The role of international finance institutions in the transition to low-carbon steel production

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Key messages

- International finance institutions (IFIs) have limited exposure to the steel sector because steel projects have not historically been a natural fit with IFI priorities.
- Most IFIs are only at the early stages of development in their green industrial strategies.
- However, IFIs can play a key role in helping to set in motion the transition to green steel in emerging and developing regions, in helping to de-risk first movers and helping governments to set ambitions, pathways, policy frameworks, and standards.
- IFIs can also directly support the development of green steel value chains by, for example, investing in green hydrogen production projects, by helping to create demand for green steel through IFI investments in infrastructure projects, and through continued support of utility scale renewables needed for the electrification of industrial processes.
- IFIs can provide technical support to governments in developing hydrogen, procurement, and circular economy strategies.
- The ways forward for different IFIs will likely vary significantly, depending on the scale of capital available, the level of development of green industry in their member countries, the type of steel sector development suited to specific countries and regions in which they operate, and on IFIs' specific business and financing models.
- The member nations/owners of IFIs should give these institutions the mandates they need to make industrial decarbonization a priority and to develop and implement industry and steel transition strategies.

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Contents

1. Introduction

The steel sector is a major contributor to global greenhouse gas emissions, currently accounting for 11% of CO2 emissions and 7% of total emissions (Swalec & Shearer, 2021). It is therefore vital to reach net-zero emissions in the steel sector if the goals of the Paris Agreement are to be achieved.

Most steel production is located in Asia, with 54% located in China alone (Bataille et al., 2021). In the coming decades, China is expected to remain the largest producer, though its production will fall while production in the US and the EU is expected to plateau. The largest increases in production are expected to happen in India, Nigeria, Pakistan and Indonesia (Bataille et al., 2021 – see Figure 1). This marks a geographic shift in global production. At the same time, global demand for steel in a medium-demand scenario, where countries converge on 250 kg per capita per year by 2080, is estimated to increase from 1900 million tons (Mt) today to 2200 Mt in 2050 (Bataille et al., 2021). The main drivers of increasing demand for steel are population growth, and industrialization and urbanization in emerging economies (IEA, 2020d).

