DECARBONIZING THE STEEL SECTOR

The role of financial institutions

RECLAIM Finance

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1. THE CLIMATE IMPACT OF STEEL

Steel production is the highest carbon dioxide (CO2) emitter among heavy industries. The steel sector accounts for around 7% of global greenhouse gas (GHG) emissions and 11% of global CO2 emissions.[1] In 2019, the sector accounted for 2.6 gigatonnes (Gt) of direct CO2 emissions globally, representing about one-quarter of industrial CO2 emissions, 7% of total energy sector CO2 emissions and more than the CO2 emissions from all road freight that year.[2] In comparison, the aviation sector accounts for 2.1% of global CO2 emissions.[3]

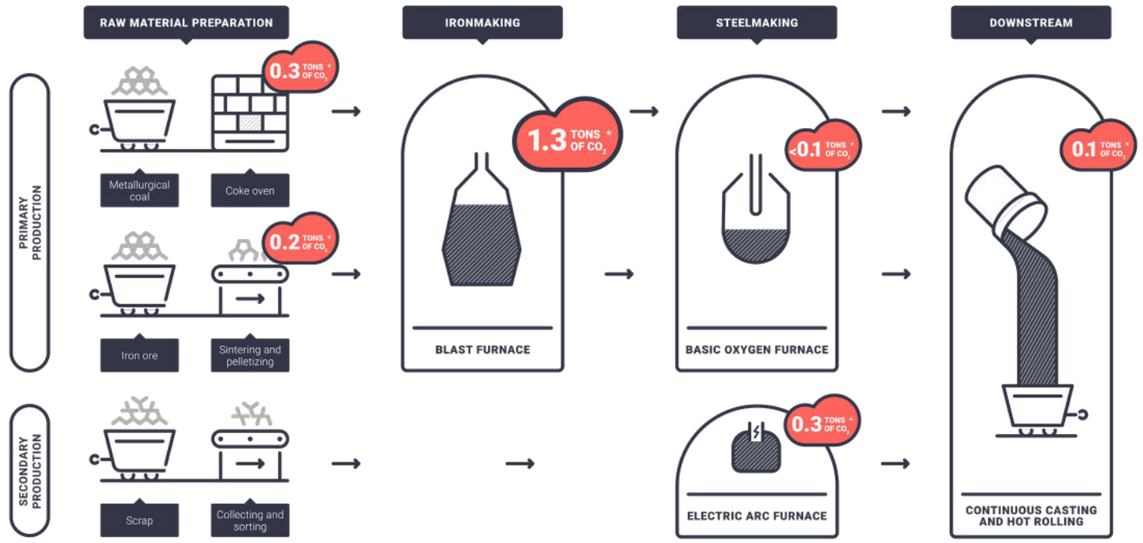
Steel sector emissions are primarily due to its reliance on coal. Metallurgical coal meets 75% of the sector's energy needs.[4] In the steelmaking process, metallurgical coal, also called coking coal or met coal, serves as a reducing agent, a source of energy and a source of carbon. It is used in the primary steel production route – the blast furnace to basic oxygen furnace route – which accounts for around 70% of steel production worldwide.[5] For one tonne of steel produced through this route, between 1.5 and 3 tons of CO2 are released into the atmosphere.[6]

2. STEELMAKING PRODUCTION ROUTES

There are two main ways to produce steel:

- **Primary steelmaking** from iron ore accounts for around 70% of global steel production. It is the most emissions intensive way of producing steel, with on average seven times more emissions than secondary steelmaking.[7] Primary steelmaking is almost exclusively done through the blast furnace to basic oxygen furnace route (BF-BOF) using metallurgical coal.
- **Secondary steelmaking** relies on electric arc furnaces (EAF), which are mainly used to process scrap. It accounts for almost 30% of global steel production.

