सत्यमेव जयते
Ministry of Steel
Government of India

सत्यमेव जयते
Ministry of Commerce and Industry
Government of India

G20 भारत 2023 INDIA

Azadi Ka Amrit Mahotsav

FICCI

5th International Exhibition & Conference on Steel Industry

INDIA STEEL 2023

April 19-21, 2023
Bombay Exhibition Centre
(NESCO), Mumbai

Souvenir

Knowledge Partner

Deloitte.

April 19-21, 2023
Bombay Exhibition Centre
(NESCO) Mumbai

ABOUT INDIA STEEL

Ministry of Steel, Government of India and FICCI are organizing the 5th edition of **INDIA STEEL EXPO from April 19-21, 2023 at Bombay Exhibition Centre, Goregaon, Mumbai;** one of its kind event for the steel industry in India which combines both exhibition as well as the conference along with round table discussions and reverse buyer-seller meets.

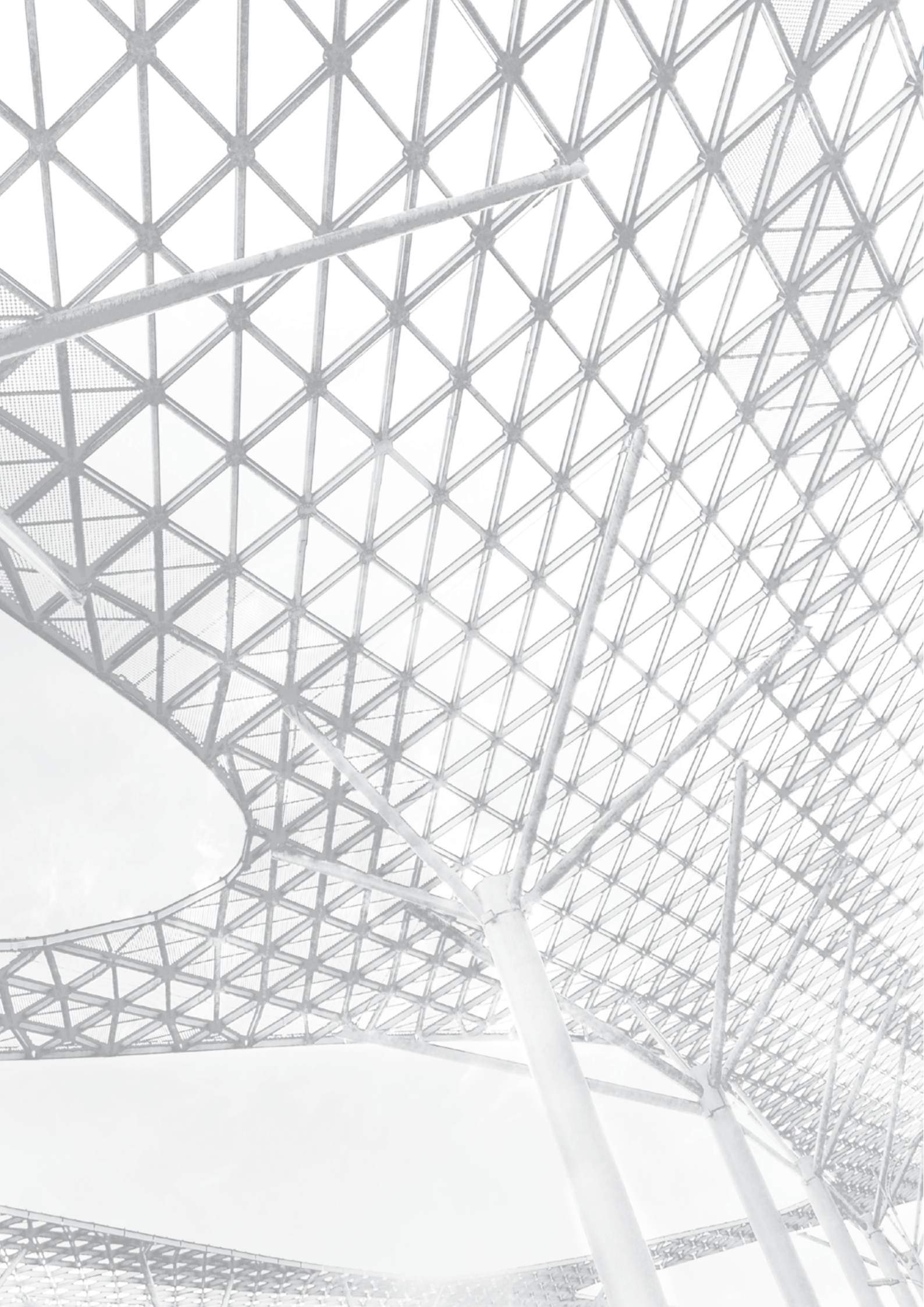
Last edition, India STEEL 2019 was successfully held in Mumbai in January 2019. More than 200 companies participated in the exhibition with more than 9,000 visitors. The conference too had an overwhelming response with more than 600 participants. Business delegations came from Austria, France, Germany, Italy, Japan, Korea, Spain, Russia, Taiwan, Turkey, UAE and US. Concurrent events like international buyer-seller meets were indicative of the truly international stature of the event.

Steel industry derives its demand from other important sectors like infrastructure, aviation, engineering, construction, automobile, defense, consumer goods, and aerospace etc. Thus, its intense integration with other important industries makes it a strategic sector for the economy. Also, with the initiatives taken by the Government like Make in India, Atmanirbhar Bharat, Net Zero Targets, etc for the Amrit Kaal Journey of the nation, steel is going to play a pivotal role in building the New India.

Therefore, the prime objective of organizing this event is to project India as an attractive investment destination for steel, explore business alliances & export opportunities for Indian steel products, highlighting technological interventions, transit towards decarbonization & net zero and deliberate on the Indian steel journey of Amrit Kaal.

The event is scheduled to attract more than 10,000 business visitors including participants from steel producers, technology giants, academicians, infrastructure developers, end-users, builders, construction and engineering companies, etc. from across the globe; having more than 200 exhibitors. The conference is well attended by 600 plus participants and has sessions focusing on key aspects of the industry like logistics infrastructure, technology interventions, green steel, policy framework, raw material security, demand augmentation, among others.

Welcome to India Steel 2023.



ज्योतिरादित्य मा. सिंधिया
JYOTIRADITYA M. SCINDIA

सत्यमेव जयते

आज़ादी का अमृत महोत्सव

मंत्री
नागर विमानन एवं इस्पात मंत्रालय
भारत सरकार, नई दिल्ली
Minister of
Civil Aviation and Steel
Government of India, New Delhi

MESSAGE

I am glad to note that Ministry of Steel, Government of India along with FICCI is organizing the **India Steel 2023** in April this year. Current developments and way forward for the Indian steel industry during Amrit Kaal has aptly been chosen as the theme of the Conference. Going forward, green steel and indigenous steel must be the key thrust areas for the Indian steel industry. India will lead by example in becoming an environmentally responsible and self-sufficient steel producing country.

Steel is one of the core drivers of industrialization. It has enabled our modern way of life and has spurred economic growth, lifted millions of people out of poverty and continues to write India's industrial growth story. It contributes around 2% to the GDP of the nation directly, while the indirect contribution is much larger, owing to linkage with significant sectors like construction, infrastructure, automobile, consumer goods, among others.

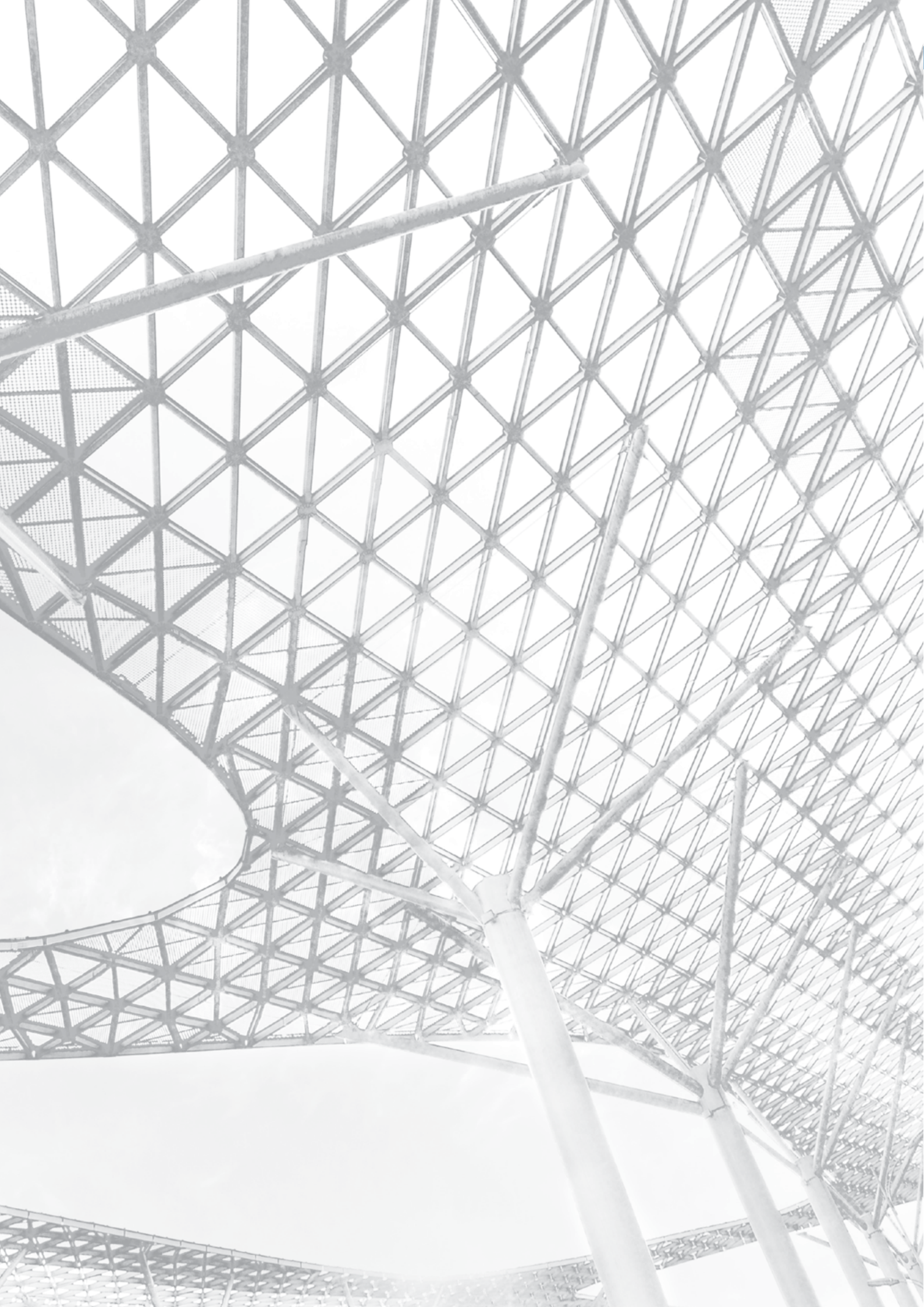
The steel industry has come a long way since 1991 to become world's second largest producer as well as the consumer today. Growing at a CAGR of 6.5% in the last three decades, we today stand at a production capacity of 155 mtpa with production reaching 120 mtpa. I am confident that policy support and timely interventions by the Government will enable the Steel industry to grow at a rapid pace during the Amrit Kaal and it would be one of the key drivers in realizing India's vision of becoming a developed economy by 2047.

This mega conclave provides an excellent opportunity to learn about the best practices and global experiences, exchange innovative ideas, and explore areas of collaboration & alliances in the steel industry, among the domestic players as well as international stakeholders.

I extend my best wishes to all the participants & organizers of the event and wish the event great success.

(Jyotiraditya M. Scindia)

Ministry of Civil Aviation : Room No. 291, B-Block, Rajiv Gandhi Bhawan, Safdarjung Airport, New Delhi-110003
Tel. : 91-11-24610350, 24632991. Fax : 91-11-24610354
Ministry of Steel : Room No. 192, 1st Floor, Udyog Bhawan, New Delhi-110011 Tel. : +91-11-23062345, Fax : +91-11-23061395



फग्गन सिंह कुलस्ते
FAGGAN SINGH KULASTE

इस्पात एवं
ग्रामीण विकास राज्य मंत्री
भारत सरकार
उद्योग भवन, नई दिल्ली–110011
MINISTER OF STATE FOR STEEL
AND RURAL DEVELOPMENT
GOVERNMENT OF INDIA
UDYOG BHAWAN, NEW DELHI-110011

संदेश

मुझे यह जानकर हर्ष हो रहा है कि इस्पात मंत्रालय, भारत सरकार, फिक्की के साथ मिलकर **'INDIA STEEL 2023"** शीर्षक के तहत इस्पात उद्योग पर एक अंतरराष्ट्रीय प्रदर्शनी और संगोष्ठी का आयोजन कर रहा है। मुझे विश्वास है कि पूर्व के संस्करणों की भांति इस वर्ष भी इस कार्यक्रम को हितधारकों से अपार प्रतिक्रिया प्राप्त होगी।

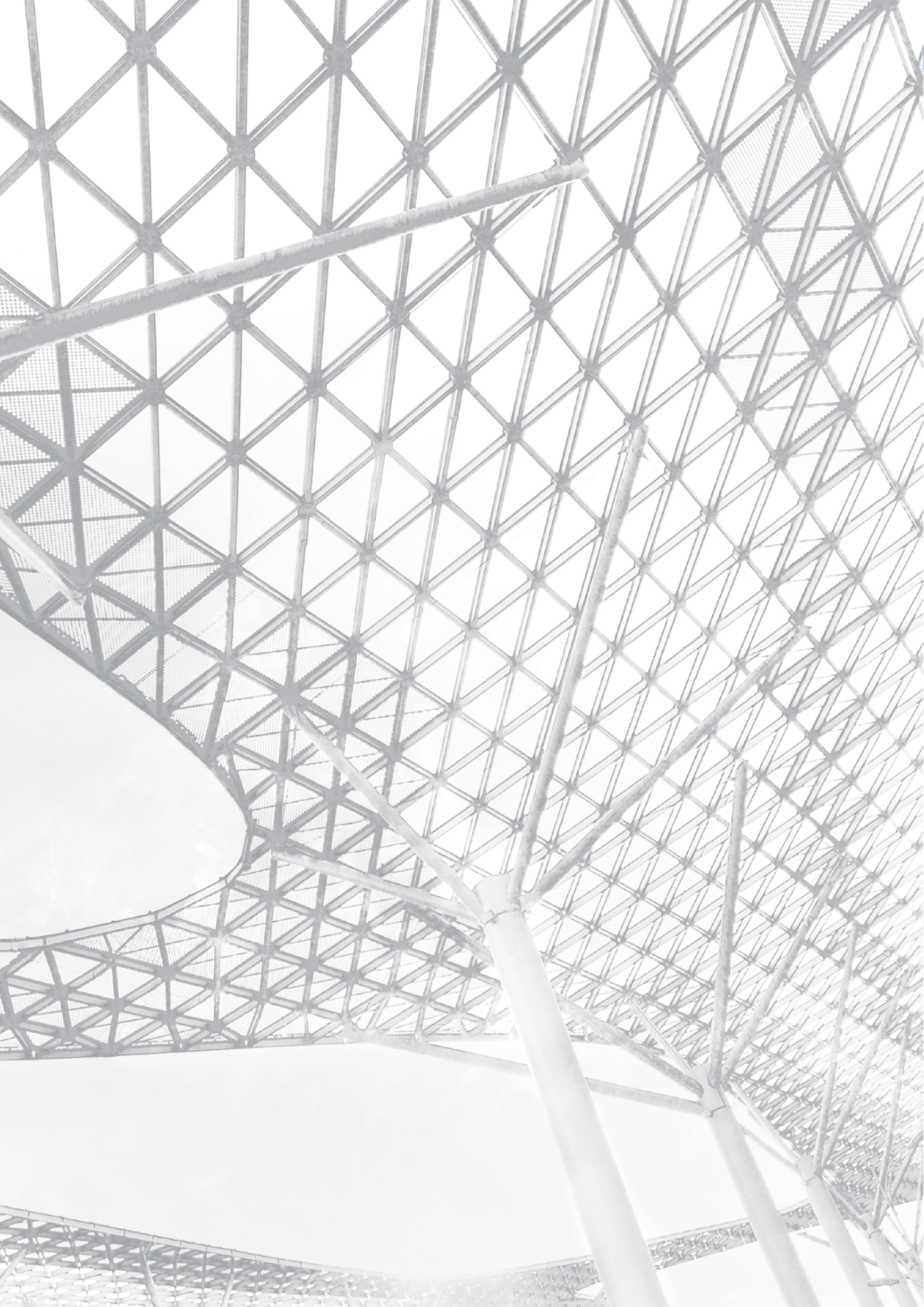
पिछले 7-8 वर्षों के दौरान भारतीय इस्पात उद्योग ने विकास के एक नए चरण में प्रवेश किया है और पुनरुत्थानशील अर्थव्यवस्था एवं इस्पात की बढ़ती माँग के आधार पर यह निरंतर प्रगति कर रहा है। मुझे खुशी है कि सार्वजनिक तथा निजी क्षेत्र की सभी कंपनियाँ अकार्बनीकरण एवं निवल शून्य कार्बन उत्सर्जन लक्ष्यों पर भी ध्यान केन्द्रित करते हुए राष्ट्रीय इस्पात नीति के अंतर्गत परिकल्पित लक्ष्यों को प्राप्त करने के लिए क्षमता अभिवृद्धि की दिशा में व्यापक रूप से कार्य कर रही हैं। सरकार इस क्षेत्र के विकास पथ में आने वाली चुनौतियों का समाधान करने के लिए उद्योग को पूर्ण रूप से सहायता प्रदान कर रही है।

मैं आशा करता हूँ कि सरकार, नीति-निर्माताओं, औद्योगिक नेताओं तथा विश्वभर के संभावित निवेशकों का यह समूह भारतीय इस्पात उद्योग को क्रांतिकारी बनाने हेतु विकास के नए संचालकों के विषय में चर्चा करने के लिए एक आदर्श मंच सिद्ध होगा। साथ-ही-साथ यह विचारों के आदान-प्रदान तथा नए उत्पादों और प्रौद्योगिकियों को प्रदर्शित करने के लिए भी एक मंच उपलब्ध कराएगा।

मैं सभी को अपनी शुभकामनाएं देता हूँ।

(फग्गन सिंह कुलस्ते)

Room No. 146, Udyog Bhawan, New Delhi-110011 Phone No. 011-23063810, 23061370, Fax : 011-23062703
Delhi Residence : 8, Safdarjung Lane, New Delhi-110011, Phone : 011-23792158



नागेन्द्र नाथ सिन्हा, भा.प्र.रो.
सचिव
Nagendra Nath Sinha, IAS
Secretary

भारत सरकार
इस्पात मंत्रालय
GOVERNMENT OF INDIA
MINISTRY OF STEEL

21st March, 2023

MESSAGE

It gives me immense pleasure to welcome you all to **India Steel 2023** organized by the Ministry of Steel, Government of India and FICCI in Mumbai from April 19-21, 2023.It is heartening to note that this is the fifth edition of the Expo, highlighting India's current stature in global steel industry landscape. Building **Brand India** as a destination for steel, the Expo has carved out its special place among global steel fraternity.

Backed by domestic availability of iron ore, cost-effective labour and strong linkage with traditional (like infrastructure, construction, automobile etc.) & emerging (like defence, aerospace, maritime etc.) sectors, the Indian steel industry is a major driver for economic growth. Post liberalization, steel production in India has grown seven-folds to reach 120 MT in FY22 from 17 MT in FY91.

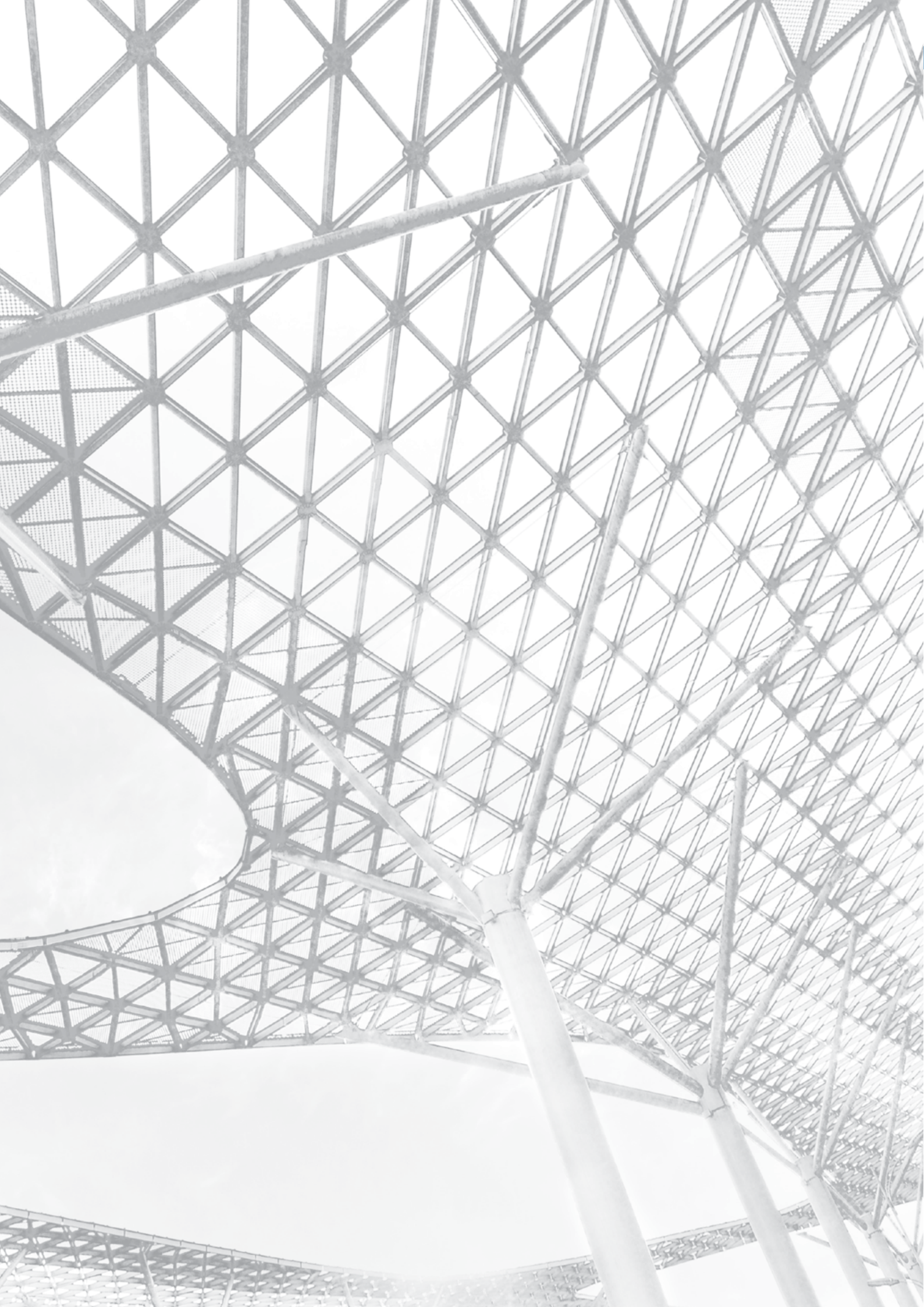
Moving forward, steel production in India would double in the decade with support of policy reforms such as National Steel Policy, Production Linked Incentive (PLI) for Specialty Steel as well as other initiatives such as creating Steel Zones and Steel Clusters as Government's strong push to drive growth and push infrastructure creation. I am confident that India would show way for adoption of low carbon steel production for the world.

This mega conclave would provide an opportunity to learn about global experiences in steel, while highlighting on the emerging trends domestically.

I extend my best wishes to all the participants & organizers of the event and wish the event great success.

(Nagendra Nath Sinha)

Room No. 291, Gate No. 5, Udyog Bhawan, New Delhi-110011
Tel. : +91-11-23063912, 23063489 (Fax); E-mail : secy-steel@nic.in



रूचिका चौधरी गोविल
अपर सचिव
RUCHIKA CHAUDHRY GOVIL
Additional Secretary

इस्पात मंत्रालय
भारत सरकार
MINISTRY OF STEEL
GOVERNMENT OF INDIA

MESSAGE

The organization of **India Steel 2023** from April 19-21, 2023 in Mumbai by the Ministry of Steel, Government of India along with FICCI is a great initiative to further the growth momentum of Indian steel industry.

Conceptualized as a dedicated show for Indian steel industry, the first edition in 2013 marked the beginning of a successful journey towards providing holistic approach to the efforts of stakeholders concerned with the steel industry. The show has gradually scaled up adding newer features for the benefits of the participants.

The 5th edition in the series, India Steel 2023, presents a great opportunity to all the stakeholders of the steel industry to come together and discuss the opportunities & challenges in the industry and ponder on the roadmap for India to emerge as a **Steel Giant** in the future.

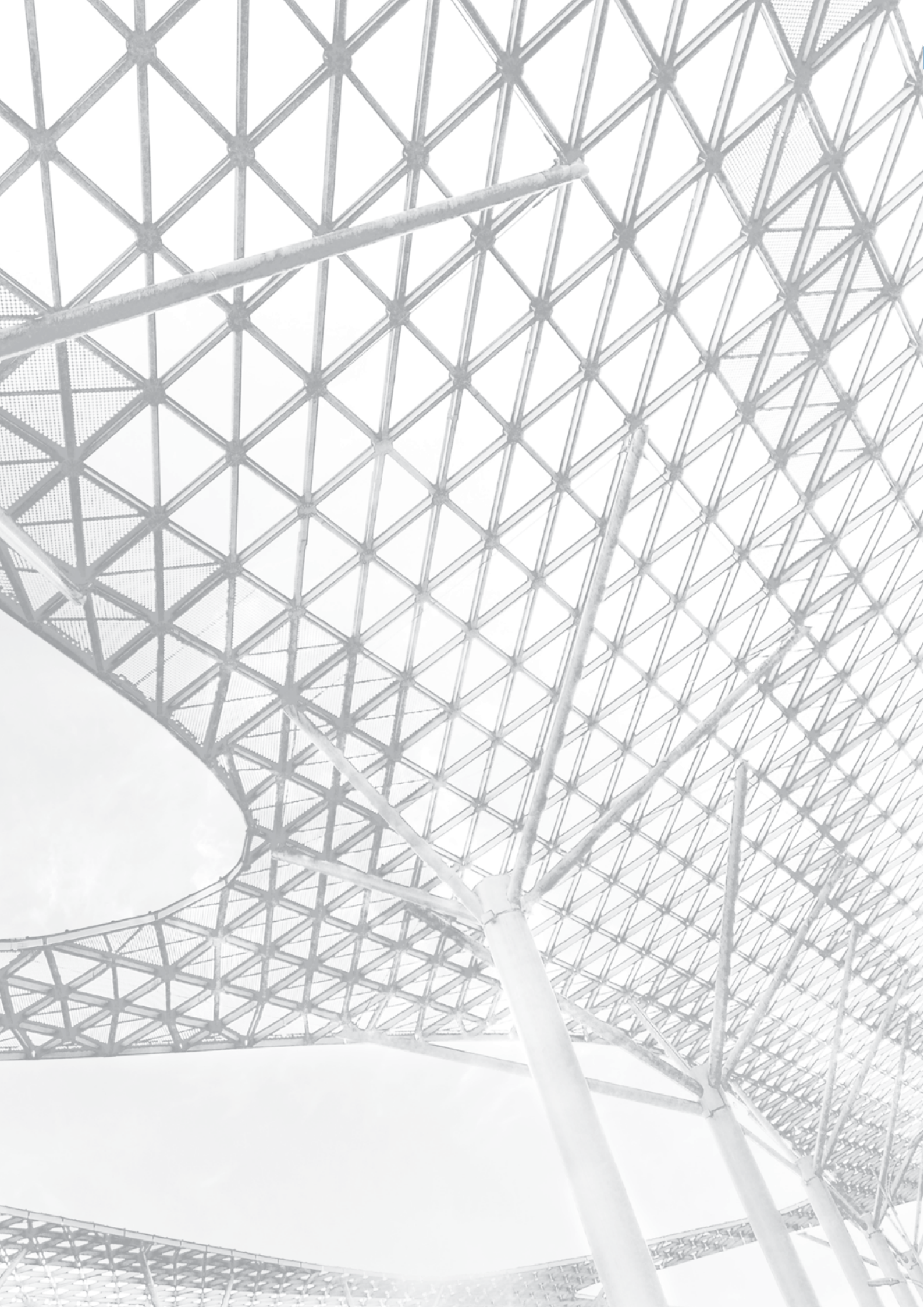
The conference spread over two days hosts important discussions which are crucial in the current scenario of Indian steel industry. The importance of steel in India's Amrit Kaal Journey, the demand dynamics and the role of logistics & technology are some of the key themes of discussions. Another principal theme for the domestic steel sector is de-carbonization and move towards low carbon emission steel (Green Steel). India is committed to Net-Zero target by 2070.

The Exhibition has proved to be the leading steel trade fair in the Indian sub-continent with exhibitors getting the opportunity to showcase their new products, offerings & technologies, exploring business alliances.

Welcoming everyone to the show, I wish the event great success.

(Ruchika Chaudhry Govil)

कमरा नं. 190, उद्योग भवन, नई दिल्ली–110 011, दूरभाष : +91 11 23063138, ई–मेल : ruchika.govil@nic.in
Room No. 190, Udyog Bhawan, New Delhi-110 011, Tel. : +91 11 23063138, E-mail : ruchika.govil@nic.in



अभिजित नरेन्द्र
संयुक्त सचिव
Abhijit Narendra
Joint Secretary

भारत सरकार
इस्पात मंत्रालय
GOVERNMENT OF INDIA
MINISTRY OF STEEL

March 22, 2023

MESSAGE

I am glad to share that the Ministry of Steel, Government of India along with FICCI will host the 5th edition of INDIA STEEL EXPO from 19th to 21st April 2023 at Mumbai. **India Steel 2023** would provide a great platform for exchange of information and innovative ideas for the growth of Indian steel sector.

The evolution of steel industry is critical to the developmental journey of any nation. The Indian steel industry has come a long way from its de-licensed & de-controlled beginnings in 1991 & 1992 respectively to being the 2nd largest producer of steel in globally with 120 million tonnes of crude steel production in FY22.

With various initiatives taken by the Government of India targeted towards urbanization and providing impetus to the manufacturing industries, the steel sector is projected to grow rapidly to meet the targets laid down in the National Steel Policy, 2017 and the next 25 years of economic growth.

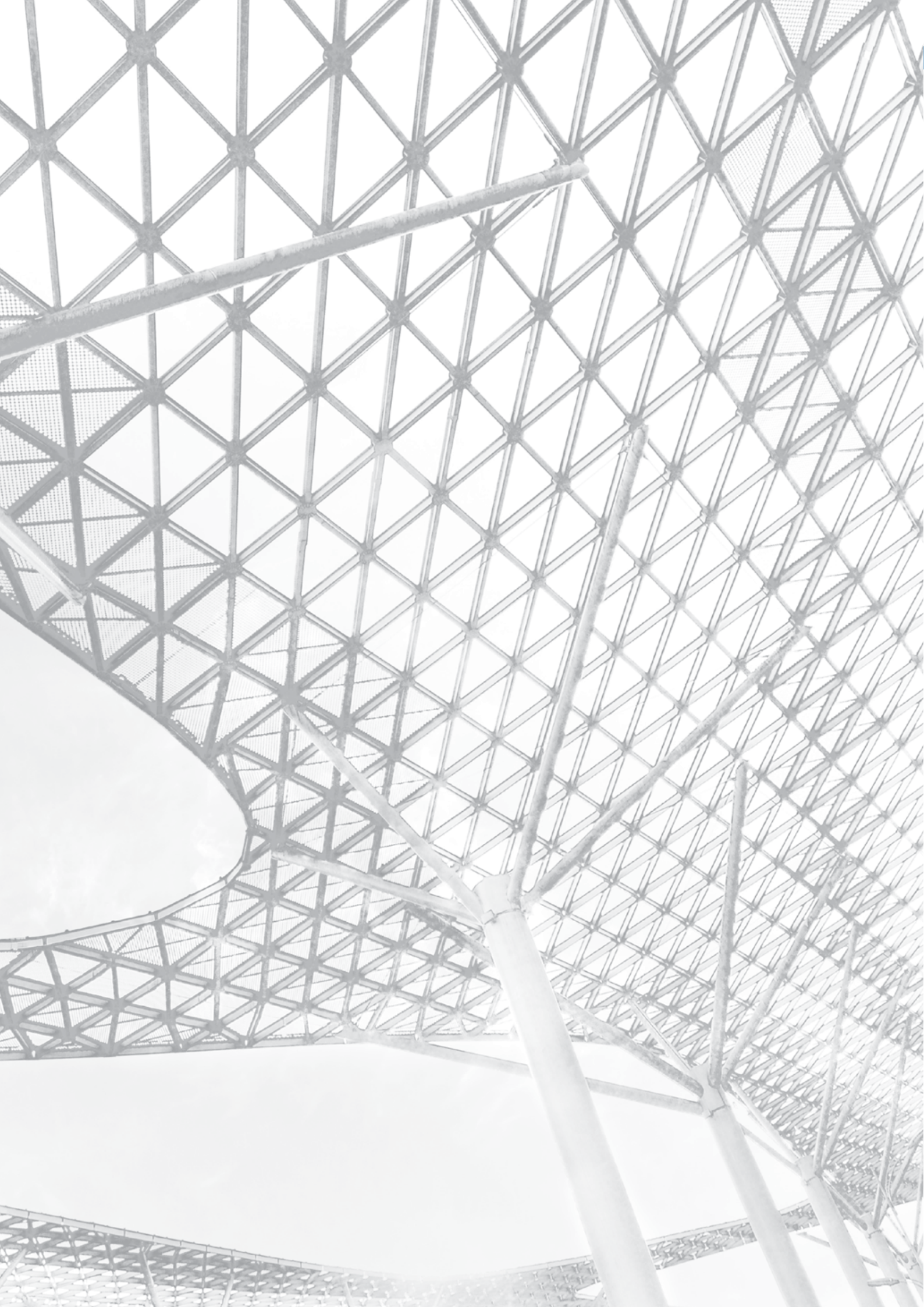
The Union Budget has also focused on infrastructure growth with the seven engines of nation building across roads, railways, airports, ports, mass transport, waterways and logistic infrastructure. India has the potential to become a steel producing, processing, and export hub with the right policy, infrastructure support, and investment in upstream and downstream allied sectors.

I commend the organizers for planning an occasion that would enable interaction between world leaders and other stakeholders to talk about new trends & perspectives on future direction of the domestic steel industry and the policy support required for leveraging the growth opportunities.

I extend my best wishes to the participants, organizers and all the stakeholders of the event.

(Abhijit Narendra)

Room No. 296, Udyog Bhawan, New Delhi-110 011, Tel. : +91 11 23061896 Fax : +91 11 23062522
E-mail : abhijit.narendra@nic.in



डॉ. संजय रॉय
संयुक्त सचिव
Dr. Sanjay Roy
Joint Secretary

भारत सरकार
इस्पात मंत्रालय
GOVERNMENT OF INDIA
MINISTRY OF STEEL

MESSAGE

It is a pleasure to know that the Ministry of Steel, Government of India in collaboration with FICCI is organizing the 5th edition of **INDIA STEEL** from 19th April to 21st April,2023at Mumbai.

The show would provide immense opportunities for the steel sector stakeholders to deliberate on the opportunities & challenges in the sector, while simultaneously exploring business alliances with the buyers technology providers and other mutual collaborations.

The growth of the Indian steel industry has been driven by factors such as increasing demand for steel, availability of abundant raw material iron ore and a supportive government policy. The country's ambitious plans for infrastructure development, such as the Bharatmala project and the Sagarmala project, are not only supporting the logistics requirements of the industry but also fueling further demand for steel products.

