

CLIMATE GROUP
STEELZERO

In partnership with



India Net Zero Steel Demand Outlook Report

January 2023



Acknowledgements

This report would not have come to life without support from the India Climate Collaborative - EdelGive Foundation Alliance and Stichting SED Fund. Their support in bringing SteelZero to India and compiling this report has been instrumental. We would also like to thank the We Mean Business Coalition (WMB) for their contribution.

Several important stakeholders from across the steel value chain were interviewed in the course of preparation of this report. While they broadly endorse the arguments presented in this report, they should not be seen as agreeing with every finding or recommendation contained herein. We would like to thank experts from the following organisations for agreeing to provide their inputs and helpful comments. They include:

Steel producers: JSW Steel, JSPL

Steel buyers: Mahindra Group, Tata Motors

Industry associations: Sponge Iron Manufacturers' Association (SIMA), Steel Research & Technology Mission of India (SRTMI)

SteelZero is a partnership between Climate Group and ResponsibleSteel, and we would like to thank K.Shivakumar from ResponsibleSteel for feeding into the report and providing valuable feedback.

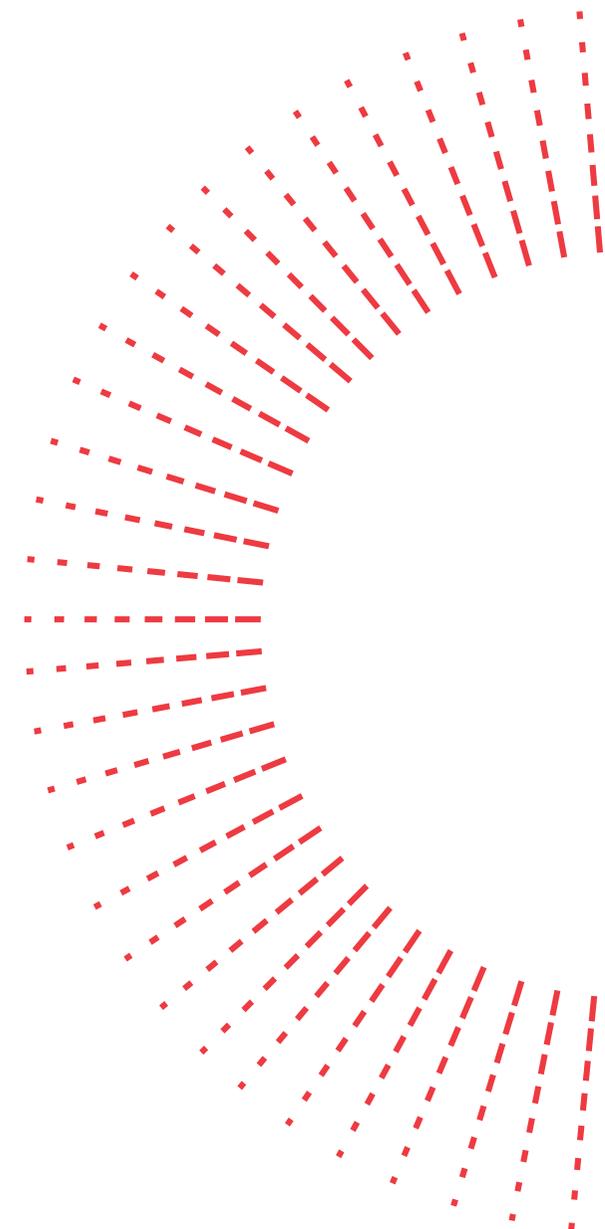
The people who worked on the report were:

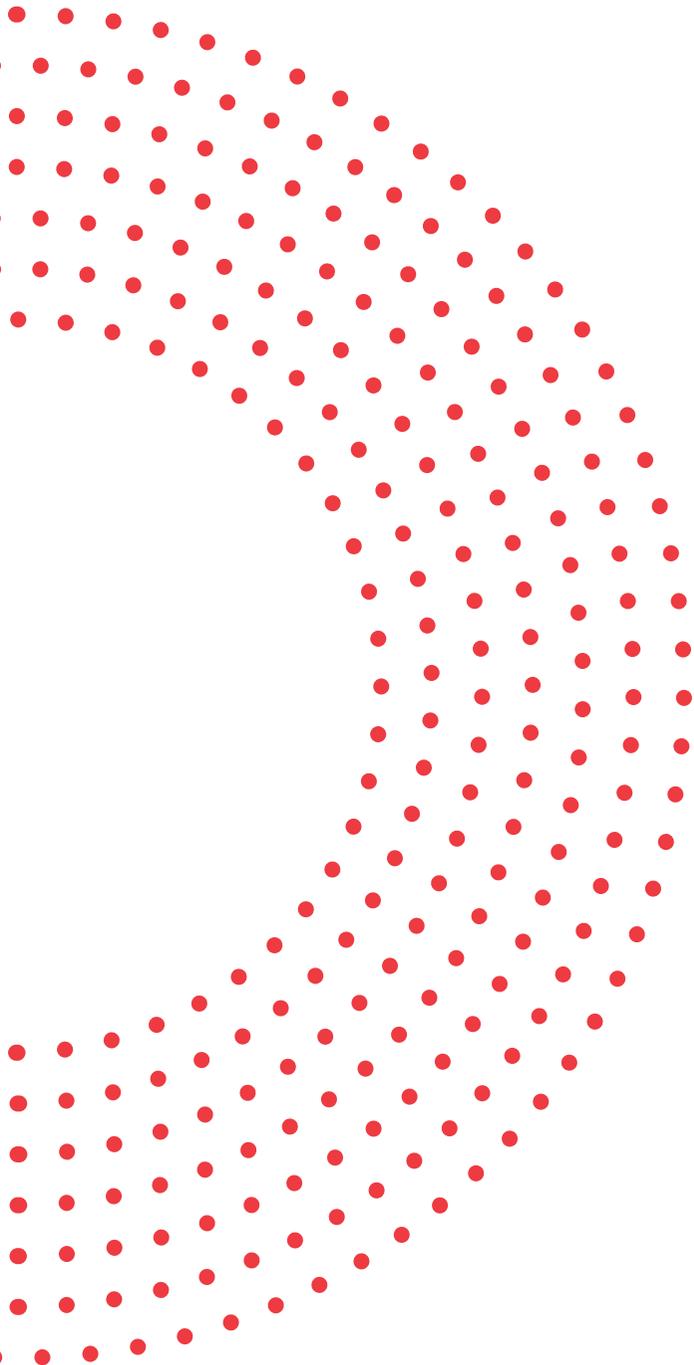
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Message

from Climate Group India Executive Director

As climate becomes a crucial imperative, the focus on decarbonisation must consider the “hard-to-abate” sectors. With this in mind, Climate Group and ResponsibleSteel came together in 2020 to establish SteelZero – a global initiative to speed up the transition to a net zero steel industry. Businesses that join SteelZero make a public commitment to use, procure and specify 100% net zero steel by 2050. By harnessing their collective purchasing power and influence, SteelZero sends a strong demand signal to steer global markets and policies towards responsible production and sourcing of steel.

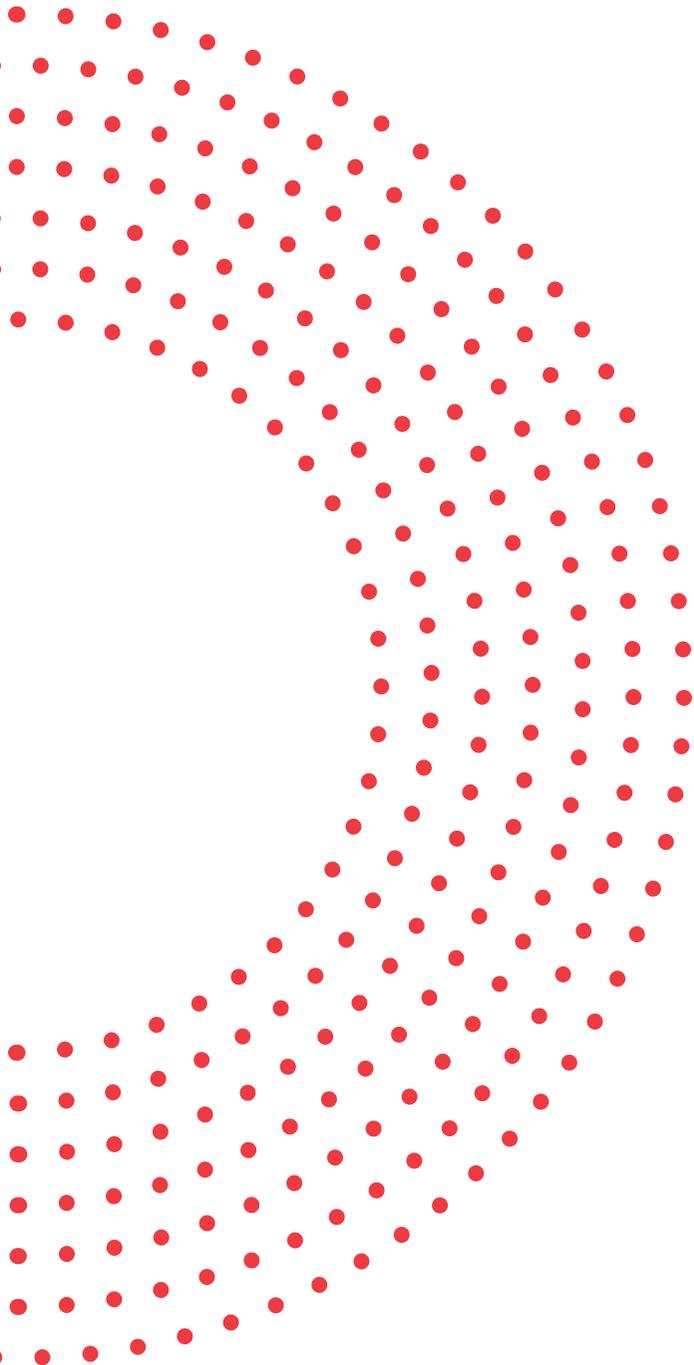
As India is the world’s second largest producer and consumer of crude steel, it is clear that any meaningful global shift towards low carbon steelmaking must be based on an understanding of India’s unique context and circumstances. The India Net Zero Steel Demand Outlook Report is an important step in building this understanding as it evaluates the Indian market for net zero steel and the factors that will drive this demand in the decades to come.

The report brings out the economic and decarbonisation opportunity available to Indian steel makers today, thus making a powerful case for adoption of low carbon technologies for steel production. Also, importantly, it will serve as a useful guide for businesses that procure steel, policymakers as well as philanthropy and investors looking to support steel decarbonisation in India.

I would like to sincerely thank our supporting partners, India Climate Collaborative, Stichting SED Fund and We Mean Business Coalition, whose support has been instrumental in bringing this work to fruition. We look forward to continuing to play our part to accelerate net zero steel transition, working closely with businesses and governments in shifting markets and policies.

Divya Sharma

(India Executive Director, Climate Group)



Message

from ResponsibleSteel

Steel decarbonisation plays a critical role in enabling the Government of India's pledges made during the climate conference in Glasgow which includes reducing emissions by a gigatonne by 2030. The demand for steel in India is projected to increase over 87% during the period 2021–2030 with over 57% increase in capacity during the same period. This growth in demand and consumption of steel in India combined with the need for capital to meet the expansion and decarbonisation efforts pose significant challenges for India. ResponsibleSteel and SteelZero have a valuable role to play in supporting India to face these challenges by driving clear demand signals for low carbon steel and providing a consistent way to measure and certify it through an established global system.

ResponsibleSteel is a global multi stakeholder initiative that represents over 13% of global steel producers in its membership with a vision to maximise steel's contribution to a sustainable society. ResponsibleSteel offers an international standard and certification program that is transparent, equity driven which steel industries can rely on to benchmark holistic ESG performance thresholds to stakeholders. The ResponsibleSteel Standard also enables policy makers and government procurement agencies to assess and set criteria for steel used in projects. SteelZero is an initiative of the Climate Group run in partnership with ResponsibleSteel, drives demand side commitments by buyers of steel to use low embodied emissions steel and, together with the ResponsibleSteel standard, sets the market compass towards the net zero production and consumption of steel, aiding national climate goals.

ResponsibleSteel offers a site certification roadmap which has been used to certify steelmaking sites across five continents covering sites producing over one hundred million tons of steel. ResponsibleSteel together with SteelZero India aims to provide a viable and practical set of tools to drive decarbonisation in the steel value chain in India and aid the nation in meeting its climate targets.

This report by Climate Group India has a strategic focus on the enabling technology and policy landscape to stimulate the demand for low embodied carbon steel across major industries in India. The report also discusses the strategic role of ResponsibleSteel and its international standard in the context of Indian steel decarbonisation and will provide an informed contribution to a complex but ever more urgent challenge for both India and the world.

Our supporting partners



India's development pathway is being shaped by today's investments in infrastructure, technologies, and industrial processes. For this reason, scalable, equitable, and effective sustainable solutions for our country's economic development must be financed and implemented now. At India Climate Collaborative, one of our priorities is to nurture high-impact opportunities in climate mitigation and resilience, and our partnership on SteelZero with Climate Group galvanises demand for net-zero steel in India while also shaping a conducive policy environment for its supply. A net zero steel sector promises to unlock decarbonisation throughout the economy, including enabling zero-carbon commitments from the construction, automotive, transport, and energy sectors. The success of SteelZero in India is likely to push the envelope on decarbonisation of not just the steel sector, but other heavy industries as well.

The India Climate Collaborative is a collective working to drive funding towards climate solutions, identify critical sectors that need investment, and enable private and corporate philanthropy to engage more effectively with climate action. We work closely with the climate ecosystem, including research organisations, implementers, government stakeholders, businesses, and more, as well as engage with our domestic and international donor base to ensure that funding flows towards high-impact climate solutions. Recognising that the climate ecosystem in India often operates in silos, we use our unique position to convene a variety of stakeholders and increase knowledge sharing, collaboration, and collective action. We were founded by some of India's pre-eminent corporate and philanthropic leaders, including Rohini Nilekani, Ratan Tata, Anand Mahindra, Nadir Godrej, and others. The ICC is legally registered as the Council of Philanthropies for Climate Action.

The ICC works closely with EdelGive Foundation through the ICC-EdelGive Alliance, which aims to further climate efforts by identifying key fundable opportunities in mitigation, adaptation, and building the capacity of the climate ecosystem.



SED FUND

Steel is one of the most emissions intensive sectors, while at the same time being the bedrock of a country's economic development. For us, decarbonization of the steel sector including production and end use represents simultaneously one of the biggest opportunities and challenges for creating a high degree of impact. This report, as part of SteelZero in India, brings much-needed focus on the importance of creating a strong market for net zero steel and the drivers which enable the same. The insights of this report will contribute to building the momentum needed for the production and mainstream adoption of net zero steel in India.

Stichting SED Fund is a philanthropic initiative to support the Sustainable Development Goals (SDGs) of clean air, access to energy, clean water, climate action and equity, by backing efforts of governments and civil society on clean energy transition, according to principles of sustainability, diversity and equity. We amplify impact by consolidating philanthropic resources, strengthening country level institutions and civil society groups and supporting initiatives that will have the most impact in support of these goals.

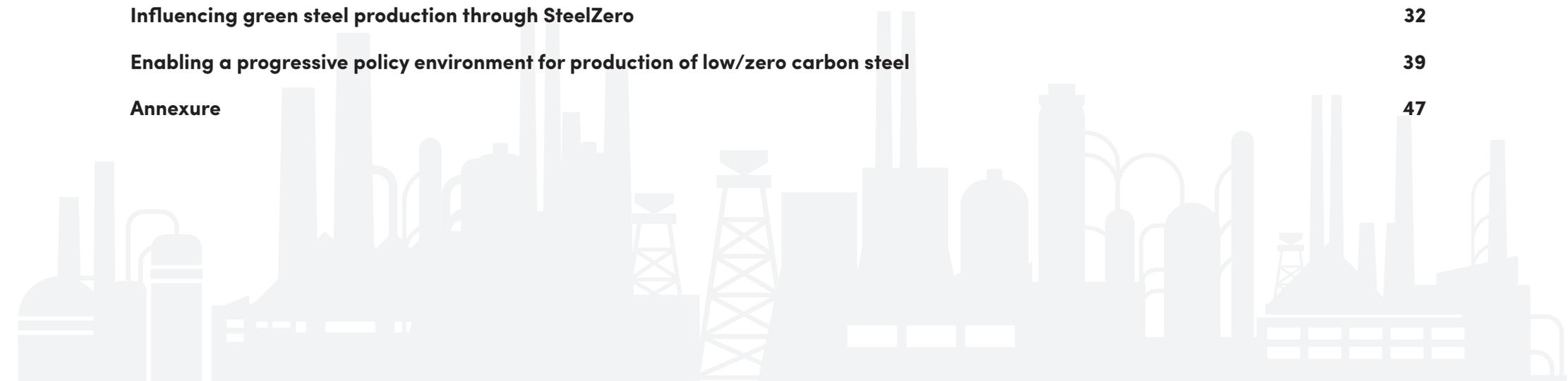


We must harness the power of demand signals to decarbonise the Steel industry in India and SteelZero provides an exemplary platform through which forward-looking businesses can drive demand for net zero steel. As a Founding supporter of SteelZero and longstanding partner of Climate Group, We Mean Business Coalition is committed to supporting the initiative to shift the Indian market towards responsible production and sourcing of steel.

We Mean Business Coalition works with the world's most influential businesses to take action on climate change. The Coalition brings together a group of non-profit organizations to catalyze business and policy action to halve emissions by 2030 and accelerate an inclusive transition to a global net-zero economy by 2050.

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Executive Summary

India requires a strong demand for clean, low carbon steel to decouple industrial emissions from economic growth

India is witnessing a significant economic transformation with a period of strong economic growth over the next few decades. This period will be marked by a massive increase in the demand for steel. Our analysis projects that the steel demand will rise to ~430 million¹ tonnes by 2050 from ~103 million tonnes in 2021. This increase will be driven largely by the expansion of infrastructure projects along with manufacturing growth in India.

Steelmaking is one of the biggest emitters of carbon globally. In India, the steel sector contributes to nearly 12% of overall greenhouse gas emissions. India's long-term development in line with 1.5-degree warming scenario will see India innovate and transition to a pathway of low carbon steel. While most of India's demand is forecast to be met through primary steelmaking, some of this demand can be fulfilled through increased use of scrap steel.

