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A Regional Approach to Future-proofing CEE Industry

The industrial base of Central and Eastern Europe is a key driver of the region's economy, and its transformation will be essential for maintaining regional manufacturing in the long term.. Transforming it will require concerted action by CEE states as well as a regional approach to exploit synergies, improve cost-effectiveness, and cooperate on mutually beneficial solutions. However, to date there has been insufficient action and regional coordination to enable an industrial transformation which capitalises on the region's strengths. This publication presents a bird's eye view of the region and its countries, reflects on the opportunities for cooperation, and puts forward concrete suggestions for anchoring the new industrial reality of Central and Eastern Europe in clean industry hubs fit for the future.

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Introduction and aim of this study

- Central and Eastern Europe (CEE) has significant potential to become a pole of clean industrial production, but **lacks the regional coordination** essential for an efficient industrial transformation
- The current nationally siloed approach **misses key opportunities to deliver industrial transformation**, including coordinated infrastructure planning to leverage key resources across the region, and exploiting a regional market for industrial products
- The need for regional coordination comes in a time of **pressure for CEE heavy industry** to transform by **decarbonising existing manufacturing** and **enabling new cleantech manufacturing**, which will be essential to maintain the regional industrial base long-term, even if it poses challenges in the short-term
- Rising carbon prices, an incoming phase-out of free allowances under the EU Emissions Trading System (ETS), new regulations to nudge the consumption of lower-carbon industrial products, and an aggressive global cleantech race all mean that **CEE countries must act now**
- At the same time, the **industrial policy landscape of the EU is undergoing a massive shift** in the wake of Russia's invasion of Ukraine, which exacerbated the existing pressure of high energy prices, and the 2024 Draghi report, which highlighted major gaps in the EU's industrial competitiveness further addressed in the recently-published EU Competitiveness Compass
- **Competitiveness will be a major driver for industrial transformation** in the EU, and the forthcoming Clean Industrial Deal is expected to lay down rules and incentives for decarbonising industrial production in the EU, anchored in competitively advantageous sectors and promoting a coordinated approach
- Given the current context, it will be key for CEE to **unlock cost efficiencies** for its industrial transformation and **align its national priorities** to ensure that advancing EU competitiveness does not come at the expense of strategic considerations for autonomy and cohesion
- The purpose of this study is to reflect on the specificities of CEE countries which contextualise their outlook for industrial transformation, and to provide a high-level assessment for the benefits of a regional approach anchored in competitive and strategic industrial clusters

Countries covered in this study

- In this study, Central and Eastern Europe (CEE) is defined as the original 12 Three Seas Initiative (3SI) countries (Estonia, Latvia, Lithuania, Poland, Czech Republic, Slovakia, Austria, Hungary, Slovenia, Croatia, Romania, and Bulgaria)
- It excludes Greece (a member since 2023), Ukraine and the Republic of Moldova (partner-participant countries), but future research will be essential to determine a coordinated approach across the eastern Mediterranean basin (Greece) and with the post-war reconstruction of Ukraine
- The 12 original 3SI countries collectively make up nearly a third of the EU territory and a fifth of its population, but account for only 10% of its GDP
- Most countries in the group historically experienced heavy industrialisation under the communist regime, are still in the process of economic convergence with the rest of the EU and tend to rely more on heavy industry than other countries
- The three seas bordering this group of countries are important assets for trade and industrial transformation (e.g., for storing industrial CO_2 emissions)
- The 3SI is an example of supranational coordination with regionally diffused benefits, for example through cooperating on the construction of regional transport corridors

Image: Original 3SI countries. Source: Civilsdaily, 2022. Who are the Bucharest Nine (B9) Countries?

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The industrial base of Central and Eastern Europe

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CEE industry in the last 40 years

The recent history of CEE countries shows a massive industrialisation during the communist regime, followed by market-driven downsizing of heavy industry, significant infrastructure investment, but generally show a continued reliance on industry for national economies and jobs. Their historical similarities translate into particular common challenges for their industrial futures, while their diversity points to the benefits of a regional approach that leverages their particularities and diffuses benefits across the region.

1980s

CEE countries have undergone import-substituting industrialization during the communist regime. Post-war economic growth has been industry-driven. Austerity measures after the oil price shock led to a reduction in investment in new machinery, creating a growing technological lag. Poland, Romania, and South-East Europe suffer more from the 1980s debt crises.

1990s

The transition to a market economy exposes the inefficiencies of state industries. Privatisation and foreign direct investment (FDI) inflows lead to the modernisation of industrial facilities. Many former state-owned companies are acquired by multinationals. Economic growth remains industry-driven to this day, albeit more balanced.

2000s

CEE economic growth is strong, but propped up by unsustainable levels of borrowing and large inflows of international finance. The 2008 financial crisis drives a reduction in foreign capital inflows and potentially halts the convergence of industrial labour productivity. Recovery after the crisis is driven by industrial activity but varies across countries, with Bulgaria and Romania starting late.

2010s

CEE investment in transport and utilities infrastructure remains above EU average, and state-driven infrastructure investment increases in some countries. With few exceptions, human capital, innovation capacity, and energy and strategic infrastructure remain below EU average. The Modernisation Fund is established, supporting 11 CEE states.

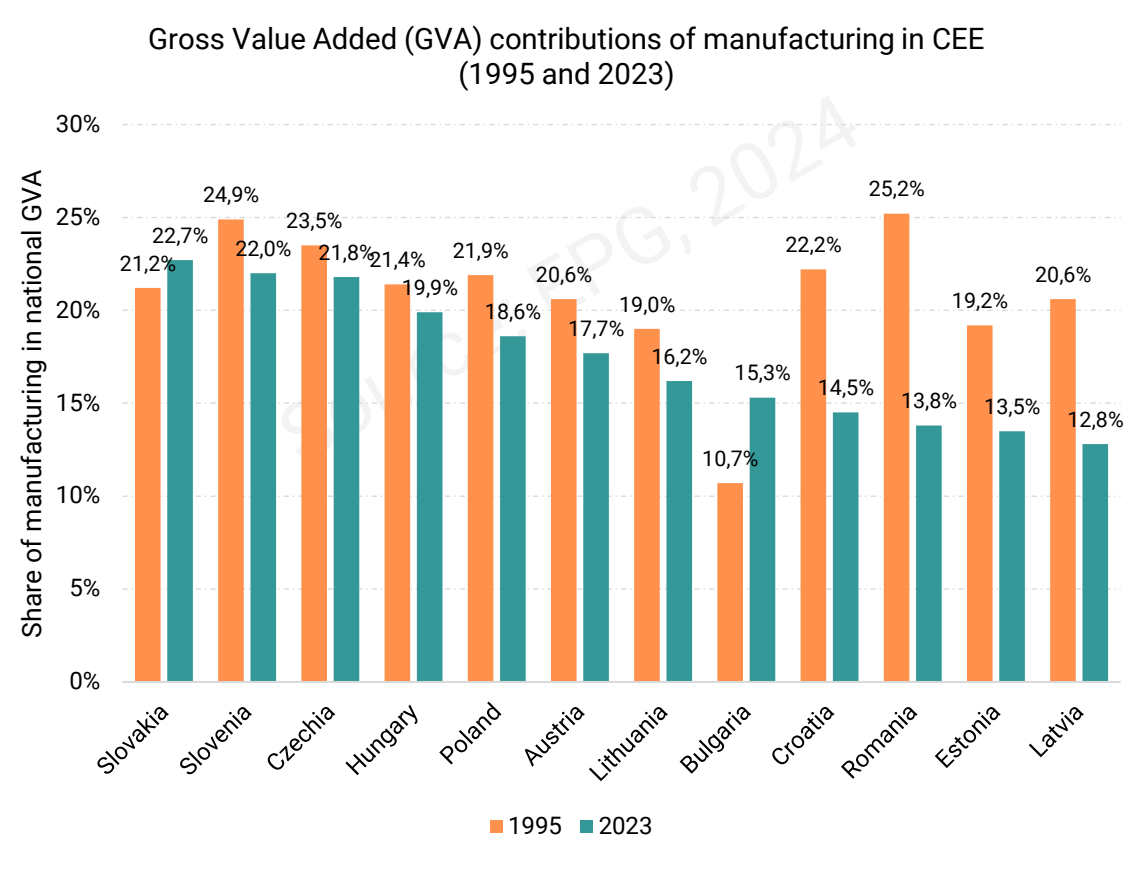
2020s

Many CEE countries may now be facing a middle-income trap, driven by skills shortages and brain-drain. Industry is still a key economic and employment contributor, but modernisation lags. The European Climate Law and Fit-for-55 legislative package are adopted. The Russian invasion of Ukraine triggers an energy crisis, with CEE countries such as Czechia and Slovakia severely affected by threatened natural gas imports.

Today, the CEE industrial base is a key contributor to national economies and national emissions inventories

- While some countries have shifted towards service-based economies since 1990, **manufacturing continues to be an important contributor** to Gross Value Added (GVA) and employment, and CEE manufacturing is **predicted to grow to 2030**
- Today, CEE countries are **export-oriented, "factory economies"**, hosting lower-value parts of production chains, providing comparatively low wages, and specialising much less in design, R&D, and marketing than their headquarter counterparts in north-western Europe
- Despite a steep decline since 1990, most CEE countries have **higher-than-average emissions intensities** at economy level
- CO_2 emissions from industrial heat production remain significant, and while absolute industrial natural gas consumption has halved since 1990, **its share in the CEE energy mix has increased**
- **Industrial processes and product use (IPPU) emissions**, the more challenging emissions to abate, have had varied trajectories since 1990, but their share in total national emissions remains **higher than EU average in most CEE countries**
- Although out of the scope of this report, non-CO_2 emissions from industry, such as methane and nitrous oxide, are also relevant for CEE countries

Graph source: EPG.



Industrial transformation is ongoing, but slow

- Given the economic importance and emissions intensity of their heavy industries CEE countries have been taking steps to transform them, but **progress is much slower than in Western Europe**
- The recent energy crisis has led to temporary or permanent **shutdowns of some CEE industrial facilities**, such as Slovalco (aluminium) and Azomureș (fertilisers)
- Other CEE industrial producers are **increasing manufacturing capacity** (e.g., Holcim's Câmpulung facility in Romania), and others are announcing **large-scale transformation projects**, including Liberty Galați's GREENSTEEL transition plan
- National governments are also **enabling industrial transformation**, including state aid in Czechia and Romania and Green Public Procurement (GPP) in Baltic states
- Other countries are **enabling new cleantech sectors**; e.g., Poland is the largest battery producer in the EU and has a booming heat pump and wind turbine manufacturing sector, Hungary is becoming a leading battery industry hub, Czechia is investing in its semiconductor industry
- In some cases, a lack of consideration for the **environmental and resource footprint** of cleantech manufacturing can lead to inefficient investments

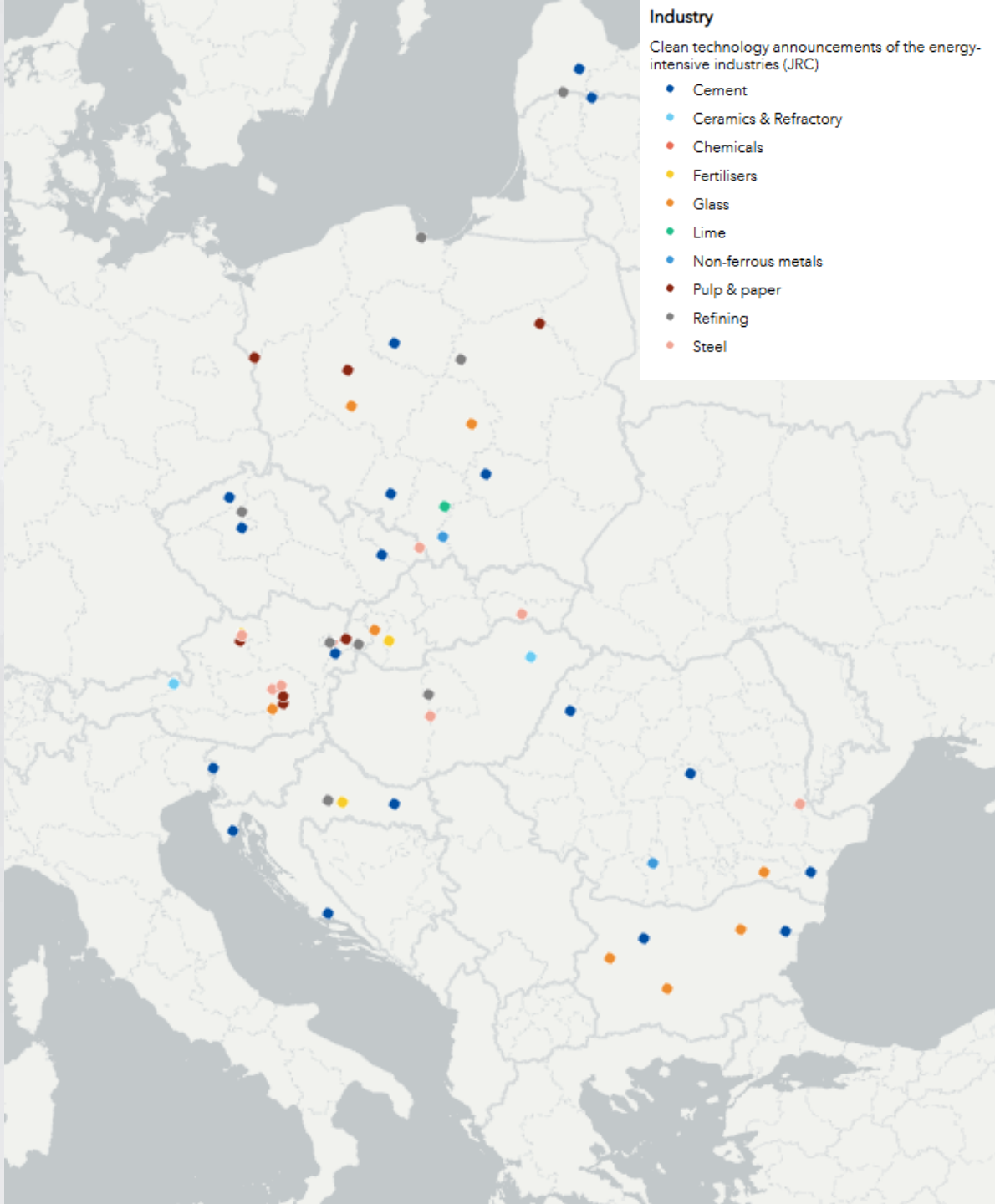


Image: Clean technology announcements of energy-intensive industries, according to a database of the Joint Research Commission of the EU. Source: JRC, 2025. Energy and Industry Geography Lab.