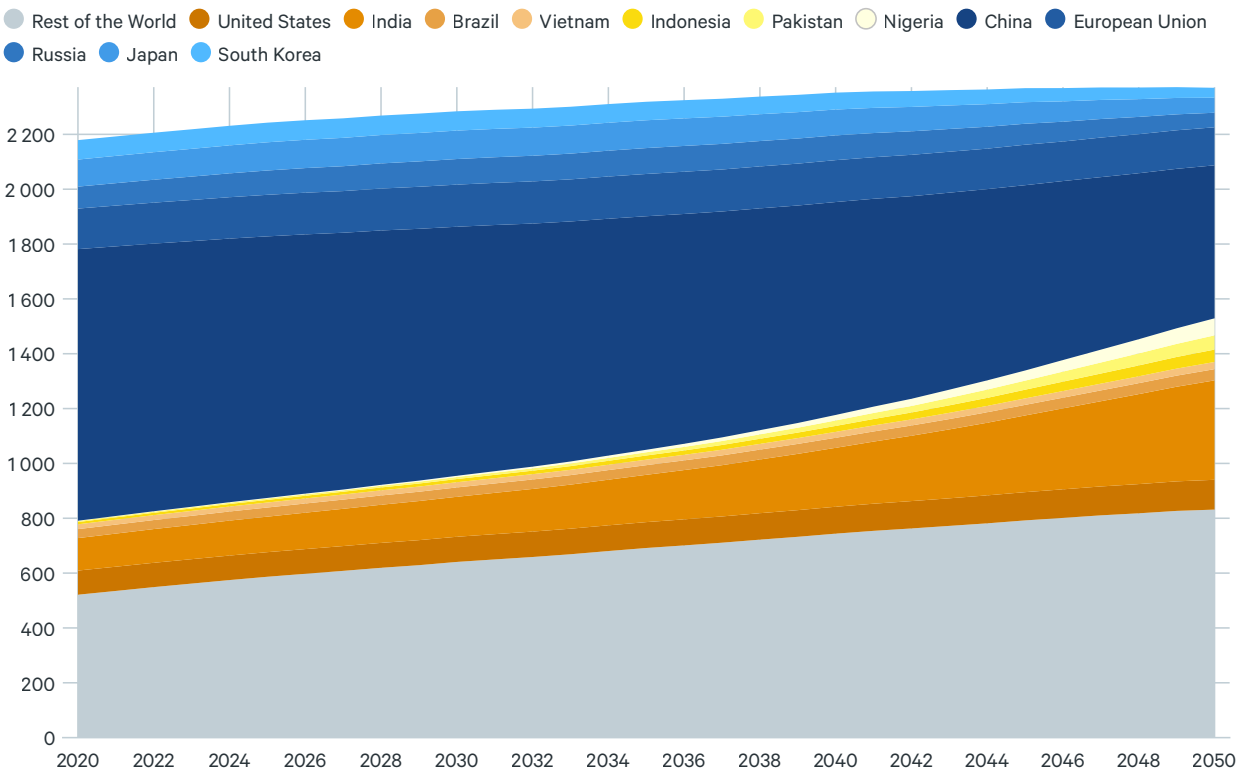


Figure 1. Projected steel production from 2020 to 2050 by location for some of the largest steel producing countries and rapidly growing producers. Global production is set to rise from 1900 Mt to 2200 Mt by 2050. Adapted from (Bataille et al., 2021).

The growing demand for steel in emerging and developing countries, combined with growing production of steel in the same regions, makes it crucial that these countries get onto clean production pathways as soon as possible. In this report we examine what role international finance institutions (IFIs), such as development banks, development finance institutions, and international green funds, can play in supporting the shift to low-carbon steel production in emerging and developing economies. IFIs play an important role both for investment in development and in climate mitigation, but their potential role in promoting green industry, and green steel production in particular, is under explored.

In this report we examine the role IFIs have historically played in the steel sector and what obstacles they face in investing in steel production now. We assess current IFI policies on decarbonizing industrial production generally and on steel production specifically. Based on interviews with key IFIs, the report identifies ways in which IFIs can support the adoption of low-carbon steel production in developing countries. Finally, we provide policy recommendations for IFIs and their member countries to set in motion green steel transitions.

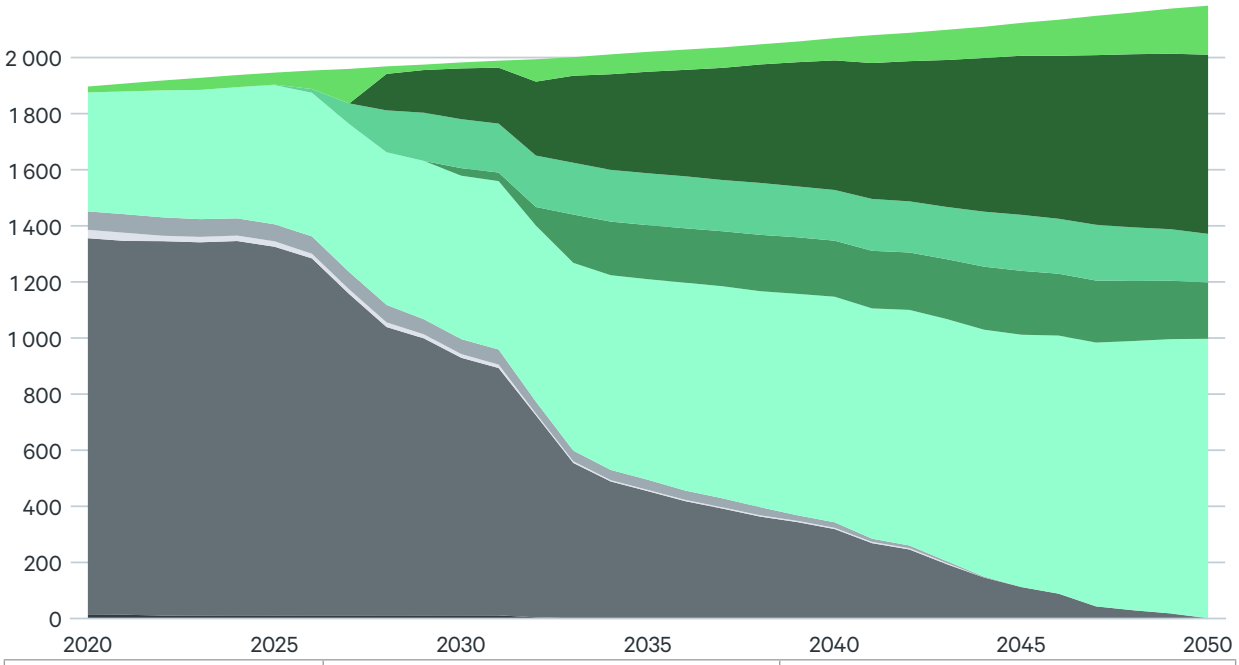
2. Background

2.1 Technology options for decarbonization

Currently, 26% of the steel market consists of steel produced from recycled scrap steel, which means that most production is so-called primary production, based on the mining and processing of iron ore. The most common route for primary steel production today is a coal-based blast furnace-basic oxygen furnace (BF-BOF), with an emission intensity of 2.2 tons of CO2 per ton of steel (direct and indirect emissions). This can be compared to scrap-based electric arc furnace (EAF) production with an emissions intensity of 0.3 t CO2/t. This means primary production and the BF-BOF route is responsible for the vast majority of emissions from the sector (Bataille et al., 2021).

