

unfold the future

The forest fibre and  
paper industry in 2050

# Investing in Europe for **Industry** **Transformation**

2050 Roadmap to a  
low-carbon bioeconomy



# Our sector **leads the way**

The European forest fibre and paper industry supplies **23% of the global market.**

It **employs 181,000 people** in **920 mills** and **505 companies**, and adds **€16 billion per year** to the European economy, generating an **annual turnover of €75 billion.**

Over **20% of European pulp and paper production is exported.** The sector mainly uses local raw materials; 83% of fibres used are sourced in Europe.

Pulp and paper producers are part of the much larger forest-based industry sector, which overall represents about **7% of EU manufacturing GDP.**

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# Leading the way to a climate-friendly bioeconomy

The European forest fibre and paper industry is at the forefront of a climate-friendly bioeconomy in which renewable raw materials replace fossil resources and are “kept in the loop”, improving both the environment and the quality of everyday life.

The industry’s path to reduce greenhouse gas emissions by 80% while creating 50% more added-value was first outlined in 2011 in our landmark **“2050 Roadmap to a low-carbon bioeconomy”**.

CEPI has persistently explored ways for the industry to reduce its emissions and add value to its materials, products and processes. Significant progress has been made over the past five years on research and innovation as well as on investments. The industry has already reduced its total (direct and indirect) greenhouse gas emissions by 44% per tonne of product since 1990.

In 2016 CEPI together with experts reviewed this progress as well as policy and technology developments. This new Roadmap explores the investment paths industry would have to follow to realise its vision. In November 2016 the initial findings of this review were opened to consultation from industry.

Building upon this contribution, the revised Roadmap focuses on investments. It also underscores how an unprecedented industry transformation could be “made in Europe” provided that R&D, policies and financing conditions are aligned.

The trends that underpinned our vision six years ago have not deviated from their course and remain valid today:

- Europe’s ageing demography
- Europe’s low-growth rates and shrinking share of global GDP
- Europe’s markets for existing products are overall mature and the bulk of global demand will occur outside Europe
- Societal demands for sustainable and responsible products remain strong, next to high-value and high-quality products, e.g. traceability, resource efficiency, recycling, etc.
- New green jobs and technologies require reformed education and skills systems

In addition, the acceleration in digitalisation of manufacturing - the so-called Industry 4.0 - and the evolution of consumer behaviour (connectivity, the collaborative economy, mass-customisation) are reshaping the future of both products and processes. Yet, Europe continues to suffer from anaemic growth, with low levels of investment in manufacturing which could compromise the long-term competitiveness and sustainability of entire sectors.

Simultaneously, the Paris Agreement to limit climate change is increasing global pressure to reduce carbon emissions. Its implications for European policies and the industry’s global playing field must be thoroughly assessed.

In the meantime, several EU policies - both implemented and under development - are already shaping the sector's investment capabilities and decisions.

**The most prominent are:**

- the 2030 Climate and Energy Framework with new targets for emission reductions, renewable energy and energy efficiency and the related Emission Trading System (ETS)
- the 2012 Bioeconomy Strategy that aims at ensuring fossil materials are replaced with sustainable and renewable alternatives
- the future of the EU framework programme for research Horizon 2020, including the Bio-based Industries Public Private Partnership
- the Circular Economy Package, which would enhance recycling capabilities and offer more opportunities for bio-based products, and
- the European Fund for Strategic Investments (EFSI), which, beyond its focus on infrastructure, may offer new funding opportunities for transformative investment

## Renewable and recyclable: the building blocks for a circular bioeconomy

The bioeconomy will build upon the unique strengths and properties of forest fibres - from their renewability and carbon sequestration capacity to their recyclability.

- EU forests are estimated to absorb the equivalent of nearly 10% of total EU greenhouse gas emissions each year. Between 2005 and 2015, European forests grew by 44,000 km<sup>2</sup>.
- Sustainable forest management practices are mainstreamed in industry and will enhance European forests carbon sink capacity.
- The pulp sector can today extract full value from wood components and side streams. Zero waste processes are now common practice in the forest fibre and paper industry.
- Paper recycling in Europe reached a record level of 71.5% in 2015, keeping fibres in the loop and extending the benefits of their renewable origin.
- After several loops, the paper and renewable cycles are ultimately maintained with new forest fibres brought into the value chain.

