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CAN Europe's transformation pathway recommendations for the steel industry

Climate Action Network (CAN) Europe is Europe's leading NGO coalition fighting dangerous climate change. With over 185 member organisations from 38 European countries, representing over 1.700 NGOs and more than 47 million citizens, CAN Europe promotes sustainable climate, energy and development policies throughout Europe.

Executive Summary

Steelmaking is one of the industrial processes that generates the highest amount of CO2 emissions in the EU, primarily due to its use of coking coal as a reactant and fuel. Accounting for 5.7% of the bloc's total greenhouse gas (GHG) emissions, driving down the emissions of this energy-intensive sector is a priority.

The main goal of this briefing is to address the need for a **comprehensive transformation** of the steel industry, to address several social and environmental crises, to avoid a worsening situation and to contribute to a restorative and regenerative approach for the EU and with the aim of supporting improvements at a global level.

Our recommendations for such a pathway feature four main headlines:

- **Prioritise circular steelmaking for a less resource-intensive industry**

A systemic, value chain approach is necessary to limit extractive activities which remain highly energy intensive and socially and environmentally destructive. Forthcoming golden opportunities are looming in the EU to secure this vision. First, for products, with the opportunity to enshrine green requirements for steel products and other intermediate products in an ambitious EU sustainable product policy (SPPI/ESPR). Second, for processes, with more circularity aspects in environmental permits at installation level, made possible by the current Industrial Emissions Directive (IED) revision. Continuing to focus narrowly on decarbonising production processes alone, especially by using green hydrogen-reduced-iron, will miss out on achieving the full transformation of the steel industry for people and the planet as large amounts of non-endemic resources (i.e. iron ore) would still need to be extracted and processed.

- **Integrate sufficiency measures into sectoral tools**

EU steelmakers have announced significant investment this decade to be at the forefront of less carbon-intensive steelmaking. Lowering the emissions of the steelmaking process with green hydrogen has even more of an impetus now that an unprecedented increase in the uptake of renewables seems to be gaining momentum against the backdrop of the Russian invasion of Ukraine and heightened energy independence awareness[1]. However, unrealistic numbers are attached to a

[1] Communication of the European Commission, REPowerEU: Joint European Action for more affordable, secure and sustainable energy, COM(2022) 108 final of 8 March 2022

transformation that would rely mainly or mostly on an energy shift, as the steel industry would need four times its existing electricity consumption to replace current conventional production levels. This increase would give rise to greater environmental and social concerns, namely infrastructure issues with land consumption and competition between the use of renewables. Adopting a more holistic reflection on the actual needs for green steel, disconnected from a growth-based approach and demanding clear prioritisation in the use of renewables and green hydrogen is therefore a tipping point of the sector's transformation.

- **Make polluters pay**

The EU Emissions Trading System (ETS) did not trigger the expected cuts in greenhouse gas emissions of industry. A significant amount of pollution worsening the climate crisis has been released without steelworks actually paying for their pollution, as most allowances were allocated for free and the scheme has been used to secure substantial additional earnings. The current ETS revision has the opportunity to right a wrong with making polluters pay and incentivise them to reduce their greenhouse gas emissions. Combined with the revision of the IED, a global approach in pollution prevention should be put forward with the possibility for authorities to limit the amount of GHG released by steelworks at installation level, along with other pollutants, to provide a safe and healthy environment for local communities.

- **Applying conditions on public funding for industrial transformation**

The existence of public funding or favourable regulations should not be the prerequisite for industry's business case, which is precisely what industry is calling for. Companies behaving responsibly towards society should also be expected to take business decisions with their funds and financing requests to pay for the sector's transformation and move away from coal. Public support should be delivered under the condition of clear industry transformation targets, according to a new social contract comprising social and climate justice elements. In no case can public funding be used for bailing out polluters with no strings attached, which is shifting money away from the transformation with the risk to artificially extend the lifespan of polluting processes, obscuring further the future of the next generations to live in a fair way on a healthy planet.

