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Fast forwarding the green transition in just and socially responsible way – cases of industry, energy and transport sectors

TREND REPORT

ON THE INDUSTRY SECTOR

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Introduction

The industry sector is profoundly impacted by the pursuit to low-carbon economy, as reaching that goal depends on the application of clean technologies, as well as transforming business models. On the one hand, clean technology supply is dependent on the energy intensive and hard-to-abate industries, which, at the same time, are the biggest contributors of GHG emissions in the industry sector. On the other hand it relies on rare-earth and other raw materials which do not naturally occur in the European Union or their domestic availability is limited, increasing the need of adapting business models to circular economy. Meanwhile the automotive industry has been undergoing a disruptive change caused by the fuel switch in the transport sector and the need to respond to the development of low carbon mobility patterns. Last, but not least, the European industry has been put under strong pressure by energy costs and decarbonisation needs, while the EU growing market demand for clean technologies has been increasingly (and predominantly) supplied by its competitors from other regions, particularly from China.

Selected data on the EU manufacturing

Basic data

The **major branches of the EU industry**, as indicated by their respective contributions to the sectoral value added are: manufacturing of food products (over 14%); fabricated metal products; machinery and equipment; motor vehicles, trailers and semi-trailers (over 12% each of the three), followed by chemicals and chemical products (over 9%), rubber and plastics products (6%) and basic metals (5%). They also account for the highest employment levels measured as numbers of full time employment equivalent in the NACE 2 C category (their collective share in employment in the industry sector equals 66%)[1].

The strategically important group are **energy intensive industries (EII)** which include: chemicals, basic metals, non-metallic minerals, ceramics, glass and cement), plastics, paper products, wood and wood products, and food. Among them the four most energy intensive industries – chemicals, metals, non-metallic minerals, and pulp and paper – contributed together 2% of the EU GDP (and 16% of the gross value added). As much as approximately 60%-80% of their production was concentrated in big enterprises.

From 2022 the EIIs have noted output losses, paralleled by the increased EU market reliance on imports (while manufacturing as a whole demonstrated a relatively stable production trend. The primary contributing factors have been energy prices[2] and emission costs, combined with substantial investment needs driven by decarbonisation, but also bureaucratic barriers, and too narrow markets for greener products. Still, the impact of carbon pricing on EIIs, has been so far

[1] Based on Eurostat data as of 2022. This VA share estimates do not take into account six manufacturing branches for which data has not been disclosed: electrical equipment; computer, electronic and optical products; furniture; basic pharmaceutical products and pharmaceutical preparations; textiles, and printing and reproduction.

[2] With electricity and fossil fuels representing 7%-9% of direct (and 12%-15% intermediate) products value in those industries. During the 2022 energy crisis, the four most intensive energy industries observed 20%-25% increases in the production costs (data quoted after The Future of European Competitiveness, September 2024).

mitigated by free ETS (Emission Trading System) allowances, which however are going to be phased out by 2035[3]. It needs to be noted that downsizing the production capacity of EII results in losses which are difficult and costly to compensate, such labour force and supplier networks losses (as a result of extended shut downs) or technology related costs (generated by the temporary suspension of production processes.)

The EU **automotive industry,** which contributes 8% of European value added, has been reorienting its production towards electric vehicles and less polluting ICE vehicles as a result of the EU climate policy driven shift in the demand of its products. While it is a net exporter of vehicles and car parts, the EU exports, measured by the number of vehicles sold, shrunk by 16% in 2022 compared to 2017[4]. Over the same period car imports from China rose nearly five-fold from 114,000 vehicles in 2017 to 561,000 in 2022. The Chinese manufacturers' share in the European EV market (BEV-battery electric vehicles and PHEV-plug-in hybrid vehicles) increased from 5% in 2015 to 15% in 2023, while that of the EU car producers fell from 80% to 60%[5].

The transport electrification trend has been driving the reconfiguration of the original value chains in the automotive industry and their merging: (1) the digital - as software and electronics already represent a significant part of a car's value, which may even rise to 50% by 2030, and AI and digital technologies relevance for car mobility is expected to grow, with such applications as autonomous vehicles or advanced driver's support; (2) mobility – with charging and refuelling infrastructure being crucial for developing an EV market, (3) circular economy (particularly, but not only, with respect to batteries) – as the EU regulations on recovery and recycling of end-of-life materials has been tightening.

Sustainability

The manufacturing sector was responsible for 694Mtoe of GHG emissions in 2023, with a 17% decline compared to 2013. It noted the biggest fall (improvement) in GHG intensity (by 34%) among the sectors of economy between 2013 and 2023, as a result of growth in GVA and moderate reduction of GHG emissions. Manufacturing also noted a 19% decrease of GHG intensity of employment (measured in hours worked) [6].

