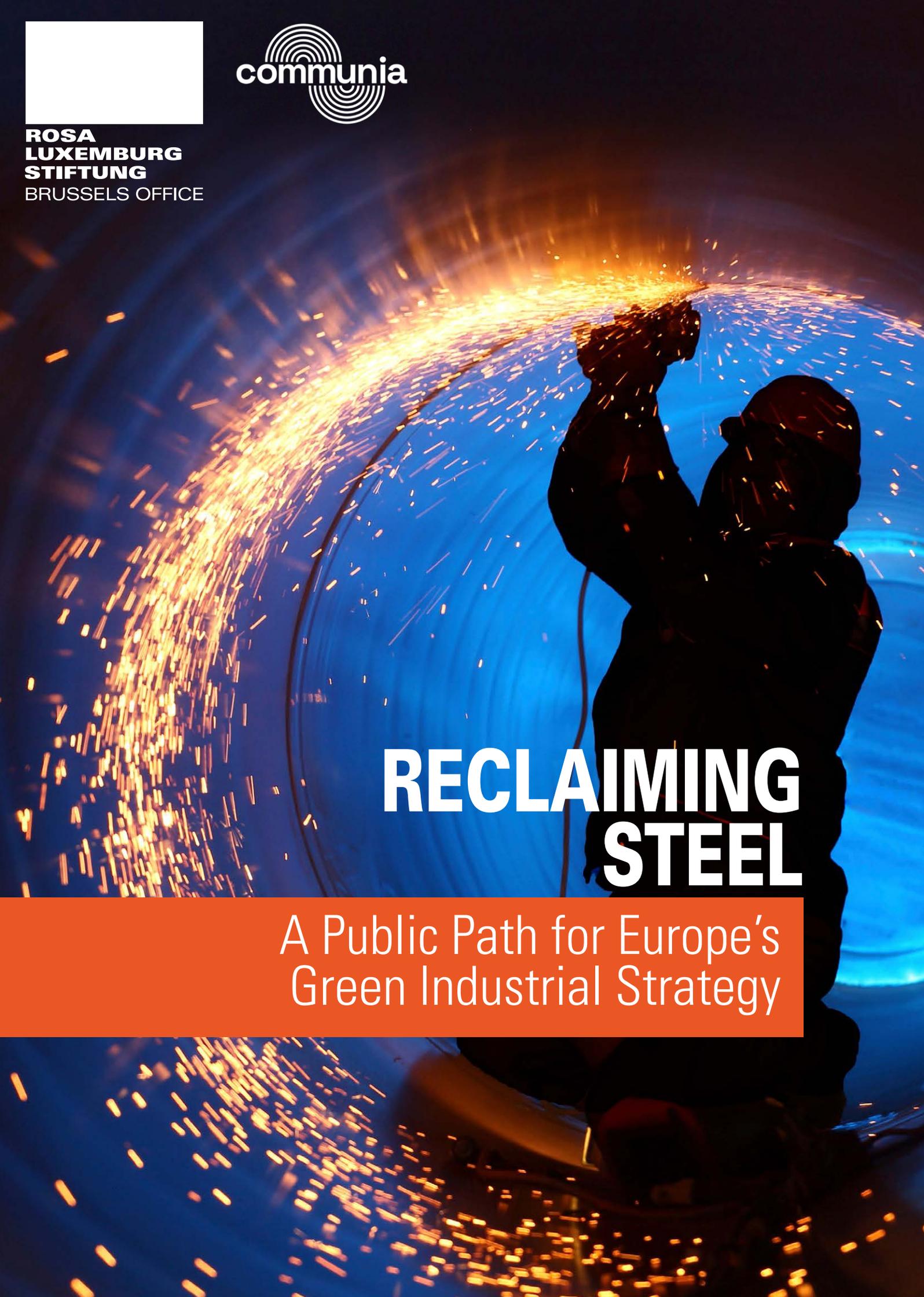




**ROSA
LUXEMBURG
STIFTUNG**
BRUSSELS OFFICE

A silhouette of a welder in a dark, protective suit and helmet, working on a large, curved metal structure. The welder is positioned on the right side of the frame, with their arms raised as they work. A massive spray of bright orange and yellow sparks erupts from the point of contact, cascading across the left and top portions of the image. The background is a deep, vibrant blue, which makes the glowing sparks stand out prominently. The overall scene conveys a sense of industrial activity and craftsmanship.

RECLAIMING STEEL

A Public Path for Europe's
Green Industrial Strategy

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COMMUNIA

Since 2020, communia has been developing strategies for a democratic economy, socialisation and public luxury as a movement-oriented think tank. To this end, communia supports social movements that advocate for socialisation and test alternative, public and democratic models of ownership to overcome both the climate crisis and inequality. Communia shapes policy, conducts research and develop new narratives for an economy that serves the many – because it belongs to the many.

ROSA-LUXEMBURG-STIFTUNG

The Rosa-Luxemburg-Stiftung is an internationally operating, left-wing non-profit organisation providing civic education. It is affiliated with Germany's Die Linke (Left Party). Active since 1990, the foundation has been committed to the analysis of social and political processes and developments worldwide.

The Stiftung works in the context of the growing multiple crises facing our current political and economic system. In cooperation with other progressive organisations around the globe, the Stiftung focuses on democratic and social participation, the empowerment of disadvantaged groups, and alternative economic and social development. The Stiftung's international activities aim to provide civic education by means of academic analyses, public programmes, and projects conducted together with partner institutions.

The Rosa-Luxemburg-Stiftung works towards a more just world and a system based on international solidarity.

ACKNOWLEDGEMENTS

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EXECUTIVE SUMMARY

The European steel industry is entering a decisive period in which economic, ecological, and technological pressures converge. Steel remains a foundational sector of Europe's economy, yet it faces structural tensions that current EU policy approaches struggle to resolve. Three central issues stand out.

A DUAL PROFITABILITY CRISIS: OVERCAPACITY AND DECARBONISATION

The steel industry faces a dual crisis squeezing its profits due to structural overcapacity alongside the urgent need to decarbonise production. A persistent mismatch between production capacity and demand threatens the profitability expectations of European steelmakers. In 2025, utilisation of the EU's steelmaking capacity stood at roughly 63 per cent, while overall steel production in Europe has declined by around 30 per cent since 2008.

At the same time, the transition to low-carbon steel requires massive investment in new technologies, such as hydrogen-based direct reduced iron. This means that an industry concerned about its profitability must simultaneously finance its own costly decarbonisation.

THE INVESTMENT DILEMMA: MASSIVE CAPITAL NEEDS AND UNCERTAIN RETURNS

Decarbonising steel production requires investments on a scale that private firms are reluctant to undertake under the current market system. Hydrogen-based steelmaking depends on vast quantities of renewable electricity and new infrastructure, and returns on these investments remain uncertain. Estimates suggest that by 2030, the additional electricity for EU steel decarbonisation projects alone could exceed Belgium's current annual electricity consumption.

A STRUCTURAL INCOMPATIBILITY: PROFIT-DRIVEN INVESTMENT AND DECARBONISATION

The scale and urgency of the transition demand a reassessment of current policy approaches. European policy largely attempts to reconcile decarbonisation goals with a profit-driven industrial structure in the steel and energy sectors. In practice, this has produced a growing gap between decarbonisation objectives and corporate investment decisions. Projects are frequently

delayed, scaled back, or cancelled when they fail to secure sufficient short-term profitability.

This contradiction limits the pace and direction of decarbonisation and suggests that subsidies, trade measures, or even partial rescue nationalisations alone are unlikely to resolve these problems. A strategy based on socialising the steel sector — understood as the expansion of collective public ownership and democratic control, and prioritisation of public needs — could help address these structural tensions. The sector has a history of public ownership and, with strong union membership and close ties between large steelworks and surrounding regions and municipalities, provides a good starting point for gradually extending this model.

Such public ownership would allow investment decisions to be guided by long-term societal priorities. Breaking with current austerity policies, it would enable the creation of stable demand for green steel in sectors where it will remain indispensable, such as housing, renewable energy and public infrastructure, and public transport. In this way, European steel production capacity could be aligned with the needs of a low-carbon economy.

This strategy would also require a parallel transition towards a public and decommodified electricity system capable of scaling renewable energy in a timely manner, and enabling long-term planning for energy-intensive sectors such as steel and hydrogen.

Reclaiming steel into public hands would allow the sector to benefit from public institutions' access to large-scale financing at lower cost, which they could direct towards productive reinvestment in decarbonisation rather than dividends for shareholders. At the same time, socialised ownership could support a just transition by preventing abrupt plant closures, safeguarding employment, and enabling meaningful worker participation in shaping the transformation of the industry.

Europe therefore faces a strategic choice: risk the gradual erosion of its steel industry under the existing market system, or pursue a coordinated strategy that places steel production in public hands, aligns it with workers' interests and planetary boundaries, and lays the foundations for a resilient, decarbonised economy.

INTRODUCTION

The European steel industry is once again in crisis. A sector that currently supports around 300,000 direct and between 2.3 and 2.5 million indirect jobs has been increasingly seeing steel companies announce closures, mass layoffs and capacity cuts.¹

These developments accelerate an existing trend: since 2008, the European steel industry has lost over 100,000 direct jobs — approximately 25 per cent of its workforce. In 2024 alone, 18,000 layoffs were announced alongside a record 12 million tonnes of capacity closures. At ThyssenKrupp Steel, 11,000 jobs are set to be cut as part of a restructuring process², and in the Netherlands, Tata Steel plans to cut over 1,200 jobs, bringing the number to more than 3,200 employees in total when restructuring-related redundancies are included.^{3,4}

Against this background, steel companies continue to lag behind in needed decarbonisation investments. In the context of such developments, Italy took control of a steel site owned by ArcelorMittal (its largest in Europe) in 2024, and the French National Assembly approved a bill led by La France Insoumise in November 2025 proposing the nationalisation of ArcelorMittal's operations in France.

