

CLIMATE
FRIENDLY
MATERIALS
PLATFORM

A Climate-Neutral Industry:

*Status of policy debate in European
Member States*

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POLICY BRIEF



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Climate Friendly Materials Platform

The Climate Friendly Materials (CFM) Platform analyses the transformation of basic material production and use to achieve carbon neutrality by 2050. Its collective aim is to aid progress toward nationally-led industrial decarbonisation policy frameworks compatible with long-term EU strategy, and to capture the potential of a just and inclusive clean energy transformation.

Convened by Climate Strategies, the CFM Platform facilitates exchange between leading analysts, policymakers, industry leaders and other relevant stakeholders. It brings together leading think tanks and university research groups in Belgium, France, Germany, Hungary, the Netherlands, Poland, Spain and Sweden to enhance Europe's analytic understanding of how individual instruments fit together into a coherent policy package.

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1. Introduction

Industry is responsible for a substantial share of greenhouse gas (GHG) emissions, accounting for about 29% globally (WRI, 2020)¹, nearly all (25%) of which stems from basic materials, such as aluminium, cement, steel and chemicals (Neuhoff et al., 2019). The emission intensity of the industry sector has decreased substantially in the last two decades, mostly due to developments in energy efficiency. According to the analysis of the Odyssee-Mure project, industrial energy consumption in the EU fell by about 50.3 Mtoe between 2000 and 2017, mainly due to energy savings (-65.6 Mtoe) and structural change (-14 Mtoe), while higher industrial activity (+23.1 Mtoe) and other factors (+6.2 Mtoe) had increasing effects.²

However, to reach the goal of carbon neutrality by 2050, absolute reduction of fossil fuel consumption must be realized through a range of mitigation options beyond energy efficiency measures. Besides the efforts of producers to replace their conventional technologies and implement fuel and feedstock switching, there is a need for increased recycling, repairing and re-using of materials and products, improving product service efficiency (e.g., through sharing and longer lifetime for products), as well as decreasing demand (e.g. through demand side measures promoting material efficiency in product design and manufacturing as well as energy sufficiency) (Neuhoff et al. 2019, Spangenberg and Lorek 2017, Fishedick et al. 2014).

Pricing emissions by implementing the EU Emission Trading System (EU ETS) in 2005 has been the principal policy response to foster emission reduction of non-diffuse sectors in the European Single Market. The EU ETS was meant to push gradual industry decarbonisation but has thus far failed to deliver extensive technology change for several reasons, namely the prolonged period of low allowance price levels and associated low cost of compliance³, the shield of free benchmarked allocation provided to manufacturing companies highly exposed to foreign competition, and the investment uncertainty caused by the unpredictability of allowance prices.

Given the long development cycles required for the development of new technologies, their elevated costs and the extended design life (15- 25 years) of process equipment, which hinders a fast sector wide adoption of clean technologies and the length of industry investment cycles, there is a need for timely action to reach climate-neutrality by 2050. To ensure timely technology adoption it is essential to create a credible long-term investment environment and provide sufficient incentives for companies to make their cost-effective utilization possible. Clear policy targets and strategies guiding corporate decision making and effective policy instruments providing sufficient incentives supporting the development and diffusion of climate neutral technologies must underpin the transformation process.

This policy brief provides an overview of the current policy landscape in five EU Member States (Germany, Hungary, the Netherlands, Poland, Spain) by investigating how the path to climate-neutral industrial production is reflected in their national energy and climate plans (NECPs) and other strategic documents, highlighting the policies and measures in place to govern the investment decisions of industrial companies. It draws attention to the differences of the approaches taken by the countries and provides some recommendations on how to translate the carbon-neutrality objective into national policy frameworks and most importantly the implementation of member states.

The analysis relies on information collected by researcher partners of the Climate Friendly Materials Platform (CFMP), which provides a forum for knowledge and information exchange between policymakers, industry representatives, researchers and stakeholders from civil society to promote and successfully implement policy mechanisms that bring about the decarbonisation of the basic materials sector. The policy brief also incorporates views of basic materials producers from the online workshop “Climate-neutral industry: State of policy debate in European Member States” held in June 2020.⁴

The first section of the brief compares the targets and existing measures contained in the National Energy and Climate Plans and other policy documents with using the policy cycle framework to determine their stage in the policy-making process. Drawing on the results and the views of industry stakeholders, the second section includes some recommendations on how to improve the representation of industry decarbonisation in national policies. The Appendix provides a snapshot of industrial production and greenhouse gas emissions in the analysed countries.

1. Including fuel combustion and process emissions for the manufacturing and the construction sectors as well as indirect emissions from electricity and heat consumption, compared to total emission data with LULUCF. Based on 2016 data from WRI: <https://www.wri.org/resources/data-visualizations/world-greenhouse-gas-emissions-2016>

2. <https://www.odyssee-mure.eu/publications/efficiency-by-sector/industry/energy-consumption-drivers-variation.html>. The values are the result of an index decomposition analysis of change in industrial energy use. The structural effect refers to the change in the share of industrial branches to industrial value added, while the activity effect reflects changes in industrial output, measured with the production index. Other effects increased industrial consumption by about 6.2 Mtoe.

3. Prices were below 10 EUR/t between November 2011 and March 2018.

4. <https://rekk.org/event/234/a-climate-neutral-industry:-state-of-policy-debate-in-european-member-states>

2. Landscape of Policy Development

The climate neutrality objective and strategic initiatives outlined in the European Green Deal Communication⁵ and the European Industrial Strategy⁶ set out the pathway for the future development and transformation of the industrial sector. The documents emphasize the need to provide support to energy intensive industries to reach decarbonisation goals via technology modernisation while avoiding the risk of losing competitiveness and relocation of production facilities (carbon leakage), as well as establishing circularity in the use of materials.