Sources: European Commission, FAO, CEPI

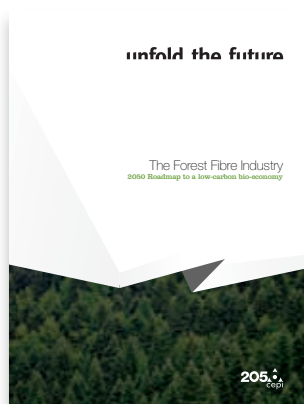
# The path to our 2050 vision

In 2011, the industry launched the perspective of **decarbonising by 80%, while creating 50% more added value by 2050**. In a fast-changing and competitive regulatory environment, it reaffirms its ambition and belief that such industrial transformation can be “**made in Europe**” with the right pro-investment policies and financing conditions in place.

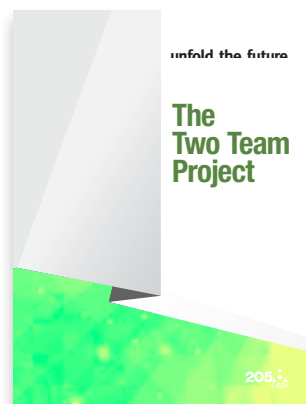
Creating value will remain the backbone for any successful industry transformation. It is a prerequisite for any investor and will be for Europe a key condition to grow capital expenditure in the region. Our vision is built on a long-term decarbonisation linked with product innovation, market developments, enhanced productivity and process efficiency.

This is the challenge the European forest fibre and paper industry is taking up. It all starts with unleashing the full potential of the bioeconomy in Europe.

At CEPI, we have been leading the debate and **unfolding the future** since 2011.



**2011**  
The **2050 Roadmap** pioneered the vision of a low-carbon and value-creating industry transformation.



**2013**  
The **Two Team Project** identified eight breakthrough technologies to cut the carbon footprint of pulp and papermaking.



**2015**  
The **Age of Fibre** showcased the industry's most ground-breaking products, demonstrating the sector's innovative power.



**2017**  
The revised **2050 Roadmap** focuses on how to achieve the investments required, in Europe, to lead the low-carbon bioeconomy.

# Creating 50% more added value: leading the European bioeconomy

The European forest fibre and paper industry is at the heart of the bioeconomy and sees its future in Europe.

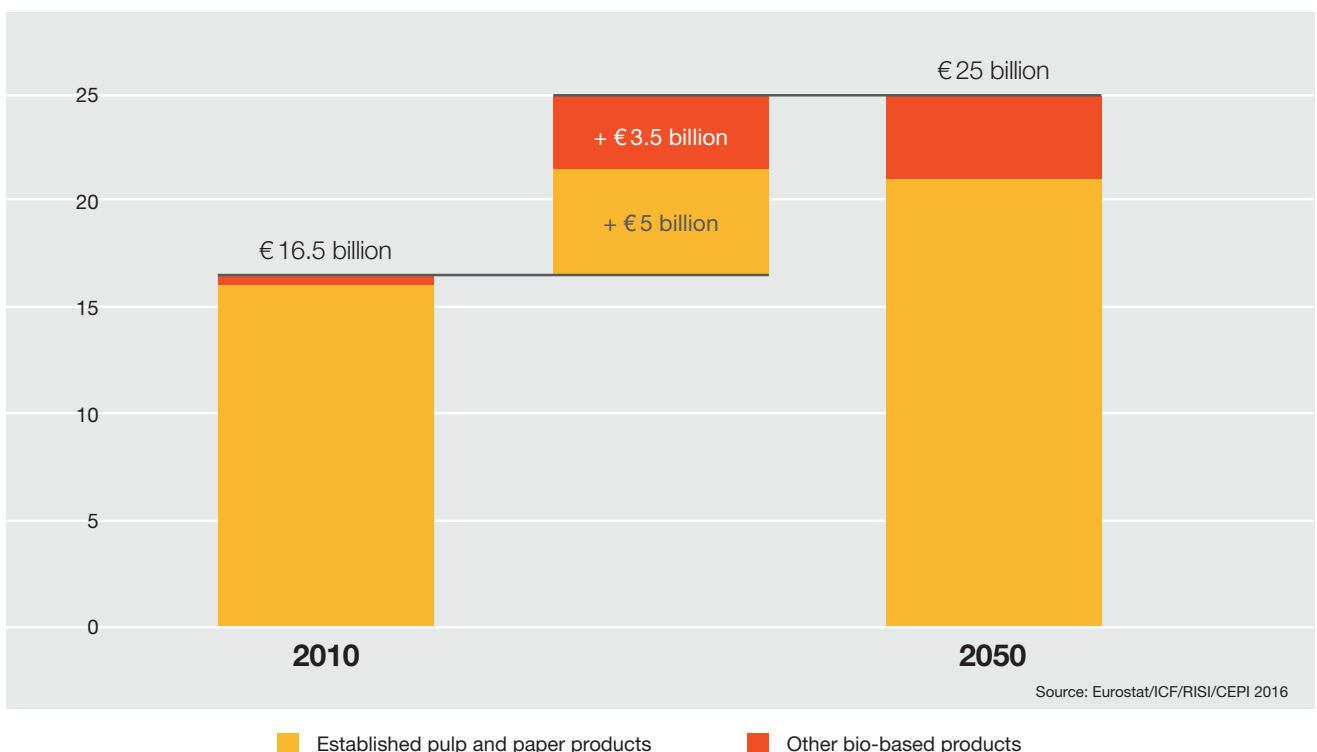
Beyond contributing to economic growth, the industry adds value to European society at large. Its value creation builds upon its sustainable raw materials, combining renewability and recyclability, its strong base of European suppliers, local communities and skilled workforce to deliver innovative solutions that substitute fossil-based products.

