



RIs as pillars in the ecosystem, addressing challenges on climate

Focus on industrial tech roadmaps

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DG Research and Innovation, Prosperity Directorate
Industrial Research, Innovation & Investment Agendas (E1 unit)

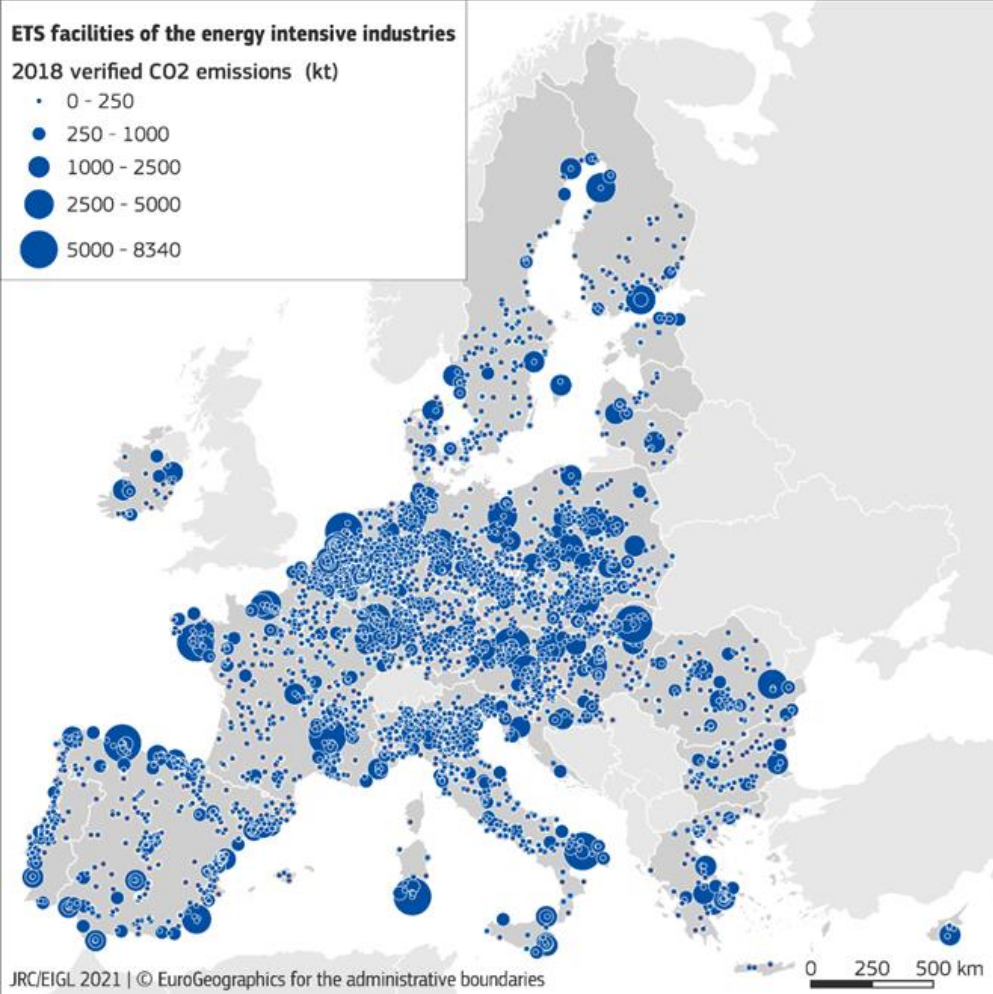


ERA Industrial technology roadmap for low-carbon technologies

*in energy-intensive
industries*

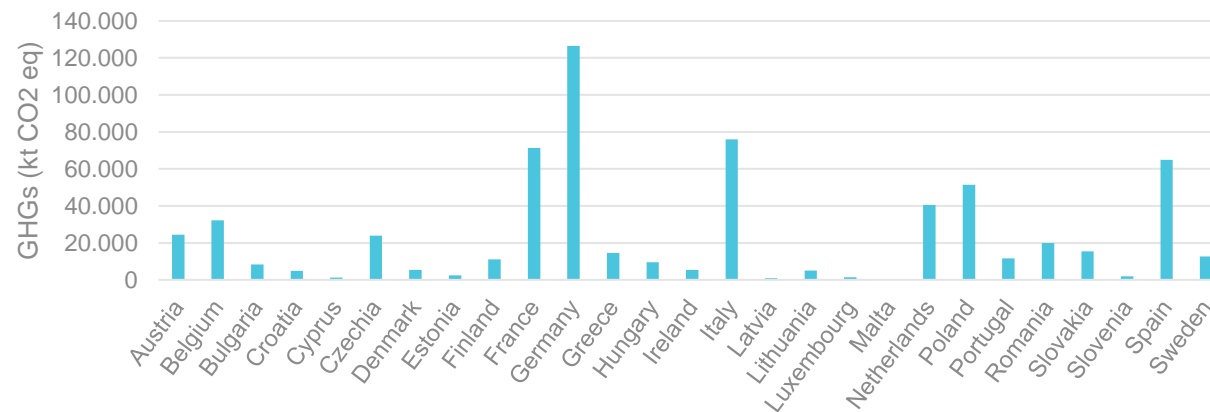


- The ERA roadmap for low-carbon technologies, developed together with Member States, industry and other stakeholders, provides a **list of key emerging low-carbon technologies** for energy-intensive industries.
