Transatlantic Climate Bridge

Transatlantic Opportunities for Decarbonizing the Global Steel Sector: Locking Ambition into Standard-Setting Initiatives

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Imprint

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List of Abbreviations

CBAM	Carbon Border Adjustment Mechanism
CCUS	Carbon Capture, Utilization and Storage
CEM IDDI	Clean Energy Ministerial Industrial Deep Decarbonization Initiative
EPA	Environmental Protection Agency
EPDs	Environmental Product Declarations
EU	European Union
ETS	Emissions Trading System
GHG	Greenhouse gas
GWP	Global Warming Potential
IEA	International Energy Agency
ISO	International Organization for Standardization
LCA	Life Cycle Assessment
US	United States
TTC	Trade and Technology Council

Executive Summary

Heavy industry is rapidly moving up the international decarbonization agenda. Once known as “harder-to-abate”, the sector’s immense contributions to global greenhouse gas (GHG) levels, combined with the increase in international net zero emission commitments, have given way to a breakthrough of transatlantic and multilateral initiatives encouraging global cooperation on industrial decarbonization. With new momentum to accelerate innovation, investment and the deployment of clean technologies, manufacturers have more potential than ever before to stay on a 1.5°C decarbonization pathway. However, heavy industry, and particularly steel, are not on track to reach the goals of the Paris Agreement.

The steel sector faces unique challenges to decarbonizing. A combination of technical barriers as well as stiff international competition and concerns of carbon leakage makes cutting emissions from steel production particularly difficult, and domestic and international policy efforts have emerged to try to tackle these difficulties. At COP26 in Glasgow, multiple global initiatives were launched that aim to do just this. Among them, the Glasgow Breakthroughs specified shared targets on scaling up clean technologies for near zero emission steel, and the Clean Energy Ministerial Industrial Deep Decarbonization Initiative (CEM IDDI) aims to create an alliance of countries with common clean public procurement targets for construction materials. On the transatlantic level, the European Union (EU) and the United States (US) last year agreed to launch the Global Arrangement on Sustainable Steel and Aluminum by 2024, which will restrict emissions-intensive steel and aluminum from both markets. Further, the EU-US Trade and Technology Council (TTC) released a work plan that includes sharing best practices on clean public procurement for industrial products. Meanwhile, the US is committing to a federal ‘Buy Clean’ program to spur demand for cleaner industrial policies.

Policymakers and producers are recognizing that steel decarbonization is the next frontier of climate change mitigation. With multiple “push” and “pull” instruments available to governments, a suite of various policy measures is key to a successful and effective decarbonization pathway. In this study, we focus on unilateral, multilateral and private sector initiatives that use certification and clean public procurement to contribute to the decarbonization of the steel sector. Like many industry decarbonization measures, certification and clean public procurement require a set of standards for calculating the embodied emissions of a product, as well as definitions for what constitutes “clean”. Standards and definitions are necessary to send the right market signals and provide clarity for producers on the long-term changes they need to make.

This study gives a breakdown of ResponsibleSteel, the CEM IDDI, and the US federal Buy Clean program, analyzes their policy goals and their political implications, and provides recommendations on how to make them more effective. The transatlantic relationship is key to ensuring continued ambition in each initiative.

1 Industrial emissions and the struggle for net zero

As we enter a new implementation phase of the Paris Agreement, industrial decarbonization has emerged as the next frontier of deep decarbonization for policymakers in the European Union (EU), United States (US) and around the world. In recent years, several initiatives have emerged focusing on these so-called "harder-to-abate sectors", emphasizing that cutting industry emissions is critical to limiting global warming to 1.5°C. Among these sectors, steel faces particular challenges to decarbonization. International coordination, especially between Europe and North America, will be critical to overcoming these challenges.

Heavy industry makes significant contributions to global greenhouse gas (GHG) levels. The industrial sector's use of energy-intensive processes and fossil fuels means that the production of five industrial materials – steel, cement, aluminum, chemicals and paper – is responsible for almost a quarter of global GHG emissions (IEA 2021b). Iron and steel production requires highly energy-intensive processes, accounting for approximately a fifth of industrial final energy consumption (IEA 2020). Nearly 75% of the energy inputs used in steel production come from coal, which contributes to the 2.6 Gt CO_2 emitted by the steel industry each year (IEA 2020). This amounts to around 7% of global emissions from the energy system (IEA 2020).

As a key material in clean energy technology such as wind turbines, hydropower plants, and electricity grid transmission and distribution infrastructure, steel will continue to play a significant role in the global economy going forward (IEA 2020). Importantly, steel production to date has also closely tracked economic development, providing building blocks for a modern economy by supplying materials for key infrastructure. Such development is still underway or in its infancy in many countries, particularly in the global south. Global demand for steel is projected to grow between 2-2.5 billion tons by 2050, depending on efficiency improvements in the sector, making effective industry decarbonization increasingly important (IEA 2020).

In the past two decades, direct CO_2 emissions from the steel sector more than doubled, largely driven by higher production in China (IEA 2020). In 2021, China was the world's largest producer of crude steel[1], producing nearly ten times more steel than the second largest producer, India. The US was the fourth largest producer and Germany the eighth (World Steel Association 2022). A major difference between producers in the US and EU and those in the rest of the world is their use of "scrap" or "recycled" steel, which significantly lowers the carbon footprints of their goods. Last year, 69.2% of American crude steel and 57.6% of crude steel in the EU was produced using steel scrap while only 21.9% of crude steel produced in China used steel scrap (BIR 2022). We analyze the scrap issue in detail in Section 3 of this report.

According to the International Energy Agency (IEA) Net Zero Emissions by 2050 scenario (NZE), heavy industry emissions must decline by 20% by 2030 and 90% by 2050. For iron and steel, this equates to a fall from 2.4 Gt in 2020 to 0.2 Gt in 2050 (IEA 2021c). To achieve these goals, significant policy intervention is required in the global steel sector.