There is an ongoing debate on who should bear the costs of decarbonisation and to what extent shall companies be made responsible for their own climate-friendly transformation. Readily deployable zero carbon technologies are not yet economical and absorbing these higher costs would certainly put them at a competitive disadvantage in the current interconnected global markets.

Therefore, similarly to the support for renewable energy generation, it is feasible to provide financial and regulatory assistance to companies deploying new industrial processes and technologies and improve their market readiness. At the same time, policy instruments should ensure that companies increasingly assume responsibility for their negative externalities while also passing costs through to final consumers. The CFMP Platform has recommended a set of policies that together can achieve those objectives, including 'Contracts for Differences (CCfD)' providing support for industrial investments in innovative low-carbon technology projects, 'climate contribution' helping to prevent carbon leakage (as an alternative to a Border Carbon Tax), 'Product Carbon Requirements' banning the use of high-carbon products and 'Green Public Procurement' increasing the market opportunities for low-carbon solutions. (Neuhoff et al., 2019)

As already mentioned, the long-time horizon needed for building or retrofitting industrial facilities make an enabling policy environment all the more urgent for member states to adopt. To better understand how different jurisdictions frame their industry decarbonization policies, we identified the most important policy instruments across the countries contextualized in the "policy cycle framework". This framework divides the process of policy making into stages from problem identification to policy evaluation, thus reflecting where the

instruments stand regarding their application(see the next section).

The main purpose of designing National Energy and Climate Plans (NECP) is to provide a comprehensive framework for achieving emission reduction targets from 2020 to 2030 on the path to 2050 carbon neutrality, in which industry is one of several sectors. Some governments also prepared specific strategies that apply to industrial decarbonisation, while other initiatives from producers or non-governmental organisations are also considered.

After introducing the policy cycle framework, this chapter reviews the current policy environment in each of the countries with special attention to:

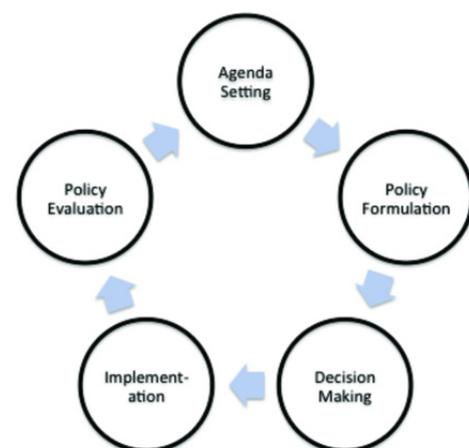
- sector specific targets
- policies and measures specified in NECP and other national policies and initiatives.

The Policy Cycle

The policy cycle (Howlett and Ramesh, 1995)⁷ is a theoretical concept that describes the typical steps in the policymaking process. Although it has been criticised for oversimplifying real-world policy elaboration, it can serve as a basic guide to translate public issues into government action.

Figure 1: The policy cycle

Howlett and Ramesh (1995)



5. COM/2019/640 final, <https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1596443911913&uri=CELEX:52019DC0640#document2>

6. COM/2020/102 final, https://ec.europa.eu/info/sites/info/files/communication-eu-industrial-strategy-march-2020_en.pdf

7. Howlett, M. and M. Ramesh (1995), "Studying Public Policy: Policy Cycles and Policy Subsystems" Toronto: Oxford University Press

The different stages of the policy cycle are as follows:

Policy formulation involves discussion between stakeholders and policymakers, suggesting alternative solutions, setting goals and identifying the steps to achieve them.

Decision-making refers to parliamentary decisions on targets and legislation, and elaborating the details of policy instruments after the formulation has been completed.

Implementation typically requires the identification of agencies responsible for executing the tasks related to the policy after putting it in place.

Policy evaluation aims to improve and refine the policy instruments and identify future issues to be addressed.

Our aim is to provide a horizontal view of national policies by comparing the participating national approaches.

Targets and policies related to industry decarbonisation

Besides the National Energy and Climate Plans (NECPs) covering the period of 2021 to 2030, member states are also obliged to elaborate their long-term strategies setting out pathways to reach net zero emissions in their economies, inducing them to think beyond the next ten-year period. These documents include indicative trajectories using modelling based on the currently available mitigation options and costs.

Table 1; Industry-related measures in Germany

INITIATIVE	MEASURE	STATUS (Policy-cycle terminology)	DESCRIPTION
NECP	Measures related to energy efficiency Promoting renewable process heat utilization Subsidies to support innovation and research programs related to decarbonisation technology development and alternative energy use (batteries, hydrogen).	Policy formation	Instruments mentioned in NECP mostly focus on energy efficiency and programs supporting technology development and research (sector coupling, materials research, CCU/CCS).
Support further design and implementation of policy initiatives announced by German Climate Action Plan	Carbon Contracts for Differences are mentioned in various policy documents (e.g. in the National hydrogen strategy) and have been in discussions between various ministries. The instrument of 'Climate contribution' was implicitly mentioned by Minister Altmeier when asking the EU Commission to go beyond BCA.	Policy formation	

The NECPs have to be structured similarly by Member States to ensure comparability and policy consistency. Typically, they focus on the three energy consumption areas (electricity, heating and transportation) while industry is rarely represented (apart from some related energy efficiency measures). The following sections compare the relevant instruments from within the NECPs and other national policies and measures related to industrial decarbonisation.

Germany

Sector specific target

A specific GHG emission target for the industrial sector in Germany is laid down in its Climate Action Plan 2050.⁸ According to this, industrial facilities should release 55 percent less greenhouse gas in 2030 (140-143 Mton) compared to 1990.

