

# Decarbonizing Metals Part Two: Financial Strength Mitigates Rising Credit Risk

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The metals sector is facing a technologically complex and lengthy decarbonization challenge, with credit risk transmission channels such as higher carbon costs becoming increasingly visible.

*This research report explores an evolving topic relating to sustainability. It reflects research conducted by and contributions from S&P Global Ratings' sustainability research and sustainable finance teams as well as our credit rating analysts (where listed).*

*This report does not constitute a rating action*



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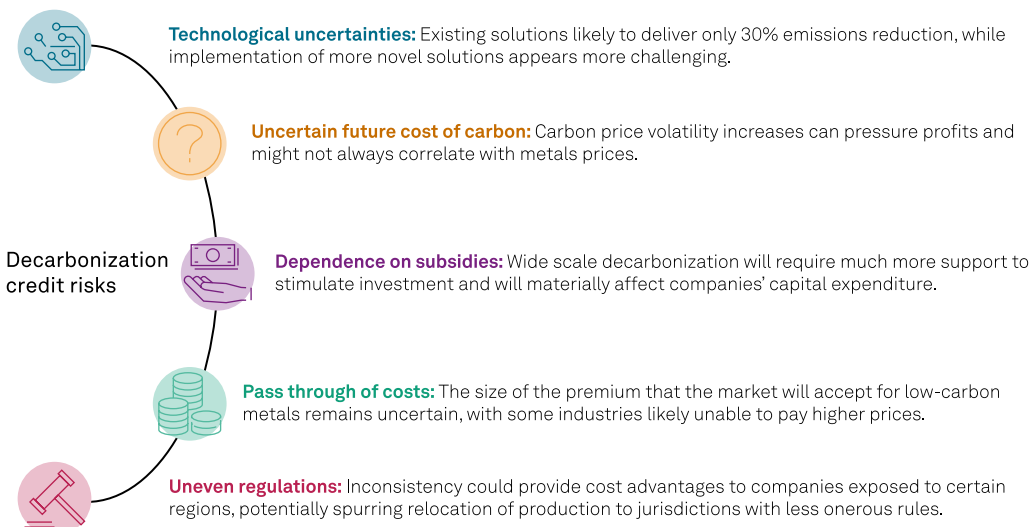
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This second part of S&P Global Ratings' research into decarbonizing the metals sector (focused mainly on steel and aluminum producers) examines the credit challenges facing the sector as a result of increasingly visible credit risk transmission channels. We notably conducted sensitivity analysis on the potential credit influence of regulations and on the strategies of EU and non-EU companies that we rate. The decision to use two samples reflects the fact that regulation is already essentially in place for EU producers, enabling us to estimate the future impact of the Carbon Border Adjustment Mechanism (CBAM) and EU Emission Trading System (ETS) reform on their EBITDA until 2035--based on the reduction of free carbon allowances and expected increasing price of carbon emissions. For producers outside of the EU we assess how the hypothetical introduction of similar regulations could impact their businesses. This research complements "Decarbonizing Metals Part One: A Pressing Issue With Uncertain Fixes" which discusses the sector's challenges, strategies, and pathways with regards to the reduction of greenhouse gas (GHG) emissions.

### Key Findings

- The metals sector faces a technologically complex and lengthy transition to low carbon-emitting practices, due to a lack of tested, cost-efficient technology and the scarcity of raw materials. This will leave it exposed for longer to the risk of materially higher carbon costs that could prove negative for metals companies' credit quality.
- Steel producers using more carbon intensive blast furnace-basic oxygen furnace (BF-BOF) technology, and which are based in the EU or have significant exports to the EU, are the most immediately exposed to carbon costs that will increase progressively from 2026.
- EU regulations could ultimately reshape the global metals sector, with broad implications for decarbonization costs and economic growth in the longer term. Differences in regional carbon prices, the ability to pass through costs, and government support for decarbonization efforts could all materially affect credit quality.
- Currently strong credit metrics and likely supportive markets should help metals companies that we rate mitigate the high cost of decarbonization. However, if higher costs coincide with a trough in the metals-price cycle then the pressure on the credit quality of some companies could materially increase.

### Decarbonization credit risks



Source: S&P Global Ratings.

## Decarbonization's Potential To Impact Credit Quality

### **Our credit ratings already factor in pressure to decarbonize but we believe the financial impact of that pressures will now increase**

Our assessment of the potential impact of decarbonization on metals producers includes risks associated with high carbon emissions and the prospective pressures to reduce them--and is notably incorporated in our industry risk assessment. Additionally, our competitive-position analysis takes into account the quality of entities' assets, including their environmental performance and the investment required to match the best performing companies in the sector. Uncertainty related to more stringent carbon regulation and the investment required for decarbonization are key reasons why, since 2021, there have been only a limited number of upgrades among large metals producers, despite the very meaningful deleveraging they achieved on the back of supportive prices.

**The formal introduction of the EU's CBAM and the gradual removal of the free allowances under EU ETS means the cost of carbon will increasingly have a material effect on the financial profiles of EU producers and companies with significant exports to the EU.** Indeed, carbon costs will become an important item in our cost forecasts for many companies, with our expectations guided by assumptions about the future prices. For companies operating in countries without carbon regulation, or countries with less demanding decarbonization targets, the financial impact is currently limited. But, the possibility that EU-like regulation could be introduced makes, we believe, EU ETS and the CBAM good benchmarks to estimate the potential long-term impact of carbon regulations in other regions.

