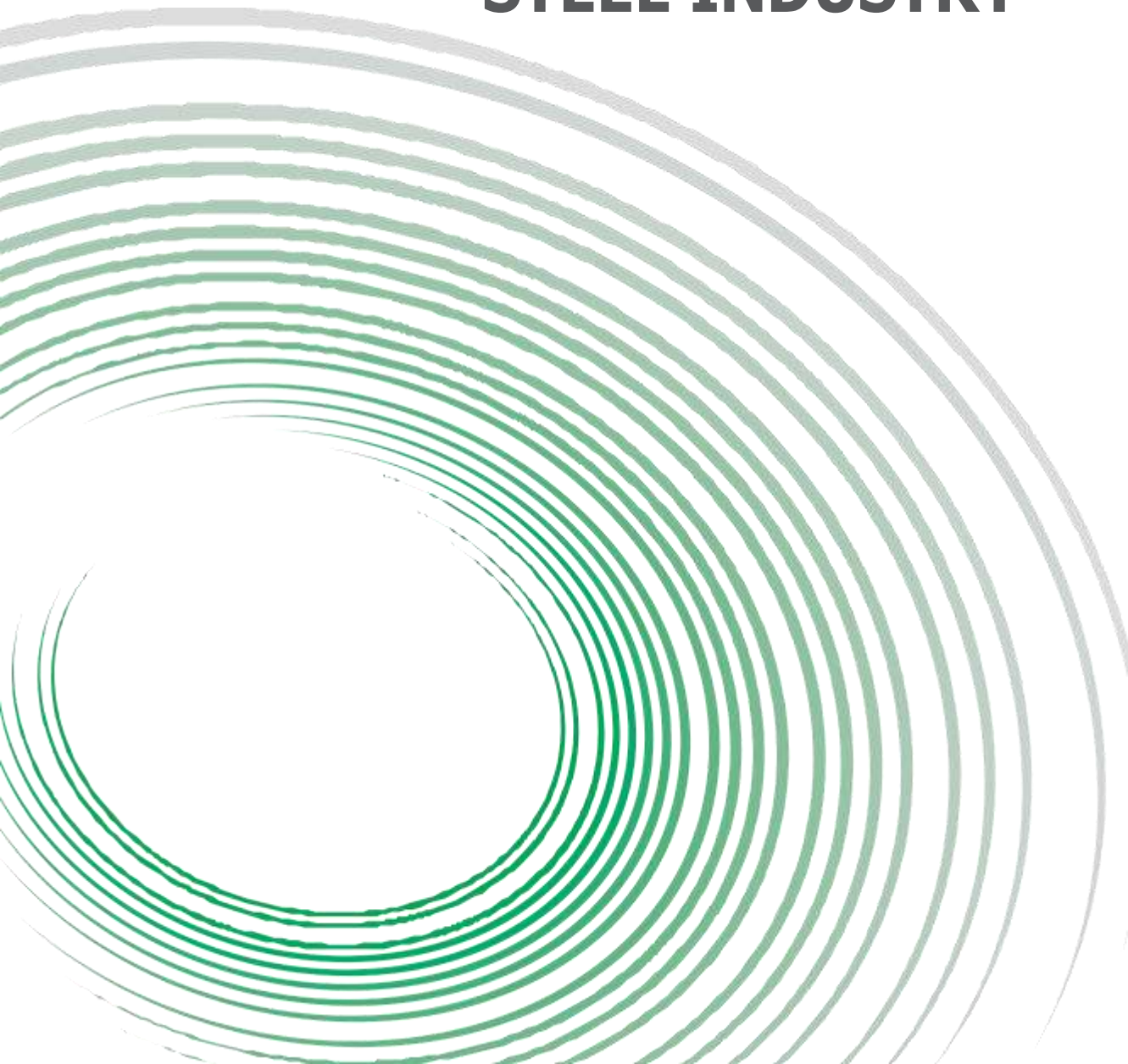
IRENA
International Renewable Energy Agency

G20
भारत 2023 INDIA

TOWARDS A CIRCULAR STEEL INDUSTRY



EXECUTIVE SUMMARY

Steel is a vital material for the progress of human societies. It is used for a wide range of applications, including infrastructure, buildings, transport vehicles and home appliances, among many others. Steel can be recycled without loss of quality, which also makes it a crucial enabler for a transition towards a more circular economy.

On the other hand, the steel sector is one of the most significant contributors to climate change. It is responsible for about 7% of global energy-related carbon dioxide emissions, since the majority of steel production relies on fossil fuels as energy sources and as reductants to process iron ore. A transition towards a fully sustainable and climate-neutral steel sector will require decisive action to continue advancing all levers of circularity. Key steps include improving material efficiency, increasing the share of recycled steel (as more scrap becomes available over time) and making steel production processes more efficient.

While all the above measures can make an important contribution, they will not be enough on their own to make the sector environmentally sustainable in the long run. Addressing the global climate change challenge will require a shift towards sustainable energy sources for producing steel. Central to achieving this objective will be the scale-up of renewable energy use in the sector.

Policy action at the national level is fundamental to achieving the circularity of the steel sector, but international dialogue and co-operation in the Group of Twenty (G20) can play a key role in advancing circularity strategies for the sector's transformation globally.