OVERVIEW OF THE MAIN STEELMAKING PROCESSES

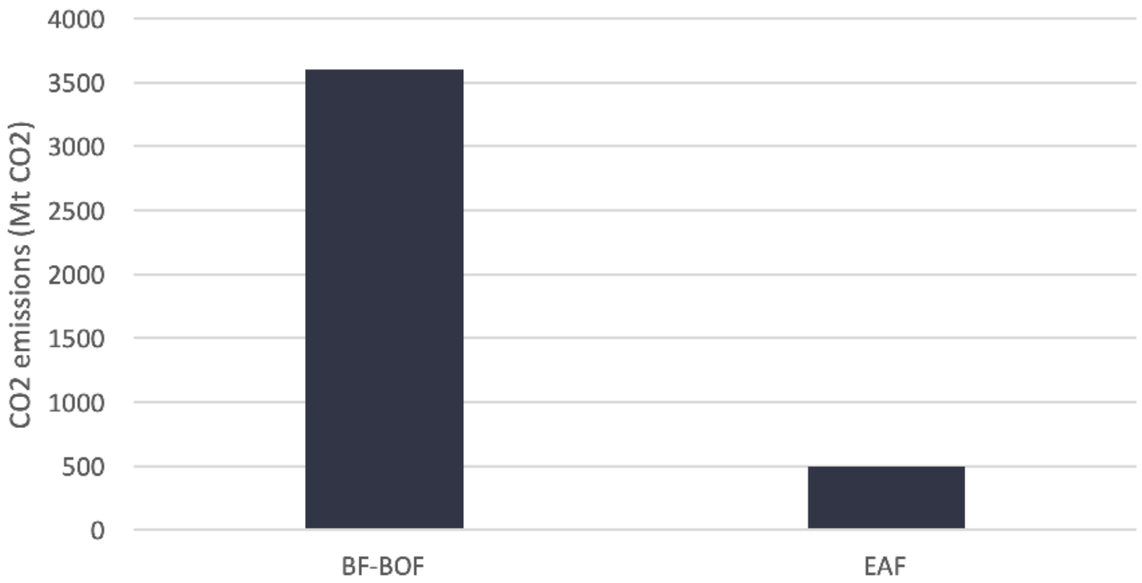


*per ton of steel - Sources: IEA; Material Economics, Industrial Transformation 2050 - Graphic design: guenole.fr ©2023

Source: IEA

The BF-BOF route is both the most CO2- and coal-intensive way to make steel. Producing a tonne of crude steel via this route with coal injection (90% of BF-BOF steel production) directly emits around 1.2 tonnes of CO2 per ton of crude steel. In addition, it results in an average of 1.0 ton of CO2 per ton of crude steel in indirect emissions from electricity and imported heat generation. In comparison, scrap-based EAF production directly emits only about 0.04 ton of CO2 per ton of crude steel, and results in an additional 0.3 ton of CO2 per ton of crude steel in indirect emissions.

Global steel industry CO2 emissions in 2019 by process type



Source: Global Efficiency Intelligence

3. CLIMATE SCIENCE ON STEEL DECARBONIZATION

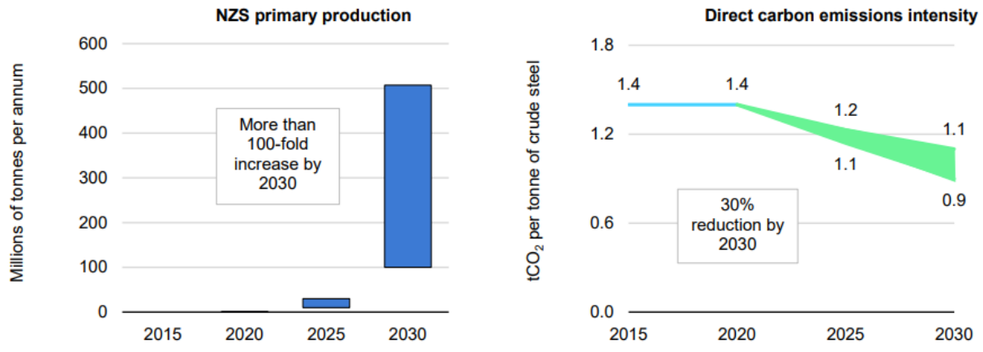
a. Steel decarbonization is the only way forward to keep the 1.5°C target within reach

The International Energy Agency's Net Zero by 2050 report (IEA NZE) calls for steel sector emissions to drop by 25% by 2030 and almost 92% by 2050.[8] It implies that the direct CO2 intensity of crude steel production needs to fall by approximately 4% each year between 2020 and 2030, though it has remained constant in the past few years. The IEA calls for metallurgical coal production to fall by about 30% by 2030, and by 88% by 2050, based on 2021 levels.[9] This implies that a 100-fold increase in net-zero steel production needs to happen by 2030.