### **Rated EU metal producers should be able to absorb decarbonization costs without a negative impact on ratings**

Our analysis shows that in the most likely scenario, where government subsidies are moderate and the pass-through of decarbonization costs to end customers is on average close to 50%, most rated EU metals producers should have sufficient levers to absorb the impact of the CBAM without a material impact on credit ratings. Yet, the effects on companies' credit worthiness of EU ETS reform and higher carbon prices will be uneven and depend on current asset quality and the ambitions of each company's decarbonization strategies

For example, we believe that [ArcelorMittal](#)'s heavy reliance on more carbon-intensive BF-BOF production, and plans to slowly decarbonize, means its carbon-cost burden could be among the highest of the companies we rate. In contrast, Sweden's EU-focused [SSAB](#) is targeting full decarbonization of production by 2034, a goal that should significantly de-risk its carbon exposure albeit at the cost of significant near-term capital expenditure (capex) and potentially higher financial leverage. Our analysis assumes mid-cycle metals prices and could be altered if requirements for increased capex coincide with a pronounced downturn in the metals sector, which could put pressure on producers' credit quality.

### **Most rated companies beyond the EU don't face imminent carbon-linked costs, but could be sensitive to new regulation in the long term**

We currently do not rate any companies outside of the EU that have large exposure to CBAM--such as might be the case for Turkish or Russian metals producers, which historically have been large metal exporters to the EU. The large non-EU companies that we rate, including those from North American and Asia, typically have little sales exposure to Europe and are therefore not

heavily impacted by CBAM. The exception is among those Indian and South Korean companies that have a higher share of exports to the EU and which could suffer some impacts from CBAM if they are unable to reassign exports to other markets, though we do not expect this would result in lower ratings.

**That said, our analysis suggests a potential sensitivity among many producers in Asia and the U.S. to the introduction of EU-like carbon regulations in their respective jurisdictions.** This is notably due to producers' generally more carbon-intensive supply chains and current lack of significant planned investment in decarbonization.

## Carbon regulations could reshape global metals markets and impact broader economies

Carbon regulations (and in the first instance the EU's CBAM and ETS reform) could lead to fundamental changes in the competitive landscape of the metals industry. This could be particularly the case if global carbon regulations are imposed unevenly, making some jurisdictions eventually more attractive for businesses from a cost perspective. For example, if EU carbon costs remain far higher than in other markets, steel and aluminum producers might relocate production outside the EU. Importantly, this might not only affect metals producers but also large consumers of metal, such as auto producers. In such a scenario, staying in the EU could prove a competitive disadvantage versus peers from regions with lighter carbon regulations. Subsidies and tax incentives offered under the U.S.'s Inflation Reduction Act could spur this migration (see "[U.S. Inflation Reduction Act Highlights Diverging Approaches With Europe](#)," March 1, 2023).

**Carbon regulation also has the potential to have a much wider and more complex impact, affecting more than just the sectors it directly targets.** For example, in regulated markets, higher prices for steel, aluminum, and cement could weigh on investment choices in other downstream sectors, or potentially make exports of finished goods less profitable. Higher costs for metals could also slow down broader decarbonization by increasing the price of already expensive metals-heavy renewables infrastructure. That said, governments that are early movers in terms of decarbonization regulation could receive additional carbon-tax revenues that can be used to support sectors most affected by carbon regulations or to provide targeted rebates of carbon costs for exporters.

## The evolution of carbon prices, subsidies, and cost pass-through will determine how carbon regulation affects metals producers

In particular we will be watching:

- The extent to which carbon prices correlate with economic cycles (accepting, as we do, that there is a high likelihood they will be correlated). Importantly for the metals and mining industries, we expect carbon prices will also maintain some degree of correlation with the commodity cycle, with the link created by the metals sector's position as one of the biggest emitters of carbon.
- The willingness of governments to provide subsidies to companies that wish to upgrade the carbon efficiency of existing assets or build new assets. Some European governments have already approved subsidies but additional incentives might be required to motivate companies to invest heavily in the European metals sector.

- The ability of companies to pass on carbon-related costs. In other words, it remains to be seen to what extent customers will prove willing to support decarbonization by paying more for greener steel and aluminium.

## The Main Decarbonization-Related Credit Risk Drivers

Through analysis of our sample of companies we identified seven potential credit risk drivers that we expect will shape the pace of decarbonization for metal producers in the coming years (see table 1). We consider EU-based producers separately to those outside the EU, as the EU's CBAM and ETS reform make certain risks more imminent for the European companies in our view.

Table 1

### Metal producers' decarbonization-related credit risk drivers

Risk driver	Potential credit impact	EU			Outside EU		
		Through 2024	2025-2029	2030-2050	Through 2024	2025-2029	2030-2050
		Short term	Medium term	Long term	Short term	Medium term	Long term
Technological uncertainties	Lower profitability	█	█	█	█	█	█
Availability of feedstock	Lower profitability	█	█	█	█	█	█
Uncertain future cost of carbon	Increased volatility	█	█	█	█	█	█
Dependence on subsidies	Higher capex and debt	█	█	█	█	█	█
Inability to pass through costs/uncertain demand	Lower profitability	█	█	█	█	█	█
Uneven regulation/carbon leaks	Changes to competitive position	█	█	█	█	█	█
Lack of emissions reporting, audit, and control	Value chain disruptions	█	█	█	█	█	█

Capex--Capital expenditure. Source: S&P Global Ratings.