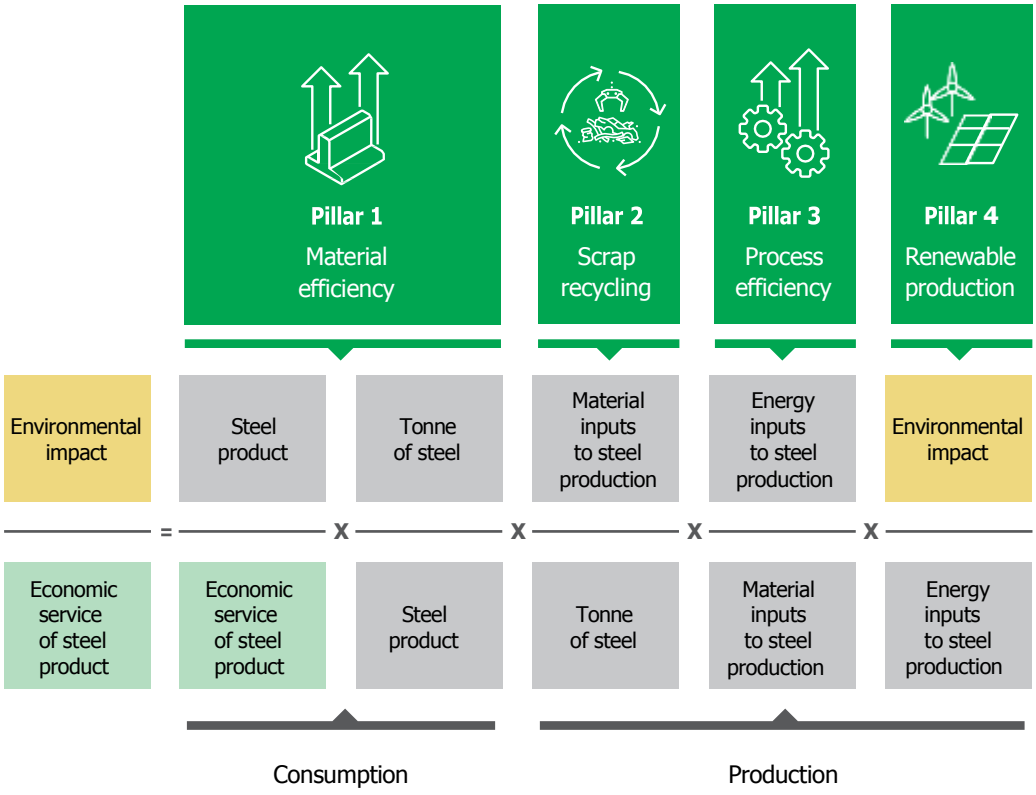
In terms of material efficiency, blueprints exist for the smarter, more optimal use of steel in key consuming sectors, such as construction and automobile production. National regulatory frameworks can act as drivers for the more efficient use of steel.

> **Recommended collaboration area: Co-operation in the G20, to identify and scale best practices in the major steel-consuming sectors, through mutual learning and exchange of regulatory experience, can contribute to the more efficient use of steel globally.**

Steel scrap recycling is at the core of a shift towards greater circularity in the steel sector. But the availability of scrap is a limiting factor, since steel products have long lifespans. About 30% of steel produced today comes from recycling scrap.

The role of steel recycling will continue to grow over time as more scrap becomes available in emerging economies, resulting in larger shares of recycled steel, in turn progressively reducing the need for primary production. By 2050, about half of the world's steel production could come from recycled scrap. National governments can make a difference

Figure S.1 Key factors in the environmental impact of steel products and four pillars of a circularity strategy



by adopting and enforcing regulations that ensure environmentally sound and thorough steel scrap collection and sorting processes. Adopting such good practices in the recovery of end-of-life steel products is also crucial to minimise scrap's contamination by other materials, for example, copper, thereby enabling the use of scrap as input for higher-quality steel specifications.

> **Recommended collaboration area: Dialogue and co-operation in the G20 can contribute towards removing the barriers to international scrap trade, allowing scrap to be transported and used where it creates the most economic and environmental value.**

A more circular and sustainable steel sector can also be achieved through making steel production processes more efficient, with widespread adoption of the best available technologies across the G20.

Recommended collaboration area: G20 members can facilitate the exchange of best practices among national policy makers and regulators. These discussions may focus on preventing market distortions that disincentivise investments in energy efficiency projects. Implementing best practices can make the industry more competitive and provide sufficient incentives to invest in improving efficiency in domestic steel industries.

A shift from fossil-fuel-based steel to renewables-based steel will be crucial in a transition to a more sustainable iron and steel sector. Renewables already supply a substantial fraction of the power used for secondary steel production in electric arc furnaces today. However, primary steel production, which accounts for about 70% of the global steel output, still relies almost exclusively on fossil fuels.

One key alternative to fossil fuels for steel production is the use of renewable hydrogen for iron ore reduction, which enables the production of near-zero-carbon primary steel. But the higher costs of production with renewable hydrogen compared with conventional steel production processes pose a barrier to its widespread adoption. However, deployment at scale could substantially reduce costs, also benefiting from further reductions in the costs of renewable hydrogen over time.

Regions with low-cost, abundant and high-quality renewable energy and iron ore resources are in the best position to make hydrogen-based iron ore reduction competitive. This creates an opportunity for international co-operation. Iron ore exporters with abundant and inexpensive renewables could capture more value by exporting processed iron. Importing countries could reduce the overall costs of decarbonising their domestic industries while retaining steel production within their borders.

A transition towards renewables-based steel will require decisive policy support in the early stages of technology adoption. Policy action at the national level can help create the conditions for investment by defining roadmaps for the sector's transformation, and the adoption of supporting measures. However, since steel is an internationally traded commodity, multilateral co-ordination will be vital.

Recommended collaboration area: G20 members can accelerate a transition towards renewables-based steel by co-operating in several areas, including dialogue towards internationally agreed definitions, standards and certifications for low-carbon steel; initial demand creation through multilateral public procurement commitments; knowledge exchange on technology research and development; professional skills needed for the transition; and technical and financial assistance to developing countries, among others.