With its ambition to add 50% more value compared to 2010, our industry would deliver approximately €25 billion added value in Europe by 2050 (gross value added at factor cost). This development should partially result from efficiency gains, enabled by smarter manufacturing, better data management and the Industry 4.0 revolution.

Adding new functions and services to existing paper and board products - connectivity, anti-counterfeiting, water-repellence, etc. - can also offer new ways to differentiate European production from global competition, with higher value and tailor-made solutions. Together with the growth of existing product segments, such as packaging, hygiene or specialty papers, these developments would generate €5 billion of added value.

The projected evolution of industry's product segments also shows that another significant share of added value (+ €3.5 billion from 2010) will come from the development and growth of new bio-based products. Ranging from food additives to biocomposites, from advanced biofuels to nanocellulose, these emerging bio-based products will indeed bring even more opportunities for growth from renewable and innovative solutions to move away from a fossil-based economy.

Graph 01: **Added-value growth projection for the European forest fibre and paper industry by 2050 (in billion €)**



# Decarbonising by 80%: moving away from a fossil-based society

Quantitatively, decarbonising by 80% compared to 1990 means that the European forest fibre and paper industry emissions would be brought down to 12 million tonnes of CO<sub>2</sub> by 2050.

This absolute emission reduction would not account for the benefits provided by carbon sequestration in managed forests, its long-lasting storage in bio-based products that are further recycled, or the substitution of fossil-based and less climate-friendly products and materials.

Nevertheless, reducing the sector's direct and indirect emissions so substantially (by 37 million tonnes since 2015) will require a combination of specific measures to gradually deliver results up to 2050.

## Emission reduction pathways 2015-2050

### Energy efficiency

The combination of process improvements, including the transition to Industry 4.0, as well as investments in state-of-the-art production technologies are estimated to lead to a reduction of 7 million tonnes of CO<sub>2</sub> by 2050.

**-7 million tonnes CO<sub>2</sub>**

### Demand-side flexibility

Leveraging its on-site cogeneration assets, the industry has the ability to engage on the energy market and adapt its energy sourcing to take hold of low prices, in particular from surpluses of intermittent renewable energy. The associated decarbonisation benefits could reach 2 million tonnes.

**-2 million tonnes CO<sub>2</sub>**

### Fuel switch

The European forest fibre and paper industry already uses biomass or gas-based boilers extensively and pioneered Combined Heat and Power (CHP) for its own energy production. Further conversion of industrial installations to low- to no-carbon energy sources are modelled to deliver 8 million tonnes of CO<sub>2</sub> emissions reduction.