The India Net Zero Steel Demand Outlook report:

- Examines the nature and characteristics steel demand in India
- Provides a view of the low carbon steel opportunity at a sectoral level with focus on key sectors such as automotive, construction & infrastructure and capital goods sectors
- Underpins the importance of demand-side policy action for a greater demand-pull for low carbon steel, and identifies policy insights learning from other geographies
- Highlights the critical role of global standards and certifications that steel producers can adopt to meet an early trajectory
- Evaluates the business environment to incentivise production of low carbon steel, along with use of scrap steel

SteelZero, Climate Group's initiative, brings together ambitious and forward-looking steel buying organisations to harness their collective purchasing power and send a demand signal in shifting global markets and policies for responsible production and sourcing of steel. Businesses that join SteelZero make a public commitment to use, procure and specify 100% net zero steel by 2050. In this regard, the India Net Zero Steel Demand Outlook explains the criteria for buyer-side companies who make this commitment, and interprets broadly the standards of ResponsibleSteel for steel producers.

The report will serve as a vital tool for companies that are pursuing a net zero strategy to reduce their Scope 3 emissions, and for investors and philanthropic donors in identifying gaps in mobilising concerted and well-rounded action on decarbonisation of steel. Main findings from the report are mentioned below:

¹ Other reports estimate the demand to be in a similar range

Key findings from the report

01

- The Indian steel industry is projected to grow to about **430 million tonnes** of annual demand of crude steel by 2050.
- A business-as-usual steel production scenario in India will lead to over **1 billion tonnes** of carbon emissions annually from the sector by 2050.
- The Blast Furnace-Basic Oxygen Furnace (BF-BOF) route is the dominant steel production route in India, while construction & infrastructure, capital goods, and automobiles are the largest consumers of steel produced.
- The expected rise of BF-BOF route share will add to industry's average emissions intensity by **0.14tCO₂/tcs by 2030** assuming the same emission intensity in steelmaking routes as in the BAU scenario.

02

- Construction and infrastructure, automobiles and capital goods constitute **more than 85%** of the total steel demand in India.
- Through procurement of green steel, large developers and asset owners have the potential to reduce **204 Mt CO₂** from their upstream Scope 3 emissions. Large, organised players constitute only around **10%** of the construction sector. **70% of India's 2030 urban infrastructure** is yet to be built signalling a huge emission risk if this demand is not addressed by low carbon steel.
- 4W automobiles constitute the largest steel user segment within the auto sector with an estimated annual demand of **38 million tonnes by 2050**. Through procurement of green steel, automakers have the potential to reduce **27 Mt CO₂** from their upstream Scope 3 emissions based on emissions from India's road transport in 2021.
- Demand of steel from capital goods manufactured domestically is projected at **35 MT by 2030**. Use of green steel should be a key priority for Capital Goods manufacturers as Scope 3 emissions form 90% of their net emissions.

03

- Key levers of decarbonisation such as energy and fuel mix optimisation, process/material efficiency circular resource utilisation etc can contribute to 50-70% decarbonisation. **Early investments in R&D and pilot projects on Carbon Capture Utilisation and Storage (CCUS), Green H₂-DRI** will be key to eliminating the majority of the remaining 30% of emission before 2050.
- Increase in domestic scrap will not only reduce carbon intensity of steel but also bring down India's import dependence by 2030. Scrap based steel production emits only around **0.5 tCO₂ as compared to 2.5 tCO₂** through production from iron ore.
- Ship recycling is well positioned to address India's growing scrap deficit by potentially contributing up to **10 Mn tonnes of high-grade scrap steel** by 2030.

04

- Learning and contextualising from initiatives such as **CBAM, emissions trading scheme, R&D funding** etc. implemented across EU, China, South Korea, US, Japan will be key to India.
- Existing policies such as the **Vehicle Scrapage Policy 2021, FAME India Scheme, Smart Cities and GRIHA** have the potential to incrementally nudge industry towards adoption and use of low carbon steel.
- Increasing use of **renewable energy, H₂/biomass injection and improving material and process efficiency** will further strengthen the policy measures. Improving scrap collection, bringing innovation through CCUS and leveraging carbon credits and certificates are equally strong avenues to expedite decarbonisation.

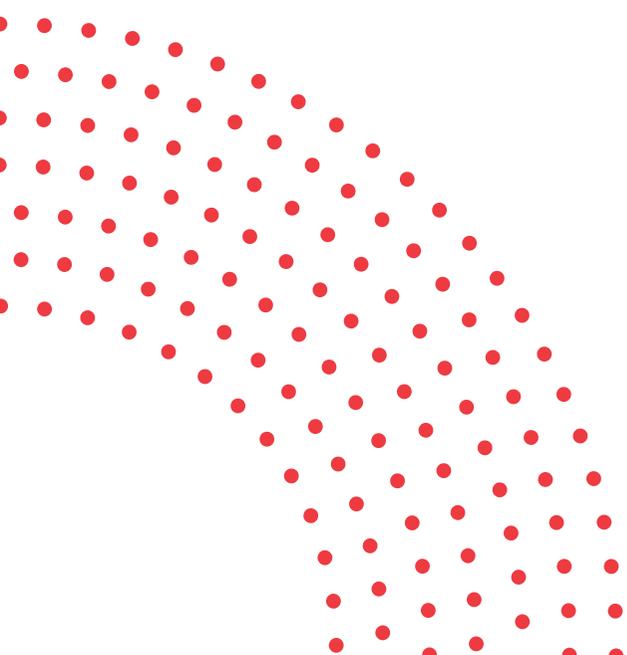
Approach and Methodology

The objective of this report is to bring out the key aspects of a demand-side led decarbonisation of the steelmaking in India, with the intent of making a robust business case for investment into low carbon steel production technologies, aided by support from policymaking. To achieve this key objective, the report follows a four-step approach: We have started off with an understanding of the Indian steel industry, in particular its current and projected emissions profile. This context setting was important to understand the decarbonisation potential of the steel sector and the role SteelZero can play in creating market demand for net zero steel in India. This has been followed by a review of the key steel consuming sectors in India, deep diving into their individual drivers for growth as well as decarbonisation. This is then followed by an analysis of the impact SteelZero can have on the production and supply of low carbon steel. Finally, we have identified interventions at a policy level that will be needed to accelerate the demand for low carbon steel.

To understand the emissions profile of the steel sector, it was first necessary to determine the expected growth of steel demand in India by 2030 and 2050. To do this, we have considered four different approaches estimating steel demand in India and used an average of those. These approaches have taken into account the sectoral growth projections of key steel end user segments such as automotive and construction, as well as estimates from reputable sources such as the Ministry of Steel's National Steel Policy and TERI. Since different steel production routes have different levels of emissions associated with them, we have also analysed plans announced by major Indian steel makers for route-wise capacity expansion of crude steel production in India.

We have then laid out the key stakeholders in the ecosystem and their individual roles in working towards the creation of a market with mainstream adoption of net zero steel. This includes steel producers, consumers, policy makers, investors and civil society organisations. This section also looks at the role SteelZero can play in activating the net zero steel ecosystem by aggregating corporate demand, along with key recent developments around the definition of green steel.

This is followed by the most substantial analysis in this report, where we have identified and then deep dived into the largest steel end user segments – notably construction & infrastructure, automotive and capital goods, since they collectively make up more than 80% of the steel demand in India today. This section was informed by primary interactions with large Indian companies, including Tata Motors, Mahindra & Mahindra, Lodha Group and L&T.



Finally, the last section explores the current policy landscape of the country with respect to steel decarbonisation and recommends a few pathways that can enable a more conducive policy environment for the production of low carbon steel in India. We have looked into the policy trajectories adopted by other key steel producing geographies in the world, such as China, Japan, South Korea, US and EU. The policy recommendations have also been made in light of India's commitment announced at COP 26 to transition to a net zero economy by 2070.

Primary Research

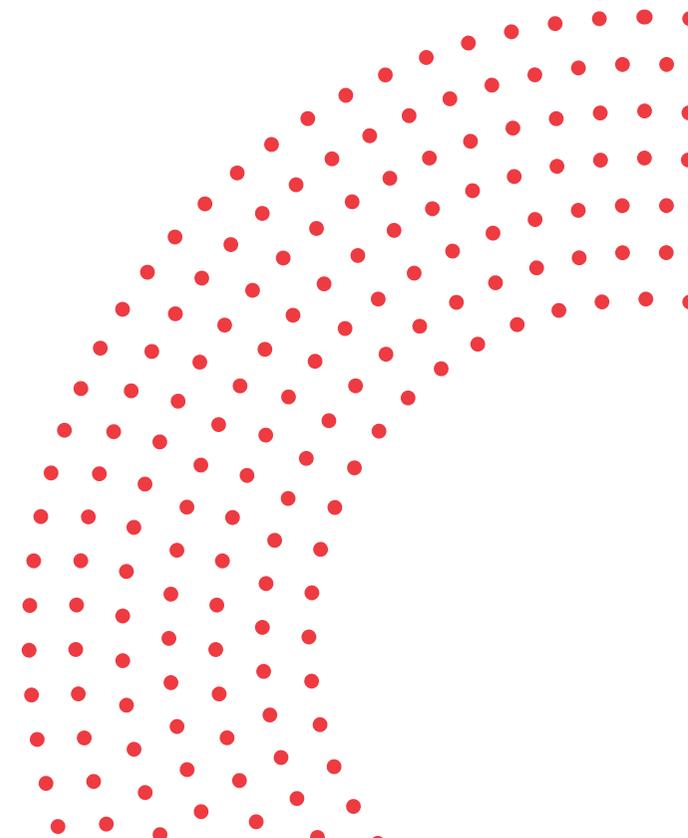
We have held targeted conversations with the following organisations to understand their Net Zero roadmap:

- **Demand side:** Mahindra & Mahindra, TATA Motors
- **Supply side:** JSPL, JSW
- **Industry Associations:** ISA, SIMA (DRI Summit), SRTMI

Secondary Research

We have based our analysis on several publications of global and national repute, primary ones among them being:

1. 'Iron and Steel Technology Roadmap 2020' by IEA, Sep 2020
2. 'ResponsibleSteel International Standard v2', Sep 2022
3. 'SBTi Corporate Net-zero Standard v1', Oct 2021
4. 'New opportunities for steel in construction and infrastructure' by CRISIL, Jan 2021
5. 'Ministry of Steel annual report 2020-21'
6. 'Steel Climate Impact - An International Benchmarking of Energy and CO₂ Intensities', Apr 2022
7. 'The Net Zero Steel Sector Transition Strategy by Energy Transitions Commission', Oct 2021
8. 'Harnessing Green Hydrogen Opportunities for Deep Decarbonization in India', NITI Aayog, Jun 2022
9. 'Pursuing Zero-Carbon Steel in China, A Critical Pillar to Reach Carbon Neutrality', Sep 2021
10. 'Green steel production: How G7 countries can help change the global landscape', Leadit, Jun 2021
11. 'Bridging low-carbon technologies - Which Capital Goods companies are driving the low-carbon transition?', Jul 2018



1

**Overview and
emissions profile
of the Indian steel
industry**

2

Activating the net
zero steel ecosystem
- led by demand

3

Sectoral demand
outlook for low/
zero carbon steel

4

Influencing green
steel production
through SteelZero

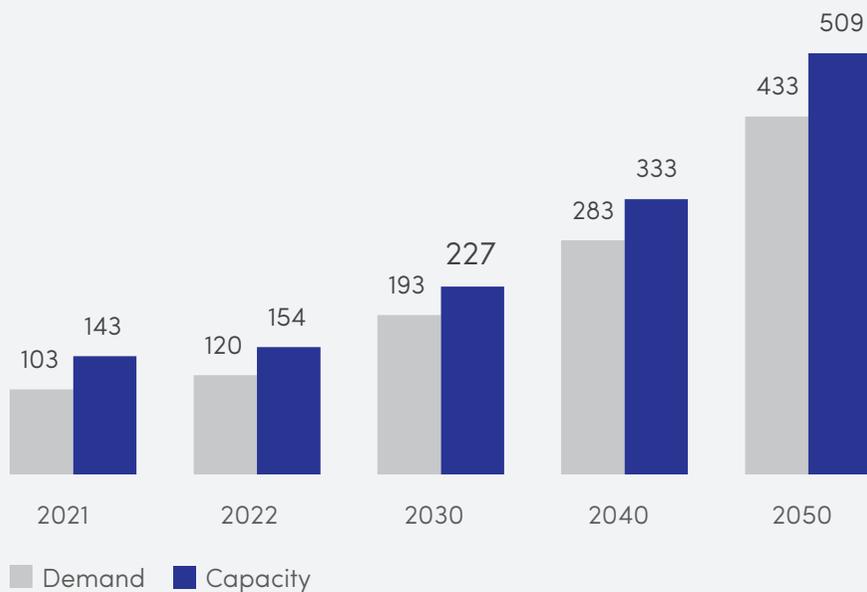
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Enabling a
progressive policy
environment for
production of low/
zero carbon steel

The Indian steel industry is poised for strong growth with ~430 million tonnes of annual demand with a production capacity of ~500 million tonnes by 2050

Driven by India’s healthy economic growth of 6.1% CAGR (Compounded Annual Growth Rate) during 2022-30 led by the growth of multiple end use industries of steel, steel demand in India is expected to grow strongly at 8.1% CAGR during the same period. It is expected to have a moderate 5.3% CAGR between 2021 and 2050. Steel is an important sector in the Indian economy, contributing 2% to its GDP (Gross Domestic Product) and employing more than 2 million people directly & indirectly.

Final figures are based on average of the four approaches outlined adjacently
Expected demand and capacity of crude steel in India (MT)



Source : KPMG Analysis (average of different approaches)

Approaches used*

1. Medium term end-use sector growth

We have considered sectoral growth projections of construction, infrastructure & automobile sectors in medium term for projecting steel demand

2. GDP elasticity of demand

Like the approach of National Steel Policy, we have projected steel demand in line with GDP with scenarios on elasticity of steel demand

3. Regression with GVA (Gross Value Added)

While regressing steel demand with GVA, we have projected future steel production using GVA forecasts

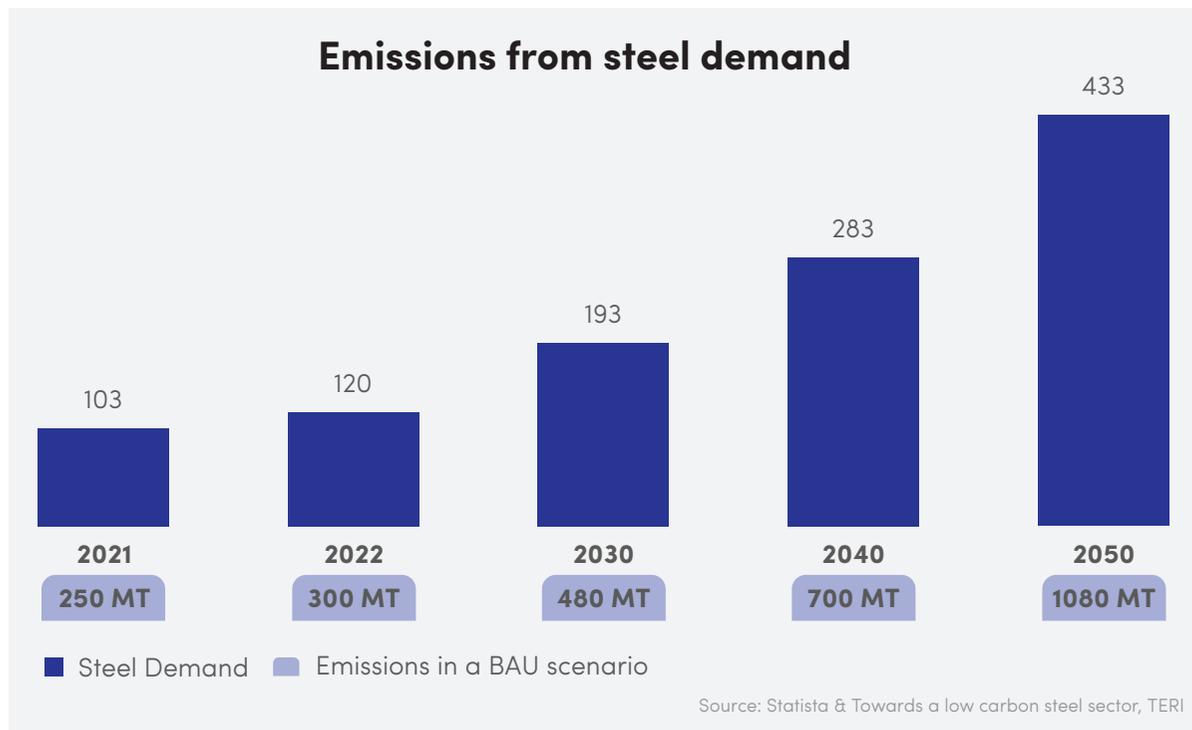
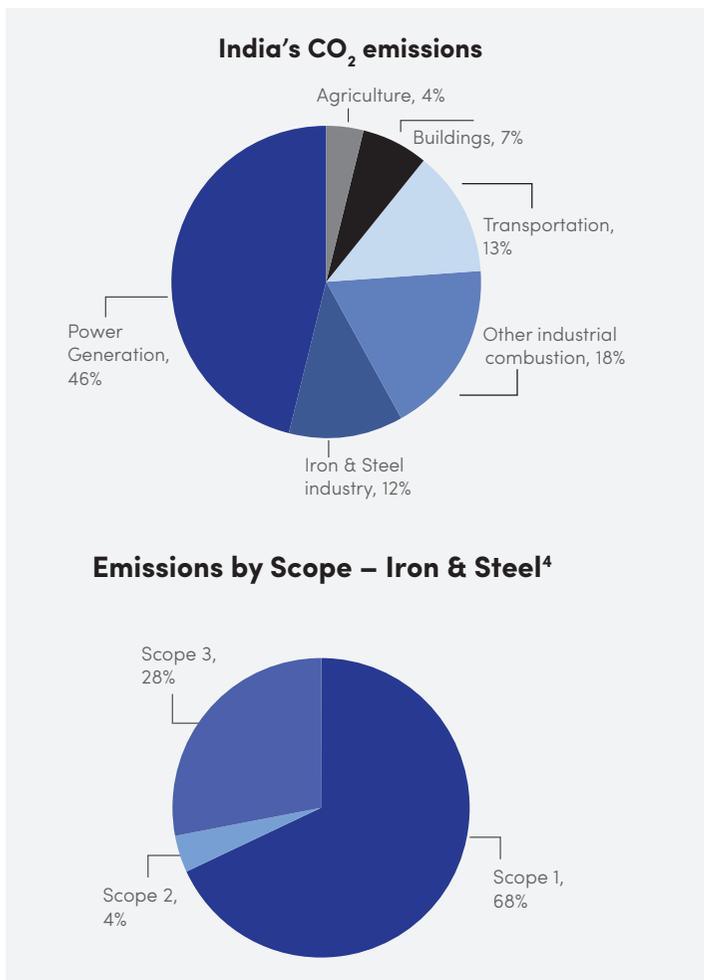
4. Other projections

We have used steel demand projections for 2031 from National Steel Policy 2017 and TERI baseline steel projections till 2050

*Details in the annexure

A Business-as-Usual (BAU) scenario, that does not decouple emissions from production, may lead to over 1 billion tonnes of CO₂ emissions annually from the Indian steel sector by 2050

In 2019, India emitted around 2.5 GtCO₂^[1] (7% of Global emissions) with steel sector contributing around 304 MtCO₂ (~12% of total India emissions).^[2] This is higher than the global scenario where iron & steel sector contributes 7% of total emissions.



