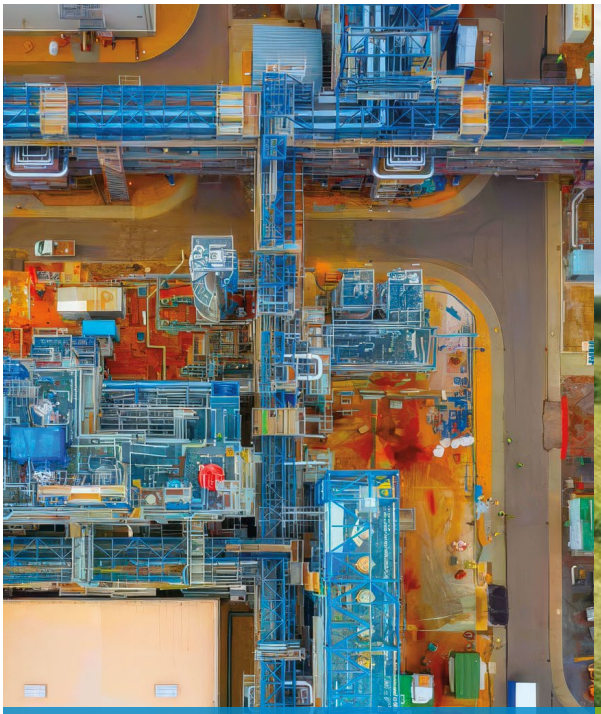






European Bioeconomy in Action

Delivering the bio-based transformation

European Bioeconomy Alliance

Intro

The European bioeconomy is at the forefront of the continent's transition toward a sustainable, climate-neutral, as well as a competitive agricultural and industrial future. This brochure serves as a vital resource, showcasing a diverse range of examples demonstrating how biobased solutions in action across Europe are actively advancing the objectives of key EU initiatives.

From pioneering biorefineries converting agricultural residues into high-value chemicals to innovative wood construction techniques and circular food systems, these examples highlight the tangible impact of sustainable innovation.

This guide highlights how the European bioeconomy holds immense breakthrough potential to scale up biobased solutions, strengthen EU competitiveness, and deliver lasting environmental and economic resilience.

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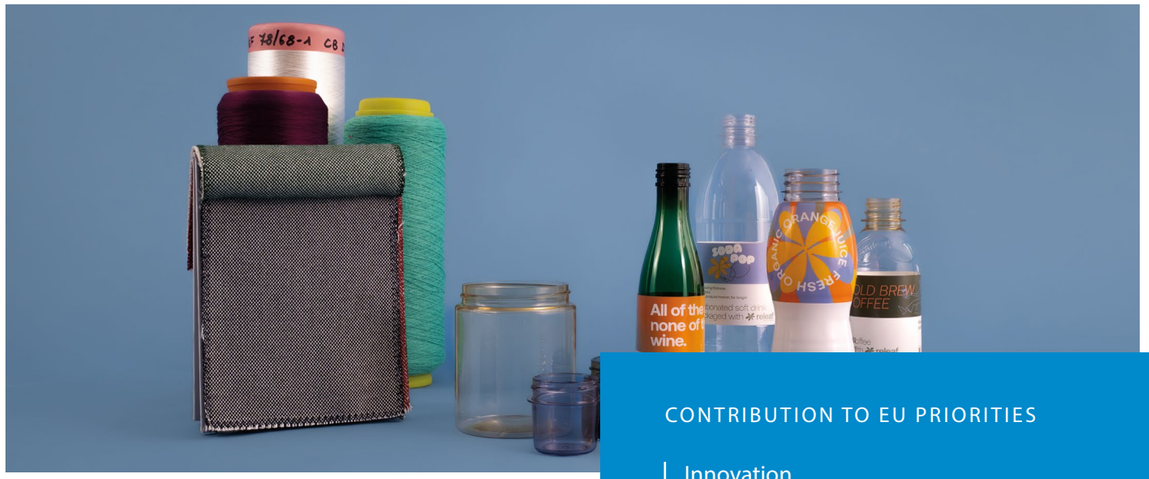
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CONTRIBUTION TO EU PRIORITIES

- Innovation
- Industrial Strategy
- Climate Strategy
- Circular Economy Action Plan

PEFerence flagship biorefinery produces bio-based polymers at industrial scale

PEFerence is an EU-funded flagship project pioneering an innovative, industrial-scale biorefinery that converts agricultural residues into FDCA and PEF (marketed as releaf), a bio-based alternative to conventional, fossil-based plastics. These materials enable high-performance, recyclable applications such as food and beverage bottles, films, and textile fibres, supporting a circular, bio-based packaging value chain.

FDCA and PEF replace plastic in bottles, films and textile fibres.

PEFerence is a flagship initiative advancing innovation at the heart of Europe's transition to a circular, climate-neutral economy. By developing a new generation of bio-based, recyclable packaging materials derived from agricultural residues, the project demonstrates how cutting-edge science can be translated into scalable industrial solutions. This approach not only reduces reliance on fossil-based plastics but also creates higher-value uses for biomass, reinforcing resource efficiency across the value chain.

Aligned with the EU's industrial strategy, PEFerence strengthens Europe's competitiveness by fostering a resilient, future-proof materials sector. It brings together industry leaders, researchers, and innovators to accelerate the commercialization of sustainable alternatives, positioning European businesses at the forefront of global markets for advanced packaging.

The project is a strong example of the circular economy in action: materials are designed for recyclability from the outset, minimizing waste and closing resource loops. At the same time, it contributes directly to the EU's climate strategy by significantly lowering greenhouse gas emissions associated with packaging production.

Through innovation, collaboration, and industrial scale-up, PEFerence showcases how Europe can lead the shift toward sustainable industry while driving economic growth and environmental responsibility in tandem.