Another 1.5°C pathway published by E3G in collaboration with the Pacific Northwest National Laboratory[10] calls for an even quicker decarbonization of the steel sector, with targets for decreasing emissions by at least 50% by 2030 and 95% by 2050, based on 2020 levels. According to this pathway, a ten-year delay in action would result in an additional 20 Gt of CO2 being emitted by the steel industry between 2020 and 2050, accounting for about 5% of the remaining total global carbon budget with a 67% probability of limiting global warming to 1.5°C.

Yet, steel emissions are growing in Europe, where the steel sector makes up 8% of EU Emissions Trading System (ETS) emissions. Approximately 80% of these emissions

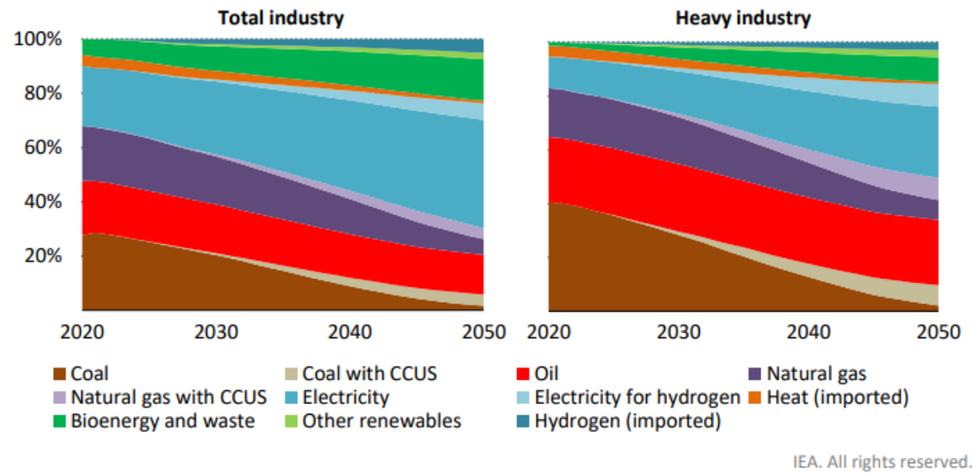
Change in direct carbon emissions intensity and net-zero steel primary production needed to meet climate goals, 2015-2030



Notes: The change in the direct carbon emissions intensity includes process emissions, and exludes Scope 2 and 3 emissions.
Sources: IEA, 2021; Bataille, Stiebert and Li, 2021; E3G & PNNL, 2021; MPP, 2021; and Agora Industry, 2021.

Source: The Breakthrough Agenda Report 2022

Global final industrial energy demand by fuel in the NZE



Source: IEA

are from only 30 blast furnaces, according to a study by Ember Climate.[11] The study also found that coal-fired blast furnaces became the biggest CO2 emitters in seven European countries in 2019: the UK, France, Spain, Austria, the Netherlands, Finland and Slovakia,[12] surpassing coal power plants. This was the first time that steel plants in Spain and the Netherlands had bigger emissions than coal power plants.

b. Existing solutions to decarbonize the steel sector

Climate science is clear on the need to decarbonize the steel sector rapidly if we are to achieve the goals of the Paris Agreement. Though the steel sector has for many years been dubbed as 'hard-to-abate' by policymakers, due in part to the lack of viable alternative technologies, multiple analyses now show that thanks to recent technological advances, the steel sector can be almost fully decarbonized by 2050.[13]

Three major studies explore available options for the steel sector to achieve net zero by 2050[14] and outline the different solutions for decarbonizing the steel sector in time.

There are currently three groups of solutions to decarbonize steel:

- Reduce the use of steel.
- Increase quality and efficiency, and scale-up recycling.
- Develop new technologies and clean sources of energy. This includes:
  - recycled electric arc furnace (EAF) steel with renewable electricity;
  - primary steel from hydrogen-based direct reduced iron (HDRI) to EAF;
  - methane-fed direct reduced iron (DRI) furnaces with carbon capture and storage (CCS); and
  - blast furnace to basic oxygen furnaces (BF-BOF) with CCS.