This is not the first time the steel industry has faced such a crisis. The capitalist mode of production experiences periodic crises of overproduction under oligopolistic competition, due to high economies of scale, significant long-term investment costs, and the nature of production through coal-powered blast furnaces. Yet, this is not a normal cyclical downturn: the sector's long-standing tendencies now collide with the existential imperative of rapid decarbonisation. Steel accounts for around 8-10 per cent of global CO₂ emissions and remains one of the hardest-to-abate sectors, with large-scale transformation of primary production to hydrogen-based routes still in its infancy.⁵

On top, global overcapacity today stands at 600 million tonnes, almost a quarter of global steel production, and according to the OECD (Organisation for Economic Co-operation and Development), it is expected to rise to 740 million tonnes by 2027.⁶

Moreover, within the European Union (EU) itself, demand across steel-consuming sectors falls far below the bloc's production capacity, reflecting the issue of domestic excess capacity even before considering global overproduction.

The current crisis is therefore shaped by the overlap of general structural and cyclical problems with the existential challenge of achieving climate neutrality. Yet steel remains one of the sectors where decarbonisation has not begun at a large scale. Recycling scrap iron with electric arc furnaces (EAFs) has emerged as part of the solution and is already widespread. However, in primary steel production the most promising route, hydrogen-based direct reduction (H₂-DRI), remains uncompetitive and corporations have been delaying or cancelling investments, even despite massive state subsidies.

In response to the crisis, governments at the EU and national level have launched a wave of industrial policies, subsidies and trade-defence measures, from the EU Emissions Trading System (ETS) and the Carbon Border Adjustment Mechanism (CBAM) to the Steel and Metals Action Plan (SMAP), and to national hydrogen strategies and site-specific rescue packages. In addition, politicians from left and right have called for — and in some cases applied — more far-reaching interventions such as nationalisations.

But a contradiction lies at the heart of Europe's current steel policy: governments simultaneously claim to defer to market mechanisms while continuously intervening to sustain private profitability. This approach — derisking green steel investments through state subsidies while maintaining private ownership, combined with occasional rescue nationalisations — fails to fundamentally address the sector's structural problems.

Decarbonisation continues to lag, capital refuses to commit to the long-term investments necessary for transformation, and uncertainty about future profitability deepens the structural inhibition to invest. No subsidy structure can bridge this contradiction, because even substantial subsidies do not make such investments commercially appealing, and cannot guarantee significant new markets. The core issue appears to be irreconcilable: long-term social and ecological needs clash systematically with short-term profit requirements.

Instead of continuing the same failed recipes that have been unable to address the economic, social and ecological challenges of the steel sector as it is today, there is an obvious but less discussed solution: public, democratic ownership and socio-ecological planning. To explore how such a future could come about, this paper will outline an alternative steel policy — one that is based on public ownership and direct public investment in the interest of securing jobs, a resilient economy, and a rapid climate transition.



Thyssenkrupp Steelworkers protest in Duisburg.

This paper is structured in the following way:

- The first chapter establishes the empirical foundation, documenting the current state of the steel industry and the decarbonisation challenges it faces.
- The second chapter examines existing EU-level policies and looks at a case study in Sweden.
- The third chapter outlines how socialised public ownership and planning at the European level can provide a genuine solution to the steel crisis.

As most investments in steel decarbonisation will still have to happen, adopting an ambitious policy of coordinated financing and public ownership can offer an opportunity to secure Europe's steel sector's future in the long-term, and regain strategic control and democratic oversight over industrial production patterns.

STATUS QUO AND KEY CONSTRAINTS

THE STEEL INDUSTRY TODAY

The steel industry is a key source of economic activity in the EU. In fact, the EU traces its history back to the European Coal and Steel Community (ECSC), which aimed at integrating national steel production into a common European framework. With the creation of the ECSC in 1952, steel became the first sector to be covered by supranational decision-making to reduce competition between its Western European founding members.

Europe used to be the world's largest steel producer. Increased production of steel in Europe led to overproduction as early as 1967, demonstrating that the crisis of overcapacity is not new.⁷

The EU's low steel capacity utilisation in the 1980s, reaching about 56 per cent, plunged the sector into yet another systemic crisis. This prompted enormous governmental interventions.⁸

Between 1975 and 1990, state aid to the industry in the European Communities reached \$55 billion.⁹ France, for instance, nationalised its steel companies Usinor and Sacilor. However, such industrial policy interventions did not succeed in preventing the loss of nearly 50 per cent of jobs in the sector between 1975 and 2000.¹⁰

In 1993, the European Commission proposed a plan to rescue the steel sector based on three core ambitions: cutting overcapacity, enabling state aid to the industry, and protecting it from imports from outside the European Communities. The question of state aid turned out to be central. Private producers opposed state aid to publicly owned companies, seeing it as a market distortion and an unfair advantage, and therefore rejected fulfilling the Commission's demands to cut production to reduce overcapacity — its key response to the steel sector crisis at the time. To alleviate these concerns, the Commission pushed for closures of mills operating at a loss thanks to subsidies, took control over administering steel sector aid, and banned support for capacity increases. This encouraged privatisation of the steel sector in Europe as a means to gain the Commission's support for the industry.¹¹ Usinor-Sacilor was privatised in 1995 (eventually transitioning into ArcelorMittal),¹² British Steel in 1988, Italy's Ilva in 1994, Portugal's Siderurgia Nacional in 1995, and the Swedish SSAB partially in 1992. While this plan of the Commission was abandoned in 1994 as demand recovered, overcapacity issues remained unresolved.¹³



Italsider plant in Taranto, Italy in 1966.

Upon accession to the EU, Central and Eastern European members were also pushed to privatise and downsize their steel production, a demand promoted by the steel lobby to limit competition. The accession had various impacts, from reshaping the region's steel sector's ownership structures and opening it to foreign investors, to modernising production and causing large redundancies.¹⁴ In 2024, only Poland and Slovakia belonged among the top ten EU crude steel producers, occupying seventh and tenth place, respectively.¹⁵

Today, the steel industry accounts for up to €177 billion (or around 4.2 per cent) in gross value added in the EU¹⁶ out of a total of €4.2 trillion.¹⁷ Most steel demand comes from construction, automotive, mechanical engineering and metal goods.¹⁸

Producing around 129 million tonnes of crude steel in 2024, the EU makes up 7 per cent of global supply. Of that, Germany produced the largest share, followed by Italy, Spain, France and Belgium. China covers 54.6 per cent of the global share, India 7 per cent, Japan 4.6 per cent, and the US 4.3 per cent.¹⁹ However, the EU's steel production has fallen by 30 per cent since 2008²⁰ and in 2015 it became a net importer, with 27.4 Mt (megatonnes) of finished steel products imported in 2024.^{21,22} According to EUROFER, the European Steel Association, in 2020 it also became a net importer of steel-intensive products.²³

A closer look at the EU's production and demand figures helps illustrate the extent of the challenges confronting the bloc's steel sector. In 2024, the EU's installed steelmaking capacity was 198 Mt, while apparent consumption reached 128.7 Mt that year. With the utilisation rate at around 63 per cent, actual steel production reached 129.6 Mt in 2025.²⁴ This comes amid declining demand from key steel-using sectors, reflecting lower car sales, slowed infrastructure projects, and subdued industrial investment.

These figures indicate that the challenges facing the EU steel sector are not merely a matter of global overcapacity or high production costs. They point to a structural mismatch between domestic production capacity and demand.

Yet EU leaders pursue austerity policies that cut public investment and increase cost-of-living pressures, as a result of which workers and public budgets have fewer means to consume and create demand across multiple steel-using sectors. At the same time, climate change impacts urgently call for a circular economy and reduced resource use, especially as economic growth has so far been impossible to decouple from the material footprint at the scale and speed needed.²⁵ As the paper outlines, the result is a steel sector caught between overcapacity, weakened domestic demand, and structural constraints in the European economy that shape its decarbonisation path.



French President Emmanuel Macron visits ArcelorMittal site in France.

LARGEST STEEL COMPANIES IN EUROPE

ARCELORMITTAL

Headquartered in Luxembourg, ArcelorMittal is Europe's largest steelmaker and the second largest in the world after China's Baowu.²⁶ With production sites worldwide, it supplies between 15 and 20 per cent of the global automotive steel market.²⁷

Despite lower sales revenues and its public references to a global steel industry crisis, its profits increased by 135 per cent in 2025 compared to the previous year, reaching USD 3.15 billion.²⁸ It also cited demand for data centres, roads and bridges, electric vehicles and the defence sector as reasons for a positive outlook.²⁹ Over the past five years, the company distributed USD 12.5 billion to shareholders — USD 1.5 billion in dividends and USD 11 billion in share buybacks.³⁰ Almost 40 per cent of its shares are owned by the Mittal family. Other major shareholders include BlackRock, Vanguard, and Mittal-affiliated private entities.³¹

In 2023, ArcelorMittal's emissions reached 114.3 Mt CO₂e — comparable to the total emissions of Belgium. Although the company has committed to achieving net-zero by 2050, its 2030 targets are not aligned with a 1.5°C pathway, and since 2018, it has reduced emissions by only around 5 per cent.^{32,33} The company has acknowledged that it is unlikely to meet its 2030 goals and has delayed or cancelled decarbonisation projects in Germany, Spain, Belgium and France,³⁴ citing the unavailability of green hydrogen and the lack of competitiveness of natural gas-based DRI production.³⁵

In December 2025, climate campaigners filed a complaint with the OECD, arguing that ArcelorMittal has failed to adopt a science-based strategy and take adequate action to reduce emissions.³⁶ Furthermore, ArcelorMittal has been in talks with the Polish government to secure state subsidies for the relining of a coal based blast furnace.³⁷

In response to repeated delays in investments in electric arc furnaces, the French left-wing party La France Insoumise proposed a bill, approved by the National Assembly in November 2025, to nationalise ArcelorMittal's operations in France, where it accounts for roughly two-thirds of national steel production.