PEFerence
The Renewable Innovation

BBI JU
Bio-based Industries Consortium
Horizon 2020 European Union Funding for Research & Innovation



CONTRIBUTION TO EU PRIORITIES

- Industrial Strategy
- Climate Strategy
- Circular Economy Action Plan

A pioneering biorefinery valorising hardwood residues

SWEETWOODS is pioneering a flagship biorefinery that transforms sustainable hardwood residues into high-purity lignin and wood sugars for bio-based chemicals, foams, plastics and construction materials. By converting over 90% of biomass into valuable products, the project creates circular, low-carbon value chains that reduce waste and fossil-resource dependence across Europe.

Over 90% of biomass converted into valuable products.

SWEETWOODS is a flagship industrial biorefinery project demonstrating how Europe's wood-processing sector can evolve into a competitive, low-carbon manufacturing industry. Based in Estonia, the project is scaling advanced fractionation technologies that convert sustainably sourced hardwood residues into high-purity lignin and wood sugars for use in industrial products including resins, insulation materials, foams, bioplastics and specialty chemicals. By creating high-value outputs from under-utilised biomass streams, SWEETWOODS strengthens industrial resource efficiency while reducing dependence on fossil-based raw materials.

A core ambition of the project is to establish a new industrial model for the European bioeconomy, integrating forestry, chemical production, materials manufacturing and downstream processing into a connected circular value chain. The project brings together industrial partners across multiple sectors to demonstrate commercially viable production systems capable of operating at scale and supplying European manufacturing markets with renewable alternatives.

SWEETWOODS also highlights the role of industrial innovation in climate action. Through efficient biomass utilisation, lower process emissions and the replacement of carbon-intensive materials, the project supports Europe's transition toward climate-neutral industry. At the same time, it reinforces regional industrial resilience, creates opportunities for green manufacturing growth, and positions bio-based production as a strategic pillar of Europe's future industrial competitiveness.

SWEETWOODS

BBI JU

Bio-based Industries Consortium

Horizon 2020 European Union Funding for Research & Innovation



CONTRIBUTION TO EU PRIORITIES

- Innovation
- Industrial Strategy
- Climate Strategy
- Circular Economy Action Plan

Turning organic waste into sustainable bio-based fertilisers

ReLeaf transforms lignin-rich agricultural and forestry residues into sustainable, high-value bio-based materials and chemicals. By advancing circular biorefinery technologies, the project reduces waste, replaces fossil-derived products, and strengthens Europe's circular bioeconomy. ReLeaf supports greener industrial value chains, lower emissions, and innovative rural economic opportunities through scalable, resource-efficient solutions across Europe.

Feedstock includes sewage sludge, food waste and fish-processing residues, across multiple pilot sites in Europe.

ReLeaf is an innovative European project developing safe, sustainable and efficient bio-based fertilisers from locally available waste streams, including sewage sludge, food waste, fish processing residues and agri-food by-products. By advancing and demonstrating cutting-edge extraction and recovery technologies across multiple pilot sites in Europe, the project is creating new industrial pathways for transforming waste into high-value bio-based products.

At the heart of ReLeaf is a strong circular economy approach that closes nutrient loops, reduces waste and decreases Europe's dependence on imported fossil-based and mineral fertilisers. The project supports a resilient European industrial strategy by strengthening regional value chains, improving resource efficiency and enabling the scale-up of innovative bio-based industries. Through collaboration between industry, research organisations and stakeholders, ReLeaf contributes to the transition towards a competitive and climate-neutral European bioeconomy.

ReLeaf is funded by the Circular Bio-based Europe Joint Undertaking (CBE JU), a Horizon Europe public-private partnership supporting research and innovation for sustainable circular bio-based industries across Europe.

ReLEAF

Circular Bio-based Europe Joint Undertaking

Bio-based Industries Consortium

Co-funded by the European Union



From wood to world solutions

CONTRIBUTION TO EU PRIORITIES

- Innovation
- Climate Strategy
- Circular Economy Action Plan

LignoBrite is a bio-based dispersant derived from lignin, a wood-processing side stream, replacing fossil-based polymers in cleaning and chemical applications. It enables high-value circular use of biomass, supports decarbonisation, and delivers sustainable performance aligned with EU circular economy and climate goals.

> A wood-processing side-stream (lignin) replaces fossil-based polymers — made in Norway, sold globally.

LignoBrite directly supports the EU Circular Economy Action Plan by enabling the substitution of fossil-based polymers with a renewable, bio-circular material derived from industrial side streams of wood processing. By utilizing a by-product like lignin — LignoBrite exemplifies high-value circular use of biomass and contributes to more sustainable product design in line with the Sustainable Product Policy Framework, particularly for chemicals and detergents.

Under the Innovation priority, the project demonstrates how advanced biorefinery technologies can translate research and industrial symbiosis into commercially viable bio-based solutions. LignoBrite enables formulators to meet increasingly strict environmental requirements without compromising performance, accelerating market uptake of bio-based alternatives across household and industrial cleaning applications.

In relation to the EU Climate Strategy, LignoBrite contributes to decarbonisation of the chemicals and cleaning sectors by significantly reducing lifecycle greenhouse gas emissions compared to conventional fossil-based dispersants. Its production is based on renewable raw materials from sustainably managed forests, supporting climate-neutral value chains and the EU's 2050 climate-neutrality objective. Together, these contributions position LignoBrite as a scalable best-practice example of Europe's bioeconomy in action.



Futerro, Reinventing chemistry using nature's own molecules

CONTRIBUTION TO EU PRIORITIES

- EU Bioeconomy Strategy: Contributing to Europe's strategic autonomy and long-term competitiveness
- Circular Economy Action Plan: Delivering a plastic (PLA) that is both compostable and recyclable, enabling appropriate end-of-life options depending on the end-application
- Climate Strategy: Contributing to the reduction of greenhouse-gas emissions
- Innovation: Building on over 30 years of expertise in bio-based chemicals and materials

With over 30 years of experience, the Belgian company Futerro develops and produces bio based platform molecules such as lactic acid and lactide, as well as PLA (polylactic acid) which is a bio-based and circular polyester.

How? By fermenting sugars from crops like corn and wheat into lactic acid, which is then polymerized into PLA. A process that harnesses CO_2 captured by renewable resources through photosynthesis.