In a BAU scenario, total emissions will increase by 7.5 % from 2022 to 2030 and 4.1 % between 2030–2050. As per IEA, the iron and steel sector is responsible for around one-fifth of industrial energy consumption in India

If no additional measures are undertaken (BAU, Business as Usual scenario), the strong growth of the carbon intensive steel industry will lead to almost doubling of emissions by 2030 and quadrupling by 2050

Source: [1] Iron and Steel Technology Roadmap, IEA [2] World Bank & IEA [3] Strategy Paper On Resource Efficiency in Steel Sector Through Recycling of Scrap & Slag, page 5/77 [4]TSL Report

The Blast Furnace-Basic Oxygen Furnace (BF-BOF) route is the dominant steel production route in India, while construction & infrastructure, capital goods, and automobiles are the largest consumers of steel produced

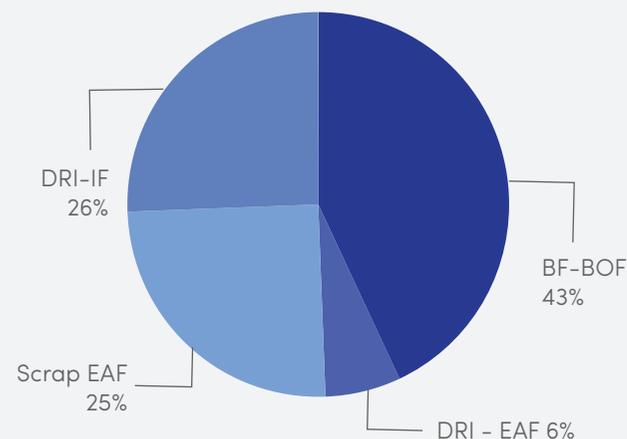
STEEL INDUSTRY

- Steel in India is produced via 3 routes – BF-BOF, DRI-EAF (Direct Reduced Iron – Electric Arc Furnace), and IF (Induction Furnace). BOF route has the highest share (45%) in steel production, followed by EAF (28%) and IF (27%).
- BF-BOF route is the most preferred route by large integrated steel players while IF units are owned by small players. The EAF route has a mix of both large and small players. Carbon intensity of coal-based DRI is highest followed by BF-BOF.
- Decarbonisation is likely to be driven by large integrated steel players owing to their financial appetite to invest in decarbonisation technologies, exposure to risk upon non-compliance, ability to attract investments, and an increasing need to manage investor and shareholder expectations.

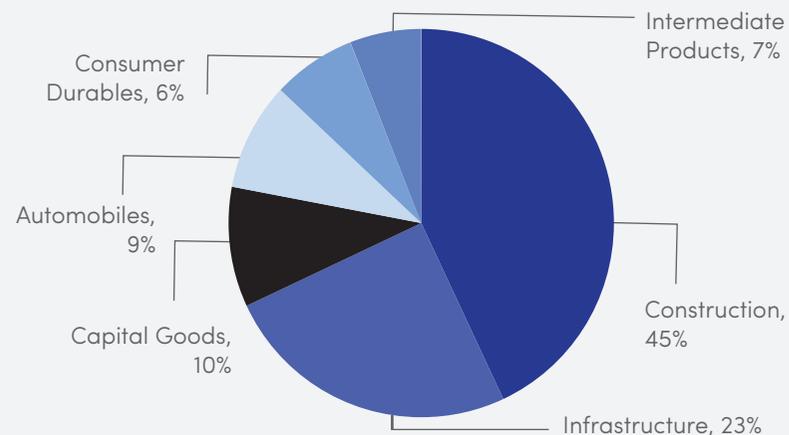
END-USE INDUSTRIES

- Construction, infrastructure, capital goods, and automobiles are the largest consumers of steel in India constituting over 85% of the total steel demand.
- The construction and infrastructure sector is poised for strong growth with growing urban infrastructure, government housing schemes etc. in the near term. The sector is however fragmented with a large unorganised segment.
- The automobile industry, on the other hand, is concentrated with large multinational companies and increasing export opportunities.

Route wise capacity India (FY21)



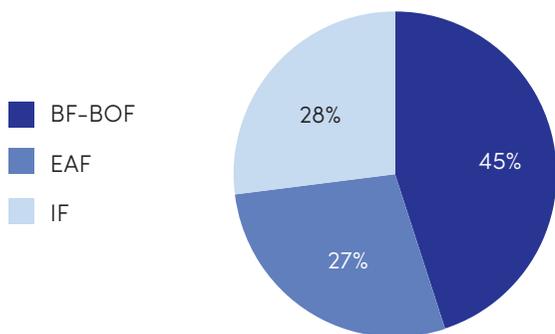
Largest consumers of steel in India (FY22)



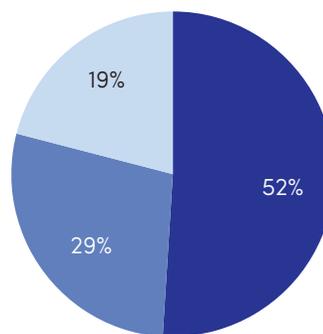
The expected rise of BF-BOF route share will add to industry's average emissions intensity by 0.14tCO₂/tcs by 2030 assuming the same emission intensity in steelmaking routes as in BAU scenario

Considering the demand projections; crude steel capacity may remain 227 MTPA (Million Tonnes Per Annum) by FY30#. As the capacity in FY21 is 143 MTPA, additional capacity of 84 MTPA will be added till FY30. Since these capacities are already planned, majority (70% i.e., 59 MT) of this incremental capacity would come from upcoming projects where route wise plans are known and remaining may come from projects whose plans are yet unknown.

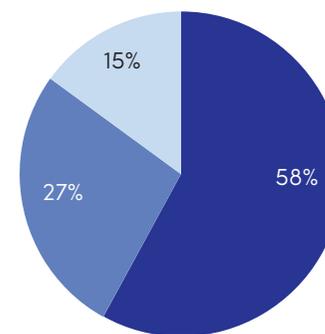
Capacity break-up FY21



At 227 MT (Base case FY30)



At 300 MT capacity Scenario



Current Capacity FY21
143 MT

BF-BOF:
45% (64 MTPA)

EAF:
27% (39 MTPA)

IF:
28% (40 MTPA)

Major additions (59 MT out of 84 MT – Route wise plans declared)

BF-BOF:
79% (JSPL, JSW, AM/NS etc.)

EAF:
21% (JSW, Rungta, JSPL etc.)

IF:
No announcements available

Remaining Addition (25 MT out of 84 MT – Route wise plans not clear)

Remaining additional announced capacity where route wise plans are not clear can be assumed at 70:30 between EAF & IF i.e., EAF 21% and IF 9% considering current break-up

Total Capacity FY30 (227 MTPA)

BF-BOF:
52% (116 MTPA)

EAF:
29% (64 MTPA)

IF:
19% (47 MTPA)

NSP Capacity (300 MTPA)

BF-BOF:
58% (174 MTPA)

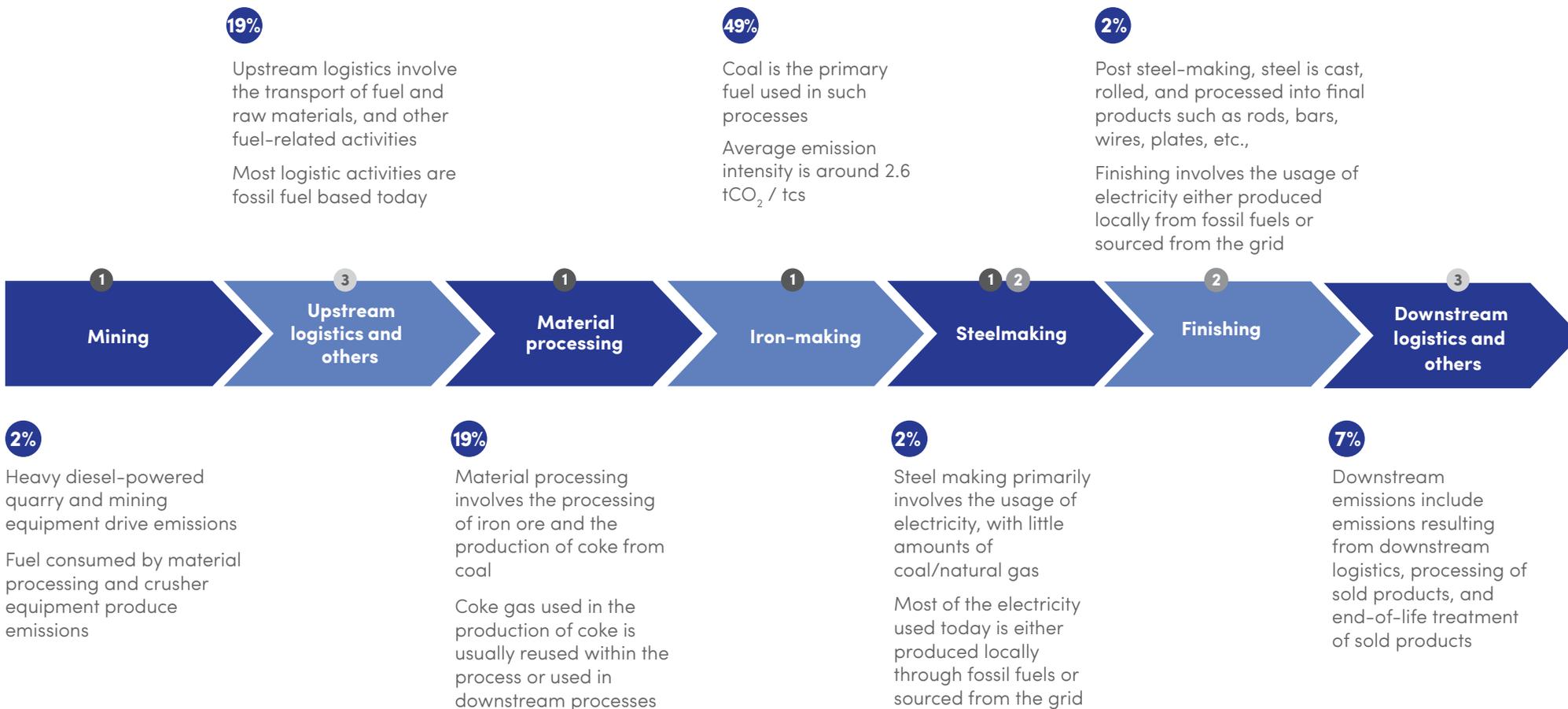
EAF:
27% (81 MTPA)

IF:
15% (45 MTPA)

*KPMG Analysis based on NSP-2017, Challenges and Outlines of Steelmaking toward the Year 2030 and beyond by MDPI # Considering crude steel demand of 176-210 MT in FY30 and 85% utilization, steel capacity in FY30 will be 208-247 MTPA (avg 227 MTPA) Source : JPC Report, Jan-Nov 2021

72-74% of the GHG emissions in the BF-BOF route is Scope 1 & 2, which is mainly contributed by the use of fossil fuel at different stages of the value chain

In a BF-BOF process, coal/coke usage in iron making and material processing contributes to almost 68% of overall steel emissions. In a Coal-DRI process, almost 95% of the emissions are Scope 1 & 2.



Scope 1 2 3 % Share of emissions intensity across the value chain

Source: IEA NZE by 2050, World Economic Forum

1) Depending on the upstream/ downstream integration of a steel player, the terminology of Scope 1 & Scope 3 may change to reflect ownership

Sources: 1. KPMG analysis using TATA steel sustainability report FY 21, TATA steel 2. Sabarish Elango, KTH

1

Overview and emissions profile of the Indian steel industry

2

Activating the net zero steel ecosystem - led by demand

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Sectoral demand outlook for low/zero carbon steel

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Influencing green steel production through SteelZero

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Enabling a progressive policy environment for production of low/zero carbon steel



Key stakeholders in the steel ecosystem must collaborate early to identify, develop and seize opportunities of decarbonisation without disruption

01

Steel consumers

Steel consumers must demonstrate climate leadership and make commitments to procure low carbon steel providing a line of sight to producers

Embodied emissions in steel are of material interest now to companies including scope 3 emissions in their net zero targets



02

Steel producers

In the short to medium term, steel producers must collaborate with their supply chain partners to deploy existing decarbonisation technologies.

They must engage with their customers, end users, policy makers and investors to co-build an economic case for supporting their early R&D and piloting new transformative technologies.



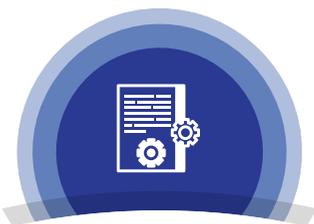
03

Policy makers

Regulators can borrow best practices from progressive policy (current trends and future direction) measures implemented in other markets.

For example, CBAM, and emissions trading schemes in the EU, China

Policy makers need to account for interactions and dependencies between steel producers and end-use consumers for holistic emission reduction policies.



04

Investors

Investors must align capital expenditure with 'net-zero' goals, and build internal capacity and capability to invest in decarbonisation projects

Investors and financial institutions must invest time and effort to play a more active role in the changing needs of the industry and contribute to projects that help Indian industry remain competitive in the global market even after adopting low carbon steel.



05

Civil society

Civil Society organisations must hold the sector accountable to meet the highest standards of sustainability

They must work towards encouraging and mobilising voluntary emission reduction commitments and action by key stakeholders.



Market

1. Pressure from rising climate risks will push for sustainable and green steel procurement for all sectors
2. Early finance supported by policy and bold industry action will move markets towards greater adoption of best available decarbonisation technologies as well as piloting of transformative technologies.

Each stakeholder must take the lead on critical steps that will enable the shift to a low carbon steel market



01

End-use consumers

Must pool demand to demonstrate evidence-based projections of green steel to incentivise producers to manufacture green steel



02

Ministry of Steel

Must develop a medium & long-term vision (2030–50) with well-defined milestones for steel companies to set and transition towards decarbonisation targets



03

Stelmakers

Must quantify and target not only Scope 1 & 2, but also Scope 3 emissions.



04

Steel producers and end-consumers

Must plan ambitious climate actions aligned with SBTi to the emissions. They need to leverage SBT sector-specific methodologies, tools and guidance while implementing best practices with the help of EAGs (Expert Advisory Groups)



05

International/domestic steel-making and end-use industry associations

Must collaborate and establish wider ESG considerations such as sustainable financing, green steel market development, updated metrics on low-carbon steel



06

Policymakers (Relevant policymaking bodies)

Must encourage faster innovation of technologies to ensure larger adoption of transformative technologies (particularly those in early stage of development)



07

Investors (both private and public) and financial institutions

Must establish focused funds for research on low carbon technologies in steel like the Low-Carbon Energy Research (LCER) funding initiative¹. These funds must be in the form of low-cost patient capital, and invest in, and de-risk decarbonisation technology projects.



08

Civil Society Organisations

Must develop accountability frameworks to guide, track and course-correct identified actions – such as the ResponsibleSteel International Standard

By making a commitment to SteelZero, demand side companies can activate and influence producer action for an early transition towards producing low carbon steel

LONG TERM COMMITMENT

Commitment to meeting 100% of steel requirement through net zero steel

SteelZero sends a strong demand signal to shift global markets and policies towards responsible production and sourcing of steel.