CEE countries can leverage the EU's momentum for industrial transformation

- As their economies continue to converge with the EU, CEE countries have a significant opportunity to **reshape their industries** and become important players in clean industrial production
- EU funding is currently available for industrial modernisation and transformation:
  - The **Modernisation Fund** with potentially significant funds available for CEE countries (see table)
  - **Cohesion Policy funds** which can launch markets for clean industrial products and fund cross-border infrastructure through the Connecting Europe Facility
  - The Just Transition Fund, which can support the adoption of low-carbon economic models within transition regions, including through **reskilling programmes for workers and support for local SMEs**
  - The Innovation Fund remains an important instrument with relatively low absorption rates in CEE, and the EU has added technical assistance for Member States with low participation to **increase the Fund's geographical balance**
- While these funds are currently available, the **ongoing negotiations of the Multiannual Financial Framework**, and suggestions of a **potential reprogramming of key funds,** such as Cohesion Policy funds, mean that CEE countries must be proactive in making efficient use of available public funding in a dual approach of development and decarbonisation
- Regional coordination can help unlock some of these efficiencies, for example by cooperating on cross-border infrastructure, opening wider markets for clean industrial products subsidised through Cohesion Policy funds, and transferring knowledge

Country	Auctioning revenues	Modernisation Fund available revenues
Bulgaria	€11.5 bn	€2.5 bn
Czechia	€7.1 bn	€20 bn
Hungary	€6.3 bn	€3 bn
Poland	€54.2 bn	€18 bn
Romania	€5.4 bn	€21 bn
Slovakia	€3.6 bn	€5.7 bn

Figure source: E3G, 2024. Calculations assume an average carbon price of €90/tCO_2. funds

However, major bottlenecks remain in the region and must be overcome

- Despite the available opportunities and momentum for the EU's industrial transformation agenda, CEE countries may struggle to keep up
- Many CEE states **lack a strategic approach** to industrial transformation and cohesion across other key policy areas
- National public funding for heavy industry operators is scarce due to **narrow fiscal spaces** compared to Western Europe
- Although plenty of EU funding options exist, their uptake **is slow**, and funding under the Innovation Fund is **highly imbalanced** due to overall low R&D potential in CEE
- Limited institutional capacity in CEE governments means these states **may struggle to keep up with the EU policy agenda**, including new regulations such as the Net Zero Industry Act (NZIA) and upcoming portfolios under the Clean Industrial Deal
- In some parts of CEE, **key infrastructure plans are missing**, including for hydrogen and CO_2 transport; in other parts, **regional efforts are underway** (e.g., Poland's participation in the Nordic Baltic Hydrogen corridor) and can be learned from as well as incorporated into a regional approach

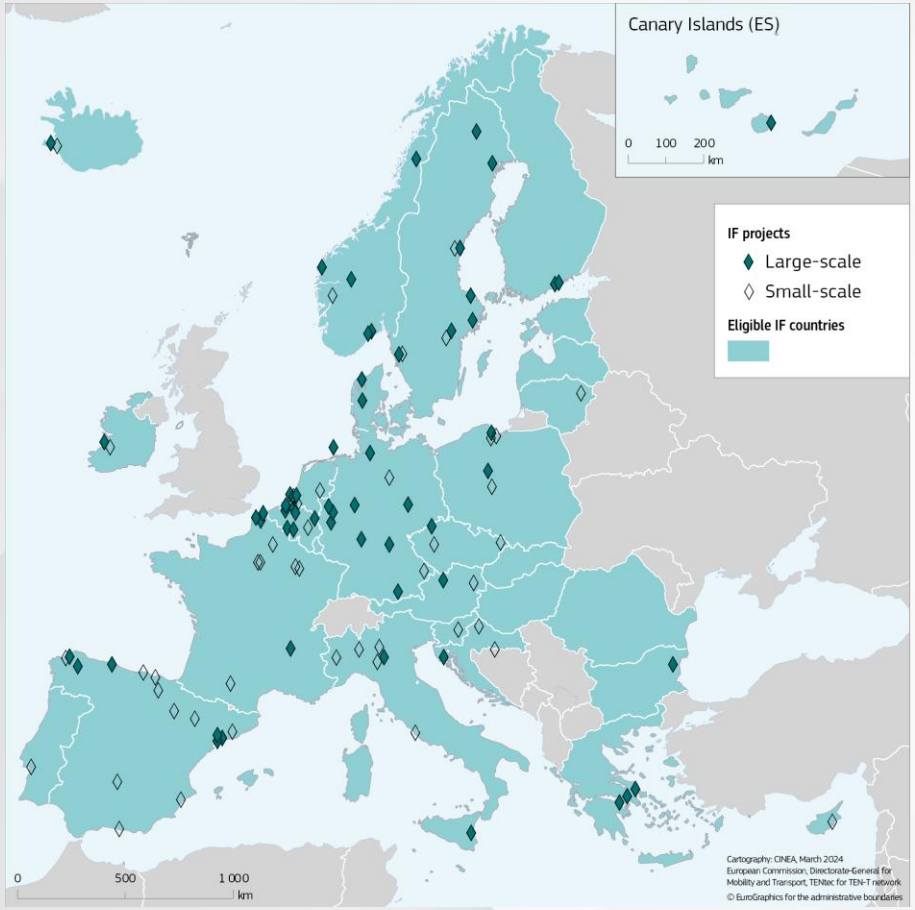


Image source: European Commission, 2024. Innovation Fund Knowledge Sharing Report. The map excludes data from 2023 calls. In the 2023 calls, 10 out of over 80 awarded projects were located in CEE countries.

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Deep industrial transformation will require a major systems overhaul

Technology, infrastructure and supply chains

- Industrial transformation in CEE will necessarily involve decarbonisation as the only way industries can **remain competitive** in the face of high energy prices, a global race to decarbonise, and the geopolitical implications of continued fossil fuel use
- CEE countries will need to **rapidly take up complex technologies**, such as Direct Reduction of Iron, carbon capture and storage (CCS) and electrification of industrial processes, and deploy them at commercial scale
- **New infrastructure, particularly cross-border infrastructure, will need to be built** to ensure the availability of renewable energy, green hydrogen, and CO_2 storage and utilisation options; many CEE countries are still lagging in modernising their existing energy infrastructure
- **Resource efficiency and circular business models** will need to become the new status quo, nested in new supply chains to ensure diversification of import sources for conventional and alternative raw materials alike

Policy, funding and financing

- CEE states will need to **adopt a regional approach** to unlock efficiencies in their planning, particularly for infrastructure buildout
- They will need to **design and implement new policy mechanisms, incentives, and regulatory frameworks** for industrial transformation, including considerations on the **environmental and resource footprint** of clean industry
- **Novel instruments** such as Carbon Contracts for Difference (CCfDs) and Green Public Procurement systems (GPP) will need to be considered as part of wider portfolios of grants, blended finance, and non-financial incentives
- This will require a **significant uptick in institutional capacity** both to keep up with EU policy developments and to deploy new policy and funding instruments for new, complex, and expensive technologies

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What is at stake for CEE's heavy industry?

Maintaining a secure base of heavy industry production

- With carbon prices set to rise and free allowances being phased out under the EU ETS, **reducing industrial emissions** will be key to maintaining a heavy industry base in CEE (see example in adjacent figure)
- This medium-term imperative of reducing emissions to cope with carbon prices compels a business case for transitioning to low-carbon industrial processes
- However, in the long term such a transition is desirable anyway, to **reduce dependence** on hydrocarbons and other critical materials, create **new economic opportunities**, **improve product offerings**, and **compete for a growing base of consumers** willing to pay for low-carbon industrial products
- To be fit for the future, **the industrial production base of CEE must transform rapidly**, and is increasingly challenged by macro-level factors including energy costs, demographic outlook, and labour availability

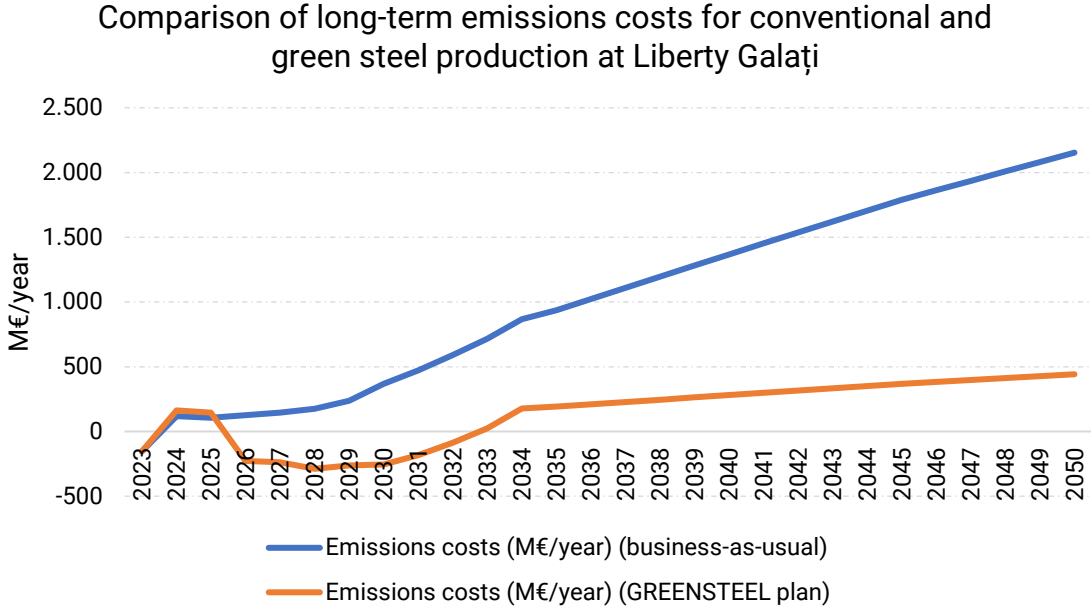


Chart source: EPG, 2024. The cost of Romania's industrial transition. The business-as-usual scenario assumes no increase in liquid steel output, while the GREENSTEEL plan includes an increase in production from 2.78 to 4.1 Mt liquid steel by 2030. Negative emissions costs are due to surplus free allowances.

Maintaining a secure base of heavy industry production

- Given the importance of industry in CEE countries, a loss in competitiveness would cause **significant socio-economic impact** in a region where many states are still catching up to the EU average, **further deepening persistent economic disparities**
- A secure and competitive base of industrial manufacturing will benefit the region and the EU, **reducing import dependencies** from third countries and enabling the growth of key domestic supply chains
- Despite a steep decline since the 1990s, some CEE states **retain a comparative advantage** in heavy industry manufacturing which opens significant near-shoring opportunities for the continent
- It will be essential to identify the sectors and areas of relative competitive advantage which bring important socio-economic and strategic autonomy benefits, pinpointing **where industrial transformation can be the most impactful**
- A truly regional approach to planning can ensure that **benefits spill over beyond national borders**, for example by ensuring a reliable supply of industrial materials for a country's infrastructure from within the region, if not from within the country