> Corn and wheat sugars are fermented into lactic acid, then polymerized into PLA — capturing CO_2 via photosynthesis.

Lactic acid and lactide are versatile building blocks for the chemical industry, used in applications such as green solvents, natural preservatives, and ingredients for the food and feed sectors. Meanwhile, PLA can replace traditional fossil-based plastics in many different applications like textiles, 3D printing, food packaging, films and more.





Biochar creates new value from local biomass in Thessaly

In Thessaly, Greece, the EU-funded TEAPOTS Project shows how agricultural residues that would otherwise be treated as waste can support the bioeconomy by being turned into renewable energy and valuable biochar. At Filia Ghi winery, this approach helps reduce fossil fuel dependence while strengthening local energy production.

Vineyard, olive and almond pruning waste turned into biochar via pyrolysis.

The Greek winery pilot focuses on turning lignocellulosic and hard-to-treat agricultural waste into useful resources for local agri-businesses. It does so by using residual pruning from vineyards, olive trees and almond trees. At the same time, the project works with local cooperatives to explore biomass from regional crops such as cotton and maize.

Biochar is a central part of this model. In practice, project partners are using pyrolysis, a process that converts biomass into biochar and energy, alongside other technologies across the value chain. In this way, the project not only valorises agricultural residues, but also helps lower emissions, improve energy efficiency and support more sustainable farming practices.

In a region facing high energy costs, unused biomass and growing climate pressure, this pilot offers a practical example of how the bioeconomy can support a more resilient energy and agri-food sector. The project is funded by the European Union under Grant Agreement No. 101118296.



CONTRIBUTION TO EU PRIORITIES

- Bioeconomy Strategy: local agricultural residues are transformed into renewable energy and biochar
- Energy Security: reducing fossil fuel dependence through biomass valorisation
- Climate Action: biochar store carbon in soil and increases water retention



Local biomass supports the bioeconomy in Milan's Parco Nord Schools

One of the largest high schools in Europe, the Parco Nord School, has ceased using natural gas and fossil fuels, transitioning to bioenergy with woodchips. This shift results in a reduction of over a thousand tons of CO_2 emissions each year.

1,000+ tonnes of CO_2 saved per year (2 MW woodchip plant serving 6,000 students)

The school, located in Milan, shows how local biomass can support the bioeconomy by turning nearby wood resources into renewable heat. Serving around 6,000 students and 7,000 daily users, the school complex replaced two natural gas boilers with a 2 MW woodchip heating plant, cutting fossil fuel use while improving energy efficiency. Carbotermo, a local company, led the project.

The project draws on woodchips and residues from nearby areas and agricultural companies within the district. Because the schools are located inside a park, local prunings could cover a large share of their energy needs, creating value from biomass that would otherwise require disposal or transport.

This makes the project a practical example of bioeconomy at a local level. Agricultural and forestry by-products are used as a local energy resource, while the renovation also helps modernise the school environment for students and staff.

Finally, the project also promotes awareness of renewable energy through direct engagement with teachers and students.

CONTRIBUTION TO EU PRIORITIES

- Bioeconomy Strategy: local biomass resources are valorised for heat production in a public building.
- Climate Action: higher efficiency and the switch to bioenergy support lower emissions in the school complex



BeetKraft®

CONTRIBUTION TO EU PRIORITIES

- Innovation
- Circular Economy Action Plan

BeetKraft®: Innovative Sugar Beet Fibres for Paper & Packaging

Südzucker is transforming the packaging industry by valorising agricultural co-products through its innovative BeetKraft® fibre. Developed via a patented refining process, BeetKraft® uses sugar beet pulp, a co-product of sugar production, to create a high-quality substitute for wood-based pulp for the paper and packaging industry.

The technology enables paper manufacturers to replace up to 40% of the classic, primary wood fibres, such as bleached hardwood kraft pulp, while improving cardboard stability and enabling lighter packaging formats.

> Replaces up to 40% of primary wood fibre in paper and packaging.

Raw materials are sourced and processed locally in southern Germany, significantly reducing transport distances and strengthening regional supply chains close to paper producers.

BeetKraft® is already being produced at industrial demonstration scale at Südzucker's Offstein site in collaboration with technology partners, marking a step towards commercial deployment.

The material is suitable for a wide range of applications including kraft paper, cartonboard and containerboard, and has been successfully tested for food packaging applications for dry, non-fatty foods.

Its performance has been scientifically validated in collaboration with the PTS — Institute for Fibres & Paper through pilot-scale testing combining primary and secondary fibres.

Since early March 2026, Südzucker organic sugar has been packaged in BeetKraft® paper and has been proving its practicality every day in food retail outlets.



Cultivate NET-ZERO by Tereos

CONTRIBUTION TO EU PRIORITIES

- Climate Strategy: Supporting industrial and agricultural decarbonization through measurable GHG emissions reductions aligned with Tereos' SBTi FLAG 1.5°C approved targets
- Farm to Fork: Promoting low-carbon and regenerative agricultural practices while improving the transparency and sustainability of food value chains
- Innovation Strategy: Developing innovative low-carbon solutions that connect alliances and farmers engaged in regenerative agriculture with industrial decarbonization and customer Net Zero ambitions
- Circular Economy Action Plan: Supporting more sustainable production models through the integration of low-carbon agricultural raw materials and reduced-carbon industrial ingredients across the value chain

Cultivate Net-Zero: turning climate commitments into tangible low-carbon solutions

With Cultivate Net-Zero, Tereos provides clients with a concrete solution to reduce the carbon footprint of their products by acting across the entire value chain, from low-carbon agricultural raw materials to industrial decarbonised processes. The offer combines regenerative agriculture practices implemented by farmers with Tereos' industrial decarbonization strategy to deliver reduced-carbon sugar, alcohol and starch solutions.

Cultivate Net-Zero relies on real and measurable emissions reductions embedded within the products themselves. Based on internationally recognized standards including the GHG Protocol and ISO 14067, and aligned with Tereos' SBTi FLAG 1.5°C approved targets, the methodology ensures traceability and supports customers in achieving their Scope 3 climate objectives.