Background

The steel industry accounts globally for 8% of final energy consumption and 7% of greenhouse gas (GHG) emissions (and 5.7%[2] of the EU's GHG emissions). At global level, coal represents 75% of the energy demand[3] as it is used as an energy carrier and a reducing agent in blast furnaces (BF) in the primary (or virgin) steelmaking route (BF-BOF route). Most steel products in the EU are produced through this primary route (57.4%[4]), and the remainder (42.6%) is produced via the recycling route where scrap steel is melted in electric arc furnaces (EAF). Both processes are energy-intensive even though the primary route emits almost three times as much greenhouse gas (1.9t of CO2/equivalent in average) per tonne of steel than the recycling route (0.6tCO2/eq in average), and releases other hazardous pollutants (particulate matter, nitrous and sulphur oxides,

[2] Communication from the Commission – Towards a competitive and clean European steel - Updating the 2020 New Industrial Strategy: Building a stronger Single Market for Europe's recovery, COM(2021) 350 final, 5 May 2021

[3] IEA, 2021 - https://www.iea.org/reports/iron-and-steel

[4] EUROFER, 2020 https://www.eurofer.eu/assets/publications/brochures-booklets-and-factsheets/european-steel-in-figures-2021/European-Steel-in-Figures-2021.pdf

etc.) inherent to the use of coal. Despite such differences in the carbon footprint of the two routes the share of both routes of production has not changed for at least a decade, even against the backdrop of worsening climate change, its consequences on people's lives, and especially the evolving EU climate policy framework.

To help ensure that the world limits the effects of climate change, to align with Paris Agreement targets and EU ambition to be the first carbon neutral continent by 2050, the steel sector will need to significantly cut its GHG emissions. For example, in a 1.5°C compatible scenario, the EU steel industry will have to reduce emissions by at least 48% by 2030 and by 97% by 2050[5], compared to 2020 levels.

European steelmakers find themselves at a crossroads to phase-out the most polluting process, as 37.1% of EU blast furnaces will reach the end of their operational life in the period 2021-2025 and another 36.8% in the period 2026-2030[6]. The end of operational life provides the opportune moment to channel investments towards deep transformation, rather than just relining BFs, which would risk a carbon lock-in for another 17 years[7]. The EU therefore needs to step up its ambition to lead the timely global steel industry transformation, as 10 more years of inaction in this sector would lead to consuming 12% of the remaining 1.5°C global carbon budget[8].

Strengthening climate and circularity links and demand-side measures

Scaling up material efficiency in steelmaking could provide a quarter of greenhouse gas emissions reductions by 2050 (22-26% in a 1.5 compatible scenario). Combined with material recirculation and new circular business models (shared cars, product as a service, etc.) the overall effect of circular measures could be a deep reduction of primary steel demand in some sectors (70% in 2050 for materials used in passenger cars[9]), with the most efficient measures being lightweighting, post-use recycling and lifetime extension of products and buildings. Opening the possibility to use secondary steel in construction would be a significant driver for steel circularity, along with the development of high-efficiency demolition waste streams, to foster direct re-use of steel.

Unfortunately, this systemic approach is slow in emerging from industry and important elements of the European Commission in industry-related efforts. Even though the European Union and Member States should clearly prioritise the use of renewable hydrogen to cut the emissions from hard-to-abate sectors, the substitution of conventional steel by an equal amount of almost carbon-neutral one has significant limits: in relation to electricity and resources. Alternative techniques to decarbonise the primary route, for example with renewable hydrogen, would still be a resource intensive process based on large amounts of iron ore[10]. Iron ore is currently the most extracted metal on the planet (and for which the EU has an external dependency as there is not much capacity within the bloc) and 98% of extracted amounts are used in steelmaking[11], with potential subsequent negative impacts of mining on land use, water pollution and human rights.

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[5] Yu, S., Lehne, J., Blahut, N., & Charles, M. (2021). 1.5°C Steel: Decarbonizing the Steel Sector in Paris-Compatible Pathways.