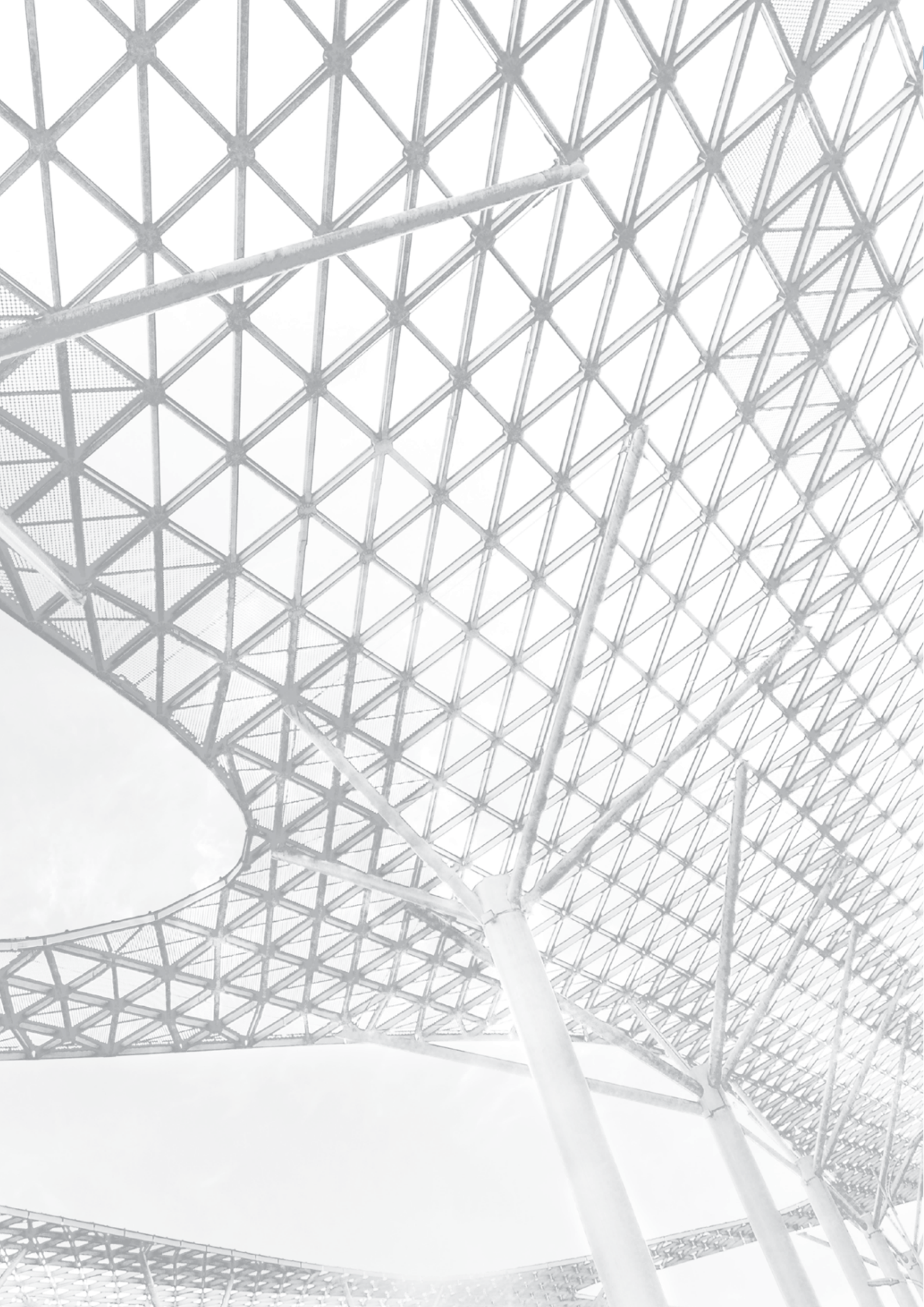
The steel industry's significance for our prosperity and welfare is widely known. Steel products play a crucial role in the development of a sustainable society. The steel industry has accelerated industrialization in India and is the backbone of many downstream industries.

Aligned with our Amrit Kaal, I am sure the conference will provide a platform to discuss our journey ahead, setting out the milestones to be achieved and the initiatives to be taken.

I wish the event great success.

(Sanjay Roy)

कमरा नं. 289, उद्योग भवन, नई दिल्ली–110 011, दूरभाष : +91 11 23063170, ई–मेल : sanjay.roy14@nic.in
Room No. 289, Udyog Bhawan, New Delhi-110 011, Tel. : +91 11 23063170, E-mail : sanjay.roy14@nic.in



Subhrakant Panda
President

Federation of
Indian Chambers
of Commerce and Industry

Federation House
Tansen Marg
New Delhi 110001
T +91 11 2335 7364
F +91 11 2332 9369
E president@ficci.com
www.ficci.in
CIN: U99999DL1956NPL002635
ISO 9001 : 2015 Certified

MESSAGE

The vision of a resilient 'New India' which prioritises sustainable and inclusive growth during *Amrit Kaal* is reliant on a strong steel industry. India is the second largest producer and consumer of steel in the world, and is today recognised as an significant player globally. Conducive, growth oriented policies of the Government of India which have had a positive impact include developing steel clusters, supporting value addition through capacity enhancement, augmenting logistics infrastructure, and promoting R&D.

FICCI, India's apex business chamber, has been very active in terms of highlighting the opportunities and challenges pertaining to the steel industry in the country. CEOs of leading companies and representatives of sectoral associations participate regularly and help in articulating views which are in national interest.

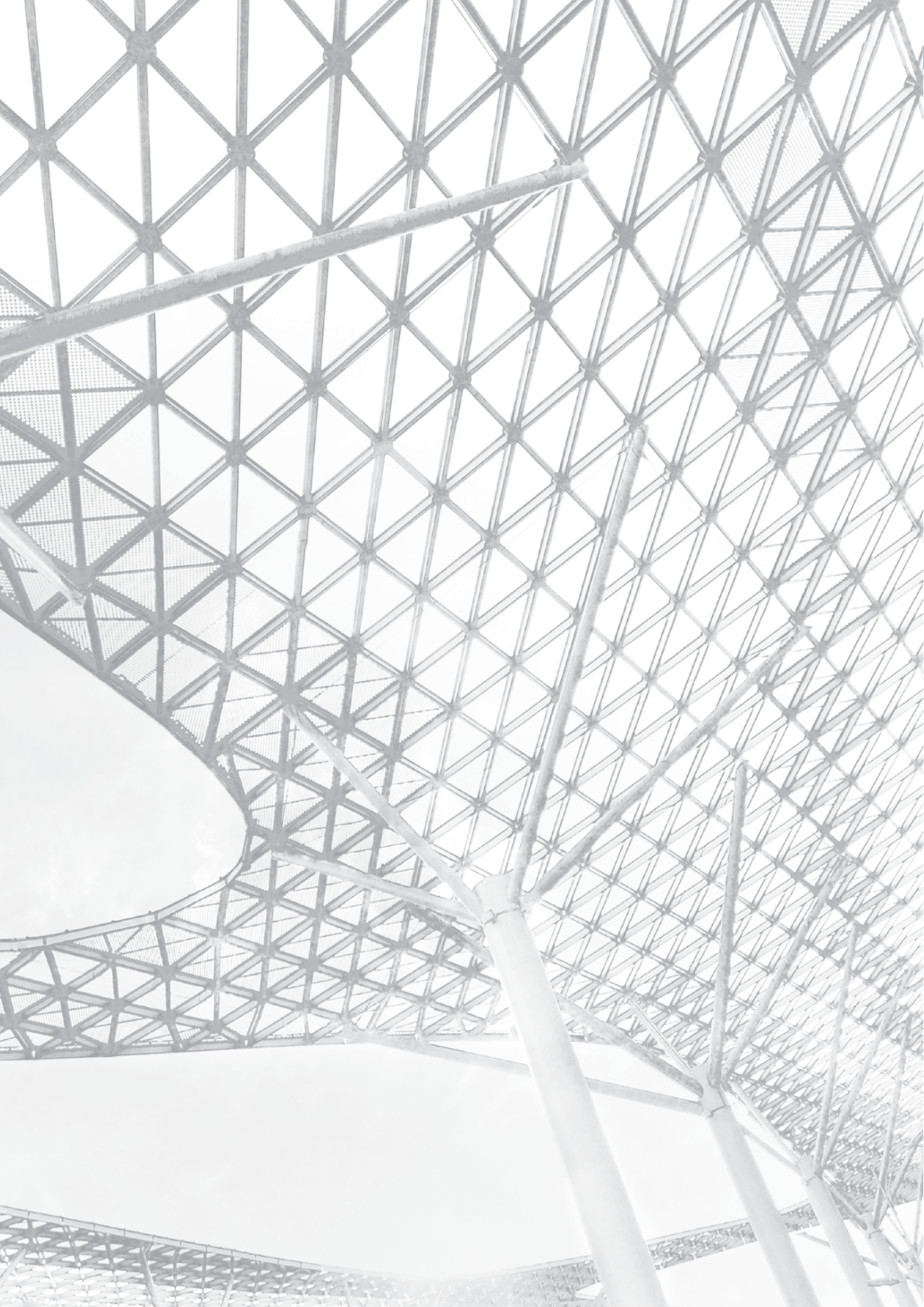
It is in this context that the Ministry of Steel, Government of India and FICCI are organising the 5th edition of **INDIA STEEL 2023** to be held in Mumbai from April 19th-21st. While the conference will see dignitaries and speakers from India and abroad, the exhibition will have participation from global steel producers who will showcase their products to more than 10,000 visitors.

I take this opportunity to convey best wishes to all the participants and exhibitors as they get together to deliberate on the growth prospects and opportunities for the sector where India is increasingly playing an important role.

Subhrakant Panda
President, FICCI and
Managing Director,
Indian Metals & Ferro Alloys Ltd

March 22, 2023
Delhi

Industry's Voice for Policy Change



Sajjan Jindal
Chairman - JSW Group

13th April, 2023

MESSAGE

Congratulations to Ministry of Steel, Government of India for organizing **India Steel 2023** in collaboration with FICCI. As a participant in this mega event, I am looking forward to exchange ideas and perspectives on the future of the steel industry.

India's economy is poised for rapid growth, supported by infrastructure development, digital inclusion, and rising per capita income. Steel will be a key player in this growth story, given its essential role in urban construction, mobility, and renewable energy infrastructure - the three emerging themes of this decade.

The Indian steel industry has an exciting future ahead, with a steadily expanding domestic market. Steel demand is expected to grow at a healthy rate during this decade, crossing the 200 MTPA benchmark by FY31.

To make the most of this period of rapid growth, the steel industry should focus on producing value-added steel products, adopting cutting-edge technologies, and implementing Industry 4.0 in the manufacturing process, while striving to reduce CO_2 emissions.

I am confident that this conference will greatly benefit India's vision towards a sustainable economy and an economic superpower by 2047. It will also pave the way for future alliances, as global and national stakeholders come together to share knowledge, explore investment potential, discuss technology and adopt best practices.

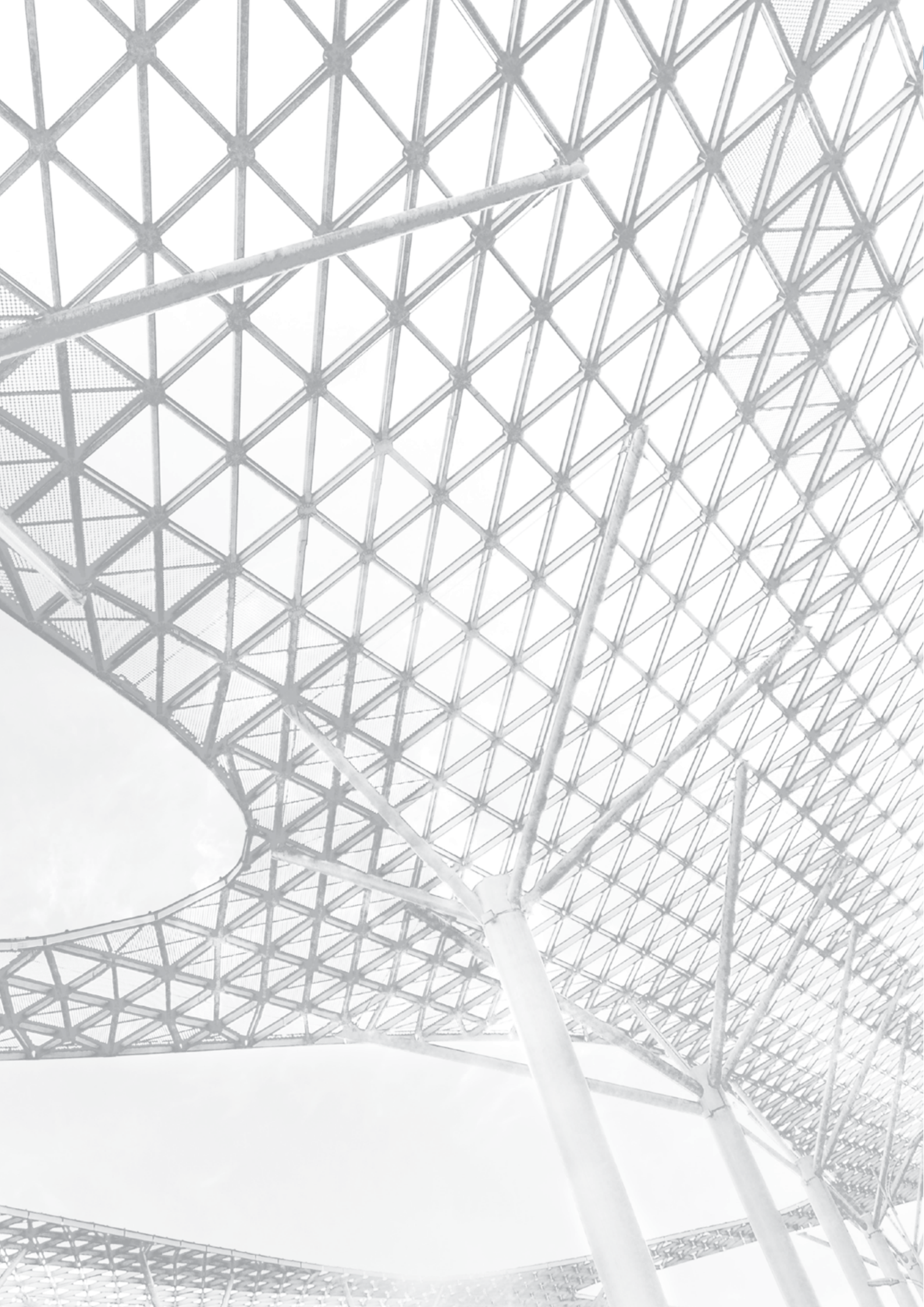
I extend my warm wishes to the organizers and wish the conference great success.

Thanking you,

With kind regards,

SAJJAN JINDAL

Regd. Office : JSW Centre, Bandra Kurla Complex, Bandra (East), Mumbai 400 051.
Phone : +91 22 4286 1000 • **Email :** sajjan.jindal@jsw.in • **Website :** www.jsw.in



Naveen Jindal
Chairman

Dear Friends,

It gives me immense pleasure to welcome you all to India Steel 2023. It is a great platform created by the Ministry of Steel, Government of India and FICCI for bringing all the steel industry stakeholders together to discuss the challenges and opportunities facing the steel industry in India and around the world.

As we gather at this forum, we are witness to the remarkable growth and evolution of the Indian steel industry. The industry has come a long way in terms of production, technology, and innovation. It has become one of the most significant contributors to the Indian economy, creating jobs, and driving growth.

The production of steel has historically been a significant source of greenhouse gas emissions. However, it is our responsibility as an industry to reduce our environmental impact and contribute to a more sustainable future. The Indian steel industry has made significant progress in reducing its carbon footprint and is committed to achieving carbon neutrality. The industry's focus on sustainability and self-reliance has opened up new opportunities for growth and innovation.

This transition to green steel manufacturing is imperative and will not only benefit the environment, but it will also create new opportunities for all stakeholders. I believe that by leading the way in sustainable steel production, we can set an example for other industries and contribute to a more sustainable future for all.

I recognize that this is a significant undertaking, and it will require the cooperation and dedication of everyone from the steel industry. However, I am confident that together, we can achieve this important goal and make a positive impact on the world.

I would like to express my gratitude to the Ministry of Steel for organizing this event and providing this platform for us to come together. I urge all the participants to make the most of this opportunity, engage in constructive discussions, and explore new avenues for growth and collaboration.

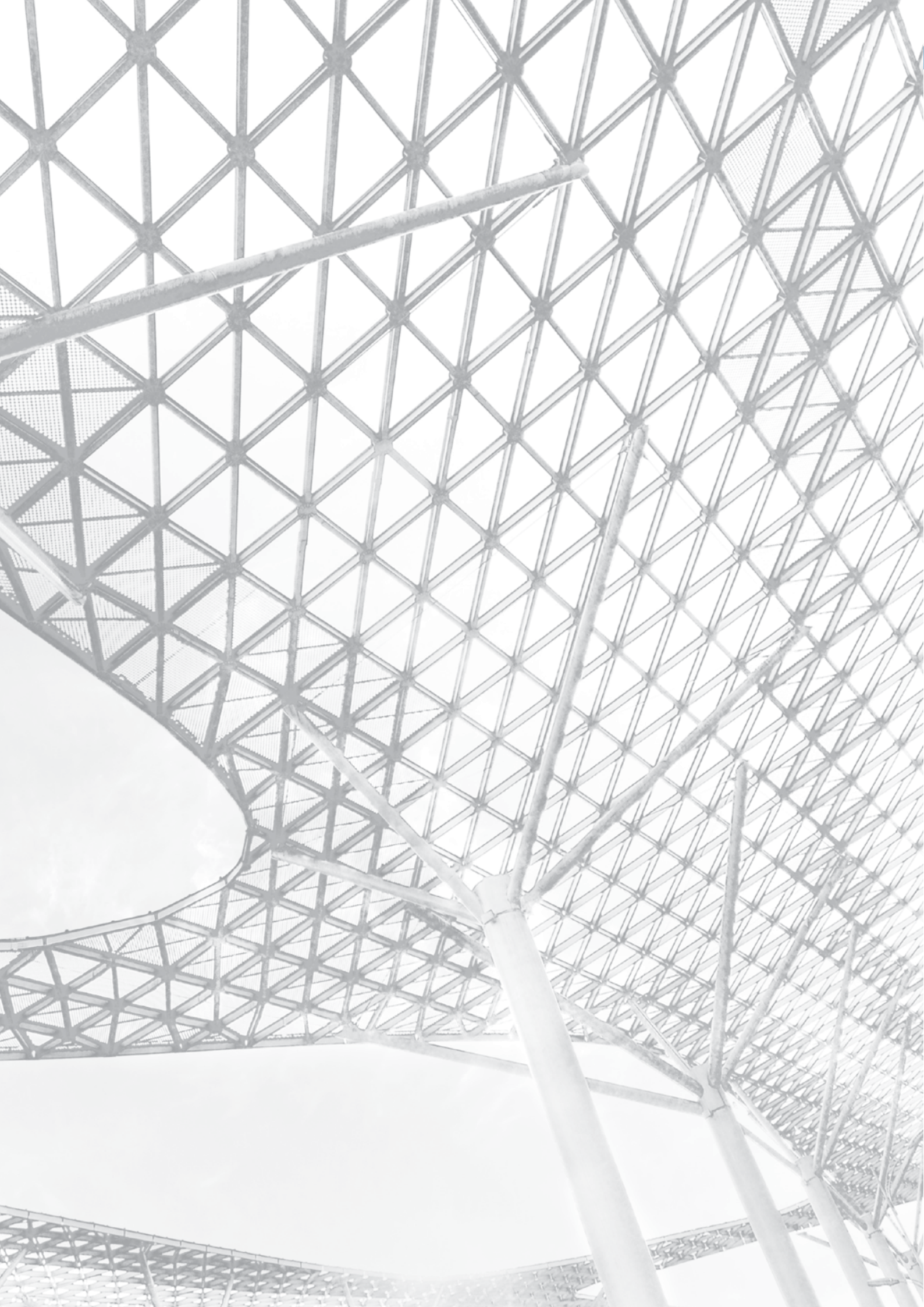
I wish you all a productive and insightful event.

Thank you.

Jai Hind.

Jindal Steel & Power Limited
CIN No: L27105HR1979PLC009913
Registered Office O. P. Jindal Marg, Hisar, 125 005, Haryana

Corporate Office Jindal Centre, 12 Bhikaiji Cama Place, New Delhi 110 066
T +91 11 4146 2000 **F** +91 11 2618 0254 **E** jsplinfo@jindalsteel.com **W** www.jindalsteelpower.com



Ms. Soma Mondal
Chair, FICCI Steel Committee and
Chairman, Steel Authority of India Ltd.

MESSAGE

It is a matter of joy for me that after four successful editions of the mega event, the Ministry of Steel, Government of India and FICCI are organizing the 5th edition of India Steel Expo with added features from April 19-21, 2023 at Mumbai.

Indian steel industry has been playing a significant role in industrial and economic development of the country. Steel Sector is important to country's economic activities as steel is used extensively in variety of areas such as infrastructure, construction, automobile, defense, transportation, packaging etc. Considering the importance of the sector, FICCI has been following an inclusive and collective approach towards voicing the concerns of Indian steel industry.

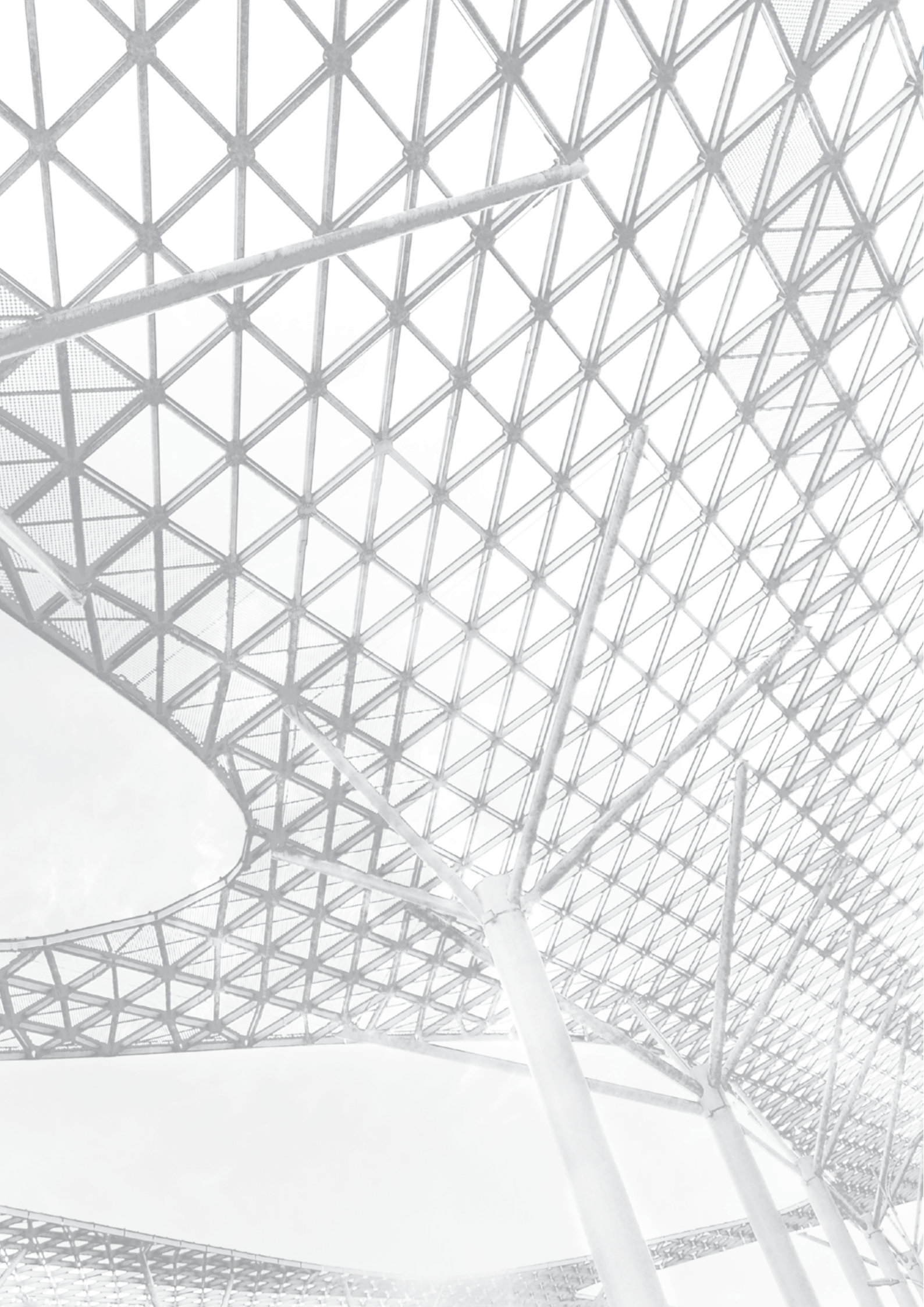
There are certain concerns in critical areas such as logistics infrastructure, capital requirements, international trade, etc. which would require redressal, for long term competitiveness of the sector.

I am sure that this exhibition-cum-conference will provide an opportunity to the industry stakeholders to discuss the challenges and remedial solutions to such challenges. Further, this event will provide a platform for exploring mutually beneficial business alliances, with consumers, technology providers and other solution providers participating.

I welcome all the speakers, participants, delegates, and business visitors to this three-day mega event to make the most of this networking and business opportunity.

I wish the event a great success.

Soma Mondal



T V Narendran
CEO & Managing Director

Message

I congratulate FICCI for jointly organizing India Steel 2023 along with the Ministry of Steel, Government of India to exchange ideas on the growth journey of the Indian Steel Industry.

The steel industry is a vital sector of our economy, providing raw materials and serving as the essential building block for key industries in the economy such as infrastructure, construction, transportation etc. contributing significantly to nation building.

As such, we must have such platforms to discuss and deliberate on the future of the industry, explore alliances, and invest in upcoming technologies & innovations to ensure continued growth and success.

The steel industry is facing a range of challenges and opportunities. From shifting global demand patterns to rising environmental and climate change concerns, we are operating in an increasingly complex and dynamic landscape. It is up to us to seize these opportunities and drive progress in the industry. I believe that industry has the potential to play a greater role in the country's economic growth.

I am sure that these three-day conglomerations of steel industry stakeholders would provide valuable insights toward addressing the pressing issues of steel industry. I look forward to fruitful discussions and collaborations that will help us shape the future of the steel industry in India.

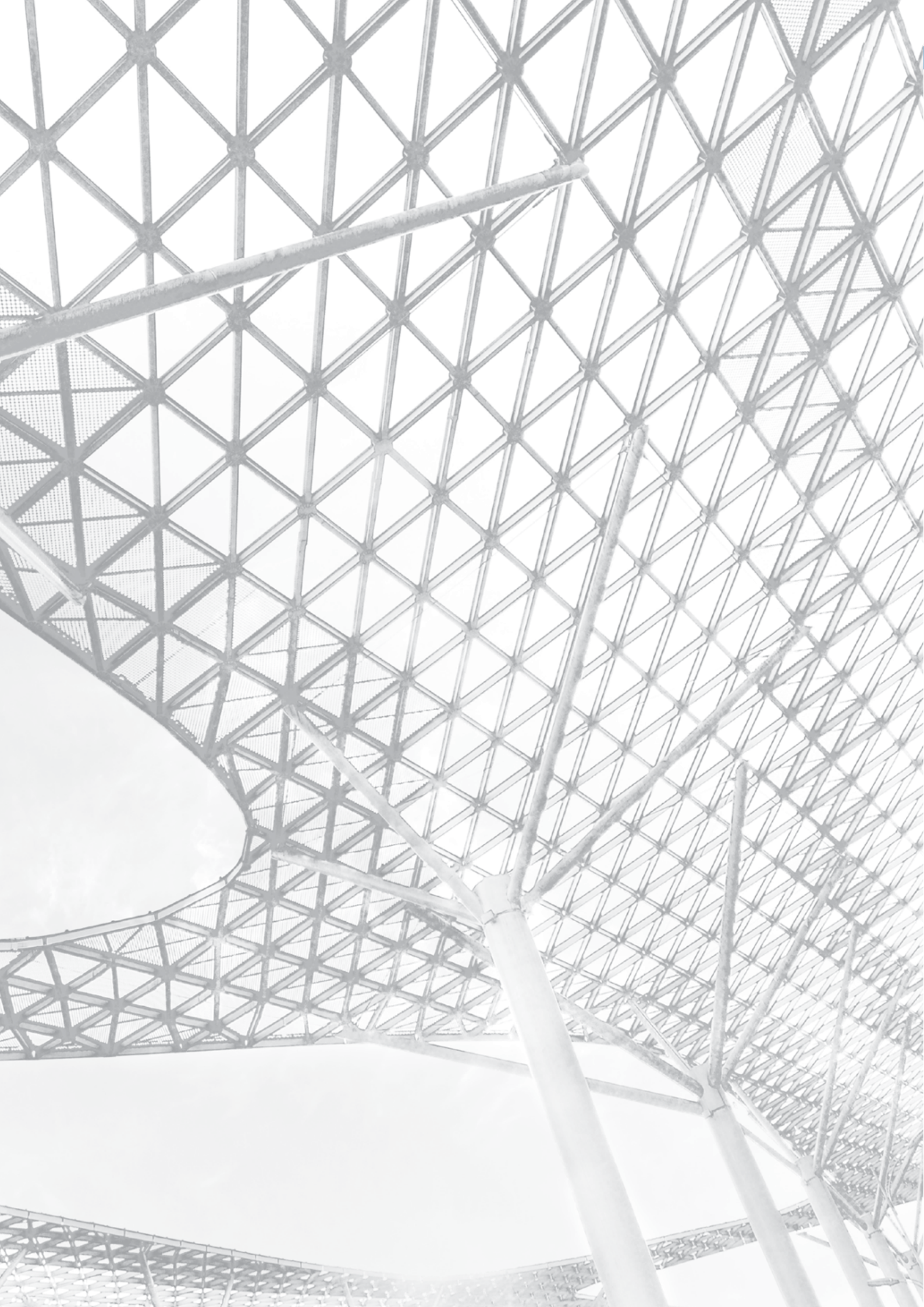
I extend my warm wishes for the success of the event.

With warm regards,

T V Narendran

Date: 23rd March 2023

TATA STEEL LIMITED
Registered Office - Bombay House 24 Homi Mody Street Fort Mumbai 400 001 India
Tel 91 6665 7274 D 6665 8282 Ext 7274 Fax 91 22 6665 7724
Email narendran@tatasteel.com
Corporate Identity Number L27100MH1907PLC000260 Website: www.tatasteel.com



AM/NS INDIA

Sh. Dilip Oommen
Executive Vice President, ArcelorMittal and
CEO, AM/NS India

MESSAGE

India Steel 2023 is a wonderful initiative by the Ministry of Steel, Government of India and FICCI. The event will provide a much-needed integrated platform to envision the growth of Indian steel industry for the next 25 years while simultaneously providing an opportunity to forge business alliances across segments with multiple stakeholders.

India has emerged as a bright spot in global economy amidst slowdown in globally. The steel sector plays a crucial role in the growth story, acting as an economic multiplier and an important avenue of employment generation.

During the ongoing decade, the Indian steel industry is expected to witness unparalleled demand from rapid developments and various government initiatives focused on sectors like infrastructure & construction, automobile, road development, urbanization, defence programmes, among others. This industry is also going to witness transition towards green with reduction in carbon emissions, driven by the net zero targets set by the steel manufacturers.

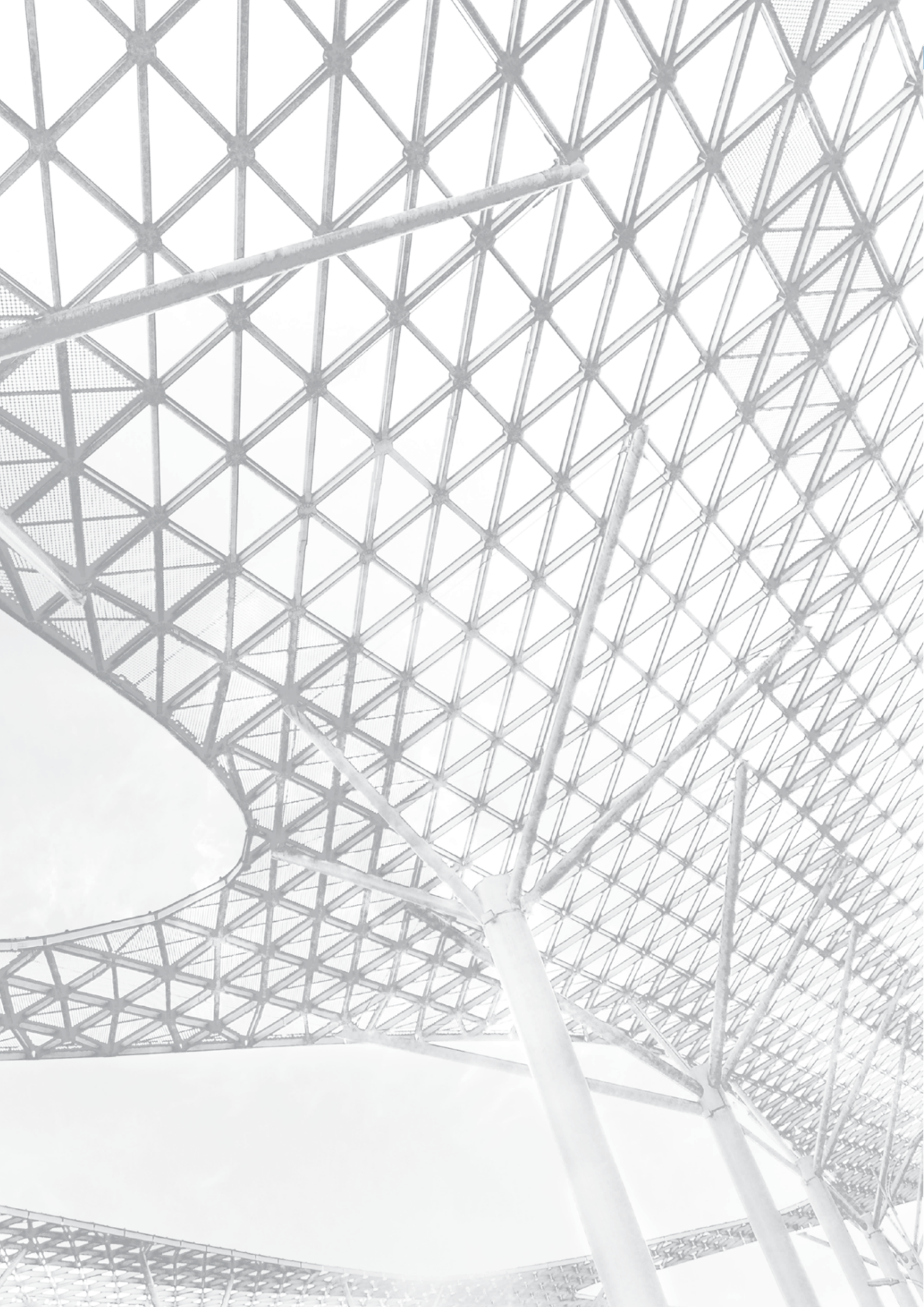
I believe this event is a great initiative to further the growth story of Indian steel sector, bringing all the stakeholders together for meaningful business discussions, collaborations and alliances. It would result in the exchange of innovative ideas through technical and interactive sessions.

I extend my best wishes to all the participants and organizers of the event.

Dilip Oommen

ArcelorMittal Nippon Steel India Limited
Raheja Towers, 6th and 7th Floor, Bandra Kurla Complex, Bandra East, Mumbai – 400 051, Maharashtra, India
CIN U63000GJ2021PTC126941 / +91-261-668 9200 / contact@amns.in / www.amns.in

SMARTER STEELS BRIGHTER FUTURES



Sh. Abhyuday Jindal
Co-Chair, FICCI Steel Committee &
Managing Director, Jindal Stainless Ltd

MESSAGE

It gives me immense pleasure to be a part of **India Steel 2023**, this mega event being held in Mumbai from April 19-21, 2023 and organized by Ministry of Steel, Government of India along with FICCI.

The Indian steel industry has come a long way since its inception. Today, it stands tall as the second-largest producer of steel in the world, after China. The industry has contributed significantly to India's economy and provides employment to millions of people.

It is a matter of immense pride for our industry that the value-added variant of steel, stainless steel is the fastest-growing metal across the world and India is the fastest-developing market for it. The demand for stainless steel in India is related with economy growth and has led the country to become the **second largest consumer of stainless steel.**

Termed as the **Wonder Metal** because of its distinguished characteristics like low maintenance, weldability, aesthetic appeal, durability, low life cycle cost, and inherent hygiene and corrosion resistance, stainless steel is inherently sustainable by virtue of using metallic scrap as its major raw material, to the tune of 80%. This **Green Metal** finds its usage across traditional applications across automobile, railways, transport, architecture, building, construction, processing, homeware, coin blanks, and blade steel. It also has a promising future in upcoming areas like green and blue economy, infrastructure, defence, aerospace, and agri and medical equipment industries.

I am confident that the Indian steel and stainless steel industries have a bright future. However, we need to work together as industry partners, with requisite handholding from the government, to overcome the challenges that plague our ecosystem. We need to prioritize safety, focus on sustainability, manage our input costs, support the government in improving the logistical backbone of the country, and invest in research and innovation to ensure continued growth and development of the industry.

As the industry leader in stainless steel, Jindal Stainless is committed to support the industry through a **four-pronged approach; first, awareness creation** about the benefits of the wonder metal across the diaspora of stakeholders; second, investment in R&D to bring **cutting-edge technology** and solutions into the country and help in import substitution for

critical applications; **third, empowering MSME manufacturers and the entire ecosystem** with technical upskilling and communication support for their focus areas; and **fourth**, finding ways to mitigate environmental impact and achieve **ESG goals**, while supporting the government's goal of reaching Net Zero by 2070. I'm happy to share that Jindal Stainless aims to commit reaching **Net Zero by 2050** itself.

As we gather to discuss the latest advancements, opportunities and challenges of our industry, I extend my best wishes to the event and the participants.

Abhyuday Jindal

Shailesh K Pathak
Secretary General

Federation of Indian Chambers of Commerce and Industry
Federation House
Tansen Marg
New Delhi 110001
T +91 11 2335 7364
E sg@@ficci.com
www.ficci.in
CIN: U99999DL1956NPL002635
ISO 9001 : 2015 Certified

MESSAGE

India Steel 2023 is dedicated to the resilience and innovation of Indian steel industry. I extend my warm greetings to all the participants of the 5th edition of the event. I am thankful to the Ministry of Steel, Government of India for jointly organizing this one-of-its-kind event on the steel industry with FICCI.