The offer is structured around three complementary solutions: "Activate" for immediate carbon footprint reduction through low-carbon raw materials, "Connect" for tailored carbon performance management and "Engage" for long-term regenerative agriculture partnerships supported by farm-level carbon diagnostics and traceable sourcing commitments.

In November 2025, Cultivate Net-Zero received the "Outstanding Innovation Award for Environmental Value Creation" and the special prize for "Environmental Value Creation" from Cogeca during the European Award for Cooperative Innovation, recognizing Tereos' contribution to combining environmental transition with economic value creation.



CONTRIBUTION TO EU PRIORITIES

- Climate Strategy
- Circular Economy Action Plan

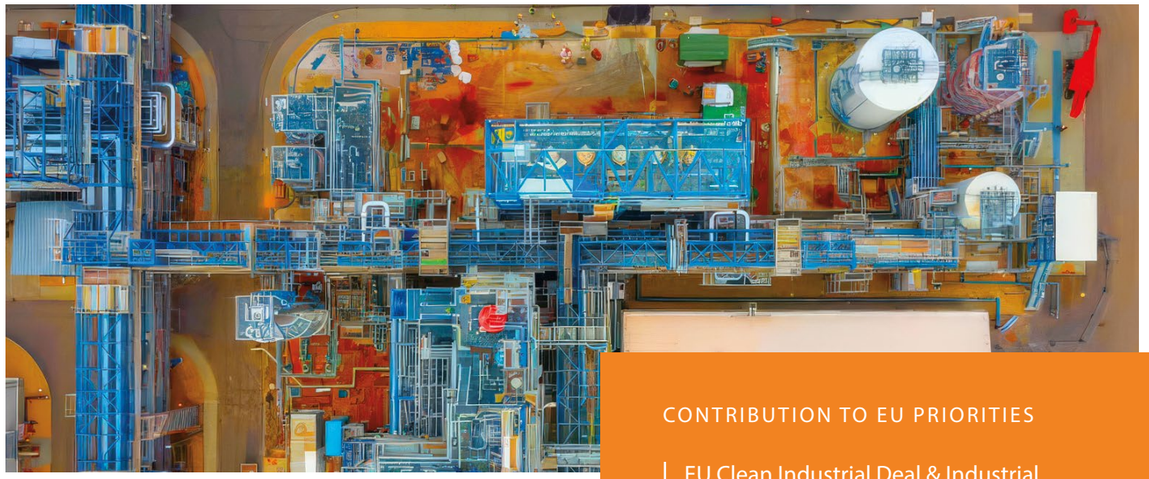
Sustainable wood construction chains demonstrating innovative materials and building systems

BASAJAUN project demonstrates how wood construction chains can be optimized to foster both rural development and urban transformation whilst being connected with sustainable forest management in Europe. A full-scale medium-sized demo building is being constructed in France that integrates various innovative materials, products and structural components.

Full-scale demo building under construction in France.

Funded by the Horizon 2020 grant agreement no. 862942, www.basajaun-horizon.eu. Basajaun demonstrates both innovative and circular products in the wood sector. It showcases resilient, sustainable value chains linking forestry, manufacturing and building industries also through digital solutions and ensuring innovation, value added and employment both in rural and urban areas.





CONTRIBUTION TO EU PRIORITIES

- EU Clean Industrial Deal & Industrial Decarbonisation
- EU Strategic Autonomy
- EU Circular Economy Action Plan

UPM Biorefinery Leuna, seeing the industrial future of Europe's Bioeconomy

UPM's €1.33 billion investment in a 'Biorefinery' in Leuna, Germany, is more than the construction of another industrial plant: it is a test case for Europe's ability to establish a competitive bioeconomy sector. As the world's largest investment in a biorefinery for biomass-based chemicals, it demonstrates that renewable carbon can replace fossil feedstocks at industrial scale in chemicals and plastics.

€1.33 billion — the world's largest investment in a biomass-based chemicals biorefinery.

The plant will produce 220,000 tonnes of chemicals annually from certified regional beechwood, including thinning wood and sawmill residues. This creates higher-value applications for biomass, complements recycling where material losses are unavoidable, and connects forestry, manufacturing and chemical production within a renewable circular economy.

It also demonstrates that the European biomanufacturing sector is way past the lab phase and has now reached the scale of an alternative industrial model for the EU.

What Leuna offers is an example of building domestic value chains based on regional resources, technology and skilled employment. It strengthens European industrial capacity, reduces dependence on imported fossil raw materials and supports the EU's global leadership in renewable, bio-based materials.

However, one flagship investment cannot transform the chemical sector alone. Replication will require predictable regulation, investment finance, sustainable biomass supplies and stronger market demand. With the right policy framework, Leuna could become a blueprint for scaling bio-based chemistry, attracting investment and positioning Europe ahead of other world regions as the leading bioeconomy hub globally.



MM Moulded Pulp, competing with fossils on their own turf

CONTRIBUTION TO EU PRIORITIES

- Packaging and Packaging Waste Regulation (PPWR) & Plastic Reduction Goals
- Circular Economy Action Plan
- EU Clean Industrial Deal & Industrial Decarbonisation

MM Moulded Pulp is MM Group's response to Europe's need for sustainable alternatives to plastic packaging. Made from sustainable wood fibres sourced from Poland, as well as water and natural additives, the material is renewable, recyclable and compostable.

Advanced pulp-moulding and thermoforming technologies produce precise, attractive components that can equal or outperform conventional plastic in quality, protection and design flexibility. Custom finishes and complex shapes make the solution suitable for functional and premium applications across Beauty and Personal Care, Healthcare, Electronics and Food Specialties.

Developed amid tightening regulatory requirements such as those of the PPWR, the project helps MM's customers in the fast-moving consumer goods markets in reducing plastic waste, lifecycle emissions and dependence on fossil-based materials. Production in Poland uses short supply chains and green energy, supporting responsible forestry, decarbonisation and regional manufacturing resilience.