This comes after Acciaierie d'Italia — formerly operated by ArcelorMittal and later co-owned with the Italian state — was placed under state administration in 2024.

As the plant struggles to stay operational, the administration sued the company in January 2026 for €7 billion in damages for intentionally transferring financial resources from the Italian site to the parent company.³⁸

THYSSENKRUPP AG

Thyssenkrupp's steel unit is Europe's second-largest steelmaker and ranked 42nd globally in 2024.³⁹ In the financial year 2024/25, Thyssenkrupp recorded €532 million in net income and paid €93 million in dividends.⁴⁰

Its largest shareholder is the Alfried Krupp von Bohlen und Halbach Foundation, holding nearly 21 per cent.⁴¹ In 2024, Czech billionaire Daniel Křetínský — responsible for some of the most polluting utilities in Europe (e.g. lignite production in eastern Germany) — acquired a 20 per cent stake in the steel unit before subsequently announcing his intention to sell it.^{42,43} Other shareholders include BlackRock and Vanguard.⁴⁴

Thyssenkrupp is one of Europe's largest industrial emitters, responsible for around 2.5 per cent of Germany's total emissions. It has committed to climate neutrality by 2045. The transformation of its Duisburg site is central to its decarbonisation strategy, with plans to construct an H₂-DRI plant to replace four blast furnaces, supplying companies like Volkswagen.⁴⁵ The plant is initially planned to operate on natural gas rather than renewable hydrogen.⁴⁶

In March 2025, Thyssenkrupp suspended its tender to purchase renewable and low-carbon hydrogen due to high prices. The company stated that construction and initial operation of the Duisburg plant would not be directly affected because it can run on natural gas — potentially avoiding around 50 per cent of emissions compared to blast furnace production.⁴⁷ Yet, at the same time, it has warned that the site risks becoming a stranded asset without access to affordable renewable hydrogen.⁴⁸

SSAB

SSAB is Sweden's main steelmaker and ranked 56th globally.⁴⁹ It operates production facilities in Sweden, Finland, and the United States.⁵⁰ Although formally a private company, its largest shareholders include LKAB, the Swedish state-owned mining company, and the Government of Finland. Other shareholders include Vanguard, BlackRock, and Goldman Sachs.⁵¹

In 2024, SSAB recorded net profits of USD 592 million. Following its policy of distributing 40 per cent of net profits as dividends, it paid approximately €282 million to shareholders. According to company reporting, it has the highest profitability in the industry compared with peers such as ArcelorMittal, Thyssenkrupp, Salzgitter, and Tata Steel Europe.⁵²

In January 2026, SSAB concluded an agreement with Rheinmetall to supply green steel, making Rheinmetall the first defence manufacturer to introduce decarbonised steel into its production.⁵³

SSAB is the largest greenhouse gas emitter in Sweden and Finland and has committed to achieving net-zero emissions by 2045.^{54,55} It cooperates with LKAB and the state-owned utility Vattenfall on the HYBRIT (Hydrogen Breakthrough Ironmaking Technology) project, which aims to decarbonise steel production through hydrogen-based direct reduction of iron ore. However, the project has faced delays linked to scaling challenges beyond the pilot phase.^{56,57}

THE DECARBONISATION CHALLENGE

Historically and up until today, most steel (around 72 per cent globally) is produced via the blast furnace-basic oxygen furnace (BF-BOF) route — first reducing iron ore to pig iron in a blast furnace and then converting it into steel in a basic oxygen furnace. In this primary steel production process, carbon is used not only as a heat source but also as a chemical agent to remove oxygen from iron ore, making it highly CO₂-intensive and not easily electrifiable. The second main route today (around 21 per cent globally) is secondary steel production. It involves melting steel scrap in an electric arc furnace (EAF), which relies on electricity and can therefore be decarbonised through renewable power.⁵⁸

However, not all steel can be recycled, and in the long-term some level of primary steel production will remain necessary and socially relevant. Industry estimates suggest that by 2050 around 50 per cent of steel production will still need to rely on iron ore,⁵⁹ but such estimates are largely based on current production and consumption patterns, favouring their business case.

There are few options for decarbonising primary steel production. Scientific consensus indicates that hydrogen-based direct reduction (H₂-DRI-EAF) will become the main alternative. Hydrogen can replace coal as the reducing agent in the direct reduction (DRI) process, producing water instead of CO₂. The resulting iron is then processed in an electric arc furnace. Overall, transitioning from blast furnaces to EAF production has been challenging. As of 2025, 15 of the EU's 47 blast furnaces still had no retirement date. Around 55 per cent of EU steel is currently produced via the BF-BOF route and around 45 per cent via EAFs.⁶⁰

Direct reduction technology itself is not new and has been used since the 1960s. Unlike blast furnaces, which must operate continuously and are highly capital intensive, DRI plants are more flexible. However, they require costly reducing agents such as natural gas or renewable hydrogen; most existing DRI plants still rely on fossil gas or coal.⁶¹ Since DRI is not inherently carbon-neutral, full decarbonisation requires hydrogen produced from renewable electricity. Studies suggest that hydrogen produced via electrolysis becomes climate-beneficial only when renewables supply at least around 70 per cent of the electricity mix; below that threshold, its emissions can exceed those of hydrogen produced via natural gas steam reforming.⁶²

While industry actors sometimes promote Carbon Capture and Storage (CCS) as an alternative solution, most assessments highlight cost and effectiveness limitations. Developed over more than half a century ago and largely driven by the oil and gas sector, CCS deployment in steel production remains marginal: according to 2024 data, only around 0.5 per cent of projected global CCS capacity over the next two decades is allocated to the steel sector.⁶³ From technical, economic, and climate perspectives, it is not currently considered a viable primary decarbonisation strategy for steel.⁶⁴



HYBRIT project in Luleå, Sweden.

GREEN HYDROGEN

EU hydrogen policy has been shaped by various industrial and energy interests, including the fossil fuel lobby, which views hydrogen and “hydrogen-ready” solutions as a means to preserve existing fossil infrastructure and assets.

Although the viability of green hydrogen across many sectors remains debated, experts generally agree that the steel sector can represent one of its most economically sensible applications.⁶⁵ For every tonne of renewable hydrogen used in steel production, approximately 25 tonnes of CO₂ emissions can be avoided — representing one of the highest emissions-reduction potentials among industrial sectors.⁶⁶

Steel production is also among the few sectors with limited alternative decarbonisation pathways.

However, most hydrogen today is made with fossil fuels, and less than 1 per cent can be considered low-carbon.⁶⁷ The EU's electrolysis capacities that can produce hydrogen with electricity from renewable sources stand at less than 0.5 per cent of the bloc's 2030 target.⁶⁸ As its production remains extremely limited, an industrial decarbonisation strategy requires alignment with overall hydrogen policies based on careful, democratic and realistic planning of how to develop and use it most efficiently and sustainably.⁶⁹



Climate activists campaigning at Tata Steel in the Netherlands.

Its development for sectors where scientific research suggests inefficient and uneconomic use, such as powering electric vehicles or heating for buildings, would come at the expense of where it is most needed.⁷⁰ This is particularly crucial as the oil refining sector represents one of the largest sources of current demand for low-carbon hydrogen.⁷¹ Yet, as a result of lobby influence, some governmental strategies and plans, such as those in Germany, include support for hydrogen use for cars or building heating.

Some of these plans are explicit about prioritising hydrogen support where there is an interest to pay for it — such as the refinery sector — leaving decisions to be driven by the profit motive rather than strategic planning.⁷²

To develop green hydrogen, a major constraint is the availability of sufficient, affordable, and sustainable renewable electricity. Currently, the EU steel industry consumes approximately 75 TWh (terrawatt-hours) of electricity annually.

Estimates suggest that by 2030, EU steel decarbonisation projects could require around 165 TWh of fossil-free electricity and more than 2 million tonnes of green hydrogen per year.⁷³ This would imply an additional electricity demand of roughly 90 TWh — more than Belgium's annual electricity consumption.⁷⁴

By 2050, electricity demand for steel decarbonisation could reach up to 400 TWh.⁷⁵ For comparison, Germany generated 257 TWh of electricity from renewable sources in 2025.⁷⁶

These projected needs far exceed realistic renewable hydrogen production capacity. Europe's green steel projects in preparation or under construction are expected to require roughly 0.9 Mt of hydrogen annually by 2030. They face delays and difficulties in scaling up production, and even if realised, this would decarbonise only about 24 per cent of primary steel production.⁷⁷

There is currently no large-scale operational electrolysis-based hydrogen capacity dedicated to steel production. The main projects under construction include Stegra and HYBRIT (Hydrogen Breakthrough Ironmaking Technology) in Sweden⁷⁸ and SALCOS (Salzgitter Low CO₂ Steelmaking) in Germany.

Besides the scale, the transition to climate-neutral steel production requires substantial capital investment. For crude steel production in Germany alone, approximately €30 billion in investments are estimated to be required by 2050.⁷⁹

Moreover, conventional steel production costs between €390 and €450 per tonne. Studies estimate that producing steel with green hydrogen would add approximately €280 per tonne in additional costs.⁸⁰ Actual costs are difficult to predict as they depend heavily on future green hydrogen prices, project costs and profit margins, which are likely to be reflected in market prices as well.⁸¹ Some calculations estimate that the price of green hydrogen for steel production would have to be around €2.13/kg to match the costs of the gas-based route — much below current numbers: in 2025, the prices for green hydrogen futures traded in Germany stood at around €9-10/kg.