Industry related measures in the NECP and other documents

The NECP identifies two complementary strategies for the transformation of industrial processes: increasing energy efficiency and closing the carbon cycle for industrial processes where the formation of CO₂ is difficult to avoid. Nonetheless, only energy efficiency measures are specified.

Hungary

8. https://www.bmu.de/fileadmin/Daten_BMU/Pool/Broschueren/klimaschutzplan_2050_en_bf.pdf

National Industry Strategy 2030	Set the goal of decarbonizing industry by means of a low-carbon production technology and CCS as well as CCU technologies, digitisation, capital flows and lightweighting.	Policy formation	Draft was published, processed by the Federal Ministry of Economics and Technology
National Hydrogen Strategy	Calls for large scale green hydrogen production and announces measures to implement it. Includes a pilot on CCfDs mostly targeted to steel and chemical industries.	Decision Making	Published in June 2020, led by Federal Ministry for Economic Affairs and Energy. Extent of electrolyser capacity needed to make "green" hydrogen with renewable electricity by 2030 was estimated.
Steel Action Concept	Calls for a long-term strong, internationally competitive and climate-neutral German steel industry and announces measures to implement it. Highlight the role of CCfDs as role of the National Hydrogen Strategy and mention possible implementation of demand side measures such as e.g. inclusion of sustainability criteria in Federal Government procurement or a quota for low-carbon (by 2050, carbon-neutral or, as far as possible, carbon-free) steel in finished products.	Decision Making	Published in July 2020 by the Federal Ministry for Economic Affairs and Energy
Green Public Procurement	Some climate-friendly procurement practices take place in an uncoordinated fashion at the local level (municipal and state level). Conversations have started with the Federal Ministry of Economics and Technology on a more coordinated strategy at the Federal level.	Policy Implementation / Agenda Setting	
Documents with roadmaps developed by stakeholders. Germany's Federation of Industry (BDI) and German Energy Agency (DENA)	BDI developed 80% and 95% emission reduction scenarios focusing on increase of renewable energy and decarbonized gas in industry and hydrogen production and networks. DENA developed roadmaps for energy transition, calling for significant increase in energy efficiency and renewable energy.		
Efforts by various groups	An initiative of German companies (Stiftung 2 grad) is committed to support ambitious German climate policy. Major Berlin-based think-tank Agora Energiewende is working to ensure a successful energy transition in Germany.		

Sector specific target

The Hungarian NECP does not specify any GHG reduction target for industry.

Industry-related measures in NECP and other documents

Through energy efficiency improvements and directing investments into low-carbon sectors outside of heavy manufacturing, Hungary's NECP aims to achieve the EU average

energy intensity of industrial production. The NECP mentions support programs promoting innovation related to energy efficiency and pilot projects to develop green hydrogen production. Energy efficiency improvements are also expected to be reached via the Energy Efficiency Obligation Scheme to be introduced for energy suppliers.

The next table presents the most important industry-related measures and their position in the policy-making process.

Table 2; Industry-related measures in Hungary

INITIATIVE	MEASURE	STATUS (Policy-cycle terminology)	DESCRIPTION
NECP	Promotion of innovation related to energy efficiency improvements in industry	Policy formation	The key role of energy efficiency is emphasized in NECP. It sets the objective to move direct investments in less GHG intensive sectors (e.g. high tech).
NECP and Act on Energy Efficiency	Implementation of Energy Efficiency Obligation Scheme for energy suppliers	Policy formation/ Decision Making	The obligation scheme may target industrial energy efficiency improvements.
NECP	Supporting innovation related to energy efficiency and pilot projects from the Innovation Fund to develop green hydrogen production	Agenda Setting	
National Hydrogen Strategy	Setting guidelines related to hydrogen utilization in Hungary coordinated by National Hydrogen Technology Platform	Agenda Setting	The strategy will be prepared by the end of 2020
Circular Economy Platform ⁹	Initiative of the Business Council for Sustainable Development in Hungary, the Embassy of the Kingdom of the Netherlands and the Ministry for Innovation and Technology of Hungary for supporting high level dialogue on circular economy to accelerate the transition.	Implementation	

9. https://www.bmu.de/fileadmin/Daten_BMU/Pool/Broschueren/klimaschutzplan_2050_en_bf.pdf

The Netherlands

Industry related measures in the NECP and other documents

Sector specific target

The Dutch NECP sets two targets for 2030 and a single goal for 2050. In the projections, 50% fewer primary raw materials are consumed and greenhouse gas emissions from production processes and the waste sector are reduced to 36 Mton of CO₂-eq in 2030. Besides the net climate neutrality of raw materials, products and processes in industry, at least 80 percent circularity of these processes are also set out for 2050.

The NECP largely builds on the Climate Law, which was passed in 2019 and its implementation plan, called the “Climate Plan”. Societal partners (industry, environmental organisations, labour unions, etc.) reached a “Climate Agreement” in 2019 which distributes the 2030 GHG emission reduction target among the main sectors, including industry, and lists a large number of agreed measures to achieve sectoral targets. Recently a strategic letter was sent to parliament by the minister, outlining the governance of the industrial climate neutrality planning. The table below provides an overview of the most important instruments.