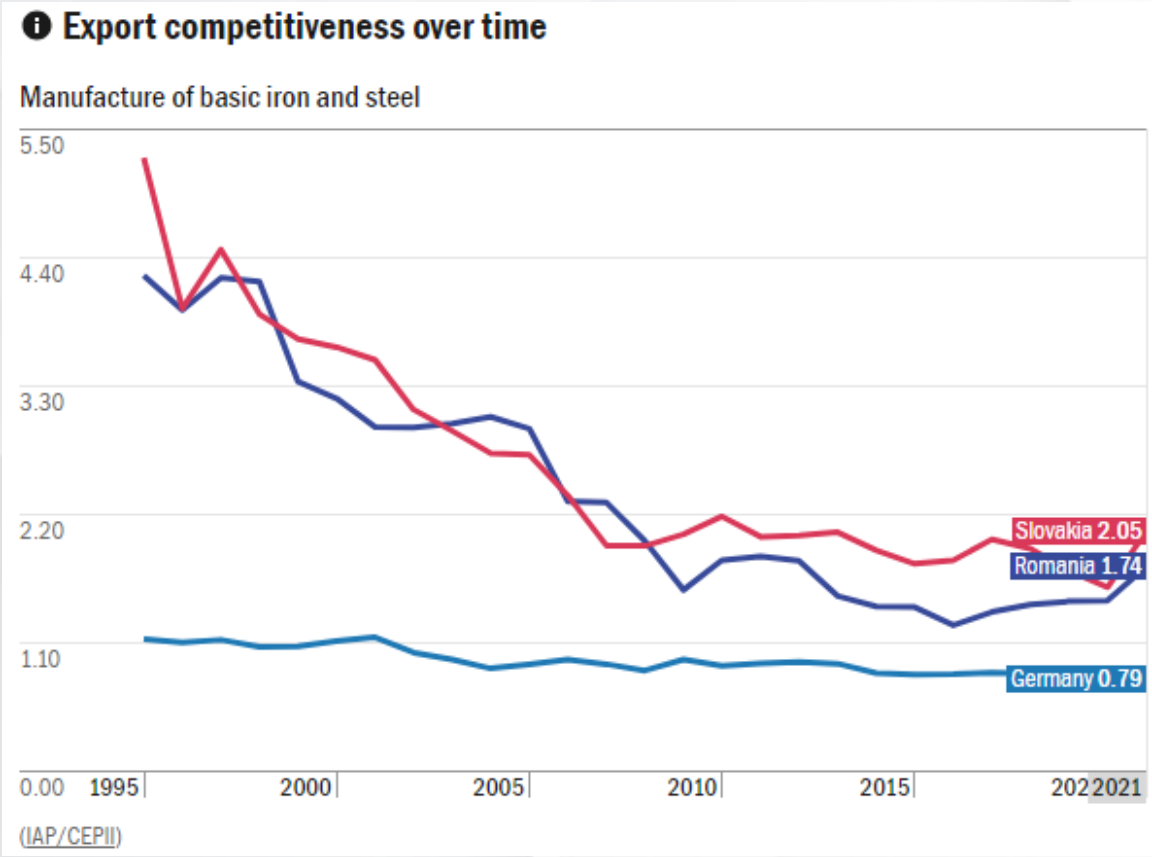
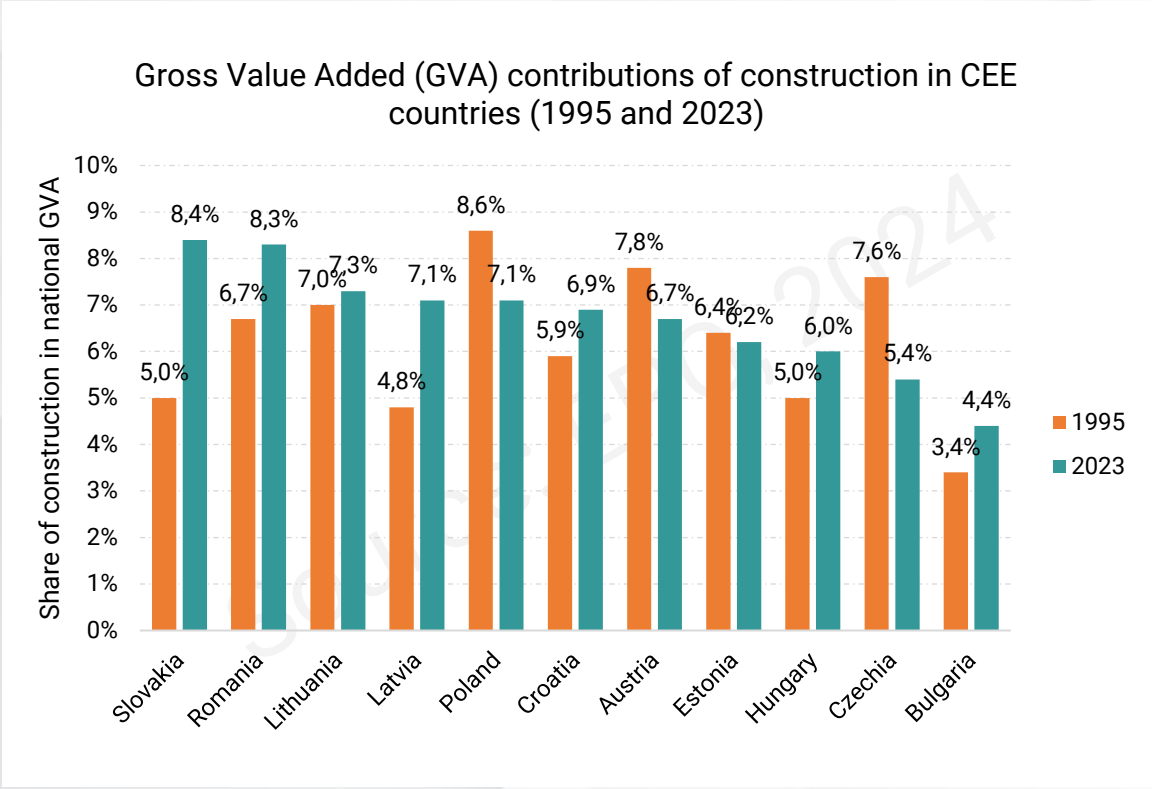


Image: Revealed Comparative Advantage (RCA) of basic iron and steel production in Slovakia, Romania, and Germany. Other countries with an RCA above Germany's include Bulgaria and Poland. Source: UNIDO Industrial Analytics Platform, 2025.

Growing downstream industries with domestic clean industrial products

- CEE countries have important **downstream sectors** positioned to become big private buyers of clean industrial products, most prominently the construction and automotive sectors
- With few exceptions, the **construction sector** has increased its GVA contribution since the 1990s, sometimes substantially (e.g., Slovakia, Latvia, Romania); it is a major consumer of concrete, steel, and other construction products
- In this sector, where final costs are more sensitive to clean steel and concrete premiums and margins are thinner, state actors can support market creation by implementing **Green Public Procurement (GPP)** systems
- **Public construction** accounts for a significant proportion of steel and cement consumption (e.g., 19% and 45%, respectively, in 2019 in Poland), positioning CEE governments to become lead market creators for clean steel and cement, incentivising domestic industrial transformation
- In the future, construction is likely to further increase, driven by the expansion of the **real estate sector** and continued **investment in public transport infrastructure** in CEE and EU neighbour countries (e.g., Serbia's Morava motorway)



Graph source: EPG, 2025.

Growing downstream industries with domestic clean industrial products

- The **automotive industry,** a major consumer of flat steel products, is one of the CEE region's most significant and competitive industries, providing up to 16% of manufacturing jobs in some CEE countries, compared to 8.5% as the EU average
- Export competitiveness of motor vehicle manufacturing has skyrocketed since 1995 in some CEE countries; becoming clean steel users can position these manufacturers to compete in new markets
- Europe's automotive sector is at a critical juncture in transitioning to zero-emission vehicles (ZEV) amidst worries of international competitiveness
- Despite this, the potential for growing **domestic supply chains of green flat steel products** is significant, as a low-carbon steel premium generates a relatively minor increase in final vehicle prices
- Creating lead markets for flat steel products can also lead to **deeper emissions cuts** across the CEE steel industry, as flat steel products are more emissions-intensive than the long products used in construction

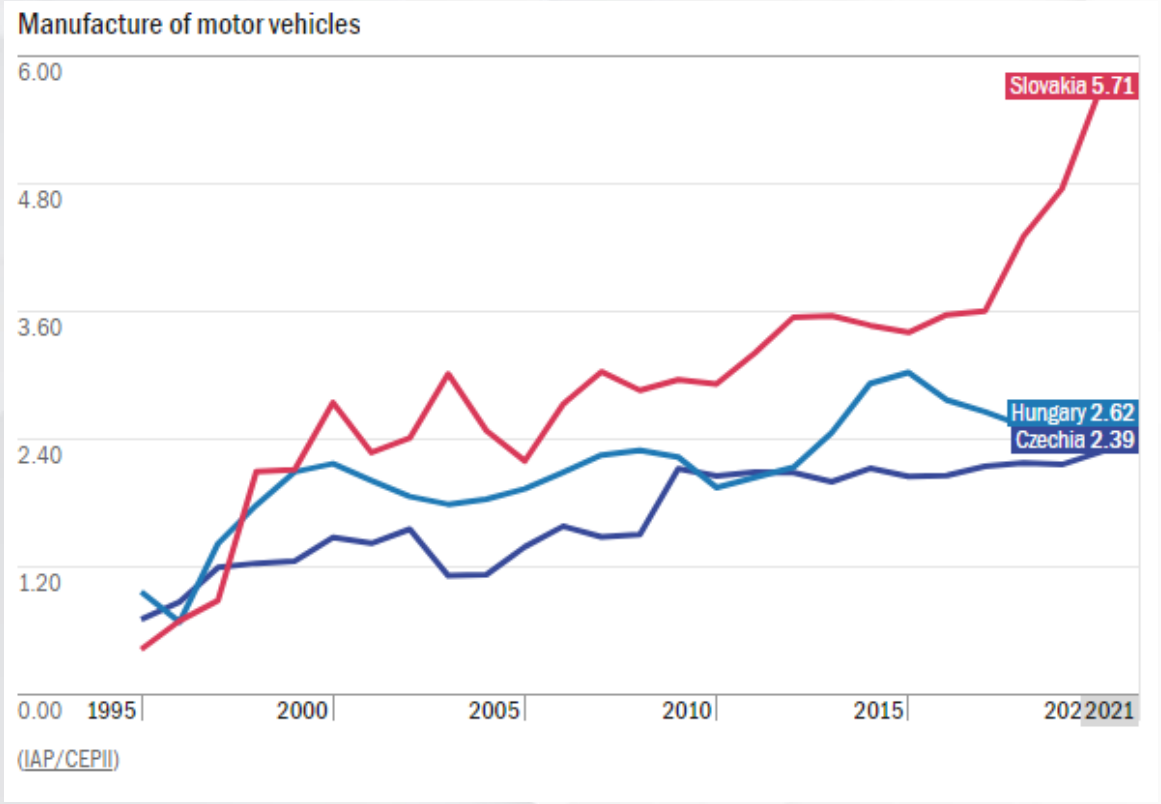
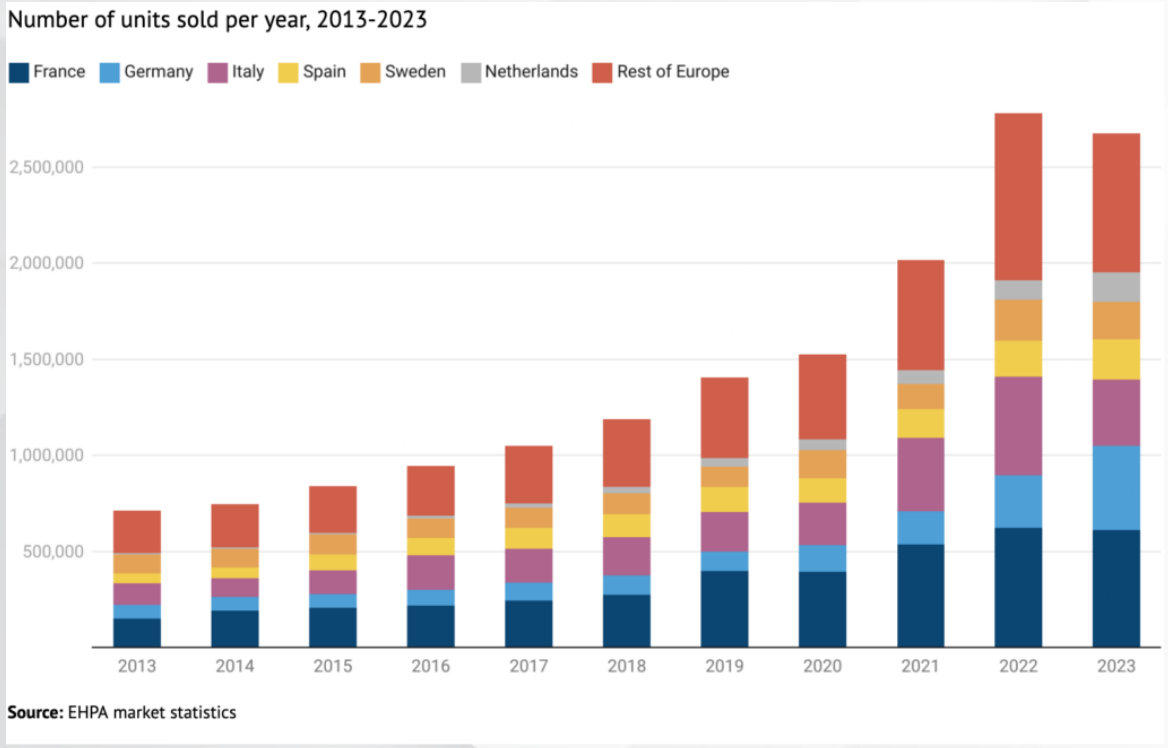


Photo source: UNIDO Industrial Analytics Platform, 2025. Revealed Comparative Advantage (RCA) of motor vehicle manufacturing in Slovakia, Hungary, and Czechia. For comparison, the 2021 RCA of motor vehicle manufacturing in Germany was 2.12.