INTERIM COMMITMENT

By 2030, a minimum of 50% steel procurement will be a combination of:

- Steel from producer with SBT or equivalent
- ResponsibleSteel™ certified steel or equivalent
- 'Low(er) Embodied Carbon Steel'

Low Embodied Carbon Steel is defined as crude steel with a GHG Emissions intensity of less than or equal to the 2030 target threshold

(i) Crude Steel produced if produced from 100% end of life scrap = 0.2 metric tonnes of CO₂ equivalent/ metric tonne crude steel

(ii) Crude Steel produced if produced from 100% iron ore = 1.4 metric tonnes of CO₂ equivalent/ metric tonne crude steel

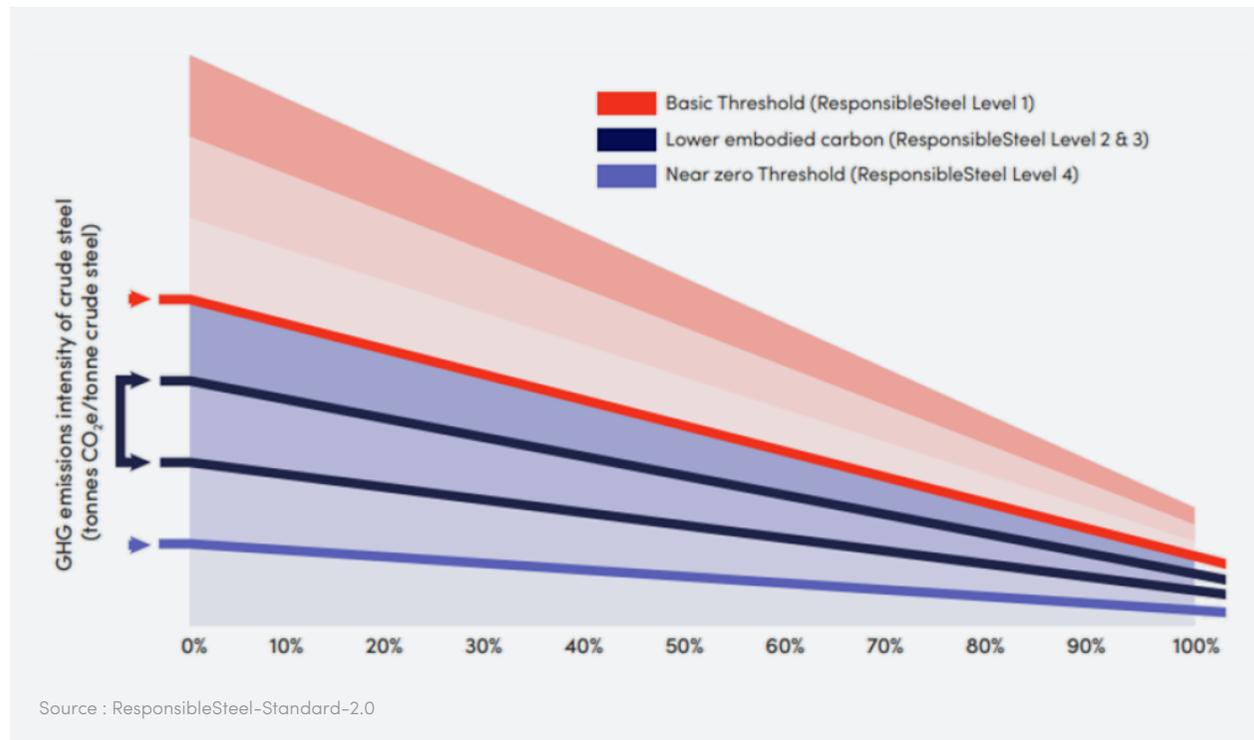
In the absence of commercially available low carbon steel or net zero steel, SteelZero's interim commitment pathways are designed to encourage steel producers to align their action with existing acceptable standards in line with the 1.5-degree pathway

 Several SteelZero members already have operations in India and are committed to buying only net zero steel by 2050



ResponsibleSteel’s multi-level grading of steel in terms of emissions intensity provides clear definitions and benchmarks to align their decarbonisation roadmap to meet SteelZero demand

- The 4 levels distinguish performances from Level 1 (basic threshold) to Level 4 ('near zero' steel). Level 4 will eventually inch towards 'net zero' steel.
- The embodied GHG intensity value enables customers to compare decarbonisation progress of all steel suppliers on a like for like basis. This model can be used to drive decarbonisation globally, and not limited to the local geography.
- The disclosure of proportion of scrap input informs customer on the level of circularity.
- Level 1 threshold will become more demanding over time considering further revisions



The ResponsibleSteel sliding scale **drives equity and promotes a just transition** of steel decarbonisation by providing a consistent, transparent international standard and assurance program. The aim of level 1 is to **generate market demand to support the creation of responsible supply chains.**



Tata Steel has become the first steel producer in India to achieve ResponsibleSteel Certification for three of its sites in Jamshedpur – a key first step towards the production of ResponsibleSteel certified steel.

1

Overview and emissions profile of the Indian steel industry

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Activating the net zero steel ecosystem - led by demand

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Sectoral demand outlook for low/zero carbon steel

4

Influencing green steel production through SteelZero

5

Enabling a progressive policy environment for production of low/zero carbon steel

Construction and infrastructure, automobiles and capital goods constitute more than 85% of the total steel demand in India

The large share of the private sector in the construction, automobile and capital goods sectors makes them ideal for engagement for SteelZero. However, a differentiated engagement strategy for each of these sectors will be needed.

Sector ¹	% Share in 2022 ²	% Share in 2030 ³	Key Segments of sector	Private share ⁷	Medium-term drivers for growth	Steel intensity ⁸
Construction	45%	60%	Housing, commercial space		Strong economic growth, national housing schemes	
Infrastructure	23%		Roads, highways, railways		Strong growth in urban infrastructure	
Automobiles	9%		Motorcycles, passenger & commercial vehicles		Strong economic activity, increased export opportunities, customer response	
Capital goods	10%	22%	Machinery and equipment		High export potential	
Consumer goods	6%		Electronics, appliances, durables		High CAGR 2025 ⁴ , new rural demand,	
Others	7%	6%	Packaging, cylinders, wagons, coaches		Strong growth in cylinders, wagons and coaches' market to grow multifold ⁵ .	



Low private share



High private share



Increasing steel consumption intensity



Decreasing steel consumption intensity



No major observable trend

[1] Sectors have been bifurcated according to NSP [2] Indsteel [3] According to the National steel policy 2017, NSP [4] IBEF [5] Moneycontrol [6] Steel consumption is still expected to grow within the construction sector to about 140 million tonnes by 2030 (according NSP) a 2x growth spurred by increased steel intensity of construction and increased construction activities. [7] Private share has been preliminarily estimated based on direct/ indirect control on steel purchase decisions [8] Steel intensity is defined as the amount of steel used per unit of gross domestic product in particular sector

Construction and infrastructure - Large developers and industrial construction owners who are sole decision makers on quality of steel used in their projects can be early movers to demonstrate demand for low carbon steel

Different stakeholders drive procurement decisions within each sub-segment of the construction sector. Industrial and residential construction sectors are largely managed by private developers who have limited external dependencies to determine quality of steel used in their projects. The procurement decisions within the infrastructure segment are led partially by government and partially by select large developers, hence policy is expected to play a key role in green steel procurement.

Segment	Individual (residential) construction	Industrial construction	Large construction (Residential & Commercial)	Infrastructure construction
	This is applicable in rural and semi-urban areas. Masons, architects, fabricators, local steel retailers are involved in the decision making.	This includes factories and other industrial facilities. Due to the large procurement orders involved, this sector can have an important influence on steel producers.	This includes factories and other industrial facilities. Due to the large procurement orders involved, this sector can have an important influence on steel producers.	This covers roads, highways, airports, ports, etc. and is largely driven by government .
Key decision maker	Owner		Large developers	Large developers / Government

- Individual residential construction is a price conscious segment with varied usage of material and unlikely to be an early mover in green steel procurement
- Large scale industrial construction can be targeted for decarbonisation as owner companies are likely to have commitments to reduce their overall emissions and green steel procurement can contribute to their decarbonisation targets. However, small and medium enterprises (SMEs) are unlikely to demonstrate similar action.
- Large residential & commercial construction has a mix of both large and medium players and can play an early leadership role. However many large projects are also price sensitive and hence low cost production of green steel will be required for sustained adoption.

Large developers and global construction firms like Severfield and Mace Group are existing SteelZero member companies with a presence in India that already have company-level public commitments to procuring low carbon steel



Large organised players are already integrating vertically and hence are likely to have more independence in steel procurement decision-making. JSW One Home by JSW Steel and TATA Aashiyana by Tata Steel, are examples of one stop shops for entire product range for individual home construction as well as organised construction.

Through procurement of green steel, large developers and asset owners have the potential to reduce 204 Mt CO₂ from their upstream Scope 3 emissions*

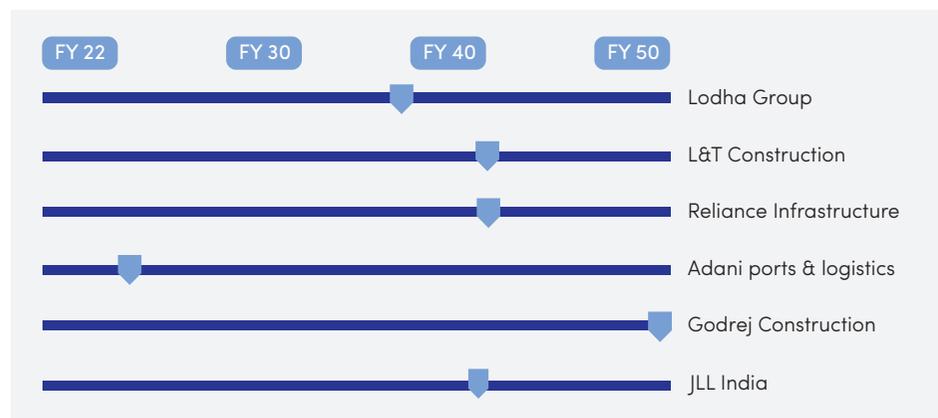
Large and consolidated players in construction sector have set ambitious decarbonisation targets that could potentially translate into green steel demand. However, given a highly fragmented market, the market share of such large consolidated players remains low (~10%).

EMISSIONS FOR THE CONSTRUCTION SECTOR# [2019]

Estimated as a sub-sector of 'Building' sector – Annually 90 % of emissions in construction phase

Emission type	Values*
Scope 1 & 2 emissions	210 MtCO ₂ ¹
Scope 3 (due to steel)	204 MtCO ₂

NET ZERO TARGETS



Sources: 1. Science Direct 2. Calculated based on steel consumption within the sector and steel emission factor illustrated earlier. Scope 2 emissions due to steel represents the addressable market of emission reduction due to green steel adoption 3. Research gate 4. RMI 5. CDP 6. Solar Decathlon India

* A following piece of analysis is being conducted to examine demand forecast for net zero or low carbon steel for the construction sector and will be published shortly.

KEY INSIGHTS FROM THE CONSTRUCTION SECTOR

- Companies taking initiatives to tackle their scope 3 emissions are likely to be the first movers in addressing embodied carbon emissions in their supply chain. For example, Lodha Group will begin to address scope 3 emissions as per the GHG accounting standard, within its spheres of influence, such as tenant energy, transportation, and embodied carbon.
- Large, organised players constitute only around 10% of the sector.³ However most public infrastructure projects are delivered by these organisations. Many of them have set net zero targets (ref. to left timelines) and are likely to include scope 3 emissions in the future.
- A significant part of the construction industry is fragmented, with more than 25,000 companies in large, medium and small categories. Scaling up voluntary decarbonisation commitments and targets for this sub-segment will be a challenge.
- Scope 3 emissions due to steel make up almost 1/3rd of overall scope 1 and scope 2 emissions within the sector⁵.
- 70 percent of India's 2030 urban infrastructure is yet to be built⁶ signaling a huge emission risk if this demand is not addressed by low carbon steel. In addition to embodied carbon emissions, efforts in these projects should also assess emissions from the full life cycle of this building infrastructure⁴.

Government policies and mandates will play a key role in capturing the demand for green steel from large infrastructure projects

Some of the key large infrastructure projects in line-of-sight account for more than 60 MT of steel demand. Aggregating demand from large infrastructure projects to indicate future demand for green steel could be an effective and efficient way for the government to encourage low carbon steel procurement and hence production

Rapid urbanisation, population growth, easy availability of finance & rise in disposable income are key drivers in growth of residential infrastructure sector.

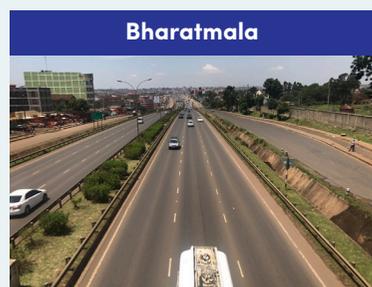
While residential growth will be spurred by major government programs such as Smart Cities Mission³ and affordable housing (PM Awas Yojana), the government is also pushing for infrastructure development with large-scale nation-wide projects such as Bharatmala, Sagarmala, Jal Jeevan etc.



KEY INSIGHTS FROM THE PUBLIC INFRASTRUCTURE SEGMENT

- As the owner of public infrastructure projects, the government can mandate low carbon steel in public procurement with pre-defined gradual enhancement of targets.
- Government procurement of steel in specific projects with huge environmental impact (e.g., development of ports, riverfronts, ecological rehabilitation etc.) can reflect whole-life carbon performance as a criterion, the way quality is incorporated in QC-BS (Quality Cost Based Selection) criteria-based tenders.
- Design and performance standards (e.g., BIS, BEE, NBC) can be updated to include new approaches to risk that will improve the material efficiency and carbon performance of buildings and infrastructure, including the reuse of materials and components.

STEEL DEMAND* FROM LARGE INFRASTRUCTURE PROJECTS



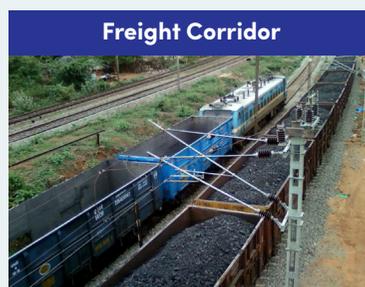
Bharatmala

Construction of 83,000 km of roads
18-20 MT



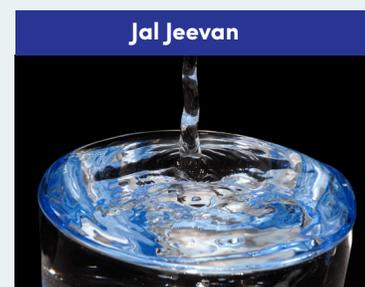
Sagarmala

Port modernisation through more than 577 projects from 2015-35
13-15 MT



Freight Corridor

2 dedicated freight corridors (Eastern & western) with total stretch of 3360km to be built
6-7 MT



Jal Jeevan

Safe drinking water to all rural households by FY2023-24
11-13 MT



Udaan

100 new airports to be built over next 20 years
7-9 MT

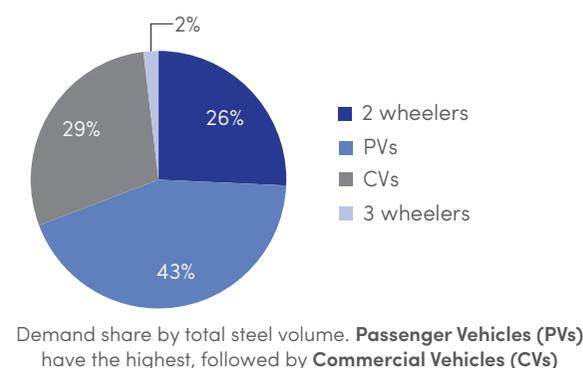
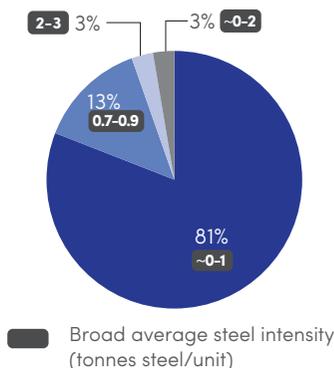
*Steel Demand for entire project cycle

Automobile – Four-wheelers constitute the largest steel user segment within the auto sector with an estimated annual demand of 38 million tonnes by 2050

The concentrated nature of the automotive industry led by large multinationals and high visibility due to direct retail markets make it relatively easy to influence as well as well-placed to take action on low carbon steel procurement commitments.

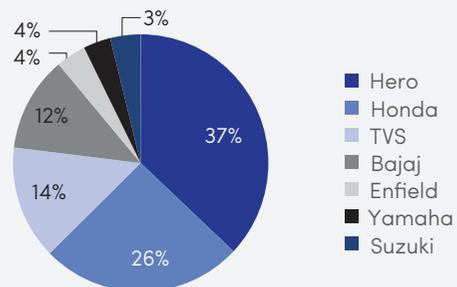
- While 2-wheelers dominate in terms of units (81%), 4-wheeler segments lead in terms of steel consumption.
- Within each of the segments, top 4 players control majority of the market share..
- The sector assumes importance due to growth of 8% till FY30¹ & its expected increase in share of steel demand from 9% to 12% by FY30.
- Although current share of EVs is less (0.15 million in FY-20¹ as against 21.5 million ICE vehicles), the share is expected to increase significantly.

Automobile Sales² (%)



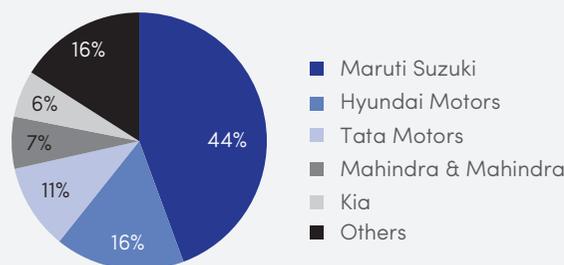
% share in Sales (2 Wheelers)³

77%



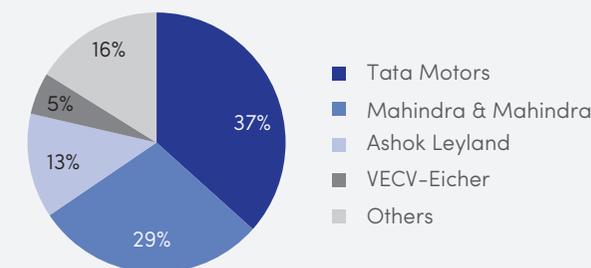
% share in Sales (PVs)⁴

76%



% share in Sales (CVs)⁵

79%



Source: [1] Electric Mobility in India, World Bank [2] Society of Indian Automobiles Manufacturers [3] India Automotive Sector 2022 Q3, EMIS [4] Sales volume of CVs across India in 2021 [5] Commercial Vehicles

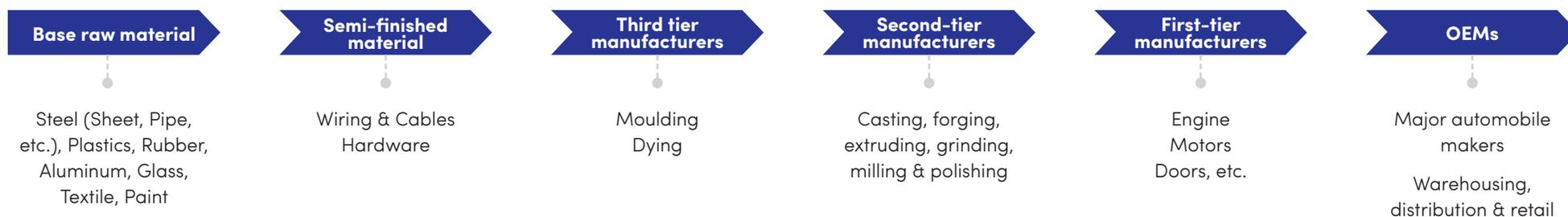
ALL FIGURES FOR FY21



Share of top 3 players in each segment

Large original equipment manufacturers (OEMs) can take the lead on low carbon steel procurement but must work with their first, second and third tier manufacturers to enable successful end-to-end adoption

OEMs are key decision makers and any commitment by them to procure low carbon steel will require the entire value chain to adapt. Some OEMs and first-tier manufacturers are already SteelZero members demonstrating value-chain level initiatives to achieve their target.