[6] Global Steel Transformation Tracker, Agora Energiewende 2022

[7] Vogl et al., Phasing out the blast furnace to meet global climate targets, October 2021

[8] Vogl et al., Phasing out the blast furnace to meet global climate targets, October 2021

[9] Material Economics, The Circular Economy a Powerful Force for Climate Mitigation, 2018

[10] 1.4 tonnes of iron ore pellets are necessary for the production of 1t of crude steel based on hydrogen-DRI.

[11] https://elements.visualcapitalist.com/wp-content/uploads/2021/09/all-of-the-metals-one-visualization.html

To meet the Paris Agreement 1.5°C limit, there is a need to decouple economic performance from metal production. Production needs to peak before 2030 with a maximum iron and steel stock in the economy around 6tonnes/person[12] . The EU is currently around 12tonnes/person. Demand for primary steel has to decrease to achieve climate neutrality[13] to benefit three main aspects: a production shift to improved quality secondary steelmaking[14], the ramp up of material efficiency measures and more focus on demand-side management. Ongoing discussions on the revision of EU policy tools need to act as a catalyst in addressing those three issues simultaneously.

With a view to positioning the EU as a frontrunner, the Ecodesign of Sustainable Products Regulation (ESPR) provides an opportunity to drive the market towards a global greener level-playing-field, requiring products to comply with minimum environmental requirements (including on resource efficiency, energy use, recycled content) regardless of their country of origin. The inclusion of 'intermediary products' in the ESPR – including steel - is pivotal to use the strong driver of ecodesign to lower the embedded carbon content of such products used in a broad range of applications. Ecodesign requirements for intermediary products should be prioritised and ensure transparent information empowering public and private consumers. The ecodesign approach has the potential to transform the whole steel value chain, as the demand for "green steel" is already strong from end-product manufacturers[15] with minimal price increases[16].

Public authorities also have a role in the green market-pull for instance by ensuring a stable and significant demand for green materials through public procurement requirements. The public procurement requirements should apply to every sector and suffer no sectoral exemption, in order for Member States to pave the way in a credible manner to bolster the green steel market in Europe.

Along with enhancing product requirements, the EU can step up its action on circular economy, factoring in material efficiency, recycling rates, energy and water use directly in steelmaking processes, at installation level. A forward-looking revision of the Industrial Emissions Directive (IED), including GHG reductions in installation-level environmental permits and setting limits in environmental performance levels, made possible by their inclusion in the Best Available Techniques, would also ramp up industry performance more effectively in an integrated way.

Integrate sufficiency measures into sectoral tools

To align with European Green Deal objectives, some European steelmakers have been communicating their carbon neutrality plans for 2050. The vast majority of transformation pathways to reach net-zero by 2050 are relying on 'breakthrough' technologies alongside an energy shift from coal-powered blast furnaces towards fossil gas/hydrogen, direct reduction of iron ore (DRI) from 2030 combined with further electrification to produce crude steel. Even though no industrial-scale DRI-plant has been yet commissioned in the EU, industries' transition pathways are already considering DRI using fossil gas as "green-hydrogen-ready", as hydrogen produced with renewable energy could theoretically replace fossil gas to reduce iron without retrofitting the installation. The

[12] Watari et al. Global Metal Use Targets in Line with Climate Goals, *Environmental Science & Technology* **2020** *54*

[13] IEA, Global Steel Track Record, 2021 – Steel demand is 7% lower in 2030 in a Net-Zero Scenario

[14] As an element of comparison, recycling one tonne of steel can save up to 1.4 tonnes of iron ore, 740 kg of coal and 120 kg of limestone (compared with the BF-BOF primary route)

[15] A handful of trucks and carmakers already announced that they would buy green steel by 2030, where automotive accounts for the second biggest demand of steel after construction products. Alliances were also built between steelmakers and wind turbine manufacturers for circular ecosystems involving green steel.

[16] Steeling Demand: Mobilising buyers to bring net-zero steel to market before 2030

availability of green hydrogen on the EU market – and thus of large amounts of renewables - is therefore key to achieving the decarbonisation strategy of steelmakers.