Claiming a position in the cleantech race

- Under the NZIA, the EU has committed to self-sufficiency and leadership in a global race to develop clean technologies, including electrolysers, CCS, and renewable energy technologies
- The **European cleantech market** is expanding: battery electric vehicle sales reached a record high in 2023, and battery storage system had record sales in 2022
- Despite an overall recent decline in heat pump sales (see adjacent figure), the segment for hot water heat pumps increased by 20% in 2023
- By 2030, the EU cleantech market size could reach **$117 billion/year**
- CEE countries can leverage this market potential, bringing **new economic opportunities** as well as **spillover benefits** for research and innovation
- By developing cleantech clusters, CEE countries can **grow their domestic supply chains** for key climate technologies, as well as become competitive exporters
- This will be dependent on **effectively incentivising domestic demand**, as well as being well-positioned to compete externally

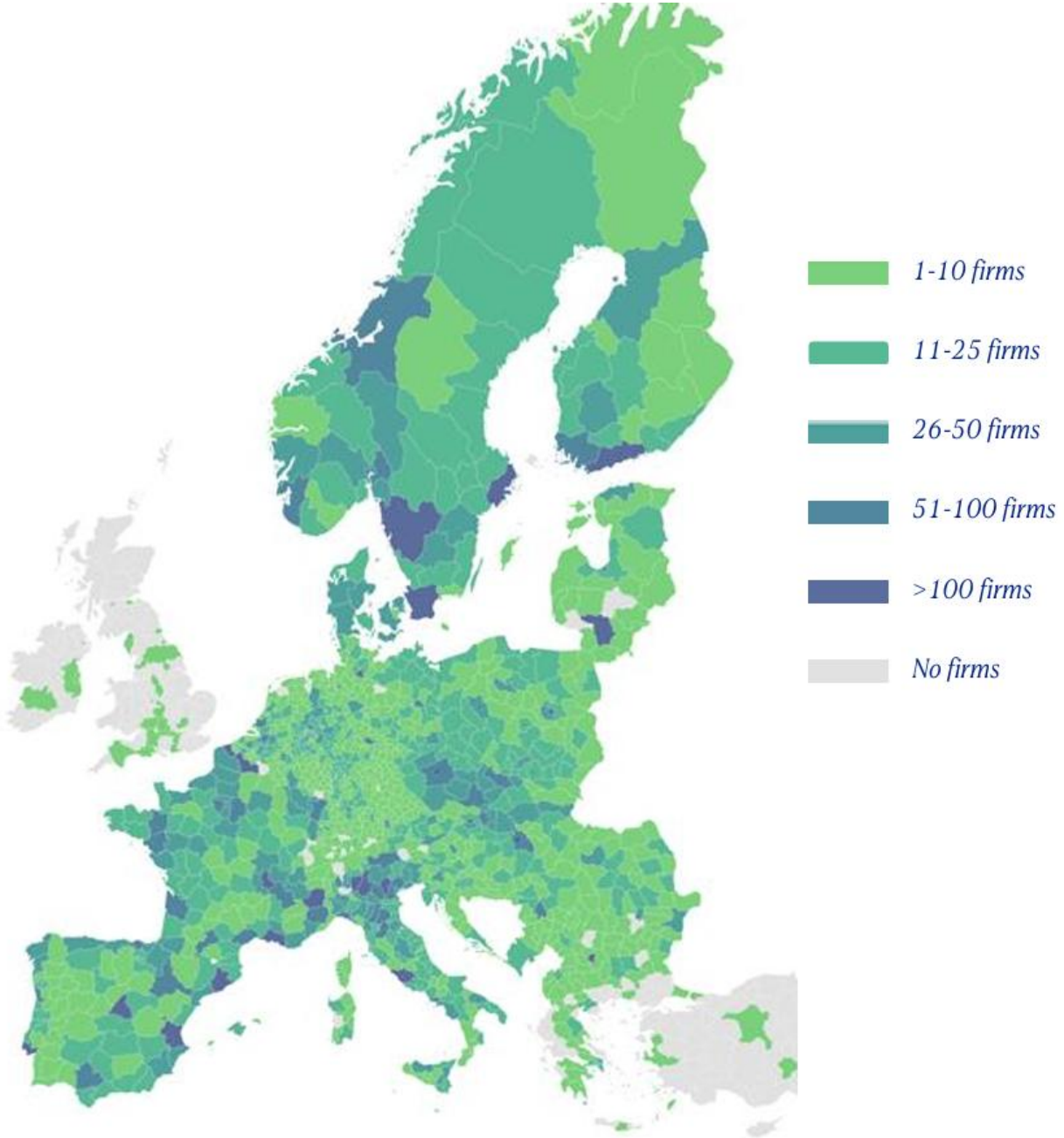
Image source: Carbon Brief, 2024. Heat pumps gained European market share in 2023 despite falling sales.



Claiming a position in the cleantech race

- CEE countries **have fewer cleantech ecosystems, companies, and innovators** than other European countries (see figure), with some promising areas in the Czech Republic, Poland, and Hungary
- **Poland and the Czech Republic** are the highest-ranking CEE countries in terms of number of cleantech players
- **Low research, development, and innovation potential** is an important bottleneck to developing cleantech ecosystems
- Innovation is clearly developing at two speeds with important gaps between CEE and North-Western Europe; Romania and Bulgaria are scored as having **the lowest innovation performance** in the EU, with Scandinavian countries being the strongest
- Without strong policies and investment environments for research and innovation, including regional collaboration on knowledge transfer and research, CEE countries risk **missing out on important opportunities** to participate in the cleantech race

Image source: European Investment Fund, 2023. Using machine learning to map Europe's Cleantech sector.



Building infrastructure for the future

- In recent decades, investment in transport and utilities infrastructure in CEE has been **above EU average**, as a natural cohesion-driven development
- In some CEE countries, government infrastructure investments actually increased after the 2008 financial crisis, despite a crash in corporate investments and international finance flows
- Investments in key infrastructure, such as the construction of buildings, roads, railways, and bridges, **are projected to increase**
- Ample EU funding for infrastructure development flows into the CEE region; in the 2014-2020 Cohesion Policy period, **the largest recipients of Cohesion Policy funding** were Poland's General Directorate for National Roads and Highways (€8.4 bn), closely followed by Romania's National Administrator for Road Infrastructure and Poland's national railway company (€4.6 bn each)
- Alongside their own infrastructure development, CEE infrastructure companies may play an essential role in the **reconstruction of Ukraine**

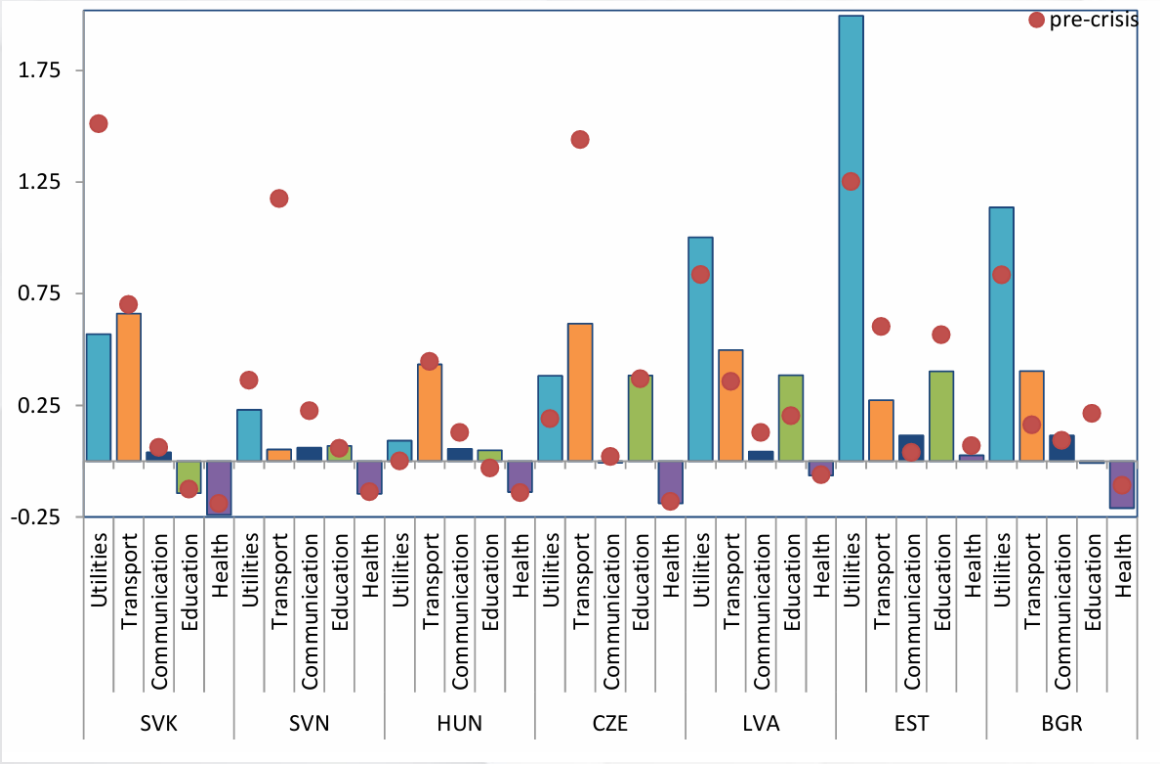


Chart: Investments in different infrastructure types in CEE countries over the 2005-2015 period (% of GDP). The red dots represent pre-2008 averages and the bars post-2008 averages. The data comprises government, corporate, PPP investment, and non-PPP projects. The Y-axis shows differences from EU average, i.e. positive numbers are above EU average. Source: European Investment Bank, 2017.

Building infrastructure for the future

- Infrastructure development requires substantial amounts of heavy industry products, including **steel and concrete**
- For example, in 2019 Poland consumed **8.6 Mt of cement** in public construction projects, nearly half of the economy-wide consumption
- Given the narrow fiscal spaces of most CEE countries and the challenges in mobilising dedicated funding, already planned **infrastructure spending could be a key lever** for incentivising the transformation of production processes for construction materials
- Leveraging infrastructure spending for transforming domestic steel and cement industries will depend on the application of **rigorous emissions and circularity criteria** through Green Public Procurement
- The revision of the Ecodesign of Sustainable Products Regulation and of the Construction Products Regulation are also set to boost the production and uptake of low-carbon materials used in construction, including rules for defining low-carbon construction materials expected in the next few years
- Alongside creating a market for clean industrial products, infrastructure development will also be key to **position CEE countries as poles of cleantech production**; e.g., Czechia is investing massively in its motorway network to better connect existing and emerging industrial hubs

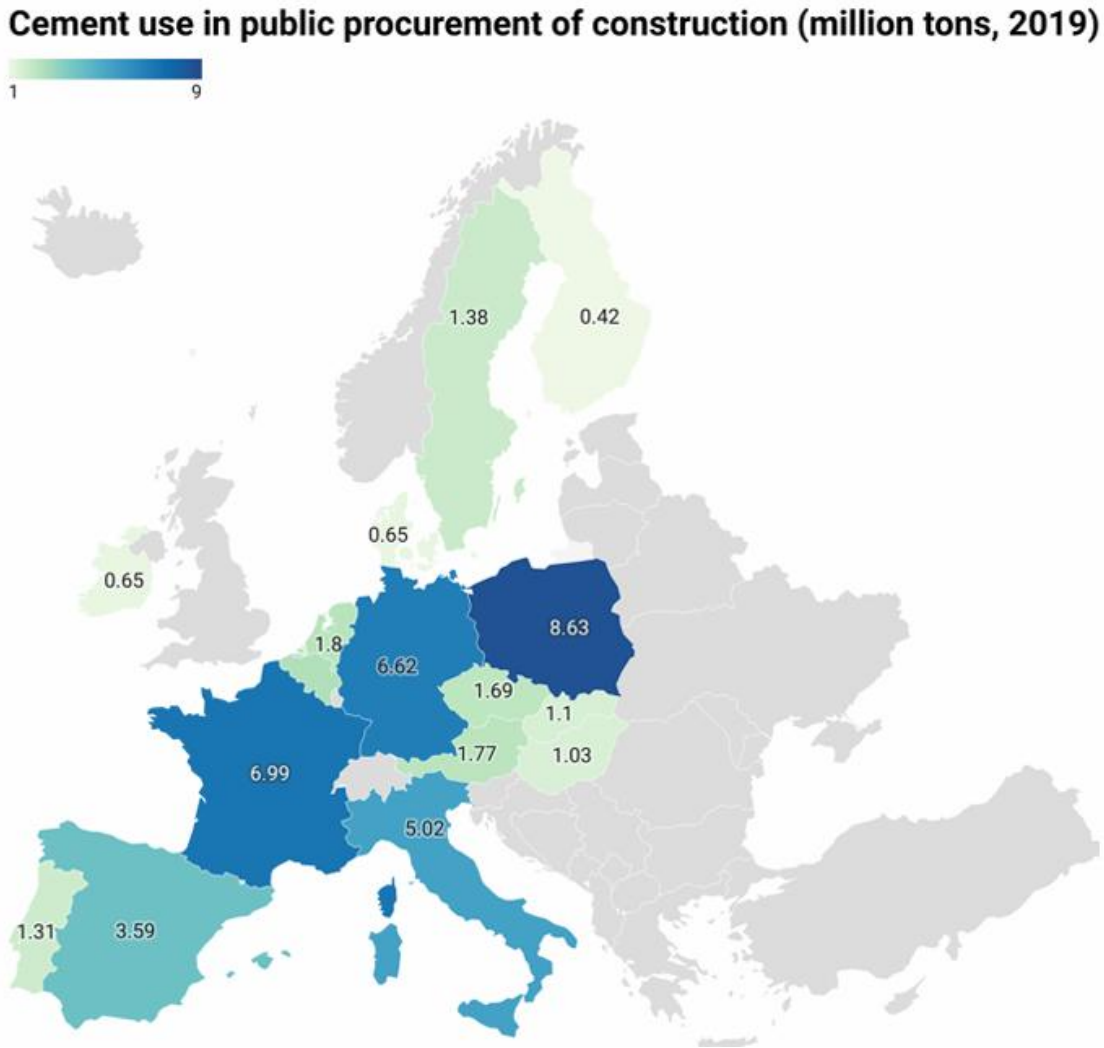


Image source: Brussels School of Governance, 2024. Public Procurement of Steel and Cement in Construction.

