



# Europe's competitiveness compass points to the biosociety

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EU's aim for open strategic autonomy and a strong bioeconomy calls for ambitious science and maximising the value of sustainably sourced bio-based raw materials in all value chains. Achieving this will strengthen both the EU's competitiveness and its comprehensive security.

Developing and scaling up innovative technologies, products and services for domestic and global markets requires an environment that supports companies and benefits citizens.

Building this innovation-friendly environment on excellent, ambitious science is essential to ensure a competitive and sustainable Europe.

## Recommendations by the Natural Resources Institute Finland

1. Increase the European competitiveness and crisis resilience by harnessing breakthrough technologies for biosociety
2. Strengthen the innovativeness of primary production - more value from biobased resources
3. Develop solutions for responsible and diversified use of natural resources

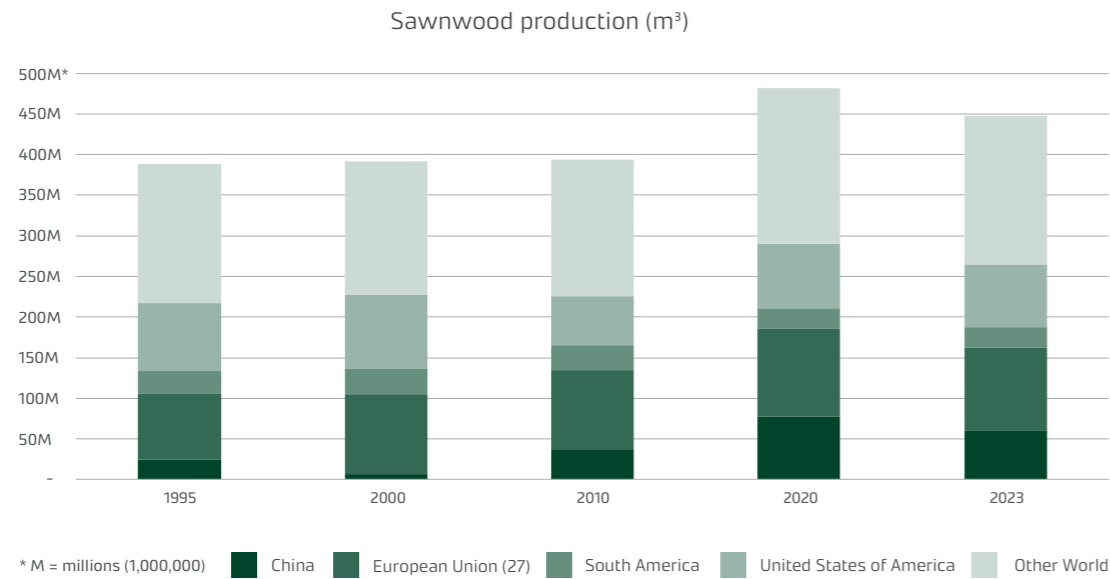
## Background

The EU's competitiveness has been affected by geopolitical tensions and slower economic growth compared to other global economic superpowers. Looking at bioeconomy in recent decades, China, the USA and South America are growing on world markets, while EU's production is decreasing.

For example, China's sawnwood production has grown by over 50%, and its pulp production has tripled between 2010 and 2023 (figure 1). This trend potentially

limits possibilities to derive higher added-value products based on biomaterials.