However, substituting the current conventional steel levels of production with steel produced with green hydrogen would require tremendous amounts of renewable electricity, way beyond the current levels of production[17], and this is only to meet the needs of the steel sector[18]. Furthermore, while waiting for green hydrogen to be at least partly available on a sufficient scale, fossil gas would be used as a transitional energy carrier either to reduce iron ore or to produce hydrogen (blue or grey hydrogen). Especially in a geopolitical context, where the EU has to swiftly ensure its independence from Russian gas, the use of fossil gas in the first place, even on a transitional basis, would contradict such a stance and risk locking-in fossil fuel assets, should the green hydrogen availability be delayed.

Counting on a full-scale renewables development producing green hydrogen and being used for electric arc furnaces (EAFs) will not, given the amounts of energy needed for the steel industry only[19], protect from necessary trade-offs and from assigning priorities between the different uses of green electricity and hydrogen (electrification of transport, shifts in the heat and power sector, transformation of other energy-intensive industries).

The current approach of the sector's transformation, based on a maximum energy and resource availability, where steelmakers are predicting their future energy needs, while expecting to be provided with such unrealistic amounts of energy, has to shift towards a sufficiency one. This sufficiency approach would put into question the amounts of steel and the subsequent energy necessary for a society to thrive. Only then will the energy infrastructure impacts on biodiversity, land use and resources be mitigated and compatible with the planetary boundaries. On top of that, a massive roll-out of green energy has to be doubled by a clear EU supply priority list, as most energy-intensive sectors are relying on the green hydrogen scale up for their transformation (chemicals, steel, fertilisers, etc.), in order to ensure that the renewable energy remains affordable and available for all (including households hit by energy poverty).

Making polluters pay

Since 2005, the EU's main policy driver to cut greenhouse gas emissions has been the Emission Trading System (ETS) under which the biggest emitters in theory had to purchase on a capped market allowances equivalent to their emission levels. Companies could trade unused allowances resulting from avoided emissions, and earnings from these sales were meant to incentivise and finance further CO2 reductions. In theory, creating a market with a capped number of allocations should have provided the sufficient price signal to companies to spur emission reductions.

However, an over-allocation of allowances and their free allocation to companies dampened this market price. Evidence of this came from the full auctioning of allowances to the electricity sector (which meant the end of free allowances, where auctioning required the true purchase of

[17] The EU steel sector would require 165 TWh of renewable electricity and 5.5 million tonnes of green hydrogen per year by 2050 to replace by green alternative the amount of steel currently produced by the primary route. It means 400 TWh of annual electricity demand, 4 times the current consumption of this energy-intensive sector, Communication from the Commission – Towards a competitive and clean European steel, COM(2021) 350 final, 5 May 2021

[18] Bellona, Case Study - Hydrogen use in Steel: Tata Steel, the Netherlands https://www.frompollutiontosolution.org/casestudy-h2insteel

[19] The amount of renewable electricity needed for the steel industry decarbonisation could represent 35% of the whole EU current renewable electricity production.

allowances), resulting in a reduction of more than 27% for the period 2013-2019. In the same period, industry emissions reductions stagnated. This is mostly due to the continued free handing out of allocations[20] to sectors allegedly exposed to the risk of carbon leakage, such as the iron and steel sector. Between 2008 and 2019, this sector was given 95% of allocations for free[21] as the number of free allowances was not adjusted to match actual production levels (reduced since the 2008 economic crisis). These free allowances generated additional profits to the sector of (€12-16 bn)[22] . This, combined with a very low carbon price[23], did nothing to internalise the cost of pollution in line with the polluter pays principle (PPP),[24] which was meant to form the basis of the ETS. This resulted in massive amounts of CO2 continuing to be released into the atmosphere and the slowing down of the overall endeavour to avoid worsening climate change[25].

The failure to implement the PPP through the EU ETS since its introduction has not only resulted in the absence of significant industry emissions cuts since 2008, but has also created shortfalls for Member States' budgets and therefore limited the amount of revenues available for public services or targeted support to industry in its transformation[26]. Maintaining free allocations to industry limits Member States' revenues (otherwise available through auctioning) that can be further reinvested in transformation (for instance, support in the reskilling of workers) as well as in other important public services.

