

POLICY PAPER

How the bioeconomy  
can contribute to our  
**Climate and  
Biodiversity  
goals**



# BioAdvantage Europe's mission

The bioeconomy is vital for Europe today. It employs around 18 million people, around 9% of the total workforce; and adds €600 billion of economic value, equal to the GDP of Switzerland. It spans agriculture, aquaculture, forestry, and all the products and waste streams that arise from these activities. This includes food and feed, forest and crop residues, sewage and manure, bioenergy, biofuels and bio-based chemicals and materials. The bioeconomy has enormous potential to shape Europe's future, by accelerating a green recovery and contributing to achieving the goals of the European Green Deal.

BioAdvantage Europe is an initiative founded by leading businesses across the bioeconomy to create a unified and constructive dialogue with EU policymakers on how to achieve this potential. This is the second in a series of policy papers BioAdvantage Europe will publish in 2020, highlighting how the bioeconomy can: 1) contribute to achieving the vision of the European Green Deal and support the post-COVID recovery; 2) support the EU's vision for biodiversity and climate; and 3) support jobs, innovation and growth in Europe.

## Introduction

Biodiversity (ecosystems, species and genes) is the bedrock upon which our planet depends. It contributes to the fulfilment of all SDGs<sup>1</sup> and in tandem with nature, is vital in supporting many economic sectors – most critically in agriculture, food and drink and construction.<sup>2</sup> Its survival also depends on a stable climate below 1.5°C.

However, scientists have recently narrowed the likely warming range to between 2.6°C and 3.9°C,<sup>3</sup> based on a range of possible greenhouse gas emission scenarios. Climate change mitigation and adaptation strategies are imperative if we are to protect and restore biodiversity.

The European Commission recently published its impact assessment of the EU-27's National Energy and Climate Plans (NECPs), alongside the new 2030 Climate Target Plan – raising its target to reduce greenhouse gas emissions from 40% to 55% in the next decade. In October, it will adopt the EU's Biodiversity Strategy for 2030, which promises to restore degraded ecosystems and provide greater protection to Europe's land, seas and forests.

# How the bioeconomy can contribute to Europe's climate and biodiversity goals

The bioeconomy will be crucial for achieving Europe's climate and biodiversity aspirations. As a sector defined by its relationship with the natural world, Europe's bioeconomy must take a proactive stance towards leading the transition to a sustainable green economy.

To make that leadership possible, policymakers need to facilitate a comprehensive valuation of the impact that innovative leaders are having within the sector. As these impacts are significant both for private and public wealth and wellbeing, investment needs to be steered to correct today's artificial discrimination against public goods in preference of private profits.

We will need a framework that recognises human, social, physical and natural capital,<sup>i,4</sup> if the bioeconomy is to lead the way to a carbon neutral Europe. Accounting for the public benefits of Europe's bioeconomy towards forest carbon sequestration, renewable energy transition, agricultural transition, water regulation, leisure and cultural activities, etc will demonstrate that the sector is in reality much more significant economically than suggested by its 'GDP contribution' of an estimated €614 billion.<sup>5</sup>

Many of the relevant solutions are already available but deploying them at scale will mean recognising the value of the invisible environmental services of Europe's bioeconomy. As European policymakers declare their intention to regulate climate change and halt biodiversity loss, private companies must be provided the tools to demonstrate the role they play in contributing to those goals. Unless policymakers demand that the private sector discloses their impact on natural capital stocks,<sup>ii</sup> the true impact – and value – of the bioeconomy will not be known.

With 30% of the EU's €1.8 trillion budget and recovery fund for 2021-2027 earmarked for climate and biodiversity-related initiatives, the EU has committed to put the climate crisis and biodiversity loss on a path to recovery. To facilitate that transformation and make the most of these funds, policymakers should require all members of the bioeconomy to report on the positive and negative natural capital externalities alongside the traditional financial returns resulting from their business operations.

This paper outlines several opportunities and policy proposals to enable the bioeconomy to fully play its part.