### Technological uncertainties → lower profitability

Commercially available technology, such as direct reduced iron (DRI) or the use of scrap metal in an electric arc furnace (EAF), can deliver only limited decarbonization so long as energy is sourced from carbon-emitting electricity grids. While this technology should enable metals companies to meet their short-term carbon targets of around 30% by 2030 (see Part One), decarbonization beyond the levels offered by DRI+EAF technologies will be difficult in our view. Further decarbonization of scrap+EAF could theoretically be achieved by replacing existing grids with low-carbon electricity, but is hindered by the intermittency of most renewable power sources, the lack of large-scale energy storage solutions, and the high levels of capex required. Hydrogen-based (and notably green hydrogen) solutions for DRI and BF-BOF exist only in the form of small-scale demonstrations and will need to prove their applicability at large scale and reasonable cost. We consider that large-scale implementation of hydrogen and carbon capture, utilization and storage (CCUS) technologies are currently challenging as the associated capex is prohibitively high. These technological uncertainties could result in slower-than-anticipated decarbonization, leaving companies exposed for longer to higher carbon costs.

## Availability of feedstock → lower profitability

Most steelmakers' near-term decarbonization plans rely on increased use of scarce resources (or feedstock), particularly scrap for use in EAFs and high-quality iron ore for the DRI process. The DRI path requires ore with an iron content of at least 67%, compared to 62.5% for ore used in the BF-BOF route, according to the Institute of Energy Economics and Financial Analysis (IEEFA). These ores are scarce, with only 4% of iron ore currently at DRI-grade. Competition for scrap is likely to raise prices and squeeze profits, especially among recyclers, as companies look to increase the proportion of scrap+DRI production. Finally, green hydrogen, although technologically achievable through electrolysis, is expensive at €6 to €7 per kilo, compared to a price of below €2 per kilo necessary for commercially viable use in steelmaking (see "[How Hydrogen Can Fuel The Energy Transition](#)", Nov. 19, 2020). Lowering the cost of green hydrogen to economically feasible levels appears difficult, or will require significant government subsidies. A lack of access to feedstock could slow decarbonization and expose companies to higher carbon costs.

## Uncertain future cost of carbon → more volatile profitability

Carbon prices have demonstrated significant volatility since the introduction of the EU ETS. The trend had been toward a gradual increase in prices until 2023, since when prices have fallen about 40% due to drops in industrial outputs--suggesting almost commodity-like volatility. The visibility of future carbon prices is thus very limited, as is the ability to foresee the forces that will drive price moves. For the metals sector this could prove an important area of risk, particularly as carbon prices might not always correlate with changes in metals prices, resulting in the amplification of profit volatility.

## Dependence upon subsidies → potentially higher capex and debt

Subsidies will likely be an indispensable part of decarbonization for several years. The EU and its member states have already approved several billion euros of subsidies to local producers to support the construction and operation of different low-carbon emitting assets (usually of a moderate-size or as demonstration models--see Appendix for more details). However, widescale decarbonization will require much more support to stimulate investment in low carbon assets and the extent of the subsidies could materially affect companies' capex. In the U.S., the Inflation Reduction Act provides subsidies for any business (including metals companies) investing in carbon capture or hydrogen production. Other regions could respond in similar fashion to support decarbonization. Relocation to more favorable jurisdictions to take advantage of subsidies could be an option for large companies, but, for smaller companies, a lack of access to beneficial regimes could result in increased capex and debt.

## Inability to pass through costs/uncertain demand for green products → lower profitability

It seems inevitable that decarbonization will increase the cost of steel production. We expect that low-carbon metals will be sold at a premium to standard products and there is some early evidence that end-users (such as auto manufacturers) will reflect greener-inputs in the marketing of their products to justify higher prices and protect market share. The size of the premium that the market will accept remains uncertain, not least as the market for green products is still emerging. We see a risk that customers of more commoditized end products (such as construction metals) might not be able to pay materially higher prices for lower-carbon inputs.

## Uneven regulation/carbon leaks → changes to competitive position

Carbon regulations and decarbonization subsidies will evolve at different paces across the globe, meaning some regions will likely provide better economic opportunities for industry to decarbonize. This could be due to a combination of lower carbon charges, higher subsidies, lower energy costs (an important component of almost any decarbonization path), and better availability of raw materials. That inconsistency could provide competitive benefits, and notably cost advantages, to companies exposed to certain regions, which could, in turn, spur relocation of production facilities to jurisdictions with less onerous carbon regulations (see Part One). This trend may be more pronounced for producers of metals for end-use, such as in the production of consumer goods, outside of territories with strong carbon regulation. While we believe jurisdiction-choice is likely to impact future investment decisions, it is also possible that it will drive plant closures in a difficult economic environment. European aluminum production appears particularly vulnerable to this risk given the impact of high regional-electricity prices, which have already contributed to a steady decline in aluminum production in the EU in recent years.

## Lack of consistent emissions reporting, audit, and control → value chain disruptions/shifting competitive positions

The reporting of carbon costs, credits, and free allowances is evolving, even within advanced markets like the EU. This reflects the fact that efficient carbon regulation will require improvements in reporting and auditing.