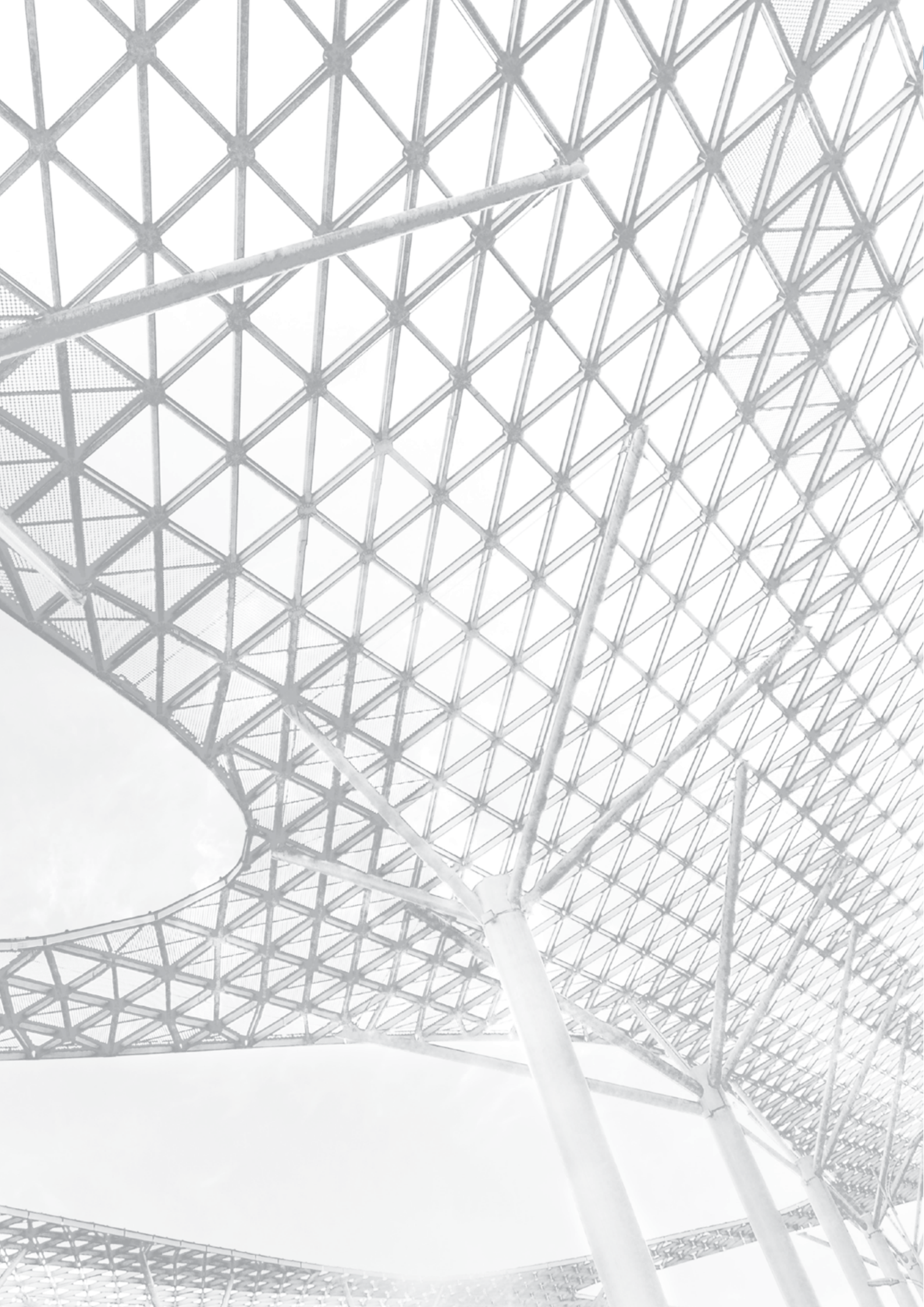
The Indian steel industry has shown tremendous growth in recent years, and the future looks even brighter. The industry has been a key contributor to the Indian economy, generating employment, driving growth, and playing a pivotal role in the development of the nation.

Guided by the National Mission of Atmanirbhar Bharat, Government of India (GoI) has been providing significant support to the industry. The GoI has identified infrastructure development as a key focus area and is investing heavily in the development of roads, railways, airports and ports, and in the process driving the demand for steel. Similarly, many state governments are investing in their infrastructure.

Initiatives like preference to domestically manufactured iron and steel products in Government procurement (DMI&SP) and participation of private companies in commercial coal mining are examples of the conducive policy framework of GoI. GoI has also provided financial support in the form of incentives for investments in new technologies and capacity enhancement.

I would like to thank our partners and sponsors for their support and commitment to the event. I once again welcome all the distinguished dignitaries, guests, speakers and participants to the event and wish the show a grand success.

Shailesh K Pathak



Dr. Edwin Basson
Director General
World Steel Association

MESSAGE

It is laudable that the Ministry of Steel, Government of India and FICCI are organising the 5th mega exhibition-cum-conference on Indian Steel Industry **India Steel 2023** during April 19-21, 2023 at Mumbai.

Steel is one of the most commonly used materials globally today. We rely on it for our housing, transport, food and water supply, energy production, tools and healthcare. Nearly everything around us is either made of steel or manufactured by equipment made of steel. Therefore, the steel industry is very important for India and the world economy. It is the backbone of any industrial nation.

Finding application in many sectors such as construction, power, infrastructure, transportation, aerospace, consumer products and industrial machinery, the Indian steel industry has strong forward and backward linkages in terms of material flows and income generation.

As a competitive steel producer, India's production is driven, to a large extent, by indigenous availability of high-grade iron ore and rising demand from diversified sectors – the two critical components for growth of steel industry in any country. The introduction of the National Steel Policy, 2017 was an important milestone in India's steel story. Aligned, with the policy, the Indian steel sector has grown to the second largest in the world and made its mark in the global landscape.

India Steel 2023, in bringing together important personalities, industry leaders and stakeholders from around the world of steel industry, would provide a great opportunity to discuss the rapidly changing scenario of steel industry globally and for India. I am confident the 5th edition of the event would achieve great success. I extend my warm wishes to all the participants.

Edwin Basson

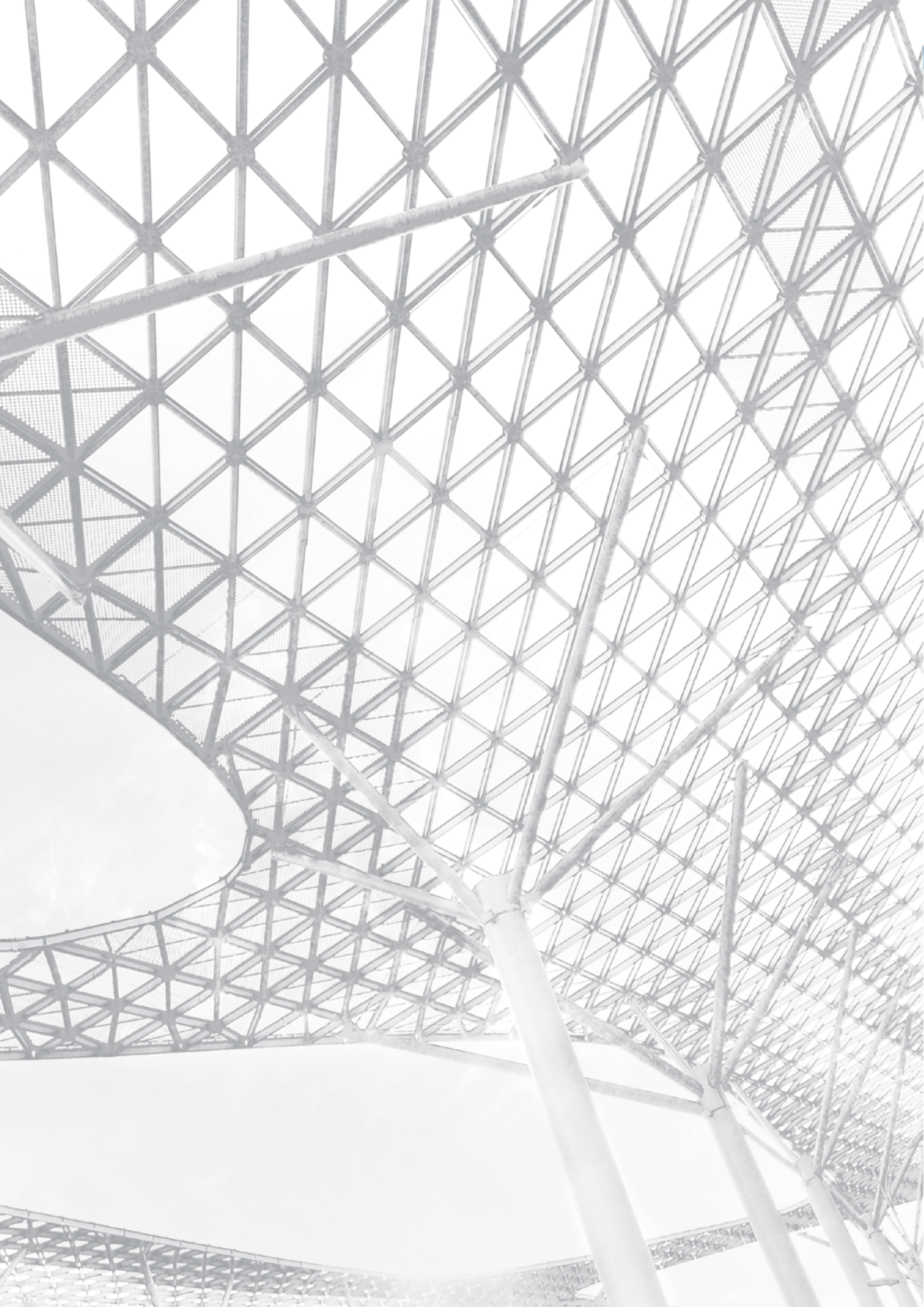


TABLE OF CONTENTS

India Steel 2023

Amrit Kaal Journey: Facilitating the Indian Growth Story

Emerging Themes for Indian Steel Industry

1. Executive Summary

The last decade was significant for the Indian steel industry, as India pipped Japan to become the world's second largest producer of crude steel[1]. India also witnessed significant capacity consolidation under the Insolvency & Bankruptcy Code (IBC) and through acquisition of steel assets by leading players. Industry consolidation is likely to improve efficiencies, capacity utilisation, and enhance domestic pricing power for the players, thus putting India firmly back on the path to potentially reach 300 million tonnes (MT) of crude steel capacity by 2030[2] and potentially 500 million tonnes (MT) by 2047. With scope for greater economies of scale and penetration in value-added special steel products, the next 25 years seem promising for the Indian steel industry.

The outlook for the global economy in 2023 is cautious[3]. This is primarily due to ongoing geo-political conflicts, tightening global financing and liquidity conditions, moderating industrial production, volatile currency movements and increasing trade tensions along with inward looking policy protectionism across developed and emerging economies. Commodities, particularly steel, are expected to be significantly impacted by such global economic and investment outlook.

Increasing focus on sustainability, emission reduction, and zero waste will continue to drive the global steel industry towards a circular steel economy[4] and environment-friendly "green" steel making process. The key objective of a circular steel economy is to produce steel with a long-life expectancy that can be used, reused, and recycled infinitely, thereby reducing the demand for raw materials due to its durability. The global steel industry is actively pursuing innovative technologies that can substantially impact the industry's environmental performance and its raw materials demand. In addition, regulations pertaining to sustainability in advanced countries and geographies such as EU are posing challenges for steel exports from developing nations such as India.

Leading global steel producers are also investing in manufacturing and digital technologies to move towards closed loop steel platforms and create new value. Digitalisation is expected to disrupt steel value chains and the value creation paradigms for steel producers going forward. Automation, analytics, digital supply chain, digital commerce will enable the steel producers to manage risks and volatility, ensure sustainability, and drive profitability across the value chain.

Steel is critical for economic growth in a developing country like India with per capita consumption of steel, an important index for socio-economic development, still considerably lower than developed economies. With an output multiplier of 1.4 on GDP and employment multiplier of 6.8, the Indian steel industry contributes approximately 2% to the country's gross domestic product (GDP) and employs over 6,00,000 people[5].

1 World Steel Association
2 National Steel Policy, 2017
3 World Bank, International Monetary Fund
4 POSCO Research Institute
5 National Steel Policy, Ministry of Steel

For the fast-growing Indian economy with many favourable tailwinds, it would not be difficult to achieve the ambition of creating 300MT steel capacity by 2030 and 500MT by 2047 provided it ensure that some of the key enablers are appropriately addressed during the upcoming Amrit Kaal period.

Demand creation: Domestic steel demand is expected to grow over the next decade due to a range of initiatives taken up by the present government, indicating a cue to capacity growth from 160 MT in FY23[6]. While several initiatives, such as affordable housing, expansion of railway networks, development of domestic shipbuilding industry, increased investments in the power sector etc. are going a long way in demand creation, there is a need for a greater focus on newer avenues for demand augmentation such as opening up of defence sector for private participation, enabling the growth in the automobile sector etc. Structural issues related to financial stress, margin pressures, and exposure of steel producers to service debts have led to insolvency and slower capacity growth. Significant capacity consolidation is underway and steel producers are expected to adopt a more cautious approach towards greenfield investments over the next 1-2 years. Increased dominance of integrated steel units is likely to have demand and price pressures for secondary steel producers.

Raw Material Availability: A relatively slow process of iron ore mine allocation along with intermittent mining bans across a few states have impacted the domestic steel sector. It is expected that 2030 will be important year for the iron ore mining sector with significant impact on steel production due to expiry of captive leases under Mines and Minerals (Development & Regulation) Act 2015. Proactive steps are needed by the government and industry to ensure a seamless transition for these significant milestones. Issues related to logistics from the mining areas also need to be addressed to mitigate lag in evacuation of iron ore. High import dependency of coking coal / coke is another ongoing concern for the Indian steel industry due to constraints related to coking coal availability and production in India. Timely steps will have to be taken to make optimal quantity available for the sector and also to improve the production through the use of new mining technologies.

Logistics infrastructure: An aspiration of achieving a steel production capacity of 500 MT by 2047 would demand a logistics infrastructure to move ~2000 MT (including raw materials and finished goods) by then. This will be a key challenge given that India is currently ranked 44th on LPI (Logistics Performance Index) by World Bank. India will have to not only address the current issues around rake availability, track congestion, road infrastructure etc. but also

6 Ministry of Steel Annual Report

evaluates innovative solutions such as slurry pipes, inland waterways, efficient use of land near ports / railway lines for blending / storage etc. to address the logistics challenge.

Capital requirement: National Steel Policy (NSP) 2017, estimates a capital investment of ~Rs.10 lakh Cr to achieve the steel capacity of 300 MT by 2030. Sustained measures will be required to address this challenge not only to increase the liquidity but also to reduce the cost of capital.

R&D spend: India would need to significantly improve its R&D efforts to enhance the quality of its products, improve environmental efficiency, and to identify cost optimisation initiatives such as reduced use of coal, use of Hydrogen as a reactor instead of carbon, better heat recovery systems, appropriate usage of slag and innovative measures to reduce carbon emissions.

Quality improvement: India has brought around 90% of the products under Quality Control Orders[7] (QCO) and it is expected that soon all 100% products would be covered under QCO. India should also ensure that it harmonizes its quality standards with the key trading countries and administers the same quality standards on imported goods as well to enable a level playing field. Indian steel companies must also adapt digital and exponential technologies to achieve quality leadership among its global peers.

Import substitution and export promotion: India's steel exports accounted for around 3% of all steel exported in 2021[8], and with steel demand expected to grow by 1.5 times by 2050 - this presents a great opportunity for Indian steel exports to leapfrog other countries in terms of market share. Considering the current growth figures (GDP growth rates over last few years) the most attractive export destinations appear to be East Asia and Pacific (China, Hong Kong, Taiwan, Vietnam, Indonesia, Philippines, Malaysia among others) and Middle East and North Africa (Saudi Arabia, UAE, Egypt, Jordan, Algeria, Tunisia, Morocco, among others). Despite the presence of a short-term window of opportunity due to Russia-Ukraine conflict and US trade war with China, growth of steel demand in traditional markets, such as the US and EU is slowing down.

Secondary steel producers are playing a key role in capacity creation; there is a need to create favourable policy environment for them to ensure a strong performance in the coming years. Reduced input costs through duty / RoE (Return on Equity) reduction on power tariffs and coordinated efforts across ministries (coal, mining, railways, power etc.) could be some of the measures that may go a long way in supporting this section.

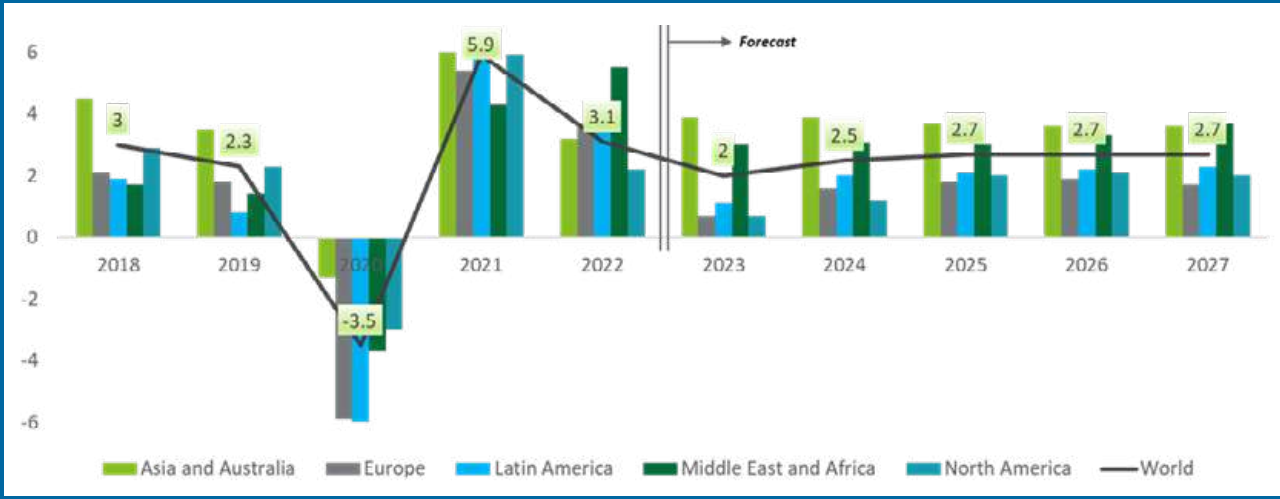
Although there are issues regarding raw material availability and financial pressures for the domestic steel industry, it has managed to come out stronger at the end of the last decade. Focused efforts from both the government and industry players are required in order to achieve the long-term growth objectives and strengthening the domestic and export competitiveness.

7 Ministry of Steel, World Steel Association
8 World Steel Association, JPC

2. Economic Outlook

While the world was still on the path to recovery post-covid, global geopolitical instability has prolonged the recovery period. The world GDP growth rate is expected to be slower in 2023, owing to the headwinds arising from the Russia-Ukraine conflict's ripple effect, in addition to high inflation and interest rates. Global inflation is expected to subside only gradually, from an estimated 9.3% in 2022 to 6.7% in 2023 and 4.3% in 2024. It is expected that major central banks might end their tightening cycles by mid-year as inflation slows, but rates will remain high in 2023-24.

Figure 1: Global GDP: Trends and Forecasts

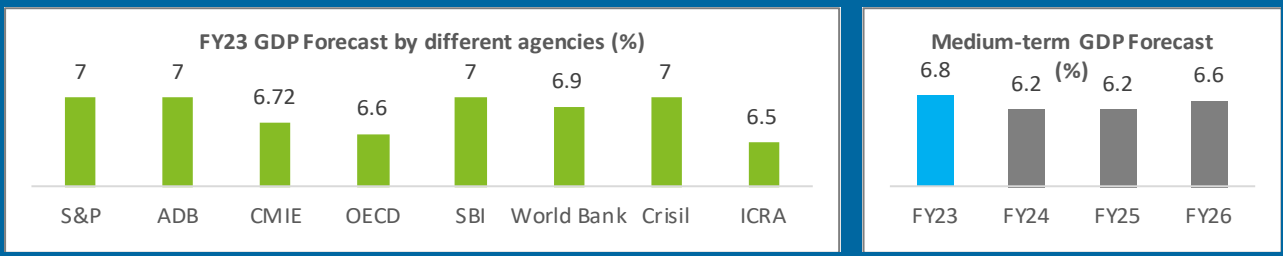


Source: Economic Intelligence Unit, The Economist

The developing economies, however, will observe comparatively higher growth rates. The emerging market and developing economies across all regions are expected to grow by ~4.2% in 2024. Moreover, India will continue to be the bright spot in the world economy, accounting for ~15% of global growth in 2023.

Despite strong global headwinds and tighter domestic monetary policy, India is still expected to grow between 6.5-7.0%. This is a reflection of India's underlying economic resilience, and ability to recoup, renew and re-energise the growth drivers of the economy.

Figure 2: Indian GDP Forecast



Source: GDP forecasts by S&P, ADB, CMIE, OECD, SBI, World Bank, Crisil, ICRA, Deloitte Analysis

3. Steel Industry Overview

Steel is one of the world's most essential materials. It is fundamental to every aspect of our lives, from construction to transportation, machinery, appliances, and packaging. It is produced in various forms such as bars, plates, sheets, pipes and wires, and can be shaped and formed through various techniques including forging, casting and rolling. Recycling of steel is also widely practiced, making it a sustainable and environmentally friendly material.

The steel industry plays a vital role in the global economy, with a significant impact on employment, trade, infrastructure development, and the growth of other industries. However, it also faces a range of challenges, including environmental concerns, fluctuating demand and raw material prices, and intense competition.

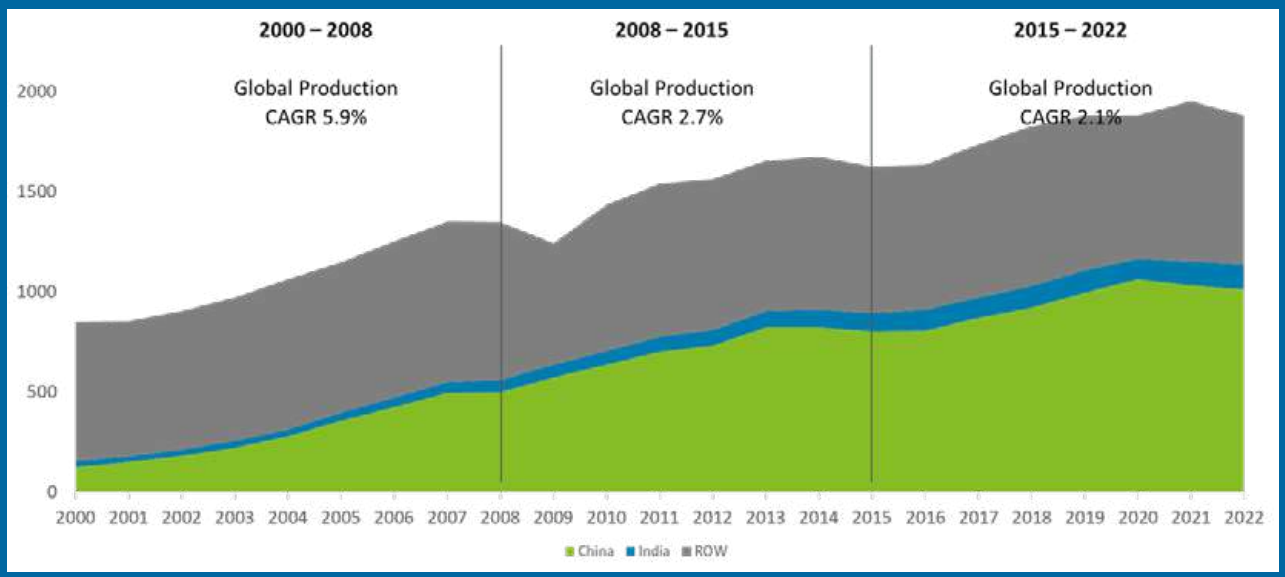
3.1 Global Steel Industry

Global steel production has increased from 850 MT in 2000 to 1,878.5 MT in 2022, owing to an increase in demand majorly due to rapid industrialization. Steel production grew at an accelerated rate of ~6% from 2000 to 2008. The growth was fueled by China, Japan, US, Russia and Germany. During the same period, China and India's steel production grew at a CAGR of 18.7% and 10% respectively.

In 2006, India became fifth largest steel producing country. The 2008 – 2015 period saw a steady growth in global steel production led by China, Japan and India. During the period, the steel production in China and India grew at a CAGR of 7% and 6.3%, respectively.

India surpassed the USA in 2015 to emerge as third-largest steel producer after China and Japan. The next 7 years saw a decent growth in the steel production amidst the impact of Covid-19 and subsequent raw materials shortage. However, India overtook Japan to become the second-largest producer of steel in 2018. Today, the global steel industry remains a critical part of the global economy, with China being the world's largest producer of steel, followed by India, Japan, the United States, and Russia[9].

Figure 3: Global Crude Steel Production Trend

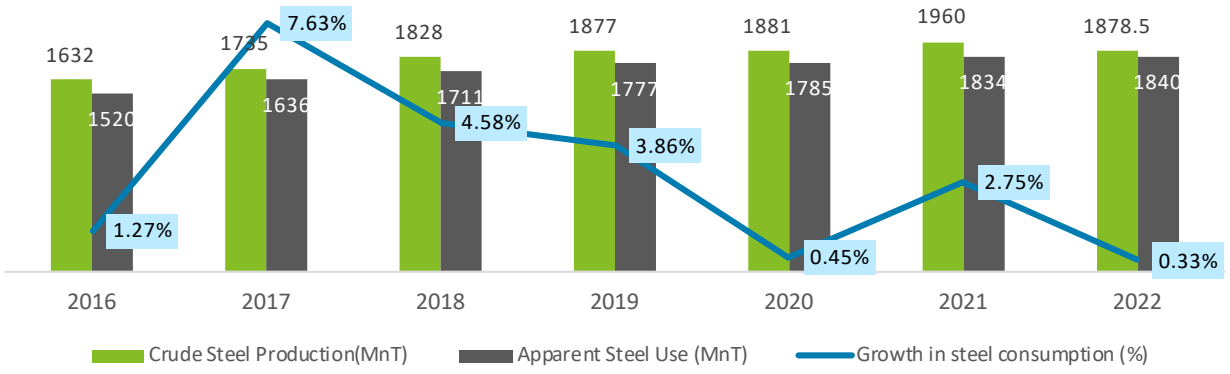


* *World Steel Association*

3.1.1 Demand Supply Trend

Global crude steel production increased from 1,632 MT in 2016 to 1,960 MT in 2021, growing at a CAGR of 3.73%. China dominated the production followed by India and Japan respectively contributing 53%, 6% and 5% of the total steel production. The world's second-largest steel producer India, increased output by 17.8% in 2021 to 118.1 MT, while production from Japan climbed 14.9% to 96.3 MT for the year.

Figure 4: Global Crude Steel Production vs Apparent Steel Use



Source: World Steel Association

The world's crude steel output saw its first decline in 7 years in 2022, as production dropped by 4.2% to 1,878.5 MT. China's crude steel production declined by 2.1% to 1.01 BT, largely due to a subdued economy amid its zero-COVID policy and uncertainties over its real estate market. Japan recorded a 7.4% decline in production to 89.2 MT as auto production slowed in the middle of chip shortage[10]. Global ex-China crude steel output fell by ~2% in 2022, likely due to a 15% drop in CIS production following Russia's invasion of Ukraine. There was a fall of 9% in the European Union due to economic impact of the war resulting in rising energy and power prices[11]. However, India was the only country that saw in increase of 5.5% in steel output among the five major steel producing countries, producing 124.72 MT of crude steel in 2022.

10 https://asia.nikkei.com/Business/Materials/World-crude-steel-output-sees-first-decline-in-seven-years-in-2022
11 http://www.eiu.com/industry/commodities/article/1782645761/steel/2023-01-01s

However, global consumption trend of steel has witnessed an increasing trend in 2022, unlike production trend. Global consumption of steel was estimated at 1840 MT in 2022 against the total production volume of 1,878.5 MT. The strong growth in construction activity and rising automotive output saw a rise in crude steel consumption in 2022. China dominates the global crude steel consumption with a 50% market share in 2022. The major driving industry is the construction sector which accounts for China's 55% finished steel consumption. The EU is the world's second largest consumer of steel, accounting for 8% of global consumption in 2022. As energy prices surged after Russia invaded Ukraine, Europe's economy faced a sharp slowdown in the second half of 2022, thereby declining EU's steel consumption by 7% year-on-year.

Figure 5: Major Steel Producing Countries in 2022

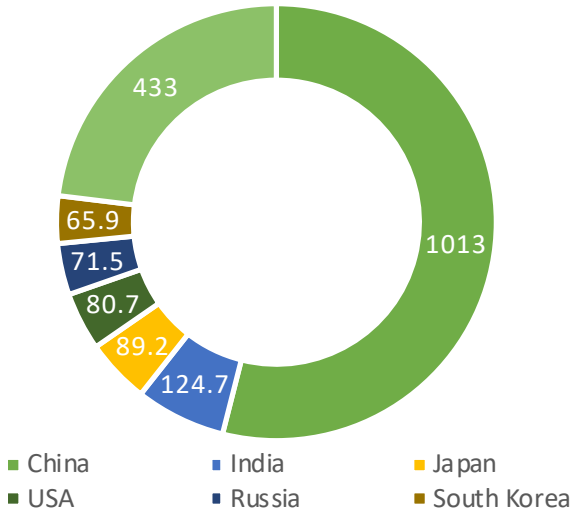


Table 1: Major Companies in Steel Production

Rank	Company	Crude Steel production (MT)	Headquarters
1	China Baowu Group	119.95	Shanghai
2	Arcelor Mittal	79.26	Luxembourg
3	Ansteel Group	55.65	Anshan
4	Nippon Steel Corporation	49.46	Tokyo
5	Shagang Group	44.23	Jiangsu

Source: World Steel Association, Fortune Global 500

The top 5 players shown in the table above account for ~18% of the global crude steel market in 2021. The global production capacity of crude steel was around 1,960 MT in 2021. China Baowu Group accounted for the largest production capacity with a production of 119.95 million tons in 2021. The production by the company occupied 6.1% of the global production shares. ArcelorMittal was the second largest company accounting for 4% of the global share and producing 79.26 million tons of crude steel. Other leading crude steel producers globally were Ansteel Group, Nippon Steel Corporation, Shagang Group, and others. These accounted for 2.8%, 2.5%, and 2.3% respectively.

3.1.2 Price Trend

Steel prices surged during the post Covid-19 recovery as raw materials supply has struggled to keep up with the demand. Steel prices and long product prices have boomed since December 2020 as supply was insufficient to cover end-use demand and supply chain restocking.

Production of long products outside China was severely hit by the Covid-19 crisis and the recovery was gradual but was outplaced by the improvement in apparent demand[12]. Iron Ore prices have increased by over 260% from USD 83.5 per tonne in May 2020 to USD 219 per tonne in June 2021, as an effect of post Covid-19 recovery, disturbing the demand-supply balance.

As Covid-19 cases rose across China in January 2020, most factories were forced to shut and production almost came to a complete halt. During this time, many governments saw construction as the key to keep the economy

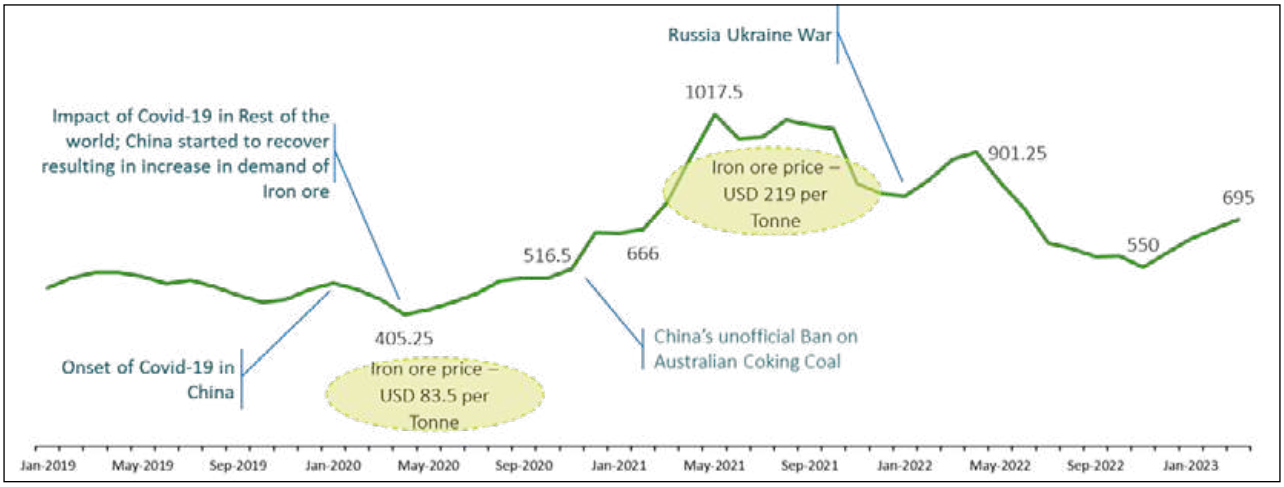
12 *https://www.fastenerandfixing.com/insight/steel-prices-have-boomed-in-2021-but-it-won-t-last-forever/*

operating, increasing the demand for basic building materials while supply was substantially impacted. In addition to iron ore, coal prices also increased, owing to China's unofficial ban on Australian coal on October 2020[13], which eventually got lifted in January 2023.

Steel prices were on downward trend for most parts of CY22 on account of factors affecting the Chinese market. Slowdown in infrastructure and construction sector in China due to stalled projects and liquidity crunch, leading to higher inventory levels was the primary reason for reduced demand.

The prices have started to recover in the ongoing calendar year and have increased 26% from November 2022 prices to reach USD 695 per tonne in March 2023 on bullish outlook.

Figure 6: HRC, FOB Rizhao, China export: 3-12mm, SS400 (USD/tonne)

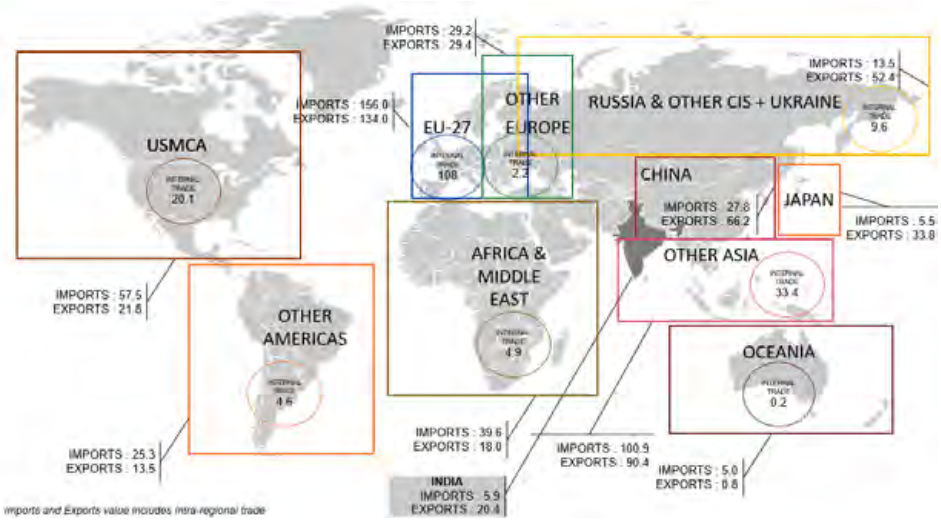


Source: Steel Mint

3.1.3 Global Trade

Steel manufacturing is a critical industry worldwide and steel is a heavily traded commodity. The global trade of steel has a significant impact on the global economy and on the competitiveness of different countries.

Figure 7: World Steel Trade Flow (MT) in CY-2021



Source: World Steel Association, World Steel in figures 2022

13 https://www.spglobal.com/commodityinsights/en/market-insights/latest-news/coal/022223-china-starts-buying-australian-coal-as-unofficial-ban-ends

International trade in steel in 2021 accounted to ~460 million tonnes. World trade flows have been consistent with production rates, with China as the largest exporting region (in terms of extra-regional exports). The largest exporters China and Japan exports majorly to the largest importing region i.e. other Asia (in terms of extra regional imports) which includes South Korea, Vietnam, Thailand and Indonesia[14]. Russia majorly exports steel to the European Nation, which is the second largest importer of steel (in terms of extra regional imports).

The major products traded include Hot rolled sheets and coils which constitutes 18.1% of the total export volume in 2021. Ingots and semi-finished material and galvanized steel are the second and the third most exported products constituting 14% and 10% of the total export volume[15].

Table 1: Major Companies in Steel Production

Rank	Exporting Countries (2021)		Importing Countries (2021)	
	Country	Total Export (MT)	Country	Total Import (MT)
1	China	66.2	European Union	48.1
2	Japan	33.8	USA	29.7
3	Russia	32.6	China	27.8
4	South Korea	26.8	Germany	23.3
5	European Union	26	Italy	20.8
6	Germany	23.9	Turkey	16.2
7	Turkey	22.1	Thailand	15.7
8	India	20.4	Mexico	15.1

Source: World Steel Association, data of CY-2021

2.2 Domestic Steel Industry

The first steel plant in India was established in 1907 by Tata steel. However, the steel industry gained momentum post-Independence as the government implemented a series of policies to support its growth. The Hindustan Steel Limited (HSL) was established in 1954, which set up its first integrated steel plant at Rourkela in Odisha in 1959. The Bhilai Steel Plant in Chattisgarh and Bokaro Steel plant in Jharkhand were established next during the 1960s.