Table 3; Industry-related measures in the Netherlands

INITIATIVE	MEASURE	STATUS (Policy-cycle terminology)	DESCRIPTION
NECP (largely based on the Climate Agreement)	Establishing a circular industry where greenhouse gas emissions are near zero by 2050	Policy formation	In 2050, raw materials, products and processes in industry are net climate neutral and at least 80% circular. In 2030, 50% fewer primary raw materials are consumed and greenhouse gas emissions from production processes and the waste sector are reduced to 36 Mton of CO ₂ -eq. To achieve this, a programme is being developed, requiring an estimated €9-15 billion investment from industry.
NECP (largely based on the Climate Agreement)	13 programmes to achieve the goal outlined above	Agenda setting	13 multi-annual Mission-oriented Innovation Programme (MMIP) have been formulated, to reduce CO ₂ emissions and increase circularity. Many MMIPs directly or indirectly influence industry.
NECP (also outlined in the Climate Agreement and the Climate Plan)	A carbon tax for industry (to be introduced in 2021)	Decision-making	The tax is set to ensure that a 14.3 Mton reduction in emissions compared with the base path is achieved in 2030. It concerns an objective CO ₂ tax, focused on avoidable emissions.
NECP (also outlined in the Climate Agreement and the Climate Plan)	CCfD to stimulate the sustainable energy transition (to be introduced in September 2020)	Decision-making	The grant’s predecessor (SDE+) focused on the financial support of renewable energy generation. SDE++ builds on the SDE+, with addition of CCS

NECP (also outlined in the Environment and Planning Act and the Energy Agreement)	Introduction of obligation to not only save energy, but also provide information	Implementation	As of December 2019, installations using 50,000 kWh of electricity or 25,000 m ³ of natural gas (or an equivalent thereof) per year or more must take all energy-saving measures with a five-year payback period, and must also report before 1 July on the measures they have taken.
Letter of ministry of economic affairs and climate policy to the House of Representatives (many goals are also mentioned in the Climate Agreement and the Energy Agreement)	Outline of measures to be taken to reach climate-neutrality goals for industry	Policy formation	Goal: climate-neutral industry, reached by means of sub-goals, including: the introduction and upscaling of new (production) technologies, large-scale use of non-fossil fuels and reuse of carbon, circularity, sector coupling and optimal use of residual heat and other products of industry by other installations, upscaling the use of electricity from renewable sources, primarily offshore wind and hydrogen, CO ₂ levy for businesses emitting more GHGs than agreed upon, subsidies for CCS projects, electrification of industrial processes, changes in infrastructure for supply and (re) use of hydrogen, electricity, CO ₂ , and heat.
<u>Energy Agreement</u>	<u>Increased energy efficiency</u>	<u>Implementation</u>	<u>Two covenants between the national government and industrial sectors outline agreements on the improvement of energy efficiency, including financing measures to alleviate investment risks for banks; external financing for business developing/improving innovative technologies for efficiency improvements; incentivising measures with a payback period of no more than 5 years.</u>
Porthos; initiative by the harbour of Rotterdam	CO ₂ storage beneath the North Sea	Decision making	Porthos is preparing a project to transport CO ₂ from industry in the Port of Rotterdam and store this in empty gas fields beneath the North Sea. The participating companies will supply their CO ₂ to a collective pipeline that runs through the Rotterdam port area. The CO ₂ will be transported through an offshore pipeline to a platform in the North Sea, where it will be pumped in an empty gas field.

Poland

Sector specific targets in NECP

Poland's NECP sets out goals for the industry in two dimensions: lowering the energy consumption and implicitly decreasing the GHG emission of the sector. The sector-specific energy efficiency target is to reduce unit energy consumption in industry by 20% until 2030, compared to its 2018 level. This goal is cited and based on another government document focusing on energy innovations which was published in 2017, though details are not provided in the NECP.

The NECP projections indicate that GHG emissions from the industrial processes will decrease from 28,5 MtCO₂e in 2015 to 23,6 MtCO₂e in 2030 (-17%), and the CO₂ emissions from combustion of fossil fuels in industry will decrease from 27,7 MtCO₂ in 2015 to 19,4 MtCO₂e in 2030 (-30%).

Industry related measures in the NECP and other documents

As mentioned above Poland's NECP does not define any concrete measures to reach its industry specific goals and any mention of climate-neutral industry is absent from the document.

Poland has not adopted an industrial strategy or policy document addressing the transition to climate neutral industrial production. While the Ministry of Economic Development announced a plan to develop a New Industrial Policy as early as 2016, the document was never completed. Instead, the government focuses on specific issues related to the EU climate and energy policy, e.g. compensation of indirect emissions costs as a part of carbon leakage protection, or options for introducing Border Carbon Adjustment Mechanisms at the EU level. The national long-term climate strategy that will be submitted to the EC considers deep decarbonisation pathways for the Polish industry and is still under internal discussion.

Several industrial associations have joined the hydrogen platform launched in mid-2020 to discuss the vision of developing a hydrogen economy in Poland. The only major announcement related to industrial decarbonisation technologies comes from the private Polish chemical company Synthos, which has announced cooperation with GE Hitachi in deploying small modular reactor. The specific policy breakdown can be seen in the following chart.

Table 4; Industry-related measures in Poland

INITIATIVE	MEASURE	STATUS (Policy-cycle terminology)	DESCRIPTION
NECP	No specific measures discussed in the Plan, only top-down projections	Agenda Setting	The Polish NECP was published in late 2019. It focuses on energy system and does not discuss industrial transition
Governmental report on high-temperature nuclear reactors (HTR) development	Vision document for HTR technology development in Poland, with potential industrial deployment after 2030	Agenda Setting	In 2017, Ministry of Energy has published a report on possibilities for deployment of high-temperature nuclear reactors in Poland
Private company initiative on small modular reactor (SMR) deployment	Memorandum of understanding with an American company developing SMR nuclear technology	Agenda Setting	In 2019, Polish chemical company Synthos has announced cooperation with GE Hitachi on deploying small modular reactor
Hydrogen Platform	Discussions on the vision of developing the hydrogen economy in Poland	Agenda Setting	Several industrial associations have joined the platform launched in mid-2020

Sector specific targets

Spain's NECP stipulates a 33% emissions reduction target for industry by 2030 compared to 1990 which is not ambitious relative to current levels (20% for energy-related emissions, negligible for process-based emissions). Reductions are expected to come from the change in fuels used for combustion, and from energy efficiency.