- Automobile markets generally have a 3-tier system. While OEMs are the final assemblers, the other manufacturers in the value chain are –
 1. **Tier-1** (assembly manufacturers) for genuine branded products like engine, motors, doors etc.
 2. **Tier-2** manufacturers who manufacture components such as nuts and bolts and other small parts
 3. **Tier-3** manufacturers (mould/dye manufacturers) are the small enterprises supplying to Tier-2 manufacturers
- The key decision makers are auto OEMs who decide and specify characteristics (design, material, composition, etc.) of all the components in an automobile.
- 90% of 2-wheeler market, ~100% of the passenger vehicles, and ~85% of the commercial vehicle segment consist of large, global players who are under increasing pressure to meet decarbonisation targets..

Source: Automotive Component Value Chain Overview, USAID



- By joining SteelZero, **SKF** has publicly committed to using 100% net zero steel across its value chain by 2050. The actions needed to achieve this target differs depending on the position of the entity in the value chain and avenues through which SKF can assert influence.
- The 2030 goal for decarbonising **SKF's** own operations will be achieved by improving material efficiency and by switching to 100% renewable energy.
- Emissions related to forging, ring and roller suppliers would be reduced by 80%, and by 70% from the plastic and rubber direct material suppliers.
- By 2030, all **SKF's** direct material suppliers will need to include scope 3 reporting and submit an emissions reduction plan.
- In upstream emissions, **SKF** has been working together with other like-minded industrial users of steel to advocate for the structural changes needed
- **Leveraging multi-stakeholder platforms such as SteelZero, SKF intends to advocate for positive and binding outcomes on net zero steel in forums such as the UN climate negotiations.**

Source: SteelZero website, SKF Annual Report

Through procurement of green steel, automakers have the potential to reduce 27 Mt CO₂ from their upstream Scope 3 emissions*

Existing net zero targets from leading automakers places them as key frontrunners to also push the agenda on procurement of low carbon steel.

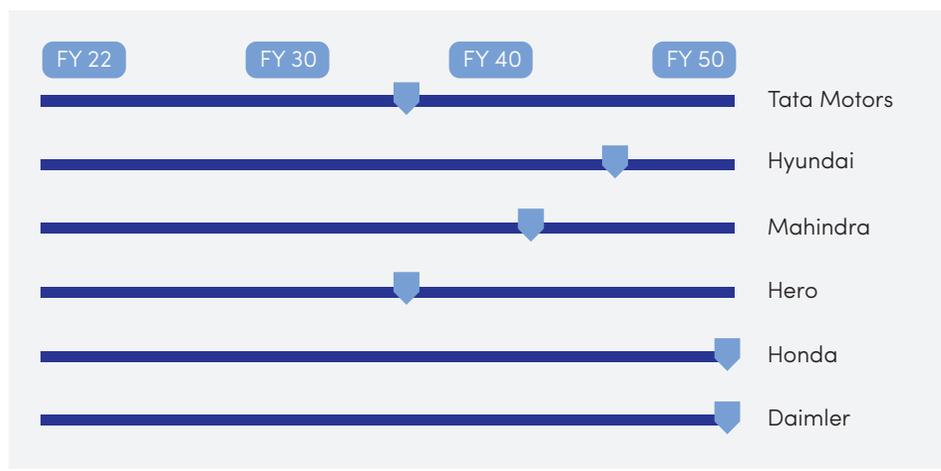
EMISSIONS FOR INDIA'S ROAD TRANSPORT# SECTOR [2021]

Road transport accounts for 75% of the total transport emissions.

Characteristics	Values
Scope 1 & 2 emissions	51 MtCO ₂ ¹
Scope 3* (due to Steel)	27 MtCO ₂

*Steel alone contributes to 20 % of the Scope 3

NET ZERO TARGETS



KEY INSIGHTS FROM THE AUTO SECTOR

- Through SBTi, **TATA Motors** has committed to reducing its Scope 3 GHG emissions from purchased goods and services and use of sold products by 54% per car by FY30 from a FY20 base year.
- **Hyundai** aims to achieve 30% of its global vehicle sales through ZEVs (Zero Emission Vehicles). The '2045 Carbon Neutral Roadmap' entails joining SBTi for credible decarbonisation targets.
- **GM** has adopted sustainable procurement practices and asked suppliers to commit to carbon neutrality, which will help reduce its own Scope 3 emissions that come from purchased goods and services by 14%.
- **Toyota** plans to reduce CO2 emissions by electrifying products, raising their efficiency, and making them lighter, increasing loading efficiency and transport efficiency and logistics.
- Some tier-1 manufacturers have also made net zero commitments such as **Motherson Sumi** for 2040, ZF CV (Wabco) by 2045 whereas others like **Minda Industries**⁶ have taken steps towards decarbonisation without specific targets.
- On an average, embodied carbon from steel in a vehicle accounts for a sizeable proportion (20%) of its Scope 3 emissions, following vehicular emissions (70%)

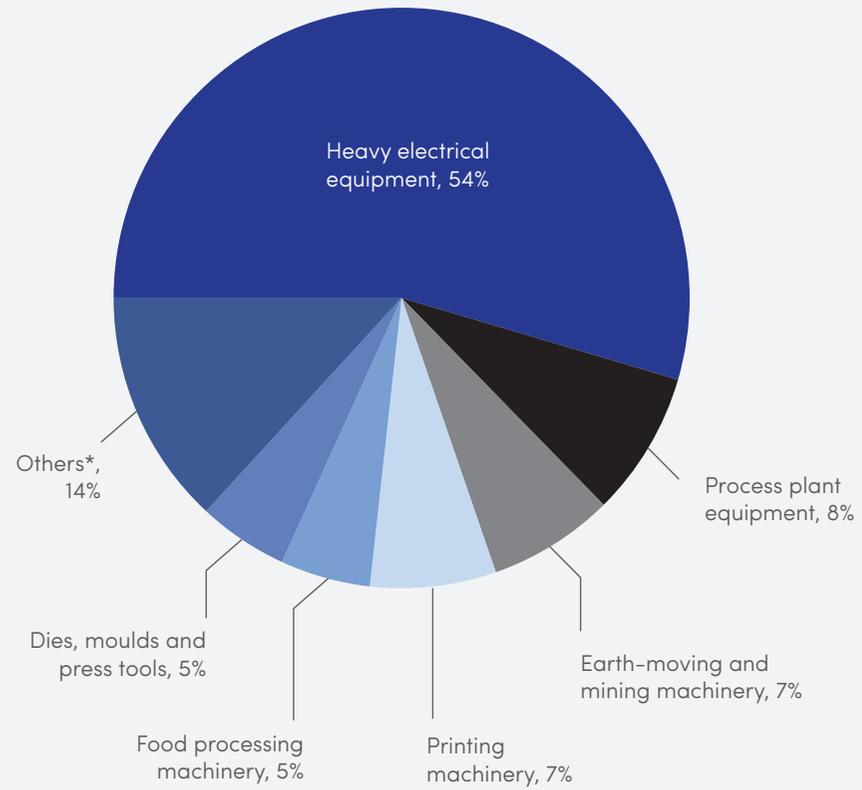
Sources: 1. As of 2019, Climate watch 2. Calculated based on steel consumption within the sector and steel emission factor illustrated earlier. Scope 2 emissions due to steel represents the addressable market of emission reduction due to green steel adoption 3. IBEF Automotive 4. Page 10, Annual Report 2021-22 5. ZF CV (Wabco) Sustainability 6. Minda Industries ESG

* A following piece of analysis is being conducted to examine demand forecast for net zero or low carbon steel for the automotive sector and will be published shortly.

Capital Goods – Despite 35% of India's capital goods being imported¹, demand of steel from capital goods manufactured domestically is projected at 35 MT by 2030

More than half of the capital goods market in India is dominated by the heavy electrical equipment manufacturer segment. Within this sub-sector, the 3 largest companies controlling 60–65% share of the market are the largest steel users.

Capital Goods Market size – Categorized



* Others include Textiles, Machine tools, Plastic machinery and Metallurgical equipment
 Source: [1] Indian Steel Association [2] IBEF [3] As per KPMG analysis – based on market size

- The Capital Goods sector provides the products, processes and technologies to key high emitting sectors: power generation, building products, transportation, industry and consumer appliances. Capital goods currently account for around 15% of the domestic steel demand, equivalent to around 15 MT.
- Demand of steel from capital goods is projected at 35 MT by 2030 with India's steel demand expected to reach around 200 MT.
- Under the National Capital Goods Policy 2016, the government plans to implement various programs to increase production of capital goods to US \$102.53b by FY25²

Key Indian Capital Goods Manufacturers

- Bharat Heavy Electricals Limited
- ABB India Limited
- Cummins India Limited
- Larsen and Toubro
- Engineers India Limited
- CG Power and Industrial Solutions Ltd.

- CDP's sector report on the Capital Goods sector identify capital goods companies into three categories - Electrical Equipment, Industrial Conglomerates and Heavy Machinery.
- Top 3 companies with highest market cap and highest emissions are **Schneider Electric**, Mitsubishi Electric and ABB within the Electrical Equipment category; **Vestas, Siemens and Honeywell** in Industrial Conglomerates; and **CNHI, Kubota, and Hitachi** Construction in Heavy Machinery.
- Products with short cycles combined with high margins provide the strongest business case for decarbonisation – **the electrical goods sub-sector with steel usage ~25% of total Capital goods'** steel demand is a potential first-mover to lead demand for low carbon steel.

Capital Goods – Use of green steel should be a key priority for Capital Goods manufacturers as Scope 3 emissions form 90% of their net emissions*

By focusing on their Scope 3 emissions, capital goods manufacturers can achieve their net zero targets sooner than peer industries.

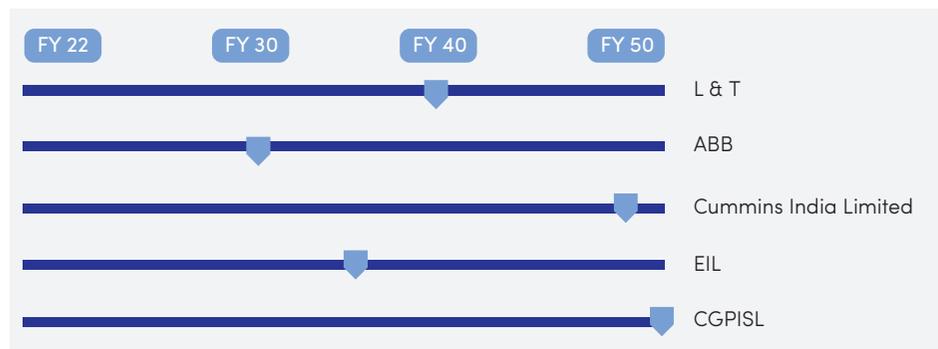
INDIA'S EMISSIONS FOR CAPITAL GOODS MANUFACTURING# SECTOR [2021]

Characteristics	Values
Scope 1 & 2 emissions	7 MtCO ₂
Scope 3* (due to Steel)	30 MtCO ₂

Capital goods contribute to 12 % of total emissions in manufacturing * Steel contribute to 15 % in Scope 3

- The biggest opportunity set available to the sector relates to electrification, with products linked to micro-grids, energy storage and distributed renewable generation
- As annual capital spending on physical assets in India is expected to rise from around \$300 billion in 2020 to \$600 billion in 2050² there will be a corresponding increase in the demand and therefore production of an equivalent volume of steel
- **As per CDP**, for a sector that is set to benefit most from low-carbon revenues, the level of focused attention on decarbonisation compared to automotive sector is low

NET ZERO TARGETS



Sources: 1.CDP Report 2. Business Today.

* A following piece of analysis is being conducted to examine demand forecast for net zero or low carbon steel for the capital goods sector and will be published shortly.



KEY INSIGHTS FROM THE CAPITAL GOODS SECTOR

- Scope 3 emissions are significant for this sector. The production activities in this sector result in significant energy use due to the nature and scale of the production.
- 32% of the companies have a Scope 3 emissions reduction target compared to 81% for Autos.
- Companies have been engaging with their supply chains. Under 'Mission to Zero', **ABB** has mandated its impactful suppliers- which account for 70 percent of its supply spend - to achieve a 50 percent reduction in their emissions by 2030.
- Scope 3 emissions are higher in production of capital goods than manufacturing as whole. This is because of higher hazardous waste generation, use of more variety of raw materials and more environmental impact associated with distribution
- The sector is not directly regulated for Scope 3 emissions. Regulatory pressure is likely to come through its end markets that are associated with high carbon emissions - power, transport, buildings and major industry sectors.
- Measuring downstream Scope 3 emissions due to purchase of capital goods is challenging. For e.g., if major capital goods purchases happen only once every few years, the manufacturer's downstream Scope 3 emissions may vary significantly from one year to another.



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Clear pathways exist for effective and efficient deployment of levers that can impact the entire value chain of steel production

Levers	Sub-levers	Areas of Impact	Value Chain Applicability
 Energy and Fuel Mix Optimisation	Renewable Electrification (RE)	Replacement of grid-based/ fossil fuel-based captive electricity with electricity generated from renewable sources such as solar and wind.	Steel-making and Finishing
	Green hydrogen / Biomass Injection	Replacement of pulverised coal injected into the blast furnace with renewable fuel sources such as Green hydrogen and Biomass	Iron-making
 Process / Material Efficiency	Improving Material & Process Efficiency	Using less material per unit of output, using higher quality input materials and improving the metallurgy of finished steel, and optimising processes to increase heat/ material recovery and yield	Entire Value Chain
 Circular Resource Utilisation	Scrap Usage	Increasing the share of scrap mix use	Steel-making
	Waste Heat Recovery/ Recycling (WHR)	Re-utilising heat generated from the manufacturing process and surplus steam from BF boilers	Iron-making
 Carbon Capture and Storage / Offsets	Carbon Capture, Usage and Storage (CCU/ CCS)	Carbon sequestration projects and/or carbon capture storage and utilisation technologies to convert CO2 emissions into useful products/chemicals	Iron-making and Steel-making
	Carbon Credits and Certificates (CCC)	Way to "cancel out" carbon emissions. It works by letting emitters fund and take credit for greenhouse gas reductions from a different project or activity elsewhere	Entire Value Chain

Swedish steelmaker SSAB, in partnership with Vattenfall and LKAB, has successfully produced the world's first fossil free steel using green hydrogen and renewable electricity.

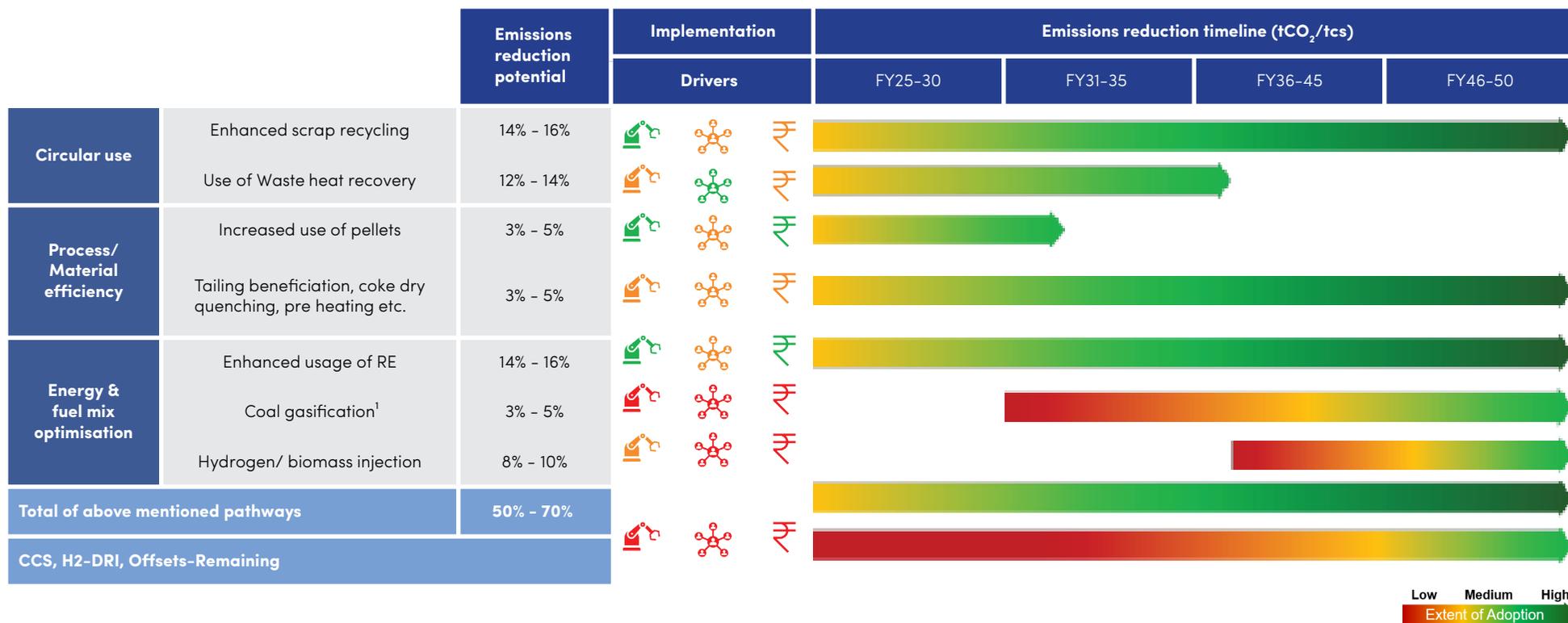
Improvement in the quality of raw material inputs leads to overall yield improvement and less material consumption. For example, iron ore with low alumina in sintering will lead to lower fuel consumption in blast furnaces.

Tata Steel has commissioned India's first state-of-the-art steel recycling plant at Rohtak with a recycling capacity of 0.5 million tonnes per annum.

JSW Steel is operating a Carbon Capture and Utilisation (CCU) facility of 100 TPD capacity where the captured and refined CO₂ is used in the food and beverages industry.

As available levers can achieve 50%-70% decarbonisation, net-zero initiatives will be key to create an ambitious demand-pull, fostering much needed innovation to meet 100% decarbonisation

Existing technologies and best available processes such as circularity, process and material efficiency, and energy and fuel optimisation can contribute up to 70% of total decarbonisation. Early investments in R&D and pilot projects on CCS, Green H2-DRI will be key to eliminating the majority of the remaining 30% of emission before 2050.



Since each of these technologies will mature at a different time, the associated emissions reduction for each will peak at different times as well. The extent of adoption of these technologies will depend on how the emissions profile of the industry evolves over this timeline.