In this, over 50 per cent of production costs are attributed to electricity.⁸²

THE HYDROGEN CHICKEN-AND-EGG PROBLEM

Steel producers face a structural dilemma. Conventional blast furnaces are expected to become increasingly uncompetitive in the 2030s due to emissions trading and regulatory measures.⁸³ The majority of steel production in Europe is ageing and investment decisions for renovations or retirement of blast furnaces are due, as they must undergo major overhauls roughly every 15 to 20 years — and these decisions may extend their lifespan by up to two decades.⁸⁴

However, investments in hydrogen-based production are difficult to justify if profitability cannot be secured. Simultaneously, large-scale investments in renewable hydrogen production face resource, technological and economic constraints due to high electricity costs and needs, weak demand, and high capital requirements. As long as green hydrogen remains a future promise, steel firms have limited incentives to commit to decarbonisation.

Unsurprisingly, fossil gas can therefore feature as a “transition” fuel in the DRI process. China’s steelmaker HBIS, for instance, has begun selling steel slabs to Italy made at its natural gas DRI plant, with reported 50 per cent lower carbon content — a level currently “almost impossible” to obtain in Europe due to a lacking offer.⁸⁵ However, such a pathway risks lock-in of polluting infrastructure if — as evidence suggests — renewable hydrogen cannot be produced in the near term, which can lead to stranded assets and high financial cost linked to carbon pricing.

Overall, this situation reflects a fundamental contradiction in green-capitalist transformation policy, which makes it poorly suited to support and establish new industrial sectors such as green steel and green hydrogen.

In response to such constraints in domestic renewable hydrogen production, the EU “plans” to meet approximately half of its hydrogen demand through imports, particularly from Global South countries — which, according to the European Court of Auditors, is unrealistic.^{86,87}

For example, facing limited land availability for mass renewables expansion, Germany’s hydrogen strategy anticipates that imports will cover up to 70 per cent of its hydrogen demand by 2030.⁸⁸ Such plans seem to ignore that hydrogen projects outside the EU also face serious scaling challenges and financial uncertainties. Civil society organisations criticise hydrogen import strategies for reinforcing neocolonial trade structures and creating negative environmental impacts in exporting countries — especially where electricity supply is already insufficient to meet domestic demand.⁸⁹



Blast furnace worker at EKO Stahl in Eisenhüttenstadt, Germany.

IMPORTS OF GREEN HYDROGEN FROM NAMIBIA

Namibia is a key country where renewable hydrogen plans are supported by countries such as Germany and Belgium. One of the main hydrogen and ammonia projects is led by Hyphen, a venture between the South African arm of the German company Enertrag and Nicholas Holdings, an offshore company registered in the British Virgin Islands.

The project is located within a national park territory, which is ancestral land of the Indigenous Nama people — an area that was restricted under German colonial rule and where access for the Nama people and the public remains limited.⁹⁰ It has raised concerns about negative impacts on biodiversity, as the plan foresees installing solar panels and wind turbines over an area reportedly close to the size of Berlin, Germany. Announced investments for the project amount to a sum comparable to Namibia's GDP in 2020. Local communities have complained about exclusion from consultations and a lack of transparency.⁹¹

At the same time, over 45 per cent of the Namibian population still lacks access to electricity, while reports suggest that Hyphen requires generation capacity oriented towards hydrogen exports that exceeds the country's peak electricity demand by more than ten times. Promises of local job creation also appear questionable, as most positions appear to be temporary or lower-skilled.

The project has struggled to secure firm financial commitments. German energy company RWE, which had initially signed on as an offtaker, withdrew citing low demand for hydrogen.^{92,93} In addition, local political support weakened, and a leading figure behind Namibia's hydrogen strategy resigned.⁹⁴ In this context, other hydrogen initiatives across the country have also faced delays and uncertain prospects.⁹⁵

This includes Hylron's Oshivela project to produce green iron using hydrogen made from renewables, which has been presented as the world's first plant to produce green iron with renewable hydrogen. The project is a collaboration between German and Namibian companies, with iron ore reduction technology supplied by a German firm.

Germany committed at least €13 million to the project, and the German metals company Benteler signed an offtake agreement for green iron.⁹⁶ While pilot-scale production has reportedly begun, limited information is accessible on the project's current production stage. The announced production target is 15,000 tonnes per year.⁹⁷

It also remains unclear whether Namibian green iron projects could become globally competitive. Countries such as Brazil and South Africa are reportedly better positioned to become frontrunners in what researchers have described as a "global race to produce the cheapest green iron." This is due to their access to large volumes of high-grade iron ore, substantial renewable energy potential, and relatively low labour costs. With low capital costs that can attract investment, Saudi Arabia and Australia are also considered potential frontrunners.⁹⁸

Green iron production could provide an opportunity for countries to develop industrial value chains with higher added value. However, securing low project costs is likely to be decisive for success — an additional "challenge" in a market already characterised by uncertainty and slow uptake of renewable hydrogen and green iron at commercial scale. Hydrogen and high-grade iron ore together account for more than half of H₂-DRI production costs, making them central to competitiveness.⁹⁹ These dynamics risks creating pressure to minimise labour, resource, and capital costs, which is not only difficult to secure, but is also a questionable path for economic development in line with social and environmental justice.

Moreover, the uncertain uptake of such projects highlights the risks of betting public funds and national development strategies on large-scale hydrogen and green iron projects. The Namibian government holds a 24 per cent equity stake in the Hyphen project and has reportedly committed an additional €40 million to derisk investments, likely alongside further spending on hydrogen-related infrastructure.¹⁰⁰

If such projects struggle or fail, this could pose major fiscal risks and increase public debt burdens.

EU POLICIES SHAPING THE STEEL TRANSITION

The importance of the steel industry as a fundamental component of industrial value chains in the EU has historically resulted in a high degree of state intervention. In recent years, national policies have largely relied on subsidy-based mechanisms to create favourable market conditions for profitability and private investment. This approach intensified following the influential report by Mario Draghi, which warned of Europe's industrial decline and called for urgent measures to strengthen its competitiveness.¹⁰¹

However, the convergence of structural overcapacity, weak demand, and the imperative for rapid decarbonisation creates conditions that this approach struggles to address.

A focus on short-term returns for private or semi-private companies conflicts with the long-term investment and planning horizon required for the steel industry's transformation towards climate neutrality.

EU leaders have, to some extent, acknowledged these tensions. With its Industrial Accelerator Act (IAA) launched in March 2026, the European Commission introduced a proposal with content criteria for specific strategic sectors benefiting from public subsidies.¹⁰² Some of its measures seem to mimic elements of China's industrial policy, characterised by stronger state involvement in guiding economic activity. These include conditions for certain foreign direct investment in strategic sectors, such as requirements for joint ventures or conditions encouraging technology transfer and know-how, or the creation of industrial clusters that can benefit from streamlined permitting, access to infrastructure and financing (similar to measures already introduced in the Net Zero Industry Act). The IAA also proposes EU origin and low-carbon requirements for some energy-intensive products. Contrary to earlier drafts, the steel sector only faces a 25 per cent threshold for low-carbon content in public procurement and schemes, and low-carbon labelling as well as EU origin requirements for steel products were dropped in the final text, reflecting lowered decarbonisation ambitions as well as the lack of capacity for green steel production.¹⁰³

While the Act (IAA) sets targets and conditions intended to promote competitive industrial activity — a novelty in the Commission's toolbox — it preserves short-term profitability and an enabling environment for business as the primary driver of industrial transformation.

In terms of steel, it does not adequately address the crises affecting the sector, such as high electricity costs or demand for green steel. For instance, industrial clusters are intended to provide information on energy demand and thereby help facilitate planning and anticipatory grid investments in these areas. This falls short of interventions capable of bringing down prices or committing to concrete investments in grid upgrading. In response to the IAA, EUROFER still called for affordable electricity prices, labelling, and EU origin requirements.¹⁰⁴ These demands are firmly seated within a market-corrective logic, asking the state to lower costs and raise barriers for competitors without engaging with deeper structural questions around long-term planning, investment in decarbonisation and the role of public actors.

Beyond the IAA, EU policy remains centred on the creation of lead markets for green products, derisking mechanisms to facilitate investment, deregulation through the reduction of administrative burdens for businesses, and proposals of options to lower energy prices. Additional measures include support for circularity, research and innovation, and assistance for workers in restructuring processes. This approach is reflected in initiatives such as the Clean Industrial Deal, the Net-Zero Industry Act, the Steel and Metals Action Plan, and the Affordable Energy Action Plan.

Alongside these initiatives, the EU has adopted a more assertive tariff policy, framed as necessary to ensure "effective protection to the EU's steel industry from global overcapacity." In October 2025, the Commission proposed a regulation to reduce steel import quotas by nearly half and to increase tariffs on imports exceeding those quotas to 50 per cent.¹⁰⁵

EU FUNDING FOR INDUSTRIAL TRANSFORMATION

By far the largest source of funding for steel decarbonisation remains national state aid. Between October 2022 and February 2025, the Commission approved nearly €9 billion for ten steel decarbonisation projects.¹⁰⁶ However, analysing all of those is beyond the scope of this paper. Instead, examining EU-level funding helps assess the options available at the supranational level, which is essential for the transition of the European steel sector as a whole.