Studies however highlight both the limited potential of CCS and the risk that investments in CCS for the steel sector may be a dead end.[15] Maximizing the use of recycled scrap and fast-tracking the innovation process needed to commercialize green hydrogen-based DRI is therefore essential.

c. Steel companies are waking up

Increasingly, steel companies are committing to net zero emissions by 2050 and some are committing to initiatives such as the Science-Based Targets initiative (SBTi).[16] Today, at least nine companies, representing around 20% of global steel production and including the five largest producers, have set firm net zero emissions commitments.[17] Reaching these commitments requires investing in the right technologies and committing to making the right choices to transform existing facilities.

There are already several projects being developed that will use new sustainable technologies. According to the Green Steel Tracker developed by the Leadership Group for Industry Transition (LeadIT),[18] there are currently 73 green steel projects in the world,[19] out of a total of over 300 steel projects in the pipeline.[20] However, the tracker shows that most of the green steel projects are located in Europe, whereas demand will mostly be in developing and emerging economies.

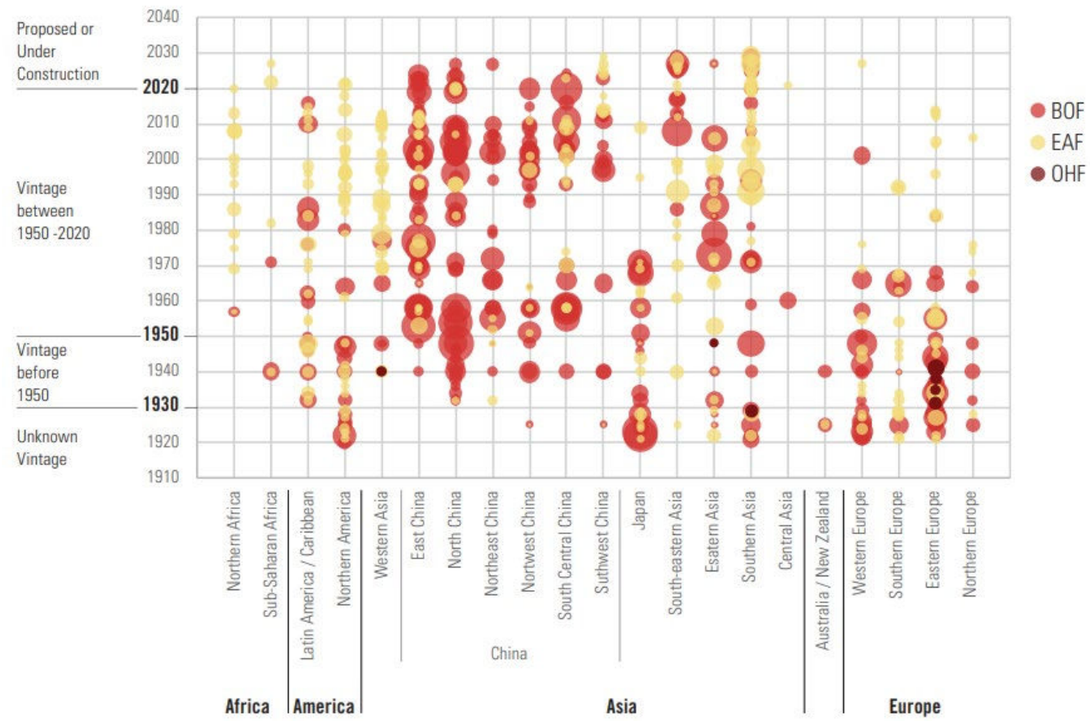
4. NOW IS THE TIME TO ACT

a. Steel demand is expected to increase

In the coming decades, steel demand is expected to grow[21] in developing and emerging economies in particular. Steel consumption increases as countries develop, driven in part by the construction, automotive and manufacturing sectors. Steel will also play a key role in the energy transition via its use in infrastructure and products, such as wind turbines, solar panels and electric vehicles.