[1] Crude or raw steel is the first solid state after melting that can be processed further or sold.

2 Twin challenges for decarbonizing steel

The steel sector faces enormous decarbonization challenges. On the one hand, steel is a product that is technically difficult to decarbonize, and alternative technologies are less readily available than in other sectors. On the other hand, it is a globally traded, emissions-intensive product that is subject to high competition, meaning producers have a close eye on their slim profit margins and their competitors when it comes to investing in new mitigation technologies. However, governments have begun to take steps to address these challenges.

2.1 The challenge of decarbonizing steel production

The manufacturing of steel is particularly hard to decarbonize for two primary reasons – (1) the process involves **chemical reactions that directly emit GHGs** and (2) the necessary energy-intensive processes **require very high heat and, oftentimes, on-site combustion of fossil fuels** (CLF 2020). Further, many technologies that will be key to decarbonizing the sector are still at an early stage of development and not yet cost-competitive, making them not readily deployable today.

2.1.1 An overview of steel production

There are two main ways to produce steel. The first uses an integrated blast furnace / basic oxygen furnace (hereafter referred to as **blast furnace**) and manufactures steel from iron ore. This process converts coal to coke, a porous, carbon-rich material that is then mixed with iron ore and limestone to make molten iron, which is then further treated to make steel. It relies on a chemical process called **reduction**, whereby carbon acts as a reducing agent to separate iron atoms from oxygen, eventually generating carbon dioxide (Eurofer 2020). This process is also referred to as **primary steel production** and creates **new or "virgin" steel**.

The second method, referred to as **secondary steel production**, uses an **electric arc furnace** and has **scrap steel** as the primary feedstock. Scrap is recycled or discarded steel or steel products. An electric arc furnace uses electrical currents to melt scrap, instead of raw iron, to produce molten steel. This process uses electricity as its main energy input (as opposed to coal in primary steel production). The emissions intensity of the scrap-based secondary production route is around 60-70% less than primary production (IEA 2021a). However, this figure is highly dependent on the source of electricity used for the secondary route (a facility that uses a large amount of scrap but sources electricity with a high emission factor may be more emission intensive than a facility that uses less scrap but is powered by renewable energy-generated electricity.)

Scrap use significantly reduces the emissions intensity of steel products, as the energy-intensive process of reduction has already been done for the proportion of metallic input that comes from scrap (though again, scrap use does not guarantee low-carbon steel.) For the primary route, scrap on average ranges between 15-25%, and can comprise as much as 30%, of metallic inputs (IEA 2022). For secondary steel production, this proportion can be over 100% (such that, to produce 1 ton of steel, over 1 ton of scrap is used as an input). It is

important to emphasize that, though scrap can reduce steel's emissions, it can only play a limited role in decarbonizing the sector. We explore this matter further in Section 3.3.

2.1.2 Decarbonization options

There are various technological and efficiency measures that can reduce emissions in the steel sector. Secondary steel production presents less of a technical problem than the primary route, as its emissions largely depend on the source of electricity and can be easily reduced by switching to electricity generated from renewables. Decarbonizing steel production across the board requires an uptake of technologies such as hydrogen and CCUS that will increase costs for producers, jeopardizing their competitiveness in the international market. As such, policy instruments are needed to breach this technology hurdle.

Beyond a greater uptake of renewable-based electricity, the **direct reduced iron** route is a new but quickly expanding option and seen as critical to reducing steel emissions. This process removes oxygen from iron ore in its solid state without melting (unlike with primary production) and is usually paired with electric arc furnaces but can also be combined with blast furnaces. In the blast furnace route the reducing agent is carbon monoxide (from the combustion of coal), while in the electric arc furnace route it is either **natural gas or hydrogen**. Direct reduction is less emissions-intensive than traditional routes and can be done with hydrogen **produced with electricity generated with renewables**, also referred to as **green hydrogen** (Lehne et al. 2021). Direct reduced iron is an important bridging technology, as facilities combining this production process with natural gas can eventually transition fully to green hydrogen without needing to embark on additional retrofits (Lehne et al. 2021).

Carbon capture, utilization and storage (CCUS) will also play an important role in decarbonizing steel. It can be combined with blast furnaces, addressing emissions that are the most difficult to mitigate, and it will be especially important to combine with blast furnace facilities that are not close to retirement (Lehne et al. 2021). Indeed, the IEA projects that around half of the 2050 industrial emission reductions are expected to come from hydrogen and CCUS technologies (IEA 2021c). However, both CCUS and direct reduced iron are at an early stage of development and not yet cost-competitive, providing little incentive for firms to embark on such expensive mitigation efforts that would leave them at a competitive disadvantage.

Material and energy efficiency measures will also be key to decarbonizing the steel sector. Unlike the aforementioned technologies, levers that improve steel's circularity and energy efficiency are readily deployable today (Lehne et al. 2021). There are many measures that can reduce steel's demand and increase its reuse and recycling, such as improving manufacturing yields, post-use recycling in buildings and extending building lifetimes (Lehne et al. 2021). Energy efficiency improvements also have great mitigation potential and include measures such as optimizing processes through better controls and monitoring, updating equipment to best available technologies and recovering waste heat (IEA 2021a).

Deep decarbonization of the steel sector will require a suite of breakthrough technologies as well as material and energy efficiency measures.

2.2 The challenges of international competitiveness and carbon leakage

Steel is a highly traded product, and the heavy industry product traded in the largest volumes. In 2019, global steel exports amounted to 405 million metric tons, with China as the biggest exporter and the US as the biggest importer (ITA). Furthermore, the world's top ten steel-producing companies only generate a quarter of global steel production, making steel also **highly competitive on the international market** (IEA 2020). Owing to the combination of steel being a trade-exposed commodity, the lack of readily available alternatives, as well as the support needed for steelworkers, decarbonizing the steel sector comes with a specific set of challenges. In transitioning the steel industry, policymakers consider how to ensure international competitiveness, how to create business opportunities through innovation, and how to guarantee the livelihoods of workers.