An example of this challenge can be found in the requirement, from 2026, that importers of goods into the EU buy carbon-emission certificates (based on €/ton emitted), whose price will depend on the average price of EU ETS allowances. Under that system, importers will be able to reduce the EU levy by the value of carbon-charges already paid during production in non-EU countries, with the idea that it will incentivize other countries to introduce similar mechanisms. But it remains to be seen how those deductions will be calculated, and to what extent the EU will recognize regimes that are likely to be established by many emerging market countries. Recent press reports indicate that the EU wants to oversee emission audits for facilities that export to Europe, but this faces opposition from many countries. And the EU's capacity to verify emissions data and conduct audits is yet to be tested. The potential is there for delays and inefficiencies to disrupt existing flows of goods, as is the risk that disruptions will affect companies' competitiveness.

## EU Metals Producers Can Manage Increasing Risks, For Now

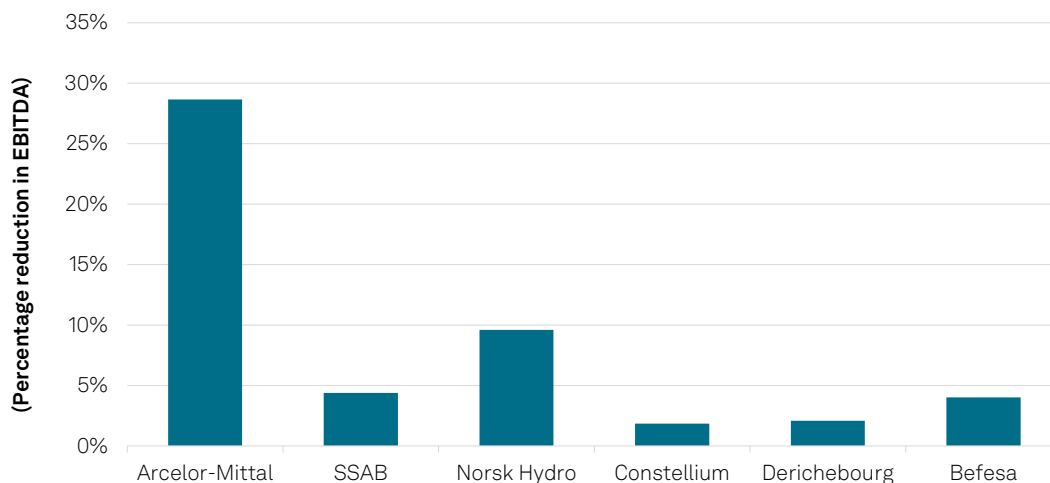
We conducted an analysis incorporating the adopted CBAM and EU ETS reforms to estimate how their implementation will affect the credit quality of six rated metals companies in the EU. We focused primarily on the magnitude of the potential reduction in EBITDA by 2034, due to the gradual reduction of free carbon-allowances and the evolution of the EU carbon price. We also considered our sample companies' announced decarbonization strategies and targets. And, we made assumptions regarding different industries' ability to pass on the price of carbon **costs** to customers, considering the replaceability and tradability of their products.

**We found that, despite a high cost of decarbonization, EU-based, rated metals producers should have the necessary levers to limit negative impacts of EU ETS and CBAM on their credit quality**, at least in our base case scenario. Our analysis shows that decarbonization costs will be

material for all rated metals producers (see chart 1), though primary steel producers are at the greatest risks from the reforms as it may become uneconomical to produce primary steel in EU over the next decade if there is no material decarbonization of the process.

Chart 1

### Reduction of potential EBITDA due to carbon taxes in 2034



Source: S&P Global Ratings.

**We anticipate a spike in investment for most metals producers, which could put pressure on free cash flow generation**, especially if prices are below mid-cycle level for a prolonged period. We believe that most carbon-intensive producers can significantly reduce the cost of carbon in their EBITDA if they follow their currently announced decarbonization strategies, which combine efficiency measures at existing facilities and construction of new plants. We also expect that, companies will be able to sell greener products at a premium thereby passing some decarbonization cost onto customers.

### Impact of carbon costs on major EU metals companies

We believe that [ArcelorMittal](#), despite its geographic diversification, will have the largest carbon-cost burden among the steel companies we rate, with its EBITDA likely 25%-30% lower by 2034 because of EU carbon-emission reforms. This reflects its heavy reliance on traditional BF-BOF process and plans to decarbonize its industrial processes only gradually--as outlined in its investment plan. The company has assessed the investment required to fully decarbonize at about €40 billion but is counting on subsidies from EU governments to support its efforts. Its current plan is to gradually upgrade European plants, while investing in traditional BF technology in emerging markets, including India. The company says some of the new capacity will be DRI-ready, though it is unlikely that green hydrogen will be available in emerging markets this decade. The company's global presence, its strong competitive position in key markets, and supportive financial policy should help limit the impact of EU regulations on its credit quality.

[SSAB](#)'s target of full decarbonization is a manifestation of its material exposure to CBAM, because about 75% of its production is in the EU. The plan should eliminate the negative impact of CBAM by 2034 but at the cost of materially increased near-term investment. We expect the company's annual capex over 2022-2030 to be about double that of its average annual capex over 2017-2021. SSAB is planning to gradually phase out BF-BOF operations replacing them first



with scrap-EAF and, after 2030, with green hydrogen-based production, which it is developing with [Vattenfall](#), an energy company, and LKAB, an iron miner. The company currently has a net cash position (largely because its EBITDA over the past two years was 3x-4x its historical and forecast average) and plans to use a combination of cash, future cash flows, and a balanced dividend policy to fund capex while maintaining strong credit quality. We expect its funds from operations (FFO) to debt to remain above 60%.