The main route for decarbonizing the sector according to Bataille et al. (2021) involves increasing the amount of steel produced from scrap, with a target to go from 26% of global production from scrap in 2019 to 46% in 2050. For primary steel production, Bataille et al. (2021) find that the most promising technology is direct reduction of iron ore using green hydrogen combined with an electric arc furnace (DRI-EAF-H2). This process entails the electrification of the steelmaking process by producing hydrogen with electrolysers powered by renewable electricity sources and supplying the EAF with electricity from renewable sources. As can be seen in Figure 2, it is large increases in scrap-based EAF production and DRI-EAF-H2 primary steel production that replace BF-BOF without carbon capture and storage (CCS). In the same scenario, traditional BF-BOF production must be phased out completely to meet climate targets, while coal-based BF-BOF combined with CCS (BF-BOF-CCS) only makes up 10% of production in 2050. Coal-based DRI-EAF accounts for a tiny share of production and is also phased out completely along with gas based DRI-EAF without CCS (DRI-EAF-GAS). This scenario would lead to emission reductions per year from 3.0 GtCO2 equivalent globally today to 0.3 GtCO2e in 2050. The scenario shows that all new plants post-2025 must be strictly low-emission plants, and there is

no room for retrofitting BF-BOFs with CCS since the capture rate would be too low – at about 50% capture possible for retrofits (Bataille et al., 2021; IPCC, 2022). [1]



OHF	*Open hearth furnace*	*Fossil fuel without CCS*
BF-BOF	*Coal-based blast furnace*	*Fossil fuel without CCS*
DRI-EAF-COAL	*Coal-based direct reduction of iron*	*Fossil fuel without CCS*
DRI-EAF-GAS	*Gas-based direct reduction of iron*	*Fossil fuel without CCS*
EAF	*Scrap-based steel production*	*Electrified process (low-CO2 electricity)*
BF-BOF-CCS	*Coal-based blast furnace with CCS*	*Fossil fuel with CCS*
DRI-EAF-GAS-CCS	*Gas-based direct reduction of iron with CCS*	*Fossil fuel with CCS*
DRI-EAF-H2	*Green-hydrogen-based direct reduction of iron*	*Green hydrogen produced with renewables*
NSP	*Non-spatially allocated production*	*Production moved to access CCS or green hydrogen*

Figure 2. Steel production by technology globally in a net-zero pathway. Source: Adapted from (Bataille et al., 2021).

Currently, the price of decarbonized steel is higher than the price of conventional steel. This "green premium" is estimated to be between 20% and 40% for DRI-EAF-H2 for the first plants, then falling to between 5% and 20% (Material Economics, 2022). For scrap-based steel the green premium is around 5% (Material Economics, 2022).

1 The steel net-zero scenario above is based on Bataille et al. (2021). Other studies have reached similar conclusions. In the Sustainable Development Scenario (SDS) in IEA (2020b), there are similar regional numbers for steel production with production in EU and the US remaining stable, while production in China decreases significantly and production in India increases rapidly. Both Xylia et al. (2018) and Wang et al. (2021) also suggest substantially higher shares of scrap compared to today (40% and 63%, respectively). In terms of technologies for primary production, IEA (2021) has a lower share of hydrogen-based DRI-EAF (about 10 percentage points lower) and a larger share of CCUS. Note that most announced real-world projects are aiming for the hydrogen-based route (Agora, 2022; Vogl et al., 2022), and retrofitting of BF-BOFs with CCS is referred to as potentially a dead end, in particular because of the low carbon capture rate of 50% (Agora, 2022; Bataille et al., 2021; IPCC, 2022).

2.2. Considerable green gap in planned steel investments

Despite the growing number of steel producers announcing investments to switch to low-carbon production processes, including five out of the top ten largest producers (Vogl et al., 2022), there remains a large gap between steel additions needed and announced low-carbon steel plants in the pipeline. The announced low-carbon plants and announced shutdowns of overcapacity without replacement for the 2020–2030 period are estimated to amount to 236 million tons (Mt) of capacity (as of August 2022), while the total estimated need for re-investment and new investment over the same period is for 1091 Mt of capacity. This entails a gap of 855 Mt of capacity between planned low-carbon production and potential re-investment or new investment in high carbon steel production in this decade (Agora, 2022). As of October 2022, the announced production of primary steel using the DRI-EAF-H2 process represents about 53% of the announced low-carbon capacity, while scrap-based EAF projects represent the remaining 47% (Agora, 2022).

So far, most new low-carbon projects for primary production are in high income countries and China (Vogl et al., 2022), while developing and emerging economies to a large extent are planning on high carbon capacity additions. Some developing countries such as Iran are planning for EAF additions, while countries including India, Viet Nam and Malaysia have high-capacity additions of high carbon assets in the pipeline for the coming decade (OECD, 2021).