**-8 million tonnes CO<sub>2</sub>**

### Emerging and breakthrough technologies

In addition to some of the breakthrough concepts identified in the Two Team Project such as the "Deep Eutectic Solvents" technology now under development, other innovative and disruptive solutions could complement the emission reduction effort by some 5 million tonnes of CO<sub>2</sub>.

**-5 million tonnes CO<sub>2</sub>**



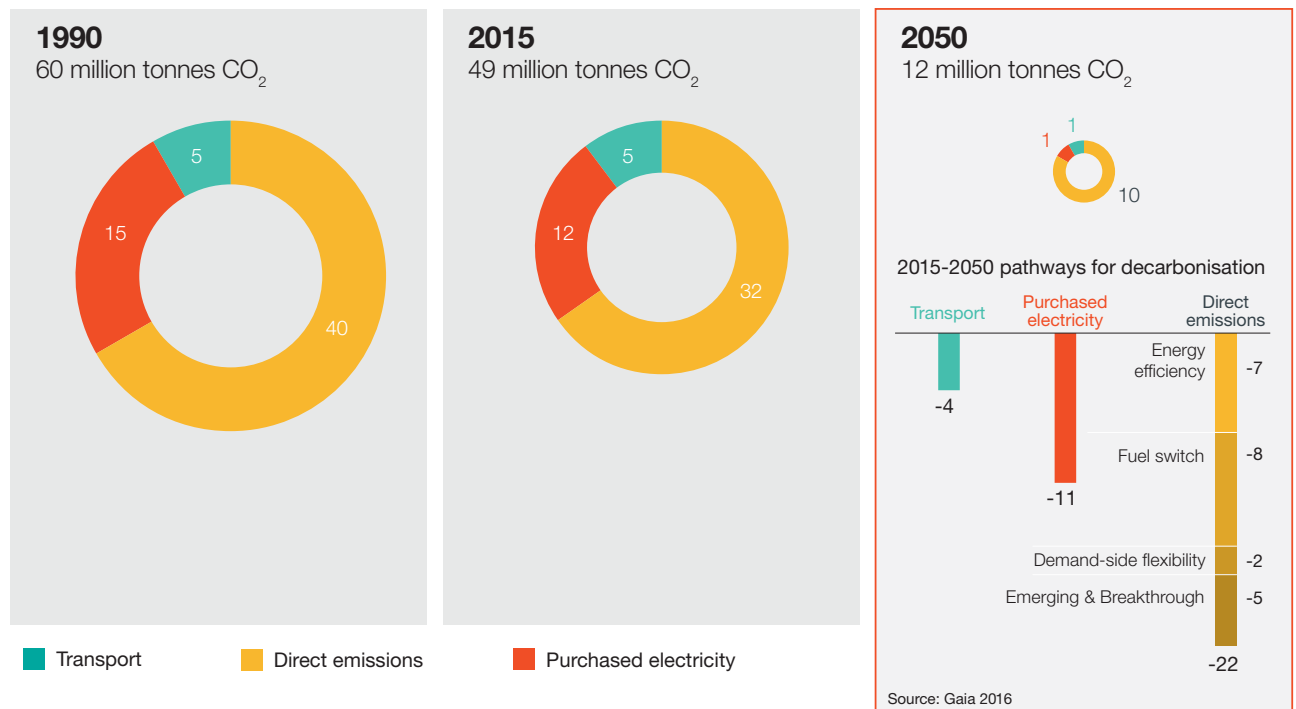
**Indirect emissions**  
 As European power production will accelerate its decarbonisation, the forest fibre and paper industry's indirect emissions from purchased electricity is foreseen to gradually decrease by an additional 11 million tonnes over the coming 35 years.

**-11 million tonnes CO<sub>2</sub>**

**Transport**  
 Emissions reduction in the transport and logistics chain of industry have been modelled to reduce our footprint by 4 million tonnes of CO<sub>2</sub> emissions. Most improvements will come from the combination of fuel and transport efficiency, improved infrastructures, intermodality and use of alternative transport fuels, such as biogas, advanced biofuels, electricity or even fuel cells.