[Norsk Hydro](#) is unlikely to incur meaningful direct financial impacts relating to carbon costs, in our opinion, because most carbon emissions relating to aluminum production are from electricity use, which is taxed indirectly through electricity prices. The EU currently operates a compensation mechanism for aluminum producers to offset these costs. The possibility that this practice will end is an ongoing risk for aluminum producers, and the European Commission should decide by 2025 whether to maintain or change the compensation scheme in light of its CBAM reforms. Norsk Hydro's diversification also offers protection, with an average of 30% of EBITDA coming from aluminum smelting, about half of which is in Norway. The remaining EBITDA comes from alumina, bauxite, hydropower, and extruded products. The company is also well diversified geographically, with about half its revenues generated outside the EU. CBAM's contingencies for carbon leakage (whereby companies transfer production to regions with laxer emissions constraints) could weaken Norsk Hydro's competitiveness and encourage the company to relocate more production to outside the EU.

We believe that the credit risks for recyclers are materially lower. We rate several steel and aluminum recyclers, including [Constellium](#), [Derichebourg](#) and [Befesa](#). While they already have lower carbon costs, they are likely to continue focusing on efficiency programs that will further reduce emissions and ultimately their exposure to carbon-related costs.

## The assumptions that underlie our analysis

### Summary of our main assumptions for EU metals producers

- Revenue and EBITDA growth for each company in line with our base-case forecasts until 2026; then 2% per year from 2026.
- Companies will maintain existing production volumes in Europe.
- Estimated chargeable Scope 1 CO2 emissions in the EU are based on discussions with companies in our sample.
- Reduction of CO2 emissions in the EU, through to 2034, as per companies' public commitments, or based on more-detailed assumptions that companies have shared with us.
- Our estimation of carbon-free allowances received and not yet used, as of year-end 2022.
- Additional annual free allowances will reduce, as per final terms that entered into force on May 16, 2023, with the following free allowance reduction rate: 2026: 2.5%; 2027: 5%; 2028: 10%; 2029: 22.5%; 2030: 48.5%; 2031: 61%; 2032: 73.5%; 2033: 86%; 2034: 100%.
- Progressive increases in CO2 prices from an average of €88 in 2023, to €91 in 2025, to €107 in 2030, and €142 in 2034, as per S&P Commodities Insights' published forecasts.
- No carbon leakage in the EU, due to prevention incorporated in the CBAM.
- About 50% of carbon costs passed on to final customers.

Our assumption that producers will be able to pass on about 50% of the carbon-reduction costs to customers relies on our expectation that low-carbon products will command a price premium.

In the EU, metals customers, such as those in the automotive sector, increasingly have their own decarbonization ambitions and need to demonstrate emissions reductions in their supply chains. For metals companies, this provides some opportunities to differentiate lower-carbon products from those of decarbonization laggards, possibly creating niche green markets. Our assumption varies between different metals and products, depending on their replaceability and the current existence of premium markets. Prices for high-carbon products could also increase if import rules tighten. Certain metal uses, such as construction, cannot be relocated outside EU and companies in such industries might be forced to accept increased prices as steel producers will try to maintain their margins while supply will be tight.

We assume that EU governments will cover the cost of some required decarbonization investment as carbon prices alone will remain too low to incentivize spending. Steel companies are large employers and are integrated into local supply chains that may require increasing amounts of low-carbon steel. We therefore expect governments and EU-level authorities/funds to provide support to primary steel producers' decarbonization efforts and to avoid the gradual decline of the steel industry in Europe. The EU has a number of programs to support steel decarbonization, such as Horizon Europe, EU ETS Innovation Fund, state aid, and the Recovery and Resilience Facility. For more information on the support that governments are already providing to the decarbonization efforts of European metals makers see this report's Appendix.

We consider that there is a chance that plans to phase out free allowances for carbon emissions will be revised after 2025, though we assume they will be phased out in line with the current EU plan. Those allowances usually cover 80%-90% of steel company emissions, and 60%-70% of aluminum company emissions, while remaining emissions are covered by carbon credits purchased through EU ETS. We estimate that carbon costs currently account for 2%-8% of EBITDA for rated European companies (these percentages would be higher when metals prices are below mid-cycle level). Companies are building stocks of carbon credits, purchased through EU ETS, to use when and if carbon prices increase.