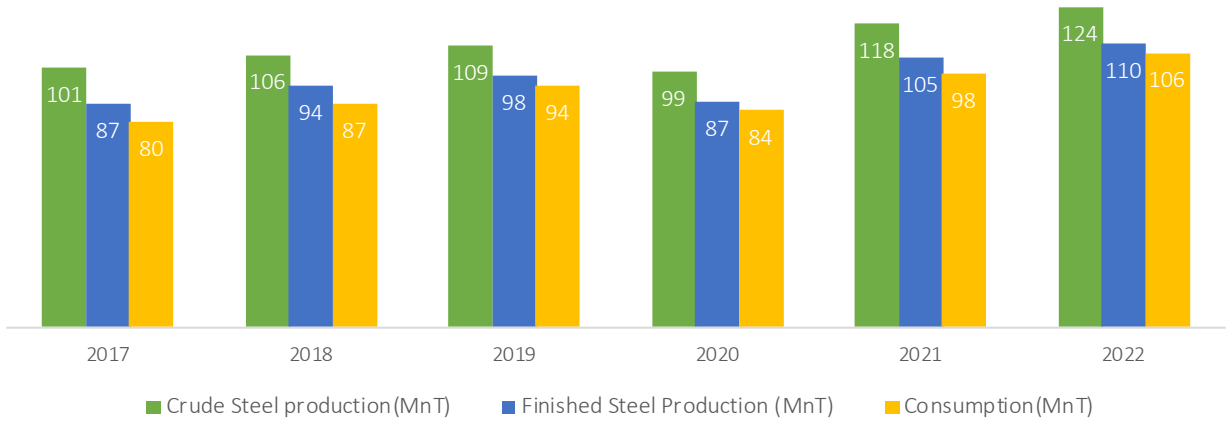
In 1973, the government nationalized the steel industry, merging HSL with other steel companies to form the Steel Authority of India Limited (SAIL). The industry picked up with the establishment of new private sector companies like JSW Steel, Jindal Steel and Power Limited and Essar Steel. India became one of the top 10 steel producers in the world in 2005, and in 2018, India went on to become the second largest crude steel producer in the world.

3.2.1 Production

India is the second largest producer of crude steel globally with 124.7 MT of crude steel production in 2022, registering an increase of ~5.7% compared to 117.6 MT produced in 2021. India's crude steel production grew at a CAGR of 7.2% from 2000 – 2022. Crude steel production fell by ~9.1% during 2020 to 99.1 MT as most of the steel producing regions witnessed a decline in crude steel output due to production cuts amidst more stringent lockdown in the country. However, the domestic steel industry witnessed a significant boost in the production levels growing at ~18.6% to reach 117.6 MT in 2021. India's crude steel production is projected to touch ~134 MT in CY2023.

14 World Steel in figures 2022
15 World Steel Association

Figure 8: Domestic Steel production vs consumption



Source: Steel Mint

3.2.2 Finished Steel Production vs Consumption

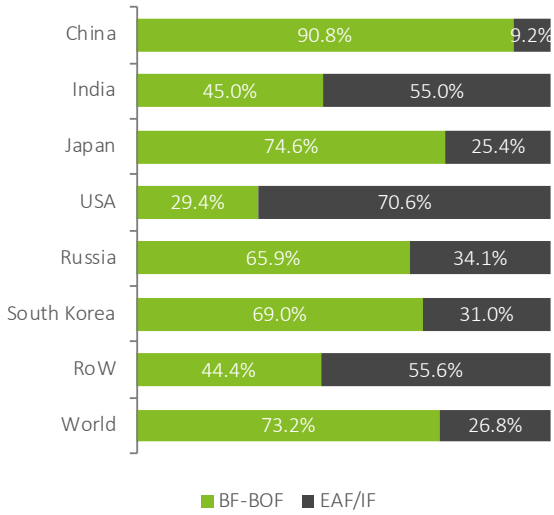
India's finished steel consumption grew at a CAGR of ~6% in the past 5 years to 106.47 MT in FY2022. India's finished steel production is projected to touch ~120.3 MT in FY2023. Buildings and Construction industry is the primary demand driver which consumes ~62% of the total production, followed by Capital goods and Automotive industry with shares of 15% and 9%, respectively. The Indian government's initiatives and schemes such as GatiShakti Master Plan, make in India, Pradhan Mantra Awas Yojna - Housing for all, Urban infrastructure development scheme for small and medium towns, etc. have created prospects for significant consumption of steel.

3.2.3 Process Routes

There has been a gradual shift in steel production route over last few years from induction furnace to electric arc furnace (EAF) by steel producers primarily due to quality concern of product through the former route. The share of steel production through basic oxygen furnace (BOF) route is likely to increase in coming days mainly due to better product quality and low availability of graphite electrodes.

Currently, India produces 55% of its steel through the EAF / IF route, however the National Steel Policy envisages to reduce this share to 35-40% while remaining 55-60% is envisaged to come from Blast Furnace route. Globally the share of EAF / IF route is considerably small at 26.8% while that of China is a mere 9%.

Figure 9: Route wise Production share (Global) 2021



Source: Mysteel Global, S&P Global, Argus Media

Table 3: Route wise Production Trend (India)

Year	BOF	EAF	IF
FY14	43%	23%	34%
FY15	42%	26%	32%
FY16	43%	27%	30%
FY17	43%	30%	27%
FY18	46%	26%	28%
FY19	45%	25%	30%
FY20	45%	28%	27%
FY21	45%	27%	28%

Source: MoS Annual Reports

3.2.4 Key Producers in India and their expansion plans

Steel manufacturing companies in India are classified into Integrated Steel Producers and Secondary Producers based on their presence in the value chain. Integrated players such as JSPL, JSW Steel, Tata Steel, SAIL, Essar Steel, and Rashtriya Ispat Nigam account for ~50% of the total finished steel production.

Figure 10: Major ISPs in India and their production share (CY22)

Before 2014, performance of leading integrated steel producers was marked by rapid capacity expansions and growing profitability. However, declining Chinese domestic demand and excess global steel capacity created uncontrolled dumping of steel in India.

Major Asian steel producers i.e. China, South Korea and Japan took advantage of the situation and started bringing domestically produced steel products on the Indian front at highly competitive price. The situation was further aggravated by the sudden cancellation of allocated raw material mines thus halting ongoing mining activities. Such disruptions in the supply chain of raw materials and finished products affected the entire industry resulting in low utilization, declining price realization, lower margins and disturbed business operations.

Many leading producers started facing the pressure of mounting debt burden due to blockage of investments in expansion and modernization plans and later embarked on either divesting their steelmaking facilities or initiating insolvency resolution process.

A few producers like Tata Steel, JSW, and SAIL managed to withstand the situation and started recovering their operations. Government of India also extended their support in the form of reform policies and strategic trade measures. Imposition of antidumping duty and safeguard duty managed to curb the growing rate of imports and improve exports of steel products from the country. Amendment of MMDR Act and other mining regulations were meant to ensure effective & efficient allocation of mining blocks and improve the pace of mining operation re-start.

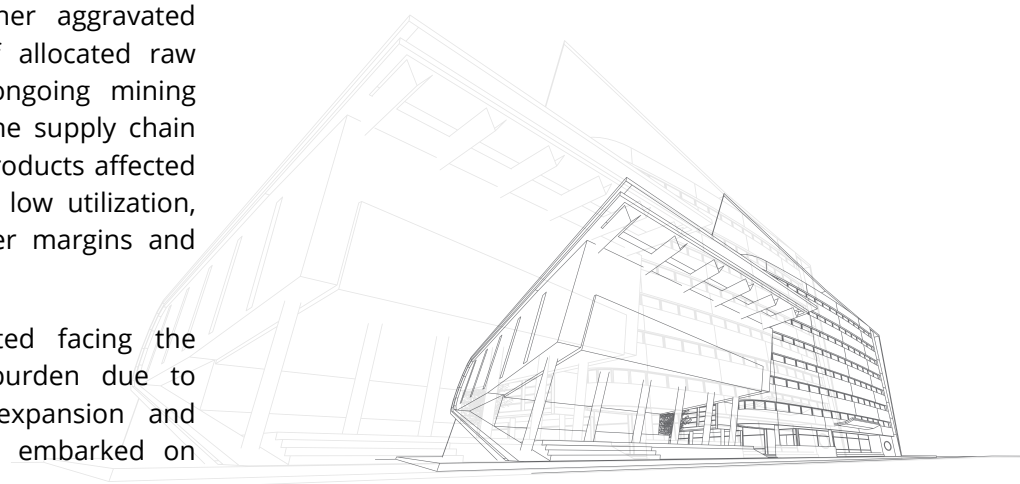
Moreover, interventions in the form of initiating the insolvency resolution of debt laden businesses helped in consolidation of the industry.

Moreover, the Major ISPs have announced plans to increase their capacities, thereby helping the nation realize their targeted capacity envisaged in the National Steel Policy. The capacity expansion plans are listed below.

Table 3: Route wise Production Trend (India)

S No	Company	Existing Capacity in MT (FY22)	Expansion Plans in MT (FY30)
1	JSW	27	50
2	Tata Steel	20.6	40
3	SAIL	23.3	50
4	JSPL	9.6	50
5	AMNS	9	30
Sub-total		**89.5**	**220**

Source: Secondary Research



3.2.5 Per capita Steel Consumption

Although India is the second largest consumer of finished steel, its per capita consumption of 76 kgs is noticeably below the world average of 233 Kgs. Some of the leading countries are South Korea (1075.6 Kg), Taiwan (885.6 Kg), Czech Republic (775 Kg), China (666.5 Kg), Austria (516.9 Kg), Italy (439.4 Kg) and Germany (426.1 Kg). Per capita consumption of steel declined significantly across most economies in 2020, as a result of the Covid-19 crisis. However, China would be the leading example for India on account of the demographic similarities and world's leading population.

However, India's per capita consumption of steel is growing at the highest rate, after China, amongst other countries across the globe. The table below highlights the per capita steel consumption trend over last 4 years, when India's consumption grew at a CAGR of 3.5% against a global increase of 1.7%, which majorly got affected due to the impact of Covid-19.

Table 5: Region wise per capita steel consumption trend (in Kg)

Region	2017	2018	2019	2020	2021	CAGR
World	216.7	224.3	230.4	229.0	232.0	1.7%
European Union	342.8	353.9	332.7	294.2	344.2	0.1%
Other Europe	295.2	266.0	235.7	243.5	276.0	-1.7%
Russia & other CIS	186.2	189.8	198.5	195.4	200.1	1.8%
USMCA	282.7	283.8	273.1	228.3	270.0	-1.1%
Asia	268.5	283.7	300.9	311.8	306.2	3.3%
Africa	28.3	28.9	30.2	26.2	27.0	-1.2%
China	544.6	585.6	636.0	699.2	666.5	5.2%
Japan	504.9	514.2	498.3	416.1	456.2	-2.5%
India	66.2	71.5	75.1	64.7	76.0	3.5%

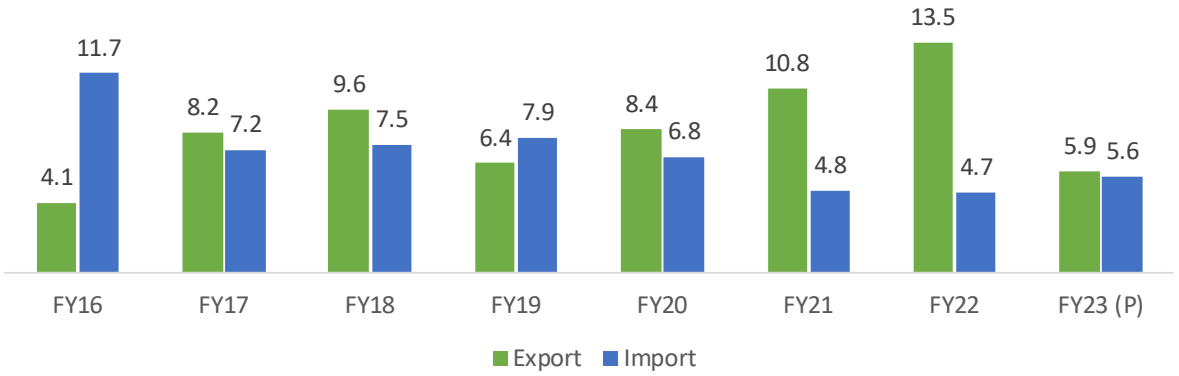
Source: World Steel Association

3.2.6 Trade

Traditionally, India was a net importer of finished steel, however the tide turned in since FY17 when India became a net exporter. With the only exception in FY19, India has always been a net exporter of finished steel since then. Even during FY23 when the Government had imposed export duty on steel products for half of the year, India has still managed to be a net exporter.

Some of the key factors that helped India revive from trade deficit and become a trade surplus country in finished steel include domestic support to the industry, introduction of antidumping duties and safeguard duties for steel products. The latest anti-dumping duties imposed by India includes import on stainless steel seamless tubes and pipes from China PR and imports of electrogalvanized steel from Korea RP, Japan and Singapore. All such measures were not only directed to restrict import of steel products, but also to improve capacity utilization, price realisation and profit margins for domestic producers.

Figure 11: Finished Steel Trade in MT (India)



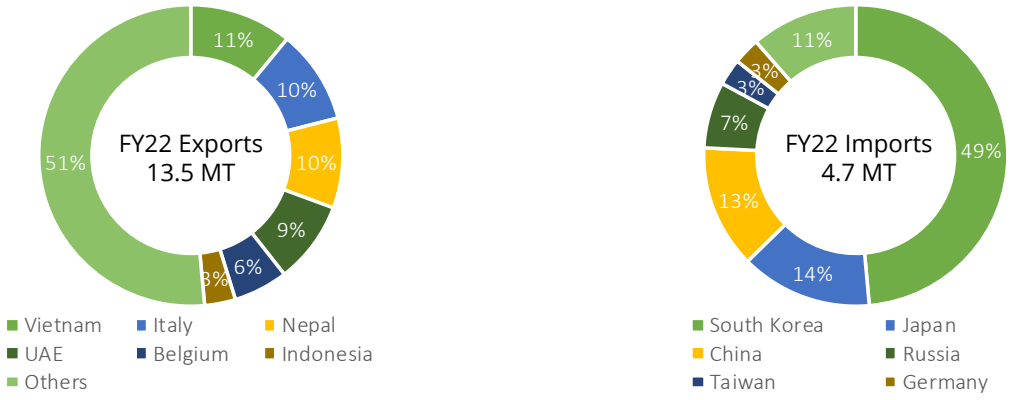
Source: JPC

Note: The provision data for FY23 is for the period from April 2022 to Feb 2023

In FY22, India imported 4.7 MT of finished steel, of which 50% was imported from South Korea. In FY18, South Korea replaced China as the largest exporter to India and since then has been the largest exporter consistently for last few years.

In terms of export, Nepal, Vietnam, Italy and UAE have been traditional destinations for export of Indian steel. In FY22, these four countries contributed to 40% of the total steel export from India. The export quantity increased by 25% in FY22 over previous year on account of reduced supply from Russia and Ukraine. However, FY23 saw a sharp decline due to imposition of export duty on steel products. The provisional figure for export of finished steel from April 2022 to Feb 2023 stands at 5.9 MT.

Figure 12: Export and Import Destinations of Finished Steel (India)



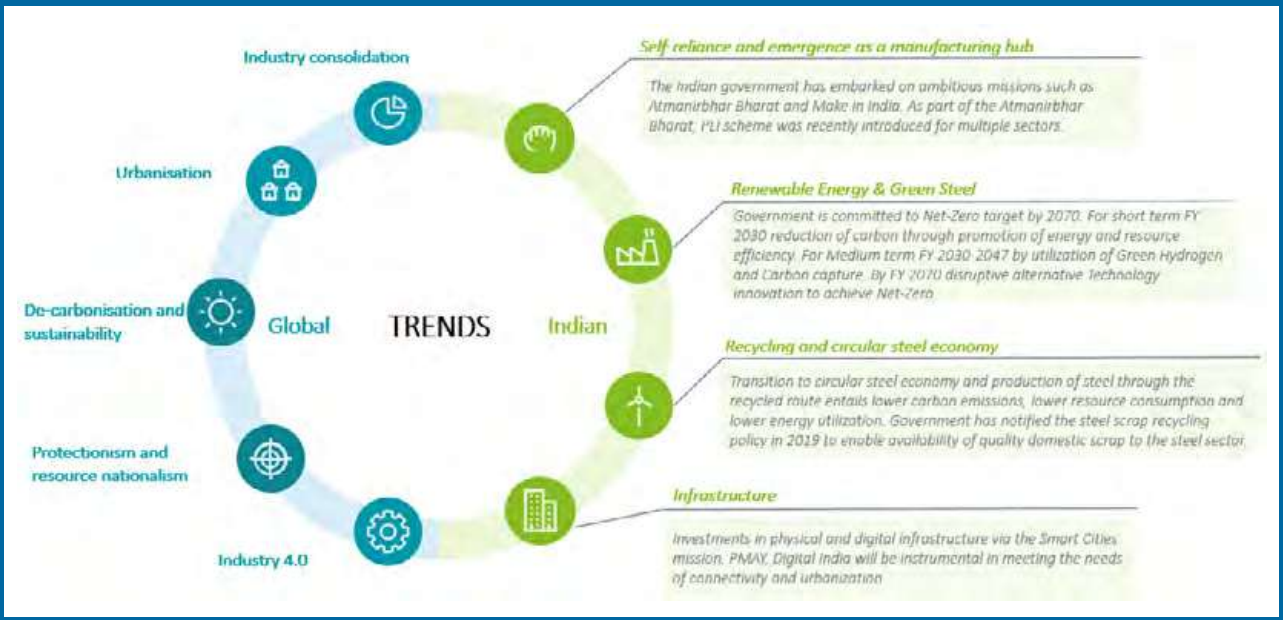
Source: Steel Mint

4. Opportunities for Indian Steel Industry

4.1 Overview

The Indian steel industry is currently the 2nd largest in the world. As India's economy grows, its steel demand is expected to grow substantially. While the outlook for the sector points to an optimistic future, it is important to track the global and the domestic trends and themes which are currently driving the steel sector. The current section explores and presents a brief perspective on the important drivers in the Indian steel industry.

Figure 13: Megatrends shaping the Indian Steel Industry



Source: Deloitte Analysis, Secondary Research, Press Information Bureau

4.2 Market Evolution

The rapid infrastructure development in India along with increasing population and urbanization which have led to a rise in demand for steel products. The automobile and manufacturing sectors are also significant consumers of steel, and the growth of these sectors has led to increased demand for steel. The same can be gauged from the fact that the combined Index of Eight Core Industries (ICI) increased by 7.4% (provisional) in December 2022 as compared to the Index of December 2021[16]. The Eight Core Industries comprise 40.27% of the weight of items included in the Index of Industrial Production (IIP). Within the combined index, the index for steel stood at 171.6 with base year as 2011-12 (base as 100)[17].

While the domestic steel sector is projected to grow multi-fold propelling the per capita domestic consumption from 76 kgs to an estimated 160 kgs by 2030, the orientation of the Indian steel sector as a net exporter is a theme which requires close examination. At the same time, the rapid urbanization of the nation is expected to bring the theme of rural steel market into the key deliberations regarding the further growth of the sector.

15, 16 Ministry of Commerce & Industry, Press Information Bureau

4.2.1 Export Orientation of the Indian Steel Sector

India exported around 5.90 million tonnes of finished steel for the period April 2022 – February 2023[18]. The major share of exports is generally finished flat products accounting for around 70-75% share with finished long products and semi-finished billets making up the balance export quantities. Exports from India are spread across the various geographies of South-East Asia, Middle East and Europe, among others. A perspective on key emerging markets for steel and drivers for the domestic sector is provided below.

Table 6: Key Emerging Markets for Export Orientation of Indian Steel

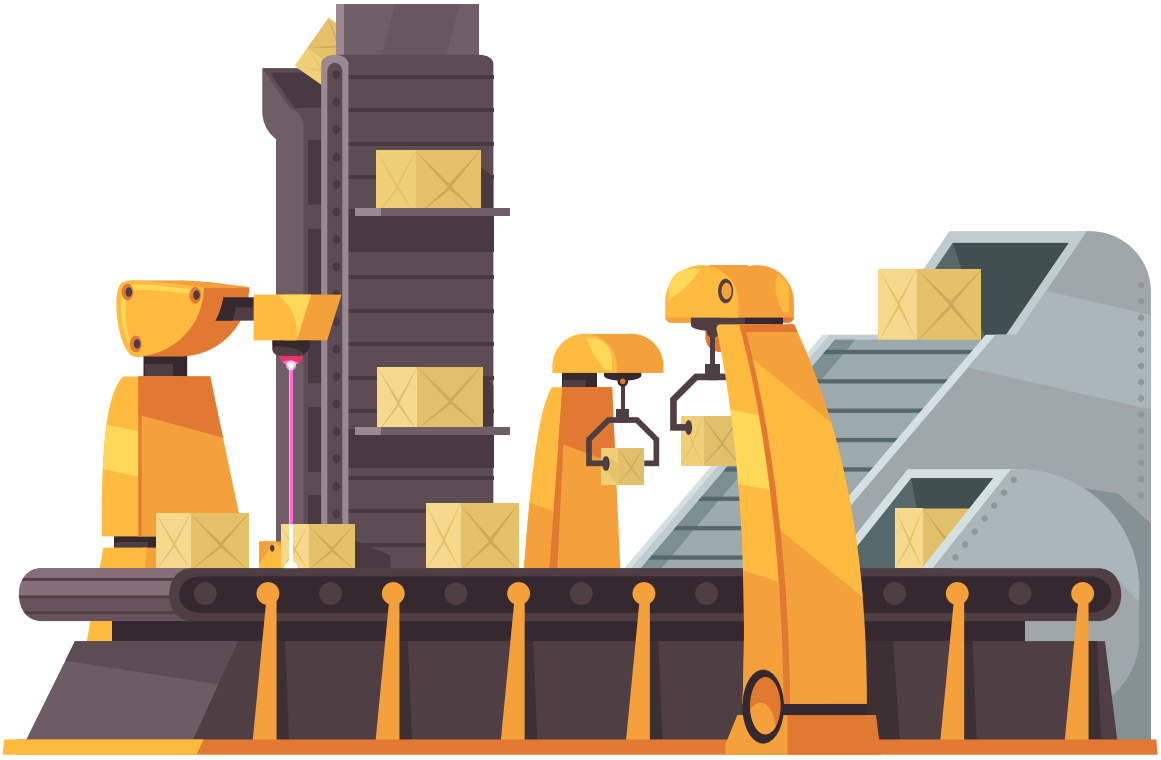
Region	Current Steel Trade Scenario	Key Takeaways for Indian Steel Sector
Asia (except China & Japan)	Vietnam, Singapore, Nepal & Hong Kong were major export destinations in the region for Indian steel for FY2021-22. The region is a net importer of steel to the tune of ~10.5 MT (2021). The major categories of exports to this region include HR coils, HR flat products among others and wire rods, bars among other long products.	Optimization of product portfolios for steel makers in India based on market assessment for target geographies and their corresponding maturity level of downstream capabilities. New market development and customer scoping by steel players with focus on countries with high net imports of steel such as Thailand, Philippines, etc.
Africa & Middle East	Africa & Middle East is a net importer of steel with United Arab Emirates (UAE) alone accounting for ~9% of exports from India for FY2021-22. Other major export destination for FY2021-22 include Egypt & South Africa among others. The region has a whole was a net importer of ~21.6 MT (2021).	The region has the advantage of geographical proximity for India as compared to other major steel export-oriented regions. Various government stimulus programs expected to drive steel demand in the region.

18 Secretary's DO Report on Iron & Steel, Joint Plant Committee

Region	Current Steel Trade Scenario	Key Takeaways for Indian Steel Sector
European Union (EU 27)	The European Union is a major net importer of steel worldwide with net imports of ~22 MT in 2021. In FY2021-22, Belgium, Italy, Poland and Spain were some of the major importers of Indian steel.	The EU imports steel of specific grades and specifications which are not manufactured in the region. Indian players can expand their footprint in this region with focused assessments for specific products.
USMCA	The USMCA region was a net importer of steel to the tune of ~36 million tonnes in 2021. USA alone accounted for 3% of India's exports for FY2021-22.	Flat products accounted for the majority of the steel imports in this region. The US imposed ad valorem tariffs of 25% on steel imports under Section 232 of the Trade Expansion Act of 1962 in 2018. The tariffs have since been removed, temporarily suspended or replaced with quota deals on a case-by-case basis with multiple trade partners.
Other America	The region had a net import of ~12 MT for 2021 with major importers being Colombia (~3 MT) and Peru (~2.5 MT). However, the region has major exporters like Brazil which had a net export of ~6.6 MT for 2021.	While the region is a major producer of iron ore, opportunities may be explored based on planned curbs of Chinese steel production in 2023 as a result of slump in iron ore futures and a broader risk aversion triggered by fears of a banking crisis.

Source: SteelMint, World Steel Association, CMIE Industry Outlook, S&P Global Commodity Insights

Note: Reported figures are for 2021 unless mentioned otherwise



Key Challenges & Opportunities

India's Iron and Steel policy is expected promote the indigenous manufacturing through widening of manufacturing base, sharing of know-how, product development as well as technological transfer by way of multi-lateral collaboration. The secondary steel sector in India currently contributes over 40% of the total capacity and it will need to play a crucial role for India to reach 300 MT capacity. Many opportunities exist for the Indian steel sector in terms of market entry. However, several challenges are faced with respect to exports of finished steel.

- **Strategy Formulation:** Indian steel players must formulate a defined strategy with regards to export orientation. In the past, steel exports were major focus in times of dip in domestic demand. Further, the Indian steel sector may shift their focus from HRC / plates and billets to more value-added products such as galvanized steel, color coated and other such products. The Indian steel sector may also explore the possibility of making its processes more robust and efficient to meet stringent requirements placed by some of the end-user sectors of steel such as automotive and aerospace industries.
- **Policy Aids:** With regards to policy, some steel importing countries and regions have implemented trade barriers and protectionist measures. For example, the EU has a quota system for import of steel by product type and country. Supplies beyond the fixed quota attracts a duty of around 25%. Additionally, the absence of major trade agreements has also contributed to lower exports of Indian steel.
- **Cost Competitiveness:** Even though, there have been significant improvements in the operational efficiencies in the recent years, Indian steel producers are still facing costs around 5-10% higher as compared to the global average . The major components of the additional costs faced are costs of finance (approximately 12% versus 3-5% in European union) along with the costs for logistics & infrastructure. These factors place India at disadvantage as compared to other major steel producers in the region such as China, South Korea and Japan. A tentative break-up of the cost premium for steel production in India is provided below.

Table 7: Cost Premium for Steel Production in India

#	Particulars	Cost (USD/tonne)
1	Logistics & Infrastructure	25-30
2	Power	8-12
3	Import Duty on Coal	5-7
4	GST Compensation Cess	2-4
5	Taxes and duties on iron ore	8-12
6	Finance	30-35
7	Total Cost Premium	80-100

Source: NITI Aayog, Achieving Green Steel: Roadmap to a Net Zero Steel Sector in India, TERI

4.2.2 Opportunities in Rural Steel

The current domestic steel consumption is skewed towards demand generation from the urban population with rural demand accounting for only about ~15-16% of the overall demand. Further, with ~65% of the total population, rural per capita steel consumption is ~1/10th of urban per capita steel consumption at 19-20 kgs per capita. Around 65% of the rural consumption of steel is focused on construction as the end use.

However, with lower per capita steel consumption and ample scope of urbanization, rural steel consumption is expected to play pivotal role in Indian steel industry's growth. Multiple key initiatives by the Government along with a host of consumption enablers are expected to drive up the steel demand in key end use sectors of the rural economy such as food processing & storage, agriculture & farming, dairy & animal husbandry and rural infrastructure development. A summary of a few key polices and their impacted sector is provided below.

Table 8: Key Policies & Consumption Enablers for Rural Steel

#	Particulars		
1	Pradhan Mantri Awas Yojana – Gramin	Increasing farm income Labour availability Demand for aspirational / lifestyle goods 46% share in national income generation Smart Villages	Construction & Infrastructure
2	Pradhan Mantri Gram Sadak Yojana		Construction & Infrastructure
3	PM Krishi Sinchai Yojana		Automobile (2W), Construction & Infrastructure
4	GOBAR (Galvanizing Organic Bio Agro Resources) Dhan Yojana (Aims to positively impact village cleanliness and generate wealth and energy from cattle and organic waste)		Animal husbandry, Dairy
5	Deen Dayal Upadhyay Gram Jyoti Yojana (DDUGJY) (Continuous electricity supply to rural India)		Transmission & Distribution
6	PM Kisan Sampada Yojana (Scheme for Agro-Marine Processing and Development of Agro-Processing Clusters)		Animal husbandry, Dairy, Food Processing, Farm equipment
7	Jal Jeevan Mission Rural		Water & Sanitation

Source: Secondary Research

Key Challenges & Opportunities

The key challenges in rural steel consumption lie across multiple factors such as awareness, affordability, skill ecosystem and access to products.

- **Awareness**: Limited knowledge of steel-based solutions and lifecycle cost assessment for steel products is a key deterrent for increased steel adoption. Currently rebars and roofing sheets are being used in rural construction.
- **Affordability**: The lower per capita income of the rural economy is leading to usage of alternate products and inefficient / make-shift solutions.
- **Skillset & ecosystem**: Lack of knowledge & vendors to carry out steel fabrication and awareness about application usage is another key challenge for rural steel market expansion.
- **Availability**: Due to wide geographical spread, limited road access & poor warehousing arrangements, availability of steel is a constraint for the rural economy.

The fast-moving consumer goods (FMCG) sector can act as a potential benchmark for steel industry towards rural penetration. A rural portfolio can potentially provide stable growth & resilience from market headwinds. Recognizing the changing customer preference, the FMCG sector is utilizing the fact that consumers in rural India are switching from unbranded, loose products to branded ones. The rural specific distribution channel of the FMCG sector making use of the local ecosystem of Kirana stores and other outlets being harnessed for last mile connectivity, is another learning that could a takeaway for the Indian steel players to harness networks of PDAs, mandis, primary & secondary distributors to enhance channel presence.

4.2.3 Infrastructure sector and opportunity in prefabricated structures

The construction and infrastructure sector accounts for more than 60% of overall steel consumption. However, there is a huge infrastructure gap in the country. It is estimated that infrastructure investment of USD 4.5 trillion may be needed through 2040. Over the next few years, the capital expenditure is expected to remain high for Indian infrastructure players across sectors. The overall CAPEX in the infrastructure sector is expected to grow at 11-12% in next 4-5 years.

Government initiatives, such as the construction of metro stations, new no-frill airports, international terminals, Bharatmala & Sagarmala projects, Gati Shakti Initiative, industry corridors, power plants, and ports, among others, that require heavy steel structures are expected to drive the growth of the prefabricated structures market.

The expansion of nuclear energy in the country is important, as it is one of the ways to reduce CO2 emissions. India plans to triple its nuclear capacity by 2024. On the other hand, the solar energy sector also represents a huge opportunity, and it is witnessing a rapid rate of adoption across the country. The steel structures play an important role in mounting solar panels.

These infrastructure development activities by the Government of India, and infrastructure industry at large, are likely to boost the Indian metal fabrication market over the next few years.

Table 9 List of Key policy initiatives and projects driving steel demand from infrastructure sector

National Infrastructure Pipeline	Dedicated Freight Corridor
PM Awas Yojana – Urban & Rural	Bharatmala
UDAN	Sagarmala
National Electricity Plan	Smart city initiative

Structural steel is traditionally fabricated on site in India, mainly due to the lack of infrastructure for transporting heavy sections from an offsite workshop to the project site. This model of fabrication of steel structures is different from the model followed in developed countries. However, the scenario is gradually changing. With the workshop delivery models being more efficient in terms of quality and timeliness, market players are moving away from on-site fabrication to fabrication in workshops. The time pressure is propelling the industry towards off-site fabrication. The workshop delivery model helps in reducing the time and cost of execution, in turn boosting the demand for steel structures in the country.

Most steel fabrication businesses (>90%) in India are small to medium-sized enterprises (SMEs) with few employees and infrastructure. These companies serve a wide array of industries, like manufacturing, construction, and infrastructure. Factors like uncertain delivery schedules from steel manufacturers, funding, and volatility in prices of raw materials can create pressure on working capital, which remains a challenge for these SMEs, as the fabrication industry generally involves working-capital-intensive operations.

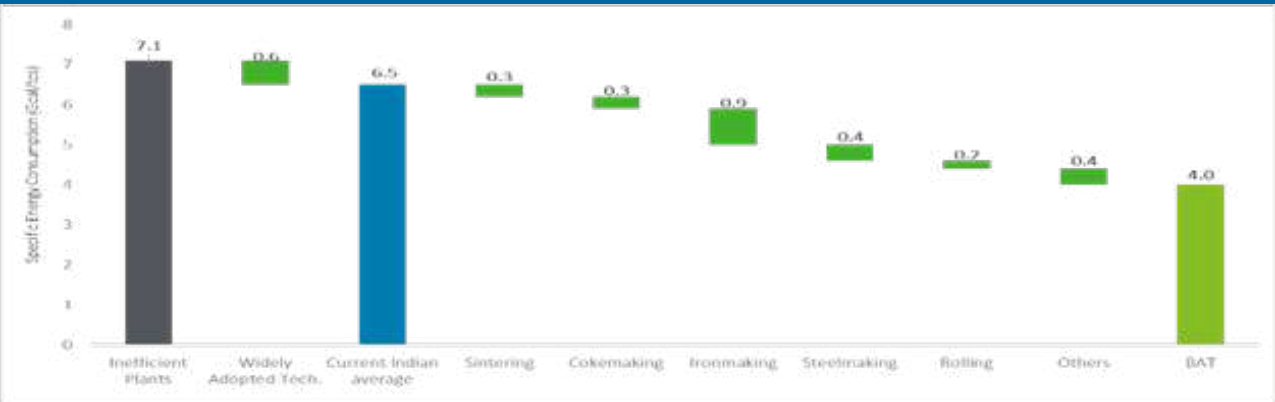
5. Focus Areas for the Indian Steel Industry

5.1 Sustainability

5.1.1 Energy Efficiency & Decarbonization

Steel making is an energy intensive process which calls for the application of the best available energy efficient technologies particularly in recently built capacity with long lifetimes. The application of best available technologies has the potential to reduce energy and emissions by around 15% across the two primary steelmaking routes[20]. Further, older plants may be analyzed for potential modernization with regards to energy consumption. The average specific energy consumption of steel plants in India varies from 5.77 Gcal/tcs to 6.70 Gcal/tcs as compared to international standards of 4.5-5 Gcal/tcs[21]. A tentative energy consumption of each stage of steel making is provided below.

Figure 14: Potential Energy Efficiency Areas for Blast Furnace route of Steel Making



Source: Achieving Green Steel: Roadmap to a Net Zero Steel Sector in India, TERI, Secondary Research

Energy efficiency improvement is one of the key levers to decarbonization of the steel industry. On an average, 1.8 to 1.9 tonnes of CO2 are generated per tonne of crude steel produced as per international standards[22] with the Indian average ranging from 2.26 t/tcs to 2.8 t/tcs of CO2. Within this context, decarbonization and growth of demand for green steel are likely to drive the next few decades globally. While regulatory landscapes across regions are driving the steel decarbonization story, major steel producers across the globe have taken up significant decarbonization targets. A non-exhaustive list of decarbonization initiatives is provided below.