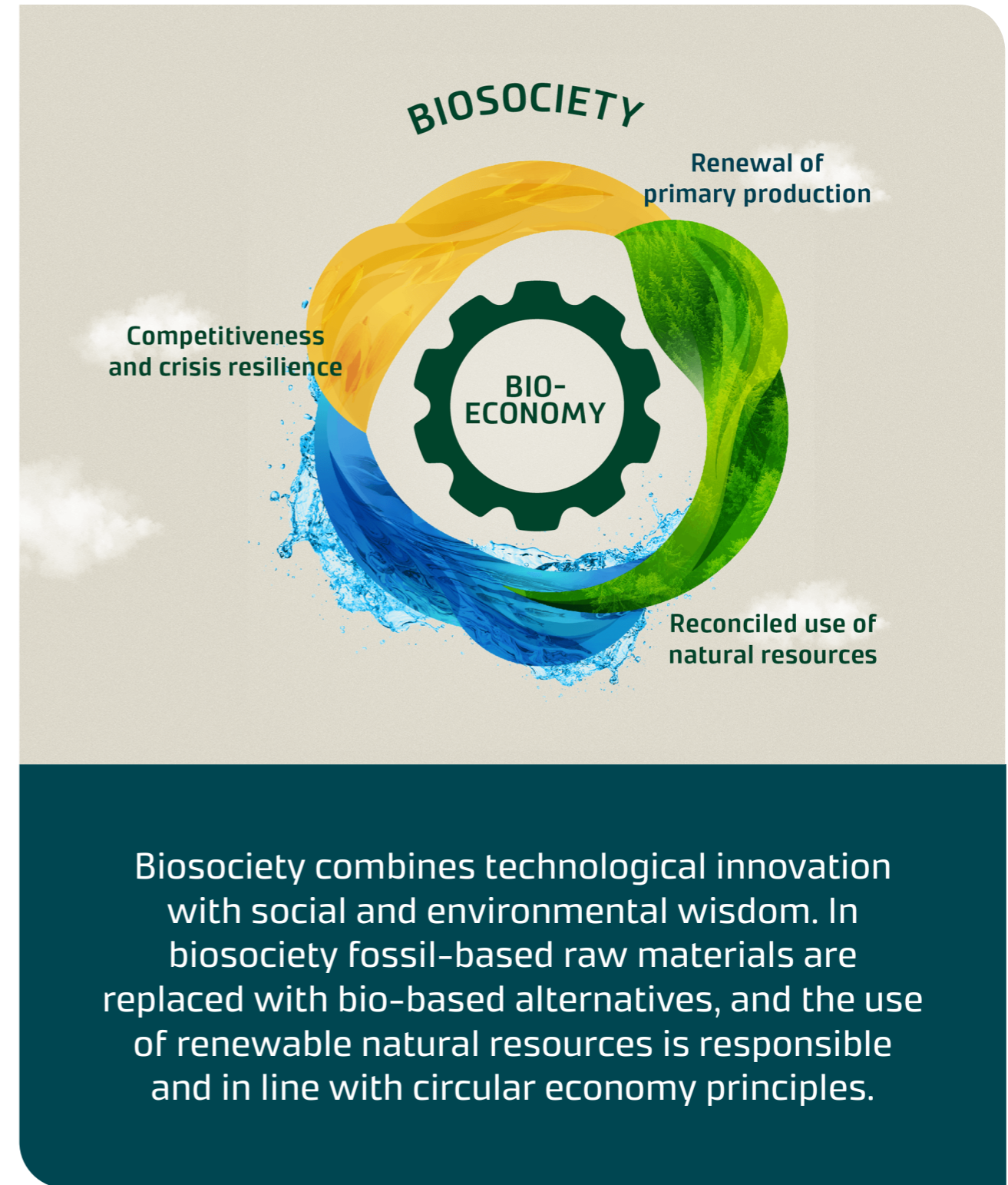
The EU's future competitiveness requires bridging the Innovation Gap with European Technology Infrastructures and the sustainable use of natural resources. The EU's support for RDI will largely interpret how well research and innovation actions succeed in developing, up-scaling, and commercialising new innovative sustainable solutions for bioeconomy.



**Figure 1** | Global sawnwood (above) and wood pulp (below, including mechanical, chemical and dissolving wood pulp) production developments from 1995 to 2023 (<https://www.fao.org/faostat/en/#data/FO>, <https://ec.europa.eu/eurostat/web/main/data/database>).

## The biosociety - powered by the bioeconomy

**Figure 2** | Biosociety is competitive and crisis resilient. It uses natural resources sustainably, and reconciles their use with other purposes, and ensures the renewal of primary production. Research provides the basis and knowledge needed for a thriving biosociety.