A range of funding instruments support industrial transition. A particularly relevant instrument for assessing both the potential and limits of EU-level public planning is the Just Transition Fund (JTF). Adopted in 2021 under the European Green Deal and financed partly through the EU's common debt under the Recovery framework, the JTF allocates €19.7 billion to support regions most affected by the transition. Through grants, loans, and guarantees, it supports objectives such as economic diversification, worker reskilling, the creation of new companies, and low-carbon industry and infrastructure.¹⁰⁷ For instance, one beneficiary has been SSAB for its steel decarbonisation project in Sweden.¹⁰⁸

The JTF has been described as a “third generation” EU industrial policy instrument because it moves beyond purely market-oriented approaches and explicitly addresses the socio-economic impacts of transition. Funding is allocated based on territorial just transition plans, which should be developed with the participation of regional and local authorities, companies, trade unions, and civil society.¹⁰⁹

However, various reports suggest that the JTF's impact is constrained by weak administrative capacity in many regions, limiting its capacity to plan and implement centrally driven funding programmes within tight timelines and procedural requirements.^{110,111} Additional concerns include the fund's limited ability to address long-standing structural challenges, risks of misalignment with regional employment and economic needs, and the absence of coherent alternative development strategies.¹¹² Civil society organisations have also observed that in some Member States, funds disproportionately benefit large companies, potentially limiting economic diversification and reinforcing existing single-industrial models.¹¹³

In certain cases, decarbonisation targets in territorial plans have been misaligned with national targets.¹¹⁴

These issues point to insufficient political interest in strengthening regional public planning capacity across the EU to implement transformation strategies. Regionally embedded democratic planning structures are crucial for aligning central strategies with local needs, ensuring efficient and sustainable use of resources, drawing on local socio-economic knowledge, and guiding decarbonisation investments rather than leaving them primarily to short-term profitability calculations.



Steel workers gather in Brussels to protest against austerity measures of European institutions.

However, strengthening planning capacity alone will not resolve the inherent tension between public goals and the interests of private companies. In strategically and socio-economically important sectors such as steel, where investment needs are high and demand strategic long-term planning, public ownership can provide better alignment between decarbonisation goals and investment decisions than reliance on attracting private investment.

Apart from JTF, there are many other EU-level instruments that can support steel decarbonisation, such as Horizon Europe, which financed for instance the ZHyRON project to recycle steelmaking by-products using green hydrogen involving ArcelorMittal,¹¹⁵ or the Innovation Fund (financed through the Emissions Trading System (ETS) revenues), which has supported projects such as HYBRIT.¹¹⁶

In terms of project lending, the European Investment Bank (EIB) is the EU's primary public bank that can finance industrial modernisation projects.

However, direct financing for green steel projects has so far remained limited — one of the reasons for which could be the bank's risk aversion in lending. For example, the EIB committed a €300 million loan to Voestalpine for research and development in green steel production,¹¹⁷ and €314 million to Stegra's H2 Green Steel project, backed by a Commission guarantee under the H2InvestEU programme.¹¹⁸

Overall, such instruments reflect an approach that seeks to address market failures through financial incentives to firms rather than acknowledging the structural limitations of relying on profitability calculations to drive industrial investment decisions. The changes negotiated for the next EU financial framework for 2028-2034 will not alter this approach. Many of these funds are planned to be brought under one large European Competitiveness Fund, which aims to simplify access to funding and streamline it around clear objectives. There is also a risk that the new fund along with the EU's deregulation ambitions will further marginalise social and environmental criteria in public funding in exchange for promoting the competitiveness agenda benefitting large companies, without transparent and democratic decision-making.¹¹⁹



ArcelorMittal in the port of Ghent, Belgium.

ADDRESSING ELECTRICITY PRICES

EU energy policy is inherently linked to steel sector transformation. The sector currently needs around 75 TWh of electricity annually, with electricity costs accounting for approximately 17 per cent of steel production costs.¹²⁰ Companies identify high electricity prices as a key reason for cancelling investments in green steel projects, and the issue features prominently in current policy debates and proposals at the EU level.

In the steel sector, decarbonisation relies on the electrification of production through EAFs and the use of hydrogen in the H₂-DRI route. However, hydrogen production through electrolysis is highly electricity-intensive. Compared to international competitors — particularly in the US and China — the European steel industry claims to face two to three times higher electricity costs and roughly double overall energy expenditures. Dependence on electricity prices therefore makes the electricity market system a key determinant of steel decarbonisation.¹²¹

Instead of pursuing comprehensive reform of the electricity market, the Commission's response to high electricity prices and industry concerns has so far centred on attempts to reduce costs through derisking measures within the existing system.

For instance, one of the Commission's new initiatives under its 2025 Affordable Energy Action Plan is a "tripartite contract" for affordable energy. This mechanism entails additional derisking through facilitating regulations, improved access to EU funding, and match-making between industrial actors and renewable energy producers to encourage investment. Further proposals include promoting efforts to reduce network charges and taxation to lower prices, and encouraging investments in grids and interconnectors.

While some of such interventions may point in the right direction, they are not binding and leave the existing electricity market structure intact. EUROFER argues that such measures fall short of the structural solutions needed to significantly lower electricity prices and fully exploit the benefits of renewables in the EU energy mix. It has called for the "true attainment of decoupling fossil-fuel prices from electricity prices."^{122,123} Responding to such demands from industrial and in light of the US-Israel war on Iran that began in February 2026, EU leaders have reopened discussions on reforming the electricity market. However, Member States clash in their demands, with many defending the current electricity market system.¹²⁴

Today's electricity market is built on a pricing system that links electricity prices to gas — the marginal and often most expensive source required to meet demand. This system was originally designed to ensure security of supply and promote competition. It emerged in the context of the neoliberal privatisation and liberalisation of Europe's electricity market from the 1970s onwards, which fragmented often publicly owned utilities into separate generation and transmission entities.¹²⁵

However, this market design does not function effectively in a power system increasingly dominated by renewables. Once constructed, wind and solar installations have near-zero production costs. When they generate large volumes — for example during periods of high wind or strong sunlight — market prices decline significantly and can even turn negative. Renewable producers experience declining revenues as prices fall — a dynamic known as the “cannibalisation effect,” under which expanding renewable capacity reduces its own market value. Gas-linked pricing helps secure revenue streams for renewable investors, but it limits the ability to fully benefit from cheap renewable generation — and still fails to guarantee sufficiently attractive profits to drive large-scale investment.¹²⁶

Under this system, even revenue-stabilising mechanisms such as long-term Power Purchase Agreements (PPAs) or Contracts for Difference (CfDs) do not resolve the underlying structural issue.¹²⁷ They are based on agreed average prices over time reflecting the market, yet renewable production occurs precisely when electricity is abundant and prices are low. Buyers may therefore resist paying prices that satisfy producers, leading to investment delays — as illustrated, for example, by the case of negotiations between LKAB and Vattenfall in Sweden.¹²⁸ The result is a system that relies primarily on expected profit margins to drive investment, which has proven insufficient to deliver the scale and speed of renewable capacity expansion required by Europe's climate and industrial objectives.

As delays in steel decarbonisation projects demonstrate, relying predominantly on market signals (and limited policy interventions) is falling short of an effective strategy. While renewed discussions on electricity market reform represent a welcome step, debates about the role of public ownership in the energy sector still remain largely absent at the EU level. Growing research shows that publicly owned electricity systems are more cost-effective and better positioned to invest according to system-wide needs rather than project-specific profitability.¹²⁹ As it becomes increasingly evident that the

current crisis requires transformative changes beyond fixing the status quo, there is a crucial opportunity to highlight the advantages of a democratic and decommodified electricity system and public ownership of energy as a public good.

SWEDEN'S HYBRIT PROJECT

Launched in 2016, HYBRIT (Hydrogen Breakthrough Ironmaking Technology) is a joint venture between SSAB, Sweden's largest steel producer and CO₂ emitter,¹³⁰ and two state-owned companies: LKAB (mining) and Vattenfall (electricity). SSAB is a publicly traded private company. Its largest shareholder is LKAB (responsible for around 80 per cent of EU iron ore production),¹³¹ with further shareholders including the Government of Finland, as well as Vanguard and BlackRock.¹³²

The HYBRIT project aims to produce steel made with fossil-free iron by using renewables-based hydrogen and decarbonised value chains, thanks to the access to northern Sweden's renewable electricity capacity, generated primarily from hydropower and wind.¹³³ SSAB plans to replace its blast furnaces in Sweden and one in Finland with EAFs and sponge iron conversion processes, while LKAB would produce hydrogen and direct reduced iron for SSAB.¹³⁴ For this purpose, LKAB's objective is to transition from its usual activities to sponge iron production, which they claim could result in emissions reductions making up two-thirds of Sweden's total.¹³⁵ The project was designated as strategic by the European Commission under its Critical Raw Materials Act.

In addition, LKAB's industrial park under construction in Luleå will include a demonstration plant for extracting and processing phosphorus and rare earth elements.¹³⁶ This would be Europe's first such site at scale, located in the region with the largest known deposit of rare earth elements in Europe. LKAB plans to exploit the newly discovered rare earths deposits in Kiruna, which has been opposed by the indigenous Sámi people, the only indigenous people recognized in Europe. For them, LKAB's mining seriously obstructs their reindeer herding and violates rights to exercise their culture in the area.^{137,138}

In 2021, HYBRIT produced the world's first hydrogen-reduced sponge iron at a pilot scale.¹³⁹ According to Vattenfall, the Luleå pilot plant already produced over 5,000 tonnes of hydrogen-reduced sponge iron.¹⁴⁰ This stage is to be followed by a larger demonstration plant in Gällivare, which would cost at least €2.7 billion (SEK 31 billion) and demand electricity corresponding to an increase in Sweden's total electricity consumption by almost four per cent.¹⁴¹

While HYBRIT demonstrates that the H₂-DRI-EAF steelmaking method is technically feasible, the project remains commercially uncertain and faces challenges. In April 2025, the Swedish National Audit Office verified whether LKAB's transition to iron ore production was undertaken in a "commercially reasonable manner" and concluded that LKAB had prioritised technological development and profitability considerations before making an investment decision. Notably, it also noted that LKAB lowered its profitability targets, while the government appears to have had a limited role in the overall transition. According to the report, LKAB's demonstration plant remains in the planning stage and the profitability of the investment is "far from certain."¹⁴²

Although the project's location is favourable due to access to relatively cheap renewable electricity, electricity supply has been at the core of HYBRIT's challenges and has required expansion of Sweden's power network and generation capacity.¹⁴³ In 2024, LKAB updated its projected annual electricity needs to around 27 TWh.¹⁴⁴ Sweden's annual electricity consumption stood at approximately 175 TWh, while other emerging clean industries in the region are also competing for renewable electricity.¹⁴⁵ This scale of electricity demand shifts projects like HYBRIT from a "simple" industrial innovation project to a major infrastructure challenge, linking steel decarbonisation directly to electricity market design and energy policy.