Given the urgency to reduce greenhouse gas emissions, free allocations cannot remain for another decade and must therefore be phased-out as soon as possible. Phase-out is even more necessary as a tool to protect from the alleged risk of carbon leakage - the Carbon Border Adjustment Mechanism (CBAM) – is to be introduced.

As the window to transform the steel industry grows smaller[27], the next decade should see significant investments in the sector's transformation to stay on track with the 1.5°C pathway, only achievable with strong market demand mechanisms such as the Ecodesign of Sustainable Products Regulation, coupled with incentives based on internalised pollution costs. Furthermore, a scenario based on a high carbon price and phase-out of free allowances by 2030 could help primary steelmaking alternative technologies to be more cost-effective than the fossil-fuel based ones (based on coal or fossil gas[28]).

Another critical point to drive down emissions is to regulate all key pollutants emitted at installation level, including CO2. Currently, the largest plants and most polluting industries are regulated through the Industrial Emissions Directive which requires installations to have an integrated environmental permit to operate. This lays down maximum pollutant emission levels associated with a process, yet excludes CO2 emissions (because the ETS was meant to address these). Applying both the ETS

[20] Jacques Delors Institute, "No More Free Lunches", Ending free allowances to the benefit of innovation, February 2022

[21] Carbon Market Watch - Decarbonising steel: options for reforming the EU's emissions trading system, March 2022.

[22] CE Delft Additional profits of sectors and firms from the EU ETS – May 2021

[23] The carbon price under the ETS remained well below 10€/t between 2012 and 2018, reaching only in 2021 the threshold of 30€/t, the initial "target" price planned during the design of the scheme in 2003 – CE Delft Additional profits of sectors and firms from the EU ETS – May 2021

[24] One assumption to reflect fully the carbon costs would be 180€/TeqCo2 as endorsed by the German Environmental Agency, in EEB, Destination Climate Neutrality – A Five-Year Policy Blueprint for Europe, September 2019

[25] European Court of Auditors, 2020, Special Report: The EU's Emissions Trading System: free allocation of allowances needed better targeting

[26] The budget of the Innovation Fund for the period 2021-2030 is estimated at 18 bn€ for a carbon price around 40€/tCO2, while a price around 75€/tCO2 would results in a 38 bn€ budget.

[27] 2050 is only one investment cycle away for the steel industry, which needs to happen in the 2020s

[28] Green Deal for Steel, What will it take and who will pay, Roland Berger 2022

and the IED to sectors is not double regulation, rather the IED would help ensure that CO2 emissions were reduced alongside other pollutants in an integrated way. A way forward would be to allow public authorities to establish a limit on CO2 emissions of a given steel mill, which could be made possible through the current revision of the Industrial Emissions Directive. It would eventually ensure a combined approach to pollution prevention in the integrated environmental permits.

Applying conditions on public funding for industrial transformation

Despite the profits earned by the iron and steel industry under the ETS, EU and national governments are also offering the industry (alongside others) significant levels of public funding support through various tools. The iron and steel sector can access public funds to a figure beyond a trillion euros[29] by 2030 from the EU level alone. The Innovation Fund, the Research Fund for Coal and Steel, the InvestEU Fund, the EU Resilience and Recovery Fund (RRF) and tax rebates on the use of energy, are a few examples of the public funding tools at EU or national level for steelmakers to decarbonise production. Latest examples showed partial support from the French government in a 1.7-billion-euro project to convert a BF into a DRI plant in Dunkirk, while Germany allocated 1 billion euro for heavy industry transformation in the period 2020-2023 alone[30]. At the same time, the EU's largest steel company, ArcelorMittal, paid €6.7bn in shareholders' dividends in 2021, based on income of €17bn[31].