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Industrial clusters: anchors for a regional industrial powerhouse

Industrial clustering can lead to efficiency gains

- To transform its industries efficiently, CEE can **leverage the existing clustering of its industrial facilities** into key manufacturing hubs
- In general, locational agglomerations of industrial activity **can lead to efficiency gains**, and clusterisation in regional, interregional and international networks is a potentially beneficial approach for the CEE region
- Europe's "Central European manufacturing core" includes CEE countries with a long industrial history (Czechia, Hungary, Slovakia, Poland, Slovenia)
- The fact that many CEE facilities are owned by multinational manufacturers headquartered in Western Europe means that the region's industrial sectors are part of **regional production networks** based on vertical differentiation and cross-border specialisation, with robust cross-border production linkages
- This specialisation initially transferred lower- and medium-skill production activities to CEE countries (see adjacent figure); over time, more advanced production stages were also located in these countries, allowing domestic supplier networks to emerge
- This means that while industry in CEE can exploit the efficiency gains brought about by the clustering of its production activity, it will need to **progress beyond the "factory economy" typology** and attract research, development, and innovation activities to maximise the benefits of industrial transformation

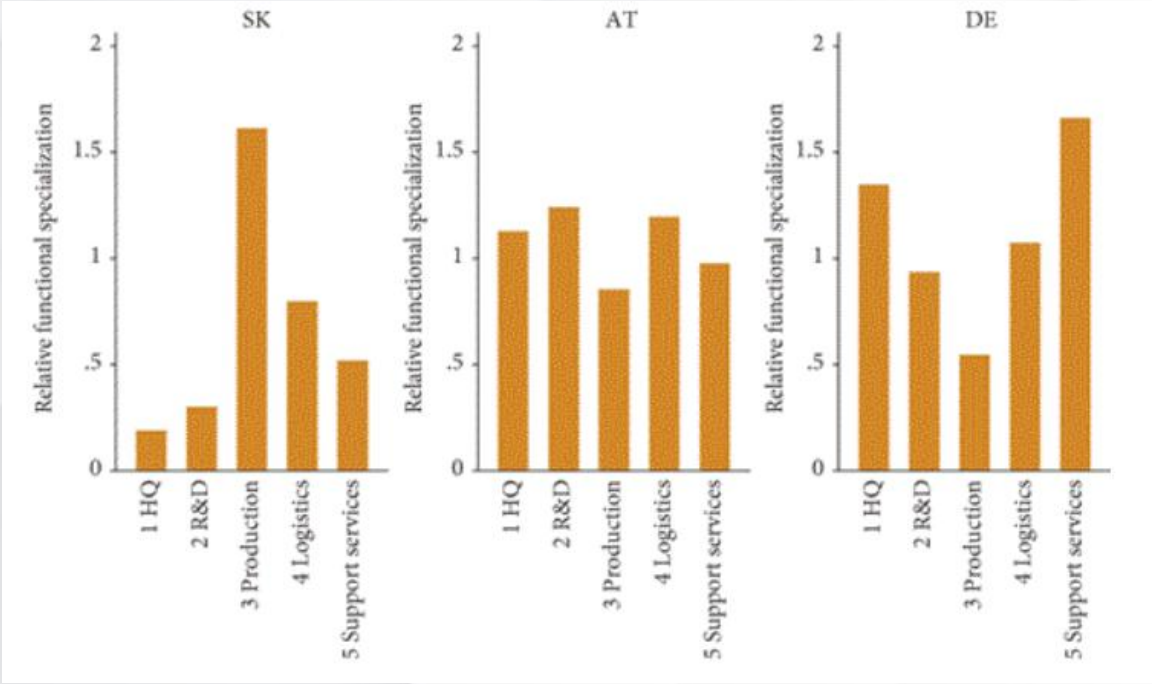


Image source: Landesmann and Schröder, 2020.
Note that SK refers to Slovakia, AT to Austria, and DE to Germany.

Where is industry clustered in CEE?

- Although the most emissions-intensive industrial agglomerations are in north-western Europe, important clusters are visible in Central-, and to some extent South-, Eastern Europe
- Examples of inner-land clusters include **Moravia-Silesia** (southern Poland, eastern Czechia); **central and south-central Poland**; **northern Poland** (Pomorskie); **western Slovakia-eastern Austria**; **eastern Slovakia-north-eastern Hungary**; **central Hungary** (Pest, Közép-Dunántúl); **central Romania** (Prahova, Dâmbovița, Argeș)
- These industrial areas are vast and host a variety of industries, most prominently **refineries** (e.g., central and northern Poland, central Romania), **chemicals** production (e.g., central Hungary), **cement and lime** production, and **steel** production (e.g., Moravia-Silesia)

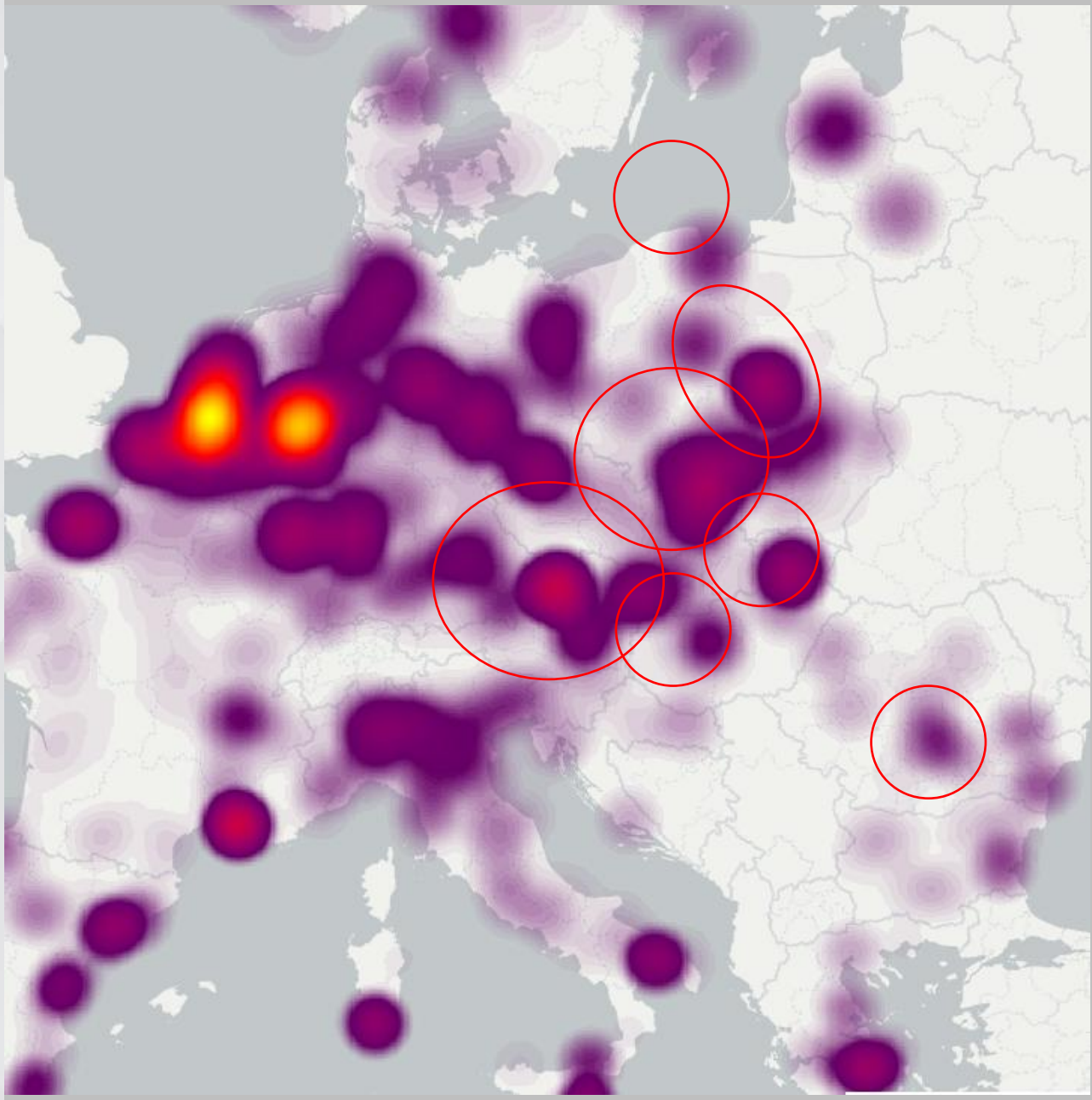
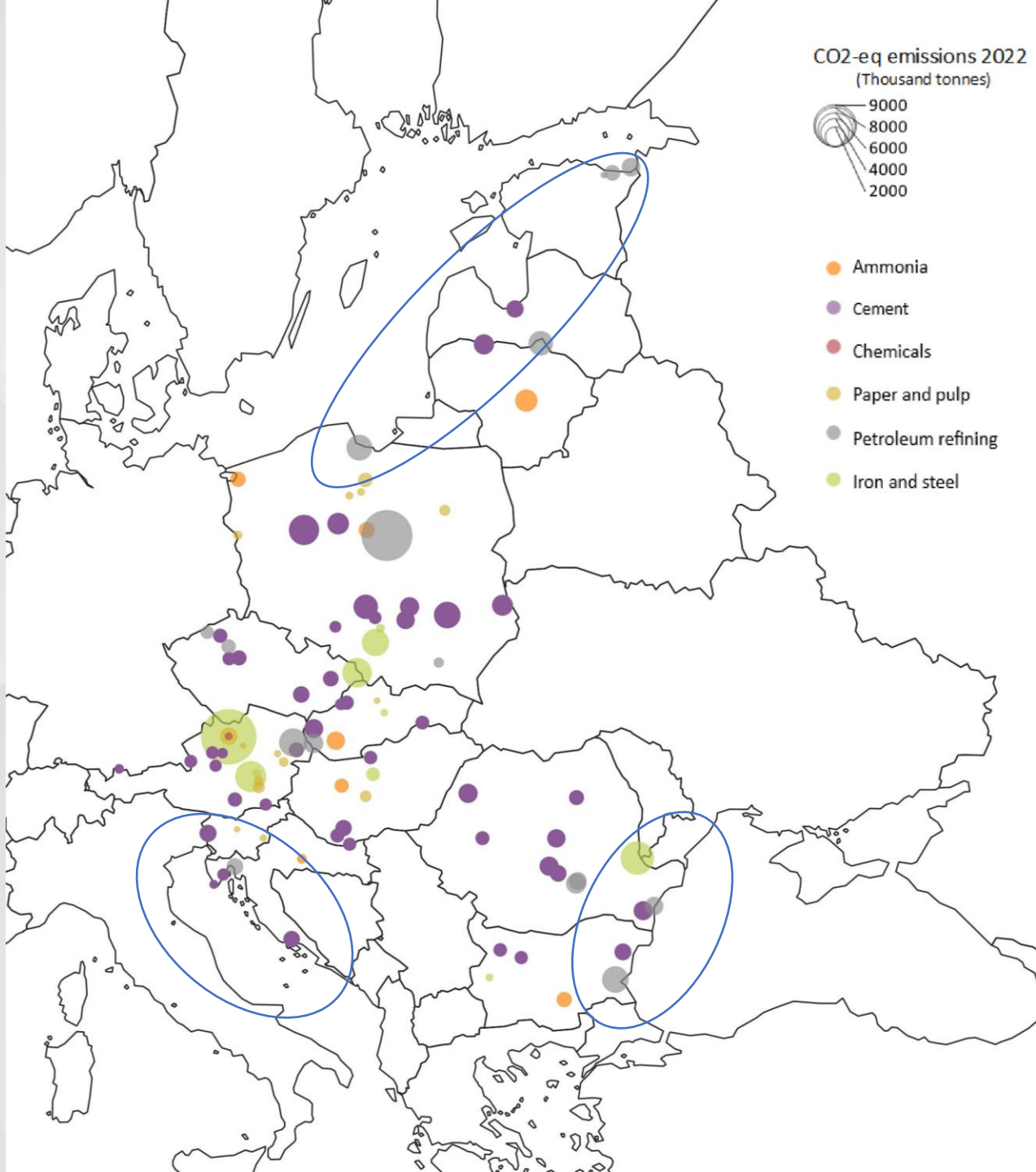


Image: Heat map of industrial emissions in Europe, excluding power, gas, and steam production. Source: JRC, 2025. Energy and Industry Geography Lab.

Where is industry clustered in CEE?

- The **Baltic, Adriatic, and Black Sea coasts** are cross-border resources that can promote industrial synergies
- In some cases, they are also **the sites of industrial clusters**: Romania's Galați and Constanța counties (hosting cement plants and primary steel production) on the Black Sea, and northern Poland (hosting a large refinery) on the Baltic Sea
- In other cases, the three seas provide potential vital opportunities for **shared infrastructure and resource exploitation:**
  - The western Black Sea for offshore wind production in Romanian and Bulgarian waters;
  - The Adriatic Sea for CO_2 storage, for example in the Ravenna Hub site, currently being developed by an Italian company and potentially accessible to Croatian emitters
  - The Baltic Sea, e.g., for the Baltica offshore wind project (Poland and Denmark) and routes to access North Sea CO_2 storage facilities, potentially through shared multi-modal transport;

Image source: EPG based on verified emissions data from the EU ETS.



Where could low-carbon industry be clustered?