LKAB has sought a long-term electricity supply agreement with Vattenfall, but the two parties have struggled to agree on pricing terms. Vattenfall requires a price agreement before committing to the construction of new onshore wind farms.¹⁴⁶

According to Vattenfall, projected electricity demand in the region — including from other industrial actors such as Stegra and its green steel project — would exceed local hydropower capacity and require expansion of wind energy, leading to higher prices.¹⁴⁷ Such disagreements risk delaying investment decisions, which depend on financial profitability that is often difficult to achieve under the current electricity market system.¹⁴⁸

In the meantime, LKAB signed a cooperation agreement with Statkraft, a Norwegian state-owned company and Europe's largest renewable energy producer, to secure electricity from a future wind park. However, this project is also still awaiting permit approval.¹⁴⁹ Electricity supply constraints are also expected to be partially alleviated by the Aurora Line, a 380-kilometre interconnector between Finland and Sweden currently under construction.¹⁵⁰

SSAB's plans for an electric steel mill in Luleå have also been delayed until the end of 2029, following Vattenfall's announcement of delays in reinforcing the transmission grid.¹⁵¹ Some experts have warned that SSAB may struggle to absorb the total cost of the project, which could exceed the company's balance sheet, particularly given uncertain returns, weak steel demand in Europe, and strong global competition.¹⁵²

This case illustrates how the current electricity market system and profit-oriented investment decisions may hinder necessary green transition investments and long-term planning — even in a country with one of the highest shares of renewable electricity in the EU.¹⁵³ In this context, a Swedish governmental commission also announced in December 2024 that it does not consider offshore wind projects in Swedish waters to be commercially viable (instead favouring nuclear power construction), despite projections that Sweden will need to double its electricity production over the next 20 years.^{154,155} This reveals a structural contradiction between the market-based electricity system and commercial decarbonisation projects that require long-term planning and coordinated infrastructure expansion.

CBAM AND THE ETS

One of the main policies the EU has proposed to address high costs in the steel industry is the Carbon Border Adjustment Mechanism (CBAM), which puts a price on carbon emissions of selected products made outside the EU, where carbon is not accounted for or costs less. Its objective is to prevent carbon leakage — the relocation of carbon-intensive production outside the EU — and to incentivise steel decarbonisation inside the EU.

CBAM is set to align the price of imports in selected sectors with domestic products, reflecting the carbon price faced by EU producers. Under this mechanism, EU importers buy carbon certificates corresponding to that price and can deduct the carbon price paid by the producer in a third country if there is a carbon pricing scheme in place abroad. So far, it covers upstream goods and is expected to be extended to certain downstream products, such as semi-finished or finished goods like car doors or washing machines.¹⁵⁶ It is the first mechanism on this scale in the world, although other carbon trading schemes exist and are emerging.¹⁵⁷



Former Ilva workers protest in the city center of Genoa, Italy.

Its effectiveness is intrinsically linked to the functioning and limitations of the EU's Emissions Trading System (ETS). Introduced in 2005, the ETS created a market for greenhouse gas emissions in electricity and heat, industrial manufacturing, maritime transport and aviation — around 40 per cent of total EU emissions. ETS 2 is also planned to be rolled out from 2028, extended to buildings, industrial heating and road transport sectors.¹⁵⁸

The ETS approaches decarbonisation with a market-based mechanism, relying on price signals rather than regulation to incentivise operators to reduce emissions by including the cost of carbon in their cost-effectiveness assessments. It operates on a cap-and-trade system, with a limit set on total emissions that installations and operators in selected sectors are allowed to emit. This limit corresponds to emissions allowances, which are then sold in auction or freely allocated to operators. The total number of allowances is gradually reduced to align with the EU's climate targets, with the cap currently set to reach zero around 2039.¹⁵⁹

Around 90 per cent of revenues from ETS auctions flow back to Member States for green transition investments and measures to address social impacts, while the remainder goes to EU funding schemes such as the Innovation Fund, Modernisation Fund, Recovery and Resilience Facility, and the Social Climate Fund to mitigate the impacts of the extended ETS.¹⁶⁰ Germany, Poland, Spain and Italy account for approximately 60 per cent of ETS auction revenues.¹⁶¹ According to the Commission's President Ursula von der Leyen, only 5 per cent of ETS revenues are spent on industrial decarbonisation.¹⁶²

The ETS faces major limitations. The European Court of Auditors concluded that it is difficult to assess its real impact due to external factors that have also contributed to emissions reductions, such as the 2009 financial crisis and the COVID-19 pandemic.¹⁶³ Moreover, emissions in the aviation sector and in over a third of EU Member States rose in 2024. According to the European Environment Agency, projections fall short of the EU's target of reducing ETS-sector emissions by 62 per cent by 2030.¹⁶⁴

A core issue often flagged with the ETS is that most energy-intensive industries have been receiving excessive free allowances due to a system that allocates more allowances than companies actually need.¹⁶⁵ In 2023, iron and steel companies (ArcelorMittal, Tata Steel and Liberty Steel Group) had the highest surplus of free allowances, which they can sell and generate profits from instead of reinvesting in emissions reductions.¹⁶⁶

While the allocation of free allowances was intended as a transitional measure, the EU steel sector's emission intensity has barely changed in nearly two decades.¹⁶⁷

Moreover, oversupply and demand fluctuations raise questions about the ability of mechanisms like the ETS to drive the necessary decarbonisation investments.¹⁶⁸

CBAM aims to complement the gradual phase-out of free allowances between 2026 and 2034. From January 2026, large importers will face CBAM-related carbon costs in addition to fulfilling reporting obligations. Its initial scope covers cement, iron and steel, aluminium, fertilisers, electricity and hydrogen.¹⁶⁹ In this way, the higher price of carbon-intensive imports is expected to strengthen the competitiveness of EU producers.

However, many questions about CBAM's implementation remain.¹⁷⁰ Steelmakers such as ThyssenKrupp and ArcelorMittal, who initially supported CBAM, are now critical of its loopholes and uncertain outcomes in light of the phase-out of free allowances — the very core of the mechanism's rationale.¹⁷¹

Estimates show that from 2030 onwards, EU carbon costs combined with the phase-out of free allowances could make the BF-BOF route non-competitive.¹⁷² ThyssenKrupp has called for free allowances to be extended beyond 2040 and for adjustments to the ETS to avoid deindustrialisation, proposing that the zero cap be moved from 2039 to 2050 as a more realistic timeline.^{173,174}

Tensions across the EU emerge: in March 2026 ten member states called for slowing down the phase-out beyond the agreed 2034 cut-off, while other states defend the system.¹⁷⁵



The Tata Steel steelworks and iron works in IJmuiden Velsen, the Netherlands.

CBAM has also come under criticism across the Global South, including in India, China, Turkey, South Africa, Vietnam and Indonesia.¹⁷⁶ Oxfam criticised it for unfairly shifting the financial burden onto the poorest countries, while Europe's carbon emissions remain roughly double those of the poorest half of countries globally.¹⁷⁷ At the same time, revenues from CBAM should go to the EU budget and are estimated to generate between €1.4 and 2.1 billion annually.^{178,179} At COP30 in Brazil, tensions intensified as countries — especially BRICS members — view CBAM as a unilateral and protectionist trade measure, whereas the EU strongly defends it as a climate policy instrument.¹⁸⁰

At least 18 countries agreed at COP30 to enhance coordination on carbon pricing to avoid CBAM-related fees.¹⁸¹ For instance, in Latin America, only Mexico, Colombia and Chile currently have a carbon tax on industrial emissions, while Brazil plans to introduce one by 2030.^{182,183} According to some calculations, Africa risks losing an estimated \$ 25 billion annually as a consequence of CBAM, including due to limited technological capacity for industrial decarbonisation.¹⁸⁴

**THE WAY FORWARD:
PUBLIC OWNERSHIP
AND PLANNING**

SOCIALISING THE STEEL SECTOR

Current EU and national policies largely fail to address the structural challenges of the sector's dual crisis — the impacts of overcapacity and the difficulties in decarbonising steel production — which are marked by delays and cancellations of green steel projects, largely due to profitability considerations and market-driven decision-making.

To address this dual crisis, a fundamentally different approach is required — one that prioritises securing Europe's industrial future while achieving rapid decarbonisation. An alternative industrial strategy for the steel sector placing public ownership and ecological planning at the centre can be better suited to address the root causes of these transformation challenges.

ADDRESSING STRUCTURAL CONTRADICTIONS

The strategic and economic significance of steel production has meant that there has never truly been a truly free steel market. The sector has a history of public ownership, nationalisation, state-organised cartels and state-market complexes, forming part of economically and socially critical infrastructure. However, its privatisation and a set of neoliberal market reforms to support free competition at the expense of public role has plunged the sector into an ever-deeper crisis, exacerbated by the urgency of decarbonisation. Private and mixed-ownership companies — which constitute most of all steel companies in Europe — are subject to short-term profit imperatives and employer's interests, but industrial decarbonisation requires long-term and comprehensive planning horizons across much broader value chains.