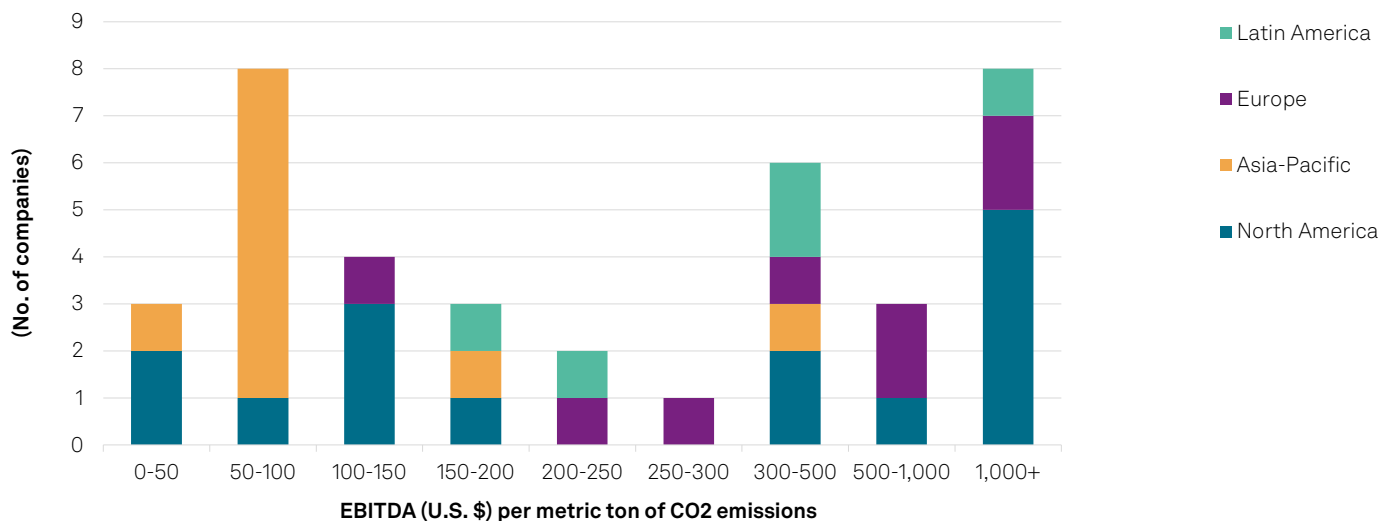
## **Most Rated Non-EU Companies Have Limited Capacity To Absorb A CBAM-Like Hike To Carbon Costs**

While the EU's CBAM will likely have limited impact on the credit quality of rated metals producers in other markets, a hypothetical introduction of similar carbon regulations in those regions could trigger more-meaningful financial impacts for certain producers. As we noted in Part One of this research, most regions outside Europe have very limited (or no) carbon emissions regulation. In the absence of regulation like CBAM or EU ETS in many large markets, our sensitivity analysis aims to assess the hypothetical impact of similar regulations on metals producers in those regions.

We calculated the average EBITDA generated per metric ton of CO<sub>2</sub> of direct emissions for major global rated metals companies and found that over a third of companies generate \$150 or less of EBITDA per metric ton of CO<sub>2</sub> (see chart 2). The companies include representatives from all the regions and are mostly traditional BF-BOF steel producers, with high emissions per ton of steel and therefore lower EBITDA per ton of carbon emitted. Such producers would be the most exposed to carbon-related costs if regulations like EU ETS or CBAM were introduced in their regions.

Chart 2

Rated metal companies' EBITDA per ton of direct CO2 emissions



Source: S&P Global Ratings.

### North America

U.S. steel producers' exposure to stricter carbon regulation is mitigated by their less carbon-intensive production, compared to some regions, though smaller U.S. companies could be at risk. While carbon regulations in the U.S. are currently limited to enforcing reporting norms, we think the passage of the Inflation Reduction Act, which aims to boost investment in green energy, might spur carbon-related initiatives over time.

**We estimate that the introduction of a carbon price mechanism in the U.S., similar to the EU ETS and the CBAM, would reduce U.S. steel producers' EBITDA margins by about 10 percentage points.** That could make some smaller U.S. producers unprofitable (notably those that generate less than \$150 per ton of EBITDA) unless they are able to pass on these costs to consumers. Even for medium-sized and large entities the costs associated with a system like the EU ETS and CBAM would have a material effect on margins and profits. Still, the asset quality of the average North American producer is significantly better than that of its EU counterpart, due to wider adoption of EAF (up to 70%), which mitigates carbon-cost related risk.

**We also believe that introduction of a U.S.-wide carbon pricing mechanism is unlikely in the next several years.** That, combined with U.S. makers' generally low percentage of exports to the EU, means we consider the current exposure of U.S. steel producers to carbon risks to be significantly lower than that of EU players.

### Asia Pacific

Carbon regulation in Asian countries is generally far less onerous than that of the EU. Some more developed Asian countries, including South Korea, have implemented EU ETS-like systems which cover metals production, while others are planning to do so to increase alignment of carbon pricing mechanisms and avoid additional exposure to CBAM for European exports. However, for the majority of Asian countries decarbonization will likely be a question for the next decade.

**Exposure to carbon regulation is unlikely to affect the credit quality of the largest steel producers in Japan or Korea over the next three to five years.** For example, South Korean metal

producers will continue to benefit from a significant share of free allowances until 2025 (unlike EU producers), which will reduce the risk from their exposure to carbon prices. Nonetheless, South Korea is the third largest exporter of steel to the EU, so exposure to more stringent carbon pricing affecting exports to Europe could become increasingly important to our ratings on [POSCO](#) or [Hyundai Steel](#) over the longer term. Japan's largest steel producer, [Nippon Steel](#), exports very little to Europe, which moderates its risk from stricter EU rules on imports. We consider, however, that Japan is more likely than South Korea to introduce a system that could push companies to prioritize investment in decarbonization.