While conditioning the roll-out of the urgent transformation of the sector for climate-related reasons to the availability of public support, steelmakers are also turning to the state in times of further crisis. The Covid pandemic across 2020 and 2021 and energy price spikes in 2022 have resulted in companies being bailed-out with very few strings attached. The iron and steel sectors are eligible for the highest support tier under the new State aid temporary crisis framework[32], to compensate for high energy prices. This could mean extending the lifespan of polluting processes while also burdening young professionals, youth and future generations with heavy debt and a still-compromised climate situation.

Furthermore, costs of the carbon prices were already passed on to customers[33]/end-users (through ETS design) and it is foreseen that the extra price for green steel will also be borne by taxpayers and end-users[34]. To align public support with the stringent need to carry out a swift transformation of steelmaking without overlooking the just transition of the sector, public financial help should be granted under strict conditions, in order to make the public support count – a social contract - and involve industries in footing the bill. This last point is also pivotal in the transformation, as the industry will be the one pocketing profits when greener products will become the norm. Guiding principles of this new social contract are at least threefold: ensuring public money spent on industry delivers on climate, social justice and generational solidarity.

[29] Ibid.

[30] https://www.klimaschutz-industrie.de/fileadmin/user_upload/KEI_download_pdf/20200709_Hinweisblatt_Foerderprogramm_Foerderfenster.pdf

[31] https://corporate-media.arcelormittal.com/media/yb1hdvlt/4q21-earnings-release-feb-9-final-v3.pdf

[32] Communication from the Commission, *Temporary Crisis Framework for State Aid measures to support the economy following the aggression against Ukraine by Russia*, of 24 March 2022

[33] CE Delft 2021

[34] Roland Berger 2022

Altogether, it means that public funding making a real impact on climate protection would condition the support to the elaboration of a legally binding transformation plan, with clear targets (e.g. minimum carbon-intensity of steelmaking, energy use) and deterrent sanctions, without opening the door to unconditional bailouts that would make the EU miss its climate goal and extend artificially or risk locking-in the most polluting or expensive technologies. Second, the new social contract should work for social justice, including the obligation to plan the just transition ahead, to not abandon workers and local communities (stated job numbers for the steel industry are 330 000 workers directly, altogether 2 million with indirect employment). It would require companies to build a dialogue with workers' representatives and civil society organisations, to address the needs for training, reskilling and upskilling at the same pace as a company's/sector's wider transformation (corporate and technological, looking at business models, ecodesign of products and processes, as well as purer technological innovation). Last, the public support for industry should be ambitious enough, not to shift the climate debt onto the next generation, and reflect on how much protection the industry really needs from the public purse, to ensure that young people now and future generations can live healthy lives free of debt due to this transformation.

Conclusion

The EU cannot achieve the industrial transformation necessary without taking an integrated approach to addressing multiple societal and environmental crises. This means addressing climate and resources also through circular economy and demand-side measures. Both principles will foster a real value chain transformation approach, taking into consideration the pressure on resources and energy that will help end-users to further transform (lowering their scope 3 emissions).

Scaling up the EU's supply of high-value carbon-poor materials will place the EU at the forefront of the sector with the opportunity to compete globally[35]. In this regard, the steel industry can go beyond the innovation limited to breakthrough technologies in steelmaking to also consider investing in innovative processes that can serve the value chain transformation as a whole. For example, increasing the quality of scrap metal (i.e. processes to help separate scrap steel from contaminants) could bolster the manufacture of second-hand steel through the recycling route. The European Union, as a net exporter of scrap metal could lead the way with an in-house high-quality scrap stock, while investigating further direct steel reuse solutions without processing, as the secondary route is not pollution-free and energy-sober; thus requiring a more holistic approach on the amount of steel actually sufficient to meet people's needs. Along with scaling up technologies, steelmakers should indeed consider the impacts on jobs of those technologies to ensure the maintaining of local and decent jobs associated with the primary and the secondary route. For the latter it is critical to assess the potential employment impacts on jobs linked to secondary steelmaking and recycling activities.

[35] By 2030, the global demand for low-CO2 steel is estimated between 80-120 million USD, Material Economics 2022