Higher upstream Scope 3 emissions in Coal gasification based DRI due to usage of Iron pellets nullify the gain by reduction through thermal heat-based emissions in rotary kiln process.

Sources : Reduction of the iron process published by TERI; Net-zero steel sector transition strategy by ETC , CEEW

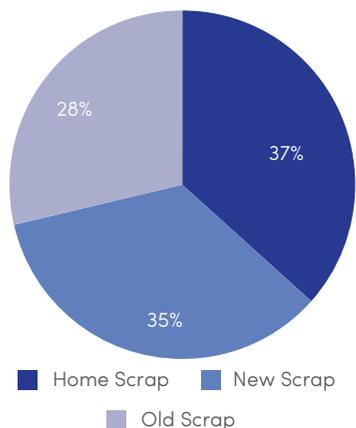
SYMBOL: Technology Ecosystem ₹ Cost

FAVOURABILITY: ● High ● Moderate ● Low/ Not Available

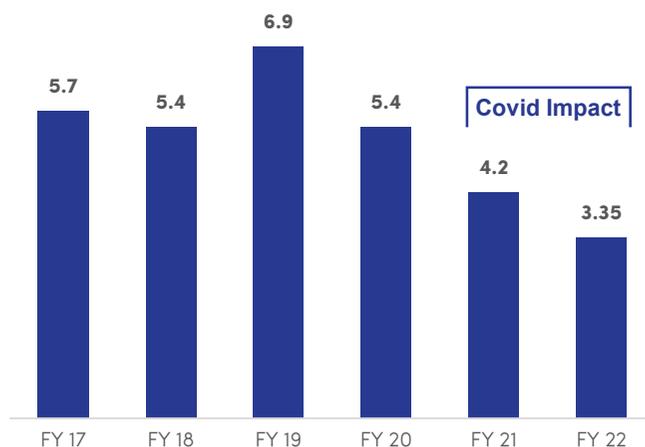
Increase in domestic scrap will not only reduce carbon intensity of steel but also bring down India's import dependence by 2030

Scrap based steel production emits only around 0.5 tCO₂ as compared to 2.5 tCO₂ through production from iron ore. Therefore, scrap can be considered as a highly effective resource for decarbonisation.

Domestic Scrap Sources

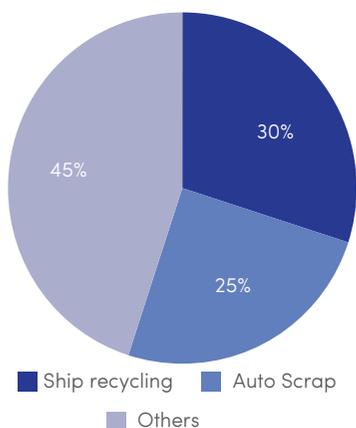


Scrap Imports (MT)

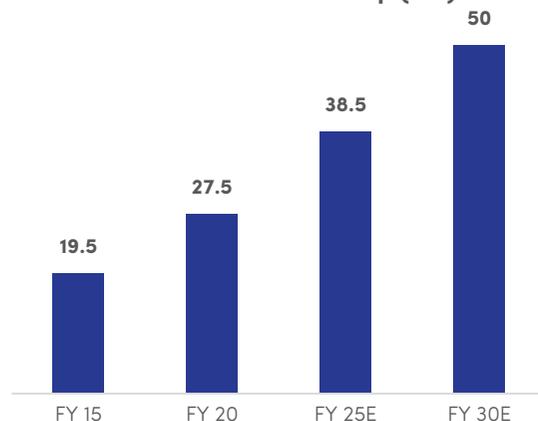


Domestic supply of scrap has been limited and therefore significant quantities have been imported in recent years. As per scrap recycling policy/strategy paper by NITI Aayog, domestic availability is estimated to increase to 50 MT in FY30 from 25 MT in FY18. Harnessing old scrap from ship recycling and auto sectors will be key to this.

Old Scrap Breakup



Domestic Scrap (MT)



Home Scrap	New Scrap	Old scrap
<ul style="list-style-type: none"> Steel scrap produced during steel production Usually added to in-house melting units If some scrap can be rolled, it is sold to re-rolling mills 	<ul style="list-style-type: none"> Scrap generated during fabrication of finished goods such as automobiles, auto ancillaries, white goods, etc. Normally directly sold by generating units to end users 	<ul style="list-style-type: none"> Scrap produced when steel products, e.g., ships, automobiles, white goods, fixtures etc. have served their useful life Large network involved in recycling supply chain

Note: Scrap estimates are as per the Steel scrap recycling policy and NITI Aayog report on scrap recycling. This may undergo changes with more information availability during the study.

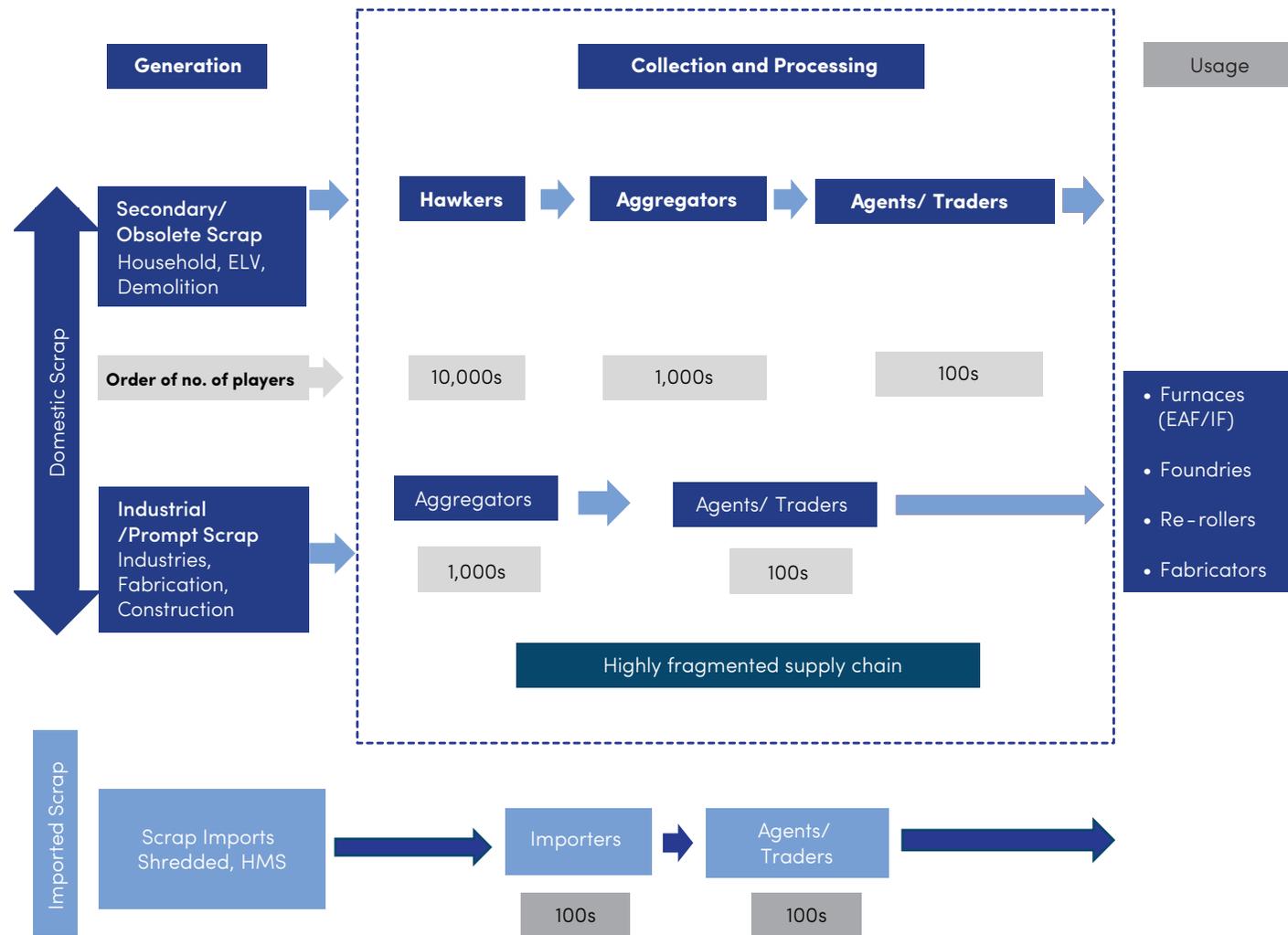
Source: 1. Ministry of Commerce Trade Statistics, <https://commerce.gov.in/trade-statistics/>, 2. Fig. 2 Steel scrap policy, Ministry of Steel & Strategy paper on resource efficiency in steel sector by NITI Aayog

Existing scrap collection methods can be significantly improved through an organised and consolidated supply chain based on a robust accountability framework

- National Steel Policy 2017 (NSP-2017) resolves to develop a globally competitive steel industry by creating 300 Million tonnes per annum (TPA) steel production capacity by 2031 with a contribution of 35-40% from EAF/IF route. It also aims to promote an organised scrap recycling ecosystem.



- As per NSP, 70-80 MT scrap would be required for steel production of 250 MT
- This will require ~700 scrap processing centres, 2800-3000 collections & dismantling centers
- The setting up of these centers near highways, industrial corridors, railway sidings and in close proximity to Sagarmala project can aid in faster development of the scrap eco-system.
- Streamlining of collection and processing of obsolete scrap is a huge opportunity to increase scrap supply. Policy support will be required to organise the sector while ensuring adequate quality, health, safety and environmental controls.



Source: NITI Aayog

Ship recycling is well positioned to address India's growing scrap deficit by potentially contributing up to 10 Mn tonnes of high-grade scrap steel by 2030*



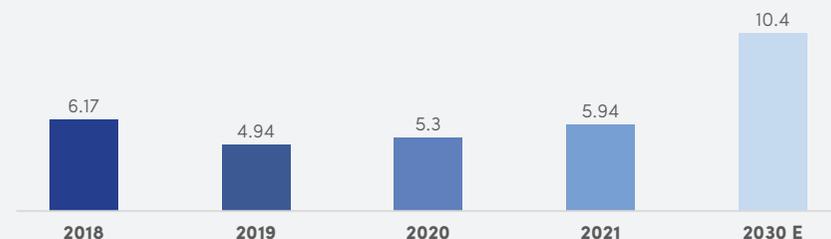
* The intent of this section of the report is to underline the critical role of scrap steel in decarbonising steel in India. Ship recycling is one industry, among several others, which has an immediate potential of infusing scrap steel. This showcase on the ship recycling sector for scrap is only indicative. Climate Group is examining scrap steel from shipping and other industries in more detail.

Role of ship builders and owners, investors, port operators and steel producers will be key to leverage the true potential of ship recycling under an enabling policy environment

A vessel typically comprises 75-80% of structural steel scrap and 5 -10% of heavy machinery (cranes, wrenches etc.). Sale of higher-value non-ferrous metals, oil, and furniture found on ships form a sizeable part of the vessel scrap beyond steel. India, Pakistan and Bangladesh alone constitute 92% of the entire ship recycling industry.

OPPORTUNITY SIZE

(LDT¹ RETRIEVAL FROM SHIPS IN MILLION TONNES)



FAVOURABLE ECOSYSTEM IN THE INDIAN SUBCONTINENT



Better demographic dividends, requirement of semi-skilled labor force along with rich experience in low-cost SR matches with government theme of "Wealth from Waste" under Swachh Bharat Mission



The industry requires relatively low fixed capital (plot lease, machinery and equipment) and high working capital



India currently has several defunct & under-utilised yards on both eastern and western coast, which can be conditioned to carry out recycling of larger ships (Panamax & above)

RISKS ASSOCIATED WITH SHIP RECYCLING

Inadequate infrastructure – EU flagged ships can only be recycled at approved yards on the EU list with no ship recycling yard in India currently approved under EU SSR³.

Lack of tertiary health care facilities in the vicinity of ship recycling yards in Alang – This constitutes a bottleneck for approval to recycle EU flagged ships

Disposal of hazardous by-products – The toxic materials contained inside the ship's structure need to be properly located, identified, removed and disposed.

ROLE OF INDUSTRY IN SHIP RECYCLING INDUSTRY



Buyers

Shipping companies are not only buyers of steel for ship building but also end of life owners of steel scrap from ship recycling. SteelZero members such as Maersk are setting an example by not only procuring green steel but also providing marine grade scrap steel.



Steel Producers

Steel producers must invest in infrastructure and capacity to effectively utilise this source of scrap steel and engage more strategically and proactively with the ship recycling industry.



Investors

Financers can incentivise best in class end-of-life ship disposal practices. For ex: The SRTI2 (Ship Recycling Transparency Initiative) aims to accelerate a voluntary, market-driven approach to responsible ship recycling with shipowners disclosing data on their ship recycling policies and practices

ROLE OF POLICY MAKERS TO MAKE STEEL AN ATTRACTIVE PROPOSITION



The Ministry of Shipping and International Maritime Organisation can work more closely with the Ministry of Steel and NITI Aayog to explore cross-industry decarbonisation benefits and develop a national level plan to leverage scrap steel from ship recycling.



More infrastructure like Alang is required, supported by an enabling policy environment to address our steel scrap deficit by tapping into the increased supply of steel scrap from ships due for recycling.



The Recycling of Ships Act, 2019 provides for the regulation of recycling of ships by setting standards and laying down the statutory mechanism for enforcement.

Source: 1. LDT (Light Displacement Tonnage) 2. SRTI 3. EU SRR (Ship Recycling Regulation)

1

Overview and
emissions profile of the
Indian steel industry

2

Activating the net
zero steel ecosystem
- led by demand

3

Sectoral demand
outlook for low/
zero carbon steel

4

Influencing green
steel production
through SteelZero

5

**Enabling a
progressive policy
environment for
production of low/
zero carbon steel**

While India's steel landscape is unique, it can borrow and contextualise learnings from policy trajectories adopted by other key steel producing regions/countries

EU¹



- **Circular Economy Action Plan 2020**
steel as one of the priorities
- **EU Emission Trading System (ETS)** – cap & allowance trading
- **Clean Steel Partnership**
research and innovation of \$ 700 mn.
- **CBAM**
reduce carbon leakage in import
- **France**
roadmap mandating 31% reduction in CO₂ emissions by 2030

CHINA²



- **Reduction in fossil fuel mix**
14th 5 year-plan target for non-fossil-based energy proportion increased to 20% from 15%
- Started **National trading system for carbon emissions**. This will cover the steel sector
- Removed tax rebate on export and put cap on steel production
- National Development and Reform Commission (NDRC) plan of 300-320 Mtpa for domestic steel scrap supply by 2025.

S. KOREA³



- **Emissions Trading Scheme**
Major emitters of GHG (including iron & steel) are required to put a limit on their CO₂ emissions with average annual cap of 610Mt CO₂ emissions set for initially 6 sectors including steel from 2021-2025

U.S.⁴



- **Waste Heat Recovery**
US has plans to develop additional routes for utilising waste gases (hydrogen, CO, CO₂ etc.)
- **Focus on energy efficiency**
More than 2/3 of total GHG emissions reduction to near zero in 2050 comes from improvement in energy efficiency and switching to low/no-carbon fuels and electrification.

JAPAN⁵

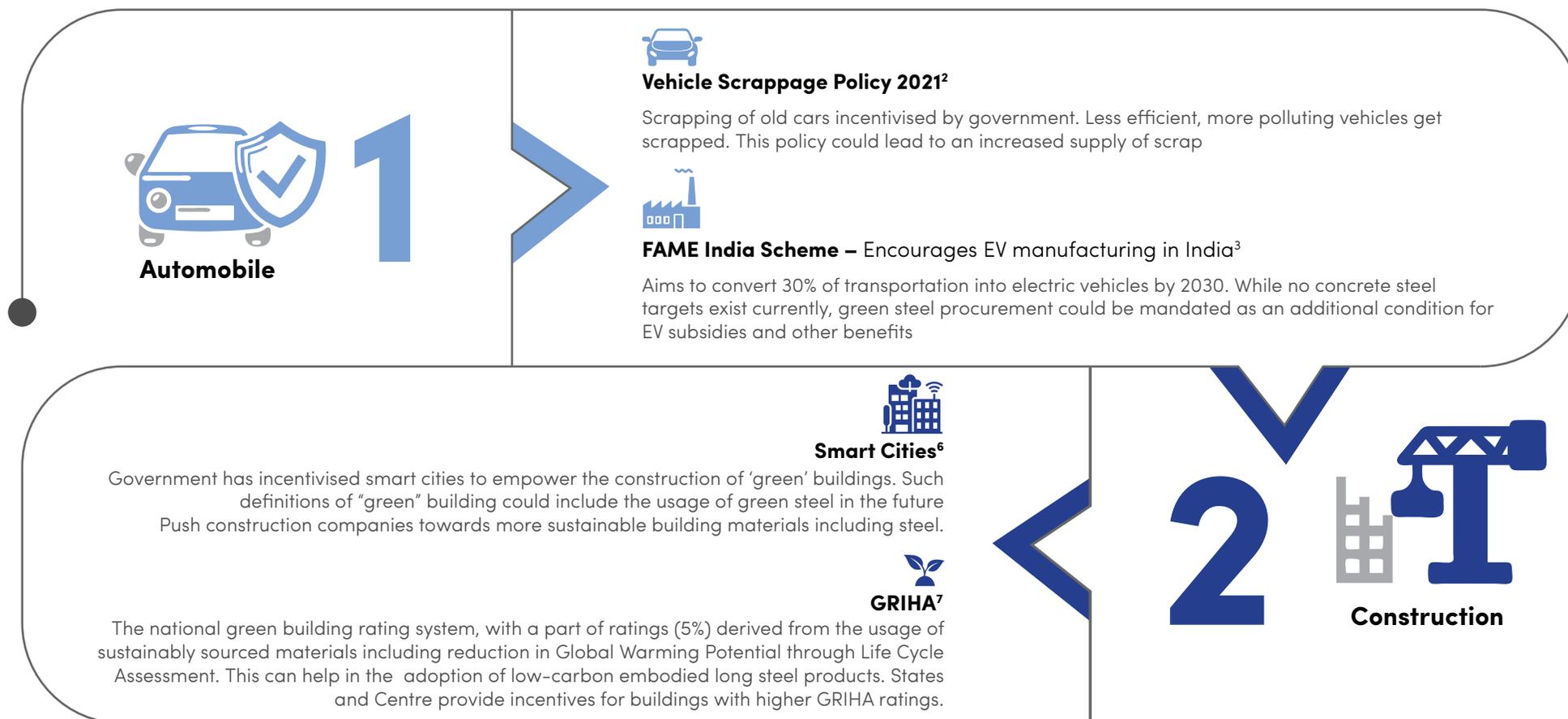


- **R&D fund**
Design and development of a promotion system and institutional design to encourage the spirit of challenges in companies in the operation of the Green Innovation Fund
- **Energy**
The 6th Basic Energy Plan sets a target of 36-38% for RE electricity in 2030

Sources: [1] Europe's steel industry sees numerous paths to decarbonisation | IHS Markit [2] World Steel [3] Steel Decarbonisation [4] Clean Energy News [5] Steel Decarb

Existing policies for end use industries can be both adapted and enforced more effectively to influence faster adoption of low carbon steel

Existing policies in the automobile and construction sectors, if effectively enforced, have the potential to incrementally nudge industry towards adoption and use of low carbon steel.