The IEA's The Breakthrough Agenda Report 2022[22] points out that less than 1 megatonne (Mt) of primary 'near-zero' emission steel is currently produced per year, whereas over 100 Mt will be needed by 2030. Projections by the Mission Possible Partnership (MPP)[23] show that steel production, already 1,950 Mt today, could increase by a third by 2050.[24] Achieving this would require the build of new facilities to expand current steelmaking capacity. However, in the absence of targeted measures (e.g. for primary near-zero emission steel) and technology breakthroughs, the MPP finds that steelmaking could emit another 90 Gt of CO2 by 2050 – almost 20% of the remaining global CO2 budget with a 50% chance of limiting global warming to below 1.5°C.[25] The Breakthrough Agenda

Global steel production by type and era of build in 2019 (GEMs Database)



Source: IDDRI, Global facility level net-zero steel pathways

Report also draws attention to the erroneous direction being taken in many parts of the world: approximately 114 Mt of new steelmaking projects were in the planning stage as of late 2021, with these relying for the most part on high-emission steelmaking routes. Financial institutions will therefore need to make the right investment choices by financing steel production that uses the least carbon-intensive methods.

b. Facilities are nearing the end of their lifetimes

In parallel to new projects, existing steelmaking infrastructure is growing older and decisions about its future will soon need to be taken. BF-BOFs have an average lifetime of 20 years. A very large portion of the BF-BOF fleet was built in 1990-2010[26] – many BF-BOFs are therefore coming up for furnace relining in the current decade.

In fact, this is the case for more than 70% of existing coal-fired blast furnaces – comprising 2.4 million jobs and around 2.2 Gt of carbon emissions – all of which need to be refurbished by 2030.[27]

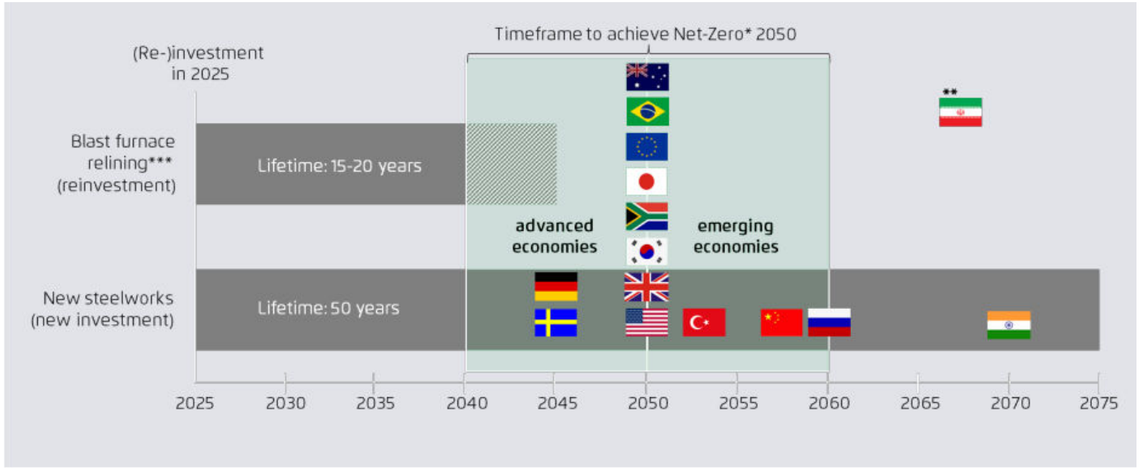
Furthermore, by 2050, practically all major production assets, even those that have been built recently or are currently under construction, will require substantial reinvestments.

c. Major investments are coming

The long lifetime of steel plants means that, if net-zero steel emissions are to be achieved, decisions on how steel will be produced come 2050 need to be made now. An analysis by the Mission Possible Partnership[28] finds that the transition of the current global steel base to net-zero compliant technologies will require an additional US$8 to US$11 billion investment annually — equal to US$235 to US$335 billion of additional investment cumulatively by 2050. This analysis also shows that, even without major transformation, the steel sector would need approximately US$47 billion in investment annually to meet growing demand over the next 30 years and to maintain existing sites. This means that, in either case, steel companies are going to need the support of financial institutions to raise necessary funds.