***“The driver of change has to be the policymaker, so this is back in the hands of the European Union. The need of the hour is for policymakers to recognise that the wind has changed. The crowd has said where it's going and now it is time for the policy side to lead.”***

**Pavan Sukhdev, President, WWF International  
and Founder-CEO of GIST Advisory**

<sup>i</sup> As laid out in the Inclusive Wealth Report (UN Environment, 2018)

<sup>ii</sup> For example, through 'Integrated Profit and Loss Accounts' or 'Impact Weighted Accounts'

# Four key areas for the bioeconomy to contribute

Europe's land is a finite and valuable resource. Agriculture, forestry, waste, bio-based chemicals and materials, and bio-based energy are all interlinked and depend heavily on well managed land. To unleash the full potential of the bioeconomy, policymakers should apply the following four principles:

**Grow more with less:** Agricultural techniques exist today that can improve productivity, sequester carbon, support biodiversity and make better use of agricultural waste. By taking advantage of these sustainable and regenerative practices, Europe can grow more food, feed and feedstocks with a smaller environmental footprint, and ensure it meets the needs of a growing population without increasing import dependency.

As well as creating biodiversity and climate benefits in Europe and beyond its borders, sustainable intensification of food and feed production in the agricultural sector can unlock other opportunities across the bioeconomy, including in forestry, bio-based chemicals and materials, and bio-based energy:

**Protect and expand forests:** improve forestry management techniques to increase carbon sequestration, restore biodiversity and support a thriving forestry sector.

**Bind carbon into products:** use bio-based chemicals and materials to store carbon, displace carbon-intensive materials such as steel and cement, and encourage circularity of bio-based products.

**Use bio-based energy where it creates most value:** use sustainable bioenergy and biofuels from feedstocks and waste to cut emissions from fossil fuels in sectors that are otherwise hard to abate.





# Grow more with less:

grow more food, feed and feedstocks with a smaller environmental footprint, meeting the needs of a growing population without increasing import dependency

Globally, it is estimated that our food systems are responsible for 60% of terrestrial biodiversity loss, 24% of greenhouse gas emissions, 33% of soil degradation and 61% of the depletion of commercial fish stocks.<sup>6</sup>

The EU needs to reduce the risk of outsourcing environmental damage through agricultural imports<sup>7</sup> and ensure that its own agricultural sector makes a positive contribution to climate and biodiversity. To achieve this, Europe needs a framework of incentives for the sector that covers all material impacts of the food system, including positive and negative externalities, within and outside its borders.

There are many agricultural techniques that create environmental benefits while also delivering economic growth and jobs. Cultivation on degraded land, regenerative land use, natural pest control, appropriate multi-cropping, soil conservation measures,<sup>8</sup> and other sustainable techniques can increase production while contributing to climate change mitigation and improve soil quality, food security and biodiversity. Stronger biodiversity itself leads to further benefits: where agricultural practices help boost wild pollinators and other species, there are proven improvements for crop yields, food quality, shelf-life and human health.<sup>9</sup>

The climate and productivity impacts of these approaches can be significant. In the case of wheat, using innovative technologies like precision agriculture and digital farming along with sustainable fertilisation could increase productivity per hectare by 48% while achieving a 69% reduction in greenhouse gas emissions.<sup>10</sup> For the European farming sector as a whole, research has shown that better agricultural practices and technologies could reduce total greenhouse gas emissions by 25-35% by 2030.<sup>11</sup>

While many of the necessary practices and technologies already exist, there will be a further need for innovation to reach net-zero from agriculture by 2050.<sup>12</sup> Developing and scaling new agricultural practices is a significant opportunity for Europe to create new green jobs and improve its global competitiveness.

*In addition to benefiting agricultural land, growing more with less (land and inputs) will enable Europe to reduce food and feed imports – limiting negative environmental impacts outside its own borders and boosting strategic autonomy – while contributing to climate and biodiversity goals. There is a huge opportunity to use marginalised land unsuitable for food production to grow feedstocks and increase forest sinks, driving greater environmental, social and economic benefits.<sup>13,14</sup>*

**“The findings showed that increased productivity and resource efficiency in agricultural production can combine increased production of food and renewable products, with less land use and much lower impact on the environment and the climate”**

Alarik Sandrup, Director of Public and Regulatory Affairs, Lantmännen

## Existing business-led solutions

- 1 Farming of the future:** Lantmännen’s Climate & Nature cultivation programme, launched in 2015, has implemented measures with up to 20% lower climate impact, including fossil-free plant nutrients and measures to promote biodiversity, such as flower zones in fields and sky lark plots.
- 2 Improving agricultural practices:** Avril has created OleoZE, a digital marketplace that certifies and traces sustainably cultivated sunflower and rapeseeds, rewarding farmers with above-market-prices for efforts to reduce greenhouse gas emissions and store carbon in the soil on their farms.
- 3 Replacing fish with algae:** fish are essential to our society, but they are under intense pressure. Veramaris, a joint venture by DSM and Evonik, have developed an algae-based alternative to fish oil, which provides an alternative for the animal feed industry to ensure humans can maintain their diet with essential omega-3 fatty acids while reducing use of marine resources. One metric tonne of Veramaris’ algal oil is the feed equivalent of oil from 60 tonnes of wild-caught fish.