1 Net Zero Auto 2 Vehicle Scrappage Policy 3 FAME 4 Steel Utilisation Pg 46 5 Net Zero Construction 6 Smart Cities 7 GRIHA 8 Rating System

The Steel sector needs to respond fast and effectively to meet India's NDCs as well as the Net Zero goal by 2070

UPDATED NDC COMMITMENTS¹

In COP-26, India promised five nectar elements to tackle the challenge of climate change – these 'Panchamrit' were translated into enhanced climate targets.

- Increase non-fossil energy capacity to 500 GW by 2030
- Meet 50 per cent of energy requirements till 2030 with renewable energy
- Reduce projected carbon emission by 1 billion tonnes by 2030
- Reduce the carbon intensity of economy by 45% by 2030
- Achieve net zero by 2070

The enhanced targets of meeting energy requirement from renewables and reduction of carbon intensity in economy will lead to renewed focus on usage of renewable energy in steel. We can expect more aggressive targets for average steel emission intensity than achieving 2.4 tCO₂/tcs in 2030 earlier

INTERNATIONAL SOLAR ALLIANCE (ISA)²

ISA is a grouping of 121 member states with a purpose of "Bring Together a group of nations to endorse clean energy, sustainable environment, public transport and Climate."

- GoI announced the establishment of a \$350 million solar development fund to enable financing of solar projects in 2018.
- The ISA has signed a tripartite agreement with the World Bank and the Government of India and is now actively involved in preparing a vision and implementation plan for "One Sun, One World, One Grid" Initiative

ISA plans to set up demonstration projects for Green H₂ though solar which can then be scaled-up and replicated across the world – highly relevant for steel.

BHARAT STAGE (BS) EMISSION NORMS³

- In 2016, the government opted to follow worldwide best practices and bypass BS V completely, opting for BS-VI instead.
- Significant investment has been made in the refinery sector to meet the challenge of supplying clean fuel all over India.
- The central government has introduced the Fame I and II policy, which provides subsidies to buyers to purchase electric vehicles (EVs).

According to the Energy Transitions Commission, embedded emissions from material usage is expected to represent more than half of an EV's lifecycle emissions by 2030, compared with around 20% of lifecycle emissions for an internal combustion engine vehicle today.

NATIONAL ACTION PLAN ON CLIMATE CHANGE (NAPCC)⁴

- NAPCC addresses the urgent and critical concerns of the country through a directional shift in the developmental pathway.
- The Action Plan lists eight core "national missions": Solar Mission; Enhanced Energy Efficiency (NMEEE); Sustainable Habitat; National Water Mission; Sustaining the Himalayan Ecosystem; Green India; Sustainable Agriculture; Strategic Knowledge for Climate Change (NMSKCC).

Amongst these, Solar Mission, NMEEE and NMSKCC have significant impact on providing directional guidance for decarbonisation initiatives in the steel industry.

Sources : 1 Panchami Commitments 2 International Solar Alliance 3 BS Norms 4 NAPCC

The government and the Ministry of Steel are responding through multiple policy measures on NDCs for Steel industry, energy efficiency and improving scrap collection

In line with the national commitments to reduce emissions, Ministry of Steel has launched multiple schemes & regulations to decarbonise the steel sector. Some of the key steps taken by the Ministry include commitments for reduction in steel emission intensity in line with INDC, National steel scrap recycling policy & PAT scheme under National action plan for climate change. The Ministry has provided specific guidelines for commitments for 2030 & beyond in the Iron-ore and DRI based blast furnaces.

NDCs FOR STEEL INDUSTRY IN INDIA ¹	PAT SCHEME	SCRAP POLICY	MOS GUIDELINES FOR ROUTE SPECIFIC COMMITMENTS	BF ROUTE ²	DRI ROUTE ²
<ul style="list-style-type: none"> MoS submitted NDCs stating that average CO₂ emission intensity is projected to reduce from 3.1 T/tcs in 2005 to 2.4 T/tcs by 2030 MoS has submitted a list of technologies recommended for Iron & Steel Sector to MoEF&CC that will help meet the target of GHG emissions The Iron and Steel industry will also adopt the Best Available Technologies (BAT) for utilising waste heat/energies from its plants as per the global benchmarks. Compared to IEA Sustainable Development Scenario projections between 1.6-1.8 tCO₂/tcs, our NDC emissions targets are less aggressive for 2030 	<ul style="list-style-type: none"> Each overachiever is issued energy savings certificates (ESCerts) that can be traded with Non-achievers. In the iron & steel sector, a limit of 20,000 tonnes of oil equivalent (TOE) is the cut-off limit criterion for an entity to be identified as a designated consumer The PAT Scheme has so far covered 163 Iron & Steel Units in India The Steel sector has been able to achieve the total targeted energy savings from PAT Cycles I, II & III for 2012- 20 to the tune of 5.5 MTOE and corresponding CO₂ reduction of 20 Million tonnes⁵ 	<ul style="list-style-type: none"> Steel scrap policy furthers the role envisaged in the NSP-2017 to ensure scrap segregation (quality wise), collection, processing and recycling The policy provides a framework to carry out the activities to have assured and regular supply of processed scrap By 2030, there will be additional requirement of 70-80 MT scrap to be handled by 700 scrap processing centers to be fed by 2800-3000 collections and dismantling centers 		<p>Phase 1: Up to 2030</p> <ul style="list-style-type: none"> Optimising the BF burden mix by maximizing the iron content in raw materials to decrease the usage of coal as a reductant. Injection of PCI up to 200-220 kg per tonne of hot metal steel in all the Blast Furnaces <p>Phase 2: Beyond 2030</p> <ul style="list-style-type: none"> Setting up of Pilot CCU plants in the blast furnaces to convert the CO₂ emission into ethanol/methanol by using hydrogen 	<p>Phase 1: Up to 2030</p> <ul style="list-style-type: none"> Increase utilisation of grey/ brown H₂ from natural gas to 70% in DRIs Set up pilot plants for infusing green hydrogen in the natural gas to meet the Green Hydrogen Consumption Obligations (GHCO) <p>Phase 2: Beyond 2030</p> <ul style="list-style-type: none"> Replication of successful technology which emerges after completion of the pilot projects

Increasing use of renewable energy, H2/biomass injection and improving material and process efficiency will further strengthen the policy measures

LEVERS

RENEWABLE ENERGY



- Target of achieving 500 GW RE capacity by 20301.
- Provision of Renewable Purchase Obligation (RPO) under National Tariff Policy.
- Development of Solar Parks and Ultra Mega Solar Power Project.
- Offshore wind energy policy, Open access policy.
- Green term ahead market (GTAM),

HYDROGEN/ BIOMASS INJECTION



- Green Hydrogen Policy – launched in 2021 for incentivising manufacturers and distributors
- Manufacturers of Green H2 / Ammonia & RE shall be given connectivity to grid on priority basis to avoid any procedural delays & allowed to set up bunkers near ports
- Under, Renewable Purchase Obligation (RPO) both DISCOM and producers will be granted incentive to produce Green H2
- Mandate for >5% use of Biomass pellet in fuel-mix in thermal power plants²

IMPROVING MATERIAL & PROCESS EFFICIENCY



- Improvement in the quality of raw material inputs leads to overall yield improvement and less material consumption for e.g.. Iron ore with low alumina in sintering will lead to lower fuel, slag rate in BF
- The principles of draft NREP (National Resource Efficiency Policy) by MoEF include “creating higher value with less material through resource efficient and circular approaches”. The NREP also identifies producer responsibility across lifecycle stages.

SIGNIFICANCE

- Indirect emission in steel industry is around 25 % of the total emissions.
- Existing steel plants can transition to increasing share of RE to significantly reduce emissions.
- GTAM incentivise renewable-rich states to become export hubs and sell surplus power at the exchange beyond their own RPO obligation – thus posing an opportunity for states with steel clusters.
- Steel industry is estimated to consume ~30 GW of RE, directly or indirectly, by 2030.

- Using H2 instead of coal will initially raise the cost of steel. Its price is expected to decrease drastically as soon as H2 is produced in large quantities – to be aided by the Green H2 policy.
- 50% of pulverised coal (PCI) can be replaced by H2¹ whereas 100 % of PCI can be replaced with Bio-mass.²
- India is estimated to be using less than 5mn t/year of biomass, although potential availability is much higher at 500mn t/year.⁴

- IEA states that material efficiency can lead up to 16 % reduction in emission in steel due to reduced and alternate usage of raw materials.
- More efficient steelmaking processes like Hisarna have emerged due to focused R&D on improving process efficiency in industry.
- In DRI plants < 200 tpd capacity, heat embedded in off-gases can be used for pre-heating of iron ore leading to low coal consumption.

Sources: KPMG Analysis, Ministry (Power, Steel, New and Renewable energy), IEA , World Steel Association, Research papers and Journals of international repute
 1. IEEFA 2. ScienceDirect 3.MIDREX 4. Argus

Improving scrap collection, bringing innovation through CCUS and leveraging carbon credits and certificates are equally strong avenues to expedite decarbonisation

LEVERS

SCRAP USAGE



- National Steel Scrap Recycling Policy (NSSRP) with an aim of 50 MT domestic supply of scrap by FY30
- Vehicle Scrap Policy 2021 – Envisaged on sidelines of NSP – 2017, along with NSSRP - will ensure availability of steel scrap to ensure scrap segregation (quality wise), collection, processing and recycling
- Recycling of Ships Act 2019 – will help reduce dependency on steel scrap imports

CARBON CREDITS AND CERTIFICATES



- Trading mechanisms to get developed in line with other developed countries (ETS), facilitating and incentivising carbon reduction.
- India has revised its carbon credit policies to ban the export of carbon credits until the nation meets its climate goals of reducing 1 BT of carbon by 2030 and achieving net-zero by 2070.
- Carbon pricing will thus be acting as an important incentive to reduce emissions aided by competition with peers.

CARBON CAPTURE, USAGE AND STORAGE (CCU/S)



- ACT - initiative to facilitate emergence of CCUS via transnational funding of projects aimed at research activities for CCUS
- Department of Science & Technology and Biotechnology jointly launched call on CCUS in 2018 to undertake joint R&D with member countries to prioritise breakthrough technologies in field of CCU
- As a part of strategic MoU with Tata Steel, CSIR has initiated steps to set up a National facility on CCUS at NEERI, Nagpur for a common collaborative platform to research

SIGNIFICANCE

- Scrap is the easiest means of decarbonisation – steelmaking from ore generates 2.5 tCO₂, scrap route generates only 0.4-0.5, a reduction of 80%
- NSSRP envisages a framework to facilitate and promote establishment of metal scrapping centers – will promote and flourish SMEs
- With enhanced usage of scrap in both primary and secondary steelmaking, there shall be considerable saving in specific energy consumption.

- Linking of emission systems will promote economic efficiency by allowing abatement to take place where it is cheapest to undertake it
- By 2027, as per IEA report, Carbon pricing initiatives will cover 20 % of the global emissions incl. steel thus incentivising self-imposed targets
- Carbon credits can also be used as a policy tool to change business practices or shifting investment decisions.

- As per IEA, CCUS facilities around the world have the capacity to capture ~40 MtCO₂ currently
- CCU/S have the potential to offset the residual emissions in steel after deployment of all levers – with ~15 % emission reduction potential by 2050

Sources: KPMG Analysis, Ministry (Power, Steel, New and Renewable energy), IEA, World Steel Association, Research papers and Journals of international repute

Additional policies and initiatives can ensure the right pace of development and penetration of low carbon steel across industry segments and value chains

01 >

Green steel inclusion within voluntary targets

e.g., for LEED certification, green steel could be included (with pre-determined target) in steel procurement plans.

02 >

Policy mandates for green steel procurement

Government, being the key stakeholder in infrastructure projects can mandate green steel procurement with pre-defined targets with gradual enhancements.

03 >

Pooled purchase commitment

Pooled purchase commitment from demand side players can push supply side to hedge their financial and regulatory risks while mobilising finance for green steel investment projects. Regulatory ecosystem will have a bigger role to play here.

04 >

Premium for low-emission production

Such as Carbon Contracts for Difference (CCfD) in EU mandated fund that hedges CO2 cost burden in certain publicly funded projects removing the large long-term uncertainty associated to carbon prices.

05 >

Mandatory inclusion of scope 3 emissions in reporting

On similar lines as the scope 3 reporting framework in SBTi's Net Zero standard, the government can explicitly identify the areas for emissions reduction within companies' sphere of influence. For .e.g., Scope 3 inventory guidance under GHG protocol.

06 >

Collaborative R&D

Financial and logistical support for collaborative (industrial, academia and research organisations) research to expedite the development of key decarbonisation technologies viably.

07 >

Phasing out of aged carbon-intensive assets

Policy mandates to phase out aged capital assets such as energy installations, inefficient machineries etc. with incentive mechanism to tide over switching costs.

08 >

National Roadmap for Decarbonisation in steel

Government can devise a technology roadmap for a broader policy direction with stage wise targets for steel manufacturers.

Sources: TERI, MoS reports, ISA and WSA reports, EU ETS reports, Several industry-specific reports on policy recommendations

Annexure

Abbreviations

Gt / Mt	Giga tonnes / Mega tonnes	CCUS	Carbon capture, utilisation and storage
CO₂	Carbon Dioxide	CCC	Carbon Credits & Certificates
GHG	Green House Gases	H₂	Hydrogen
tcs	Tonnes of crude steel	PAT scheme	Perform achieve and trade
CAGR	Compounded Average Growth Rate	ACT	Accelerating CCUS Technologies
BAU	Business as usual	DST	Dept of Science & Technology
BF-BOF	Blast Furnace, Blast Oxygen Furnace	DBT	Dept of Biotechnology
DRI-EAF	Direction Reduction of Iron, Electric Arc Furnace	RINL	Rashtriya Ispat Nigam Limited
IF	Induction Furnace	SAIL	Steel Authority of India Ltd
NG DRI	Natural Gas DRI	JSPL	Jindal Steel & Power
GVA	Gross Value Added	AM/NS	Arcelor Mittal Nippon Steel
PVs	Passenger Vehicles	LEED	Leadership in Energy & Environmental Design
CVs	Commercial Vehicles	TERI	The Energy and Resources Institute
OEMs	Original Equipment Manufacturers	NSP	National Steel Policy
EU	European Union	MTPA	Million Tonnes per Annum
FAME	Faster Adoption & Manufacturing of Electric & Hybrid Vehicles in India	CIS	Commonwealth of Independent States
GRIHA	Green Rating for Integrated Habitat Assessment	USMCA	US Mexico Canada Agreement
ESG	Environmental, Social & Governance	CEAP	Circular Economy Action Plan
ETS	Emissions Trading System	SBTi	Science Based Targets initiative
CBAM	Carbon Border Adjustment Mechanism	TOE	tonnes of oil equivalent
5YP	5-year plan	NAPCC	National Action Plan on Climate Change
UNGA	United Nations General Assembly	NMEEE	National Mission for enhanced energy efficiency
Y-o-y	year on year	NEDO	New Energy and Industrial Technology Development Organisation
MoS	Ministry of Steel	INDC	Intended Nationally Determined Contribution
RE	Renewable Energy		

With end use sector approach, steel demand is estimated to grow by 7.5 % by 2030

1 Medium term End-use sector growth

Sectoral growth projections of construction, infrastructure & automobile sector have been considered in the medium term for projecting steel demand



End Use Sector	Current Share	Growth Drivers	Expected growth till 2030
Construction (Real Estate)	43%	Residential and commercial real estate	11.7% 2021-2025, 6.5% 2026-30 ^[1]
Infrastructure	25%	Road, Railways, irrigation, urban infrastructure etc.	7% till 2030 ^[2]
Automotive	9%	Demand from commuters, rural demand	7.7% ^[3]
Others	23%	Consumption demand, heavy & light industries	6.1% ^[4]

Weighted average growth of 7.5% till FY30

In the medium term, growth in the construction sector, accompanied by larger infrastructure spending and increased automobile sales will spur the demand of steel.

Based on this, crude steel demand is projected to be around **210 MTPA by 2030.**

Source: [1] KPMG and NAREDCO Real estate growth [2] Infrastructure sector in India – Growth, Trends & Forecasts by Modern Intelligence [3] Electric Mobility in India, World Bank [4] OECD long-term economic projections

In line with GDP growth, steel demand will range between 181 MT and 198 MT by 2030

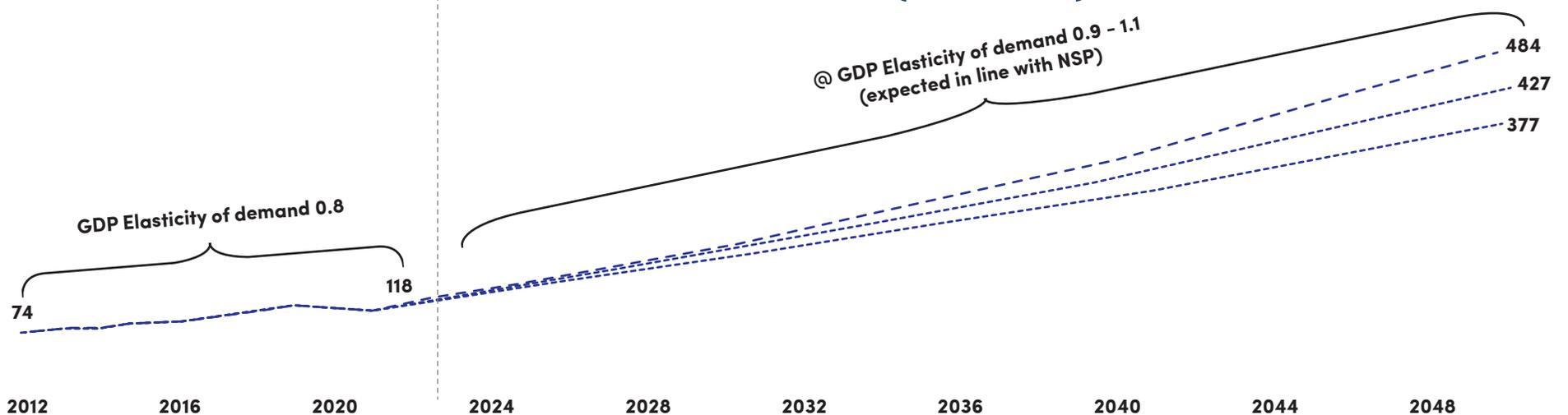
2 GDP elasticity of demand

GDP growth projections have been used in line with OECD estimates @6.1% till 2030, 4.6% for 2030-40 and 3.7% for 2040-50.