**-4 million tonnes CO<sub>2</sub>**

Graph 02: CO<sub>2</sub> emissions reduction and decarbonisation pathways for the European forest fibre and paper industry by 2050



# Transforming industry: 40% more investments

Since 2010, the forest fibre and paper industry has invested on average about €3.5 billion per year in tangible capital goods in Europe. However, a combined effort to decarbonise and make the sector grow will require significant additional investment, beyond current levels.

External experts were consulted to model and estimate investment needs required for this transformation. Estimates foresee the need for an extra €24 billion by 2050 to ensure that the decarbonisation measures identified effectively deliver their expected reduction benefits for industry direct emissions. Over the same period, a further €20 billion will need to be invested in the production of new bio-based products.

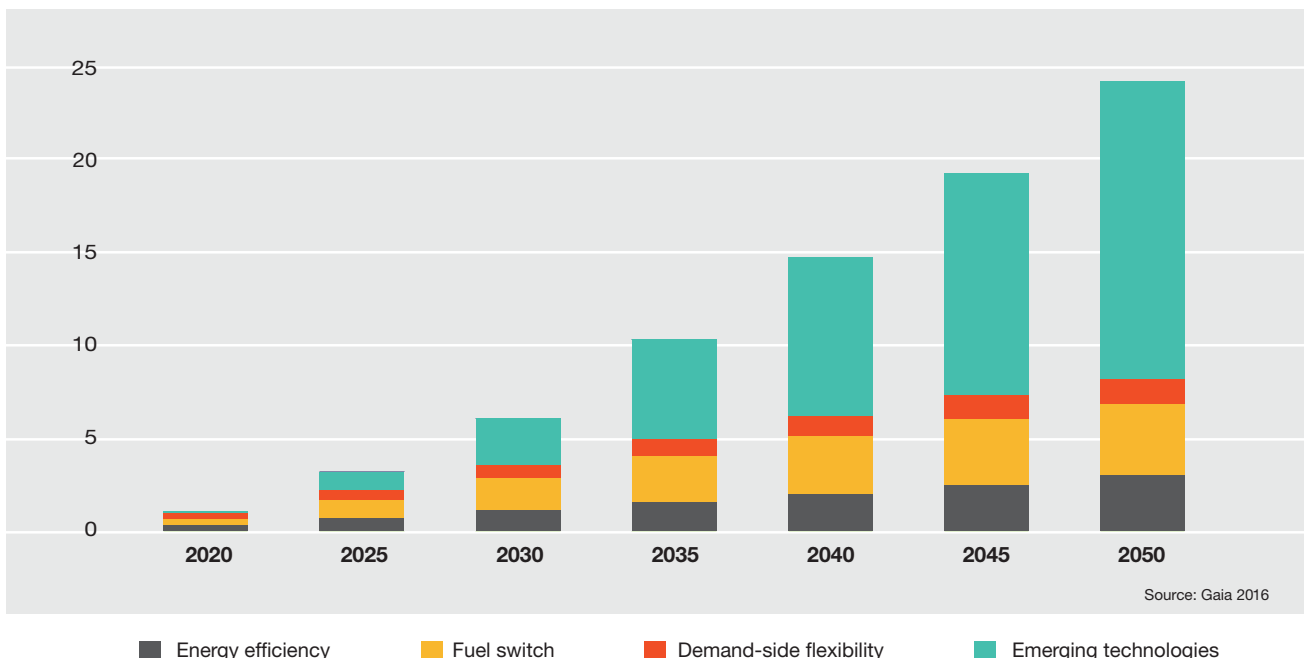
Investments for decarbonising direct emissions from industry have been estimated according to the short to long-term commercial availability of technology and industry investment cycles.

Projected amounts outlined refer only to capital expenditure (CAPEX) and do not include research and development expenditures.

The projection stresses how critical the commercial availability of emerging and breakthrough technologies will be to enable their large-scale deployment in Europe and ramp up direct emissions reduction.