Steel production requires high levels of capital investment over long investment cycles, and firms operate in highly competitive international markets with thin profit margins (IEA, 2020c). At the same time, the scale of the transformation of the sector requires around a 20% increase in investment compared to business-as-usual (IEA, 2020b). This, combined with the higher operating cost for producing low-carbon steel, makes the transition challenging.

Major efforts need to start now to overcome these challenges because the 2020s are a crucial window in which the transition to green steel must be accelerated. Most of the steel plants in operation today were built between 1990 and 2010 and will thus need to be relined in this decade (Agora, 2022; Bataille et al., 2021; IEA, 2020a). In developing and emerging economies there will be a substantial amount of new steelmaking capacity added up to 2030. It is crucial that low-carbon solutions are chosen during this period of re-investment and new investment to avoid lock-in of carbon-intensive steel production for decades that will undermine climate targets. Emerging and developing countries could be in the forefront of the steel transition, but to achieve this, low-carbon technologies need to be financed and implemented.

2.3. Challenges for the steel transition in developing and emerging economies

Many of today's steel producing developing countries have a low penetration of electricity from renewable energy and nuclear, which are particularly important for electrifying the steelmaking process (Arens et al., 2021). India is expected to have the largest growth in steel production, and it also has ambitious targets for decarbonizing electricity generation, however many other developing countries do not have sufficiently ambitious targets on renewables (Arens et al.,

2021). More generally Arens et al. (2021) find that no countries outside the EU-28 combine ambitious long-term climate targets with ambitious medium-term renewable energy targets. More ambitious targets are needed to improve prospects for decarbonizing the steel sector, and Arens et al. (2021) warn that current 2030 climate targets do not put any pressure on steel producers to decarbonize.

The green premium of low-carbon steel, combined with the risks and costs of investing in new low-carbon technologies and long payback periods, are barriers to decarbonation shared by all heavy industry. These types of barriers can be particularly difficult to overcome in developing countries that have poorer access to affordable capital. Today, most of the finance for steel comes from state-owned enterprises and private corporations. However, a recent assessment for the Asia-Pacific region by the Glasgow Financial Alliance for Net-Zero (GFANZ) argues that, for both more and less developed countries, public finance will need to play a much larger role to realize a transition of the steel sector. The assessment found that up to 2040 about 3% of required finance is projected to be public funds designed to reduce the risk of private investment, and about 49–55% to be some form of direct public finance (GFANZ, 2022). The role of public sources of finance is likely to be especially important in developing regions.

The increasing need for public finance, alongside the particular challenges emerging and developing countries face in decarbonizing heavy industry, raises the question of how IFIs can help to decarbonize the steel sector in these economies. IFIs appear to be well placed to help launch steel transitions in these markets given their mandates for advancing economic development and their increasingly important role in advancing climate mitigation and adaptation.

3. Methodology

To assess the extent of IFI's past and current investment in the steel sector we searched the project databases of 24 IFIs (see Table 1) for steel related projects using keywords related to the steel sector.

Table 1. IFI databases assessed for this study

• African Development Bank - AfDB • Arab Fund for Economic and Social Development - AFESD • Asian Development Bank - ADB • Asian Infrastructure Investment Bank - AIIB • Black Sea Trade and Development Bank - BSTDB • Caribbean Development Bank - CDB • Climate Investment Funds - CIF • Council of Europe Development Bank - CEB • Development Bank of Latin America - CAF • Eurasian Development Bank - EDB • European Bank for Reconstruction & Development - EBRD • European Financing Partners - EFP • European Investment Bank - EIB	• Global Environment Facility - GEF • Green Climate Fund - GCF • International Finance Corporation - IFC • Inter-American Development Bank - IADB • Islamic Development Bank - IsDB • New Development Bank - NDB • Nordic Investment Bank - NIB • North American Development Bank - NADB • OPEC Fund for International Development - OFID • Organization of American States - OAS • World Bank

We also examined the current policies and strategies for climate mitigation, decarbonization of heavy industry, and decarbonization of 12 IFIs. We selected IFIs that are important for development and climate investments in developing regions and those that could be expected to have more advanced industry strategies. This data provided us with a map of the current exposure of IFIs to the steel sector and the status of their forward planning for it.

In addition to desk research, we interviewed representatives from IFIs that are important sources of development and/or climate finance in those developing and emerging regions in which steel production can be expected to expand over the coming decades. The interviews were designed to get a better understanding of the barriers IFIs face to advancing the transition of the steel sector and what opportunities they see for playing a larger role in the transition.