The NECP refers to the importance of industry decarbonisation and underlines that technology transfer to industry must be strengthened. It also identifies research areas for resource-intensive industry, including process efficiency, residual heat recovery, increase of renewable energy, and integration of carbon capture. It mentions the preparation of an Industrial Development Plan which will look at potential in the value chain of renewable technologies and map the technological, industrial and knowledge capabilities. The next table includes the most important measures.

Table 5; Industry-related measures in Spain

INITIATIVE	MEASURE	STATUS (Policy-cycle terminology)	DESCRIPTION
NECP	Promoting decentralized generation and self-consumption of RES in industry	Agenda Setting	Includes the provision of subsidies for decentralized RES production and self-consumption, the incorporation of the energy dimension into industrial policy tools, setting up voluntary agreements with industrial subsectors to utilize renewable energy, and promoting energy studies and audits helping to identify technology options for utilizing renewable heat in the industrial processes.
NECP	Promotion of renewable gases. (including hydrogen)	Agenda Setting	Supporting production of renewable gases by defining a strategy for their deployment, providing certificates of origin, removing regulatory barriers, clarifying the rights and roles of industry participants, and conducting awareness-raising actions for potential end-users
NECP	Improvements in technology and management systems in industrial processes	Policy formulation	The measure seeks to improve energy management systems of industrial processes for companies in non-ETS sectors. Supporting facilities include repayable loans and public aid to advanced production processes (1.647 M€) for high-efficiency equipment.
NECP	Support of high-efficiency cogeneration.	Agenda setting	Transition to high-efficiency cogeneration will be encouraged through multi-annual tendering of support to promote the building of 1200 MW capacity.

National policy	Industrial strategy	Agenda Setting	As of December 2019, installations using 50,000 kWh of electricity or 25,000 m ³ of natural gas (or an equivalent thereof) per year or more must take all energy-saving measures with a five-year payback period, and must also report before 1 July on the measures they have taken.
Initiatives by companies and associations	Roadmaps for different industries towards decarbonisation.	Agenda setting	Oil refining has already set ambitious decarbonisation targets for 2050.

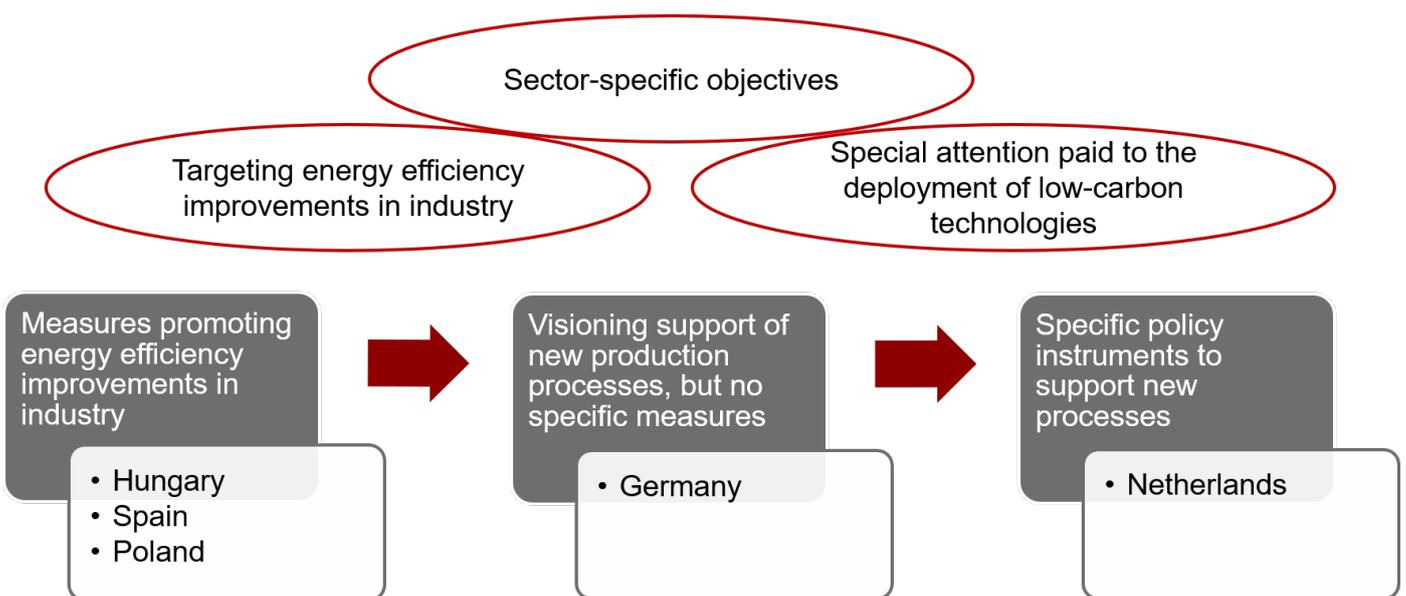
Status of policy making in the analysed countries

The policy instruments presented above provided an overview of where the investigated countries stand in the process of framing their industry decarbonisation policies. The next figure illustrates the state of development in the different countries.

Except for Hungary, all NECPs include sector specific GHG emissions reductions targets for industry. None are very ambitious in the 2030 timeframe, reflecting the early stage of low-carbon technology development and the recent addition of industry decarbonisation ambitions in the policy agenda.

Policy instruments range from promoting energy efficiency (in Hungary, Spain and Poland) to planning and applying specific policy instruments supporting the decarbonisation of production processes and enabling infrastructure (Germany and the Netherlands). The number of measures planned or elaborated also varies across countries with the Netherlands and Germany outlining more measures compared to the other three countries. Within the policy cycle, Hungary, Spain and Poland are at the agenda setting and policy formulation stage, Germany is in between formulating policy and decision making, and in the Netherlands many of the measures have already reached the stages of decision making and implementation.