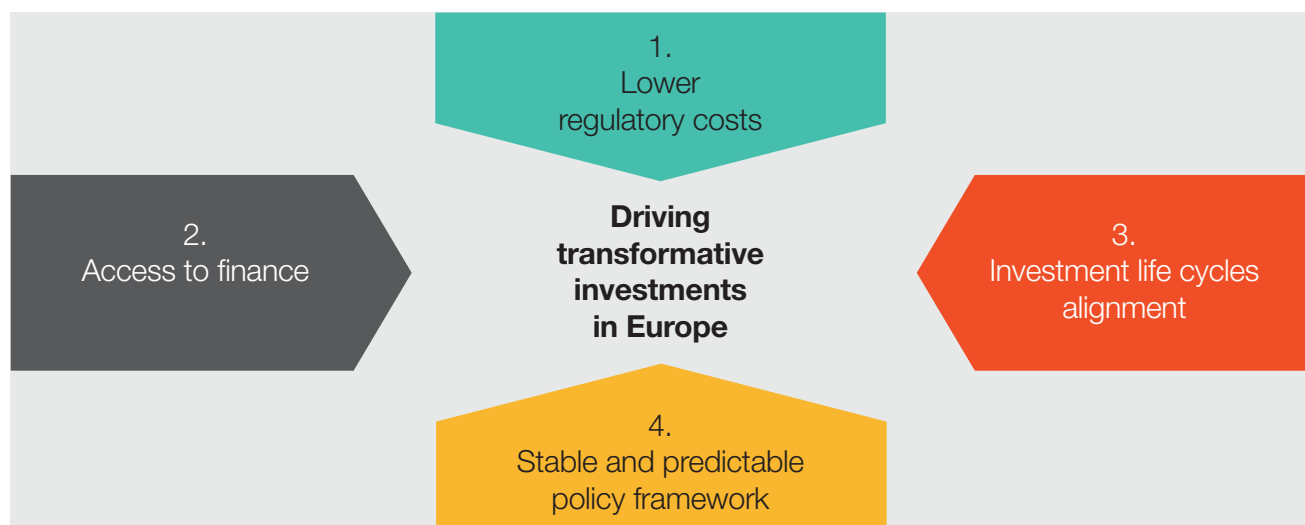
Overall, the decarbonisation and value creation pathways identified by industry would require 40% more investments than current levels over the next 35 years. This increase in capital expenditure is an obvious challenge in an increasingly competitive international environment where investment returns and risk profiles determine capital allocations between regions. In this context, it will be essential to strengthen the financial sustainability, the investment capability and attractiveness of European industry, in order to support the deployment of transformative investment in Europe.

Graph 03: **Cumulative investments for the forest fibre and paper industry decarbonisation pathways by 2050 (in billion €)**



European policymakers have only recently begun to focus their attention on Europe's investment gap to achieve its growth and jobs ambition. Several initiatives such as the Juncker Plan for investment or the REFIT programme have been put in place. Yet, to support and accompany industry transformation, policies need to decisively embed a pro-investment approach in four areas: reducing regulatory costs, addressing investment risk profiles, matching investment life cycles and preventing regulatory uncertainty.

Graph 04: **The four essentials to foster industry investments**



### 1. Regulatory costs

In 2016 the European Commission requested an independent assessment of the Cumulative Cost Impact of EU policies on the forest fibre and paper industry. The study reveals that between 2004 and 2014, regulatory costs, caused in particular by the stratification of environment, energy and climate measures, tripled over the period and wiped off an average of a third of the industry's profitability. More worryingly, the increase in regulatory costs reached an average of 6% of the added value created by industry and never reversed. A policy reset to restore competitiveness, investment capacities and attractiveness in the region is obviously necessary at both EU and national levels to propel long-term investments.

### 2. Access to finance

Transformative investments, such as pioneering the production of new bio-products or revolutionising an entire production chain with new technologies, face additional challenges to access finance due to their radically new or specific risk profiles. New models of risk-sharing or financial facilities will be required over the transition for these investments. Public finance instruments could play a key role, be it by de-risking investments, guaranteeing loans or facilitating a faster transition between R&D and large-scale technology deployment in Europe.

### 3. Investment life cycles

Equipment and investment life cycles should also be taken into account by policymakers - just as the sector is obliged to do. The average age of the forest fibre and paper industry production equipment in Europe (between 15 and 30 years) gives more time for developing and implementing some of the steps to decarbonise and generate value, including as-yet-unknown breakthrough technologies. The implementation steps of policy measures should be phased to better match rather than conflict with investment cycles.