---

20 Achieving Green Steel: Roadmap to a Net Zero Steel Sector in India, TERI

21 Glossary of Terms & Definition commonly used in Iron & Steel Industry, Ministry of Steel website

22 Glossary of Terms & Definition commonly used in Iron & Steel Industry, Ministry of Steel website

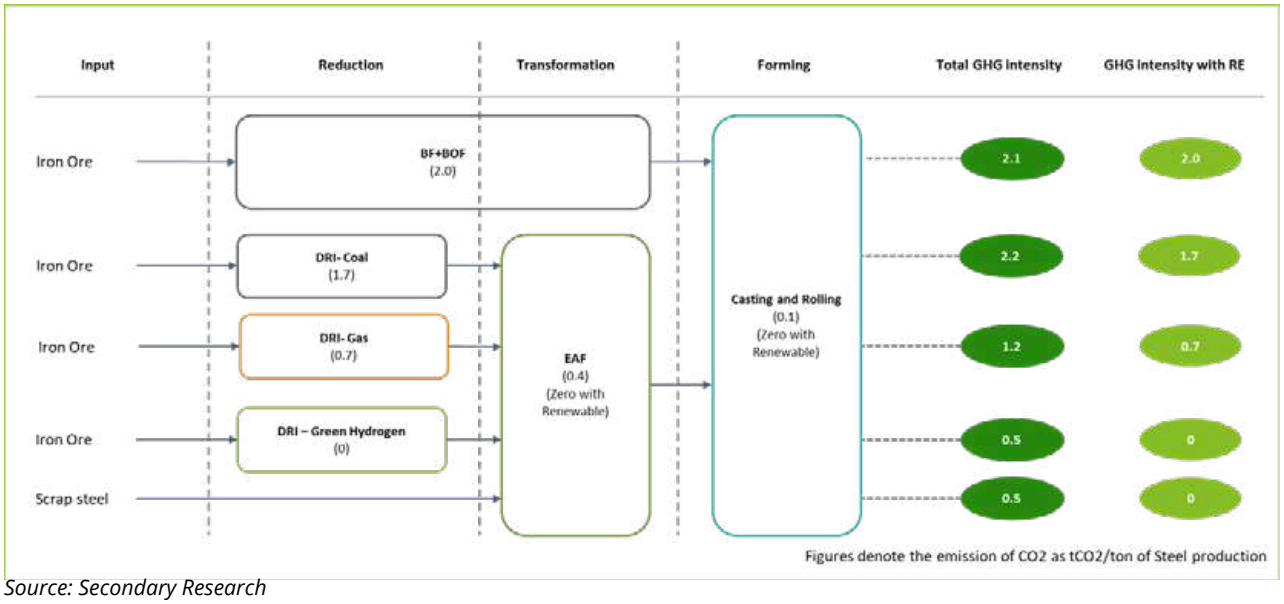
Table 9: Decarbonization Targets & Initiatives by Global & Indian Steel Makers (non-exhaustive)

#	Steel Producer	Decarbonization Target/Initiative
1	SSAB	2020: The pilot facility for the production of fossil-free sponge iron in Luleå was commissioned. 2021: SSAB produced the world's first fossil-free steel, produced using HYBRIT technology, and delivered to the customer. 2025: Replacement of BF with EAF at SSAB Oxelösund as demo plant. 2030: Transformation of remaining BFs to mini mills with EAFs at SSAB Raahe & Luleå The HYBRIT* project is a pioneer in decarbonizing steel production, using fossil-free electricity for the electrolysis of water to produce hydrogen.
2	ArcelorMittal	2030: Target of reducing CO2 emissions by 25% globally, and in its European operations, by 35%. 2030: DRI-EAF investments in Europe (Germany, Spain) & Canada, smart carbon & gas injection, souring of clean electricity, scrap utilization
3	ThyssenKrupp	2025: Initial commissioning of 2.5 million tons capacity, replacing BF with DRI and iron melting technologies, that will avoid emissions of 3.5 million tons of CO2 (investment of ~2 billion Euros). Full-scale by 2030
4	H2Green Steel	2030: Greenfield steel plant in Sweden, producing 5 million tons of steel with electricity from fossil-free sources and green hydrogen H2 Green Steel is a new company founded in 2020, with the ambition to accelerate the decarbonization of industry using green hydrogen
5	United States Steel (USS)	2030: 20% reduction in CO2 emissions, achieved through process optimization and EAF investments. 2050: Net Zero, achieved through mini-mill developments, DR with NG/ H2, carbon capture, etc.
6	Tata Steel	Tata Steel plans to reduce CO2 emissions by at least 30% by 2030 Recently, Tata Steel's Dutch arm signed an MoU with Ford to supply its plants in Europe with green steel after 2030
7	JSW Steel	JSW TMT rebars have been recently certified with GreenPro ecolabel certification, conducted by CII with international standards and product for green product labelling. JSW developed products like Non-Grain Oriented Fully Processed (NGOFP) electrical grade of steel which help reduce core losses, further reducing greenhouse gas (GHG) emissions.
8	Jindal Stainless	Jindal Stainless Ltd. has partnered with Hygenco India Private Limited to install a Green Hydrogen Plant which will enable JSL to considerably reduce its CO2 emissions by nearly 2700 MT per annum. The hydrogen produced is planned to replace ammonia in its in-house annealing of stainless steel, which is part of the heat treatment process

Source: Analyst Reports, Annual Reports, Secondary Research

Indian steelmakers have taken up various initiatives for decarbonization with focused initiatives in a host of areas such as green-labelling and development of specialized steel products, among others. Carbon emission scenario in the iron ore & steel industry would also imply use of syngas and hydrogen. The following figure provides a tentative overview of the greenhouse gas intensities based on different kinds of inputs and processes.

Figure 15: Production Routes and Carbon Intensity of Various Steel Production Methods



Source: Secondary Research

Decarbonization of the steel industry at large scale is the need of the hour based on net zero targets of the nation and the growing demand for green steel domestically and as well as potential export markets. However, there are several challenges for the decarbonization journey in steel sector globally and India. Major challenges for decarbonization of the steel sector have been tabled below.

Table 10: Challenges for Decarbonization of Steel Sector (non-exhaustive)

#	Focus Area	Key Challenges
1	Assets & technology	Young age of existing steelmaking assets Varying maturity of proven enabling technologies
2	Shortage/Cost of green H2 and renewable electricity	Lack of green infrastructure for renewable electricity and H2 production High cost of H2 will make green steel uncompetitive
3	Raw material availability	Scarcity of high Fe-content iron ore needed for DRI, pressure on supply sources Limited availability of high-quality, prime scrap for EAF production
4	Financing & capital expenditures	High asset investments needed, e.g., in EU estimated 70-100 billion Euro. Steelmakers have low profit margins and are not able to absorb investment costs
5	End markets	Demand for green steel from region/industry is variable Significantly higher "green premium" price of low carbon steel will be a challenge to get accepted The continued speed of industrialization of China coupled with risks of downturn
6	Policy & regulatory	Lack of any clear certification standards for low carbon steel Regulatory framework is needed that provides a level playing field

Source: Deloitte Analysis, Secondary Research

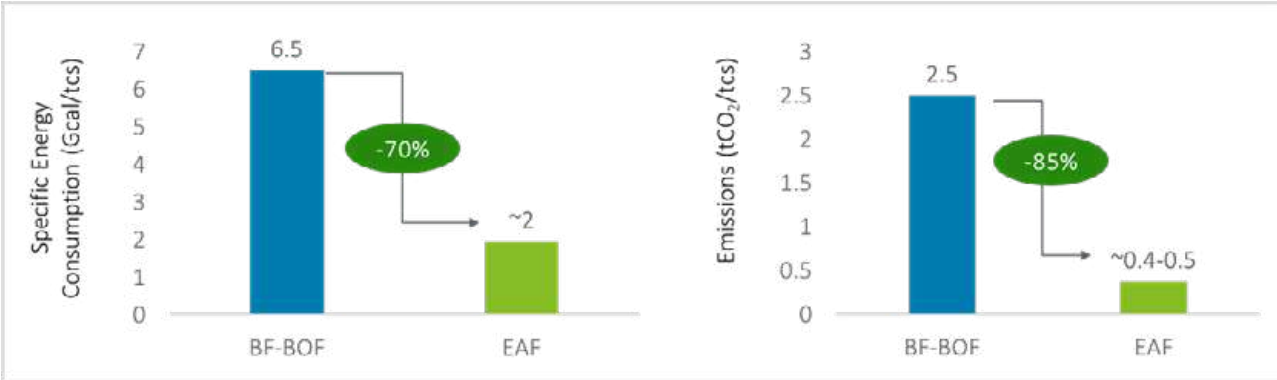
Carbon Border Adjustment Mechanism (CBAM)

The Carbon Border Adjustment Mechanism (CBAM) is a carbon tariff on carbon intensive products imported by the European Union. It has been legislated as part of the European Green Deal and takes effect in 2026, with reporting starting in 2023. It would translate into a 20-35% tax on select imports to EU from countries like India, starting January 1, 2026. India's iron and steel exports to EU countries will face extra scrutiny under the mechanism. The Indian steel industry while working on its transition to net zero and decarbonization would also need to be extra careful with the CBAM legislation and accordingly transit towards green steel.

5.1.2 Circularity in Steel Sector

Due to its endless capacity for use, reuse, and recycling, steel is a material that is ideally suited for the circular economy. While iron ore remains the primary source of steel making, used or re-used steel in the form of scrap is the secondary raw material for the steel industry. A significant portion of the small steel manufacturers in the Indian steel industry use scrap together with other inputs in the EAF / IF to produce steel. Currently, there are more than 1,200 electric arc furnaces and induction furnaces operating in India and are largely dependent upon scrap as the major feedstock.[23]

Figure 16: Tentative Benefits of Scrap-based Steel Production



Source: Achieving Green Steel: Roadmap to a Net Zero Steel Sector in India, TERI

With the Ministry of Steel's endeavor to develop a globally competitive steel industry by adopting state of the art environment friendly technologies, the Steel Scrap Recycling Policy was released in 2019. Ferrous scrap being the primary raw material for EAF/ IF based steel production, the policy envisages a framework to facilitate and promote establishment of metal scrapping centers in India. The policy framework provides standard guidelines for collection, dismantling and shredding activities in an organized, safe and environmentally sound manner.

This is in line with the objective of the National Steel Policy, 2017, which envisages scrap-based steelmaking as one of the most important options to reduce greenhouse gas emissions with a target contribution of 35-40% from EAF / IF route for the 300 MT steel production capacity target of 2030.

The rise of finished steel production of ~250 MT as envisaged by the NSP 2017, the corresponding demand of scrap is expected to touch 70-80 MT, requiring ~700 scrap processing centers, i.e., ~700 shredders. This shall correspond to be fed by ~2800 to 3000 collection and dismantling centers spread across the nation[24].

One of the major challenges faced by the secondary steel producers is the availability of quality scrap. Scrap with less or no impurities shall result in better long products that are

23 Steel Scrap Recycling Policy, Ministry of Steel, Press Information Bureau

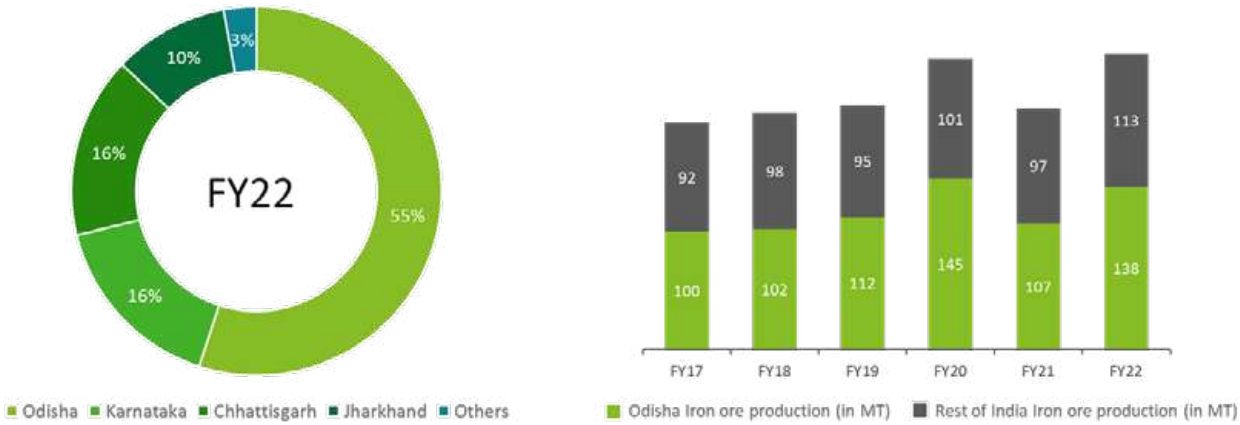
24 Steel Scrap Recycling Policy, Ministry of Steel, Press Information Bureau

commonly used in construction industry and is common use steels. The increased production of vehicles and increased use of consumer durable white goods in the last two decades and their rapid obsolescence shall generate large quantities of end-of-life products. This shall result in generation of continuous flow of large ferrous scrap for recycling in steel production. An Inter-Ministerial Coordination Committee has been set up with Secretary, Ministry of Steel as Convener and Secretaries of Ministry of Road Transport & Highways (MoRTH), Department of Heavy Industry (DHI), Ministry of Environment, Forest & Climate Change (MoEF&CC), Department Revenue and Ministry of Labour & Employment as members to analyze the policy changes required for creating an organized steel scrapping eco system and monitoring the operationalization and enforcement of relevant laws/regulations in this regard[25].

5.2 Raw Material Security

India has total resource of over 33 billion tonnes of Iron ore which are concentrated in 4 major states namely Odisha, Chhattisgarh, Karnataka and Jharkhand. Odisha plays a dominant role in Iron ore production, contributing more than 50% of the total production. The other three major states contribute around 40% of the total production.

Figure 17: Dominance of Odisha in Iron ore production in India

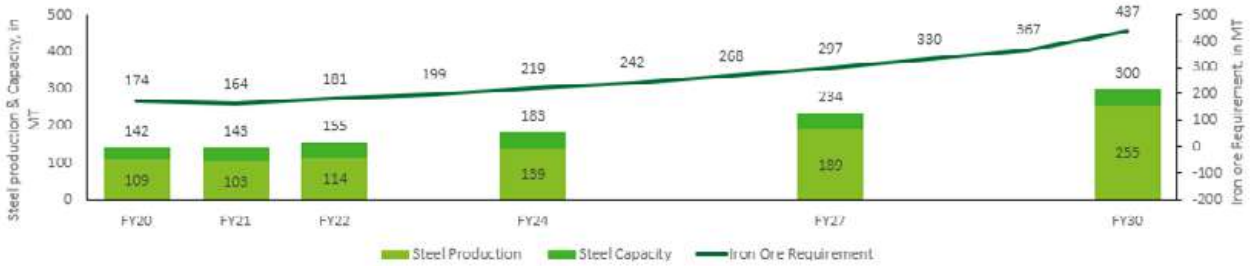


Source: SteelMint

India is a surplus producer of iron ore. The domestic production of iron ore in FY22 exceeded 250 MT against a domestic consumption of less than 200 MT. Going forward as India expands its crude steel production capacity, with vast available resources, the supply is also expected to increase in line with the demand.

However, concerns around prices, delays in operationalization of blocks due to delay in EC, FC, regulatory approvals, funding issues, high taxes and logistics constraints are adding to "Pushback" cost for secondary steel producers.

Figure 18: Tentative Iron Ore Requirement for Steel Industry



Source: Ministry of Steel, Secondary Research

Historically, iron ore mining in India has been dominated by merchant players with Odisha producing more than half of domestic production; but the trend is likely to change shortly with the exception of NMDC & OMC. A paradigm shift has surfaced post the conclusion of the 2021 iron ore block auctions in Odisha.

Figure 19: Recent Shifts in Iron Ore Block Ownership

Source: CMIE Industry Outlook, World Steel, Visual Capitalist, Global Newswire, GIA Research

On average the premiums have inched up from 104% in 2020 auctions to 124% in 2021 auctions. There is a shift in the ownership of iron ore capacities (Integrated Steel players vs Merchant Miners) pre auction and post auction. Further, the MMDR Amendment of Section 8(4) stating that the period of mining leases of government companies (other than leases granted through auction) may be extended on payment of additional amount (Equivalent to one hundred and fifty per cent of the royalty payable for iron ore) along with the MMDR Amendment of Section 8(5) and 8A(7A) stating that the 50% of the production of mineral and coal from captive mines can be sold after meeting the requirement of the end use plant and after paying additional amount (such rates varies from 50% to 200% on royalty) are some of the key changes along with high premiums in auctions which are likely to increase iron ore prices in India.

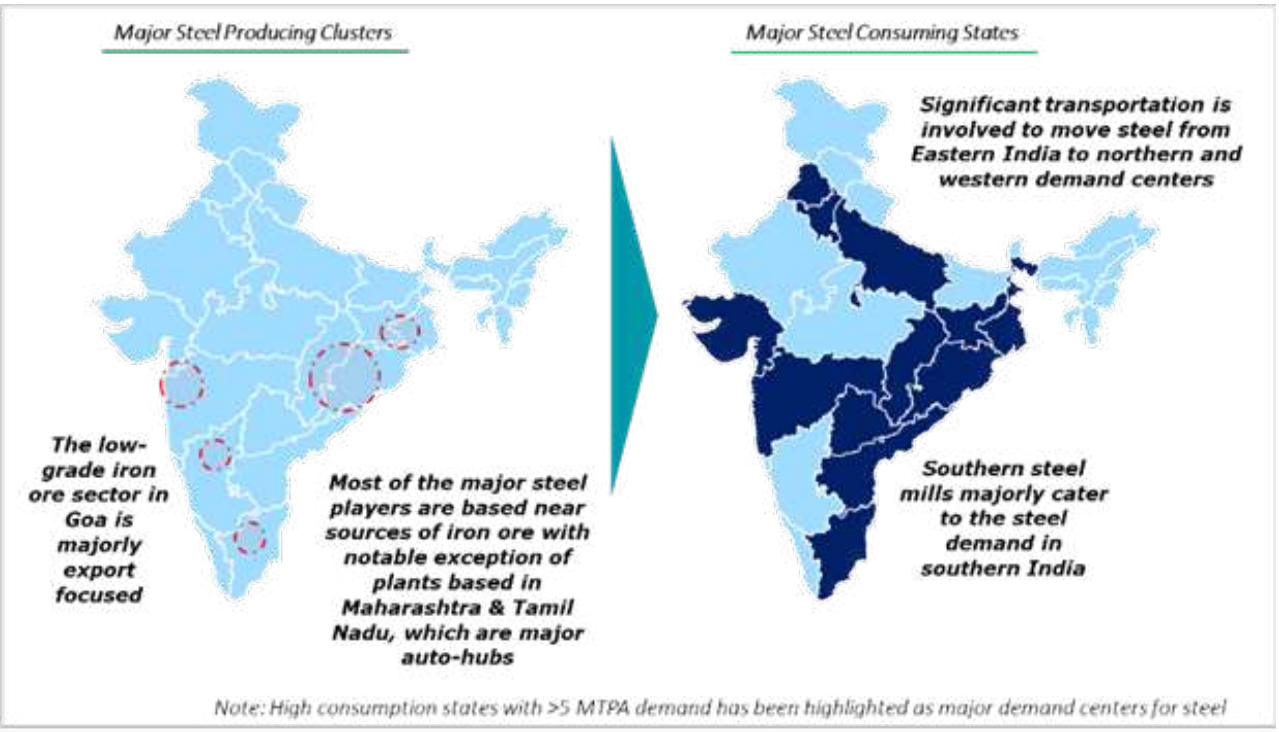
A number of implications are emerging from this trend of shift of ownership:

- ~ 30% of the total production of India shall be captive in nature
- Steel exports will witness growth with foreign technology providers and critical steel plant manufactures to set up manufacturing set up in India with iron ore exports coming down.
- Smaller players in the steel sector shall be reliant on large merchant miners such as NMDC & OMC and express reduced interest in captive mines.
- Large steel players may continue to buy iron ore from merchant miners due to high costs in the captive mines.

5.3 Logistics

Logistics play an important part in the iron and steel sector. The in-bound and out-bound logistics are highly dependent on the lead distance of the iron-ore mine sources and the consumption markets of the final product respectively. The Indian steel industry is disaggregated into regional clusters of supply and demand. Most of the steel plants are close to iron ore mines. Such a distributed profile requires significant inter-state long haul movement from East and West India to North India where the auto and capital goods production clusters, major cities and infrastructure project sites are located.

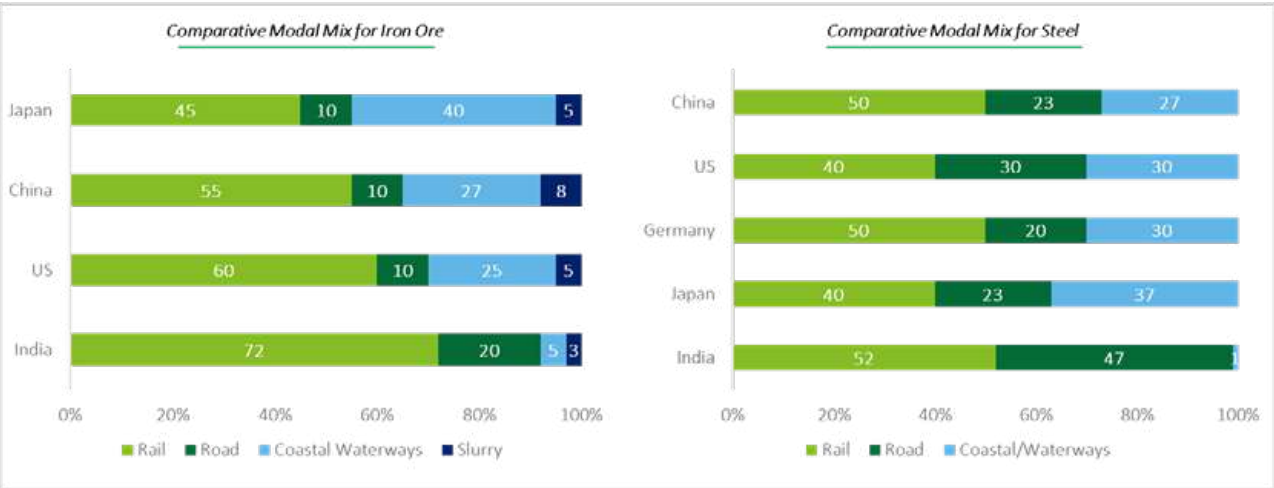
Figure 20: Major Clusters of Steel Production & Consumption



Source: Draft National Logistics Policy, Ministry of Commerce, Secondary Research

The modal share of inbound raw materials such as iron ore and coal in India is heavily skewed towards railway transportation while that for steel is towards roadways. A comparative overview of modal mix for iron ore and steel for India and other major steel producers globally is provided below.

Figure 21: Comparative Modal Mix for Iron Ore & Steel Logistics



Source: Draft National Logistics Policy 2019, Ministry of Commerce, Secondary Research

Key Challenges

The major transportation and logistics constraints impacting the sector revolve around infrastructure, service provision and operating and regulatory environment. A brief description of the key issues has been tabled below.

Table 11: Key Challenges for Logistics in Steel Sector

#	Focus Area	Key Challenges
1	Infrastructure	• Analysis of railway line capacity against demand and identification of severe congestion required to plan for future capacity building • Primitive handling equipment at goods sheds and terminals • Constrained availability of rolling stock and lower rake turn-around-time (TAT)
2	Service Provision	• Higher landed cost of rail transportation • High terminal detention owing to loading / unloading delays • Low transit time guarantee in rail transportation • Limited adoption of RFID / GDP services in trucks • Skill development is overlooked despite road sector being manpower-intensive • Optimization of rake allocation
3	Operating and Regulatory Environment	• Formulation of integrated logistics policy to address requirements and concerns of the sector • Inadequate and poor maintenance of weigh-in-motion instruments by IR

Source: Deloitte Analysis, Secondary Research

Way Forward – Sectoral Plan for Efficient Logistics (SPEL)

The Hon'ble Prime Minister launched the PM GatiShakti National Master Plan for providing multimodal connectivity infrastructure to various economic zones in 2021. Under this initiative, the Government has put forward the vision of developing a technologically enabled, integrated, cost-efficient, resilient, sustainable and trusted logistics ecosystem in the country for accelerated and inclusive growth. Various interventions have been proposed under the policy which are to be implemented through a Comprehensive Logistics Action Plan (CLAP).

One of the interventions proposed is the formulation of the Sectoral Plan for Efficient Logistics (SPEL) to address logistics issues about infrastructure, processes, digital improvements, policies and regulatory reforms, and capacity building for better workforce, prioritize cross-sectoral cooperation duplicate efforts and focus on optimization of modal mix. The SPEL is envisaged to be based on current origin-destination (OD) mapping, establishing the future supply mix along with future OD mapping and finally analyzing the constraints to enable decision making on planning of infrastructure such as First Mile Connectivity (FMC), trunk line infrastructure addition and Last Mile Connectivity (LMC) for clusters of the iron and steel sector.

5.4 Policy & Regulatory Framework

To promote the domestic steel industry, the Government of India has been taking fiscal and regulatory policy reforms to enable the growth of domestic steel production. Given below are key policies introduced during last few years to facilitate the domestic steel players:

Table 12: Key Policies introduced in India in recent years

#	Focus Area	Year of Policy Introduction	Key Challenges
1	DMI&SP Policy	2017	• Preference to Domestically Manufactured Iron & Steel Products (DMI&SP) in Government Procurement • To promote growth and development of domestic steel Industry and reduce the inclination to use, low quality low cost imported steel
2	General Financial rules (GFR, 2017)	2017	• Promote steel usage by amendment to consider life cycle cost analysis in Government projects • Expected to help push for Capital Goods manufacturing in Steel Clusters
3	National Steel Policy (2017)	2017	• Focus on growth in Steel production, aspires to achieve 300 MT of steelmaking capacity by FY30-31 • Per capita steel consumption to 160 kgs by FY30-31
4	Steel Scrap Policy (2019)	2019	• Scrap policy and recycling efforts also aimed at reducing carbon footprint • Setting up scrap dismantling and processing centres
5	SIMS (2019)	2019	• Steel Import monitoring system (SIMS) to bring transparency and provide advance information • Quality control Orders (QCOs) aimed at curbing imports of substandard steel items
6	Promotion of Greenfield investments	2019	• Addressing five key challenges - land availability, iron ore at competitive prices, statutory clearances, logistics infrastructure, incentives • Driven by Steel CPSEs, State governments, Steel Ministry

#	Focus Area	Year of Policy Introduction	Key Challenges
7	Steel Cluster Policy (Draft, 2019)	2019	• Six components – capacity expansion, Cluster setup, Capital goods, Logistics, raw material security, labour • Ancillary and Downstream clusters around ISPs • Value added clusters setup near demand centres
8	Make in India (2014), Atmanirbhar Bharat (2020)	2020	• Make in India to encourage manufacturing in India • INR 20 lakh crore package as part of its Atmanirbhar Abhiyaan aimed at reviving economic activity • Govt notified changes in rules disallowing global tender up to INR 200 crore • Government e-Marketplace (GeM) makes country of origin mandatory with a Make-in India filter (50% local content criteria) • Steel sector declared essential service during lockdown
9	Production Linked Incentive (PLI) Scheme	2021	• Government has approved inclusion of 'Specialty Steel' under the Production Linked Incentive (PLI) Scheme with a 5-year financial outlay of ₹ 6322 Crore to promote the manufacturing of ' Specialty Steel'. • It aims to attract capital investment, generate employment and promote technology up-gradation in the steel sector.

In addition to the above policy measures, regular tax reforms and changes in tax rate and duties are being done to promote and regulate the domestic steel industry. Some of the recent tax measures concerning the steel industry are given below:

- In budget 2021-22, the Government had revoked the anti-dumping duty (ADD) and CVD on certain steel products while reducing customs duty uniformly to 7.5% on semis, flat, and long products of non-alloy, alloy, and stainless steels from 10-12.5% levels earlier .

- In an effort to provide relief to MSME secondary steel producers the import duty on steel scrap was brought down to nil to support user industries hit hard by a sharp rise in steel prices.

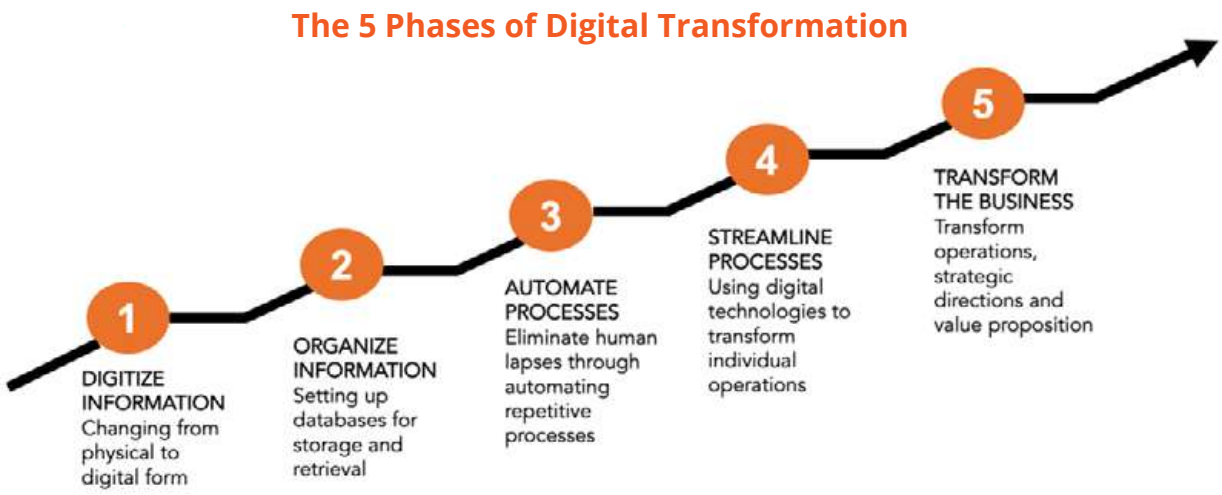
- The Government has with effect from 19 November 2022 rolled back export duty on iron ore pellets and steel products, including pig iron, flat-rolled products of carbon steel and stainless steel, bars, rods and non-alloy steel, vide Notification No. 58/2022-Customs dated 18 November 2022. Export duty on iron ore with a grade higher than 58% has been reduced from 50% to 30%.

The policy and tax reforms work toward the common goal of removing the bottlenecks in the entire value chain associated with the steel industry, right from the raw materials to the production of finished products. It seeks to achieve harmony among each of the associated industry whether mining, pet coke, pellet, sponge iron, etc. that would ensure the profitability & growth of each sector and the ecosystem as a whole.

5.5 Digitization and Industry 4.0 in Steel Sector

Digitization can help a steel company to improve its operational efficiency, achieve higher productivity, reduce wastage and generate better profits in the long run. Digitization does not necessarily mean the usage of sophisticated instruments but rather focuses on how human efforts can be used more effectively and in a timely manner with the help of any machine. The context of digitization and the degree to which it can be adopted also depends on the existing operational maturity of the steel company. A typical digital transformation journey has multiple stages as shown below.

Figure 22: Typical Stages of Digital Transformation in a Manufacturing Company



Source: A Sharper View: Analytics in the Global Steel Industry, Deloitte

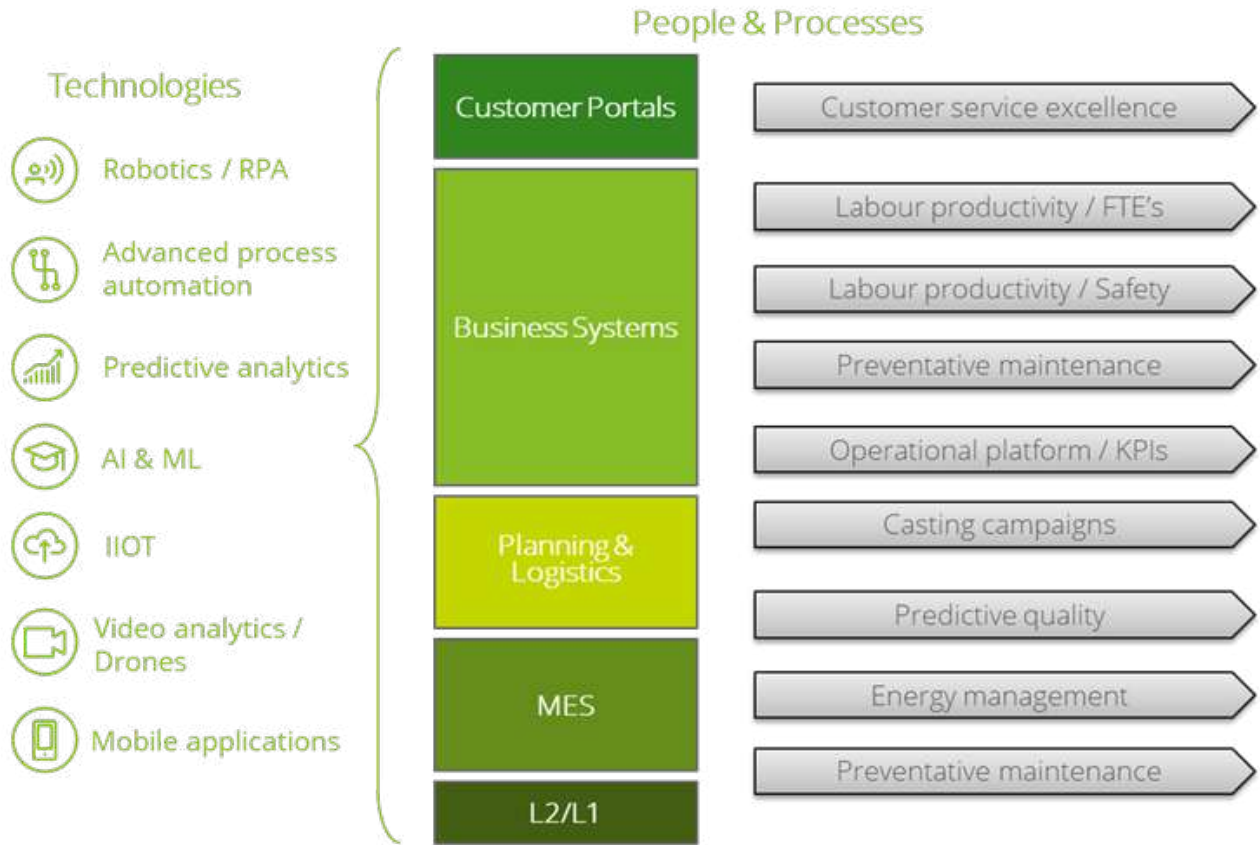
About 60% of the Indian crude steel production comes from the top 6 integrated steel players. The remaining 40% of the production comes from either lower capacity integrated steel plants or from smaller players. From a process route perspective, about 28% of the crude steel is produced through induction furnace route (adopted by small scale manufacturers with scattered geographical presence). The above figures indicate that the majority of Indian steel sector is consolidated by large players however, a large amount of steel is produced by the smaller players as well. The operational maturity of these different types of steel plants (integrated and non-integrated) vary significantly and hence their digitization needs are also different.

Smaller companies are mainly focusing on Stage 1 (digitizing information) and Stage 2 (organizing information) and partly on Stage 3 (automate operations). Larger integrated steel players on the other hand are starting their journey from Stage 3 and focusing on Stage 4 (streamlining processes) and Stage 5 (transforming the business). In recent years, companies have started adopting ERP (Enterprise Resource Planning) software to aid them in their digitizing and organizing their information. The focus of digitization for larger players remains on automation of operations and streamlining processes.

In the last decade, another concept has been driving the digital transformation initiatives of companies, which is Industry 4.0. Industry 4.0 refers to the intelligent networking of machines and processes for industry with the help of information and communication technology. This helps to monitor the manufacturing processes and equipment performance on a real-time basis, which allows timely interventions to ensure high quality output. This involves multiple technologies like Internet of things, cloud computing, AI & machine learning, cybersecurity, digital twin, etc.

The figure below shows the various focus areas of the steel value chain and what are the digital initiatives that may be used across all of them.

Figure 23: Digital Technologies which may be applied in the Steel Value Chain



Source: Deloitte Analysis

The key digitization technologies and their applications in the Indian steel industry are covered below:

Robotics

Robotics can be used to replace manual inspection in hazardous areas and can reduce accidents and casualties. For example, in an electric arc furnace, robotized inspection system may be used to inspect the refractory lining of the furnace after the steel has been tapped. Similarly, robotics may also be used to check the quality of a carbon electrode in an EAF after every tapping. This ensures that faulty electrodes can be replaced early and melt productivity can be increased.

Advanced Process Automation

This finds application in blast furnace operation which is highly dynamic and operates with hundreds of process parameters. OEMs like Primetals have developed BF process control systems with advanced automation. The typical challenge faced by any blast furnace operator is determining the optimum burden mix, reducing coke consumption, maintaining productivity and product quality. Such advanced process automation systems use sensors at different points of the blast furnace, analyze the data on a real-time basis and helps the operator to make timely adjustments to the process parameters. This ensures high productivity by maintaining a uniform melt temperature and reducing fuel consumption. Tata Steel Kalinganagar plant uses such a system in its blast furnaces.

Predictive Analytics

This technology incorporates the usage of Artificial Intelligence and can help steel companies to optimize their operational performance. Predictive analytics can be used to reduce process fluctuations and maintain the optimum parameter. For example, in a cold rolling mill, it

can be used to predict the mill vibration levels for maintaining the optimized steady-state speed. It uses real-time inputs from sensors, control systems and product data to predict the probability of mill vibration & adjusts the steady-state speed accordingly. This improves the mill efficiency as well as product quality.

Artificial Intelligence and Machine Learning

AI can help to improve decision making processes and reduce manual interventions. An area where AI can be potentially applied is in casting and rolling. Once the molten steel strands come out on the rollers, it is very difficult to manually verify the end product's raw-material composition. Additionally, manually differentiating between strands of different heat numbers and sequence numbers can be challenging. AI algorithms can be used to track the details of the production process to enable real-time identification of deviations at any point. The operator can also monitor whether all parameters are always within acceptable limits. Once the AI platform identifies anomalies in the process, the system relays these changes to the operators, who can immediately intervene and alter the process parameters in real-time. JSPL steel plants have used such a system successfully recently.

Similarly, machine learning has been applied successfully in solving the logistical challenges of Tata Steel BSL. They are tracking their vehicles in real time and also guiding them on what routes to take depending on the historical experience. These tracking and routing capabilities are enabled by machine learning algorithms. These algorithms analyze historical data to identify the best routes for executing deliveries. This has helped Tata Steel BSL to optimize their deliveries and achieve a reduction in their loading and unloading turnaround time.

Industrial Internet of Things (IIoT)

This technology refers to the extension and use of the internet of things (IoT) in industrial sectors and applications. The basis of IIoT is to generate connected data from different sources and ensure their integration in a single platform. This results in the generation of actionable insights which can help a company to improve its existing processes. An illustration of IIoT is the development of a digital twin. A digital twin is the virtual representation of a physical object or process. These digital twins can be used to simulate the actual physical conditions and predict the outcomes accurately. Tata Steel has started pilot trials of creating digital twins of their steel plants, through real-time data analytics, thereby opening up possibilities for data-driven 'Smart Factories' in the future. They have successfully developed Digital Twins for sinter plants (equipped with artificial intelligence techniques) to achieve benchmark CO2 emissions.

Video Analytics / Drones

Video analytics can be used for surveillance, quality assurance and production improvement in a steel plant.

- Surveillance: Drones / fixed cameras can be used to control the security of sensitive locations within the plant. It can be used to monitor unauthorized movement as well.

- Quality assurance: Video analytics can be used to detect jamming. For example, proper positioning of steel slabs into a furnace optimizes the productivity in the mill. Proper alignment in the furnace is imperative to reduce the chance of jamming from a wedged slab. Video analytics can help to position the slab accurately. It can also be used to measure the smoothness on the surface of finished products.