Public ownership can resolve this contradiction by liberating the transformation challenge from the profit motive. With strong union membership and close ties between regions and municipalities in proximity to large steelworks, the sector provides a good starting point for expanding democratic ownership and decision-making.¹⁸⁵ Combined with policies such as demand stabilisation and public planning for essential infrastructure and value chains, a socialised steel pathway can draw inspiration from the German legal context. A possible definition of socialisation that captures this concept can be articulated along three pillars:

- Transforming ownership structures from private property to forms of collective or common ownership, for instance through expropriation or nationalisation.
- Shifting governance structures from reliance on private authority or unilateral state control towards democratic, participatory forms of decision-making.
- Reorienting economic objectives from profit maximisation and capital-market priorities towards needs-based activity and the pursuit of the common good.

This strategy proposes a form of public ownership that can break with the profit-driven pathway and guide the future of European industry towards meeting real demand in a decarbonised production system. In this context, six central advantages of public ownership emerge as particularly relevant for addressing the steel crisis:

1. Directing investment and increasing stability:

In the context of the current overcapacity and decarbonisation challenge, public ownership would enable the steel sector to prioritise structural, technical and economic challenges over short-term profitability. This is particularly relevant for the large-scale steel production, renewable electricity and hydrogen capacities required for decarbonisation.

From a macroeconomic perspective, removing profitability from the driver's seat would allow industrial policy to build a European green steel industry with sustainable production levels in the long run, appropriate to local demand. In the short term, this would also allow weighing the social and fiscal costs of site closures — such as unemployment and regional economic decline — against short-term firm-level savings.

On the long-term road to sustainable levels of production, public ownership can also address demand downturns. Publicly owned steel companies can accept temporarily higher unit costs and maintain production sites as part of targeted regional industrial plans, even where this is not immediately optimal from a narrow business standpoint. This creates the space needed to implement and build support for long-term transformation.

2. Enabling long-term planning for societal needs:

Public ownership of the steel sector can direct production towards long-term societal needs and provide stable and long term perspectives for future development, thereby also addressing problems of demand uncertainty. In this context, effective use of public procurement that can generate stable and societally beneficial demand would require a break with harmful austerity policies.

There is an ongoing debate about the quantity of steel required in a socially and ecologically sustainable economy, with some arguing that production needs to not only be decarbonised but also downscaled in the future. This rings even more true in the context of neocolonial continuities in the EU's green hydrogen procurement from Global South countries. A future economy that prioritises public goods over unsustainable private consumption or militarisation — for example public transport instead of luxury private vehicles and “net-zero” military equipment, or durable products instead of short-lived goods — would align steel production with societal needs such as wind farms, infrastructure modernisation, railways, or housing.

Long-term demand planning is crucial because modern integrated steel plants cannot easily reduce output in response to price fluctuations. Blast furnaces, in particular, require continuous operation and cannot be flexibly shut down without significant technical and economic risks.

Securing long-term demand at sustainable levels through publicly guided social and ecological investments would reduce uncertainty, stabilise investment conditions, and strengthen low-carbon steel demand.



A worker at ThyssenKrupp's Duisburg site, Germany.

3. Cross-sectoral coordination and planning:

Transforming the steel sector under public ownership requires coordinated planning of the energy system. A public electricity system can address a central bottleneck in energy-intensive steel production: reliable access to affordable renewable electricity and hydrogen. Rather than reflecting real production costs, the current electricity market primarily rewards investors and shareholders while limiting renewable expansion. The increasing use of long-term price agreements outside the market (such as PPAs) demonstrates that the market-based system is insufficient for managing the scale of the transformation.

Publicly owned and democratically governed utilities could support renewable expansion more effectively by carrying out investment in line with climate goals. A publicly owned energy sector could also decommodify electricity, eliminate excess profits and democratically decide on pricing, thereby enabling targeted industrial policy as well as lower consumer prices.

Renewable hydrogen has also failed to scale up due to high capital and resource requirements, cost structures, and profitability constraints. Its development must therefore be decommodified and planned in a sustainable and realistic manner, prioritising where it is most promising and necessary through public planning mechanisms that reflect the interdependence of the energy and steel sectors.

A public electricity system would help stabilise cost structures for steel production and ensure that hydrogen deployment is aligned with industrial priorities rather than driven primarily by the fossil fuel lobby. It would also allow for carefully planned and realistic allocation of hydrogen to sectors where it is indispensable, such as steel, rather than to areas where better solutions exist.

4. Using public funds efficiently:

Public ownership also improves how public money is used in the transformation of the steel sector. Decarbonising European steel production will require hundreds of billions of euros, with substantial investments needed before 2030 to avoid locking in fossil-based infrastructure. All political actors acknowledge that this can only work with public support.

Financial markets impose risk premiums to compensate for uncertainty, increasing borrowing costs. Public bodies can access capital at significantly lower costs, reducing overall investment expenditure and improving long-term planning stability. Instead of funneling money into shareholder payouts, public owners can also reinvest surpluses directly into decarbonisation. Moreover, instead of competition, public ownership would allow for cooperation and coordination among steel producers at the national as well as EU levels.



Workers on a railway bridge construction site, North Rhine-Westphalia, Germany.

5. Securing just transition and employment:

Publicly owned steel industries are better positioned to ensure a just transition. Through public planning, abrupt plant closures and mass layoffs can be avoided, and employment can be safeguarded through structured retraining and skill development aligned with regional economic needs. Workers in public and democratised enterprises can shape the direction of transformation, rather than just reacting to decisions taken elsewhere. When short-term profit is no longer the main decision-making principle, measures such as reduced working time can be introduced to help share work and mitigate the social impacts of restructuring.

Public authorities can also facilitate alternative industrial activities that generate demand for green steel, moving beyond attempts to preserve the status quo through decarbonisation. For example, upgrading and expanding decarbonised public mobility systems (such as buses, trams, and rail infrastructure) can significantly shift domestic steel demand.

Such a public-oriented economy can integrate ecological transformation with employment creation. For instance, studies show over 350,000 jobs could be created in Germany alone with an ambitious mobility transition.¹⁸⁶

6. Investing in industrial and socio-economic resilience:

Finally, public ownership in the European steel industry represents a long-term investment in critical infrastructure for a resilient economy. In times of increasing geopolitical tension, local steel production becomes strategically important as it is a core input in economic activity.

Relocation or loss of European green steel production capacity could result in large-scale job losses and ruptures in regional socio-economic fabrics, potentially reinforcing political instability and strengthening far-right narratives that exploit deindustrialisation.¹⁸⁷ Public ownership of the sector can guide investment decisions based on those factors outside of short-term profitability considerations.

LEGAL PATH TO PUBLIC OWNERSHIP

There are a number of ways to increase the share of public ownership and public direct investment in the steel industry, and depending on the national legal framework, different approaches present distinct advantages and disadvantages. German constitutional law provides an interesting and unique legal framework that can offer guidance for ambitious socialist transformation strategies beyond the German debate: the political structures established in the socialisation article of the German Basic Law can also be achieved through a combination of other legal instruments.

Article 15 Grundgesetz (German constitution):

„Land, natural resources, and means of production may, for the purpose of socialisation, be transferred into common ownership or other forms of public enterprise by a law that determines the nature and extent of compensation. [...]“

Article 15 of the German Basic Law provides a constitutional basis for the socialisation of crucial economic infrastructure, thereby enabling the legislature to transfer relevant economic sectors into public ownership or other forms of collective governance. This provision reflects the historical influence of the workers' movement and the closely associated socialist and social-democratic traditions. While compensation to previous owners takes place, under current constitutional interpretation it can be below market value.¹⁸⁸ This provides the public with considerably greater financial scope for transformations than would be possible under a conventional nationalisation through buy-back, bailout, or compulsory state administration.

In Germany, the Left Party (Die LINKE) is calling for extensive public participation or nationalisation of steel companies, and individual party sections in steel-producing regions have advanced far-reaching proposals, which include full socialisation of the steel industry. The party's Co-Leader Ines Schwerdtner has emphasised both the urgency of combating deindustrialisation and the broader vision of socially owned industrial structures. The party now seeks to strengthen its focus on organising workers in industrial centers. In November 2025, the parliamentary group of Die LINKE convened a major steel policy conference in Duisburg, a central site of the German steel industry and of the historical labour movement, engaging leading works council

representatives, as well as workers from the local steel sector, where public ownership and socialisation were debated as policy alternatives.

Within the trade unions, and in the largest union IG Metall, public ownership is being increasingly discussed, especially with regards to so-called natural monopolies such as power transmission networks. However, public ownership of industries is not yet part of the unions' policy platform. Industrial policy concepts of the major unions still revolve around reducing international competition and subsidising steel firms through energy price caps and direct subsidies. Yet, due to the current crisis, a debate is opening up around more structural solutions. In the "pre-neoliberal" era, public ownership and socialisation had been key demands of the unions, and IG Metall's statutes still state the "transfer of key industries and other market- and economy-dominating enterprises into public ownership" as one of the 13 main goals of the union.¹⁸⁹

At the European level, ambitious models of public ownership, such as socialisation, are legally feasible under European law. Article 345 of the Treaty on the Functioning of the European Union (TFEU) states that the treaties "shall in no way prejudice the rules in Member States governing the system of property ownership." It preserves the property regimes of Member States, and European primary law does not, in theory, preclude socialisation at the national level.

EU competition rules can obstruct the creation of state monopolies. Yet, Article 106 of TFEU deals with the so-called services of general economic interest, which provide public goods that could not be delivered without state support — such as water and electricity distribution, post or transportation. In principle, they can be exempt from competition rules when they would prevent them from delivering such services.¹⁹⁰ Of course, achieving this vision would undoubtedly meet challenges stemming from European laws mandating competition and the political composition of institutions interpreting them. At the same time, many exemptions already exist in terms of intervention in free competition and other EU rules (such as price caps or easing debt rules).¹⁹¹ This highlights the space to explore political and legal avenues of publicly owned industry and electricity systems outside of pure market logic.