Due to the above-mentioned challenges, countries that require steel producers to embark on costly mitigation efforts often perceive a risk of **carbon leakage,** a phenomenon whereby domestic producers that adhere to stricter climate policies in one country shift production elsewhere due to the fear they will be outcompeted by producers from another country with weaker climate measures. It should be noted that the risk of carbon leakage is a topic of debate and evidence proving carbon leakage occurs is limited. Nonetheless, regardless of the evidence, there are significant concerns among policymakers that their industries may relocate to jurisdictions with laxer mitigation requirements, which subjects climate-ambitious countries to economic dislocation and does not lower global levels of GHGs but merely shifts them elsewhere. It is important to note that not all decarbonization measures come with such a risk, for example lowering emissions by using scrap and investing in energy efficiency. As more and more countries roll out their pathways towards net zero emissions, however, policymakers are looking for solutions to address carbon leakage.

2.2.1 International efforts to address carbon leakage

Border carbon adjustments recently emerged as such a tool for addressing carbon leakage, with the EU carbon border adjustment mechanism (CBAM) becoming the most well-known example. The CBAM seeks to level the playing field between European industry that is subjected to a price on carbon through the EU emissions trading system (ETS) and imports that are not. The mechanism is also meant to incentivize countries that export a large volume of industrial products to the EU to adopt industry decarbonization policies.

Climate clubs have also (re)appeared as a potential forum for countries to coordinate on sectoral decarbonization. German Chancellor Olaf Scholz, under the German G7 Presidency, prioritized launching an "open, cooperative international Climate Club". At the G7 summit at the end of June 2022, leaders agreed to work towards establishing a climate club of countries committed to advancing ambitious and transparent mitigation policies, industrial transformation, and a just transition, and invited other major emitters, G20 members, and other developing and emerging economies to join them (G7 Germany 2022).

An international climate club has the potential to lead other countries to implement climate policies similar in ambition to those of countries in the club, which would decrease competitiveness concerns between steel producers implementing mitigation measures. It

could also create preferential market access for lower-carbon steel. Both of these outcomes could significantly combat the risk of carbon leakage. A club can further accelerate steel decarbonization by member countries adopting common emissions accounting methodologies and coordinating on financing for clean technology.

In the transatlantic relationship, the **EU-US Global Arrangement on Steel and Aluminum** could be viewed as a precursor to an international climate club. The two sides will agree to shared standards on methodologies to measure emissions in steel and aluminum and will restrict the imports of emissions-intensive steel and aluminum to their markets. Furthermore, the **EU-US Trade and Technology Council** (TTC) is also working on developing shared standards for determining the emissions-intensity of products, as well as sharing best practices on clean procurement for industrial products.

3 Standards, definitions and the comparability conundrum

As countries implement economy-wide net zero commitments, they must develop decarbonization goals specific to the steel sector and establish pathways with which to achieve them. There are a number of industry decarbonization policies to contribute to an overall effective policy mix for lowering emissions that include both “push” and “pull” mechanisms. Governments can implement a suite of policies which help push the supply of near zero emission materials production and support technology and infrastructure for efficient production, such as funding for technology innovation, development and demonstration (IEA 2022). Policymakers may also choose to apply pull mechanisms which help create demand for near zero emission products through clean procurement, ecolabels and certification schemes, and carbon contracts for difference, among several other measures.

For both push and pull policies, policymakers must establish standards and definitions that outline these decarbonization goals and set a threshold beyond which a product cannot be considered “clean”. Standards and definitions are not only critical for informing the design of the decarbonization measures, but also for giving certainty to producers that there will be a market for near zero emission products. **Clean public procurement**[2] is a strong lever that governments can use to support the development of lead markets for near zero emission products and could be used to steer producers towards lower emission production processes.

The goal of a clean public procurement program is to use government purchasing to support lead markets for clean materials. A clean procurement program should give **clear guidelines to firms** so they know what is expected of them (and can adapt long-term investment decisions accordingly) and so they have an idea of how the environmental impact of their products affects their likelihood of winning a contract. Governments may need to invest in more **capacity building** to help companies submit bids for projects under the new clean procurement rules. Clean public procurement programs can be designed in many ways through setting adoption, industry, product-level, or project-level targets. The key to developing clean procurement policies is determining the embodied emissions in a product through reporting standards and methods. The most common way to do this is through life cycle assessments and environmental product declarations (see below in Section 3.2).

3.1 Policy standards and definitions can drive (or slow) change

How policymakers define these standards determines how ambitious a policy instrument is. A clean public procurement plan that stipulates only a small portion, relative to current market capacity, of government steel purchases must be “clean” will not send the message to producers that drastic and urgent efforts to reduce their products’ emissions must be taken. Similarly, a definition of “clean steel” that includes emission intensities at the current industry average will not incentivize an uptake of expensive mitigation technologies or a change in production processes.

[2] Importantly, there are many policy measures for industrial decarbonization at governments’ disposal; for the intended scope of this paper we focus on the merits of public procurement to decarbonize the steel sector.

Policymakers use definitions to differentiate steel products from one another and incentivize the production of, and thus **market creation** for, cleaner steel. They send a clear signal of what needs to be achieved in the long term, in a sector where returns on investments take place over decades, and inform the overall pace and strength of producers' emission-reduction efforts. In practice, the IEA report on how the G7 can achieve a net zero heavy industry sector by 2050 provides useful guidance on establishing common definitions to send these signals, but that do not favor one technology or another (IEA 2022).