## Protect and expand the sinks:

improve forestry management techniques to increase carbon sequestration, restore biodiversity and support a thriving forestry sector

Forests currently cover more than 40% of Europe's land area<sup>15</sup> and absorb the equivalent of nearly 13% of total EU greenhouse gas emissions each year.<sup>16</sup> With improved management and incentives for land owners to expand these resources, there is significant potential to double Europe's carbon sink by 2050.<sup>17</sup> However, planting fast-growing monocultures can destroy local biodiversity, so a nuanced, geography-specific approach that maintains and restores indigenous species is essential.

Sustainable silviculture, afforestation and reforestation are critical for habitat provision, air quality and soil carbon sequestration, as well as reducing susceptibility to disease and extreme weather events. By transferring carbon into soils through litterfall, forests can improve soil organic matter. For every 1% increase in organic matter, an acre of soil can draw down 10 more tonnes of carbon.<sup>18</sup>

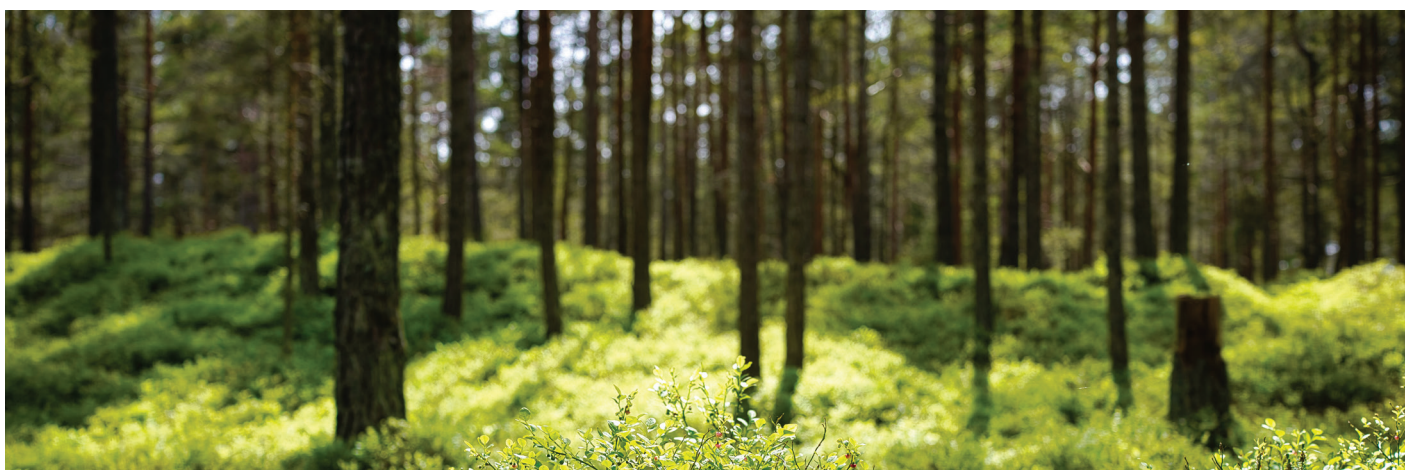
Investing in ecological corridors and natural and man-made green infrastructure has the potential to increase biodiversity and species movement in Europe. By reconnecting nearby forests – as well as other protected areas including parks, wildlife passes and hedgerows that have been separated by agricultural land, transport routes and urbanisation – ecosystem services could increase by approximately 10%.<sup>19</sup>

***“There are a lot of opportunities. There are plenty of forests and arable land where precision farming and new technology can help fulfil the goals of the Farm to Fork and EU Biodiversity Strategy for 2030. The bioeconomy can deliver a lot of value to Europe's ambitions.”***

Franc Bogovič, Slovenian MEP, Chair of Bioeconomy Working Group of the EP Intergroup on 'Climate Change, Biodiversity and Sustainable Development

### Existing business-led solutions

- 1 Boosting carbon capture:** Yara offers specialised fertiliser for Boreal forests that improves yield, both in terms of quality and volume, and increases long-term carbon capture capacity.
- 2 Protecting forest biodiversity:** Stora Enso's forestry management initiative, Forest Path, provides Finnish forest owners with a service promoting sustainable values and alternative harvesting practices. Forest owners may choose to designate ecologically valuable areas of forest for conservation, while still enabling other parts of their property to be utilised commercially with carefully planned felling and regeneration.
- 3 Making the invisible visible:** GIST Advisory performed an Integrated Profit and Loss measurement for Sveaskog, Sweden's largest forestry company, and calculated that the value to society and nature generated by their ecosystem services, was 10 times their net profit for the year.