PUBLIC COORDINATION OF INDUSTRIAL POLICY

As the steel sector plays a key role in shaping regional and local economies, decarbonisation policies require a broader public planning approach that reflects this reality. Guidance in this regard can be drawn from trade union demands as well as from experiences with state-led industrial planning in countries such as China and Brazil.

UNIONS AND INDUSTRY FOR PUBLIC GOOD

According to CGT Métallurgie, a French steelworkers' union, there is "no industry without public service and no public service without industry."¹⁹² Both the CGT and a report of the French National Assembly calling for the nationalisation of ArcelorMittal in France emphasise the strategic nature of steel production, which underpins sectors that directly affect people's lives, such as housing, transport (including rail and automotive), and the ecological transition.^{193,194}

Hillal Sor of the Belgian metalworkers' union MWB-FGTB similarly argues that the market alone cannot decide what is produced, how much, and how. According to Sor, European austerity policies and treaties constitute a key obstacle to moving towards a "social Europe" through increased investment in public services and social protection.¹⁹⁵ He also stresses that MWB-FGTB seeks to move away from technocratic discourse in industrial policy debates and instead emphasise the social and class importance of industry.¹⁹⁶ The FGTB has proposed an industrial policy that supports sectors with high social and economic added value, which could be implemented through policies such as public control over land, conditionality in public funding for companies, investment in public transport, and sustainable and locally rooted economic development which can provide sufficient employment and link complementary activities across different sectors.^{197,198}

In the rail sector, a coalition including the German Steel Federation (VW Stahl) and several non-profit organisations called in December 2025 for the use of low-carbon steel in railway infrastructure modernisation to support domestic economy and climate goals, including through public funding.¹⁹⁹ IndustriAll Europe has similarly called for the steel sector to be recognised as strategic within the EU industrial strategy, arguing that it is currently marginalised in favour of a narrow focus on net-zero technologies rather than sectors that deliver public benefits, such as rail. The union has also

demanded exemptions for green public investments in rail from EU fiscal rules.²⁰⁰

In the United States, the United Automobile Workers (UAW) have outlined a vision for a green industrial policy centred on public projects and expanding clean energy industries in California through union labour. The UAW proposes creation of state "enabling institutions" which can facilitate the expansion of zero-emission vehicles and low-carbon technologies, coordinate between private and public institutions, and carry out research.²⁰¹

THE ROLE OF GOVERNMENTS IN INDUSTRIAL POLICY

The experience of China offers further policy lessons. This has increasingly been recognised by the European Commission, which has recently proposed measures resembling earlier Chinese policies, such as mandating joint ventures to facilitate technology transfer and introducing manufacturing clusters.

China's emergence as a leader in clean technology has been driven by several factors, notably its ability to articulate long-term strategic visions and translate them into regional and local policy planning. Research on Chinese industrial policy between 2002 and 2022 shows that local governments were responsible for approximately 80 per cent of industrial policy initiatives.²⁰² The state plays a key role in guiding the production of goods and services, including supporting the private sector while steering it towards strategic priorities. Initiatives such as the Made in China 2025 (MIC2025) strategy combine financial support with a broader range of policy tools.²⁰³ However, research also indicates that additional financial support under MIC2025 produced limited gains in productivity and innovation, suggesting that funding alone does not necessarily generate outcomes that firms would not otherwise achieve.²⁰⁴ Further challenges arise from cross-regional coordination problems and risks of duplication across provinces — structural issues that also characterise the EU.²⁰⁵

China's industrial policy tools extend far beyond subsidies. They include public procurement, localisation requirements, restrictions on foreign enterprises, preferential loans, national investment funds, land-use discounts, labour support, and research and development.²⁰⁶

A central feature is cluster-based manufacturing, which aims to strengthen local supply chains by encouraging firms in related industries to cluster together and source from local suppliers. Notably, the emergence of clusters in China was not driven by market prices but by a response to restrictions that were in place on private enterprise at the time. The state assumed a coordinating role to reduce obstacles, such as land-use restrictions and limited access to finance, initially embedding firms within public ownership structures. Following the relaxation of private ownership rules in the late 1990s, many of these enterprises were subsequently privatised.²⁰⁷ Today, these clusters connect specialised smaller firms responsible for specific production segments and integrate them into final production networks. Research suggests that this approach improves productivity and resource allocation efficiency, as firms benefit from shared financial, technological, and labour inputs.²⁰⁸



A worker at the ThyssenKrupp Steel plant in Duisburg, Germany.

Additional policy initiatives have also supported industrial growth. In the electric vehicle sector, China introduced transport electrification pilot programmes focused on public services, including buses, sanitation and postal vehicles, before expanding to private cars. These programmes aligned with broader government goals to reduce pollution.

The rapid growth of China's electric vehicle market can therefore be attributed to a broad range of local and national policies over time, including pilot projects and experimentation, concrete electrification targets in selected cities and restrictions on conventional vehicle registrations.²⁰⁹ It is within this policy environment that companies such as CATL emerged as global leaders.²¹⁰

Some of these mechanisms in China's industrial policy — long-term strategic planning, active involvement of local and regional public authorities, strategic use of public procurement, pilot projects, and clustering rooted in local supply chains — illustrate options that could inform European industrial policy design. Here, the EU can benefit from its existing funding and policy instruments to implement coordinated strategies under the socialised ownership approach involving local and regional governments, unions and civil society.

Brazil under President Luiz Inácio Lula da Silva adopted a missions-oriented industrial policy in 2024 that links industrial development to socially relevant objectives. Inspired by the work of economist Mariana Mazzucato, the policy defines six "missions" focused on goals such as urban well-being, public health, and the energy transition, which are intended to guide investment in Brazil's industrialisation and national development. For instance, one target is to increase domestic production of sustainable public transport, such as electric buses and metro rail, by 25 per cent. While the policy is set within a neoliberal framework and it is still early to evaluate its potential, the policy can provide a useful example of a strategy underpinned by public finance and public ownership mechanisms to support sectors considered strategic for long-term development.²¹¹

Overall, these international examples can provide reference points for developing a European strategy grounded in public ownership of the steel industry, complemented by a public and decommodified energy sector and the public planning capacity needed to address the sector's dual crisis. As stated by Mario Draghi, a central figure in shaping the EU's current industrial policy, Europe must become a "genuine federation" to avoid deindustrialisation.²¹²

A pan-European approach is particularly crucial for steel, given its strategic role and the scale of resources required for decarbonisation. The magnitude of the challenges facing the sector underscores the urgency of working towards a truly democratic EU and its institutions capable of prioritising public interest over corporate profit.

CONCLUSION

The European steel industry is caught in a dual crisis that current policy frameworks are ill-equipped to resolve. On one hand, structural overcapacity and domestic demand below production capacities threaten the business case for steelmaking in Europe. On the other hand, the urgent need to decarbonise the sector requires massive long-term investments in new production technologies that are hard to scale up and remain commercially unattractive.

Despite billions of euros in public subsidies, decarbonisation is struggling to advance within the existing market framework. The most advanced project examined in this paper — Sweden's HYBRIT — illustrates these limits. Even with favourable conditions, including access to renewable electricity and the participation of state-owned partners, the project faces difficulties scaling up under the prevailing market system, where investment decisions are ultimately governed by profitability requirements.

Steel producers therefore face a structural dilemma. Conventional blast furnaces are expected to become uncompetitive in the 2030s, yet much of Europe's production capacity is ageing and requires investment decisions that will shape the sector for decades. Companies remain reluctant to commit to costly decarbonisation without near-term profits — especially amid excess capacity and uncertainty over the renewable hydrogen needed for decarbonisation of primary steelmaking. Green hydrogen production today is still extremely limited, and most hydrogen is produced from fossil fuels. In such an environment, a transition towards green steel appears incompatible with the short-term return expectations persistent in steel and energy sectors.

The contradictions of the current EU approach call for a different industrial strategy. This paper explores an alternative path based on socialised ownership and industrial planning, which can free investment decisions from short-term profit imperatives and enable progress in industrial decarbonisation. Such a strategy would allow the prioritisation of the technical challenges of the transition, a coordinated phase-out of fossil-fuel-based production and capacity, and the strategic development of renewable hydrogen where it is most viable, sustainable, and aligned with regional socio-economic objectives.

Under this strategy, steel production can be oriented towards long-term societal needs, which should guide public procurement and create stable demand for green steel in sectors where it is indispensable — such as housing, wind turbines, and public transport — while generating substantial employment and strengthening Europe's industrial base. This can also help align European steel production capacity with demand in a low-carbon economy.

Bringing the steel sector into public hands would enable access to loans at significantly lower costs, and free up funds for productive long-term investment in decarbonisation instead of feeding the dividends of asset managers like BlackRock or Vanguard.

Socialised ownership would also allow the transition to be managed in a socially responsible way — avoiding abrupt plant closures, safeguarding workers, and integrating regional economic realities into industrial planning. This can help secure strong and resilient local economies, better shielded against supply chain shocks in an era of deepening geopolitical instability, and prevent deindustrialisation.

Achieving such a transformation would require a parallel transition towards a public and decommodified electricity system capable of scaling renewable energy and enabling well-informed long-term planning for energy-intensive sectors such as steel and hydrogen.

The crisis facing the steel industry is therefore not a temporary downturn but the expression of a deeper incompatibility between the profit-driven organisation of a strategic sector and the social, ecological, and economic imperatives of the transition. As the investment decisions that will shape the future of European steel are still largely ahead, the window for this transformation remains open. Europe's choice is ultimately not between minor market reforms and public ownership. It is between risking the erosion of its industrial base under private control, and a coordinated strategy that places steel production in public hands, aligns it with workers' interests and planetary boundaries, and lays the foundations for a resilient, decarbonised economy.

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