- Production improvement: Knowing the length and speed of steel slabs is essential information for the accurate alignment of oxygen torches and mechanical cutters after the molding process. Through video analytics technology both the length and speed of the slabs can be measured in order to optimize subsequent processes. Similarly, level detection of molten metal can be done through photosensors that spontaneously detect infrared energy emitted from the heated material.

In conclusion it can be said that digitization can have a wide gamut of applications in the Indian steel industry. It can help to solve the challenges in a cost-effective manner. It is to be noted that digitization is not a one stop solution. It is a gradual transformation journey and can only be successful if properly channelized through human efforts. Indian steelmakers need to create more awareness amongst its employees to ensure that digitization is embraced and driven in a positive manner.

6. Way Forward

India has been steadily climbing the economic ladder. It now stands as the 5th largest economy, 6 positions up since 2012. It is envisioned that India will be a USD 32 trillion economy (2nd largest) by 2047, 'Amrit Kaal'. Steel has been the bedrock of economic development in past and will continue to support the overall economic as well as the national development. Increasing urbanization, push on infrastructure projects, logistics networks, industrial corridors, e-mobility, renewable energy, etc. would be the key themes for steel industry. Vehicle scrapping policy, Steel scrap recycling policy are some of the key initiatives to promote circular economy and achieving India's net zero emission target timeline of 2070.

Digitalization, technological development, and continuous R&D are dimensions which will help the steel industry unlock its full potential. These developments have enabled the steel value chain players in efficiency improvement, process optimization, while new product developments have helped in gaining new market access (end usage as well as geographies). The technological developments, however, have much scope of growth, especially vis-à-vis green steel technologies, specialty steel etc.

The industry is already gearing itself up for capacity expansion to satiate the domestic demand. Key players have clear laid out plans for medium term capacity expansion plans and are continuously recalibrating towards the Amrit Kaal vision achievement. The policy framework is also evolving in line with the industry demand and follows a forward-looking approach.

Note: Developed by Deloitte in Consultation with Industry & FICCI

India Steel 2023

Amrit Kaal Journey: Facilitating the Indian Growth Story

INDUSTRY ARTICLES

Raw Material Aspects for Indian Steel Industry

Sh. Pankaj Satija
Managing Director
Tata Steel Mining Ltd.

Sh. Devraj Tiwari
Assistant General Manager
Tata Steel Mining Ltd.

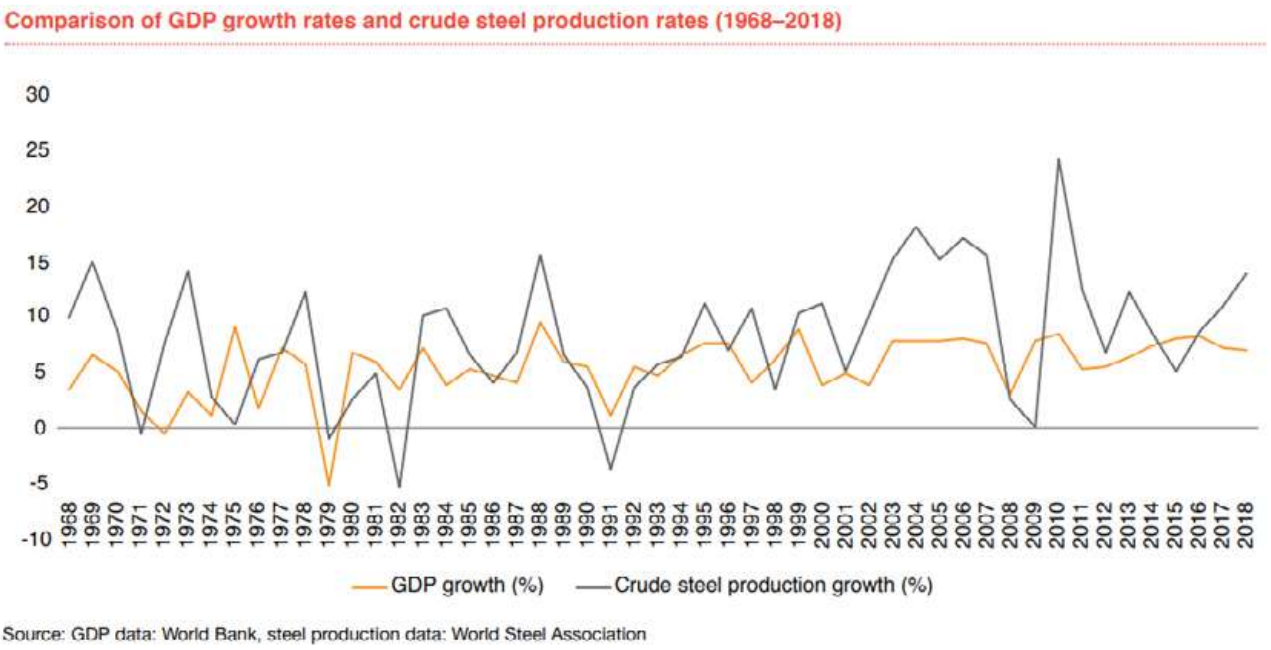
Sh. Niladri Bhattacharjee
Assistant Divisional Manager
Tata Steel Mining Ltd.

Abstract

The Indian steel industry is one of the largest producers of steel in the world. The industry's growth is supported by a variety of raw materials, including iron ore, coking coal, limestone, scrap metal and others. Although, the Indian steel industry has access to a variety of raw materials, which has helped it to become a major player in the global steel market, the industry still faces challenges related to the availability and quality of some of these raw materials, particularly coking coal.

Introduction

India has been emerging as a major player in the global steel industry. It is currently the second-largest producer of steel in the world after China. In FY22, the production of crude steel and finished steel stood at 133.596 MT and 120.01 MT, respectively (Indian Steel Industry Report, IBEF). The steel industry is a crucial sector for India's economic growth and development, contributing to the country's GDP and providing employment opportunities.



Source: World Bank & World Steel Association

The Indian government through Ministry of Steel has introduced the National Steel Policy in 2017, which envisages the development course of the Indian steel industry till 2030–31. The broad outlines of the policy are as follows:

1. Steel-making capacity is expected to reach 300 million tonnes per annum by 2030–31.
2. Crude steel production is expected to reach 255 million tonnes by 2030–31, at 85% capacity utilisation.
3. Production of finished steel is to reach 230 million tonnes, considering a yield loss of 10% for conversion of crude steel to finished steel with a conversion ratio of 90%.
4. With 24 million tonnes of net exports, consumption is likely to reach 206 million tonnes by 2030–31.
5. Per capita steel consumption is anticipated to rise to 160 kg.
6. An additional investment of INR 10 lakh crore is envisaged.

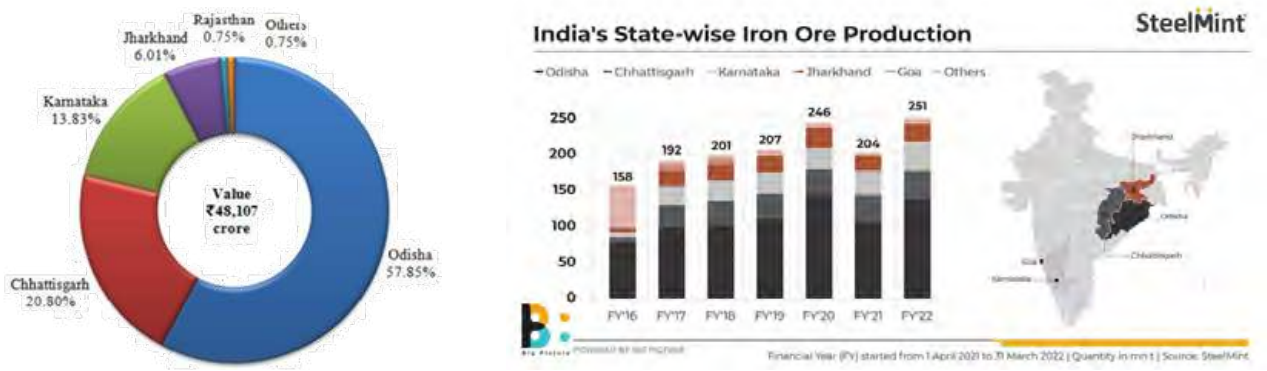
For the steel industry to reach 255 million tonnes of crude steel production by 2030–31, production needs to grow at a CAGR of about 7.2% (Financial Express, 2022). However, achieving crude steel capacity up to 300 million tonnes will necessitate widespread mobilisation of natural resources, finances, manpower and infrastructure along with land.

Raw Materials for Steel Production

The primary raw materials required for steel production are iron ore, coking coal and limestone. Although India has abundant reserves of iron ore and coal, it has negligible reserves of coking coal. The demand of raw material i.e., iron ore for Indian Steel Industry is met from the domestic supply in the country while the demand of coking coal is met mainly through imports.

Iron Ore:

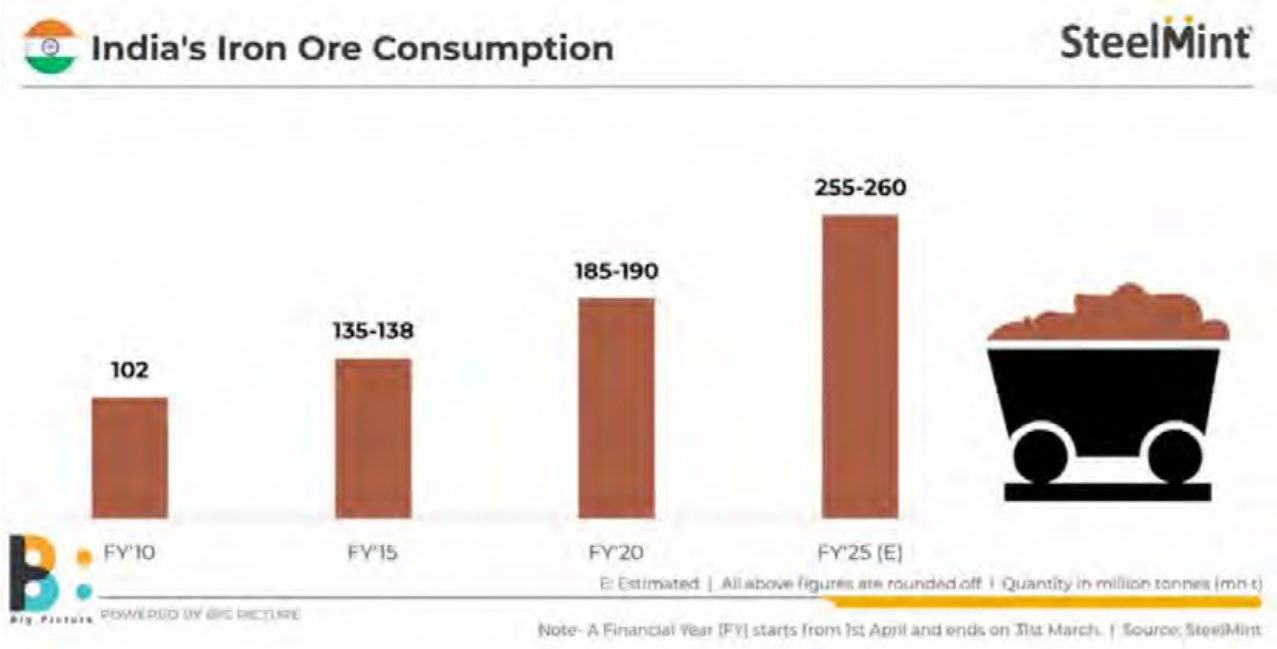
Iron ore is the primary raw material used in the production of steel. India is blessed with abundant reserves of iron ore, which is essential for the growth of the steel industry. The country has the seventh largest reserves of iron ore in the world, with over 33 billion tonnes of resource and 6 billion tonnes of reserve (IBM). The major iron ore producing states in India are Odisha, Jharkhand, Chhattisgarh, Karnataka, and Goa. India is one of the leading producers of iron ore in the world.



Source: Steelmint and Ministry of Mines

With the help of new mining policy reforms, which aim to facilitate production, India seems well-placed to meet its iron ore demand in the next few years from domestic resources and will not be dependent on imports. India's total iron production is expected to grow to 300-310 million tonnes by FY'25 from 246 million tonnes in FY'20 (Steelmint Forecast).

To cater to the steady demand of steel industry, major miners have marked out expansion plans. For instance, India's largest merchant miner, NMDC, gears to expand production to 56-58 million tonnes by FY25 from the current 42 million tonnes. OMC, the second-largest merchant miner, will increase output to 38-40 million tonnes from its present 27 million tonnes (pib.gov.in).



Source: Steelmint

Reforms like dissolution of demarcations between merchant and captive blocks is allowing any company (steelmaker or merchant miner) to sell in the merchant market without any end-use restrictions and this will increase ore availability.

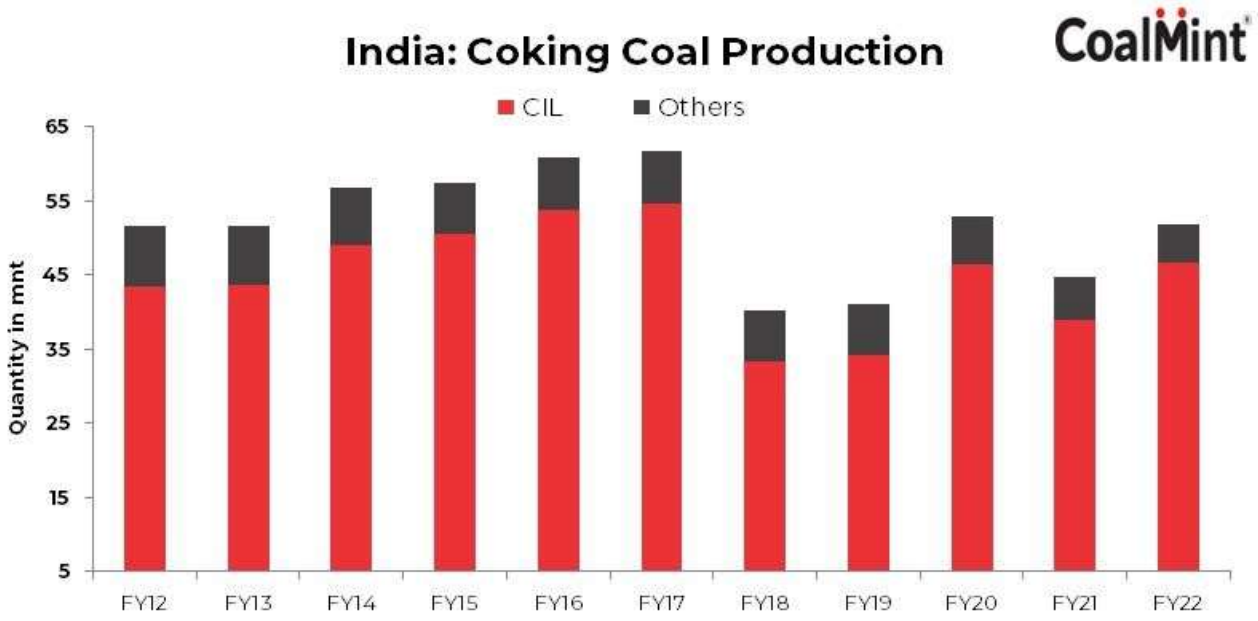
Moreover, mills will be able to sell 50% of their mined output in a year in the open market from mines won in previous auctions (prior to the policy announcement dissolving captive-merchant bifurcation).

Coking Coal:

Coking Coal is another crucial raw material for the steel industry, as it is used as a fuel in the blast furnace process. Although, India has the fifth largest coal reserves in the world, with over

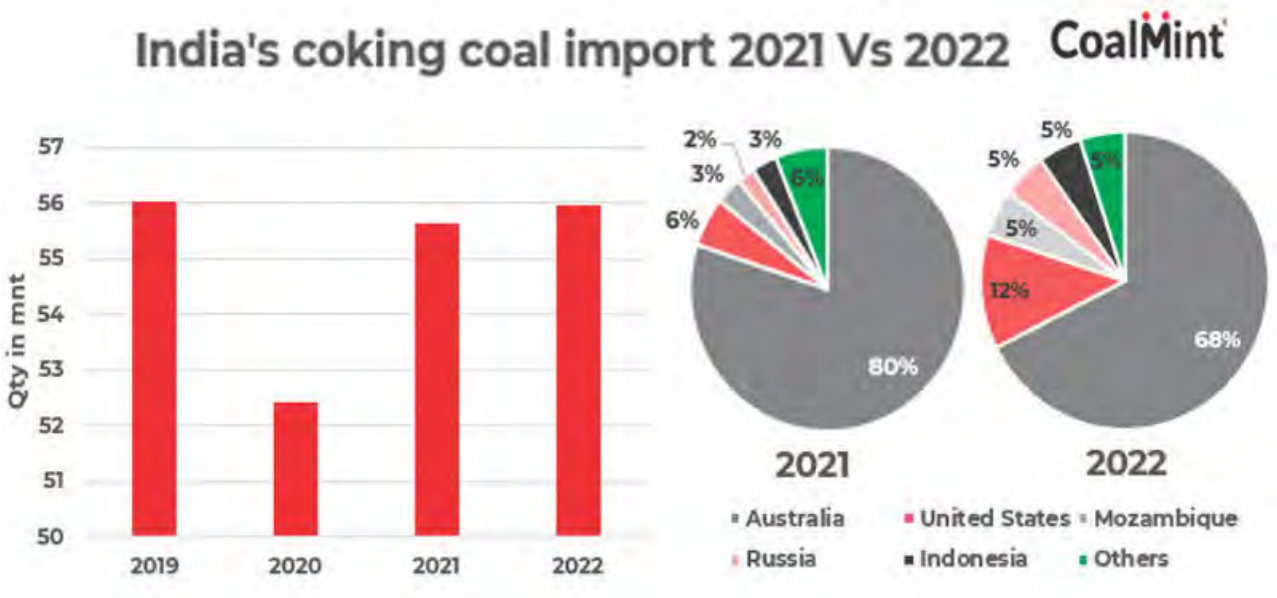
187 billion tonnes of coal reserves, however, India has only ~35 billion tonnes of coking coal reserves (Ministry of Coal).

The National Steel Policy envisages that India will reach 300 million tonnes of steel-making capacity, and 68% of that will be through the blast furnace route, which requires coking coal. This converts to about 200 million tonnes of steel being produced using coking coal resulting in an annual consumption of about 180 million tonnes of coking coal.



Source: Ministry of Coal

India largely fulfils its coking coal requirements (70% as per MoC) through imports from Australia. But due to vagaries of weather, there has been huge fluctuations in coking coal supply as well as coking coal prices. The country imported 57 MT of coking coal in FY22 to produce 120 MT crude steel (Steelmint).



Source: Directorate General of Commercial Intelligence and Statistics

Jharia coal field in the eastern India is amongst the world's largest coal fields in terms of reserves, with an estimated coal reserve of approximately of 19.4 billion tonnes. The coal mines in Jharia have had to deal with fires and issues related to subsistence right from the time mining operations commenced in early 1900. The development of the Jharia coal field will secure the coal requirement of the steel industry, acting as a major incentive for investment.

The National Steel Policy, 2017, envisages that only 65% of India's coking coal requirements will be met through imports by 2030–31. If India plans to consume 180 million tonnes of coking coal annually, around 60–65 million tons will be sourced from domestic sources. India also needs to buckle up its coal washery capacities. Over the last 4 years, only about 20-30% of coking coal produced was washed before utilisation with average yield of ~47% (Ministry of Coal).

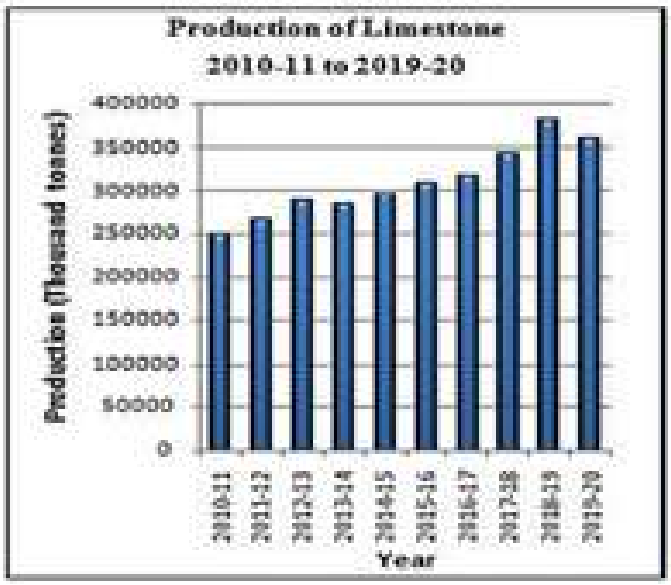
Government has launched 'Mission Coking Coal' in August 2021 to suggest roadmap to augment the production and utilization of domestic coking coal in India by 2030. Commercial mining, with a provision for 100% foreign investment, has also been allowed by the Government.

Limestone:

Limestone is the third major raw material required for steel production, as it is used to remove impurities during the steelmaking process. In Steel Industry, limestone is used both in blast furnace and steel melting shop as a flux after calcining. It is also added as flux in self-fluxing iron ore sinters. It has two basic functions in steel making, first to lower the temperature of melting and second, to form calcium silicate which comes out as a slag, as it combines with silica in iron ore.

India has significant limestone reserves, with over 16 billion tonnes of reserves and over 200 billion tonnes of resources (IBM). However, flux grade limestone reserve in India is only 1.9 billion tonnes (IBM). The major limestone producing states in India are Andhra Pradesh, Rajasthan, Gujarat, and Madhya Pradesh.

However, flux grade limestone i.e., SMS, BF and Chemical-grade limestones occur in selective areas and in FY'20, import of high-grade limestone was 26 million tonnes from countries like UAE, Oman, Malaysia, Vietnam etc. Thus, there is need for exploration and auction of Flux Grade Limestone blocks.



Source: Ministry of Mines

Other Raw Materials:

Apart from these primary raw materials, other materials required for steel production include ferroalloys (such as ferrochrome, ferromanganese, and ferrosilicon), scrap, and refractories.

Manganese is an essential requisite for iron & steel production due to its capability for sulphur fixing, de-oxidising and good alloying properties. It is used in steel making as ferro manganese and silico manganese. The amount of manganese used per ton of steel is ranges from 6 to 9 kilograms. About 30 percent of that is used during refinement of iron ore, and the remaining 70 percent is used as an alloy in the final steel product.

Although India produces ferroalloys domestically, it is dependent on imports for some ferroalloys like ferrosilicon, ferronickel etc to meet its requirements. For scrap, the country has a significant scrap generation capacity, and the government is taking steps to strengthen the supply chain for scrap collection and distribution to promote the use of scrap in steel production.

Sourcing Strategy of Raw Materials for Steel Making

Main Raw material	Domestic /Import
Iron Ore	Domestic
Coking Coal	Mainly Imported (80:20)
Corex Coal	Imported (100%)
PCI Coal	Imported (100%)
Low Ash Coal (DRI Industries)	Imported (100%)
Limestone	Domestic/ Import (50:50)
Quartzite	Domestic /Imported
Dolomite	Domestic /Imported
Scrap	Domestic /Imported
Graphite Electrode	Domestic
Needle Coke	Imported

Main Ferro Alloys	Domestic /Import
Ferro Manganese	Domestic*
Silico Manganese	Domestic*
Ferro Silicon	Imported
Ferro Nickle	Imported
Ferro Chrome	Domestic
Ferro Vanadium	Domestic/ Import (50:50)
Ferro Tungsten	Imported
Ferro Niobium	Imported
Aluminum	Domestic

Key policy interventions required to ensure Raw Material Security for the Steel Industry

Iron Ore:

1. Distribution of Iron ore by mining companies is an important area for smaller steel making units and adequate availability of Iron ore to all users must be ensured.
2. Auction of iron ore blocks at regular intervals and availability of an Auction Calendar and acquisition of mineral assets overseas through KABIL. Sale of material available from old, expired leases through auction can also be done.
3. Utilization of low-grade fines must be promoted and regulatory changes for incentivizing use of low grade to be encouraged.
4. Fair pricing with rationalisation of all Taxes, Royalties, Levies.
5. Transportation of iron ore fines to pelletization units to be planned through slurry pipelines and conveyors.
6. Encourage beneficiation and pelletization through:
    a. Supply of Iron Ore fines at a reasonable cost (mining cost basis).
    b. 'ZERO" Royalty on transfer of Iron ore fines to beneficiation plants.
    c. Excise duty exemption for import of machinery needed for beneficiation
    d. Preferential policy for land allotment for setting up of beneficiation plants, tailing ponds etc.
    e. Concession in rail/road transport and Power subsidy.

Coking Coal:

1. Facilitate exploration & optimal utilization of deep-seated coking coal reserves. Adoption of new technology for exploration and standardisation of resource classification.
2. Identification of additional coking coal blocks for production by CIL and private sector. Coking Coal blocks should be allocated through limited auction solely amongst end users in the steel industry to ensure maximization of indigenous coking coal for steel making.
3. Zero diversion of coking coal for sub optimal utilization in thermal power generation through formation of adequate number of modern coking coal washeries for washing the entire produce from CIL's coking coal mines.
4. Drop Anti-Dumping Duty on import of Met coke, in view of high prices of Met Coal and Met coke and reduce Import duty on Coking coal to Zero.
5. Focused drive to extinguish fire at Jharia within next 5 years.
6. R&D initiatives for utilisation of non-coking coal for coke making.
7. Setting up of coking coal washeries on aggregator model basis to be explored and Possibility of setting up small (1 MT) Mobile washeries to be explored.
8. Considering usage of alternative reductants like Natural gas , hydrogen etc.

Fluxes & Other Raw Materials:

1. Increased exploration efforts to raise resources of flux grade limestone, manganese and chromite ore.
2. Ferro Alloys availability from Domestic producers must be high.
3. India is largely dependent on imports of Refractory Raw Materials. Suitable measures and technical simplifications should be done to support the rising requirement of refractories.
4. The scrapping facilities that the policy aims to build will increase India's capacity to process mixed metal scrap and aid in importing unrefined scrap and processing it in India. For India to reduce its scrap deficit, other policies have to be implemented corresponding to the recently released Vehicle Scrappage Policy and upholding Zero duty on import of scrap, while export of scrap must be stopped.

Status of Auction of Blocks (Ministry of Mines & Coal Darpan):

Mineral	FY16	FY17	FY18	FY19	FY20	FY21	FY22	FY23	Total
Limestone	4	5	10	5	4	9	18	19	**74**
Iron Ore	1	7	2	9	17	1	13*	28	**77**
Coal	Allocated			**123**	Auctioned				**62**
Manganese	0	1	0	1	3	0	3	16	**24**
Iron Ore & Manganese	0	0	0	0	6	0	1*	0	**6**

Conclusion

The availability and quality of raw materials have a significant impact on the growth and competitiveness of the steel industry. The quality of coal has a direct impact on the cost of steel production. The use of low-quality coal results in higher production costs, which makes Indian steel less competitive in the global market. The availability of iron ore has also been a concern for the industry, with issues such as illegal mining and environmental issues.

In conclusion, the availability of raw materials is crucial for the growth of the Indian steel industry and while the country is blessed with ample reserves of iron ore and limestone, but the quality of coal and is relatively low and availability of flux

grade limestone is a challenge. The government is currently taking steps to address this issue and promote the use of alternative fuels and raw materials and increase exploration through funds available from NMET. With the implementation of right policies and initiatives, India's steel industry has the potential to become a global leader in the years to come.

Note: Inputs & Views are personal of the author (s) and not necessarily of FICCI

Steeling for Success: A Look at India's Steel Industry

Sh. Ranjan Dhar
Co-Chair, FICCI Steel Committee and
Chief Marketing Officer
AM/NS India

An industry of industries, steel is the backbone of modern civilization, a vital element for new India's economic growth story. The Indian steel industry has come a long way from being dependent on imports to becoming one of the largest producers of steel globally, notwithstanding unprecedented challenges. With a vast and varied industrial base, the steel industry significantly contributes to the country's GDP and employment, apart from creating a high multiplier effect spanning different sectors across the country.

The steel industry has emerged as one of the primary drivers of growth, fostering innovation, modernization, and infrastructure development. India is the second-largest producer of steel globally, with an annual crude steel capacity of over 154 million tonnes, as of 2021-2022. The industry contributes over 2% of the country's GDP and fuels other significant shares such as the Auto industry, (7.5% of GDP & 49% of manufacturing GDP), Infrastructure (5% of GDP), the capital goods industry, (2% of GDP) and more, generating employment for millions of people directly and indirectly, all leading up to supporting sustained efforts towards building an Atmanirbhar Bharat.

Despite the critical disruptions caused by the pandemic, the steel sector has shown remarkable resilience – the industry's quick adaptation to new ways of working, strict adherence to safety protocols, and adoption of technology-driven solutions have helped mitigate the impact of the pandemic on the industry. The industry's performance during these challenging times is a testament to its importance to the Indian economy and its ability to withstand external shocks.

India's steel demand is highly driven by developments in infrastructure, automotive and railway sectors coupled with factors like the opening up of the defence sector for private participation and the vehicle scrappage policy. The finished steel consumption is expected to rise from the current 106 million tonnes per annum to 230 million tonnes per annum by 2030. Moreover, India intends to more than double its steel production to 300 million tonnes per annum by 2030. Favourably, the Indian steel industry has been witnessing the increasing investment in recent years, driven by the consolidation of players and the entry of entities from other sectors.

The Government's vision of a $5 trillion economy entails investments worth INR 100 lakh crore in steel-intensive infrastructure sectors. Steel, with its multiple inherent advantages of durability, faster completion time, reduced environmental impact, and creation of a circular economy, will have a crucial role to play in India's rise. Keeping in mind its importance and relevance, and to ensure its vision incorporates India's growth

imperatives and addresses the aspirations of all stakeholders of the Indian steel ecosystem, the Union Government has developed its policy framework -

The National Steel Policy (2017) has set a target of 300 million tonnes of steel production by 2030, and the Production Linked Incentive Scheme (2020) provides financial incentives to boost production. The Quality Control Order (2020) covers 46 steel products and aims to promote the use of high-quality steel. The Steel Scrap Recycling Policy (2019) promotes the use of domestic scrap in steel production. As far as ArcelorMittal Nippon Steel India - joint venture between two global steelmakers ArcelorMittal and Nippon Steel, is concerned, the company is exploring the use of scrap metal to reduce reliance on primary raw materials. The new steel policy promotes the use of steel in rural India, and the National Mineral Policy (2019) aims to promote the sustainable development of mineral resources and value addition in the mineral sector.

With the goal of increasing steel production, these initiatives are expected to drive development and contribute to the overall progress of India. AM/NS India itself plans to boost annual production capacity up to 30 MTPA in the near future. Multiple industry players are moving in similar directions.

Another great thing about steel is that it has reduced environmental impact in many different ways. Steel is one of the most recyclable materials in the world, recycling saves energy and reduces greenhouse gas emissions compared to producing new steel from raw materials. Steel producers are trying to implement water conservation measures, reduce waste, and optimize production processes to reduce their environmental impact. Many producers, including AM/NS India, are also adopting renewable energy sources such as wind and solar power to lower greenhouse gas emissions.

As the steel industry continues to work towards reducing its environmental impact, one of the emerging trends is the concept of "green steel." This involves the manufacturing steel without the use of fossil fuels, it promotes the use of low-carbon/carbon-neutral processes. In fact, many producers, including AM/NS India, are not just following sustainable practices but also leading the charge toward green steel. Some of our Green Steel initiatives include -

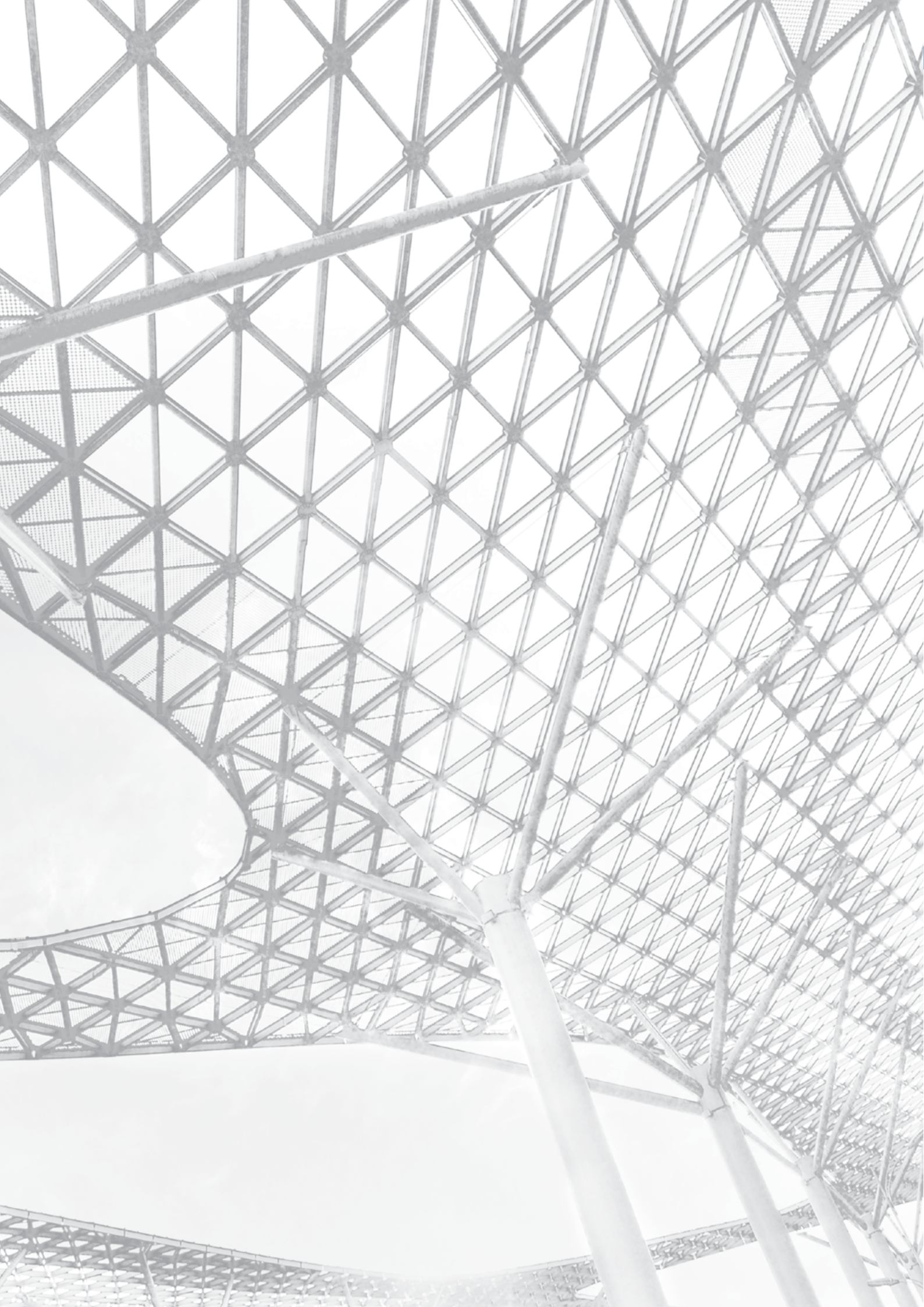
- Utilizing Renewable Energy: AM/NS India is participating in one gigawatt integrated renewable energy power-plant project in Kurnool, Andhra Pradesh. The company aims to source 20% of its energy from renewable sources by 2025.
- Carbon Capture and Storage: In order to reduce its carbon footprint, AM/NS India is exploring the use of carbon capture and storage (CCS) technology. The company is working with various research institutions and technology providers to develop and implement CCS technology. Additionally, it is implementing low carbon technologies such as direct reduced iron (DRI) and electric arc furnaces (EAF) that emit fewer greenhouse gases than traditional methods of steel production.
- Responsible Sourcing: AM/NS India has established responsible sourcing policies and procedures to ensure that its raw materials are sourced from environmentally and socially responsible suppliers. The company collaborates with its suppliers to promote sustainable practices such as using renewable energy, reducing waste and emissions, and sourcing materials responsibly.

The realization of India's steel industry growth vision will encounter several challenges in the foreseeable future including but not limited to the higher cost of capital, old infrastructure resulting in India's per capita lower labour productivity, and competition from imports. But as India's steel industry continues to evolve and adapt to changing circumstances, it is important to remember the resilience and ingenuity of the Indian people. Despite challenges, the industry is poised for growth and prosperity.

We all strive to overcome the challenges that lie ahead, embracing innovation, technology, and sustainable practices, we are committed to reimagineering our way to a smarter, brighter future!

Note: Inputs & Views are personal of the author (s) and not necessarily of FICCI


RE/MAGINEERING
BRIGHTER FUTURES
WITH SMARTER STEELS.
SMARTER STEELS
BRIGHTER FUTURES
AM/NS
INDIA
ArcelorMittal Nippon Steel India



How Stainless Steel can help build New India

Sh. Vijay Sharma
Director
Jindal Stainless Ltd.

Preamble

Globally, the rise and rise of the stainless steel industry over the last four decades has been nothing short of meteoric. Stainless steel has outpaced other metals such as carbon steel, aluminium and copper due to rising demands. From 1980 to 2021, stainless steel has exhibited a CAGR of 5.35% as compared to an average CAGR of 2.5% for the major metals.

India has already set the stage to take the lead and be a part of this unprecedented growth story. It is today the world's second largest consumer of stainless steel, thanks to a growing economy and its direct linkage to consumption of stainless steel. For the next few decades, this consumption is poised to grow at a CAGR of minimum 8%. The growth is going to be further fuelled through inorganic growth potential arising from the need to create sustainable solutions for India.