Standards and definitions can steer steel producers towards ambitious decarbonization efforts or lock the sector into business-as-usual practices that are not 1.5°C-compatible.

3.2 Measurement standards: an overview

There are also standards for calculating and reporting environmental impacts of steel manufacturing. These measurement standards also have an important role to play – they help to provide a common understanding regarding the assessment of emissions from steel production. The environmental impact of one unit of steel cannot be determined in a transparent manner until agreement is reached on what to measure and how to measure it. To then make this unit of steel comparable to a unit of steel produced elsewhere, perhaps even in the same facility using a different production process, agreement must first be reached on a standardized way to report the results of these evaluations.

There are many **international frameworks** that provide guidance on how to measure and report emissions from steel production – such as the **International Organization for Standardization's (ISO) 14404 series, the Greenhouse Gas Protocol's Iron and Steel Tool, and the European Standard EN 19694**, among others. However, they contain different options for how to conduct these calculations, and the environmental impact of two steel products whose emissions were accounted for differently using the same standard may still be difficult to compare. Effective policy design can specify how to apply these measurement standards such that comparison across steel products and producers is possible.

These frameworks employ commonly used metrics for calculating steel's embodied emissions as well as a standard way to report them. These are summarized below.

Environmental product declarations, life cycle assessments and the carbon footprint

Environmental product declarations (EPDs) are a type of environmental impact reporting standard. They aim to transparently report objective, comparable, and third-party-verified data about the environmental impacts of products' and services' life cycles (International EPD System 2022).

The foundation of an EPD is a **life cycle assessment (LCA)**, an analysis technique used to assess the environmental impacts at all stages of a product's life, from raw material extraction and manufacturing to distribution and use. An EPD is the final report and standardized method of reporting the results of an LCA. When preparing an EPD, a set of guidelines must be applied that specify elements such as the unit of measurement being reported, production steps that must be included within the life cycle inventory, which life cycle impacts to use, and how to address assumptions made during calculation (Hasanbeigi and Shi 2021).

EPDs can report on a variety of environmental impacts, such as acidification, ozone depletion, and smog formation, among others. In the case of an LCA focusing on GHG emissions, emissions produced over the life cycle of a product or process are tracked and reported using a metric called **global warming potential (GWP)**, expressed in kilograms of CO_2 equivalent. This quantity is also referred to as a **carbon footprint** (CLF 2020).

3.3 The scrap problem makes reliable comparison difficult

While EPDs, LCAs and carbon footprints are useful, they are incomplete metrics for quantifying the GHG emissions of steel products. They can be used to track the **total embodied carbon in a project or end product** across multiple materials, and they are valuable data in determining **total life cycle emissions**. With steel, however, they **cannot paint the full picture**, importantly because a carbon footprint **does not account for the use of scrap**.

Scrap use is one of the most important methodological aspects for assessing steel emissions. As such, and given how much **scrap use lowers a steel product's emissions intensity**, a metric measuring embodied emissions that does not account for scrap leaves out critical information.

3.3.1 A challenge for policymakers

The scrap issue has significant implications for policymakers. Standards for low-emission steel that do not adjust emissions intensities based on scrap strengthen the incentive to pivot towards greater scrap use. This is problematic for various reasons:

- **Scrap is limited**. The availability of scrap will not be sufficient to meet demand for several decades, a reality further exacerbated by projections for increased steel demand given economic growth in emerging economies (IEA 2022).
- **Certain steel products cannot be produced with scrap**. Some products must be manufactured with advanced, high-strength steel that cannot be produced with scrap. Several such applications are critical for the green transition, such as steel parts in windmills and electric vehicles.
- **Scrap is already incentivized**. Scrap is inexpensive and is one of the most recycled materials in the world. In spite of this, the steel sector is not close to achieving the necessary emission cuts.
- **Scrap use does not reduce emissions across the sector.** Without accounting for scrap, policies incentivize firms to acquire more scrap instead of addressing the components that make the steel sector so hard to abate. A facility creating steel from scrap could, for example, use electricity generated from a coal-fired power plant and still produce steel that is significantly "cleaner" than a facility creating steel from iron ore using the most cutting-edge, emissions-reducing technology available.

Blast furnaces, that can only use up to a maximum of 30% scrap, will continue to have an important role in the steel sector for decades to come and are significantly more difficult to decarbonize than electric arc furnaces. Under current conditions, the IEA projects the emissions intensity of blast furnaces declining by 13% by 2030 and 23% by 2050, far from the 90% target (IEA 2022). Scrap use cannot enable these necessary cuts.

In other words, scrap alone will not put the steel sector on a 1.5°C-compatible pathway.

4 Pioneers in standard setting and public procurement

As outlined above, policymakers have several options to choose from a broad industrial decarbonization push and pull policy mix. **Independent certification and clean public procurement** have emerged as two strategies for supporting lead markets for clean industrial products, which like many push and pull policies require standards and definitions for what constitutes near zero emission production. Certification schemes provide a **basis for which consumers seeking environmentally friendly products can guarantee their sourcing materials are clean**. Sometimes known as ecolabels, these certification initiatives **help bring together all actors along a product's value chain and incentivize producers to make the necessary investments** to reach the certification level and have a guarantee that their product will be bought by consumers.

As detailed in Section 3, clean public procurement is a key 'pull' policy instrument to **stimulate demand for clean industrial goods in spite of their higher production costs**. Public procurement makes up a significant amount of countries' GDP around the world, and as such is one of the most important policy levers a government has at its disposal to try to influence the sectors from which it procures. Procurement amounts to 14% of the EU's GDP (Hasanbeigi et al. 2021a), around 10% in the US (Oecd 2022), and up to 30% in developing countries (Hasanbeigi et al. 2021a). Clean public procurement is also seen as a measure to address carbon leakage and safeguard domestic industry competitiveness.