## Recommendation 1

### Increase European competitiveness and crisis resiliency by implementing breakthrough technologies in primary production

The EU's future competitiveness and well-being depend on how effectively research and innovation succeed in developing, scaling up, implementing and commercialising innovative, and sustainable solutions. Strong EU-level boosting and networking are crucial for piloting and scaling up new high-added-value products and fostering innovative regional clusters. Business ecosystems formed by research actors, industry, and SMEs have the capacity to drive technological renewal in primary production.

However, barriers to adoption remain. These obstacles should be removed, while incentives and public support to fuel innovation and uptake should be developed and promoted.

**“A dedicated mission is needed to research and develop emerging and breakthrough technologies that will strengthen crisis resilience and boost European competitiveness.”**

#### Action points

##### 1. Strengthen the role of biosociety in EU industrial policy

Ensure sustainable and competitive biomass sourcing by embedding biosocieties firmly into EU industrial strategies. Foster cross-sector collaboration between research, industry, and finance, and drive societal transformation to enable industrial-scale demonstrations and the creation of high-value, branded products from raw materials. Bridge the phase from lab to fab.

##### 2. Establish an EU breakthrough instrument

In our view, as presented in Draghi-report, the EU should create an instrument that can bridge EU's innovation gap between US and China by investing in higher-risk and higher-reward breakthrough technologies. The goal of this mission should be to position Europe ahead of other global leaders in selected strategic areas such as generative AI and hybrid computing when applied to bioeconomy applications, such as the development of faster breeding technologies using quantitative genetics and gene editing as well as in the creation of next-generation biomaterials.

##### 3. Enhance adaptive and precision agriculture and forestry to meet future climatic stressors

Invest in predictive models powered by big data and remote sensing so that the development of early warning systems and risk assessments in primary production is truly enabled. Equip harvesting machinery with digital systems and smart AI-based decision support tools to adopt adaptive management practices that respond to diverse and changing conditions.

## Recommendation 2

### Strengthen the innovativeness of primary production - more value from biobased resources



The EU's primary production, agriculture and forestry, contributes significantly to the socio-economic development, security of supply, and regional well-being. It supports the livelihoods of millions of people and delivers high quality products to global markets, contributing to a positive trade balance.

On the other hand, the EU is heavily dependent on external inputs such as nutrients, proteins, sugars and oils. To address this, the food chain needs to be renewed. Improved collaboration and greater renewability in primary production are needed to attract new players to the bioeconomy.

#### Action points

##### 1. Boost the geopolitical and innovativeness shift in food production

Recognise the impact of climate change and geopolitical tensions on the global shift in food production towards Northern Europe. Boost regional food security and accelerate the adoption of novel technologies in food value chains. Support new plant breeding technologies, farming practices, and the coherent development of new food legislation.

##### 2. Establish a European Water-Energy-Food Nexus

Develop an EU-level Water-Energy-Food Nexus strategy that is strongly based on research, development and innovation. Focus on integrating nutrient recycling, sustainable water management, and renewable energy in agriculture. Establish concrete funding mechanisms and public-private partnership models to accelerate innovation uptake.

##### 3. Support the development of strong regional innovation ecosystems and value chains promoting circular principles in bioeconomy development

Accelerate resource efficiency in the food and wood value chains by creating a Bioeconomy Tech Skills Framework. This should focus on digital agriculture, regenerative practices, AI, and data-driven decision-making, aligned with European data spaces and sustainability goals.

**“Renewing the food chain is essential for Europe's resilience.”**

## Recommendation 3

# Develop solutions for responsible and diversified use of natural resources



European forests provide products and services through diverse value chains and contribute to healthy societies. The pressure on forests has intensified due to their expanding and diversifying use. Rising temperatures, natural disturbances and damages are reducing forest productivity. Combined with intensive utilisation, this has led to a decline in carbon sinks and the degradation of biodiversity.