## Bind carbon into products:

use bio-based chemicals and materials instead of steel, cement, and fossil fuels wherever practicable

The European chemical industry is Europe's biggest industrial consumer of electricity,<sup>20</sup> and its molecules and materials are used in every sector. Achieving carbon neutrality requires transitioning to a circular, bio-based chemical industry. However, the majority of organic chemicals and polymers are still derived from fossil-based feedstocks, predominantly oil and gas.<sup>21</sup> Removing fossil subsidies and incentivising the production of sustainable bio-based chemicals and polymers is critical to meeting Europe's emission reduction and biodiversity goals.

Utilising spare capacity in EU biorefineries<sup>22</sup> to produce bio-based chemicals in conjunction with biofuels and bioenergy can decrease additional investment needs, shorten time-to-market and make plants commercially viable at smaller scales, as well as increase the efficiency of biomass use.<sup>23</sup> Furthermore, introducing long-term policy measures to create a level playing field and incentivise investment in existing solutions could accelerate their large-scale deployment and subsequent environmental benefits. In the case of lignocellulosic bioethanol, an alternative bio-based feedstock to petrochemicals, it has the potential to accrue up to 90% in greenhouse gas savings.<sup>24</sup>

Bio-based materials, such as harvested wood, hold large potential for emission reduction, both in the carbon they sequester and the lower production footprint they provide in comparison to fossil-dependent counterparts, such as steel and cement. If grown sustainably, timber in construction represents the most carbon-saving of any biomass use, saving over 3 tonnes of CO<sub>2</sub> per tonne of material used when accounting for sequestration and displacement of masonry.<sup>25</sup>

***“The importance of carbon removals is growing. We need to do much more to increase carbon removals from land, forestry and through material substitution. This is where the bioeconomy comes in.”***

Peter Wehrheim, Head of Unit “Food Systems and Bioeconomy”,  
European Commission, DG Research & Innovation Company

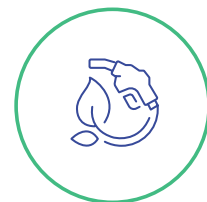
### Existing business-led solutions

- 1 Waste to chemicals:** Shell, with others, is developing an advanced ‘waste to chemicals’ (W2C) plant in the Netherlands that can make valuable chemicals out of non-recyclable waste materials. The plant will be able to process 360,000 tonnes of waste into 220,000 tonnes or 270 million litres of sustainable methanol. This is more than the total annual waste from 700,000 households and reduces CO<sub>2</sub> emissions by approximately 300,000 tonnes.
- 2 Low-emission fertiliser:** Neste has shown that a robust and low-investment method can reduce up to 50% of greenhouse gas emissions during food industry effluent treatment and create bio-based fertiliser in the process, reducing the need for more harmful synthetic options.
- 3 Environmentally friendly solvents:** typically, solvents in the metal cleaning industry are made from fossil-based petrochemicals with high Volatile Organic

***“It is important to emphasise that we need a level playing field in the global market. If the same rules apply to everyone, then the European companies can compete better.”***

Petteri Kuuva, Director of the Finnish Government's  
Climate and Energy Strategy

Compound (VOC) emissions. Avril produces organic ester solvents derived from renewable raw materials (vegetable oils and animal fats), which are environmentally friendly and more cost effective.



# Use bio-based energy where it creates most value:

use sustainable bioenergy and biofuels from feedstocks and waste to cut emissions from fossil fuels in sectors that are otherwise hard to abate.

Heavy-duty transport, aviation, shipping and industry make up 30% of EU emissions.<sup>26</sup> These sectors cannot be electrified quickly and, including light-duty vehicles, are projected to use internal combustion engines for years to come.<sup>27</sup>

Thus, sustainable biofuels<sup>iii</sup> are crucial for Europe's decarbonisation goals, and present an immediate solution to reducing oil import dependence. Bioethanol production with European sourced feedstock provides audited emission reductions of 72% compared to fossil fuels,<sup>28</sup> and using biodiesel instead of conventional diesel is 65%-90% less carbon-intensive.<sup>29</sup> Innovative technologies offer potential to go even further, through carbon capture in soil.<sup>30</sup>

With much of the EU's industrial biorefining capacity underutilised (up to 40%), there is huge scope to increase production economically and meet near-term emission reduction targets.<sup>31</sup> Given current limitations in Europe's biomass availability, investment in existing biorefineries could also help ensure raw materials are used to optimal efficiency and sustainable biofuels and biogas are produced to their highest performance criteria.