Several new initiatives focusing on decarbonizing heavy industry have been introduced over the last few years, ranging from 'Buyer Clubs' of private companies like the First Mover's Coalition to country-based initiatives focused on innovation for decarbonizing the steel sector like the Glasgow Breakthroughs. The Breakthrough Agenda launched at COP26 in Glasgow focuses on accelerating innovation and the deployment of clean technologies in five sectors, including steel. The goal of the Glasgow Breakthrough on steel is to make near zero emission steel the preferred choice for steel-buyers on international markets through a global uptake of efficient and clean production methods for producing near zero emission steel by 2030 (UNFCCC 2022).

Three initiatives – ResponsibleSteel focused on the private sector, the CEM IDDI on the multilateral level and the US Buy Clean program on the domestic side – stand out as excellent opportunities for setting standards for near zero emission steel and/or programs to support public and private procurement of near zero emission steel. Although this study focuses on these initiatives that drive independent certification and clean procurement, there are multiple policy options available for decarbonizing the steel sector, and for an industry decarbonization strategy to be successful, policymakers should apply a policy mix. For the intended scope of this paper, we focus on independent certification and green public procurement as two of many important levers to decarbonize the steel sector.

4.1 ResponsibleSteel Standard

ResponsibleSteel is a global multi-stakeholder standard and certification initiative for the steel industry. It has some of the largest steel companies in the world as members, including thyssenkrupp Steel Europe and ArcelorMittal. Its mission is to **maximize steel's contribution to a sustainable society and enhance the responsible sourcing, production, use and recycling of steel** by: providing a multi-stakeholder forum to build trust and achieve consensus; developing standards, certification and related tools; and driving positive change through the recognition and use of responsible steel (ResponsibleSteel 2022). A key pillar to achieving this mission is the ResponsibleSteel Standard.

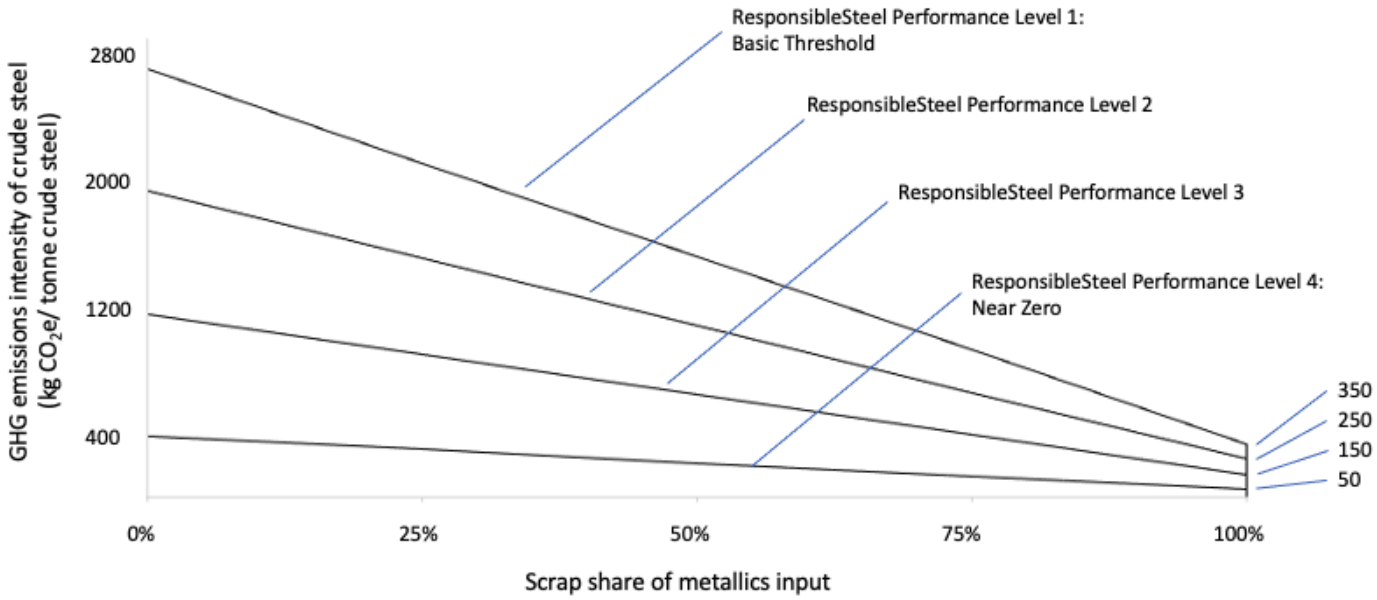
The Standard was created in November of 2019 and includes twelve principles of responsible steel production that cover a range of environmental, social and governance issues. Principle 8 – "Climate Change and Greenhouse Gas Emissions" – addresses corporate and site-level strategies, plans, and targets for the reduction of GHG emissions aligned with the Goals of the Paris Agreement as well as the measurement, reporting and disclosure of site-level GHG emissions data.

The Standard does not apply a full life cycle approach to embedded GHG calculations. It requires both that product carbon footprints are determined and disclosed, and that site-level GHG emissions are measured from the extraction, transportation, and processing of input materials to the crude steel level, following internationally consistent scope boundaries and GHG accounting rules. The latter measurement is then used to set threshold levels of performance for the GHG emissions intensity of crude steel and as a point of comparison. The majority of emissions in steel manufacturing occur at the crude steel level, and using crude steel as the point of comparison has the advantages of both simplifying the certification process and offering a metric that can be used to compare many producers, as there are numerous processes that go beyond crude steel.