Answering high demand, the business has recently expanded capacity, installing new tooling and equipment, and investing in automation, and process optimisation, all while lowering its operational carbon footprint and improving energy efficiency. Capacity growth is expected to create skilled employment. The workforce has increased more than fourfold within one year, and projected revenue from 2025 to 2026 is expected to more than triple.

> Workforce up 4x in one year, revenue projected to more than triple from to 2025 to 2026.

Crucially, MM Moulded Pulp is more than a packaging innovation: it is a strategic project for Europe's bioeconomy, showing how renewable resources, advanced industrial technology and regional value creation can work together. By accelerating the replacement of plastics and advancing circularity, it can help establish European leadership in next-generation fibre-based packaging.



ORYZITE® a plastic substitute made from rice husks

CONTRIBUTION TO EU PRIORITIES

- Innovation
- Industrial Strategy
- Circular Economy Action Plan

In Spain, the Award winning cooperative Càmara Arrossera del Montsià with its ORYZITE® project transforms rice husks into a sustainable material that can replace a significant share of petroleum-based plastics. This bio-based product is not just for rice bags. Because it is light and heat-resistant, besides being an optimal product for packaging, it has entered high-tech supply chains such as automotive, furniture and design.

The ORYZITE project aligns perfectly with the EU Innovation Strategy and the Circular Economy Action Plan by transforming rice husks, a by-product of rice production, into a sustainable, plastic-free material.

> Just 16 kg of material per kW — lower energy footprint than fossil-based plastic.

ORYZITE's production process exemplifies circularity: it valorises agricultural "waste" which are not waste but by-products, reduces CO_2 emissions and lowers energy consumption (16 kg of material per kW), replacing fossil-fuel-based plastics in industries like automotive, logistics, and packaging. This aligns with the Circular Economy Action Plan's focus on sustainable product design, waste prevention and bio-based alternatives. Additionally, by creating a closed-loop system, where rice husks are upcycled within the same facility, ORYZITE embodies the EU Innovation Strategy's push for eco-innovation and industrial modernisation.

By offering a lightweight, heat-resistant and versatile alternative to plastic, ORYZITE supports the transition to a resource-efficient economy. This initiative proves that agricultural cooperatives can drive systemic change, turning waste into high-value, low-impact solutions.





CONTRIBUTION TO EU PRIORITIES

- Innovation
- Industrial Strategy
- Circular Economy Action Plan

Södra

Södra, a cooperative of over 50,000 forest owners in Sweden, founded in 1938 and now the largest forest-owner association in Sweden is a global leader in circularity specifically because they have bridged the gap between forestry and the fashion industry. Their flagship circular initiative is a world-first technology called OnceMore®. Södra solved the "blended fiber" problem that has historically sent millions of tonnes of clothes to landfills and, by using recycled cotton, it reduces the amount of virgin wood needed for textile pulp.

> 50,000+ forest owners — Sweden's largest forest-owner cooperative, founded 1938.

OnceMore® innovation directly aligns with the EU's Circular Economy Action Plan, Climate Strategy, and Innovation Policy by addressing a critical challenge: recycling blended textile waste. Traditionally, cotton-polyester blends were non-recyclable, ending up in landfills. Södra's chemical process, at its Mörrum mill, separates polyester (used for energy recovery) and extracts pure cotton cellulose, which is then combined with virgin wood pulp from sustainably managed Swedish forests. The result is a high-quality dissolving pulp used to produce Viscose, Lyocell, or Modal, sustainable textiles with the feel of silk or cotton but a far lower environmental footprint.

By solving the "blended fiber" problem, Södra diverts textile waste from landfills, reduces reliance on virgin wood, and cuts CO_2 emissions, key goals of the EU Green Deal and Circular Economy Action Plan. This closed-loop system minimizes waste, maximizes resource efficiency, and supports the EU's push for climate-neutral, innovative industries. Södra's model proves that forestry cooperatives can drive systemic change, turning waste into high-value materials while advancing sustainable fashion and a circular bioeconomy. Their work embodies the EU's vision of cross-sector collaboration for a zero-waste future.



CONTRIBUTION TO EU PRIORITIES

- Innovation
- Industrial Strategy
- Circular Economy Action Plan

Caviro

The Italian wine cooperative Caviro, biggest vineyard in Italy, exemplifies the fully integrated circular models approach through a "total use" model in the wine sector, where nearly all by-products from wine production are valorised. High-value compounds are extracted for food, industrial, and pharmaceutical uses, while remaining biomass is converted into bioenergy. The resulting digestate is then transformed into organic fertilisers that are returned to member farmers, effectively closing the loop. Through this system, Caviro achieves a waste recovery rate close to 100% while generating renewable energy and reducing emissions.

> ~100% waste-recovery rate — from grape pomace to fertiliser, closed loop.

Caviro embodies the EU's Circular Economy Action Plan and Innovation Strategy through its fully integrated, zero-waste model. By valorising nearly 100% of wine production by-products, Caviro aligns with the EU's ambition for a climate-neutral, resource-efficient economy. Their "total use" approach extracts high-value compounds from grape pomace, seeds, and stems for food, pharmaceutical and industrial applications, while converting remaining biomass into bioenergy. The resulting digestate is then transformed into organic fertilisers, returned to member farmers; by such closing the loop and reducing reliance on synthetic inputs.

This model directly supports the EU Circular Economy Action Plan's goals of waste prevention and resource efficiency. By generating renewable energy and cutting emissions, Caviro also contributes to the EU Climate objectives, and participate in decoupling economic growth from resource use. Additionally, their innovative valorisation of agro-industrial waste exemplifies the EU Innovation Strategy's focus on eco-innovation and industrial symbiosis. Caviro is turning waste into economic and environmental value while fostering resilience and sustainability in the wine sector.





Taking sustainable agriculture practices to the next level

CONTRIBUTION TO EU PRIORITIES

- Climate Strategy: Supports greenhouse gas emission reduction and climate change mitigation.
- Farm to Fork Strategy: Promotes sustainable food systems and eco-friendly farming methods.
- Circular Economy Action Plan: Encourages efficient resource use and minimises waste in the agricultural sector

Across the EU, members of the European Biodiesel Board (EBB) play an active role in supporting a shift in agricultural practices, driving improved sustainability and ecological awareness. EBB member initiatives drive change that bolsters the production of sustainable biofuels while improving agricultural sustainability. Innovative practices are not mere techniques, they represent a broader commitment to reshaping the agricultural landscape and are key to achieving the EU's ambitious climate and energy transition objectives. By enhancing soil carbon storage, these practices sequester carbon dioxide, thereby directly combating climate change.