The magic metal, the green metal that is Stainless Steel

Stainless steel has been widely recognized as a green metal that is completely and infinitely recyclable without any impact to quality. Thus, it enables a circular economy.

As a **specialty metal with unique high corrosion resistance** properties, stainless steel is environment supportive (low emission footprints, recyclable, low maintenance), **people friendly** (production safe, inert, fire resistant, crash resistant, aesthetically appealing) and economical (longer life, lesser life cycle cost, higher returns, high strength to weight ratio), making it **highly sustainable.**

This metal finds application in various areas like **ART** (automobile, railways & transport), **Process Industries** (nuclear power, oil & gas industries, pharma, energy, petrochemical...), **ABC** (architecture, building & construction), **households** (white goods, utensils etc), razor blade, coin blanks etc. Stainless steel also plays a critical role in **nation's priority areas like renewable energy** (hydrogen mission, biofuel usage), **agriculture** (food, dairy, fisheries agri industries), **healthcare** (medical equipment, pharma), **infrastructure** related initiatives (infrastructure, logistics) and **strategic** areas like nuclear energy, defense & aerospace. It also is the most appropriate metal for the upcoming sphere of **blue economy initiatives.**

The India Picture

India's **per capita consumption** of stainless steel went up from 1.2 kg in 2010 to 2.5 kg in 2022. As per the Stainless Steel Vision Document 2047, published by CRISIL in partnership with Indian Stainless Steel Development Association, this number would touch about 12 kg by 2047. The document forecasts the **consumption growth** of the metal to reach 20 million tonnes by 2047 from 3.9 million tonnes in 2022. The significant jump is attributed to the encouraging economic growth and focus of government in areas which drive stainless steel consumption.

The Indian stainless steel industry, comprised by a healthy mix of large, mid and small sized players, including the public sector and the MSMEs (which account for about 35% of the capacities), is fully equipped to meet and even exceed these growth forecasts. In fact, a lot of untapped potential lies in the MSMEs in terms of under-utilised capacity, and hence, it is crucial to build on the sector in order to survive and thrive in the demand and supply dynamics. The domestic stainless steel industry is geared to not just meet domestic demand, but also cater to the most sophisticated and quality-conscious consumers world over.

Building Blocks of Growth in India

In good news for our industry, the recent Union Budget of 2023-24 identifies the key focus areas and spells out its massive outlay in capex and railway modernisation, to the tune of Rs 10 lakh crore and Rs 2 lakh crore, respectively. Other initiatives like augmented spends under PM Awas Yojana, additional airports, Green Hydrogen Mission, upgradation of agri storage capacities, modernisation of urban sewage systems, scientific management of dry and wet waste, focused infrastructure development at state-level, creation of Urban Infrastructure Fund etc will have a multiplier effect on investment and consumption of both steel and stainless steel.

Traditionally, about twenty five years ago, it was the household sector that consumed a lion's share of stainless steel consumption in the country, at nearly 80% of the total consumption. The figure now stands at less than 40% as the usage of the metal has diversified in growing and emerging applications. Advanced economies across the globe stand testimony to the fact that a nation's consumption of stainless steel progresses in line with the maturity of its economy. Stainless steel consumption is spurred by expenditure on quality infrastructure, sustainable transport, safe and enduring industries and hygienic and aesthetic consumer goods. There's no doubting that with its versatile and sustainable properties, stainless steel will play a crucial role in building a stronger and more resilient economy as India continues to develop and modernise.

A Conducive Policy Environment

While the potential of the stainless steel industry is enormous, industry seeks enhanced & specific policy support on issues related to:

- Raw material security as most of input materials are inadequately available in India
- Creating level playing field against subsidized dumped import especially from China and Indonesia
- Downstream skill upgradation through dedicated training infrastructure
- Policy on mandatory life cycle based evaluation and costing
- Supportive schemes on key cost elements of logistics and hedging cost
- Adoption of Industry 4.0, digitalization, and R&D
- Exports opportunities like the Brand India initiative
- Specific policies to protect and nurture our MSMEs

The Path Ahead

The Indian stainless steel industry is currently at a juncture where it is evolving and has the potential to serve key economic segments. For India to achieve the $40 trillion dollar economy target of 2047, stainless steel will be an important contributor. India's exemplary growth story will continue to soar higher if and when a supportive policy environment is in place. Besides the policymakers and academia, fellow manufacturers need to work towards bringing reforms and create an ecosystem for this wonder metal to spread its wings.

Note: Inputs & Views are personal of the author (s) and not necessarily of FICCI

STAINLESS EFFORTS FOR A SUSTAINABLE FUTURE

VISION 2050

Green House Gas Emission 0%

Five pronged ESG (Environmental, Social, Governance) strategy of Jindal Stainless

- Care for environment
- Empowering stakeholders
- Well-being of employees
- Product stewardship
- Ethical conduct

Highlights

- India's first stainless steel company to set up a Green Hydrogen Plant
- Co_2 emission reduced by ~1.4 lakh tonnes in FY 22
- 300 MW of Hybrid Renewable Energy projects to supply power on RTC (Round the Clock) basis by FY 2023-24
- Installation of a 7.3 MW Floating Solar Plant
- Domestic sourcing of 65-70% stainless steel scrap and 100% of other raw materials
- Goal of touching 1 million lives by the end of decade through CSR initiatives

Exploring Innovative Technologies and Integration Strategies for Sustainable Steel Production

Tackling Steel's Carbon Footprint: How Renewable Energy and Green Hydrogen Can Help Reduce CO2 Emissions

Sh. Shivanand Nimbargi
Chair, FICCI RE CEOs Council and MD & CEO, Ayana Renewable Power

Sh. Arulkumar Shanmugasundaram
ED-Operations
Ayana Renewable Power

Summary: The steel industry is a significant contributor to CO2 emissions, generating 1.89 tonnes of CO2 per ton of steel produced. Global steel production in 2021 was approximately 1.86 million tonnes, resulting in 2.6 billion tonnes of CO2 emissions, which accounts for 7% to 9% of global CO2 emissions. Although steel companies have reduced their energy consumption by nearly 60% since 1960, more progress is needed to reduce CO2 emissions. The International Energy Agency (IEA) has provided a three-pronged approach to reduce CO2 emissions in the steel industry: 1) improve raw material quality, energy efficiency, process yield, and reliability, 2) maximize scrap use, and 3) develop new breakthrough technologies such as carbon capture and storage, using low-carbon electricity for steelmaking, and substituting carbon with hydrogen as the reactant. Renewable energy, including round-the-clock (RTC) electricity, has a significant role in providing low-carbon electricity for the steel industry. Ayana's mission is to be the low-cost renewable energy provider, and to this effect, they are exploring solar, wind, hydro, battery storage, and other technologies for producing RTC electricity. The key elements for supplying RTC power are the location of the solar and wind sites, storage technologies that can provide 6 to 8 hours of storage, optimal integration of the technologies to match the load profile, and scheduling of the power to reduce excess power. Green hydrogen production is another use case for low-carbon electricity, which requires different electrolyser technologies such as alkaline electrolysis, proton exchange membrane (PEM) electrolysis, and solid oxide electrolysis. PEM electrolysis technology is relatively new and has the flexibility to handle power variations and operate part-time. In the long term, hybrid technologies with PEM / SOE may lead the market segment, as it provides a scalable solution given storage technology limitations and cost.

What is the significance of the steel industry's CO2 emissions and what is the IEA's roadmap for reducing them? How can renewables help achieve round-the-clock low carbon electricity for the steel industry and what are the key elements for supplying round-the-clock power? What are the different electrolyser technologies for green hydrogen production and how can renewables be integrated into them?

Steel industry is a significant consumer of electricity and generates 1.89 tonnes of CO2 per ton of steel produced. Globally in 2021 nearly 1.86 million tonnes of steel were produced resulting in 2.6 billion tonnes resulting in 7% to 9% of global CO2 emissions which is significant. Steel companies use 20 GJ of energy per tonne of steel produced and this consumption has reduced nearly 60% since 1960 which is significant progress but more needs to be done.

IEA has laid out a roadmap for reduction in CO2 for the steel industry a three-pronged approach

1. Program to focus on raw material quality, energy efficiency, process yield and reliability. Such an effort will benchmark the plants to the best performance and achieve the same.

2. Maximising Scrap Use

3. Development of new breakthrough technologies

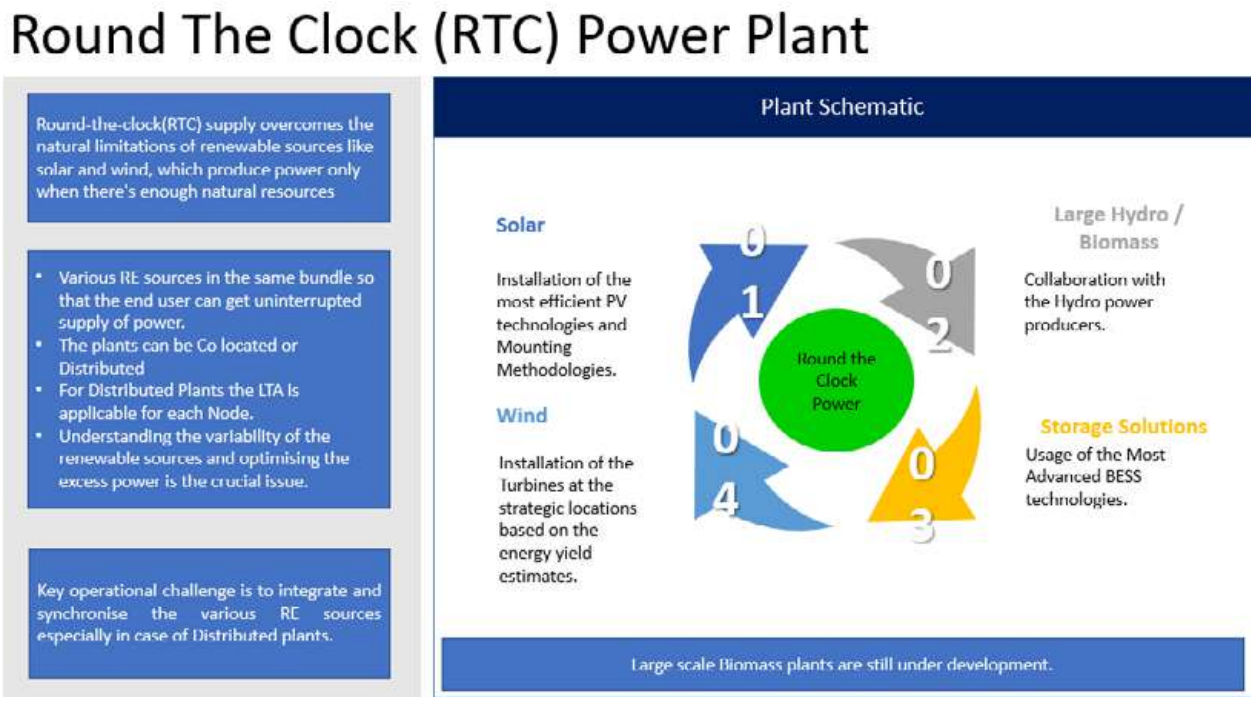
   a. Carbon Capture and Storage

   b. Using low carbon electricity for steel making through electrolysis based steel making process

   c. Substituting Hydrogen for Carbon as reactant resulting in by-product being H20 rather than CO2

Renewables have a significant role to play in providing low carbon electricity Round The Clock (RTC) with appropriate storage technologies. This RTC electricity will help in new electrolysis based steel making process as well as for producing green hydrogen from water thru electrolysis.

Ayana's mission is to be the low cost firm renewable energy provider and to this effect Ayana has been exploring range of technologies – Solar, Wind, Hydro, Battery Storage etc for this application. Round the Clock renewable is the Holy grail in renewable energy production and significant progress is being made in this area.



Key elements for supplying Round The Clock power

1. Wind and Solar sites with good resource: Complementarity of the renewable resources is critical for most optimal solutions. Location of Solar and Wind plays a critical role. While the sites can be collocated it is not mandatory. Hourly profiles for the Solar and Wind resource are integrated. Also, choice of solar technologies such as fixed tilt vs tracker, wind technologies – Wind turbines with larger rotor diameter vis a vis smaller play a critical role in the optimisation. The technology choices and the mix of capacity is very specific to the combination of the sites selected and each project would require a unique approach.

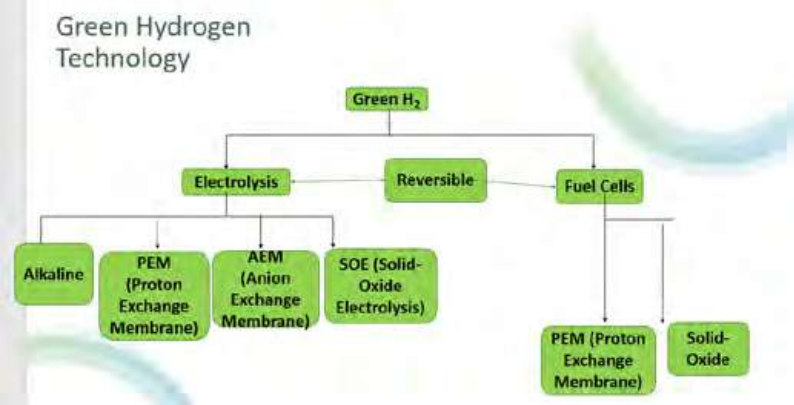
2. Storage technologies that can provide 6 to 8 hours of storage: There are multiple storage technologies available for the integration. For profiles where storage requirement to meet end profile is for a shorter duration Lithium battery-based solutions can be explored. For profiles where the storage requirement is higher more traditional technologies such as pumped hydro, NaS batteries are more appropriate. There are many new technologies in the anvil such as Vanadium Flow batteries, CAES etc but these technologies are still at their infancy. Pumped Storage is the most competitive solution in the marketplace today.

3. Integration of the technologies optimally to meet load profile: One key aspect is the integration of the various technologies to match the load profile. Sophisticated algorithms have to be deployed whether it be Mixed Integer Linear Programming or AI/ML based scheduling algorithms. There are new optimisation algorithms under development. The challenge here is to determine which part of the renewable energy should be used for charging the battery and when. Also, when the battery needs to be discharged. Also, in cases where second cycle is possible how do we effectively use the second cycle. This is still early development in the industry and needs to be determined.

4. Scheduling of the power optimally to reduce excess power: Once the resources are in place forecasting and scheduling plays a critical role in ensuring a continuous flow. For forecasting accurate weather predictions especially for solar during monsoon periods is a challenge and generally wind projections are very local and difficult to project especially 24 hours ahead of time. There needs to be very sophisticated digital operation centres which do this work and continually improve while meeting demand profile. Having some sort of Demand Side Management will help moderate the demand and provides another lever in achieving true RTC power / firm renewable power.

Currently to achieve RTC power PLF of 85-90% is possible in India with Solar, Wind and Storage resources. If the load profile is also such that it can work with 85 to 90% of connected load, then there is a possibility to match without relying on banking. Banking while effective is not practical to do in larger scale.

Other use case for the low carbon electricity is in the production of Green Hydrogen. Green Hydrogen has different Electrolyser Technologies:



Alkaline Electrolysers: It is a very established product and mature. This requires continuous supply of power to produce hydrogen. To be able to run alkaline purely thru renewables may be challenging without banking or use some sort of stabilising fossil fuel-based power. Improvements are required in electrolyser to work with some variability even if RTC renewable is provided since assurance of continuous power cannot be considered.

PEM Electrolysers: Proton Exchange Membrane technology is relatively new with custom stacks for electrolysis and different combinations of electrode materials. This technology while more expensive than Alkaline has flexibility to handle power variations and also to operate part time. For example hybrid solar -wind solution can be used to operate these PEM electrolysers

Solid Oxide Electrolysers: Solid oxide electrolysis (SOE) is a technology used in the production of green hydrogen through water electrolysis. In this process, an electric current is passed through water, splitting it into hydrogen and oxygen gases. Solid oxide electrolysis cells are made of ceramic materials that can operate at high temperatures (typically 700 to 900°C) and use a solid oxide electrolyte to separate the hydrogen and oxygen gases.

Unlike other electrolysis technologies, such as alkaline and proton exchange membrane (PEM) electrolysis, solid oxide electrolysis can operate using high-temperature heat sources, such as waste heat from industrial processes or concentrated solar power. This makes it a promising technology for the production of green hydrogen using renewable energy sources.

Conclusion

In the long-term scalable solution given storage technology limitations and cost and inability to bank the power Hybrid technologies with PEM / SOE may lead the market segment. As capex comes down the cost of reduced utilisation in terms of capex/depreciation can be much less than the additional cost of the RTC power to run at 95%+ continuously unless there are developments in Alkaline electrolysers that can manage the power variability effectively.

The advent of 85-90% renewable power can substantially reduce the carbon emissions from the steel industry and can make a significant impact in the reduction of CO2 by nearly 50% from current levels by 2050 as per the World Steel congress target aiding in the energy-transition and mitigation of Co2 as per the advised and permissible levels.

Note: Inputs & Views are personal of the author (s) and not necessarily of FICCI

Dilemma of Indian DRI Industry

Sh. Deependra Kashiva
Director General
Sponge Iron Manufacturers Association of India

1. Current Indian DRI Scenario

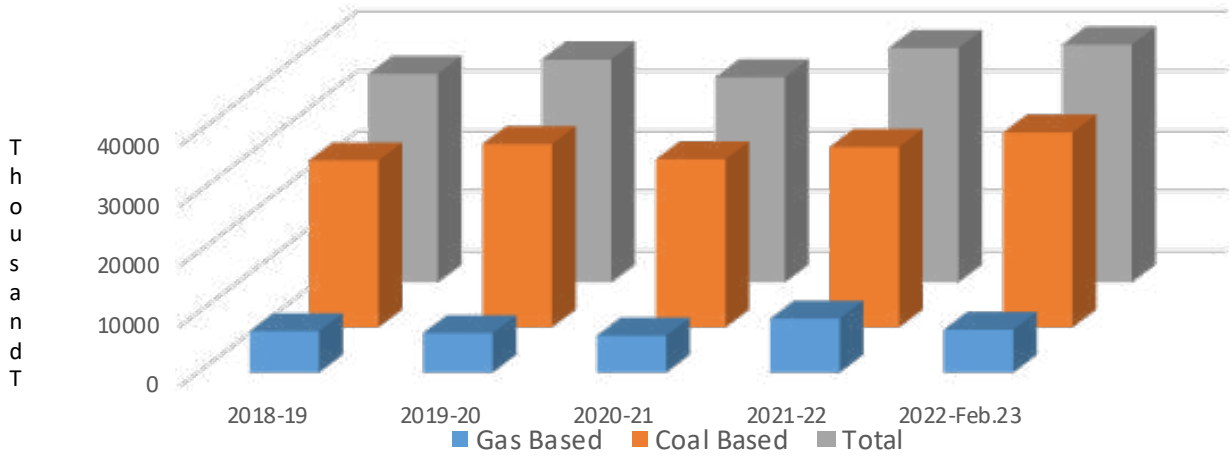
Indian DRI Industry, within a span of 42 years since its inception, has been world largest DRI producer for last consecutive 20 years. It has been playing important role in augmenting steel production in the country. Besides, it saves FE, provides huge employment ,contribute in exchequer and regional developments. Major growth in coal-based sector was from 2003-04 to 2008-09 mostly in small and medium sectors. Domestic DRI capacity increased by about 280% in nine years during 2005-14. No greenfield natural gas based DRI plant came up after 1994 (29 years) due to non-availability of natural gas. India is only country in the world making DRI from coal gasification. Due to the non-availability of natural gas at affordable prices, more than 80 per cent production is through coal-based route.

1.1 Structure of the industry

Process Route	No. of Units	Capacity in MTPA
Coal Based	283	37.073
Gas Based	5	12.20
Total	288	49.273

1.2 Production

Year	2018-19	2019-20	2020-21	2021-22	April 2022 - Fab. 2023
Gas Based	6899	6564	6148	8978	7129
Coal Based	27806	30539	28007	30053	32475
Total	34705	37102	34155	39031	39604



2. Contribution of DRI Industry in Steel Production

DRI is a substitute of steel melting scrap and substantially contribute in metallics requirement of steel industry. Due to limited domestic availability, about 5-7 million tonnes of scrap is imported annually resulting precious foreign exchange outgo. Availability from the global sources is likely to shrink in coming years as entire world is moving towards DRI + electric steel making route basically to reduce carbon footprints and to meet their national targets. The current focus of the major global steel producers is to produce low carbon steel / green steel for which efforts are being made to produce green DRI with the help of green hydrogen and renewable energy. Gas based production route is highly desirable due to the low tramp metals and highly eco-friendly in nature. This route also desirable for transition to green DRI once availability of green hydrogen is made available at affordable prices.

2.1 Growth Prospects

National Steel Policy -2017 realized the importance of DRI and projected 80 million tonnes requirement by 2030. In the year 2021-22, DRI production grew by 13.5%. As per the JPC current data, growth during April – January in the current financial year was 9.7%. It is expected that DRI production in the country will increase to 42-43 million tonnes in the current financial year compared to 39 million tonnes of last year.

Assuming a modest growth rate of about 7% we expect that DRI production in the country would be around 72 million tonnes by 2030 against the target of 80 million tonnes as envisaged in the National Steel Policy -2017.

In the light of above, Indian DRI industry plays and has a potential to play important role in augmenting steel production in the country subject to the hand holding by the central and state governments.

3. Challenges of Indian DRI

- **Coal Based Route:** Coal based DRI capacity is about 40 MTPA and contributes more than 80% in the total DRI production. Due to the current technological limitation this route leads to higher energy consumption and CO2 emissions.

- **Natural Gas Based Route:** There is a limited availability of natural gas from domestic sources and more than 50% of the total domestic requirement is supplemented through Imports. Import prices are very high and are also volatile. Current Ukraine – Russian war has further aggravated the situation.

- **Syn Gas Based Route:** Commercially proven technology for Syn gas (coal gas) is not currently available. Secondly it also generates CO2 until unless CCUS system is incorporated.

- Green Hydrogen Based Route: Currently, there is uncertainty about its availability, infrastructure and price of green hydrogen. In addition, it is highly inflammable and offers challenges for storing it.

4. Emissions Related Issues

Despite low per capita emissions (1.8 tonnes CO2 per capita), India is third largest global emitter. Contribution of Indian steel industry is 12% of the total domestic CO2 emissions.

4.1 Targets of reduction in CO2 Emissions

- As per the Paris declaration (COP 21), India is committed to reduce 35% CO2 emission by 2030. In addition, in the recent COP 26 meeting, India has committed to be Carbon Neutral by 2070.

- As per the draft VISION 2047, CO2 emissions intensity is proposed to be reduced by 20% by 2030 and 50% from 2.55 to 1.3 tonne CO2/per tonne of crude steel by 2047 and 100% by 2070.

5. Way Forward

5.1 Possible Short -Term Solutions to Reduce Emission Intensity

5.1.1 Maximize the use of steel scrap

Availability from domestic and international sources is limited and likely to persists. High price of good quality scrap is also a limitation to increase its consumption. Therefore, Vehicle Scraping Policy should be vigorously implemented and setting up of more scraping yards should be encouraged.

5.1.2. Increase use of gases in coal- based route DRI production

There is a need to substitute part of coal by bio-gas / syn gas / natural gas / green hydrogen in the existing coal based DRI route to save about 40 MTPA installed capacity which has been set up with huge investment, provide large number of direct and indirect employment and plays very significant role to the regional development.

Above suggestion requires to be techno economically established through R&D efforts. It may be mentioned here that due to SIMA's persistent efforts, one such project is being pursued in IIT Roorkee. There is need to take up such more R&D projects.

5.1.3 It is desirable to explore the possibility of using CCUS in the rotary kilns.

5.1.4 Need to encourage existing producers to adopt measures like waste heat recovery plant, pre heating of iron ore/coal, automation, use of energy efficient devices etc.

5.2 Long Term Solutions

5.2.1 To set up more natural gas (NG) based DRI plants. Due to the uncertainty in the availability and its prices, no NG based DRI plant has come up in the country since last 29 years.

GAIL has set up a 2655 Kms gas pipe line from Jagdishpur to Haldia with investment of about Rs. 13000 Cr. This passes through major public and private sector steel plants, DRI plants and pellets plants in Jharkhand, Orissa and WB. So far, no major iron and steel producer have shown any serious interest. Ministry may organize a meeting with all stakeholders like Ministry of Petroleum and Natural Gas, GAIL, major iron and steel producers to sort out the present situation.

5.2.2 To set up syn gas based DRI plants. Though it highly desirable in view of the vast coal reserves in the country however lack of commercially proven technology and high capex are the stumbling blocks.

Merchant syn gas plants based on commercially proven technology should come up either in the four cluster of DRI or near the iron ore belts with proper infrastructure facilities.

5.2.3 To set up green hydrogen based DRI plants. To reduce CO2 emissions, use of green hydrogen in BF and DRI making is highly desirable. However, presently there is limitation in the use of green hydrogen in the Blast Furnace route (10-15%) Major global steel producers are contemplating to switch over to Green Hydrogen + Electric Arc Furnace route.

Green DRI is going to play a major role in India to fulfil our commitment and to be Carbon Neutral by 2070. However, availability of green hydrogen at an affordable price, required infrastructure and storage facilities will decide the expansion of this route.

Presently lot of R&D work is going on in various countries to produce green steel/low carbon steel through green DRI. There is a need to take up a National Demonstration Project in India under the R&D mission to produce steel through green hydrogen based on indigenous resources.

6. Conclusion

Indian DRI industry has been contributing significantly in the metallics requirement of the steel industry. It is expected this industry will continue not only to augment steel production in the country but also in the reduction of carbon footprints.

Note: Inputs & Views are personal of the author (s) and not necessarily of FICCI

Alloy Steel of India

Dr Anil Dhawan
Director General
Alloy Steel Producers Association

Alloy Steel in India always remained an Industry which remained outside the gambit of Steel Distribution Controls of Government of India and therefore had its own challenges and different environment of free market for its demand-based evolution, investment-based sustainability and technological advancement-based growth in the country.

From a mere three to four suppliers, producing less than a million ton in 1970s, the Industry has grown to about 12 Million ton capacity, capable of meeting entire demand of Alloy steels & SS for Strategic sectors like Auto, Defence, Aerospace, Nuclear power generation, Railways etc. Alloy Steel Producers Association was established in 1969. It represents today more than 95% of total Alloy Steel Industry in India.

About Alloy Steel

The term "alloy steel" refers to steels with other alloying elements added deliberately in some proportion in addition to the carbon. Common alloyants include manganese (the most common one), nickel, chromium, molybdenum, vanadium, silicon, and boron.

Addition of these alloying elements leads to increase in a range of improved properties in alloy steels (as compared to carbon steels) like strength, hardness, toughness, wear resistance, corrosion resistance, hardenability, and hot hardness.

Requirements of alloy steels are in small batches ranging from 500 Kgs to 60 MT per grade. Each alloy steel grade is tailor-made as per customer specification, quantity requirements and end application. Hence, it is not a commodity steel. It is used in highly specialized applications like engine and transmission parts in auto sector and other niche applications in engineering, railways & defence sectors.

Alloy Steel End Applications

- Transmission parts
- Engine components
- Steering components
- High tensile fasteners
- Fuel injection pumps
- Bearings
- Braking system

- Suspension parts
- Windmill – Power Sector

Grade

- More than 400 varieties

Products

- Bars
- Wire Rods
- Wires
- Bright Bars

Sizes

- Wide range varying from 3 mm to 250 mm

Shapes

- Rounds, Square, Flats, Hexagons
- Rectangles & Customized Shapes

Capacity & Production

Current capacities are around 11 million Tonnes. In view of the current pandemic situation and severe prolonged slowdown during FY20-21, the alloy steel production is estimated around 5.5 to 5.8 million tonnes in the country. The industry is ready to make future investments to cater the needs of user industry and to contribute to meet 300 million tonnes target.

The alloy steel industry in India caters to global and world-class auto makers and original equipment manufacturers (OEMs) like Honda, Toyota, Bajaj Auto, Tata, Mahindra & Mahindra, Ashok Leyland and Maruti Suzuki amongst others. Alloy steel items are not commodity products but are highly customised, mainly for the auto industry, and constitute a prominent section of high-value and specialty steel products. The alloy steel producers installed total capacity is around 12 million tonnes (mnt). Indian alloy steel producers have accepted the challenges of providing quality steels to these global players and are continuously investing in R&D, new facilities and upgrading in terms of environmental requirements.

Alloy Steels - Key Supplier for strategically important sectors

- For India, to realise its dream to emerge as Auto Hub on the global map, widespread and sustainable growth of alloy steel industry is necessary.
- Moreover, the recent government polices are giving thrust on encouraging the domestic production of Aviation, engineering and defence sector. These sectors will also need special alloy steel and high-end alloy steels.
- Domestic Alloy Steel Producers have 100% capacities and capabilities to cater to the full demand of auto sector.
- While the industry is preparing itself for future growth despite numerous challenges, we seek some support from the government.

Recommendations for the Sector

- Inclusion of All Alloy and Special Steel, in chapter 72 in RoDTEP.
- Inclusion of Grades for Auto and Defence and other strategic applications in PLI-2 Scheme and inclusion of Suggestions of Alloy & SS Steel Producers.
- Removal of DFARS-USA regulations to allow Indian Special steel sales to US Defence OEMs for Defence Platform.
- Removal of EU Quotas for Alloy and SS steels on import of Indian Alloy and Special Steels into EU.
- Re-introduce Anti-Dumping Duty on import of Alloy and Special Bars & Rods Steels into India.
- Withdraw Concessional NIL duty on Import of Alloy and SS Steels from NAFTA Countries into India.
- BIS to expedite IS licenses to Domestic Alloy Steel Producers for IS 11169 and implement complete localisation of grade IS 11169 from Indian Producers.

Challenges being faced by the Alloy Steel producers & recommendations to the Government

Dumping by FTA countries at Nil Duty are a serious concern

As with other items of steel, the alloy steel industry too has been facing serious concern over the dumping of alloy steels by FTA countries like Japan, South Korea and especially China. It does not offer a level playing field to the domestic alloy steel producers largely on account of higher power and transportation costs. The import penetration is around 12-13% in case of alloy steel products and Japan and South Korea accounts almost 60% of the total imports of alloy steel in the country.

The alloy steel producers have been requesting help from the Steel Ministry and the government in curbing undesirable imports of alloy steel, particularly from the FTA countries, and China, since these steels are easily available from the domestic alloy steel producers.

Increase in cost of manufacturing

However, with a sharp increase in raw material prices, alloy steel producers in India are fighting with their back to the wall and consequently mulling a price increase.

Alloy steel producers follow a period-specific price contracts structure which is normally revised 2-4 times a year depending on individual arrangements. The negotiations with major OEMs are inked taking into account the increase in raw material prices during the period as well as the demand and supply situation and the international prices scenario. Global prices of all steel items have increased tremendously as is seen in the last few months.

EV demand a Positive Step

The alloy steel industry is also working proactively to meet the challenges of producing steels for electric vehicles (EVs) as well as higher demands that will arise out of the newly announced vehicle scrappage policy of the Government of India, which will accelerate demand for fresh vehicles.

High Taxes, Levies & Duties

Royalty on iron ore is one among the highest in the world. Additionally, there are heavy levies and taxes, development fees which are not available for Input Tax Credit and are great impediment to cost competitiveness of domestic alloy steel producers. Anti-dumping duty on Met coke is another issue. LAM Coke is not available in sufficient quantities in the country and hence the domestic user industry is left with no choice but to import the same. The import of LAM Coke from China and Australia attracts anti-dumping duty which increases the cost for LAM Coke.

Power/ Electricity Cost: Uniform tariff across all states for alloy steel producers

In India, the power cost is way high compared to other steel making countries. The high-power tariff for industries reduces the cost competitiveness of Indian alloy steel makers. It is state subject and thus it varies from state to state. Some states offer conducive polices while some are so stringent and charge high power tariff that the steel making in those states is becoming unviable.

Scrap: Zero percent basic custom duty should be extended beyond March 2022

For EAF route of steel making, scrap is an important key raw material. For adequate availability of scrap at competitive prices, the National Steel Scrap Policy should be implemented at earliest. There is shortage of scrap in the domestic market and hence the domestic alloy steel producers' resort to imports. Till the domestic availability of scrap is inadequate, the current provision of zero percent basic custom duty should be extended beyond March 2022.

Opportunities Targeted

Production Linked Incentive Scheme for Sociality Steels

The sector thanks the govt for brining PLI Scheme for Specialty Steel. Under PLI scheme for Special Alloy Steel, the domestic alloy steel manufacturers are going to invest and increase their production and Capacity further to cater to the rising and future demand from the auto sector and other user industry like construction, railways, defence etc.

Alloy and SS steel producers have participated and few have qualified and awaiting signing of the MOU with the Government now.

However other Major alloy steel producers have given their fresh recommendations to the ministry to Include Specific Grades required for Defence Production, Auto and Bering Grades, SS grades, and also to allow the same grades to those who could not participate in PLI -1, to encourage larger participation of alloy & sp steel producers. The suggestions by ASPA are being seriously considered by the Govt. and PLI 2 is very shortly likely to be announced. This will encourage higher investment in High end Grades, import substitution, better Capacity utilisation and open great Export opportunity for Domestic Alloy Steel Producers.

Green Steel Initiatives

Alloy Steel producers are way ahead in making Green Steel in India and Kalyani Steel group has already taken a big leap in this Direction. They have already launched their Green Steel Brand. All other Alloy Steel Producers are way ahead in this direction

Note: Inputs & Views are personal of the author (s) and not necessarily of FICCI

Mining Sector in India: Challenges and Opportunities in Amrit Kaal

Sh. Manish Mishra
Chief Regulatory Affairs
Tata Steel Ltd

Sh. Amit Prakash Singh
Resident Executive, Delhi
Tata Steel Ltd

"This Amrit Kaal is providing us a golden opportunity to fulfil the dreams and goals of this aspirational society," – Honorable PM Narendra Modi.

Amrit Kaal is a Vedic term which signifies the perfect time to start a new venture. Government of India has been rolling out policy initiatives and setting up the direction for India's growth journey to 2047.

India is the fastest growing large economy in the world and is recognized as a bright spot on the horizon by IMF. Indian economy grew from 1 trillion to 2 trillion in eight years, from 2 trillion to just under 3 trillion in just another seven years. Indian economy is poised to be a 5 trillion economy by FY26/27 despite the setback after COVID-19, supply chain crisis and geopolitical situations.

Government of India has taken target of 143 lakh crores investment in National infrastructure pipeline by 2024-25, $1 trillion target for gross value added (GVA) from manufacturing and increase manufacturing share to 20% of GDP by 2024-25 from current 17%. India has also declared its decarbonization target, Net zero by 2070, 45% reduction in carbon intensity by 2030, half of energy requirements with renewable energy by 2030. India is playing an important and responsible role in meeting the sustainable development goals.

Metal and mining industry is one of the core industries of the Indian economy. Minerals are precious natural resources that serve as essential raw materials for fundamental industries, so the growth of the mining industry is essential for the overall industrial development of India. India is home to approx. 1,531 operating mines and produces 95 minerals, which includes 4 fuels, 10 metallic, 23 non-metallic, 3 atomic and 55 minor minerals (including building and other materials).

India is world's second largest producer as well as consumer of steel. During the financial year 2021-22, the total finished steel consumption in the country was 106 MT and is expected to reach more than 230 MT by 2030-31. The metal and mining industry has potential to significantly impact GDP growth, foreign exchange earnings, and give end-use industries like building, infrastructure, automotive, and electricity, among others, a competitive edge by obtaining essential raw materials at reasonable rates. For Indian mining and metal industry.

Development of mining sector is essential for country's development in industrial sector. The industry is heavily regulated, however, framework has changed significantly in the last five years, to bring in transparency and efficiency. The mining acts and rules are being amended to ensure ease of doing business. The automotive sector, steel sector growth and opening up of mining sector will drive metal and mining sector in upcoming years.

Mining industry is vital for India's industrial growth and needs to go through incremental and transformative measures to ensure mineral sufficiency for Atmanirbhar Bharat. These measures ranges from technology deployment, skill development, digital drivers, policy support and new ventures to cater the emerging needs of the industry.

Technology: Technology is core to transformation of the metal and mining sector. It cannot be changed using a magic wand but requires a persistent push towards a productive efficient ecosystem. To fulfill the goals of Amrit Kal, mining sector need to benchmark itself with creme de la creme of the globe. There are limited mines using state of the art fleet. Only few companies have set up the coal washing facility. Indian steel makers are at comparative 100-dollar cost disadvantage than a global steel company due to inadequate infrastructure, logistics, costly capital, power and taxation policies. Technology can convert these challenges into opportunities.

Digital technologies are playing the role of change agents in metals and mining industries. Tata Steel has implemented Fleet management system (FMS) in its iron and coal mines and noted observable increase in workers productivity. Few mines have their own inbuilt productivity digital tools such as SmartMine which are assisting the shift in charges to take data based informed decision for HEMM availability and utilization.

New technologies such as 5G are going to be a catalyst in industry transformation. 5G networks will provide opportunities to the mining industry such as automation and remote operations due to improved coverage, lower latency and higher reliability at every stage of its business operations. 5G has the potential to increase 25% of mineral production. There are already 5G related used cases such as autonomous haulage system, robotic dump truck in Russia and Canada.

Meta-trends: Data analytics, Internet of things is currently being used by a few in the industry. IoT can provide solutions to better monitor equipment health, algorithm-based recommendations for improving operational efficiencies. IoT can enable officer to take correct data-based decision, assists the management to have insights which were never available earelier. Tata Steel is using in-house developed module i.e. SmartMine empowered by IoT and AI, focussed on increasing the equipment and operators productivity in its mine.