One of the key features of ResponsibleSteel's approach to steel decarbonization is its treatment of scrap. It adjusts a steel product's emissions factor based on the amount of scrap used to produce it. To do so it applies a variable threshold approach – or a **sliding scrap scale** – where the **threshold for emissions intensity of a unit of crude steel producers need to meet to achieve a certain performance level is a function of scrap used as an input**. The scale goes from 0 – 100% scrap use, as well as 0-100% iron ore input, such that steel produced with 0% scrap will have a much higher threshold of kilograms of CO_2 equivalent per ton of crude steel (kg CO_2e / ton crude steel) needed to achieve certification than will steel produced with 100% scrap.

The Standard offers four performance levels – ranging from the least ambitious "Basic Threshold" level that uses emission intensities that are better than the current global average to the "Near Zero" level that is based on near zero GHG emissions – that use the following emission intensity thresholds:

FIGURE 1: RESPONSIBLESTEEL PERFORMANCE LEVELS



(ResponsibleSteel 2021)[3]

Overarching goals of the ResponsibleSteel Standard

ResponsibleSteel has over 100 members, including business members from the entire steel value chain (including steel companies, mining firms, and steel purchasers) and civil society organizations focused on environmental, social and governance principles. Business and civil society members also have equal representation and say on all issues.

ResponsibleSteel seeks to **provide an ambitious steel standard for the private sector**, following the procedures for the development of an international standard and following ISEAL best practice.[4] It takes a **global approach to steel decarbonization**, in that it does not dictate how or where to reduce emissions. Its Standard is **technology neutral**, meaning it does not advocate for one technology for producing steel over another (for example, it does not make a distinction between or incentivize primary steel production using blast furnaces or secondary production using electric arc furnaces). This approach drives incentives for deep decarbonization in the steel sector while allowing ResponsibleSteel to remain inclusive of countries like China, which produces over 90% of its steel by the primary steel production route (Hasanbeigi 2020). Although ResponsibleSteel focuses on certifying the private sector without relying on governments to set the standards, the above-mentioned performance levels and their emission intensity thresholds can be incorporated by policymakers when establishing definitions of near zero steel and designing clean public procurement schemes.

[3] This graphic represents a draft of the ResponsibleSteel performance levels under review by ResponsibleSteel members at the time of publication.

[4] The ISEAL Code of Good Practice for Assessing the Impacts of Social and Environmental Standards Systems (Impacts Code) supports standards systems to measure and improve the results of their work and to ensure that standards are delivering their desired impact (ISEAL Alliance 2022).

4.2 The Clean Energy Ministerial Industrial Deep Decarbonization Initiative

The Clean Energy Ministerial Industrial Deep Decarbonization Initiative (CEM IDDI) is an **international coalition of countries and public and private organizations that aim to decarbonize heavy industries**. The initiative, which was launched in 2021, is led by the United Kingdom (UK) and India and is coordinated by the United Nations Industrial Development Organization (UNIDO) (UNIDO 2022). Other members include Germany, Canada and the United Arab Emirates.

The IDDI promotes **public procurement commitments for steel and cement as a means to shift demand toward low carbon materials**. To help achieve this, IDDI participants have launched the Green Public Procurement Campaign. This campaign aims to convince ten countries to participate in the campaign and commit to green public procurement principles by 2023 for the construction sector (Clean Energy Ministerial 2022). Governments joining IDDI may choose from three levels of ambition for the pledge. IDDI also aims to improve data accuracy and reliability with regard to carbon intensity of industrial goods. This entails setting an ambitious goal for public procurement, establishing a definition for ”green” steel and how to measure it using current standards (instead of introducing a new ISO standard) (UNIDO 2022). The goal is to have a minimum of ten governments sign on to the initiative and make public procurement commitments for low-carbon steel and cement. With 90% of steel produced in around ten countries, leading ten countries to make public procurement commitments could have a lasting impact on decarbonizing the steel industry (Clean Energy Ministerial 2022).

The IDDI is organized into three working groups: working group 1 is focused on data and reporting, chaired by the UK; working group 2 covers low-carbon standards, including interoperability of the array of measurement standards, and is chaired by Germany; and working group 3 explores green public procurement and is chaired by Canada (IEA 2022).

Overarching goals of the CEM IDDI

The primary goal of the CEM IDDI is to **develop a global market for low-carbon industrial materials** such as steel and cement. To achieve this, the IDDI must first agree to a **framework on accounting for embodied emissions** of the materials. Without globally recognized definitions of what constitutes near zero emission steel, the IDDI hopes to support shared standards for calculating the emissions in products to then develop shared definitions.

There is potential for the IDDI to send the right signals for the global market on clean industrial goods, but it remains to be seen how ambitious the initiative will be. The IDDI plans to announce its pledge for green public procurement in September during the Clean Energy Ministerial in Pittsburgh, after which a consultation process among members will be undergone. Targets for members will be voluntary.

Although the US led establishing the G7 Industrial Decarbonization Agenda, which strengthens collaboration on procurement strategies, and launched the First Mover’s Coalition, which focuses on private procurement, the US has so far declined to join the IDDI. The US is only an observer, perhaps stopping short of full membership due to concerns over complementing its own procurement policies.

4.3 United States federal Buy Clean program

Under the Biden Administration, the US is taking various steps towards tackling industrial emissions. These include providing subsidies for retrofits and innovation, setting up the clean procurement task force, and launching the EU-US Global Arrangement on Steel and Aluminum (The White House 2022). The Bipartisan Infrastructure Law passed in Fall 2021 allocated $8 billion in funding for the Department of Energy to launch Regional Clean Hydrogen Hubs, as well as $1 billion for a Clean Hydrogen Electrolysis Program and $500 million for Clean Hydrogen Manufacturing and Recycling Initiatives focused on equipment manufacturing and supporting domestic supply chains. The EU-US Global Arrangement on Steel and Aluminum, on the bilateral level, is an attempt to establish the "world's first emissions-based sectoral arrangement on steel and aluminum trade" to restrict high-emissions steel and aluminum from entering the US and EU markets, with negotiations planned to be completed by 2024 (The White House 2021a). Beyond subsidization and the EU-US Global Arrangement on Steel and Aluminum, the **US is focusing on clean public procurement as a key instrument for decarbonizing heavy industry.**

On 8 December 2021, President Biden released Executive Order 14057, "Catalyzing Clean Energy Industries and Jobs Through Federal Sustainability," and the accompanying Federal Sustainability Plan that outlines the country's strategy for lowering its GHG emissions. One of these measures is the creation of the first-ever national Buy Clean program (BlueGreen Alliance 2022). Under the Federal Sustainability Plan, Buy Clean is defined as "a policy to promote the purchase of construction materials with lower embodied emissions, taking into account the life-cycle emissions associated with the production of those materials" (The White House 2021b).