Bio-based waste materials can also create higher value products – including sustainable biofuels, bio-based chemicals and bio-based plastics. In turn, this creates an even more circular bioeconomy, reducing emissions and reinvigorating local economies through skilled 'green' jobs.<sup>32</sup> Achieving these benefits means managing waste differently, so that waste streams can be separated, transported, and used economically.

***“In Central and Eastern Europe, in countries with a lot of arable land, there are big challenges and opportunities to use new technologies connected with bioethanol, biogas production, bioenergy and also new materials that can replace fossil-based materials.”***

**Franc Bogovič, Slovenian MEP, Chair of Bioeconomy Working Group of the EP Intergroup on 'Climate Change, Biodiversity and Sustainable Development**

## Existing solutions

- 1 Reducing transport emissions:** Scania and Lantmännen are collaborating to promote climate-smart heavy transport solutions using ethanol as a biofuel (ED95), which can reduce carbon emissions by 90% compared with diesel.<sup>33</sup> The ethanol is produced from local feedstock, such as wheat and residues from the food industry.<sup>34</sup>
- 2 Sustainable aviation fuel from waste:** Neste produces sustainable aviation fuel from waste and residues, proven to cut emissions by 80%. Current capacity is 129 million litres per annum, however, with the support of Shell Aviation and other partners, Neste expect to increase this to 1.9 billion litres by 2023.<sup>35</sup>
- 3 Bioethanol from residues:** Novozymes supplies enzymes to biorefineries that produce lignocellulosic ethanol from sawdust, wood residues, bagasse, corn

stover, wheat straw, and rice straw; supplying GHG reductions between 80% and 120% compared to fossil gasoline, supplying a stable monetization of agricultural residues.<sup>36</sup>

- 4 An alternative to diesel:** Avril produces a 100% sustainable biofuel (Oleo100) made entirely from French rapeseed, which reduces CO<sub>2</sub> emissions by at least 60% compared to fossil diesel, and fine particle emissions by up to 80%. Oleo100 is compatible with all B100 approved diesel vehicles, enabling rapid deployment with existing fleets.

<sup>iii</sup> By sustainable biofuels, this initiative means biofuels that produce substantially less greenhouse gases than fossil fuels when all their impacts are accounted for throughout the product's lifecycle; and are produced in a way that does not cause significant damage to biodiversity, ecosystems, soil health and areas of high conservation value; and does not pose competition to food.



# Policy proposals

Developing a consistent policy framework that enables all actors in the bioeconomy value chain to contribute will require action across a range of policy areas. Specifically, it must:

- Provide clear and measurable targets and indicators not only for emission reduction but also on biodiversity loss, based on science providing a clear pathway forward
- Establish a coherent monitoring and evaluation mechanism to ensure policies are being implemented consistently and properly across all Member States
- Incorporate the entire bioeconomy value chain into existing EU reporting and policy planning tools (incl. National Energy and Climate Plans, CAP, Farm2Fork)
- Ensure Member States understand the importance of the bioeconomy and biomass policies when designing their national strategies under the CAP post-2020 to increase synergies within the entire value chain

The following policy proposals are recommended by sector, synthesised to a level to stimulate debate and discussion:

## Agriculture

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**Reward environmental services:** implement an effective monitoring framework with target-oriented incentives to reward farmers and landowners for using practices that protect biodiversity and soil quality while also boosting efficiency. The CAP and Farm to Fork mechanisms should take a holistic view to implementation that incentivises collaboration.

**Support changing agricultural practices:** use recovery and Just Transition funding to reduce the risk and cost barriers related to more widespread adoption of environ-

mentally friendly agricultural practices, such as investing in training, providing grants / competitive loans for technology to enable farmers to change their ways of working.

**Stimulate further innovation in more efficient practices:** use the Innovation Fund, Horizon Europe and the new EU budget to prioritise research and development in high-productivity, low-impact agricultural techniques, given the potential benefits for climate and biodiversity as well as for economic growth and employment.