### 4. Regulatory certainty

Throughout our consultation, all experts, whether financiers, risk-rating agencies or industry executives stressed the importance of avoiding policy and regulatory uncertainties that plague investors' confidence and the ability to rate the risk associated with long-term investments. Building upon the long-term strategic goals it pursues, Europe can enhance the predictability of the policy developments and guarantee a stable regulatory framework for long-term investment.

# Accelerating industry transformation in Europe

The European forest fibre and paper industry believes that 80% decarbonisation combined with 50% added value in Europe can be a reality within 35 years. It has the potential to “walk the talk” along the paths we have identified. To set the right investment environment, conditions should apply at both EU and national levels.

First and foremost, a level playing field needs to be restored and maintained both with global competitors and trade partners as well as within the EU between products or sectors. As mentioned above, specific de-risking or risk-sharing tools and improved conditions for accessing finance, including for research and development, should be assessed and, where needed, implemented.

Since 2011, important policy developments have taken place in Europe and more changes are foreseen with the implementation of the 2030 energy and climate change package and the Energy Union. Aligning the existing and forthcoming pieces of the policy jigsaw puzzle to put industry transformation on the right track will require a strong policy focus or shifts in seven specific areas:

## 1. Bioeconomy

Building a vibrant bioeconomy in Europe requires a shared vision and collective effort by all EU institutions to make it a mainstream priority. It should be at the core of the next EU framework programme for research and innovation, just as it should be central in other EU policies (agriculture and rural development, climate and energy, environment, public procurement, etc.).

## 2. Research

Future European R&D programmes need to focus less on incremental research and development of known technologies and more on speeding up both the development and deployment of emerging technologies, and the acceleration of the identification of breakthrough technologies. More funding must be directed to commercial pilots and demonstration plants to validate new technologies at industrial scale. Instead of adding funding layers on a limited number of topics and priorities, real added value should be sought from EU grants and support.

This, combined with a reduction and simplification of the administrative burden, would increase business participation into the programme.

## 3. Raw materials

Ensuring wood mobilisation from sustainably-managed forest resources and fostering a high-performing recycling chain will be critical to securing the quantity and quality of the raw materials the industry needs for its development in Europe.

The principles of a cascading use of wood should guide and allow for enhanced value creation and resource allocation across the forest fibre industry and paper value chain. In a context of growing competition between energy and more value-creating use of renewable resources, support schemes or policy measures encouraging low-efficient energy use should be eliminated. In parallel, and as waste collection improves, it will be essential to ensure that recycling operations effectively happen in Europe and feed final production processes.

Climate mitigation policies should fully take advantage of the combined benefits of carbon sinks, storage in products and substitution.

## 4. Energy and climate change

The new Electricity Market Design needs to complete EU market integration and remove regulatory barriers to unleash the potential of industrial demand-side flexibility. The on-site generation of low- to no-carbon energy by the industry should be encouraged. To allow for the most cost-effective decarbonisation of electricity, market distortions should be avoided. Over the transition phase towards an integrated and low-carbon power system in Europe, a compensation mechanism for the carbon cost pass-through in the price of electricity should be established.

As carbon price will increase over the next decade, financial capacities and the investment risk profile of industries exposed to the Emissions Trading System (ETS) will further erode. It will also deter international capital allocation in exposed European industries. The ETS needs to be decisively used as a pro-investment tool that rewards and effectively supports manufacturing industry investments to accelerate greenhouse gas emissions reduction.

### 5. Transport

Europe's decarbonisation will need a cost- and resource-efficient reduction of transport emissions, e.g. through optimal use of transport networks and infrastructure, as well as of the various transport modes (rail-road in particular). Policies should facilitate cross-border trips, which are currently restricted by divergent truck weights and load limits. Maritime transport requires a global approach and solutions to avoid a distortion of competition between European and overseas players.

### 6. Skills and education

Embracing Industry 4.0 and the bioeconomy revolution will also require new skills and competences to operate the smart factories of the future as well as to develop and produce new bio-based products. Member States will therefore play a decisive role in adapting education and training curricula to the new needs, drawing from exchange of experiences and best practices at European level. In addition, enhanced mutual recognition of qualifications at European level will ease mobility, not only across borders, but also between companies.