The **Buy Clean Task Force** is an inter-agency working group charged with **promoting the use of construction materials with lower embodied emissions and pollutants** across every stage of manufacturing using a lifecycle analysis. The White House Council on Environmental Quality is leading the task force, which has participation from several agencies. The US Environmental Protection Agency (EPA) has contributed expertise to the task force on understanding emissions, at what phase of production they occur, information on accessing data, as well as how to evaluate the emission-intensity of production. The task force will **recommend the materials that should be prioritized for public procurement, provide support for emissions reporting and decarbonization, and launch public procurement pilot programs** (The White House 2022). External studies have shown a federal Buy Clean program for steel has the potential to reduce emissions by millions of tons depending on its level of ambition (Hasanbeigi et al. 2021b).

Buy Clean is already influencing federal procurement in the US. It has led to the General Services Administration's implementation of low carbon concrete and sustainable asphalt standards in certain projects as well as support for clean building materials in federal transportation projects from the Department of Transportation (The White House 2022). The General Services Administration is the premier acquisition agency of the US government and is in charge of all federal procurement. Meanwhile, the US has had procurement strategies in place for years that encourage the purchase of more sustainable materials for the

government's use such as ecolabel programs like ENERGY STAR for industry (ENERGY STAR 2022).

Overarching goals of the Buy Clean program

Supporters of Buy Clean policies in the US seek to use clean procurement to close the "**carbon loophole**", which occurs when products coming from other countries without industry decarbonization policies are used in government infrastructure projects (BlueGreen Alliance 2022). Advocates of clean procurement argue that Buy Clean policies can mitigate this through requiring the use of cleaner products in government-funded infrastructure projects, if domestic industry is cleaner than importers. Further, the US government is a large purchaser of construction materials like steel, and with a large number of infrastructure projects that require steel, harnessing the government's purchasing power can be a strong tool for stimulating demand for clean products. Of total yearly steel consumption in the US, approximately 18% could be attributed to public construction in 2018, with 27% of funding coming from federal tax dollars and the rest coming from state and local funds (Hasanbeigi et al. 2021b).
In such a challenging political environment, the Biden Administration has limited tools to implement industry decarbonization policies that garner wide buy-in from industry stakeholders, but clean procurement is the potential exception. Advocates for Buy Clean policies, led largely by the BlueGreen Alliance, pulled together an expanded coalition of climate organizations, labor unions and industry stakeholders that support the measure.

The **American steel sector looks favorably upon expanding the Buy Clean program** to include a federal clean procurement plan for the sector and believes it should be an advantage for their companies, given their products' environmental performance compared to those of their international counterparts, which is largely due to scrap use. It will be key for the final Buy Clean program to implement strong standards that account for scrap in order to effectively put incentives on steel producers to invest in decarbonization, instead of relying on their relatively clean level of production from scrap use.

5 Recommendations

The global steel sector is not on track to meet the goals of the Paris Agreement (Transition Pathway Initiative 2022). Private sector initiatives like ResponsibleSteel offer ambitious standards that can eventually be implemented by policymakers. Clean public procurement will be an important policy lever for governments to make serious efforts on putting the steel sector on a 1.5°C-compatible decarbonization pathway. Procurement spending from governments around the world amounts to an annual cost of $11 trillion and is responsible for 15% of global GHG emissions (World Economic Forum 2022). However, a clean public procurement program will only help countries reach their industry emissions goals if it contains strong and ambitious standards to incentivize producers to invest in near zero emission technologies and production processes, otherwise producers will continue their business-as-usual methods. The **US, EU and the CEM IDDI have important roles to play in ensuring the establishment of ambitious public procurement plans and encouraging their uptake internationally**, and the **US and EU can also influence international decarbonization efforts through bilateral trade deals**. In this section we provide recommendations for how to achieve these goals.

1. The United States to implement an ambitious design of Buy Clean

As the main policy tool of the US to decarbonize the industrial sector, Buy Clean must contain strong, ambitious standards and definitions to incentivize the steel industry to make the necessary investments to decarbonize. Without an ambitious public procurement scheme – along with investment in the steel sector to implement energy efficiency practices, switch to lower carbon fuels, and adopt new technology – the US will not achieve its decarbonization goals.

1.1 Buy Clean to account for scrap in its definition of clean steel

The US should ensure that the definition of clean steel under its Buy Clean plan accounts for scrap use. Buy Clean's emission intensity thresholds for clean steel should be a function of scrap use, following the ResponsibleSteel Standard's or the IEA's sliding scrap scale.

1.2 Buy Clean to implement a tiered approach to public procurement requirements

Buy Clean should apply a tiered approach to procurement. A certain percentage of government purchases should be near zero emission steel, following the ResponsibleSteel[5] and IEA[6] definitions; another percentage should fall within the ResponsibleSteel range of performance levels 1-3 or the IEA[7] range of low emission to near zero emission steel. These percentages should be updated every three years to increase the percentage for near zero emission steel and progressively decrease the percentage of non-near zero emission performance levels. Doing so would strike a balance between incentivizing a race towards ambitious emissions reductions while also ensuring that a significant number of firms do not go under but can ramp up mitigation efforts over time.