As indicated already, rising demand will require new projects to be built while existing facilities are rebuilt or replaced. Meeting sector growth needs with coal-based capacity risks creating long-term carbon lock-in and stranded assets.[29] While demand-side levers have an important role within all pathways for steel decarbonization, financial institutions also have a key role to play by making the right investment choices that support the development of green steel technologies. As studies converge to show that the steel sector can be decarbonized while still meeting demand – implying the need for significant investment in new technologies – the opportunity is being created for financial institutions to make these right choices now.

Technical lifetime of coal-based primary steel production capacity and timeframe to achieve Net-Zero 2050



Agora Industry, 2021

* South Korea and South Africa have announced carbon neutrality targets. The targets of Australia, Russia and Turkey are not official yet. All others have announced net zero targets. **n/a; no target *** 15 years lifetime in advanced economies; 20 years lifetime in emerging economies

Source: Agora Industry

In summary, major investments are coming, and with them the opportunity for financial institutions to actively take part in the decarbonization of the steel sector. This can be done by conditioning their financial services to 1.5° aligned decarbonization targets, and engaging with steel companies to push them to set ambitious climate objectives.

5. RECOMMENDATIONS FOR FINANCIAL INSTITUTIONS

Financial institutions have a key role to play in decarbonizing the steel sector by ensuring that financial investments are directed at the right technologies, allowing the industry to move away from metallurgical coal. Considering the climate impact of coal-based steelmaking and factoring in the time-sensitivity of steel decarbonization, Reclaim Finance urges financial institutions to:

- **End all direct support to new metallurgical coal mines and metallurgical coal mine expansions, and offer financial services to clients and investee companies active in the sector on condition that they commit to halting the development of such projects.** Most financial institutions already have policies that cover thermal coal. Now is the time to complete these policies by also addressing metallurgical coal, guaranteeing that all coal commitments are comprehensive and consistent. Though metallurgical coal will continue to be used for steelmaking in the coming years, the sector needs to transition to new ways of producing steel now – and, indeed, is already starting to do so. Investing in new metallurgical projects is thus counter-productive and risky.
- **End all direct support to coal-based steelmaking facilities, including: new BF-BOFs, BF-BOF expansions, BF-BOF retrofits; and apply a condition to financial services offered to clients and investee companies that they commit to halting the development of coal-based steelmaking facilities, including expansions, modernizations or retrofits of existing facilities.** Steel sector emissions predominantly come from the BF-BOF route, which uses metallurgical coal. Tackling steel sector emissions thus requires changing the way steel is produced. Building new coal-based facilities or extending the lifetime of existing ones is therefore incompatible with decarbonizing the steel sector.
- **Ask clients and investee companies to develop the right technologies.** When building a new project or replacing a BF-BOF that has reached the end of its lifetime, financial institutions have a key role to play in asking steelmakers to develop the most adequate technologies. Priority must be given to the least carbon-intensive solutions, maximizing the secondary steel route through electric arc furnaces running on renewable energy, and avoiding wasting time and resources on unproven and unsustainable solutions such as CCS.
- **Ask steel and metallurgical coal companies to adopt and publish robust climate strategies, with a commitment to a 2050 net zero objective aligned to a 1.5°C pathway.** Pushing companies to publish more information on their climate commitments, and to consult shareholders through Say on Climate, can be a way to compel industry actors to raise their climate ambitions to a suitable standard.

  This includes:

  1. Calling on clients and investee companies to adopt a robust and comprehensive climate plan, including submission to a shareholder vote. This climate plan should at least include the following indicators:
     - ✔ Short- and medium-term GHG emissions reduction targets on Scopes 1, 2 and 3, expressed in both absolute and intensity terms, encompassing all activities.
     - ✔ Possible contribution of captured GHG volumes to achieving emissions reduction targets.
     - ✔ Carbon offsetting approaches that may be implemented to complement the reduction targets.
     - ✔ Targeted energy mix evolution for the short- and medium-term.
     - ✔ Short- and medium-term capex plans disaggregated by activity and by allocation between maintenance and development of company assets.
     - ✔ Short- and medium-term opex disaggregated by activity and by cost item.
     - ✔ Explanation of a baseline scenario used to set climate targets, and how it considers the best available science.
  2. Asking companies to make climate strategy an integral part of their governance. This includes:
     - ✔ Making sure the board has a clear oversight of climate change and has named a board position with responsibility for climate change, ensuring that the board overall has sufficient capabilities to assess and manage climate-related risks and opportunities.
     - ✔ Incorporating climate change performance within the company's executive remuneration scheme.
     - ✔ Committing to reflect the way in which climate change and global decarbonization efforts are being captured in critical accounting assumptions and judgements within the company's accounting practices and related disclosures.