For the interviews, we approached several relevant IFIs and were able to secure interviews with seven of these organizations. Over the first half of 2022, semi-structured interviews were conducted using an interview protocol. We presented our desk-research findings to the interviewees to get their feedback on accuracy and their input on their current engagement with and strategies for the steel sector. Discussions then centred around barriers and opportunities for IFIs in the steel sector transition. The IFIs were offered anonymity for the interviews, and in the results, we do not link responses to specific IFIs. The interview results were interpreted by each member of the research team to tease out the main themes in the responses and to verify these interpretations between team members. Our initial interpretations of the data were compiled and shared with our interviewees (via email) to give them an opportunity to correct any misinterpretations and to give respondents the opportunity to expand or further clarify responses. We then updated our analysis based on these responses.

4. Results

4.1 IFI exposure to the steel sector and existing policies and strategies

An overview of the project databases of 24 major IFIs revealed that between 2000-2021 a total of 79 steel projects were approved for financing by nine IFIs (namely ADB, BSTD, EBRD, EIB, GEF, IFC, NIB, OFID and WB) that total EUR 3.4 billion of investment (inflation adjusted).

As shown in Figure 3, most of these investments are concentrated in Europe and Central Asia, followed by South Asia, and the Middle East and North Africa. The volumes of investment in these regions contrast with the regions where production is expected to increase in the future.

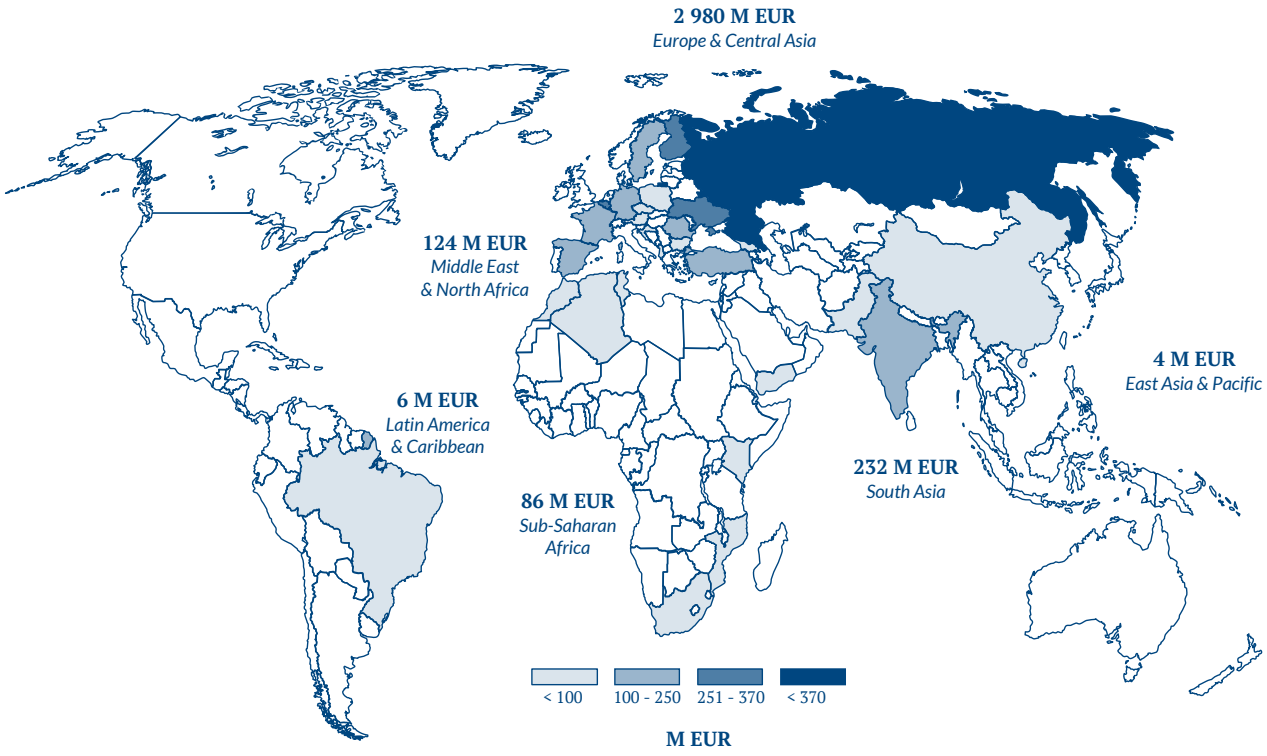


Figure 3. Volume of IFI investments in steel projects by region between 2000 and 2021

Furthermore, as shown in Figure 4, most investments from IFIs in the steel sector have focused on modernizing existing plants through new equipment, including new rolling mills, manufacturing equipment and capacity expansion. However, these modernization projects are business-as-usual upgrades and process optimizations driven by cost reductions rather than modernization carried out to meet climate targets. In short, the large majority of IFIs' investments in the steel sector to date have not been directed towards transformative or radical change of production processes. The main exception is EIB, which in 2021 provided a substantial amount of finance for research, development, and innovation related to reducing emissions from steel projects.