100% French rapeseed — a full swap for fossil diesel across professional fleets.

Efforts by EBB members are instrumental in fostering a paradigm shift from traditional farming methods to more environmentally friendly and resource-efficient practices within the production of renewable energy. This transition is critical for the long-term sustainability of the agricultural sector, ensuring it contributes positively to the environment rather than depleting it. By articulating sustainable bioenergy production and agricultural transition, EBB members contribute to creating a blueprint for the future of Europe's bioeconomy, but are setting an example for the rest of the world.

A prime example of this commitment is Oleo100, a project by Avril Group, one of EBB's members. With its project, the French biodiesel producer not only improves the way agriculture works, but also supplies 100% sustainable, French, rapeseed energy. This B100 biodiesel can substitute and displace the use of fossil diesel, in all types of professional fleets. In a complimentary initiative called Empreinte, the company is also providing farmers the opportunity to receive an additional GHG credit which rewards more sustainable agricultural practices such as the use of cover crops, improved soil organic matter management, reduced agricultural intrants.



Climate-neutral fermentation through CO_2 capture

CONTRIBUTION TO EU PRIORITIES

- Innovation
- Climate Strategy

Alco Bio Fuel, Messer Benelux and Ijsfabriek Strombeek have invested in a CO_2 capture process at the Alco Bio Fuel ethanol refinery in Ghent. As renewable ethanol is produced, 160,000 tonnes of CO_2 are captured annually for use in other sectors — avoiding the need for CO_2 of fossil origin. At Alco Energy Rotterdam, an additional 400,000 tonnes of CO_2 is captured yearly.

160,000–400,000 tonnes of CO_2 captured annually at the Ghent and Rotterdam plants.

Climate strategy: European renewable ethanol production is integral to meeting EU climate objectives, and it makes a strategic contribution to energy independence and food security. Ethanol production creates not just renewable fuel to reduce emissions from road transport, but also high quality and high-protein animal feed. In this project, it also creates CO_2 for use in greenhouses and beverage applications.

Innovation: European ethanol biorefineries are constantly innovating and improving their sustainability. ePURE members' ethanol reduces emissions by more than 75% on average compared to fossil petrol. Thanks to capturing the biogenic CO_2, the emission savings of ethanol can be as high as 95%. With the new innovations come additional co-products to reduce Europe's fossil dependence.



Decarbonizing production of biofuels at the Enviral bioethanol facility

In an effort to minimize the environmental impacts of its biofuel operations, Enviral, together with its sister companies, continuously updates its technology in order to maximize the amount of waste that can be re-used as well as to curb the greenhouse gas emissions from its production.

At Enviral's plant in Leopoldov, Slovakia, this principle is built into the production process itself. The country's largest bioethanol plant, with an annual output of 175,000 m^3, works on a maximum-waste-reduction principle, ensuring that nearly everything entering it leaves as a useful product. Solid residues from corn fermentation are dried and pelletized into DDGS, a valuable protein-rich feed for livestock. Wastewater treatment produces methane-rich biogas, which is used to generate process steam and reduces the plant's need for natural gas.

The facility's current decarbonization project aims to further reduce its natural gas consumption, improve the utilization of waste heat and increase the efficiency of technologies, leading to lower energy consumption and further reduction of CO_2 emissions.

CONTRIBUTION TO EU PRIORITIES

- Circular Economy Action Plan — The facility operates a wastewater processing plant which captures and reuses biogas. The plant also processes used cooking oil.
- Climate Strategy — Reduction of CO_2 emissions. Some 40 000 tons of Enviral's CO_2 emissions are captured and re-used annually.

Enviral is a part of the Envien Group, which also includes affiliate bioethanol producers in Brazil and India. They contribute to the decarbonization of transport by replacing fossil gasoline with ethanol, a renewable fuel made from agricultural raw materials that can be blended directly into gasoline. We thus help curbing greenhouse gas emissions from transport, one of the sectors where emissions are among the most difficult to reduce.



Microbial solutions for sustainable crop nutrition

Pivot Bio is an innovative agricultural biotechnology company pioneering microbial solutions that enable crops to fix nitrogen directly from the atmosphere. By enhancing naturally occurring soil microorganisms, these biofertilizers improve nutrient use efficiency, support yields, and reduce reliance on synthetic fertilizers.

> Engineered microbes deliver a continuous nitrogen supply throughout the growing season.

Pivot Bio's approach is based on nitrogen fixation, a natural biological process through which atmospheric nitrogen is converted into forms plants can use, such as ammonia. Its proprietary microbes, produced via fermentation, colonize plant roots and deliver a continuous supply of nitrogen throughout the growing season.

This microbial technology represents a shift towards biological crop nutrition, offering an alternative to conventional synthetic fertilizers. By improving how plants access nutrients, such solutions can contribute to more sustainable agricultural practices and reduced environmental impacts.

EU Bioeconomy Strategy: This case illustrates how innovation in biotechnology can support the transition to a sustainable and circular bioeconomy. By scaling microbial-based solutions, it reinforces the role of biological resources and processes in reducing reliance on fossil-based production systems, while also strengthening Europe's strategic autonomy and reducing dependencies on imported fertilizers and energy-intensive inputs. In doing so, it fosters competitiveness, resilience, and innovation in Europe's agri-food sector.

CONTRIBUTION TO EU PRIORITIES

- EU Bioeconomy Strategy







Enzymes as enablers of the bioeconomy

Enzymes are proteins found in all living organisms that increase the efficiency of chemical reactions. They are particularly important for the bioeconomy as they enable the efficient conversion of renewable biomass into bio-based products, providing an alternative to energy-intensive chemical processes based on fossil fuels. Enzymes such as cellulase can break down biomass into usable compounds for further processing and can also assemble bio-based products such as bio-based polymers for use in a variety of sectors, including food and feed, agriculture, detergents, paper and pulp, textiles, bioenergy, and specialty chemicals. This supports the transition away from a fossil based economy towards a circular bioeconomy.