Figure 2; Status of policy making in investigated countries



3. The perspective of companies in the basic materials sector

The CFMP platform organised the online workshop “Climate-neutral industry: State of policy debate in European Member States” on 11 June, 2020 with the participation of policy-makers, researchers and company representatives from the cement, steel and petrochemical sectors.

Representatives of carbon-intensive companies revealed interim GHG reduction targets for 2030 in line with the EU goals following participation in the development of low-carbon technology roadmaps for their industries. Some contribute to the development of new production technologies through research and pilot projects and all of them look to exploit opportunities to contribute to the circular economy through recycling and waste utilization.

Approaches to emission mitigation can vary according to the location of the industrial facilities, depending on the local availability of alternative raw materials, clean energy, and opportunities for carbon storage and utilization. The presenters also emphasized that decarbonisation efforts face different legal approaches and national funding programs across the EU.

The priority policy needs from the companies perspective are ensuring a level playing field through carbon border adjustment mechanisms, maintaining the functionality of the value chains during the economic downturn, creating a transparent and predictable legal environment, supporting the administration of recycling policies, providing financial support for the cost intensive transition towards carbon neutrality, establishing a framework for green electricity and green hydrogen supply and harmonizing the calculation of product carbon footprints throughout the EU. Policy harmonization would be beneficial along other dimensions as well. Significantly different national policies could create unfair competition between companies based within the different national jurisdictions of the common single market.

4. Conclusions, policy recommendations and questions

This policy brief explored differences in the industry decarbonisation policy approach and speed between selected member states through NECPs and other policy documents, with the most important findings summarized below:

- Although all countries set industry-specific 2030 emission reduction or energy efficiency targets, they are conservative and not yet in line with the long-term objective of reaching net zero emissions in all countries. The exceptions are Netherlands and Spain which have already formulated their net zero-carbon strategy for 2050.
- The existing or planned instruments and measures for 2030 do not go beyond targeting energy efficiency improvements in Hungary, Poland and Spain. Only the Netherlands and Germany put in place or plan to introduce incentives to help the introduction of advanced technologies and industrial processes. However, support for research and development programs appear under the 'Research, innovation, and competitiveness' dimension of the NECP in all countries, and nearly all are planning to elaborate strategies for the deployment of clean hydrogen.
- There are also large differences among countries regarding the number and status in the policy-making process: the Netherlands has the most comprehensive list of measures, many of which are already in the decision making and implementation phase. In Germany most of the instruments are under policy formulation, while in Hungary, Spain, and Poland the cited measures are mainly at the stage of agenda setting and policy formulation.

The relative underrepresentation of industry in the National Energy and Climate Plans is partially due to the binding structure that has to be followed in its preparation, focusing more on the areas of energy consumption (electricity, heat, transport). Additionally, governments have probably focused on sectors that are less costly to decarbonise to reach the interim 2030 targets. Industry-related measures mostly appear in some sections of the Governance Directive (2018/1999/EU), e.g. under the energy efficiency and the research, innovation and competitiveness dimensions. On the other hand, the Long-term Strategies require a sector-specific approach including a trajectory for emission and energy demand reduction based on defined policies and measures related to industry decarbonization. Long-term strategies are under elaboration for

about half of EU member states, including Hungary and Poland, while the Netherlands, Spain and Germany already have submitted them.

Because decarbonisation of industry is only now emerging as a key long-term EU policy objective and experience is limited, it is not central to NECPs and strategies are still being developed. It is possible, that the 2030 agenda of some countries have not yet been clearly designed with the mindset of zero emissions in 2050. As the development and adoption of carbon-free technology requires many years and industrial sectors are characterized by long investment cycles, it is important that member states swiftly establish a clear strategic framework for the decarbonisation of their industry sectors and create a supportive and enabling policy environment helping them to move towards carbon-neutrality. Policy instruments should ensure that companies increasingly assume responsibility for their negative externalities while also passing costs through to final consumers. The CFMP platform has proposed a possible policy package including 'Contracts for Differences (CCfD)', which provide support for industrial investments in low-carbon innovative production processes, a 'climate contribution' helping to prevent carbon leakage (alternative to a Border Carbon Tax), 'Product Carbon Requirements' banning the use of high-carbon products and 'Green Public Procurement' increasing the market opportunities for low-carbon solutions. (Neuhoff et al., 2019)

Requiring member states to place more attention on formulating sectoral goals and measures in the NECP in line with the long-term zero-carbon targets could help directing more focus on the industrial strategy also in the medium term.

A remaining question is, what is the appropriate level of regulation for the industrial sector. Some instruments require EU level action (e.g. international competitiveness), but others, currently left to the member states (e.g. organising auctions for providing support under a CCfD) should consider the scale and characteristics of participants. Manufacturing¹⁰ companies vary significantly in their size in terms of employment and value added. The largest emitters, mainly the producers of basic materials, are huge international corporations with operations in several member states with differing national agendas and

10. Based on Eurostat's classification, manufacturing sector also includes the manufacture of coke and refined petroleum products, the manufacture of basic metals, the manufacture of other non-metallic mineral products and the manufacture of chemicals and chemical products.

targets. Whether they will be forced to apply the new technologies across all facilities largely depends on the revision of the EU Emission Trading System, the success of the carbon border adjustment mechanism and the evolution of the European allowance price. At the same time, companies prefer a higher level of policy harmonisation across countries which could contribute to avoiding distorted competition within the EU single market due to different national policies.