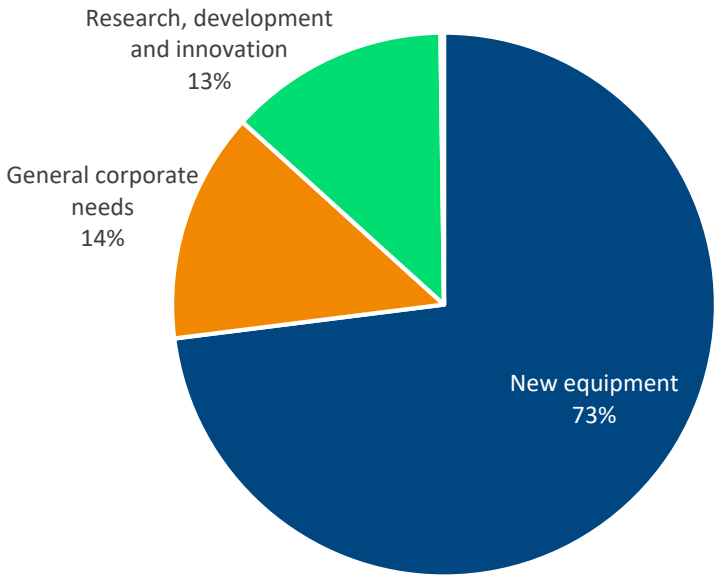


Figure 4. Percentage of IFI investments allocated for different purposes in steel projects between 2000–2021.

Note: Feasibility studies made up less than 0.5% and have been omitted.

4.2 IFIs' strategies and policies

As Figure 5 shows, four of the 12 IFIs we selected for review have published specific decarbonization strategies related to heavy industry and only two have such strategies related to steel. Based on our interviews we find that three more are planning to publish policies explicitly focused on heavy industries in upcoming strategy documents and one of these strategies will address steel specifically. For those IFIs that do have industry decarbonization strategies in place, these tend not to be very detailed and to only cover industry best practice, energy efficiency, and circularity.

In terms of steel, EBRD has the most developed decarbonization strategies, which include the financing of technologies and infrastructure for clean energy and emissions reduction. EBRD is also working with the International Energy Agency on developing low-carbon pathways. The IFC mentions investments in decarbonizing the steel sector as an example of the type of

investment they could make via a new fund, run by the venture capital firm The Engine, to scale up global technology solutions in emerging markets. In their 2021 report, the IFC report a USD 20 million investment in the fund (IFC, 2021).

On the other hand, the BSTDB continues to explicitly support projects involving metallurgical coal for steelmaking (BSTDB, 2021). This goes against the trend of major IFIs moving away from financing coal projects over the last decade (IISD, 2021; Oil Change International, 2019). At the same time, none of the strategies and policies we reviewed comment on exposure to coal as a consequence of investments in conventional steelmaking projects.