Powers bio-based products across 7+ sectors: food, feed, agriculture, detergents, paper/pulp, textiles, bioenergy, specialty chemicals.

CONTRIBUTION TO EU PRIORITIES

- EU Bioeconomy Strategy: Enzymatic processes are recognized as key enablers of industrial biotechnology, supporting the scale-up of bio-based chemicals and other high-value applications. By enabling lower-energy production pathways and reducing reliance on fossil-based inputs, enzymes contribute to strengthening EU competitiveness and developing lead markets for sustainable bio-based solutions.
- Life Sciences Strategy: Enzymes, as key components of industrial biotechnology, contribute to the deployment of life sciences innovations across sectors, supporting sustainable solutions in food, industry and materials while strengthening Europe's competitiveness and capacity to scale-up bio-based production.
- Innovation: EU research and innovation, including public-private partnerships like the Circular Bio based Europe Joint Undertaking, are key to develop and scale-up sustainable bio-based solutions, including cutting-edge biotechnology solutions.





Biobased plastics contribute to a competitive and circular European bioeconomy

Biobased plastics contribute to Europe's transition towards a competitive, circular and climate-neutral economy by replacing fossil carbon with biogenic carbon from sustainably sourced biomass. As one of the most advanced material applications of the bioeconomy, biobased plastics help reduce dependence on fossil resources while creating value from agricultural and forestry feedstocks and supporting rural development.

Biobased plastics are already used in a wide range of applications, including packaging, consumer goods, agriculture, textiles and automotive products. They enable the production of innovative materials with a lower reliance on fossil feedstocks while maintaining product performance and functionality. As demand for sustainable products grows, biobased plastics can play an increasingly important role in diversifying Europe's material base and strengthening industrial resilience.

In addition, certified biodegradable and compostable plastics provide targeted environmental benefits in specific applications where biodegradability offers clear added value. In particular, compostable plastic products and packaging can support the separate collection of biowaste and contribute to improving the quality and quantity of organic waste streams collected for recycling.

Continued innovation in biobased plastics and industrial biotechnology is expanding the range of applications available on the market and contributing to the development of a sustainable carbon cycle. To fully realise their potential, biobased plastics require a supportive policy framework that recognises the complementary role of recycled and biobased carbon in achieving Europe's climate, circularity and competitiveness objectives.

CONTRIBUTION TO EU PRIORITIES

- Competitiveness and Industrial Strategy — Strengthening European value chains, innovation and strategic autonomy through biobased materials
- EU Bioeconomy Strategy and Biotech Act II — Creating lead markets for innovative biobased materials and supporting industrial biotechnology
- Climate Strategy — Reducing reliance on fossil resources and contributing to greenhouse gas emission reductions
- Circular Economy — Supporting the transition from fossil to sustainable carbon and contributing to circular material flows



CONTRIBUTION TO EU PRIORITIES

- EU Bioeconomy Strategy
- Circular Economy Action Plan

Restoration of the Notre-Dame Cathedral in France

Developing the Bioeconomy is crucial to both strengthen the EU's competitiveness and strategic autonomy, and to mitigate the effects of climate change. While EUSTAFOR's members are suppliers for state-of-the-art biorefineries and sawmills across Europe, they prove that bioeconomy is also our oldest sector. Despite progressing innovation, traditional wood construction is still effective long-term storage of carbon.

On 15 April 2019 the world witnessed how the Notre-Dame cathedral in Paris burned down. Soon after, the decision was made to restore it as close as historically accurate. Launched on March 5, 2021, the Notre-Dame reconstruction mobilized the entire French forestry and timber industry. As part of the restoration, ONF (National Forestry Office) mobilized supply of exceptional oak trees needed for the reconstruction of the spire, transepts, nave, and choir roof structures. The foresters collaborated with architects and conservators to replace the massive beams in the cathedral, logs with more than one meter in diameter and up to 20 meters tall were needed.

1700 oak logs from state forests and 130 oak logs from communal forests were selected individually and delivered to the public company in charge of the restoration: 491 logs were used for the reconstruction of architect Viollet le Duc's spire and the frameworks of the transepts, and another 1200 to rebuild the 13th-century framework of the nave and the choir.

~2,000 oak beams: 1,700 from state forests + 130 from communal forests.

The selection, harvesting and preparation of these oak logs took place from 2021–2023, and installation on the cathedral was done in 2024. The carbon in these nearly 2000 oak beams will be stored for hundreds of years before they require restoration again.

EUSTAFOR's members supply around 1/3 of the wood on the EU market. They collaborate in R&I projects and are suppliers to a wide range of customers, from energy plants and sawmills to state-of-the-art biorefineries.



CONTRIBUTION TO EU PRIORITIES

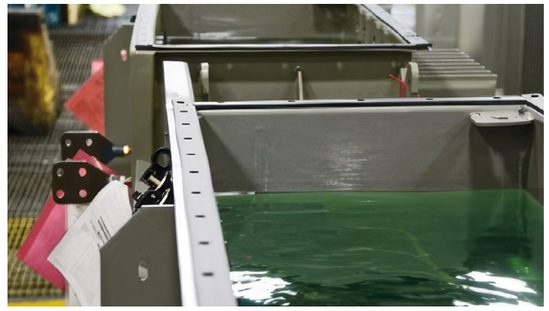
- Biodiversity — reducing pollution
- Circular Economy Action Plan — enhancing circularity through reuse and recycling

Biodegradable transformer oil made from processed vegetable oil

Transformers function to reduce the voltage of electrical power from the grid, to make it suitable for domestic and local industrial use. Transformer oil made from processed vegetable oil is biodegradable and safer for the environment than its mineral alternative. Traditionally, mineral oils are used to insulate and cool the transformer unit, but interest in vegetable alternatives is growing and holds several advantages: due to its high flash point, the temperature at which the oil spontaneously ignites, the risk of fire is considerably lower than when mineral oil is used. And if any leaks do occur for some reason, vegetable oil is biodegradable.