  Reclaim Finance's detailed recommendations on companies' climate commitments can be found here.

Growing momentum within the financial sector around steel decarbonization

- The Rocky Mountain Institute launched the Sustainable STEEL Principles at the NYC Climate Week in September 2022. These principles outline standards for measuring and disclosing the alignment of steel lending portfolios with 1.5°C targets, which also equip financial institutions to set credible and robust net-zero targets in line with NZBA requirements. The first six signatories are Citi, Crédit Agricole CIB, ING, Société Générale, Standard Chartered, and UniCredit, which together represent US$23 billion in steel loans. Financial institutions are encouraged to join the Sustainable STEEL Principles to accurately assess the climate alignment of their steel lending portfolios and ultimately advance the decarbonization of the steel sector.
- The Institutional Investors Group on Climate Change (IIGCC) has published a steel sector strategy as part of the Climate Action 100+ initiative. Climate Action 100+ gathers over 615 investors responsible for over US$55 trillion in assets under management.
- The Climate Bonds Initiative (CBI) launched a steel criteria and policy guidance at the end of 2022 as part of its labeling scheme for bonds, loans and other debt instruments.
- GFANZ is soon expected to release a series of briefs for "high-emitting and hard-to-abate sectors" – aviation, oil and gas, and steel to complement its Expectations for Real-economy Transition Plans report published in September 2022.

APPENDICES

Abbreviation	Definition
BF-BOF	Blast Furnace to Basic Oxygen Furnace. Blast furnaces are used to sinter iron ore, basic oxygen furnaces are used for smelting.
DRI	Direct Reduced Iron. This is the product of the direct reduction of iron ore in the solid state by carbon monoxide and hydrogen derived from natural gas or coal.
EAF	Electric Arc Furnaces for recycled steel.
CCS	Carbon Capture and Storage.
HDRI	Hydrogen-based DRI.

Sources and useful resources

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- Achieving Net Zero Heavy Industry Sectors in G7 Members (IEA, 2022)
- Global Steel at a Crossroads (Agora, 2021)
- The Breakthrough Agenda Report 2022 (IEA, 2022)
- Net zero steel pathways:
  - Making Net Zero Steel Possible (MPP, 2022)
  - Net Zero Steel project (IDDRI, 2021)
  - 1.5C Steel: decarbonising the steel sector in Paris-compatible pathways (E3G & PNNL, 2021)
- What is Green Steel? (Global Efficiency Intelligence, 2023)
- Green Steel Tracker (LeadIT)
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16. More information on the SBTi can be found here.
17. IIGCC, Initiative supported by investors representing USD $55 trillion sets decarbonisation expectations for steel industry in line with IEA 2050 scenario, 2021
18. The Green Steel Tracker is available here.
19. As of February 2023.
20. Global Energy Monitor's Steel Plant Tracker lists 309 steel projects that are currently "proposed" or under "construction". More about its methodology is available here.
21. The 2022 Breakthrough Agenda report points out that less than 1 Mt of primary near-zero emission steel is currently produced per year, whereas over 100 Mt will be needed by 2030.
22. IEA, 2022 Breakthrough Agenda Report, 2022
23. The Mission Possible Partnership is comprised of four core partners – World Economic Forum, the Energy Transitions Commission, Rocky Mountain Institute, the We Mean Business Coalition. Their goal is to create a community of CEOs from carbon-intensive industries, along with their financiers, customers, and suppliers, to push for the decaboniaztion of seven industrial sectors.
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Reclaim Finance is an NGO affiliated with Friends of the Earth France. It was founded in 2020 and is 100% dedicated to issues linking finance with social and climate justice. In the context of the climate emergency and biodiversity losses, one of Reclaim Finance's priorities is to accelerate the decarbonization of financial flows. Reclaim Finance exposes the climate impacts of financial players, denounces the most harmful practices and puts its expertise at the service of public authorities and financial stakeholders who desire to bend existing practices to ecological imperatives.

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