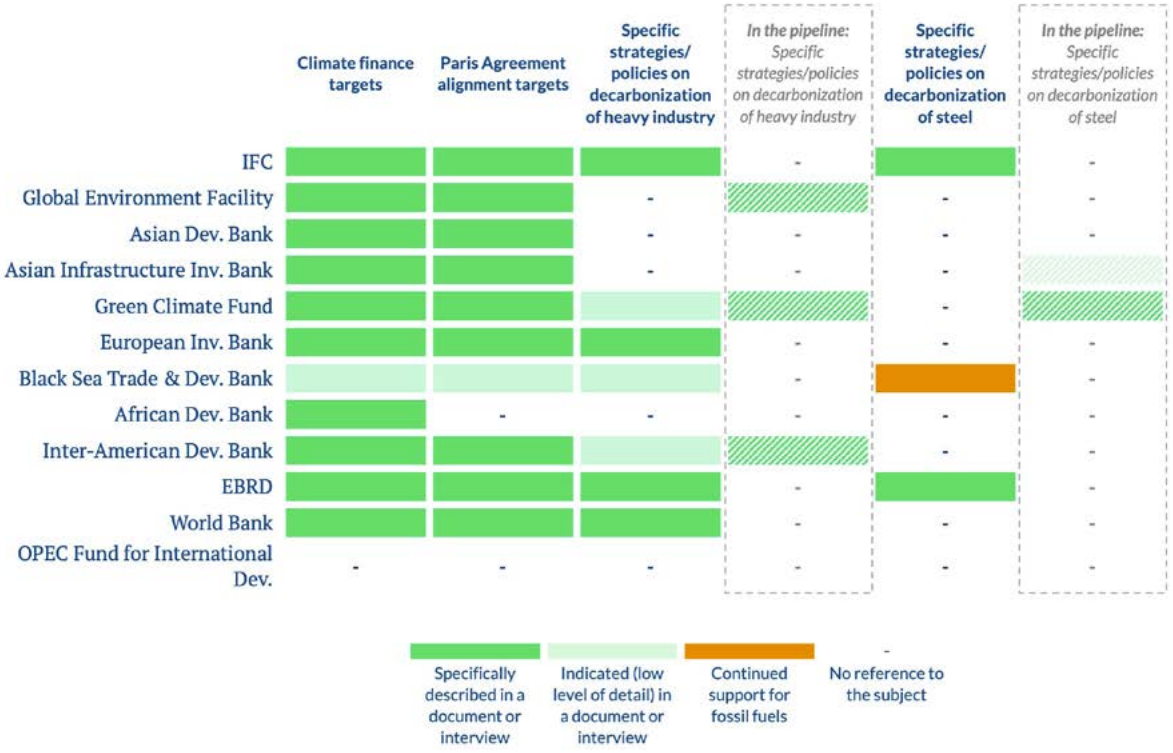


Figure 5. Existing and upcoming decarbonization strategies and policies of major IFIs

Most IFIs subscribe to common greenhouse gas accounting frameworks that consider significant embodied emissions (scope 3 emissions) from financed projects. Yet most IFIs do not define what "significant" means, and few of them have published anything on scope 3 emissions related to heavy industries or the use of heavy industry products such as cement and steel, in, for example, infrastructure projects. The only notable exception is the Inter-American Development Bank, which has published methods for calculating greenhouse gas emissions for steel, iron and cement, as well as a method for calculating embodied emissions (e.g. in buildings and construction).

4.3 IFI perspectives on barriers and opportunities to invest in the steel transition

Based on our interviews with selected IFIs we identified barriers that help to explain the limited exposure to the steel sector among IFIs over at least the past two decades. Our respondents also identified opportunities for IFIs to play an important role in accelerating the shift to low-carbon steel production in developing and emerging economies.

4.4 The size of the firms and investments involved

One of the key reasons for IFI's modest exposure to the steel sector can be explained by the types of companies involved in the sector and the size of the investments needed to develop steel production facilities. Steel producers tend to be large firms that are financed by corporate banks and from capital markets, while IFI finance tends to be directed to small and medium enterprises and to companies where IFIs can provide financing that is additional to what the private market can provide (so called "additionality"). At the same time, IFI due diligence processes and requirements on sustainability performance can make them an unattractive source of funding for industrial corporates compared to private sector sources. IFIs may also face challenges associated with the ownership structure of steel companies, e.g. forms of state ownership that weaken the transparency, corporate governance, or bankability of companies. Investments in steel production are also very capital intensive and for some IFIs the financing they can provide is not at the scale that is needed. For other IFIs, the investment could leave them over-exposed to a particular company or sector. In some cases, IFIs may need government guarantees to direct significant financing to a large new steel project given their diversification requirements.

Opportunities for IFIs

De-risking and financing first movers

Despite several obstacles to IFI engagement with the steel sector, there is significant potential for IFIs to contribute to the deployment of green steel production. Supporting early adopters of low-carbon production technologies and practices can be a strong fit for IFI financing. Working with first movers, IFIs can meet their additionality and climate impact requirements even in a context where large amounts of corporate financing will need to play the main role in the realization of a project. IFIs financing can be important for de-risking investments and mobilizing other sources of private capital, for helping projects to access other sources of official climate finance, and for delivering credible due diligence to projects that can help to attract other investors.

4.5 Country priorities

Many IFIs, such as multilateral development banks, have not tended to provide finance to large industrial sectors, focusing instead on basic infrastructure investments. At the same time, developing and emerging countries have yet to prioritize decarbonizing the steel and cement sectors, with much of the current climate financing focused on generating clean energy, as well as adaptation measures. Furthermore, demand for green industrial products has yet to emerge in developing countries, and their governments are yet to set targets and policy frameworks for transitioning industrial sectors. These issues are particularly challenging for some IFIs whose finance priorities are country driven, because climate finance will need to be directed towards national priorities for sustainable development. Without the right kind of demand from governments and markets, there is not a pipeline of financing opportunities for IFIs in this space.

Opportunities for IFIs

Hydrogen strategies and road maps

New technologies, such as hydrogen-based steel production, appear to be soon ready for commercialization (Vogl et al., 2022). Hence, there is a clear climate impact case for IFIs to engage with green steel production. IFIs can support emerging technologies, especially hydrogen production from renewable electricity. Hydrogen has a role to play in the transition of several sectors, so IFI engagement can also support multiple transition pathways. As a first step, IFIs can help to facilitate country road maps for hydrogen in collaboration with government and industry. This type of road mapping and planning helps to send clear signals to market actors on the directions that countries are taking.