[5] See ResponsibleSteel "near zero" performance level 4 in Section 4.1
[6] See (IEA 2022) "Chapter 3: Defining 'near zero emission' materials production"
[7] See (IEA 2022) "Chapter 3: Defining 'near zero emission' materials production"

Further, a certain percentage of government purchases should be of steel produced with less than 30% scrap, which the IEA suggests as a potential distinction for primary steel production (IEA 2022). This measure, paired with material and energy efficiency incentives as well as subsidies for decarbonization technologies such as green hydrogen and CCUS, will avoid steering the market towards greater scrap use as an alternative to decarbonizing primary steel production, as the primary route will continue to be critical to meet steel demand for decades to come.

1.3 To provide certainty for producers, Buy Clean to incorporate long-term purchase agreements

The US can ensure a strong and effective Buy Clean program by including long-term purchase agreements for near zero emission steel, which then will provide producers with an even stronger business case for investing in near zero emission steel production. Long-term purchase agreements incorporated into the policy design of clean procurement programs will give confidence to producers that there will be a lasting market for clean steel.

2. The EU and US to adopt ambitious definitions for near zero emission steel in the Global Arrangement on Sustainable Steel and Aluminum

Recognizing that US climate policy supporters face enormous hurdles in passing legislation through Congress, the Global Arrangement on Sustainable Steel and Aluminum represents a creative approach to decarbonizing the steel and aluminum sectors in both markets, if the deal's standards and definitions are ambitious. The EU and US are in negotiations to agree on a standard that will restrict access to emissions-intensive steel and aluminum, but it remains unclear how ambitious the definitions for low carbon steel and aluminum will be. The negotiations are slated to be completed by 2024. To showcase transatlantic leadership on decarbonization through a sectoral approach, the EU and US should ensure their commitment to strong definitions for near zero emission steel. The technical working group can consider the aforementioned definitions laid out by ResponsibleSteel or the IEA.

3. All EU Member States and the US to join the CEM IDDI

With one EU Member State signed on to the CEM IDDI and the US participating only as an observer, there is a significant missed opportunity for the EU and US to showcase leadership on clean procurement. EU Member States should join Germany and the US should join European partners in making strong global commitments on clean procurement, as well as leverage their diplomatic strengths to encourage other countries to join as well.

4. The CEM IDDI to adopt ambitious definitions and targets

The CEM IDDI has the opportunity to become the primary vehicle for supporting demand for near zero emission steel, if it can scale up its country membership while remaining ambitious. As with all international initiatives, the CEM IDDI will have to strike a delicate balance of retaining a high level of ambition while successfully persuading member countries to join. Starting next year, it will provide governments with hard targets that follow a concrete timeline, in addition to having the mandate and strong backing of legitimate actors, including from the steel sector itself, to achieve its steel decarbonization goals. The IDDI will offer governments both a definition of green steel as well as specific recommendations on green public procurement target reductions

by 2030. By 2025, it expects to have a minimum of ten governments pledge to reduce embodied emissions in all major public construction projects by 2050 in line with a 1.5°C future.

4.1 The CEM IDDI to establish definitions for near zero emission steel that are clear, commonly recognized, and ambitious

The CEM IDDI working group 2 should employ the above-mentioned ResponsibleSteel or IEA definitions of near zero steel in its definition of green steel.

4.2 The CEM IDDI to follow the IEA's recommendation for an effective clean procurement policy in setting strong targets at the project level

For an effective clean procurement program that instills confidence in the steel sector's transformation, the IEA recommends setting strong targets at the project level and calls for a minimum share of near zero emission materials in projects using public money (IEA 2022). The CEM IDDI working group 3 should employ the IEA's guidance in its recommendations for green public procurement reduction targets.

6 Conclusion

Without drastic and immediate policy interventions, the global steel sector will not achieve the cuts in GHG emissions that will put the world on a 1.5°C-compatible pathway. The unique decarbonization challenges the steel sector faces underscore the need for international coordination on ambitious emission reduction policies.

The recommendations outlined above highlight the potential for ResponsibleSteel, the CEM IDDDI and US Buy Clean to make a significant impact on reducing emissions from the steel sector. Implementation of these recommendations could lead to the establishment of an international alliance of countries committed to green procurement policies, in which they harmonize embodied emissions measurement standards as well as clean steel policy standards and definitions.

If the US and all EU Member States joined the IDDI, the initiative would gain some of the world's largest economies, emitters of GHG, and producers of steel. The US and EU Member States' membership would bring the IDDI closer towards becoming a forum for launching a green steel procurement alliance between countries, a development for which the IDDI advocates (Hasanbeigi et al. 2021a). Such an alliance could accomplish the following objectives:

- Catalyze demand for green steel at scale
- Ensure incentives for the decarbonization of both the primary and secondary steel production routes
- Address concerns of international competitiveness and carbon leakage
- Harmonize definitions of low-emission and near zero emission steel and the methodologies to measure embodied carbon in steel
- Create a larger combined potential market for low-carbon steel products
- Reduce trade tensions between steel-producing countries, especially those with clean public procurement schemes
- Provide security and long-term investment signals to steel manufacturers
- Foment steel decarbonization technology and policy innovation
- Align the pace at which governments decarbonize heavy industry (with an ambitious alliance ensuring this pace is 1.5°C-compatible)

In addition to accomplishing these objectives, an international green steel procurement alliance could be incorporated into the forthcoming open and inclusive climate club currently under debate at the G7. Collaboration between transatlantic partners on strengthening and harmonizing steel decarbonization policies has great potential to place the global steel sector on a fast-track to rapid emission reductions and can serve as a model for further international decarbonization initiatives.

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