Literature

- BMUB (2016) Climate Action Plan 2050 Principles and goals of the German government's climate policy, Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB), 2016 November, https://www.bmu.de/fileadmin/Daten_BMU/Pools/Broschueren/klimaschutzplan_2050_en_bf.pdf
- Economidou M. (2017) Assessing the progress towards the EU energy efficiency targets using index decomposition analysis, EUR 28710 EN, Publications Office of the European Union, Luxembourg, 2017, JRC Science for Policy Report, JRC106782, https://ec.europa.eu/commission/sites/beta-political/files/assessing-progress-energy-efficiency-targets_en.pdf
- Fishedick M., J. et al. (2014) IPCC (2014) Fifth Assessment Report of the Intergovernmental Panel on Climate Change, Industry. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.
- Neuhoff, K., O. Chiappinelli, T. Gerres, M. Haussner, R. Ismer, N. May, A. Pirlot and J. Richsteinet (2019) Building blocks for a climate-neutral European industrial sector, Climate Strategies, <https://climatestrategies.org/publication/buildingblocks/>
- Rissman, J., C. et al. (2020) Technologies and policies to decarbonize global industry: Review and assessment of mitigation drivers through 2070, Applied Energy 266 (2020), 114848
- Spangenberg, J. H. and S. Lorek (2019) Sufficiency and consumer behaviour: From theory to policy, Energy Policy 129 (2019) 1070–1079

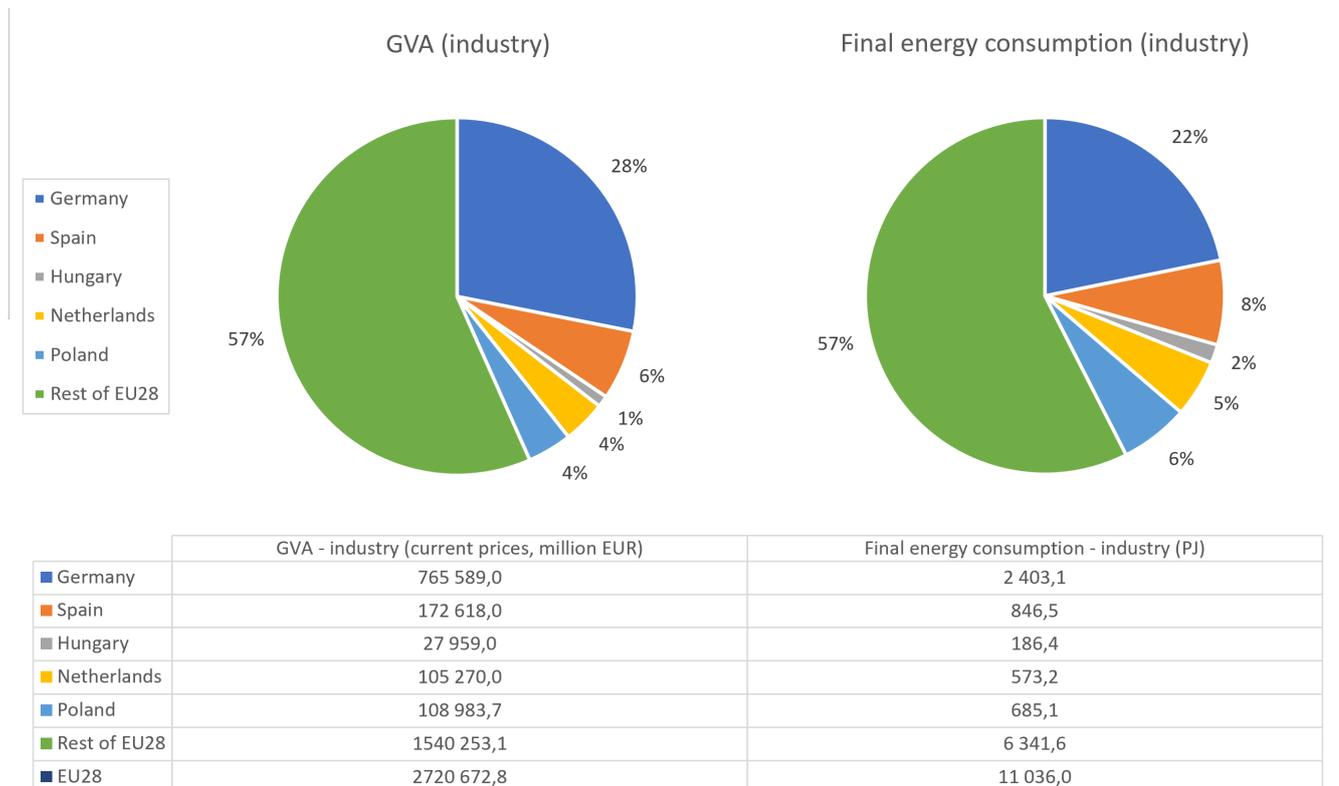
Snapshot of industrial production and greenhouse gas emissions in the analysed countries

In the appendix, the evaluated countries (Germany, Hungary, the Netherlands, Poland and Spain) will be overviewed according to their actual industrial production and greenhouse gas emissions. The five countries differ substantially regarding the role their industrial sectors play in their economies, and the related energy and emission patterns.

Based on its contribution to the national gross value added, industry's¹¹ share is the highest in Germany (23,23%) and the lowest in Spain (12,17%) slightly below that of the Netherlands (12,41% in 2018). These rates are lower than the EU average (16,09%). The proportion of the industry in the Hungarian (20,45%) and Polish economies (19,55%) can be considered high, exceeding the overall EU28's value.

The next graph shows the contribution of the sectors' gross value added (GVA) and energy consumption to the corresponding total values of the EU28 in 2018.

Figure 3; Contribution of the industry GVA of the countries to the industry GVA of the EU28 and the share of energy consumption of the industrial sector in the analysed countries within the energy use of EU28 industrial consumption in 2018. REKK figure based on Eurostat.