Supporting government priorities

The priorities of both donor and recipient countries guide IFI lending practices. IFIs can act as knowledge partners to support countries in further developing their priorities. This can be a way for IFIs to support first steps towards green industry strategies with lower levels of funding. For some IFIs, financing large industrial actors may never be a good fit, but directing financing towards feasibility studies and the development of policy frameworks can be a critical capacity-building step.

4.6 Environmental, social, and technology challenges

IFIs have strong sustainability mandates and these mandates can make them hesitant to engage in the steel sector. Primary steel production depends on the mining of iron ore and there are significant environmental and social issues related to this. And with current technologies, primary steel production also emits a large amount of CO2. The efficiency gains that are

possible from modernizing plants that use current technologies may not deliver the level of climate impact IFIs are seeking. Moreover, new low-carbon production technologies for steel production are not yet proven and there is not a pipeline of bankable projects.

Opportunities for IFIs

Small and medium-sized enterprises (SMEs) and green value chains

IFIs can also play a role in financing innovative SME enterprises that are part of green value chains for industrial production. This approach may be a better fit for some IFIs than working with large established corporates. Hydrogen production and transport are good examples of potential IFI niches in the green steel value chain. Other opportunities could be found in value chains in scrap-based steel production.

Demand for green industrial products

On the demand side, IFIs could support governments in developing standards and green public procurement frameworks or road maps. IFIs can also develop their own green procurement standards, which can be important for developing lead markets, given their role in financing basic infrastructure. There are challenges for IFIs on the demand side given that green steel is not currently available. At the same time, the development of strategies and standards for defining green materials and products would send important market signals, and IFIs have the potential to play a key leadership role in setting out the way forward on green procurement

Secondary steel production

Steel production that is based on scrap must rise dramatically from a quarter of total global production to half of global production. Scrap-based production can be particularly important in the developing regions IFIs are engaged with. Our research and interview responses indicate that this type of steel production can be a good fit with IFI priorities and financing given its clear climate benefits and the scale and location of projects. Furthermore, many IFIs are also placing a growing emphasis on circular business models, and historically, the only greenfield projects financed by IFIs having been for secondary steel. EBRD funded one mini-mill project in Georgia in 2008 and one in Russia in 2007 (EBRD, 2007, 2008).

Continued support for the expansion of utility-scale renewables

Production of green hydrogen is dependent on access to large amounts of low-carbon electricity, and likewise the decarbonization of scrap-based production is also dependent on access to low-carbon electricity. IFIs can support the electrification of steel production and of industrial production more generally by continuing their support for investments in utility scale renewables.

5. Policy recommendations for IFIs and IFI member countries

IFIs have limited exposure to the steel sector and tend to be in the early stages of developing strategies for financing transitions in heavy industry. However, we found that IFIs can play a key role in accelerating transition to green steel in those emerging and developing economies where demand for steel is expected to rise, and where most of the new carbon intensive steel is announced (OECD, 2021).

One important role for IFIs is to draft new strategies or revise existing policies for helping governments to develop road maps, policy frameworks and standards for decarbonizing the steel sector. This is crucial because the lack of an enabling policy framework is a barrier to private sector action. Most countries in our study lack policy incentives, tax benefits, carbon pricing or specific green procurement policies to support companies in making investment decisions. IFIs could provide governments with know-how and resources to create such a supporting policy environment and reduce uncertainty for companies and funders.

Demand creation has been identified by many as crucial for transforming the steel sector, due the price premium associated with low-carbon production processes (Bataille, 2020; Hermwille et al., 2022; Maltais et al., 2022; Vogl et al., 2021). IFIs are big funders of steel-intensive infrastructure projects and could therefore stimulate the demand for green steel by setting greenhouse gas targets, including embodied emissions, for these projects. IFIs can assess their ability to support demand for green steel through their infrastructure investments. They can also help governments to create similar procurement strategies for their investments in infrastructure and construction.

Although this study finds that IFIs could take a leadership role in green steel, it is the member nations and owners of the IFIs that must give these institutions the mandates they need to develop and implement industry and steel strategies. Currently, only Sweden has made a heavy industry sector-specific contribution to the Climate Investment Fund. We recommend that IFI member nations make industrial decarbonization a priority.

Decarbonizing the steel sector requires substantial growth in scrap-based steel production. IFIs can assist governments in creating strategies and policies that promote circularity. IFIs could also adopt targets for circularity within the projects they are funding.

There are many other opportunities for IFIs to play a role in the steel transition. However, each IFI and the region it focuses on is different. Therefore, the role of IFIs in greening the sector will depend on the amount of capital available, how far green industry has developed in member countries, and how different models of developing the steel sector fit with specific countries or regions and the different financing and business models of IFIs.

We believe IFIs are now well placed to develop detailed plans and policies for their role in decarbonizing heavy industry, and to work out, in collaboration with governments and private actors, how they can support the acceleration of investment into green industrial production.

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