- It outlines **scenarios** for the transition of energy-intensive industries to climate neutrality and **tools for leveraging R&I investments** to accelerate development and uptake of low-carbon technologies.
- It elaborates on R&I needs, including **public and private R&I investments, green patenting activity** and **enabling conditions**, including **regulatory framework, valorisation** and **standardisation** aspects.



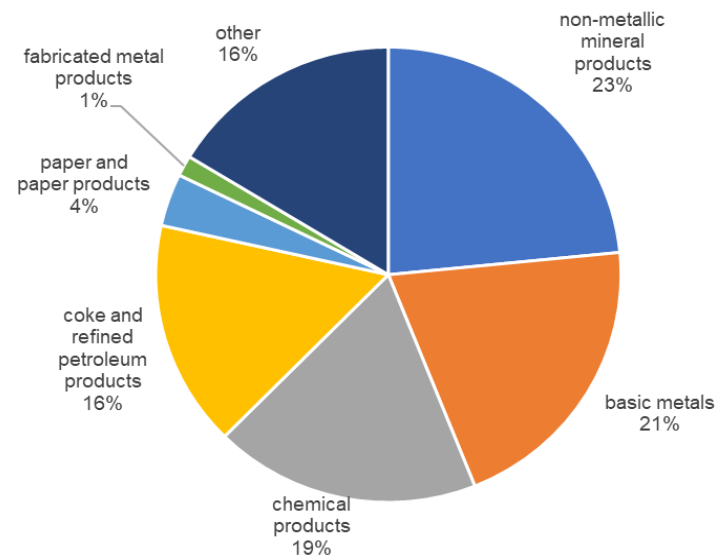
Source: Energy and Industry Geography Lab (Joint Research Centre), 2022.

Distribution of EII greenhouse gas emissions by Member State



Source: European Environment Agency, GHG Data Viewer

Concentration of GHG by sector



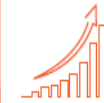
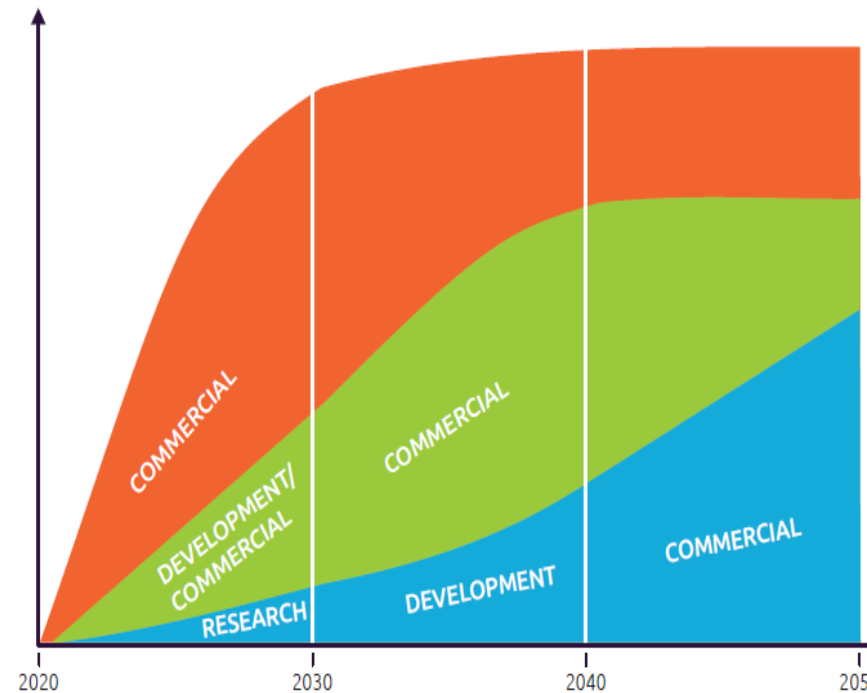
Source: ETS & Eurostat data, processed by the Austrian Institute of Technology.