Crude Steel demand (in MTPA)

Steel Demand (crude steel equivalent)



Growth in steel demand is strongly linked with growth of the economy. Over the last 10 years, elasticity of steel demand has been around 0.8. While the National Steel policy has assumed an elasticity of steel demand of 0.8 till FY20 and 1.0 FY20 onwards, for our analysis we have created 3 scenarios by varying the elasticity in the range of 0.9-1.1, and accordingly steel demand varies from 377 to 484 MTPA in 2050.

Source: [1] KPMG and NAREDCO Real estate growth [2] Infrastructure sector in India – Growth, Trends & Forecasts by Modern Intelligence [3] Electric Mobility in India, World Bank [4] OECD long-term economic projections

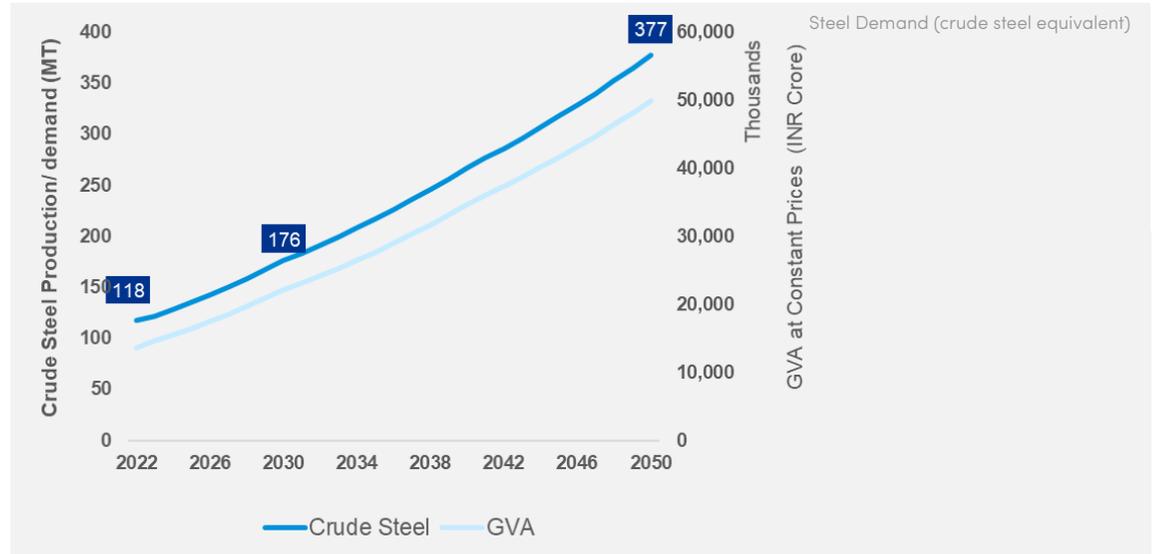
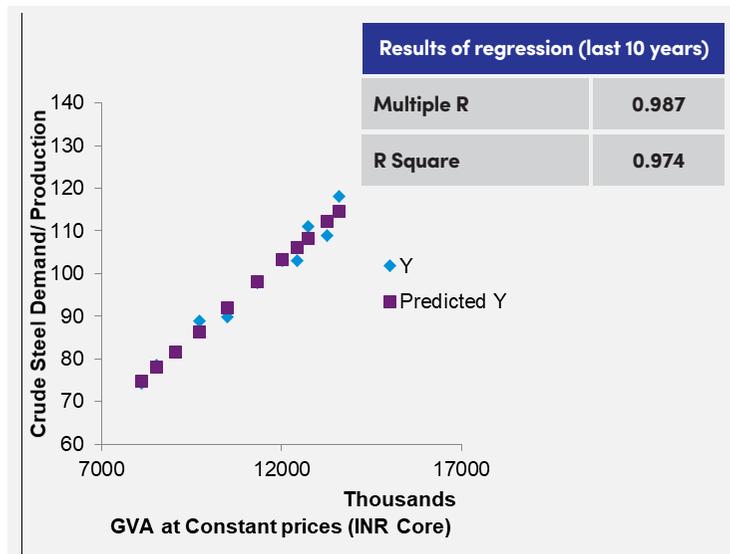
Based on economic projections & trend analysis, steel demand is expected to grow by ~5.2% till 2030

3 Regression with GVA

This approach uses regression of steel demand with GVA and projects future steel production using GVA forecasts till 2050



Regression between Steel Demand (MT) and GVA at Const Prices (Rs. bn)



Growth in steel demand is strongly linked with growth of the economy. Over the last 10 years, elasticity of steel demand has been around 0.8. While the National Steel policy has assumed an elasticity of steel demand of 0.8 till FY20 and 1.0 FY20 onwards, for our analysis we have created 3 scenarios by varying the elasticity in the range of 0.9-1.1, and accordingly steel demand varies from 377 to 484 MTPA in 2050.

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TERI and NSP predict higher steel demand by 2030 & beyond

4 Other Projections

National Steel Policy-2017 has given steel demand projections for FY31

TERI baseline steel projections (without resource efficiency)



Unit	Scenario	2030	2050
Crude Steel Capacity	MT	National Steel Policy	279 (300 by FY31)
	TERI, Baseline	245	Average: 262
Crude Steel Production/ Demand	MTPA	National Steel Policy	237 (255 by FY31)
	TERI, Baseline	227	Average: 232
Finished Steel Production/ Demand	MTPA	National Steel Policy	214 (230 by FY31)
	TERI, Baseline	205	Average: 210

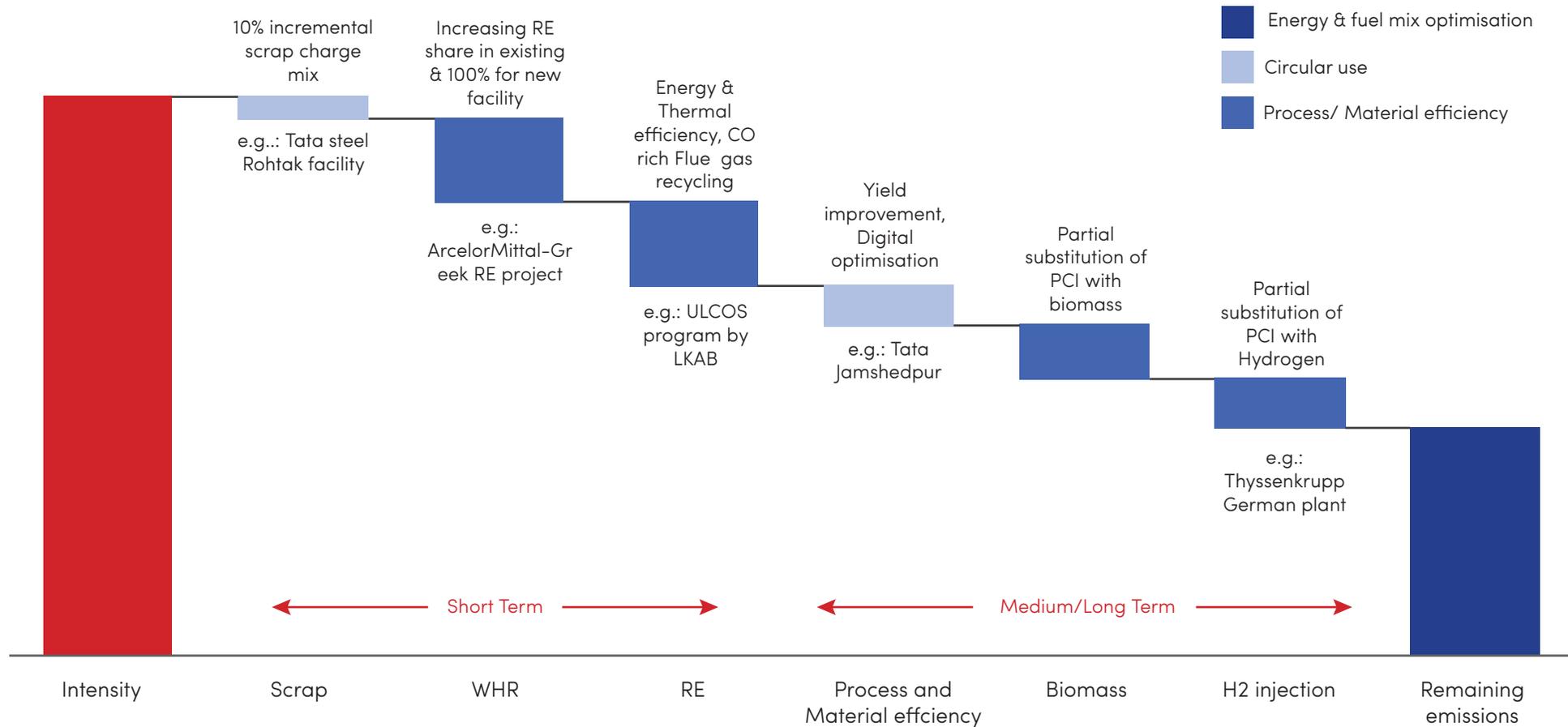
Steel Demand (crude steel equivalent)

NSP and TERI have both projected a strong growth in steel demand by 2030, at a CAGR of 9.1% and 8.5% respectively (base FY22). As both these projections were made before the Covid-19 pandemic, to account for the post-Covid scenario, a lower demand estimate may be more accurate.

Source: National Steel Policy 2017, TERI Towards a low carbon scenario

Pursuing existing pathways can potentially decarbonise the BF-BOF production route by 60-65%

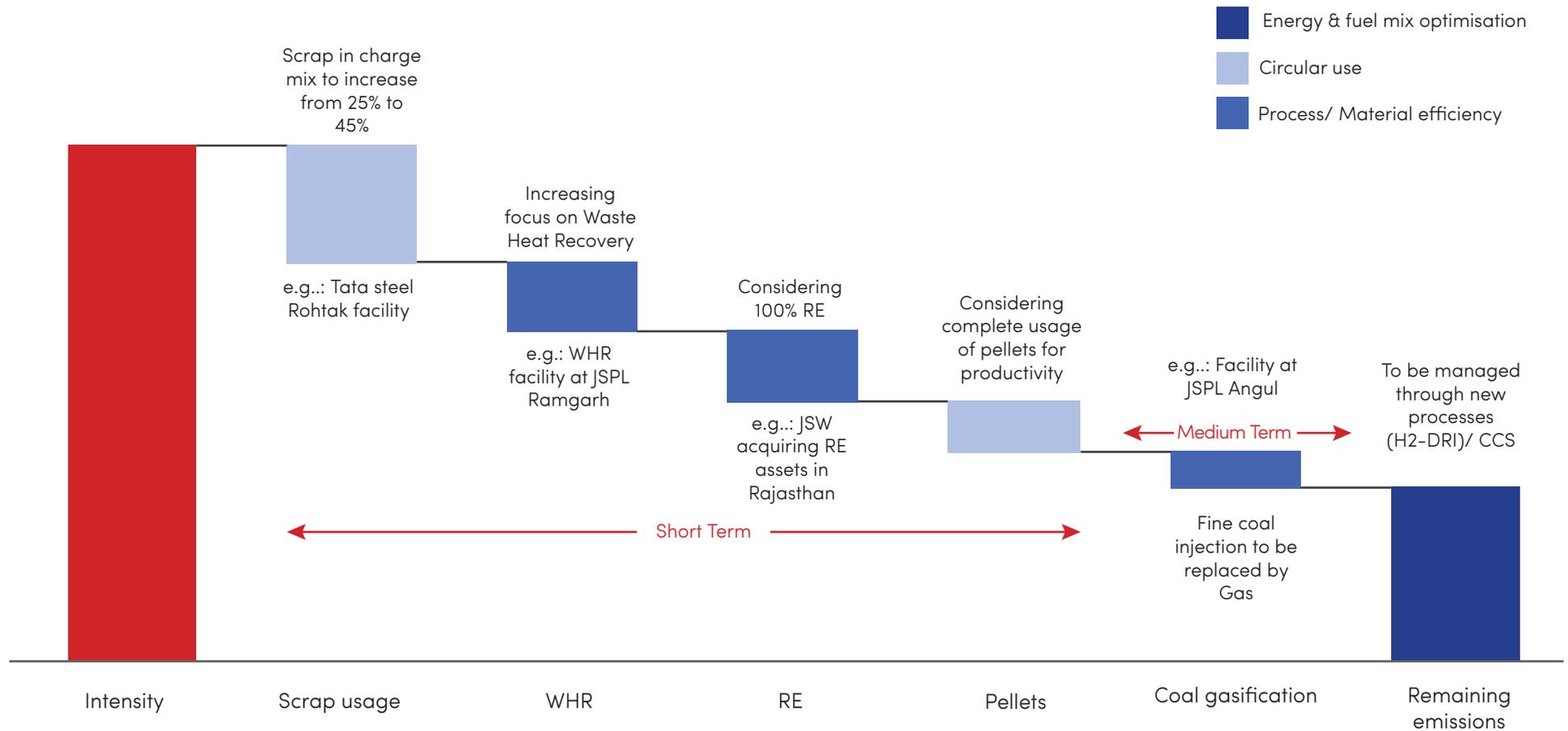
Increasing the share of renewable energy in the electricity mix, and achieving thermal efficiency through waste heat recycling represent the biggest opportunities to decarbonise BF-BOF-based steel production. Both these pathways are being actively deployed by both Indian and global companies.



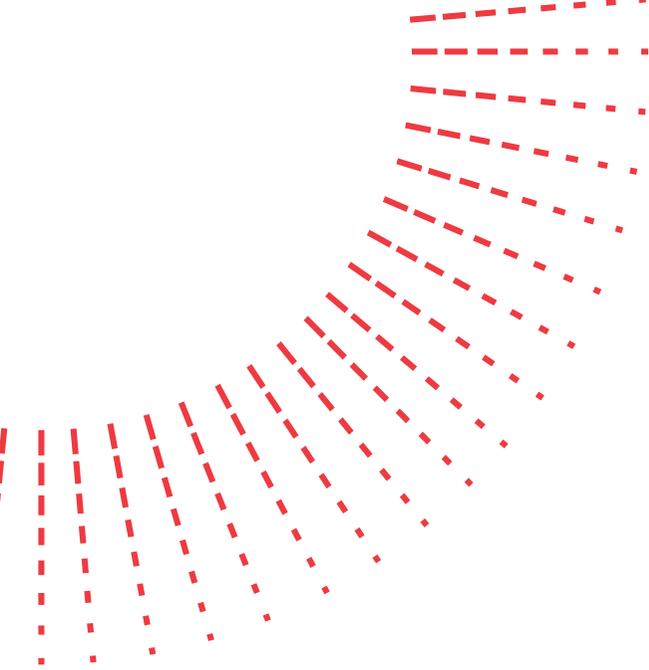
Source: Net-zero steel sector transition strategy by ETC, KPMG analysis based on inputs from industry experts, Steel company reports

Pursuing existing pathways can potentially decarbonise the coal DRI-EAF production route by 65-70%

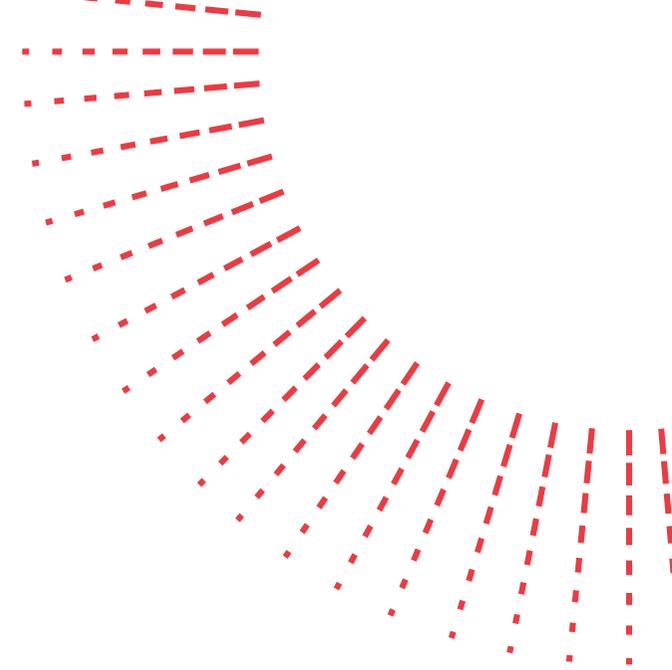
Increasing the use of scrap steel will have the biggest impact in decarbonising steel production through this route. This route is likely to get replaced by H2-DRI-based steel production in the medium to long term, given they both have the same downstream processes.



Source: Net-zero steel sector transition strategy by ETC, KPMG analysis based on inputs from industry experts, Steel company reports



Disclaimer: This report has been prepared by Climate Group with technical support from KPMG, but the views contained herein do not necessarily reflect the views of either organisation. This report has been prepared for informational purposes only and although every attempt has been made to ensure accuracy of data, it is not intended to be relied upon as accounting, tax, legal or other professional advice and does not accept any responsibility for the consequence of its use.



CLIMATE GROUP
STEELZERO

In partnership with



SteelZero is a global initiative bringing together forward-looking organisations to speed up the transition to a net zero steel industry. Led by the international non-profit Climate Group in partnership with ResponsibleSteel, organisations that join SteelZero make a public commitment to procure, specify or stock 100% net zero steel by 2050. By harnessing their collective purchasing power and influence, SteelZero is sending a strong demand signal to 14 shift global markets and policies towards responsible production and sourcing of steel. #SteelZero