In manufacturing, the biggest GHG emissions come from the **energy intensive industries**. Those which are generated by the manufacturing of cement, glass, steels, chemicals and plastics are difficult to reduce with currently available technologies (so called hard-to-abate industries). Fossil materials (coal, gas, and oil) are used as fuel (for achieving required heat and pressure which is hard to electrify) or for chemical processes and as feedstock**.** In 2021 the HtA industries collectively contributed 19% of overall GHG emission in the EU business sector and 68% of the GHG emissions in manufacturing.

[3] For instance CO2 costs accounted only for 2% of the total production costs in the EU 27 steel production in 2019 ("The future…" op. cit.)
[4] https://www.acea.auto/files/ACEA-Pocket-Guide-2023-2024.pdf
[5] https://www.iea.org/reports/global-ev-outlook-2024/trends-in-electric-cars
[6] Eurostat env_ac_ainah_r2

The decarbonisation of HtA requires significant investment, but much of it is not economically viable, not only due to high upfront capital costs[7], but also because green technologies are not mature enough to safely project operational costs, which are anyway affected by the high prices of electricity and low-carbon fuel. At the same time the EIIs are capital intensive, relying on long investment cycles of 30-40 years, so any selected technology would inevitably be locked-in for a long period.

At the same time, besides other strategic applications, the EII output (such as steel, metals, and cement) is crucial for greener products and infrastructure (e.g. for electrical equipment, wind turbines, energy efficient construction).

The automotive industry, which is not an EII, has a key role in the electrification of transport. However the carbon footprint of electric vehicles in the production value chain is higher than that of ICE vehicles, as their manufacturing is more energy intensive and battery production requires raw material mining and processing.[8]

Challenges related with clean technologies

While the market for clean technologies, notably those related to energy generation and storage, and absorbing emissions, is going to grow, and Europe has pioneered a number of CTs and was able to develop production base for a number of CTs quite early, the share of EU manufacturing in supplying the CT domestic market has been decreasing and its position in the global CT trade has been deteriorating. The EU is also highly reliant on imports for critical raw materials on which clean technologies show significant dependency, as their deposits are mainly situated outside the EU.

On the one hand, Europe has higher capital and operating costs (including those of raw materials, energy, and labour), particularly in comparison to China. On the other hand, there are dedicated programmes supporting the development of local CT manufacturing in economies competing with Europe. A mix of policy measures and high levels of subsidies have helped to build a globally relevant CT manufacturing capacities in the Asia-Pacific region (in some cases leading to overcapacity, for instance for solar PV in China). In the US Inflation Reduction Act of 2022 companies (irrespective of size) can benefit from tax credits for CT including deployment, with bonuses linked to the domestic content share in products (with eligible share rates increasing over time) – the support which is competitive in terms of level, scope and access compared to incentives available in the EU. In this situation certain CT segments EU enterprises are deciding to shut down, cut or relocate part or entire production to other regions of the world.

Besides that the EU spends less on decarbonisation related innovations than the major Asian economies, its industrial, research, and innovation policies are not sufficiently aligned, and there are obstacles in transitioning innovations to the market and scaling them up[9].

[7] Such as required by electric arc furnaces (EAF), green hydrogen, carbon capture and storage (CCS), carbon capture and use (CCU), and raw material recycling.

[8] As indicated by an IEA analysis, 5 May 2021

[9] See "The future…" op. cit. for a detailed analysis of the global competitive environment.

EU policy response

To secure the competitive position of the EU-produced goods towards those manufactured in regions were no or low carbon prices apply the Cross Border Adjustment Mechanism (CBAM) was introduced (to fully take effect since 1st January 2026, after the current transition period) imposing charges on imported products, reflecting CO_2 emissions involved in their production. To avoid carbon leaking, direct and indirect emissions down the value chain will need to be taken into account (which maybe challenging for complex products, given limited data availability) and the range of covered products will need to be extended. There are also concerns that CBAM can be circumvented, or that it is not sufficient to offset the costs of green hydrogen based production (e.g. in steel or ammonia production[10]).

To boost the EU manufacturing capacity in supplying the growing market for clean technologies (for products, their components, or machinery necessary for manufacturing those products) Net Zero Industry Act (NZIA) was adopted in June 2024 with the target for the EU domestic production to meet 40% of the European demand annually by 2030, and to reach 15% of the global market value by 2040. It also sets CO_2 capture and storage at 50 million tons by 2030. The Regulation provides for streamlining permitting procedures, introduces conditionality to public procurement and renewable energy auctions (on environmental sustainability, resilience, cybersecurity, and other non-price criteria), as well as puts a 50% cap on the value of a technology that can be imported from a single country outside EU. Other measures include 'net-zero' acceleration industrial clusters, "regulatory sandboxes" (for undertakings to test NZT in a real world environment, under a scheme monitored by a competent authority), and European Net-Zero Industrial Academies to develop education and training programmes to upskill and reskill people for NZT value chains, to achieve the double goal of reindustrialisation and decarbonisation.