This product contributes to the objectives of the Circular Economy Action Plan by helping "close the loop" of product lifecycles through greater recycling and reuse. It also contributes to the EU Biodiversity Strategy as it prevents damage to the environment and biodiversity caused by alternative mineral oil leaks.

Higher flash point than mineral oil — lower fire risk, plus biodegradable.





CONTRIBUTION TO EU PRIORITIES

- Climate Strategy — Reduction of CO_2 emissions
- Innovation
- Circular Economy Action Plan — Ensure less waste and make sustainable products the norm in the EU

Carbohydrates as replacement of phenol formaldehyde resin for insulation

Phenol formaldehyde resins were traditionally used as adhesive in the production of mineral wools (Glass & Stone wool).

Starch-based carbohydrates replace toxic phenol-formaldehyde resin in glass and stone wool insulation.

Crop-based carbohydrates can successfully substitute phenol formaldehyde resins in these industrial processes with beneficial effects on both economic and environmental sustainability.

The replacement of these fossil-based resins addresses and eliminates the negative toxicological effects of formaldehyde release from the production processes, and it equally presents economic advantages according to the different bio-based ingredients used as a replacement.

Starch is renewable and biodegradable, and as such it and its derivatives are a well-suited raw material for the sustainable use of agricultural products in the bio-based industry.





CONTRIBUTION TO EU PRIORITIES

- Climate Strategy — Reduction of CO_2 emissions
- Innovation
- Circular Economy Action Plan — Ensure less waste and make sustainable products the norm in the EU

The Food and Beverage Carton Alliance

The Food and Beverage Carton Alliance (FBCA) was established in 2025 through the merger of ACE (the Alliance for Beverage Cartons and the Environment) and EXTR:ACT, bringing together two complementary organisations that had long supported the environmental performance and recycling of food and beverage cartons in Europe. The creation of FBCA reflects the sector's response to evolving policy and sustainability priorities, as the EU increasingly focuses on integrated solutions linking climate action, circular economy, food security and industrial competitiveness.

Formed in 2025 through the merger of ACE and EXTR:ACT.

FBCA is an important enabler of the bioeconomy as food and beverage cartons are packaging solutions based largely on renewable, bio-based materials, primarily wood fibres sourced from sustainably managed forests. This supports the substitution of fossil-based materials with renewable resources, while maintaining high standards of food safety, product protection and performance.

Beyond material sourcing, food and beverage cartons play a key role in supporting resource-efficient and resilient food systems. By protecting food and extending shelf life, often without the need for refrigeration, cartons help reduce food waste and optimise resource use across the agri-food value chain, a core objective of the circular bioeconomy.

Building on the legacy of ACE and EXTR:ACT, FBCA continues to support collection and recycling at scale through specialised processes that recover paper fibres and other materials for reuse.

By providing the food and beverage carton industry's perspectives, FBCA helps support EUBA's work towards the promotion of a pragmatic, competitive, and innovation-friendly policy framework for the uptake of bio-based solutions as substitutes for fossil-based materials and resources.

FBCA contributes to the development of a competitive, low-carbon and circular bioeconomy in Europe and globally.

RECY:CHECK

CONTRIBUTION TO EU PRIORITIES

- Innovation
- Circular Economy Action Plan — Ensure less waste and make sustainable products the norm in the EU
- EU Packaging and Packaging Waste Regulation (PPWR)

RECY:CHECK a science-based recyclability certification system

In 2025, FBCA launched RECY:CHECK to provide a credible way to assess the recyclability of fibre-based composite packaging under real industrial conditions and in line with evolving EU policy requirements.

> Launched 2025 — first science-based certification built specifically to prove recyclability under the EU's PPWR.

RECY:CHECK is a science-based recyclability certification system that quantifies and verifies how packaging performs in real industrial recycling conditions, using a harmonised methodology aligned with EU requirements.

It was created to fill a critical gap: the need for a credible, standardised way to prove recyclability under the EU Packaging and Packaging Waste Regulation (PPWR), particularly for complex fibre-based composite packaging, where existing assessments did not reflect real recycling systems or regulatory expectations.

RECY:CHECK provides robust, comparable evidence to support policy engagement, ensuring fibre-based composite packaging is assessed fairly within EU rules.

For industry, it is a practical tool to improve design, demonstrate compliance, and align innovation with real recycling performance.

More broadly, it underpins the EU bioeconomy by strengthening the credibility and circular performance of fibre-based materials, supporting the shift from fossil-based solutions to renewable, fibre-based packaging systems.

The FBCA encourages all those organisations or companies who can benefit from the RECY:CHECK certification to familiarise themselves with the RECY:CHECK method and FAQs.

About

The European Bioeconomy Alliance (EUBA) brings together leaders across the bioeconomy value chain to establish bio-based solutions as a cornerstone of European competitiveness and sustainability.

Our Mission

As a unique cross-sector alliance, EUBA is committed to informing and supporting European, national, and regional leaders in the creation and implementation of a regulatory framework that accelerates the European Union's transition away from reliance on fossil-based feedstocks and toward a circular, carbon-neutral economy.

EUBA Members

Bio-based Industries Consortium
BioChem Europe
Bioenergy Europe
CEFS EU Sugar
CEPF Confederation of European Forest Owners
Cepi Renewable Recycled Responsible European
copa cogeca european farmers european agri-cooperatives
EBB European Biodiesel Board
ePURE european renewable ethanol
EuropaBio The European Association for Bioindustries
europeanbioplastics
eustafor Managing State Forests Responsibly
FEDIOL
STARCHEUROPE Plant-based solutions
The Food & Beverage Carton Alliance Essential. Renewable. Circular.

What brings us together

- Transforming renewable resources into innovative, high-value products and materials for everyday life
- Maximising local, renewable resources to foster the production of high-value bio-based materials 'Made in Europe'
- Embedding resource efficiency and sustainability across all value chains



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