### 7. Financing

A broad range of initiatives have been put in place at EU and national level to facilitate access to finance. Making these tools more readily available and operational for investors remains a challenge, particularly for SMEs. European industry organisations such as CEPI clearly have a role to play in raising awareness of these financing tools and facilitating their access by investors across Europe. A better tailoring of these tools to match the specificities of different industries would be beneficial. Less burdensome administrative requirements and more efficient EU processes are equally essential to speed up this assessment and simplify the validation of projects.



# Putting the **policy jigsaw** together

Achieving a massive reduction of both direct and indirect emissions while creating sustainable value requires aligning Europe's policies and putting them on track for the next decade and beyond.

Some policy measures will be critical in triggering the change and facilitating this transition; others will act as catalysts for this transformation over time.

The following matrix outlines how each of the paths for value creation and decarbonisation can be triggered or amplified by the seven policy areas identified. It includes existing EU initiatives that are needed in order to achieve our goal. These are divided into Key enablers (required) and Catalysts (facilitating the process).

This matrix will serve as a checklist to ensure that both industry and policymakers are on track to deliver on our common vision.

## **Glossary of acronyms**

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**CAP**

Common Agriculture Policy

**COSME**

EU programme for the competitiveness of SMEs

**DSM**

Digital Single Market

**EFSI**

European Fund for Strategic Investments

**EIB**

European investment Bank

**EIP**

European Innovation Partnership

**ESCO**

European Skills and Competences programme

**ETS**

Emissions Trading System

**PPP**

Public Private Partnership

**LULUCF**

Land Use, Land Use Change and Forestry

# Alignment matrix

Catalysing and enabling transformation

	1 Bioeconomy	2 Research	3 Raw materials	4 Energy and climate	5 Transport	6 Skills and education	7 Financing						
<b>Value creation and GHG emissions reduction pathways</b>	Mainstream policies	Accelerate breakthrough technologies	Funding for industrial scale pilots	Sustainable mobilisation of wood	Enhanced recycling	Non-distorted raw material and energy markets	Energy market integration	ETS as a pro-investment tool	Cost-efficient decarbonisation	Reform curricula	Mutual recognition of qualifications	De-risking investments and access to finance	
		Horizon 2020-2030	Horizon 2020-2030	State Aid Guidelines Energy & Environment, PPP, ETS Innovation Fund	Waste legislation: Circular Economy Action Plan	Waste legislation: Circular Economy Action Plan	Cassading use guidance, Renewable Energy Directive, Circular Economy Action Plan	ETS innovation Fund, National use of ETS revenues	Fuel Quality Directive, Biomass Sustainability Criteria	Blueprint for sectoral cooperation on skills, Digitising EU industry (DSM)	New skills agenda, ESCO, Erasmus +	Capital Markets Union Green bonds EFSI EIB COSME	
	Core markets and applications + EUR 5 billion	Horizon 2020-2030	Horizon 2020-2030	LULUCF CAP rural development	Electricity Market Design	Electricity Market Design	Electricity market design	National use of ETS revenues	Electricity Market Design	ETS indirect cost compensation	Low carbon mobility strategy, Fuel Quality Directive, Efficiency standards	ETS indirect cost compensation	Connecting Europe Facility, Structural funds, EIB
<b>Added-Value</b>	New bio-based products + EUR 3,5 billion	Bioeconomy Strategy	Horizon 2020-2030	Horizon 2020-2030	Horizon 2020-2030	Horizon 2020-2030	Horizon 2020-2030	Horizon 2020-2030	Horizon 2020-2030	Horizon 2020-2030	Horizon 2020-2030	Horizon 2020-2030	Horizon 2020-2030
		Energy efficiency - 7 mt CO <sub>2</sub>	Fuel switch - 8 mt CO <sub>2</sub>	Demand-side flexibility - 2 mt CO <sub>2</sub>	Emerging/breakthrough technologies - 5 mt CO <sub>2</sub>	Purchased electricity - 11 mt CO <sub>2</sub>	Transport - 4 mt CO <sub>2</sub>	Energy efficiency - 7 mt CO <sub>2</sub>	Fuel switch - 8 mt CO <sub>2</sub>	Demand-side flexibility - 2 mt CO <sub>2</sub>	Emerging/breakthrough technologies - 5 mt CO <sub>2</sub>	Purchased electricity - 11 mt CO <sub>2</sub>	Transport - 4 mt CO <sub>2</sub>
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Key enabler

Catalyst

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