- As heavy industry producers and clusters decarbonise, their regions can attract **ancillary cleantech industries** such as low-carbon hydrogen production and carbon capture and storage (CCS)
- **Coal regions**, which were historically co-located with heavy industry, can transform into renewable energy and hydrogen production hubs, benefitting from extensive electricity infrastructure already in place, **good availability of renewable energy**, including solar energy (see adjacent figure) and other advantages
- Romania's ample CO_2 storage potential and historical expertise with oil and gas production can also position it as a **hub for CCS** in the region
- Existing industrial clusters can also fructify **resource- and infrastructure-sharing models** with cleantech and low-carbon industrial producers, promoting circularity and reducing costs
- Shared infrastructure will be essential for decarbonisation technologies such as carbon capture, where exploiting existing clusters to "collect" captured CO_2 can help mitigate technological and market risks
- Clean technologies and fuels can be leveraged for multiple purposes within industrial clusters; for example, clean hydrogen can be used as a fuel or raw material for industrial production, with surplus production used for energy storage

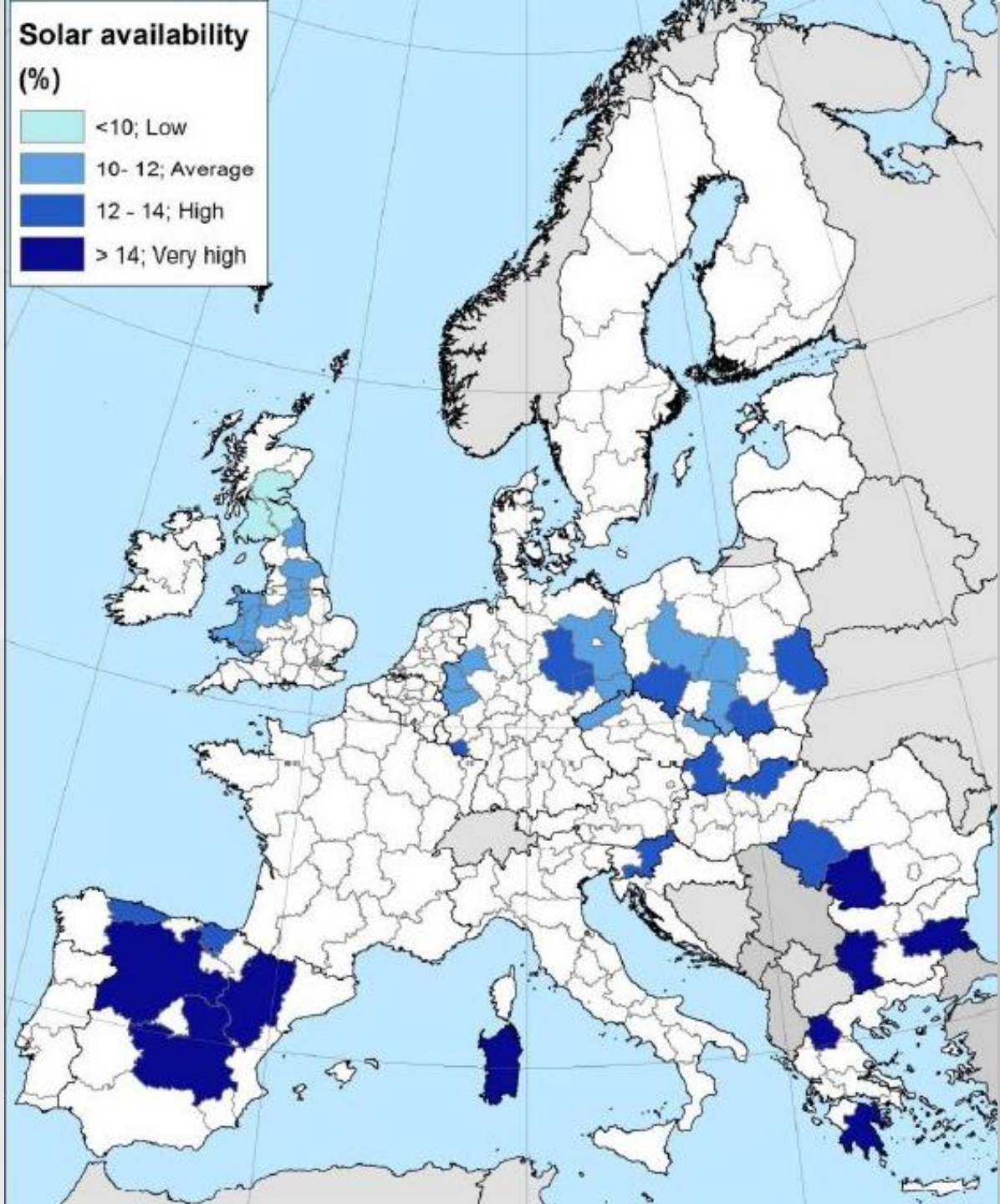


Image: Solar energy availability in Europe's coal regions. Source: JRC, 2018. EU coal regions—opportunities and challenges ahead.

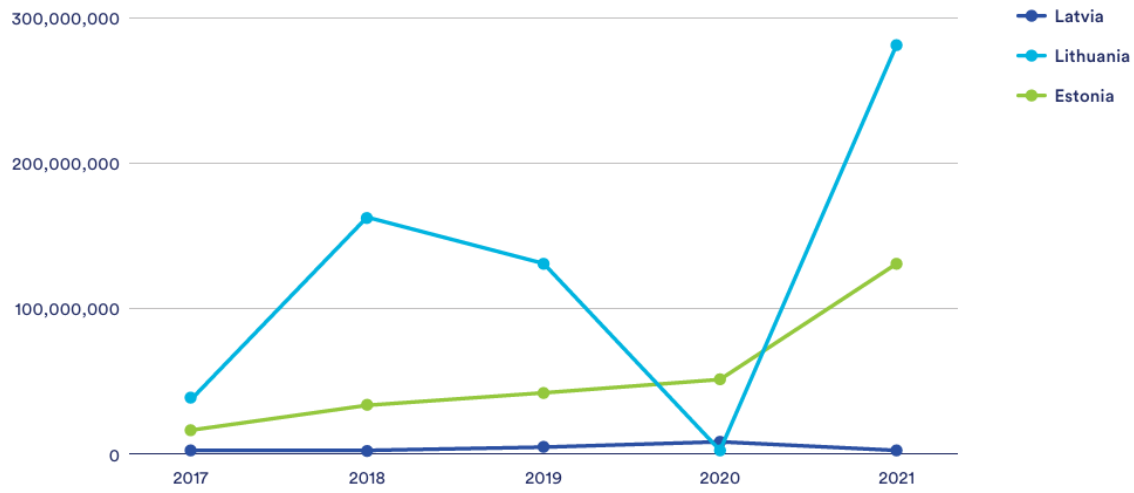
Where could low-carbon industry be clustered?

- In addition to supporting the transformation of existing industrial hubs, **new cleantech hubs** can emerge in CEE countries as strategic clusters
- Exports of electric vehicle (EV) batteries, heat pumps, wind turbines, and solar panels from the region are **poised to triple** if market shares are maintained and Net Zero Industry Act (NZIA) goals are met
- Industrial hubs can develop around these technologies, linked to existing value chains and strategically positioned to exploit renewable energy resources and supply clean technologies to domestic heavy industry
- Projects of Common Interest (PCIs) and Important Projects of Common European Interest (IPCEIs) can be **important instruments for deploying new regional supply chains** for renewable energy components, hydrogen, and other key technologies
- Some CEE countries are already exploiting cleantech potential, e.g., **Poland** for XXL offshore wind towers and batteries, where planned investments total over €2 billion, with the largest in Silesia (an already heavily-industrialised region)
- Cleantech investment in some **Baltic countries** has increased, including next-generation batteries in Estonia and green hydrogen in Lithuania

Image: Investments in the Baltic cleantech sector. Source: Clean Air Task Force, 2023. Building Resilience Through Clean Technology Innovation in Central and Eastern Europe.

Figure 2: Total investments into the Baltic cleantech sector (2017-2022 Q3)

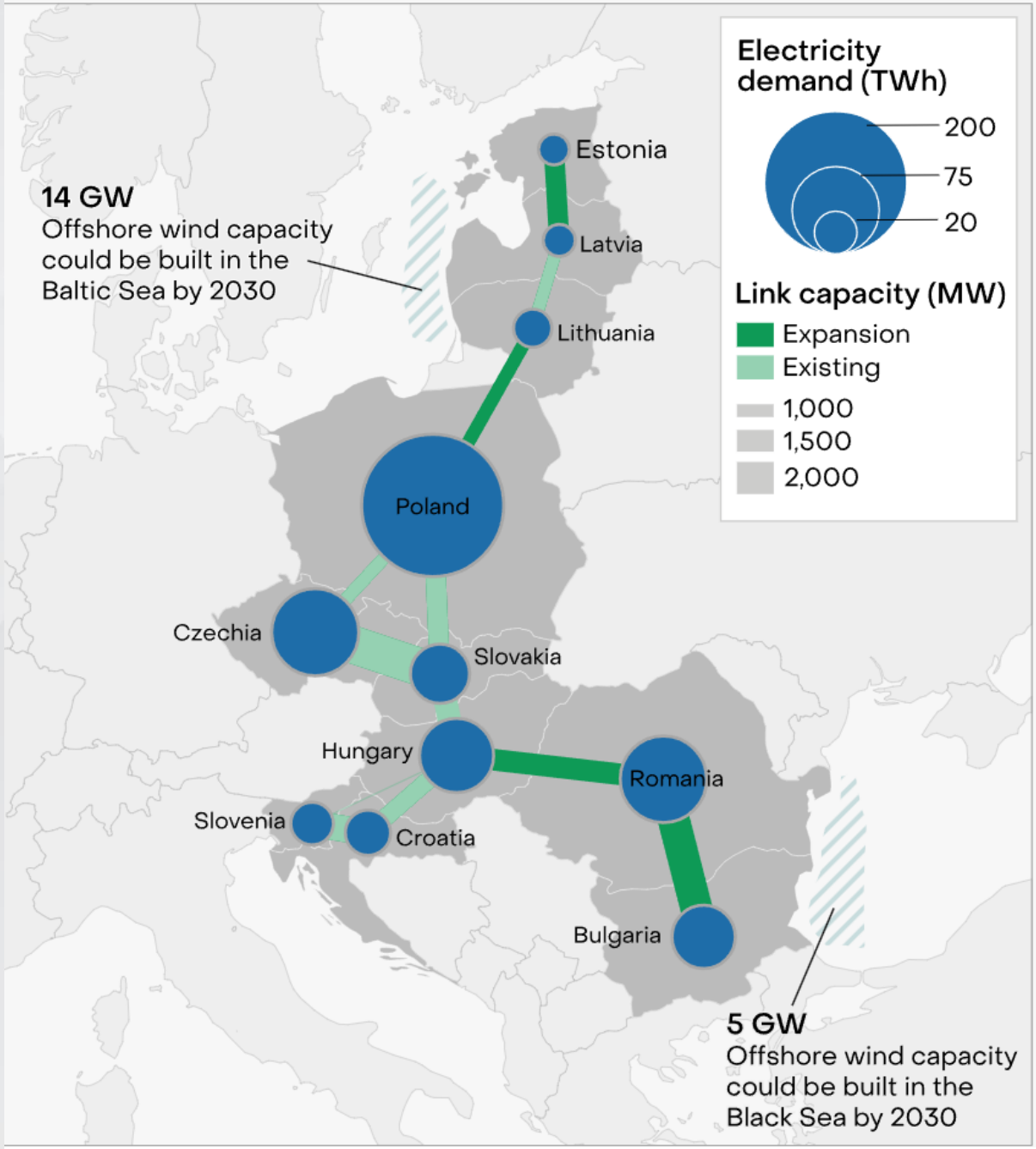
Source: Baltics Building a Cleantech Innovation Powerhouse, Cleantech for Baltics



A regional approach can help unlock efficiencies

- Leveraging existing, emerging, and future clusters for industrial transformation will be more efficient if it includes **a regional approach to planning**
- As industry transforms, increased demand for clean electricity, low-carbon hydrogen, and utilisation and storage sites for captured CO_2 also compels a regional approach to **ensure availability of key inputs across the region**
- For example, up to 19 GW of offshore wind power could be built in the Baltic and Black Seas by 2030, and expanded interconnection capacities in northern and southern CEE could help channel the produced energy to meet industrial demand across the region
- Several trans-national energy projects, including the EL-WIND offshore wind project in the Baltic Sea, the LitPol interconnector and a "Black Sea Corridor" shared grid expansion project, are already underway
- Such approaches can serve as a model for future hydrogen and CO_2 networks in the CEE region

Image source: Ember, 2023. In it together: The road to a cheaper, cleaner CEE power system.



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Regional infrastructure for a renewed CEE industry

The case for coordinated infrastructure planning

- Infrastructure planning across countries and sectors allows for **the combined utilisation of energy carriers and infrastructures**
- This can help avoid cost increases due to siloed installation of inefficiently high capacities (including renewable energy, electrolysers, and CO_2 infrastructure), a key element of providing CEE industries with the infrastructure required to transform
- The value of cross-border infrastructure is highlighted through the EU's system of Projects of Common Interest and Projects of Mutual Interest, which includes hydrogen and CO_2 transport (see adjacent figure)
- Consolidating planning across the CEE region also **widens the pool of available flexibility options**, such as demand-side response and smart storage, helping to balance supply and demand at a regional scale and reducing the uncertainty of projected demand for clean industrial fuels and technologies
- **Coordination between Member States** will be key to achieving efficient integrated infrastructure planning, as highlighted in the EU's recently-released Competitiveness Compass

Image: Projects of Common Interest and Projects of Mutual Interest for electricity, hydrogen, and CO_2 transport. Source: European Commission, 2025. PCI-PMI Transparency Platform.