R&I investment needs



The roadmap points to a gap between the current overall R&I investments across energy-intensive sectors and the amount needed to reach EU Green Deal emission targets for 2030 and 2050.

Market scale-up of the technologies



DRIVE TO MARKET SCALE Massive deployment starting in 2020



ACCELERATION & SCALE UP Market scale can start during the decade 2020-2030



INNOVATION BETS Market scale expected after 2030

Source: Capgemini 2020.

Most relevant 'technological pathways' (technology groups)



The analysis results in a list of the **most relevant technological pathways** for the decarbonisation of energy-intensive industries at varying levels of technological readiness

Technological decarbonisation pathways in EII	Assessment of technology readiness (TRLs)	Application potential by sector
Electrification	low/ medium	High for chemicals, non-ferrous metals; iron & steel, ceramics, glass
Use of green hydrogen	medium	High for chemicals, iron & steel and non-ferrous metals
Carbon capture and storage	medium/ high	High for cement & lime, chemicals, iron & steel
Carbon capture for utilisation	medium	High for cement & lime, chemicals, iron & steel; but also for all other EII
Alternative fuels and feedstocks (excl. H ₂), bio-based resources, and integration of renewable energy	medium/ high	High for cement, chemicals, pulp & paper, non-ferrous metals, glass; but also for all other EII
Alternative materials and more energy efficient processes	medium/ high	High for cement & lime, chemicals, iron & steel, pulp & paper, non-ferrous metals, ceramics; but also for all other EII
Materials efficiency, secondary resources and waste valorisation (incl. recycling/CE and industrial symbiosis)	medium/ high	High for all EII

Source: First ERA Industrial Technology Roadmap, European Commission (April, 2022).

Main outcomes



Key findings

Gap between current R&I investments and levels needed to reach the Green Deal objectives

A key barrier to rollout are the uncertainties around authorisations of first-of-a-kind installations

Patenting filings in green inventions by major EU companies continue to increase, but the role of SMEs in them remains unclear

EU green standards for low-carbon technologies appear to be underdeveloped in some areas

Suggested actions

Assess the potential for establishing an industrial alliance or similar initiative for low-carbon technologies in energy-intensive industries

Facilitate specific national sectoral and cross-sectoral strategies or programmes with key stakeholders as part of ERA policy agenda

Establish a community of practice to facilitate authorisation for FOAK installation for low-carbon industrial technologies

Improve the knowledge on patenting for green technologies and for energy-intensive industries

Facilitate further valorisation by exploring with industry the opportunity to open up IP on central (cross-sectoral) green inventions, widening the access to IP for licensing (e.g. patent pool) and knowledge transfer

Cooperate with European standardisation organisations (e.g. CEN, CENELEC) and industrial partnerships to identify and fill main standardisation gaps for innovative LC industrial technologies

CIRCULAR INDUSTRIAL TECHNOLOGIES ROADMAP

FOR ENERGY-INTENSIVE INDUSTRIES, TEXTILES, CONSTRUCTION



LINKING INDUSTRIAL ECOSYSTEMS* ...

- 🏭 ENERGY-INTENSIVE INDUSTRIES
- 🏭 TEXTILES
- 🏭 CONSTRUCTION

**Resource intensive ecosystems, with a high circularity potential*



PROCESSES 4 PLANET



MADE IN EUROPE



**CIRCULAR BIO-BASED
EUROPE**



BUILT 4 PEOPLE



AI, DATA & ROBOTICS

... TO KEY HORIZON EUROPE PARTNERSHIPS

CIRCULAR INDUSTRIAL TECHNOLOGIES ROADMAP

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Publication

End of 2022



KEY TECHNOLOGIES



Design technologies



Materials sourcing technologies



Production technologies



Recycling technologies



Horizontal technologies

Design for sustainability



Collaborative consumption



Lifecycle extension



Network-based models



AND BUSINESS MODELS



Thank you!

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