As clean technologies show considerable reliance on raw materials with limited availability in the EU Critical Raw Materials Act was adopted to strategically reduce dependence on any single supplier country, and enhance sourcing of materials within the EU. By 2030 the domestic European consumption is to be met internally at the following minimum annual levels: 10% for extraction, 40% for processing, and 25% for recycling. The Regulation puts a cap of 65% on sourcing any strategic raw material from a single third country.

The New Batteries Regulation adopted in 2023 sets (1) targets for the collection of batteries (63% by 2027 and 73% by 2030 for portable batteries, and 51% by 2028 and 61% by 2031 for light EV batteries) as well as for lithium recovery from waste batteries (50% by 2027 and 80% by 2031), (2) minimum levels of recycled content for industrial, SLI batteries and EV batteries (16% for cobalt, 85% for lead, 6% for lithium and 6% for nickel), (3) recycling efficiency target for nickel-cadmium batteries and for other waste batteries at 80% and 50% respectively by 2025.[11]

[10] Energy and climate transition: How to strengthen the EU's competitiveness. A study for Business Europe, Compass Lexecon, July 2024

[11] Preceded by the Circular Economy Action Plan adopted in 2020.

Labour related challenges

In 2022 the employment in the EU manufacturing sector (NACE 2 C category) equalled 25.75 million full time job equivalents (1% less than in 2021). In 2021 four EII industries: chemicals, metals, non-metallic minerals, and pulp and paper products accounted for 13% of jobs in manufacturing, equal to 3% of the employment in the EU market sector.

It is expected that the investment driven by the decarbonisation and circular economy needs in **steel and metals sector** will create job opportunities helping to save 100 000 jobs in the metals sector by 2030. (The basic metals sector lost 1% full time job equivalents between 2021 and 2022). In the manufacturing of electronics and electrical equipment, including batteries, employment is projected to grow by 3.2% and 2.2% (compared to the baseline scenario[12]) driven by the development of reuse and recycling practices[13].

From 2015-2022 jobs in **clean technology manufacturing** increased by 12% (compared to 4% in manufacturing as a whole), and there were twice as many vacancies in 2019 than in 2023, with 25% of EU companies reporting labour shortages in Q3 2023. This segment of the industry sector, i.e. supplying the demand related to producing or storing renewable energy, absorbing emissions, or achieving high energy efficiency performance is expected to see the highest relative employment gains. Besides manufacturing, increased labour demand is also expected in clean technology installations and maintenance[14].

The automotive industry directly and indirectly (downstream) represented 6.1 % of total EU employment (providing jobs to 13.8 million people in the EU, including 2.6 million in vehicle manufacturing, which account for 8.5% of employment in the manufacturing sector)[15]. From 2021 to 2022 the automotive sector lost 3% of full time equivalent jobs)[16].

Considerable job losses are expected, as the industry reorients form ICE vehicles to EVs, as the production of the former is 30% less labour intensive. In spite of this 23,000 additional jobs (1%) have been forecasted in the motor vehicle sector between 2020 and 2030 in the EGD scenario, compared to the baseline projection. The correcting factor may be the application of robotics, automation and AI replacing low-skilled workers. At the same time engineering and ICT occupations are expected to account for 90% of job increase in this sector[17].

Skills

New skills are needed by manufacturing companies to reorient their operations and business models and be able to reduce their carbon footprints. As green and digital transitions are linked with each other, a shift in occupational profiles and an increased demand for digital skills are

[12] i.e. scenario without the European Green Deal
[13] https://www.cedefop.europa.eu/files/4206_en.pdf
[14] "The Future…" op. cit.
[15] Eurostat, quoted after "The Future…" op. cit.
[16] Eurostat sbs_ovw_act
[17] Tracking the Green Transition in Labour Markets, CEDEFOP, 2023

expected with a wider use of AI technology (for instance in the automotive sector), and also new cross-cutting specialisations and hybrid skills profiles have already started to emerge[18].

A large scale investment in skills will be necessary, with a view of the NZIA implementation. A demand of skills enabling the transition to circular economy related to processes, products, services and systems through optimisation and innovation has been growing. In the recent years (2018-2022) the most searched job profiles were those of research and development managers, followed by industrial, production and environmental engineers. In the construction materials production sector the most frequently sought skill in this respect was lean manufacturing. Besides professionals involved in product design, workers involved in product remanufacturing and repair will be searched for. While some companies may bridge the skills gap by outsourcing, jobs in the sector can be sustained and their number can rise only if they increase their in-house competence by investing in the relevant upskilling and reskilling of their staff[19].

The twin transitions pose the task for employers to commit to worker retraining, upskilling and career development helping them to transit to new roles in the green economy, and to involve workers representing organisations in the planning and implementation of transition strategies, elevating the need of social dialogue and collective bargaining. They also require supportive measures and policy frameworks to make the transitions just and prevent de-industrialisation of Europe.

[18] Greening The Economy: Employment and Skills Aspects, Business Europe, October 2021

[19] "Tracking…" op. cit.

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