Cross-border electricity infrastructure can improve the economics of industrial electrification

- Energy-intensive industries in CEE face **some of the highest electricity prices in Europe**, making industrial electrification economically challenging (see adjacent figure)
- CEE countries could deploy up to 283 GW of solar and wind power by 2030, reducing power prices in the medium term and enabling the transformation of industry through **direct electrification and renewable hydrogen production**
- Cross-border networks can help **smooth out regional demand patterns**, reducing curtailment and power price volatility, as well as ensuring supply across a region with variations in renewable energy potential
- Adopting a regional approach can reduce the **required increase in national transmission capacities** associated with an expansion of renewable energy capacities but will increase requirements for storage and cross-border transmission infrastructure, with question marks over who funds such infrastructure
- Expanding access to renewable electricity across the region will also necessitate **thorough planning of supply chains and port infrastructure** for offshore renewables
- **Clear industrial transformation plans** will enable more efficient planning of regional network development, by allowing the mapping of future industrial demand and flexibility options

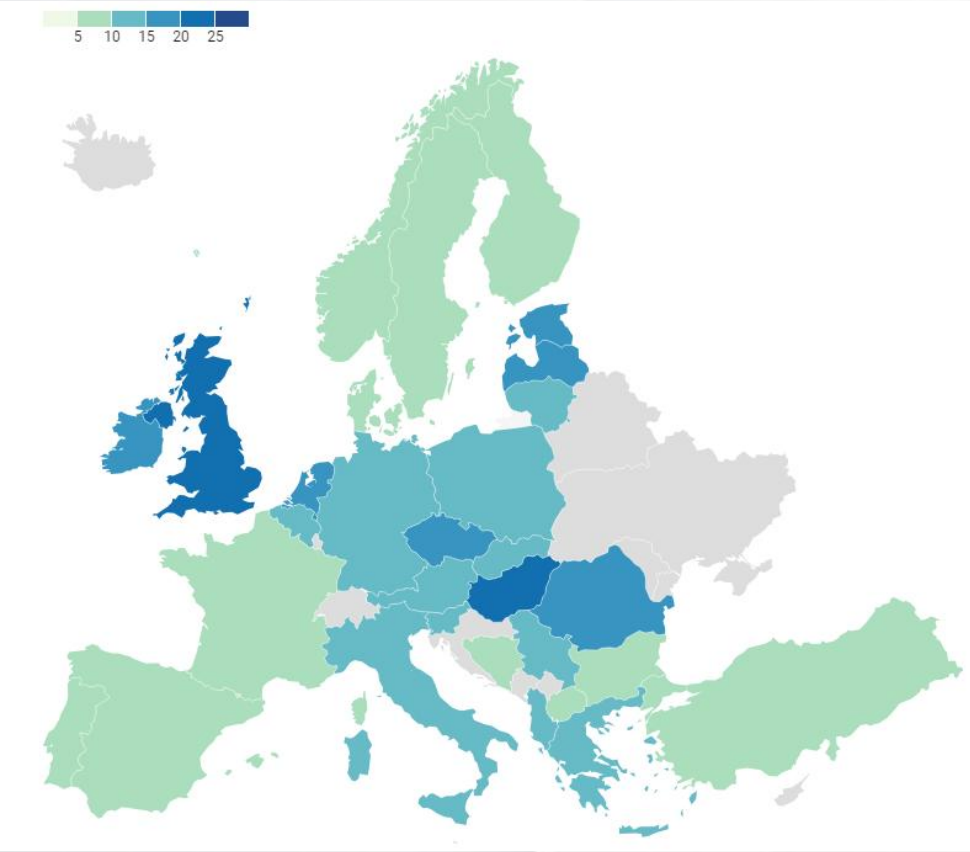


Image: Energy-intensive industrial electricity tariffs, excluding recoverable taxes, H1 2024 €c/kWh. Source: Sgaravatti, 2024. How to fill the remaining gaps in pricing the emissions of the EU's energy-intensive industries.

Hydrogen hubs can bolster industrial transformation

- Industrial transformation in the steel and chemicals sectors, including emerging cleantech sectors such as e-fuels, will require **a steady supply of low-carbon hydrogen**
- Given the current lack of long-distance hydrogen transport infrastructure, opportunities for the **co-location of production and consumption** will need to be investigated before planning a regional hydrogen network
- Existing CEE industrial clusters can serve as a basis for co-location, for example oil refining areas in Romania and Poland, with good wind energy potential (see adjacent figure)
- Concepts such as Hydrogen Valleys in Europe are **potential models for developing local networks** of hydrogen producers, multi-sector consumers, and infrastructure; e.g., the North Adriatic Hydrogen Valley between Slovenia, Croatia, and Italy
- Long-term, CEE countries could be **cost-effective exporters of renewable hydrogen** to Western Europe; one study on pathways for Europe-wide decarbonisation models hydrogen export capacities of up to 4 GW from Romania to Germany by 2050
- Connecting hydrogen hubs to future demand centres will require an integrated market, including hydrogen quality standards, and clear financing for cross-border infrastructure, as well as investment in electricity and hydrogen storage to ensure uninterrupted supply
- Cross-sectoral and cross-country planning could help **avoid unnecessary oversizing of hydrogen transport and storage infrastructure** due to a siloed national approach

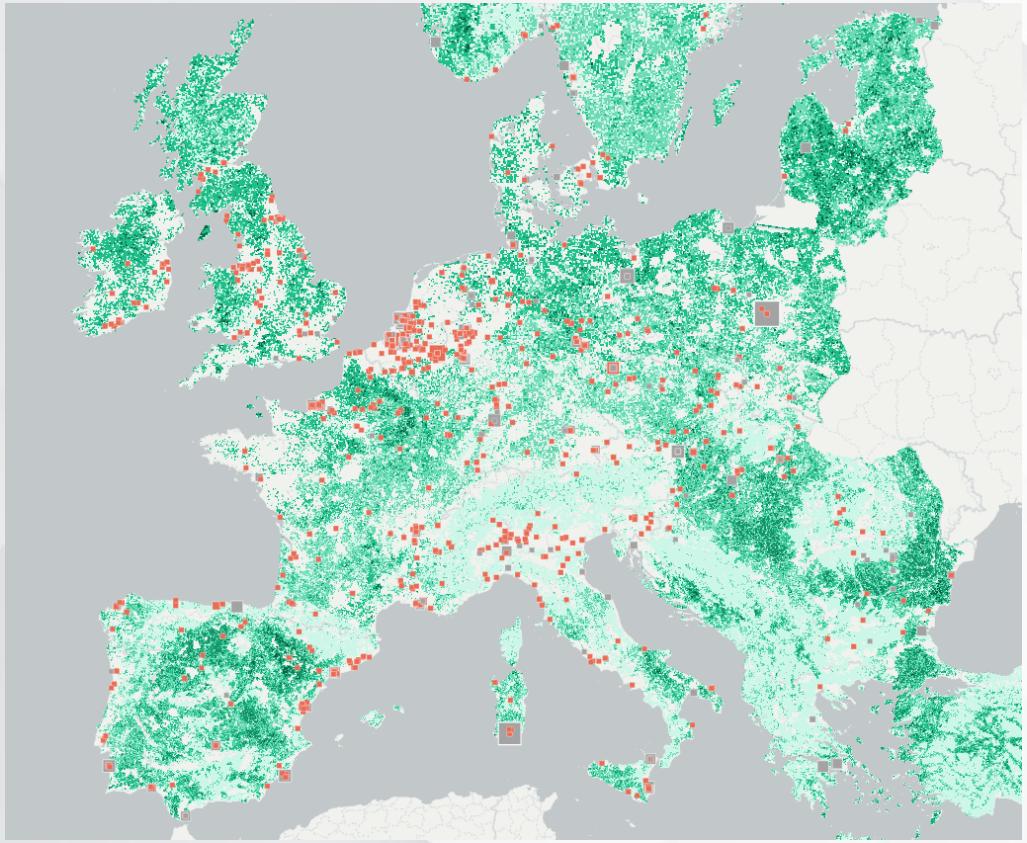
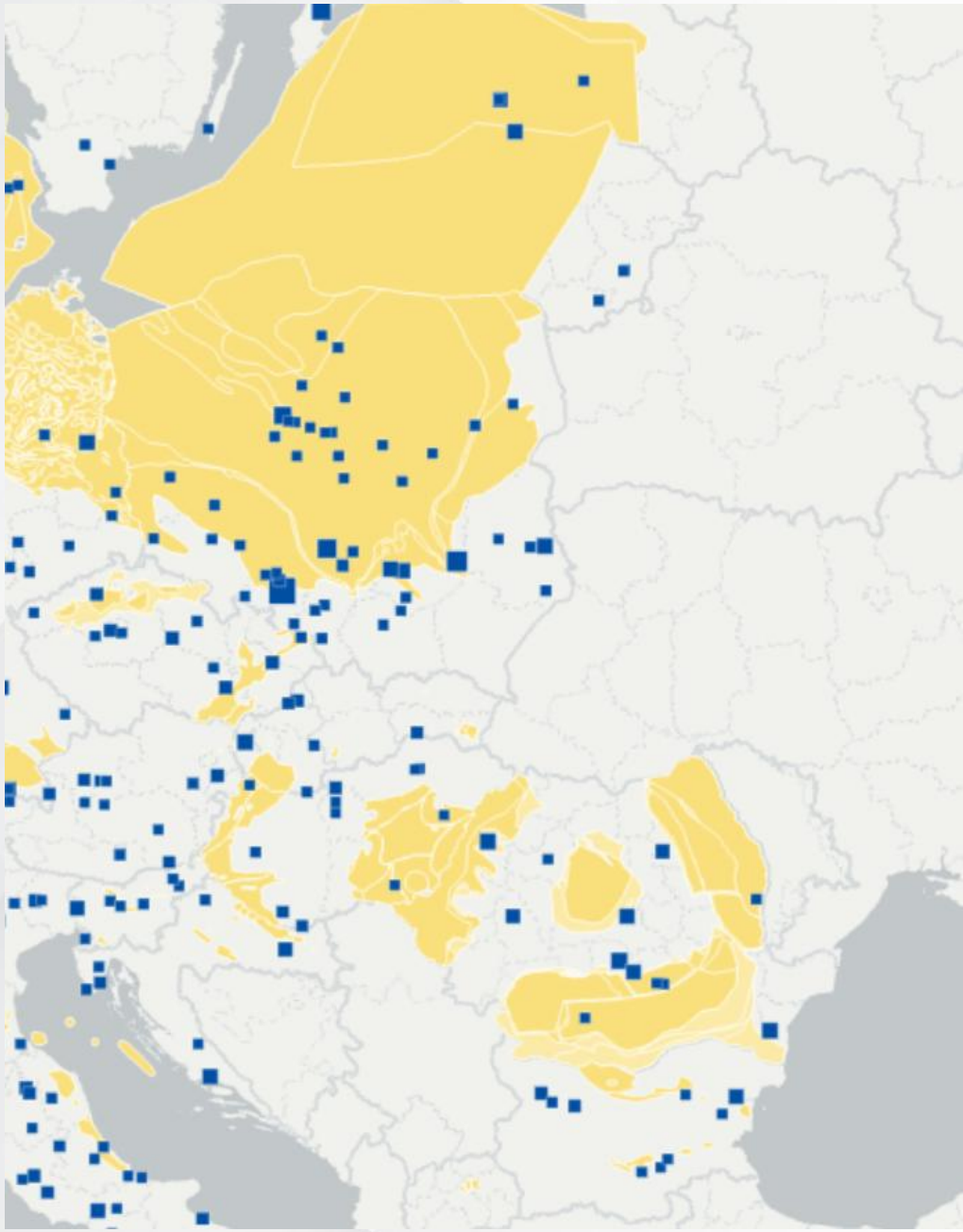


Image: Refineries (grey squares), chemicals producers (orange squares), and wind energy potential (background colours). The size of the squares represents ETS emissions. Darker background colours represent higher wind energy potential. Source: JRC, 2025. Energy and Industry Geography Lab.

Regional CO_2 transport networks can ensure access to vital CCS solutions for heavy industry

- Carbon capture and storage (CCS) is essential for reducing the process emissions of industries such as cement, lime, refining, and chemicals production, as well as enabling negative emissions
- The variation in CO_2 storage potential and experience with oil and gas exploration across the CEE region means that **cross-border CO_2 transport will be essential**, and "CO_2 storage hubs" will emerge in the region
- A regional CO_2 transport network **could be more economical than a pan-European network**, with future interconnection capabilities built in
- The Baltic, Black, and Adriatic Seas are **important shared resources for CO_2 storage and aggregation of demand** for CCUS along industrialised coastlines
- As prime candidates for CCS, **cement producers** will require timely access to CO_2 storage and utilisation sites, but their dispersed nature means they may not always benefit from shared infrastructure
- Regional development of CCS should thus consider **the co-location of CO_2 capture, utilisation, and storage where possible, and multi-modal transport** including backbone, cross-border pipeline networks for long-distance transport, with connection points for future access of emitters who are slower to transform, and non-pipeline modes for dispersed emitters
- Cross-border CO_2 transport will be dependent on the harmonisation of CO_2 standards and overcoming regulatory barriers, such as the London Protocol

Image: Cement production plants (blue squares; size of squares corresponds to ETS emissions) and CO_2 storage potential (yellow background). Source: JRC, 2025. Energy and Industry Geography Lab.