11. Including: mining and quarrying; manufacturing; electricity, gas, steam and air conditioning supply; Water supply; sewerage, waste management and remediation activities - based on the Eurostat's classification: <https://appsso.eurostat.ec.europa.eu/nui/setupModifyTableLayout.do>

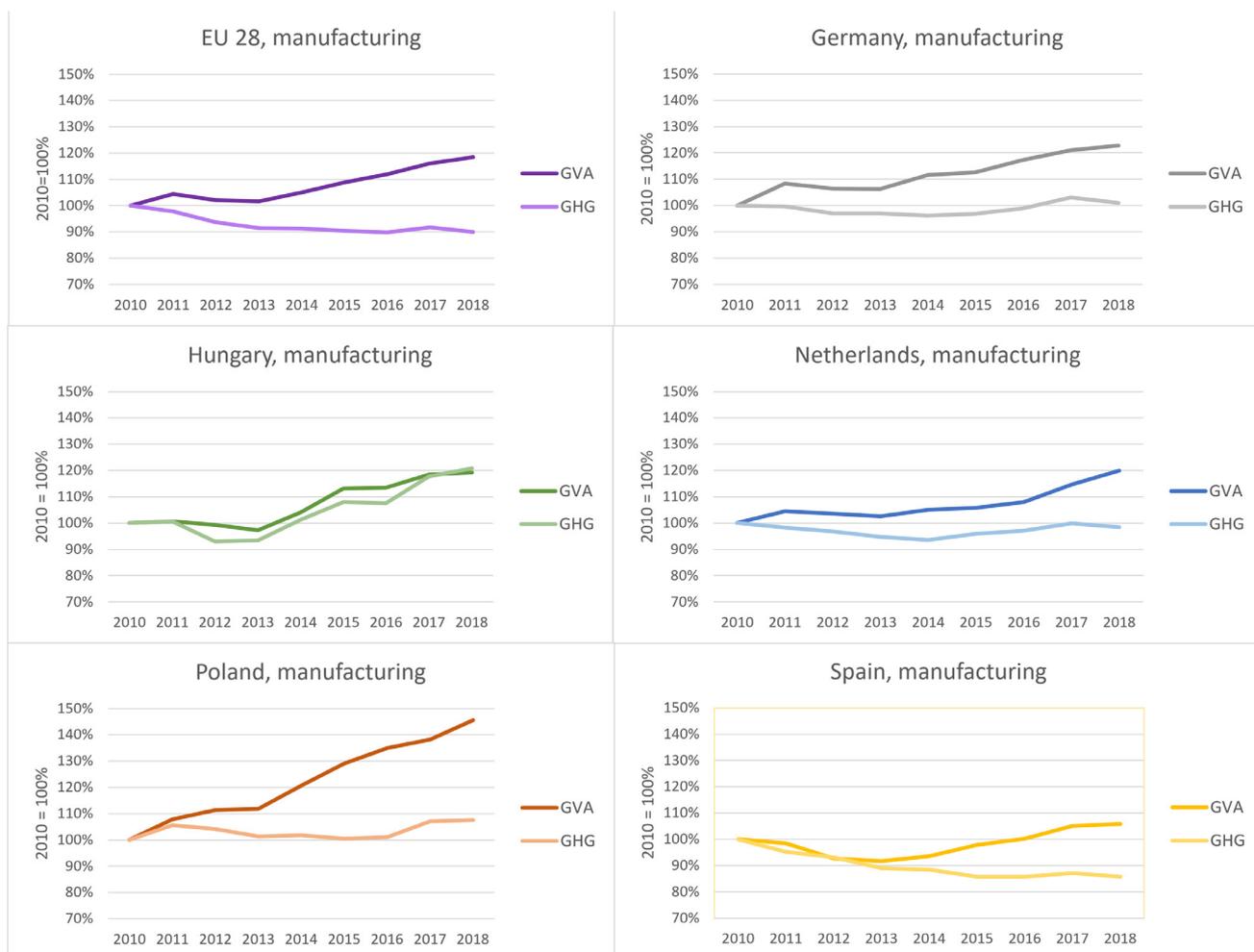
As Figure 3 reveals, Germany's industry is responsible for almost 28% of all industrial value added in the EU. Its contribution to the final energy consumption is only 22%, whereas in the case of the other four evaluated countries the share of industry in energy consumption is higher than its share in value added. This means that only the German industry sector's energy intensity¹² is better than the EU28's average from the five analysed countries. Hungary is the smallest contributor to both industrial GVA and energy consumption of EU industry. However, it is important to note that these statistics also reflect the differences in the composition of national industry sectors by branches with varying energy intensities.

Figure 4 compares the evolution of greenhouse gas emissions (GHG) and the gross value added in the manufacturing sectors of the five countries and the EU28 compared to 2010. The

graph reveals that in the period of recovery from the economic recession, almost all countries were successful in decoupling growth from GHG emissions except Hungary. In Spain, GHG emissions have fallen while the GVA value has grown moderately.

In the case of Germany and the Netherlands, the volume of GHG emission remained about the same while the GVA index has increased by 20 percent. Although emissions increased by about 8% from 2010 in Poland, industry value added grew by a comparatively robust 46%. While GHG emissions have fallen substantially in the Hungarian industry in the last decades (24% compared to 1995), the industrial sector is not yet on track to decouple its economic growth and emissions. Lower emissions may result from decreased economic activity (falling production), changes in the structure of production (higher share of less emission-intensive subsectors) and improved emission mitigation.

Figure 4: The evolution of GHG emissions and GVA (chain linked volumes, million EUR) in the manufacturing sectors, 2010-2018 (2010=100%), REKK figure based on Eurostat



12. Measured by GVA/final energy consumption, following Eurostat and JRC (see Economidou M, 2017).