**We believe that the rest of Asia has a long decarbonization road ahead, particularly given that much of its steel and aluminum assets--notably in India and China--are fossil fuel dependent.**

More than three quarters of Asia's steel is produced in blast furnaces, while aluminum is predominantly produced in coal-fired plants (see Part One). Large emerging economies will likely prioritize growth in metals production--India's five top steel producers are planning to double capacity by 2030 and are unlikely to move away from blast furnaces any time soon. Therefore, we think that the introduction of strict regulation without state-support is highly unlikely in the near term. While the Chinese government has announced it plans to extend its own domestic ETS to cover aluminum, it is unlikely to be nearly as onerous as EU regulation--allowances in the existing Chinese scheme have traded at a much lower value than those in the EU. Asia's dependence on fossil fuels in production means that significant investment will be required over the long-term horizon if decarbonization is to be achieved.

**Indian companies' sizeable EU exports mean they appear comparatively more exposed to CBAM than their Chinese counterparts**, though a reported Indian CBAM scheme is likely to prove limited. We understand that the scheme under consideration could replicate the principles of the EU's CBAM but is likely to target only products exported to the EU, to ensure any levies are collected by India. That said, the scheme could impact the profitability of some Indian steelmakers, and might have to be offset with domestic sales growth (see "[Indian Steelmakers' Growth Ambitions Hinge On Domestic Demand](#)," Aug. 2, 2023).

## Other regions

**Latin American (LATAM) steelmakers appear little exposed to carbon-regulation risk.** No LATAM country, apart from Mexico, has implemented carbon taxes or emission trading systems, though some are considering it. Exports to the EU are very limited, even for the largest LATAM metals producers, so potential exposure to EU carbon pricing initiatives is likely only a long-term risk. LATAM is also more reliant on EAF steelmaking, which makes it relatively less exposed to decarbonization costs.

**Unrated Turkish steel producers and Gulf Cooperation Council (GCC) aluminum producers are highly exposed to carbon regulation.** We do not rate any metals producers in Türkiye, but we note that they are likely to be more affected by CBAM regulation in the short term, as Türkiye is the largest exporter of steel to the EU. This risk is additional to the looming challenge of adapting to the EU's upcoming restrictions on imports of steel made using pre-products procured from Russia and then processed in a third country. Türkiye announced plans, at COP28, to implement an ETS that could bring it in line with the EU's CBAM rules, with the aim to launch a pilot phase in 2025, but for now there is little detail on how it might be implemented.

Most GCC countries are in a similar position to Türkiye. GCC aluminum makers' reliance on European exports are less important than for their Turkish steel counterparts but could still be meaningful for some producers. GCC aluminum makers' average direct emissions are lower than those of Chinese and Asian peers, but still higher than their counterparts in the EU.

We currently do not rate any Russian metals producers, though we note that prior to 2022 they accounted for a meaningful portion of EU steel and aluminum imports. Russian exports to the EU are subject to sanctions which may remain in place for the foreseeable future. In the event that trade resumes, we believe Russian producers will be moderately impacted by CBAM, as many have upgraded their production assets and gas is their main source of energy. Ukrainian producers are among the highest-emitting exporters to the EU and it remains to be seen if they will receive a temporary exemption from CBAM.

## Carbon Regulation Could Reshape The Global Metals Sector With Broader Impacts On Economies

The EU's ETS and CBAM regulations aim to level the playing field for EU producers, including those in the metals sector. Metals companies can adapt, but the effects of the regulations may be felt more broadly in the global economy.

### The EU's CBAM could significantly alter the flow of goods

EU regulations may encourage metals producers from countries with no, or very-light carbon regulations to increasingly focus on domestic markets or redirect exports to markets with similarly light regulations. This will increase competition in some areas, potentially forcing out high-cost producers. At the same time, companies located in emerging markets could be incentivized to direct lower-emission products to highly regulated markets, like the EU, while directing other products to markets with weak carbon regulation. The EU is aware of that risk but has not communicated a mitigating strategy at this stage. Shifting regulation and strategies will also come with physical and logistical challenges, which could affect trade flows.

**CBAM may not offer comprehensive protection to EU producers and could usher in shortages and increased prices.** We foresee the potential for a shift from production in the EU, which would be subject to higher charges. That, in turn, could create a material incentive to import secondary steel into the EU, where it will command a premium--the EU's CBAM could increase the cost of delivered steel to Europe by about 56% for India and 49% for China by 2034, according to a 2023 study by Wood Mackenzie. We also see a risk that non-EU producers will view costs related to CBAM and the need to increase capex to lower carbon emissions as outweighing the attractiveness of exporting to Europe, potentially exposing Europe to the risk of undersupply. CBAM in its early stages will cover raw materials and simple goods, but the EU plans to extend its application over time. If it takes in a greater number of downstream products and finished goods, it could put more pressure on more supply chains, resulting in further shortages.

**Aluminum trading could feel the most significant impacts if the EU's CBAM is expanded to account for Scope 2 emissions and if current compensation that offsets the EU's high electricity price is ended.** The European Commission is due to decide on those matters by 2025 and a ruling that expands CBAM could change the industry landscape significantly. The inclusion of Scope 2 electricity use could increase the average cost of aluminum imports by five to 10 times by 2034, with Chinese and South African supplies most impacted. This increase might encourage large aluminum exporters to establish separate renewables-based facilities targeting the EU while continuing to use non-renewable electricity for production aimed at other markets. This could result in the EU becoming the main (and thus most competitive) market for low-carbon aluminum from around the world, increasing competition for European producers, who could also face higher costs.