## Forestry

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**Help forest owners innovate and strengthen management:** provide land and forest owners with easy access to advice and training on innovative forest management strategies that support carbon sequestration and biodiversity. Focus this support in geographies where there is significant potential for improving skills and know-how.

**Create incentives for sustainable afforestation and reforestation:** ensure that the economic incentives to stimulate reforestation and afforestation projects are attractive relative to other uses of land, in the Common Agricultural Policy and other mechanisms. Furthermore, shift from planting fast growing monocultures to planting mixed tree species to maximise Biodiversity-Ecosystem Functioning.

**Implement a regional approach:** tailor incentives based on regional circumstances, opportunities and challenges, at the same time ensuring synergy with other EU policies (e.g. Common Agricultural Policy, Renewable Energy Directive, Biodiversity Strategy).

## Bio-based chemicals and materials

**Support markets and investment:** enable investment via existing instruments for markets to develop and create policy incentives that generate demand for sustainable bio-based chemicals and materials. For example, by introducing blending mandates or using new biomaterial criteria in green public procurement rules, the Product Environmental Footprint (PEF) and EU Ecolabel.

**Support sustainable wood products in construction:** given their large abatement potential and longevity when

deployed as building materials, incentivise the use of responsibly sourced wood products. For example, by providing incentives for the use of timber in construction through the EU's 'Renovation Wave'.

**Implement a sustainable chemical taxonomy:** ensure consistent terminologies, methodologies and standards are adopted across the European chemical industry, including Life Cycle Assessments to determine which bio-based chemicals are sustainable alternatives to petrochemicals.

## Bio-based energy and fuels

**Specific sustainability assessments and thresholds:** put GHG reduction performance and bioeconomy contribution at the centre of the EU's Renewable Energy Directive and appropriately reward the biofuels that achieve the highest performance and contribution, specifically by:

- Developing an accounting system for feedstocks' total environmental and social footprint to incentivise better practices and eliminate those that are unsustainable
- Revising current restrictions and caps so that they are based on the proposed accounting system rather than blanket rules based solely on crop or feedstock type. This would allow all sustainable biofuels to contribute to renewable energy targets, if they fulfil the emissions and sustainability criteria while still excluding those with a high ILUC and deforestation risk

**Well-to-wheel approach:** acknowledge the use of sustainable biofuels when setting up CO<sub>2</sub> standards for vehicles and road charging, basing the emission reductions on a 'well-to-wheel' approach. This provides consumers and

policy-makers with accurate information on vehicles' real climate impacts and allows for deeper GHG emission reductions compared to fuel consumption or efficiency-based regulation.

**Support the growth of markets for sustainable fuels:** in sectors such as aviation where volumes are currently small and markets immature, ensure that demand-side policies, such as blending mandates on buyers, are matched with supply-side policies that support production growth, to minimise cost increases for industries in transition.

**Revise waste legislation to improve collection and use of waste and residues:** review existing definitions of co-products and waste, as well as end-of-waste criteria to reduce administrative barriers to valuable uses of waste. Standardise municipal, agricultural and forestry waste collection and sorting systems across the EU, and strengthen requirements for waste sorting, to enable businesses to make efficient use of bio-based waste as well as recycled fossil carbon in and across geographies.



# Unleashing the potential of the bioeconomy: a cross-sector partnership

BioAdvantage Europe, with the support of Scania, Avril, Lantmännen, Novozymes, Neste and many others have been working together to identify opportunities for unleashing growth in the bioeconomy in Europe. We represent many different sectors both relevant to the bioeconomy and with business activities in a range of geographies across Europe.

Our work has shown that there is significant potential for the bioeconomy to contribute to more sustainable and inclusive growth in Europe, and that it can play a crucial role in meeting the goals of the European Green Deal. But we also recognise that the bioeconomy needs an integrated, effective, common-sense and fact-based policy framework to meet this potential.

At this important moment in Europe's transition, we are: raising awareness of the potential for the bioeconomy; showcasing best practice in growing, using and re-using bio-based feedstocks; supporting policymakers to develop policies that deliver cuts in CO<sub>2</sub> emissions at scale; protecting and restoring biodiversity; as well as generating rural growth, jobs and innovation. We will do this by demonstrating the bioeconomy in action and its potential across Europe, and highlighting opportunities to improve policy at EU, national and regional levels to achieve this potential.

**Achieving the potential of the bioeconomy will hugely benefit Europe's climate and biodiversity ambitions, and we call on policymakers to work with us to create a policy framework that enables this.**



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