Transport infrastructure will be essential, and can further incentivise industrial transformation

- North-south cross-border transport infrastructure links **are key to economic growth** in CEE; for example, developing high-speed rail in CEE could generate returns of 200% on the initial investment costs by 2050
- Despite a 200% increase in motorway length between 1995 and 2013, **road infrastructure remains underdeveloped in CEE** compared to Western Europe; rail infrastructure also faces significant gaps
- Road and rail infrastructure development can impact industrial decarbonisation by (1) encouraging industrial development through **intensified trade**, and (2) incentivizing the production of **low-carbon construction materials** by applying environmental criteria in public procurement (Green Public Procurement)
- Incentivisation of industrial transformation through such criteria could potentially be significant: up to 75% of the lifetime carbon of roads is "embodied" carbon (i.e., generated through the production and use of materials, particularly asphalt and concrete)
- For railway infrastructure, the main embodied carbon contributor is the steel in track rails and clips, suggesting further incentives for low-carbon steel production for rail infrastructure development

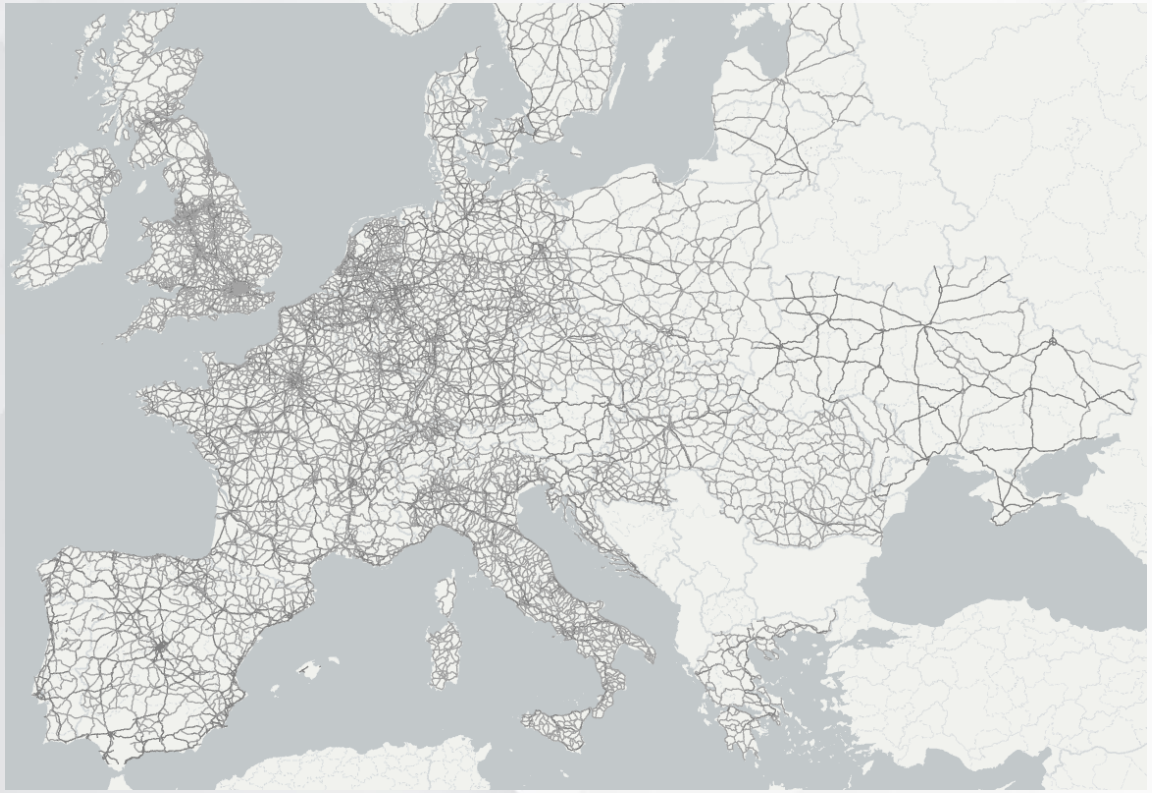


Image: Motorways and long-distance primary access roads in Europe. Source: JRC, 2025. Energy and Industry Geography Lab. No data was available for Bulgaria in the EIGL database.

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What is needed from CEE and EU policy?

The opportunities for creating a clean industry in CEE are significant

- The urgency of transforming industry in CEE is commensurate to the opportunities it could unlock
- The **industrial base in CEE**, with its associated knowledge and skills, could provide a robust foundation from which to transform existing industries and enable new ones
- Ample renewable energy resources, particularly in south-eastern Europe, position the region to become a **key producer and exporter of clean energy and hydrogen**
- Ongoing infrastructure development, with massive investments in road and rail networks, could launch a **new market for clean industrial products**
- **Cleantech manufacturing hubs** can also emerge, spurring economic development in coal regions and other Just Transition communities
- The region's renewable energy potential makes the development of cleantech value chains attractive, for example for exploiting solar PV potential (see adjacent figure)
- A coordinated regional approach to industrial decarbonisation and cleantech development can help **exploit synergies and increase efficiency**, while leveraging the different areas of specialisation for specific countries and regions
- Clean industrial production and cleantech manufacturing may also play a key role in the post-war reconstruction of Ukraine

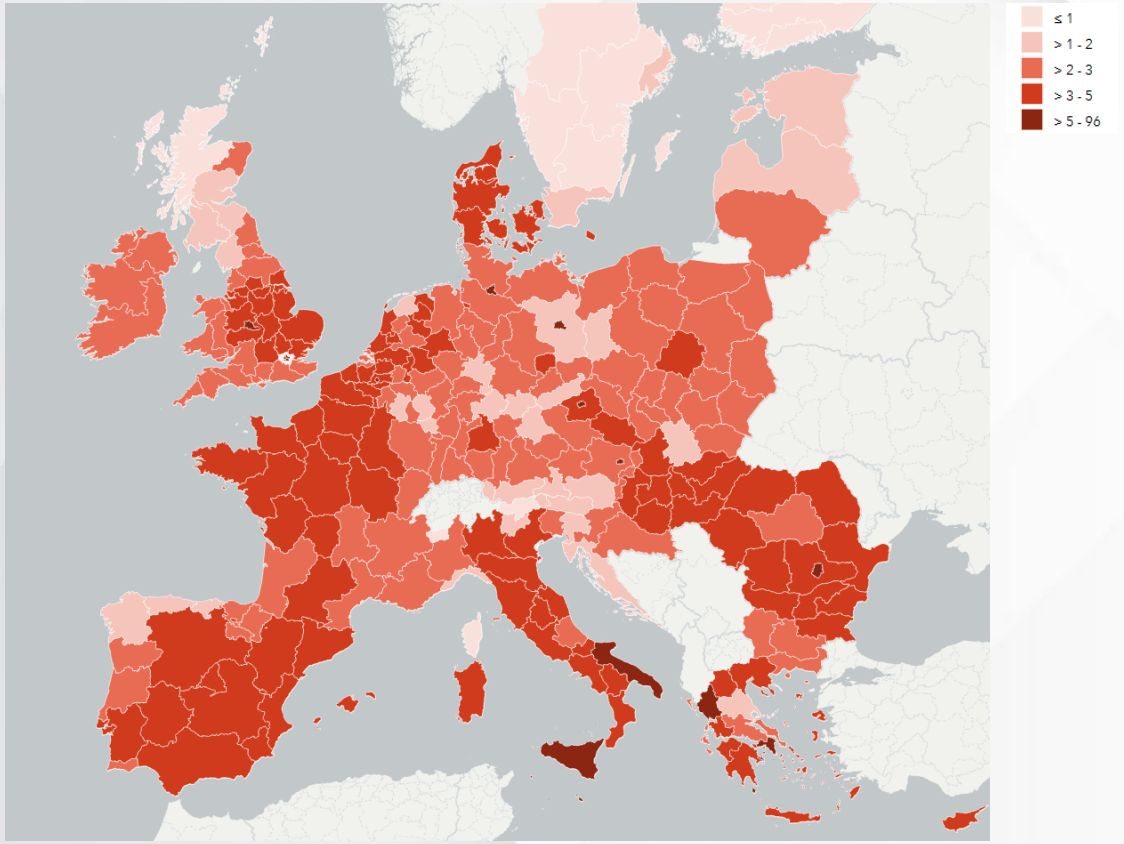

Image source: JRC, 2025. Energy and Industry Geography Lab: Solar energy potential (GWh/m²)

Policy Recommendations

CEE countries

1. Adopt a regional and coordinated approach to clean industry
2. Align national climate, industrial, development and innovation policies
3. Earmark funds for industrial transformation and deploy new funding instruments

European Union

4. Ensure the Clean Industrial Deal avoids a two-speed Europe
5. Maintain regional development funding and link to industrial decarbonisation
6. Strengthen national planning for industrial transformation

CEE countries must adopt a regional, coordinated approach

- By adopting a **regional approach to industrial decarbonisation**, CEE countries can leverage their comparative advantages as part of a system-wide transformation, including vital supply chains and infrastructure
- Cross-sectoral planning of industrial transformation can help **unlock efficiencies** through resource and infrastructure sharing; similarly, cross-national planning reduces the need for national infrastructure, but **increases requirements for cross-border infrastructure and storage** systems
- Regional planning of transport infrastructure can also support a **regional market for low-carbon industrial products and cleantech**, improving trade routes
- Such a regional approach could be **rooted in competitive industrial clusters**, exploiting existing industrial agglomerations with good transformation potential
- The assessment of transformation potential should be based on competitive advantage, but also **considering strategic issues** such as socio-economic impact, autonomy and the reduction of import dependence, including energy, industrial products, and critical raw materials

This coordination must also be internal, aligning climate, industrial, and development policies...

- **Coherence across national policies** will be key to enable a coordinated approach across the region, ensure investor certainty for industrial transformation, and avoid inefficiencies in the implementation of policies and incentives
- In particular, CEE countries must ensure that their decarbonisation objectives for industry are **matched by suitable policies and incentives** for industry to transform
- Policies need to be **socially just**, incorporating issues faced by workers and consumers, and can be based on **cross-party agreements** to ensure political continuity and prevent backsliding
- Such policies must be accompanied by the **elimination of distortionary subsidy schemes** which may undermine incentives for improving industrial resource efficiency and generating emissions reductions
- CEE countries must also **improve their research and innovation policies**, including leveraging the potential of digitalisation, to secure a competitive edge in emerging markets for net-zero technologies, which position the region as a key component of green industrial supply chains in Europe

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… and matched by an increased availability and certainty of funding

- CEE countries must **increase their absorption of available EU funding**, including the Innovation Fund, to deploy first-of-a-kind technologies such as hydrogen-based industrial production and carbon capture and storage
- The region must also **leverage PCIs and PMIs** as instruments for fostering cross-border decarbonisation; successful examples exist from Poland, Hungary, and Croatia which could be further replicated
- CEE countries must **develop their capacity to deploy novel funding instruments**, such as Carbon Contracts for Difference and blended finance, alongside conventional grants and loans, to enable industrial transformation within narrow fiscal spaces
- **Climate conditionalities on existing subsidies**, for example on industrial energy bills, should be strengthened to ensure that such subsidies incentivise industrial energy efficiency
- **Investment in research, development, and innovation** must also increase, to enable emerging cleantech sectors and domestic supply chains of net zero technologies for transforming heavy industry
- CEE states could also **leverage their infrastructure spending** to create markets for green industrial products, for example by introducing sustainability criteria into their public procurement systems, or mandating public infrastructure bodies to incorporate life-cycle emissions thresholds into their projects

The EU must avoid a two-speed Clean Industrial Deal

- The forthcoming Clean Industrial Deal could be a game-changer for industrial transformation across the EU, building on the need for **a joint approach to development and decarbonisation** outlined in the Draghi report
- The recently-published EU Competitiveness Compass foresees the identification of **competitive sectors of strategic importance**, to be recommended to Member States as focus areas for investment and development
- In advancing clean industry on the basis of competitive advantage, the Clean Industrial Deal **must ensure that intra-EU industrial relocation does not occur because of over-sized and unsustainable subsidies** offered through state aid and in the absence of an EU-wide fiscal redistribution system
- Industry **should not be incentivised to relocate based on whom can mobilise the most short-term state support**; the EU's Competitiveness Fund, which will reallocated Cohesion Policy funding, and the planned revision of the EU state aid framework, **must account for potential imbalances** in the single market and always **balance strategic considerations with the assessment of competitive advantages**
- Realising development gains from cleantech development in CEE will require **a coordinated EU strategy, a unified approach among CEE states**, and **significant private-sector investment**, which will be driven by robust supply chains, strong R&D ecosystems, and a skilled workforce

EU regional development funding must be maintained and linked to industrial transformation

- Raising the funding required for the clean industrial transition, which is just one component of the EU's competitiveness agenda, will require **more targeted and focused use of public funding**, as well as mobilising more private financing
- **Regional development funding**, an essential instrument for advancing CEE economies and generating spill-over benefits to the entire Union, should be leveraged for industrial transformation in a dual decarbonisation-development agenda
- For example, **introducing mandatory Green Public Procurement (GPP) criteria in Cohesion Policy funding** could ensure that infrastructure development in CEE uses clean industrial materials, reducing life-cycle emissions and incentivising domestic industrial transformation
- Such regional development funding **can also be anchored in identified areas of competitive and strategic advantage** and exploit a regional approach to infrastructure buildout
- The EU can **support regional integration by leveraging existing planning and funding instruments**, including the TEN-E and TEN-T regulations, and planning channels such as gas and electricity transmission system operator development plans (ENTSO-G and ENTSO-E, respectively)

National planning must be strengthened and coordinated across countries

- **National planning of industrial transformation must be strengthened**, with safeguards in place for backsliding, **and coordinated** between CEE countries to optimise the efficiency of the transformation
- The EU could leverage the **future revision of the EU Governance Regulation** to ensure that Member States anticipate their infrastructure, energy, resource and market creation needs to enable a successful transformation, including through their National Energy and Climate Plans (NECPs)
- The Competitiveness Compass foresees a Competitiveness Coordination Tool to ensure effective alignment and coordination of national decarbonisation policies, and a Competitiveness Fund to improve efficiency of spending; **these new facilities must ensure full accessibility for all Member States**, particularly those in the CEE region on whom the planned reprogramming of Cohesion Policy funding may have an impact
- These coordination facilities must also **consider issues of social fairness and strategic autonomy** alongside competitiveness, to ensure that they do not deepen the imbalance between Western and Eastern Europe

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EPG is an independent think-tank specialising in energy and climate policy, focusing on the decarbonisation of the Romanian and Central and Southeastern European economies. Founded in 2014, EPG operates as a research institute primarily financed through competitive research grants. Its research aims to promote a constructive, evidence-based dialogue on decarbonisation and economic transformation among decision-makers and the public, both regionally and globally.

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