## Carbon regulation could have broader effects on economies.

We think the long-term impact of carbon regulation on macroeconomic indicators is very difficult to estimate, especially at a stage where some regions' regulations are well ahead of others. One of the main uncertainties relates to the demand response to a material increase in prices for steel, aluminum, and cement, which are primary costs for many projects. This could impact the economic growth of whole countries or regions, especially during times of increasing cost of capital. Higher domestic prices will also likely result in reduced exports of these materials.

**At the same time, carbon regulation should bring in some tax revenues, which could be used to offset the negative implications of charges.** For example, the European Environment Agency reported that 2022 revenues from the EU ETS totaled €30 billion, with majority of those proceeds used to support emission reduction projects or sectors most affected by carbon-related regulations. The European Commission expects CBAM to bring in around €10 billion per year by 2030, although it remains to be decided how those revenues will be used. The balance between carbon-linked tax collection and support for key sectors will be a factor in determining carbon regulation's potential impact, but it is clear that it could be much wider than on just the sectors directly targeted.

**Ultimately, the cost of broader decarbonization might increase.** Steel and aluminum (as well as cement, which will be covered in another report) will be significant components of the wider decarbonization of economies over the coming decades. The transition to renewable energy will require wind turbines, solar panels, and an extensive grid of power lines, all of which will require large quantities of metals (and cement). If prices increase due to a "green premium", or because producers pass on emission costs to customers, then already-expensive infrastructure might become more costly. This could slow decarbonization or require additional support from governments.

## Looking Ahead

We expect regulations to remain a key credit risk transmission channel for the metals sector. Metals producers in the EU, and some other jurisdictions, already face regulations which increase their costs and are already stimulating decarbonization. For now, we see carbon costs as manageable for most market participants, at least until 2030, with major metals producers already planning investment in lower-emitting production processes in support of their own carbon-reduction targets.

However, regional differences in carbon prices, subsidies, and ability to pass-through costs will be central to the effect that carbon regulations will have on metals producers. We will be watching how carbon prices correlate with economic cycles, governments' willingness to provide subsidies and incentives to companies that wish to improve the carbon efficiency of existing assets or build new greener assets, and companies's ability to pass on carbon-related costs. How these elements play out globally will ultimately govern the impact on credit quality across the sector.

## Related Research

- [White Paper: Assessing How Megatrends May Influence Credit Ratings](#), April. 18, 2024
- [Decarbonizing Chemicals Part Two: The Credit Risks And Mitigants](#), Sept. 5, 2023
- [Indian Steelmakers' Growth Ambitions Hinge On Domestic Demand](#), Aug. 2, 2023
- [Carbon Pricing, In Various Forms, Is Likely To Spread In The Move To Net Zero](#), Aug. 9, 2022
- [U.S. Inflation Reduction Act Highlights Diverging Approaches With Europe](#), March 1, 2023
- [Why Climate Risks Are Changing So Few Corporate Ratings](#), April 12, 2023
- [How Hydrogen Can Fuel The Energy Transition](#), Nov. 19, 2020

## External Research

- [Playing by new rules: How the CBAM will change the world](#), Wood Mackenzie, Sept. 21, 2023
- [Emissions Trading Worldwide Status Report, International Carbon Action Partnership](#), April 10, 2024

## Appendix

### European state support for metal producers' decarbonization

[ArcelorMittal](#) is one of the largest receivers of subsidies across many jurisdictions. In the EU the company had a total of €1.65 billion of grants approved for low-carbon projects in 2023. They included an €850 million grant by France to build a direct reduction plant (DRP) and two EAF's at Arcelor's site in Dunkirk; €460 million from Spain to replace a BF with a DRP plant and EAF in Gijon; €280 million from Belgium to replace one of two BFs at a site in Ghent with a DRI plant and EAF; and €55 million from Germany for a "demonstration" plant in Hamburg that will produce steel from 100% renewable hydrogen.

The European plants are due to start operations in 2026, with the exception of the Spanish plant, which is due to be commissioned in 2025. However, as Arcelor recently stated, the Hamburg, Gijon and Ghent projects have been or might be cancelled because of exceptionally high costs and little possibility to make them competitive at current construction and hydrogen costs. Importantly, Arcelor estimates that that it needs hydrogen prices to be about €1.5/kg, well below the average price of €6.3/kg in Europe in 2021, which is difficult to foresee in the near-term. In 2021, [ArcelorMittal](#) received \$500 million in loans and grants from Canada's Ontario provincial government to build a hydrogen-ready green steel plan.

HYBRIT technology, which has been developed by [SSAB](#), [Vattenfall](#) and LKAB, received €143 million from the EU Innovation Fund to build an industrial- and commercial-scale demonstration plant in Sweden, with the aim of replacing coal-fired BF with a green hydrogen-DRI plant. The 500 MW fossil-free hydrogen electrolysis and DRI plant, located in Gällivare will supply an EAF in Oxelösund. The project will also include production of fossil-free pellets for the reduction process.

[ThyssenKrupp](#) (which is not part of our research) has agreed a deal to receive as much as €2.1 billion from Germany to fund green steel development in Duisburg. The funding includes €700 million from the German state of North Rhine-Westphalia.

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