To be able to respond to the increasing demands placed on forests under changing environmental conditions, new solutions for responsible and diversified forest use and management are urgently needed.

### Action points

#### 1. Promote business models that recognize immaterial values of natural resources

Develop the valuation, accounting, and reporting of immaterial natural resources such as biodiversity, clean water and carbon storage across the entire value chain. Strengthen nature crediting, certification schemes and compensation models to foster nature-positive economy that empowers business organisations and societies while simultaneously enabling production and promoting competitiveness.

#### 2. Implement regionally adapted forest and agriculture governance

Define overarching goals for forestry while allowing regions to develop cost-efficient solutions tailored to their climatic and ecological conditions. Regionally adapted approaches are essential for effective forest use, particularly when implementing restoration and biodiversity conservation measures in an economically efficient way. Harmonised EU policies should support both ecological integrity and socio-economic development, while maintaining flexibility at the local level.

#### 3. Accelerate productivity and climate resilience in forestry

Establish EU-wide frameworks and funding mechanisms to support the development and deployment of modern tree breeding technologies that enhance the forest productivity and resilience to climate change, and improve material sourcing. These frameworks should build on innovations from the bioeconomy.

## RDI topics

#### 1. Future genomes and biomaterials boosted by hybrid calculation.

Harness future quantum technologies to enable future bioeconomy. Increase knowledge of genomic characteristics and develop tools to improve the breeding of high-yield, resilient crops with enhanced nutritional quality.

#### 2. From climate hazards and global market shocks to AI-driven solution leaps.

Investigate how climate change hazards and global disruptions affect the sustainability and competitiveness of the European bioeconomy. Solution driven leaps on forest management, circular bio-based innovations, and socio-economic modelling accelerated by the AI are needed for a resilient bioeconomy.

#### 3. Innovative business models for immaterial bioeconomy.

Explore and pilot new business models that leverage ecosystem services and nature-based solutions throughout the value chain, focusing on fair and sustainable use of natural resources that enhances wellbeing and economic diversification, and promotes competitiveness.

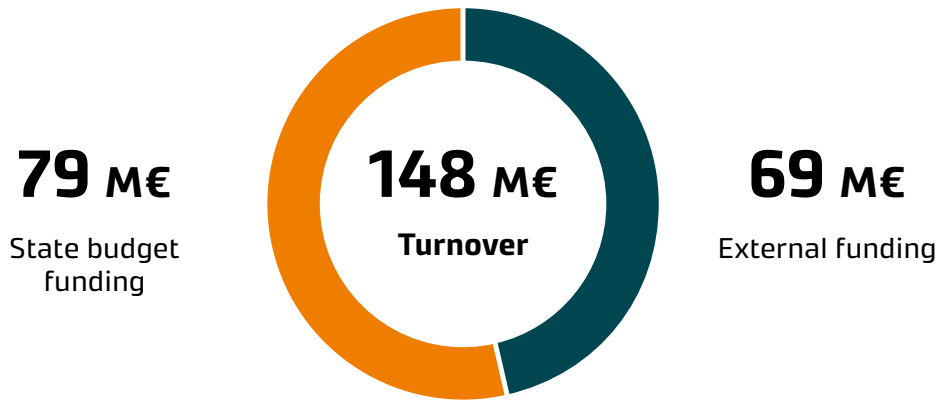
#### 4. Smart biomass valorisation systems.

Develop AI-driven tools and optimized models for harvested and circulated bio-based raw materials to ensure competitiveness and sustainability. The development of AI-driven tools is essential to maximize sustainable value creation across the food, wood, and chemical sectors.

#### 5. Building of comprehensive security.

Support the societal resilience, focusing on food and energy security. Explore the potential of novel technologies, including modern gene technologies and dual-use innovations applicable in agriculture and forestry, to improve long-term stability and preparedness.

# Luke in brief



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Helsinki, Viikki



**1298**  
employees

**630** scientist  
**616** experts  
**52** professors

We build sustainable future and well-being  
from renewable natural resources.



Luke Position Paper  
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