Decarbonisation: India has made its global commitment to be net zero by 2070 and reduce its carbon intensity by 45% by 2030 as part of Panchamrita. It is an uphill task with limited clarity for different industries. It is assumed that global commitments towards climate change requires innovative solutions and will pave way for many nascent and new industries. Mining and metal industry is the critical enabling key for ensuring raw materials for the new industries in Atmanirbhar Bharat.

There are transformations ongoing in mining industry as well. Tata steel has kickstarted using LNG based HEMMs for reduced carbon footprint. The mining industry will be shifting towards electric based HEMMs or hydrogen powered HEMMs to meet sector specific decarbonisation target.

Technology and decarbonisation drive will require heavy usage of rare earth minerals, deep seated minerals which are presently considered as the necessary ingredients for manufacturing of clean energy storage options. Startups and new ventures will play an important role in formulating new innovative ideas and business models and enabling the sector growth.

Government of India has introduced National Mineral Policy 2019 to bring regulations for sustainable development in mining. NMP also aims to bring transparent and balanced enforcement for affected people at mine sites.

The existing regulations and framework are a complex and high time consuming. Despite many changes over the years, there are still many bureaucratic approval processes, frequent policy & guideline change that restricts the sector to achieve its potential and contribute to the growth of the nation.

While the metal and mining sector has been a significant growth driver for any economy, many scholars have pointed out that the operating locations has the rising income inequality. Few Australian studies have noted the corelation between the income inequality and level of mining activities in Australia. As per world inequality report 2022, India has faced spectacular increase in income inequality. It is vital for India to tackle this income inequality issue. Most of the Indian mining sites lie in a remote location where the society has limited access to social and economic opportunities, public infrastructure, healthcare etc. In the upcoming era of green energy, a shift is expected across the industries. It is paramount for the industry, the government and all stakeholders to collaborate and ensure that the transition maximizes the social and economic opportunities.

Note: Inputs & Views are personal of the author (s) and not necessarily of FICCI

TATA STEEL

#WeAlsoMakeTomorrow

TATA

Steel Recycling Plant, Rohtak, Haryana

CREATING A CIRCULAR ECONOMY

Tata Steel's Steel Recycling Business is a pioneering initiative and a step towards sustainable steelmaking. The Company has already set up 0.5 MnTPA steel recycling plant at Rohtak, Haryana. Work has also been initiated on the 0.75 MnTPA scrap-based Electric Arc Furnace (EAF) steel plant at Ludhiana, Punjab. These state-of-the-art plants will streamline the unorganised scrap supply chain, enhance transparency and lower dependence on imports. Sure, we make steel.

But **#WeAlsoMakeTomorrow**.

www.tatasteel.com

Decarbonization Challenges in Metal Sector – Need of Focussed Research and Role of Recycling

Dr Mukesh Kumar
Senior Advisor
JSP Group Advisory Services

Indian Metal industry is facing the biggest challenge of Decarbonization as it may impact its global competitiveness and some of the export markets due to continuous environmental restrictions being imposed or announced by various countries. Due to limited alternate technological options available, majority of the countries are using metal recycling and renewable energy as a tool for Decarbonization but that may not be the case for India being a young economy and large growing need. Efforts are being made globally, either individually or collectively, through Research and Development (R&D) programs in metal processing as well as in carbon capture and utilization with focus on carbon recycling, but the same is yet to gain momentum in India who has taken the path of technology follower till date in the metal sector. Both, Ferrous and Non-ferrous metal industries are highly energy intensive and majority of its energy needs are met by coal, resulting into high carbon intensity of the sector. Steel sector alone is contributing nearly 12% of India's CO2 emission as its average emission intensity at 2.55 T/T of crude steel is much higher than global average of around 1.85 T/T of crude steel. Major steel producing developed nation could reduce the carbon emission largely by extensive usages of scrap and renewable power i.e. recycling. Similarly, around 12-15 T of CO2 is generated for each ton of Aluminium as nearly 13,000-14,000 KWh of electric power is utilized for each ton of Aluminium which is normally coal based in India.

Metal sector is being regarded as "Hard to Abate" sector and efforts are being made to reduce CO2 emission in the sector. No doubt, metal recycling can be the easiest road map for Decarbonization as the energy requirement in recycling of various metals varies from as low as 5% to on average of 20% resulting in reduction of emission by around 70-80%, but the availability of adequate quantity of scrap is the major challenge. Metal recycling can play a key role in the transition from linear economy to a circular economy as most of the metals are highly recyclable and can be an excellent substitute for metal produced from virgin mineral resources without compromising on basic properties. In absence of large metal recycling, bringing focus on carbon recycling for converting CO2 into fuel like Syn gas, Carbon mono-oxide, Bio-Ethanol and other applications may address the issue to a large extent till alternate technologies like Hydrogen or Electrolysis based becomes commercially viable.

Introduction

Metals (and their alloys) are valuable materials that can be recycled again and again without degrading their properties. Iron and steel are the most recycled materials. Other highly recycled metals and alloys include aluminium, copper, lead, zinc, brass and tin. Precious metals, such as gold, platinum, silver, iridium and palladium, are also extensively recycled.

The share of secondary production in total finished metal output has generally increased over time. This pattern, combined with concerns about domestic supply risks, the negative environmental consequences of primary metal extraction and processing, and the management of steadily growing waste streams have led to increased interest in how to move towards an economy in which waste materials are captured and fed back into the economy i.e. moving away from linear economy to circular economy. The basic objective of circular economy is on keeping resources in a continual economic loop, while retaining as much value as possible. It has been accepted globally that the protection and efficient use of natural resources is vital for sustainable development. Resource efficiency need to be improved to remain competitive, achieving economic growth and for protecting environment, climate and planet.

In addition to financial incentive, present day focus is on environmental imperative in metal recycling. It enables us to preserve natural resources while requiring less energy to process than the manufacture of new products using virgin raw materials. Also, recycling emits less carbon dioxide and other harmful gasses. Some of the developed nations are targeting phasing out of virgin ore-based metal production of important materials like iron and steel and switching over to scrap based production with use of renewable energy so that a zero-carbon economy can be created for the overall benefit of the mankind. With increased focus on recycling, nearly 30% of the Steel of total production of 1860 million tonnes is being produced by using scrap. It is expected that by 2050, nearly 40% of the steel demand shall be met by recycling only.

Carbon Emission and Metal Recycling

Primary metal industry is highly energy intensive but the form of energy is changed from metal to metal. In Steel industry the major source of energy is carbon whereas electricity is the main energy source in Aluminium. Thus, the average CO2 emission in steel industry is almost same globally but in Aluminium industry large variations are observed depending upon the source of electricity. The carbon footprint of primary aluminium is thus highly dependent on the source of electricity used. As a result, the carbon footprint of primary aluminium varies between less than 4 tons CO2-equivalents per ton aluminium in hydropower-based regions to more than 20 tons CO2-equivalents per ton aluminium in coal power-based regions. The recycling process of aluminium, however, requires only 5% of the energy required in the primary industry. The same is applicable for other metals like Zn, Pb etc. the metal industry generates large amount of greenhouse gases and mainly carbon di-oxide.

Metal recycling is imperative to meet global targets to reduce greenhouse gas emissions and improve air quality in urban areas. Nonferrous metals are essential for a low-carbon future involving electric vehicles, solar energy, and increased digitalization. Scrap metal can benefit by processing and melting scrap to produce those metals in a environmentally friendly manner.

Steel sector alone contributes nearly 7-8% of global CO2 emission and around 12% in India as nearly 2.5-2.8 T of CO2 is generated for each ton of steel. One of the main and easy to adopt pathway for Decarbonization is promoting use of scrap in the production of metal through recycling as the energy requirement in recycling of various metals varies from as low as 5% to on average of 20% resulting in reduction of emission by around 70-80%. Thus, metals can play a key role in the transition from linear economy to a circular economy as most of the metals are highly recyclable and can be an excellent substitute for metal produced from virgin mineral resources without compromising on basic properties. In case renewable energy is used in the metal recycling industry, it can help in developing a green metal industry besides minimizing use of fossil fuel considerably.

Challenges in Metal Recycling

Though many technological advances have improved many facets of recycling operations, the industry keeps on encountering new challenges. An important reason for the low recycling rate has to do with the design of various metal products. The growing complexity of various modern products and their material mix makes recycling increasingly difficult. For instance, a smartphone can contain more than 70 different elements. So, extracting every kind of materials from a mobile phone and reusing them in the production of new products makes it difficult.

The volume of electronic devices entering the waste stream poses additional challenges requiring new technology. Although these devices are made with precious metals, they contain such minute amounts that recovering them is not cost effective without new technology. The separation of e-waste devices requires more technologically advanced and sophisticated equipment.

Rare earth elements (REEs) are key raw materials in the development of low-carbon industrial processes and especially in green energy technologies. REEs are especially used in the production of magnets, catalysts, alloys, electronics, glasses and ceramics. They make electric and hybrid vehicles work. They are hard to extract from ores because they are often linked to other minerals and occur at low concentrations. They barely exist in pure form on earth.

In addition, the processes required for their extraction and mutual separation use high amounts of energy and demand complex drilling technologies. REEs are rarely found at economically attractive concentrations, which make them expensive and complicated to extract and separate in required purity. Ores of REEs involve complications in mining which makes the valorisation of secondary resources such as e-waste or end-of-life energy systems very attractive. The demand for these elements has been importantly increasing in past years. Green energy, technology, and e-mobility strategy, now adopted by many countries are being strongly linked to the availability of REEs, and therefore the recycling of these elements is becoming increasingly important for transition to a green and circular economy. Despite that, commercial recycling of REEs is still very low, mainly because of inefficient collection, technological separation challenges, and lack of incentives even though it has great potential. Recycling could be an effective strategy to overcome the impact due to mining REEs.

Despite the low recycling rates, REEs are not expected to be used less in the upcoming years. On the contrary, their demand is growing rapidly. Recycling of REEs is thus a real topic that will develop more and more rapidly. Waste from energy technologies such as batteries, lamps, and magnets represent a powerful and futuristic opportunity for REE supply chain. Recycling will add up to mining to satisfy the future REE demand. Recycling of REEs should be prioritized for elements that are short in supply (dysprosium, neodymium, europium, yttrium, and terbium). Recycling should also be focused on the most valuable elements. High-purity REE separation processes have to be developed from the complex energy system wastes.

Recovering precious metals such as palladium, platinum, gold and other valuable metals such as copper, lead, and silver from electronic waste becomes economically viable only if enough scrap is collected.

Emerging Trends in Metal Reprocessing

Looking into the future, scrap metal recyclers can anticipate more complicated products and materials entering their waste stream, but with more intelligent product design. Manufacturers of consumer goods like electronics are looking at innovative ways to improve product design so that when an item is at the end of its useful life, it can more adequately be broken down and disassembled for easier recycling.

The use of artificial intelligence (AI) is expected to play a larger role in the recycling industry in future. AI guided robots can pull recyclable materials from waste streams. AI machines are expected to be able to recognize materials with optical technology in future.

A lot is talked about vehicle scrapping. Beside steel car encompasses rubber, plastic, textiles, and trace metals present in future—particularly dangerous ones such as cadmium and lead—it's important for recyclers to extract as much value from these leftovers as possible before consigning cars to the shredder.

Need of Carbon recycling

Although, industry is working on carbon avoidance and carbon minimization but carbon capturing and utilization (CCU) i.e carbon recycling can help the industry to a large extent. Although, numbers of options are available for carbon utilization in applications like fuel, plastic, bio-ethanol, methanol, mineralization, algae oil, etc but high cost of carbon capturing and conversion becoming a major bottleneck for promoting such efforts. There is a need to develop cost effective carbon capturing and developing technologies like conversion into Syn Gas or Carbon Mono-oxide or Carbon flakes or dry reforming so that carbon can be recycled within the sector and dependency on imported fuel like coking coal in steel sector can be minimized considerably. There are numbers of institutes like IITs, CSIR labs who have initiated advanced researches in this area but the same need to be accelerated by strengthening Industry-Institution interface so that demonstration and commercialization of technologies, so developed can be ensured at a faster pace.

Conclusion

Metal recycling contributes to a progressive move toward a more circular economy. However, the loop cannot be completely closed for two reasons. First, demand will continue to increase due to population growth, product innovation and economic development. Second, in most applications, metals stay in use for decades before being ready to recycle and use again. Consequently, the growing demand for metals will require a combination of raw materials coming from mines, as well as from recycled materials.

Recycling industry is constantly investing and innovating to ensure the circular management of metals. However, it is more difficult to collect and reprocess increasingly complex materials such as electronic scrap. Recycling can be made economically more attractive by innovative product design to increase overall yields. In addition, regulatory policies must continue to encourage recovery and recycling.

The metal demand in the country shall continue to be met by the primary sector for the next several decades and thus there is a need to promote carbon recycling besides bring focus on carbon minimization and avoidance by advanced technologies so that India remain globally competitive and met its environmental obligations.

Establishing a strong scrap metal recycling industry along with carbon recycling in the country shall go a long way in establishing circular economy in the metal sector which shall not only create large employment opportunities but will also help in averting climate change by decarbonizing the metal sector and thus complying to the commitment made in COP21 & 26 and meeting SDG goals.

Note: Inputs & Views are personal of the author (s) and not necessarily of FICCI

Steel Sector – Propelling Economic Growth of the Nation

Sh. V R Sharma
Co-Chair, FICCI Mining Committee and
Vice- Chairman, JSP Group Advisory Services

The United Nations Report on population released in July 2022 on World Population Day revealed that India is expected to be the home of approximately 170 Crores people by 2050. It is a formidable challenge for India to cater to such a massive population and to maintain consistent growth.

In India, the Budget allocations lay emphasis on the rural sector. Many economic issues need to be addressed like Housing, Schooling, Healthcare, Drinkable Water etc. and one such core sector, which can provide solutions to all the above issues is the Steel Sector in India, which has the enormous potential of transforming backward areas into developed ones.

If India currently is on a growth trajectory, the credit goes to one of the core sectors of the economy too, the Iron & Steel sector that has created a solid base for the growth of heavy, medium, and light enterprises after the 1st five-year plan. Steel is critical to manufacture Engineering Goods, Construction materials, Defence, Medical, Telephonic, Scientific Equipment, and a variety of consumer goods. The Steel industry is one of the key industries of economic growth since it supports ancillary industries and also plays a pivotal role in propelling national growth.

Steel as an industry touches many facets of daily life. The electric arc furnace (EAF) method of Steel production can use exclusively recycled Steel although the Blast Furnace-Basic Oxygen Furnace (BF-BOF) route can use up to 30% of recycled Steel. There are more than 1000 grades of Steel with many physical, chemical, and environmental properties and approximately 75% of Modern Steel has been developed in the past 20 years.

According to the report by World Steel Association, crude Steel production reached 1950 million ton per annum in 2021 and China is the leader with more than 1000 Million tons followed by India with 118 Million Tons. Japan is third with 96.3 MTPA and the USA with 86 MTPA. Till 2017 India was behind Japan but today it is the 2nd largest producer of Steel In the world for the last 4 years. An interesting fact, which makes us proud is that India which was the 10th highest producer of Steel in 1995, is now at 2nd position in the world, which bears testimony to the rapid strides made by our steel industry in the last 25 years or so.

According to the Ministry of Steel, per capita consumption of finished Steel in 2020 was 228 KG for the world and 691 KG for China. The same for India was 78 KG in 2022. Indian steel sector is dynamic and it is growing at a CAGR of about 5 -6 % y-o-y. It will witness huge demand driven by affordable housing (both in Urban & Rural areas), expansion of Air & railways network and roads, DFC, Metro Trains, RRTS, Bullet Trains, Gas Pipeline, Sagarmala, Bharatmala, the opening of Defence Sector for private participation, and the

growth of automobile sector. It is expected that the consumption of Steel in India will increase to 160 KG by 2030.

According to World Steel Report, the growth of the Indian Steel sector has been spectacular and is performing well to revitalize the Indian economy in the post-covid19 pandemic era. However, The Indian Steel Exporters are facing a cost disadvantage of around 50 USD per ton due to the rates of taxes, cess, duties, and royalties across the value chain. A favorable intervention by the competent authorities would extol the industry to open up more markets and make pricing more competitive with regards to exports.

Despite recession, the demand for steel is increasing gradually. The demand for steel across the globe is expected to reach 2 billion by 2035, growing at a CAGR of 1.4%.

Growing private investment is also an advantage. Once 60% steel production was controlled by Government globally but now it is reduced to 30-40%. India is also empowering private investment in Steel sector and started disinvestment in government-controlled units. NINL has already been sold to Tata Steel whereas divestment of RINL, SAIL's ASP, and SSP, BISL, NMDC's Nagarnar Steel Plant, and VISP may be in the pipeline.

The Ministry of Steel in India helps in planning and driving sustainable growth and development in this industry. Various policies are framed according to the production, distribution, pricing, trade, etc. in this industry. According to the National Steel Policy – 2017 the Government has laid a broad roadmap to encourage Steel Industries both on the demand and supply side and prodding the industry to produce more steel and wants the country's steel production to go up to 300 MTPA by 2030. This indeed is a mammoth task and cannot be achieved through brownfield processes alone. This can be achieved by greenfield projects by existing players as well as foreign players bringing in FDI in the sector and also through brownfield expansions across the country.

Apart from this, the Government is giving preference to domestically manufactured Iron & Steel products in Government procurement. Under Make in India initiatives the Govt. has approved a production-linked Incentive (PLI) scheme for specialty Steel. It is expected that specialty Steel production will become 42 million tons by the end of 2026-27. This will ensure that approximately 2.5 lakh Crores worth of specialty Steel will be produced and consumed in the country which would otherwise have been imported. Similarly, the export of Steel is expected to become 5.5 million tons as against the current 1.7 million tons that can generate foreign exchange worth Rs.33,000 Crores.

Steel Sector Contributes about 2% of India's GDP and employs about 6 lakh people directly and 20 lakh people indirectly. The Economic Reforms in 1991 proved vital for the sector and added a new dimension to the overall industrial growth of the nation in general and the Steel sector in particular. Under the initiative, the Govt. abolished licensing requirements for capacity creation; except for certain locational restrictions. Major decisions were taken and the Steel Industry was removed from the list of Industries reserved for the public sector. Automatic approval of foreign equity investment up to 100% was granted. Price and distribution controls were removed with a view to making Steel Industries efficient and competitive. Restrictions on International Trade were removed and a drastic reduction in import duty was enacted.

The step to liberalize the economy proved effective, as the general policy measures like reduction of import duty on capital goods, convertibility of rupees on trade account, and permission to mobilize resources from overseas financial markets among others, also benefited the Steel Industries. Today, as the 2nd largest Steel Producer globally, the Indian Steel Industries has made rapid progress.

India was not a known Steel Exporter before 1991, although exporting Steel started way back in 1964. There was no concrete export regulation and it was dependent largely on domestic surpluses. Soon after economic liberalization, the export of Steel recorded a quantum jump. Subsequently, the rapid growth of domestic Steel demand led to a decline in the rate of growth in steel exports and it was ensured that the domestic requirements are adequately met. However, the trend has changed in the last 3-4 years. Now, Exports are growing at a significant rate and exports of total finished Steel has jumped and India is now a net exporter of total finished steel.

Due to the gradual opening up of the economy, a focused reform process in place, and almost stable growth, Investments have flown in significantly into the Steel sector. With Government support, major investments were done in Odisha, Chhattisgarh, Karnataka, Jharkhand, and West Bengal. Rapid strides have also been made towards further progress and commissioning of new capacities like those in the case of SAIL-RSP, SAIL-ISP, RINL, NMDC, TATA STEEL, JINDAL STEEL & POWER, JSW STEEL, AM/NS (Erstwhile ESSAR STEEL) among others. Crude Steel capacity of the country stood at 154.230 million tons, as per data released by JPC (Joint Plant Committee) while the National Steel Policy- 2017 envisions domestic crude Steel capacity reaching 300 million tons by 2030.

One of the important issues affecting the steel industry is logistics. Steel Plants in India are placed in remote areas with several logistic challenges. Therefore, as per NITI Aayog estimate, a relative cost disadvantage for Indian steelmakers is at USD 20-25 per ton of finished steel. Railways are the preferred mode of transportation for steel and meet more than 80% of the total logistical requirements of the steel industry, therefore, there is an impelling need to improve the physical infrastructure especially by Indian Railways. Further, ports should operate at international level of productivity. Digitalization of supply chain nodes like document processing and clearance at ports etc. are to be expedited for smooth & cost-effective operation.

Steel and iron sector globally emits almost 7% of total CO2 emissions, therefore, radical changes in technologies are required in iron and steel production to make the process greener and more sustainable. Government of India is working on schemes like Coal Gasification, National Hydrogen Mission towards achieving the "Green Steel" target.

As per the recommendations of IPCC (Intergovernmental Panel on Climate Change), focus needs to be on industrial sectors such as steel to reach net zero emissions by 2050. Major steel producing countries have set ambitious targets to reach net zero economics. Therefore, a revolution in steel production is within reach, with a wide a range of solutions such as coal with green hydrogen, greater recycling of scrap steel etc.

The coal gasification technology is aligned with India's aim to be free from carbon emission by the country's defined target of 2070. The technology can be used to convert coal into syngas which can be used for producing power, petrol, diesel and other petroleum products, which can reduce dependence on crude oil. JSPL is the first company in India to build the coal gasification plant and the first in the world to produce DRI / Steel via coal gasification process, and other steel Industries can adopt such innovative practices as well. The CGP propelled DRI Plant at Angul Steel Complex of JSP is now a technology demonstrator to reduce Carbon footprint without impeding the growth of Steel Sector. The gasification technology which contains 56% hydrogen in syngas may help India to overcome the shortage of oil, gas, methanol, ammonia, urea and other products, making the country Atmanirbhar in every aspect.

Further, to encourage Scrap based Electric Arc Furnace Steelmaking, Government may consider immediate rollout of "One Nation One electricity tariff". JSP is producing 40% Steel through the EAF route, a step in the right direction to protect our environment. The company is committed to comply with the Government commitment given to COP26 and plans to achieve Carbon Net Zero by 2035.

The average Co2 emission intensity of the India Steel Industry has been reduced from around 3.1 tons of crude steel in 2005 to around 2.6 tons of crude steel by 2020. The government has informed that the steel industry has been able to achieve the total targeted energy saving from Pat Cycles from 2012 to 2020.The perform, Achieve, and Trade (PAT) is a flagship scheme under National Mission for Enhanced Energy Efficiency (NMEEE).

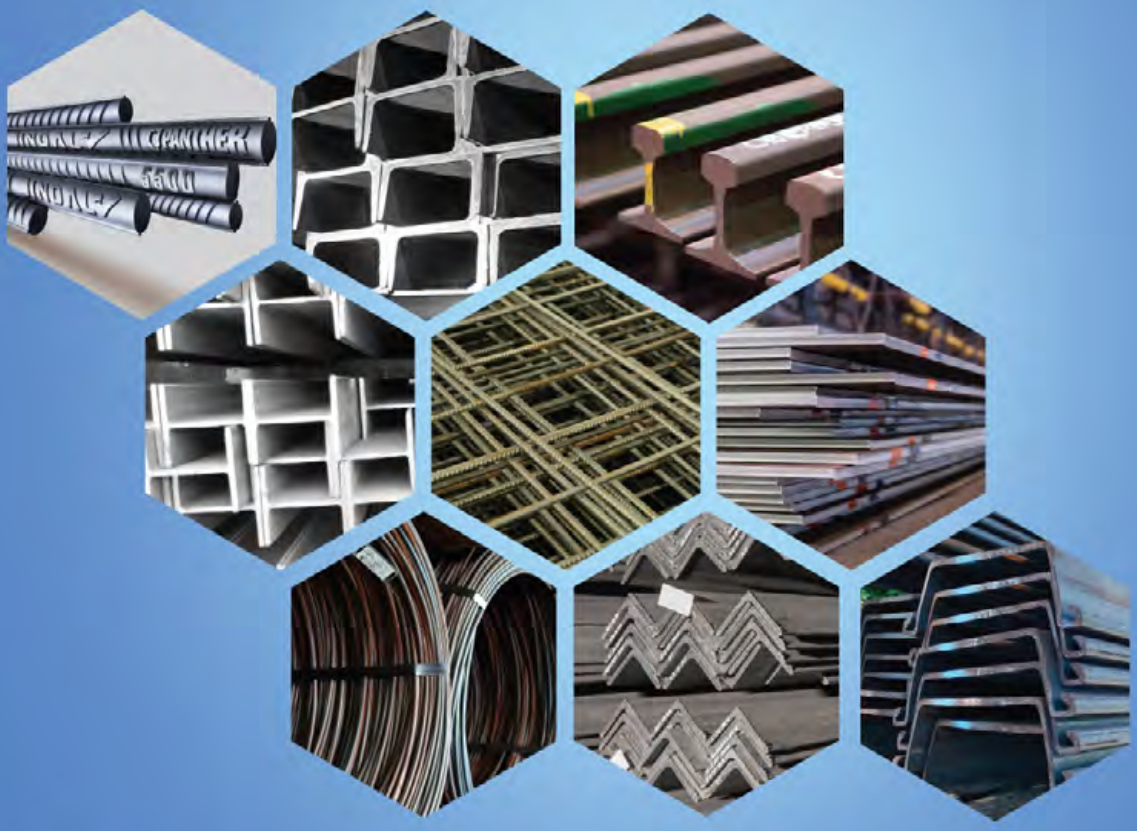
One firmly believes that India is destined to rise and shine. Under its Atmanirbhar Bharat Mission, all of us must contribute and work whole-heartedly to reach the US$ 5 trillion objective that we have set for ourselves. And to achieve this target, Steel industry will play a pivotal role in India's growth story.

Note: Inputs & Views are personal of the author (s) and not necessarily of FICCI

JINDAL
STEEL & POWER

A REVOLUTIONARY EVOLUTION OF INDIAN INFRASTRUCTURE

DIVERSE AND INNOVATIVE PRODUCT RANGE FROM JSP



- TMT Rebars
- Parallel Flange
- Beam & Columns
- Angles
- Channels
- HR Plates & Coils
- Cut & Bend TMT
- Wire Mesh
- Wire Rods
- Track Rails & Crane Rails
- Fabricated Structural Steel

Contact us: shop.jindalpanther.com | Toll free number on 1800 208 2008

India's First and Largest Producer of Fe 550D TMT Rebars

A PRODUCT OF JINDAL STEEL & POWER | @JindalPanther JindalPanther jindal-panther

Empowerment through Skilling: Key to India's Growth Story

Sh. Pritam Purkayastha
Director
BPNSI

The youth population in India is growing rapidly and is expected to continue for the next 30-35 years. This is bound to inject new dynamism into the country's economy if appropriate initiatives are taken in areas of education and employment. Reportedly ~5 million youngsters are added every year in the race for jobs. However, despite the potential of this huge demographic dividend, many lack the necessary skills to secure a job. The government is constantly trying to bridge this gap, and millions of the youth have been trained in various skills in the past and several job fairs were organized to get them placed in industry and other institutions.

The generation of productive and adequately remunerated employment is an indispensable component in the fight against poverty. While this task presents a major challenge for all the States and the UTs in India, it is by no means an insurmountable one. Success depends on several key factors, first and foremost being a semblance of normalcy by way of restoration of higher and more stable rates of economic growth. This must be further supported by policies and programs to deliberately stimulate employment in those sectors of the economy which on one hand hold the greatest promise for employment and income generation such as the MSME sector, and on the other hand, the implementation of strategies which can, among other things, improve the access of all groups to education & training and income generating activities in a sustainable manner. The spirit of entrepreneurship should also be inculcated, which is now evident in the growing number of start-ups in the economy. Additionally, the international community can play a critical role in changing the rules of international economic systems in favour of emerging economies.

India, as a developing country and emerging economy is complete with plethora of opportunities for potential employment generation. The reality, being significantly different, can be attributed to the once ill-designed education structure, which is now fortunately in the process of transformation. Till now, society had been keen on acquiring a pass certificate to participate in the labour force and demand jobs, but apparently vast majority of the graduates churned out of this system in India were evidently found to be unemployable.

Though it is usually said that the task of employment generation requires concerted action by several ministries and departments of government both at the national as well as at the state levels, it is not the responsibility of the government alone. Employers' and workers'

organizations, as well as other members of civil society should play an increasingly active role in the process. The support of the international community is also critical, not only in terms of resource flows, but in changing the rules of international economic systems in favour of emerging economies.

The labour market information system needs improvement, so that emerging demand for skills are spotted quickly and the necessary training & certifications for the same are created subsequently. This calls for an agile public-private-academia partnership in capturing demand for skills and following through with quick investments in skill-building to match demand with supply. Jobs and skills planning need not necessarily be centralized, rather it can be done at local levels, where there is granular information on education, skills, and job options. The key to employment growth is not the big company or factory that employs thousands of workers, but the MSME sector. Furthermore, the spirit of entrepreneurship should be inculcated, which is evident in the growing number of start-ups in the economy. India must focus on its domestic economy to create jobs because globally, protectionist attitudes are only set to intensify.

Courtesy: The Economic Times

Governments, businesses, and non-profit organizations have a critical role to play in promoting skilling and employment generation. This can involve developing and funding training programs, providing access to education and training resources, and creating policies and incentives to encourage businesses to invest in skilling their workforce. Schemes like Mudra, Skill India, Swachh Bharat, Piped Water for All, PMKVY, SEWA, and renewable energy initiatives can create momentum in the economy to fuel job creation. Digital technologies can catalyse growth, and given the global trend towards informalization and self-employment, India is well-positioned to avoid substantial structural adjustments.

The challenge is to effectively skill, up-skill, and re-skill India's workforce, as major opportunity for India stems from its existing economic structure that is dominated by the informal sector comprising particularly marginalized communities such as women, minorities, and low-income individuals. Skilling is the process of acquiring the necessary skills, knowledge, and attitudes required to perform specific tasks or jobs, and it is crucial for employment generation and social upliftment. Thus, such programs can help reduce poverty & inequality and help promote social inclusion, as well as drive innovation and economic growth. Skilled workers are essential for developing and implementing new technologies and processes, which can lead to increased productivity and competitiveness in various sectors. This, in turn, can lead to economic growth and further job creation.

Courtesy: MyGov Blog

In fact, Skilling has been used in various countries and communities around the world to generate employment and uplift society.

- **India's National Skill Development Corporation (NSDC)** has implemented a skilling initiative aimed at training 150 million individuals by 2022. The program targets marginalized communities, including women, rural youth, and individuals from low-income backgrounds, and provides training in various sectors, including healthcare, hospitality, and construction.
- **In South Africa, the Harambee Youth Employment Accelerator** has implemented a skilling program aimed at providing employment opportunities to young people. The program provides training in various sectors, including retail, hospitality, and call centres, and has helped over 150,000 young people secure employment.
- **In the United States, the Skills for America's Future initiative, launched by the Obama administration**, aimed to bridge the skills gap by connecting employers with training providers. The initiative partnered with

businesses across various sectors, including healthcare, manufacturing, and technology, to provide training and employment opportunities to individuals.

- **The European Union's European Social Fund (ESF)** provides funding for skilling programs aimed at improving employment opportunities and social inclusion. The ESF has funded various initiatives, including the Youth Employment Initiative, which aims to provide employment opportunities to young people, and the Skills for Growth initiative, which provides training and development opportunities to individuals.

- **The NGO Magic Bus in India** provides a skilling program aimed at empowering marginalized youth. The program provides training in various skills, including digital literacy, financial management, and leadership, and has helped over 400,000 young people secure employment or start their own businesses.

These examples demonstrate the potential of skilling and encompasses various aspects of society and the economy such as employment generation, social upliftment & inclusion, equal employment opportunities, innovation and economic growth, competitive business & economy, poverty reduction, entrepreneurship, and public-private partnerships/ collaboration.

By investing in skilling programs and supporting the development of a skilled workforce, societies can create a brighter future for all especially when the Indian economy is poised to touch USD 5 trillion soon and is aspiring to emerge as a USD 30 trillion economy in the next 3 decades.

Although the timelines have been distorted due to the headwinds originating from covid circumstances, but the country is poised to reap the benefits of its demographic dividends, provided we take the right steps in the right direction and at the right time. The innovative minds of India's young population can be tapped for all round socio-economic growth of the nation. One of the major requirements in this transformational journey is availability of skilled manpower, in the context of both local and global perspective. So, skill development is the need of the hour.

The author is Director, Biju Patnaik National Steel Institute (BPNSI)

Note: Inputs & Views are personal of the author (s) and not necessarily of FICCI

Logistics Intervention for the Steel Industry

Sh. K K Agarwal
Chairman & Managing Director
CJ DARCL Logistics Ltd

Solving Logistical Bottlenecks for Steel Industry

Steel producers are often facing the arduous challenge in managing logistics requirements, which even prove to be a costly affair as the complexities surmount. Be it physical transportation of raw materials for steel production or the transportation of finished steel to demand centres, bulk material logistics has always been difficult. While in countries such as China, Japan, or Korea, majority of steel plants are situated near the coast, India's steel plants are found inland, which makes it even more difficult to manage transportation.

Railways have been one of the most preferred modes of transportation for steel manufacturers and we have seen more than 80% of the total logistics requirements of the steel industry are being met through the railway network. Even though we have seen the stride in development of railway infrastructure lately, constraints are still way too many.

Research estimates highlight that for every 1 tonne of steel produced, roughly 3 tonnes of raw material need to be transported. India's robust steel industry aspires to attain the magic figure of 300 million metric tonnes (MT) production per annum in the next decade based on the vision embedded in the National Steel Policy 2017, which is almost double the current capacity of 150 MT. However, the mission to achieve the targets may get trounced as the domestic steel producers are struggling with the inadequate availability of rakes for transportation of iron ore. With a view to draw attention of policy makers towards this growing concern, industry has urged to give priority to domestic steel producers by allotment of more rakes. Industry stakeholders are of the view that dedicated railway lines should be developed for steel plants. Additionally, necessary steps should be taken to establish more ICD ports in unrepresented areas.

Governmental Plan of Actions

In another interesting development, last year, the Ministry of Steel has onboarded itself on the PM GatiShakti Portal (National Master Plan portal) and has identified 38 high impact projects to develop multimodal connectivity and bridge the missing infrastructure gaps, in tune with the objective of the mission. Three rail projects with a total length of 850+ km have been approved under PM Gati Shakti to speed up the movement of coal, and iron ore. These projects are intended

to speed up the transportation, optimise connectivity to economic clusters, reduce the turnaround time of containers, to name a few. The National Logistics Policy aims to create a single-window e-logistics marketplace, promote the use of technology, and create a sustainable and integrated logistics infrastructure. The Sagarmala Project aims to develop port-led industrialization and create a maritime-focused economic zone. These initiatives will provide a significant boost to the logistics sector and enable the seamless movement of goods across the country. These initiatives aim to develop the logistics infrastructure in the country and improve connectivity between ports, highways, and railways. This will benefit the steel industry by improving the transportation of raw materials and finished products, reducing transportation costs, and improving delivery times.

Pivotal Role of Logistics in Steel Industry

Logistics plays a crucial role in the steel industry's supply chain. Steel production involves various stages, including raw material procurement, production, transportation, and distribution. Each stage of the supply chain requires efficient logistics to ensure timely delivery of raw materials and finished products. The logistics sector provides the necessary infrastructure, including transportation, warehousing, and distribution networks, to ensure the seamless flow of goods throughout the supply chain.

While Railways will remain the primary mode of transportation, industry stakeholders together with the policy makers must work towards enhancing coastal / water ways for domestic transport, which is relatively cheaper and has not got due attention for decades. Such enabling investment projects would, in turn, accentuate the demand for steel. Leading companies are exploring multimodal routes to not only strengthen logistical capabilities but are also embarking on their decarbonisation strategies.

Steel companies are trying innovative ways to reduce logistical bottlenecks. One of them being the deployment of Electric Vehicles (EVs) for transportation of finished steel. This move can solve the dual purpose of finding alternate routes and empowering sustainable transportation in the long run. The Central Government is at the helm of taking appropriate measures in consultation with the industry stakeholders and is devising ways to not only explore alternate routes of transportation, but also strengthen the existing infrastructural capacities to augment growth of steel production in the country.

The logistics service providers must understand the steel industry's unique requirements, including the transportation of heavy and bulky goods and the need for specialized equipment. They must also be able to provide customized logistics solutions to cater to the steel industry's diverse requirements.

CJ DARCL is the first mover in customization of its containers as it has specialized Multiuse containers which are specially used to carry long products – Steel Pipes, TMT Bars, Plates etc. Its having groves on surface which support in carrying steel coils safely. Double Stack Dwarf Containers (DSDC) for Lubes & Petrochemicals, Openable Containers to carry glass products etc. In Rail transportation containers play a

vital role as customized containers increases our fleet strength & enable us to be a unique service provider for the client. It gives an edge over the competition. For safety of coils, the company has customized its fleet with special beds, which is safer solution and take additional precautionary measure while transportation on the patchy roads, to avoid damages and denting. The solutions are being modified as per the client's requirement and the regular analysis & observation keeps the company informed about the key areas of improvement.

The steel industry in India is heavily dependent on the logistics sector for its growth. The logistics sector provides the necessary infrastructure for the steel industry to access raw materials, transport finished products to customers, and distribute products to various parts of the country. Without a robust logistics sector, the steel industry would not be able to grow in India. As India is moving towards becoming a global manufacturing hub, the steel industry has emerged as a major emphasis area. Reducing Logistics costs is one of the most primary methods of making steel globally competitive, which both private logistics players, and the government is working towards.

Fluctuations in demand and supply limiting the growth of the logistics industry.

Another critical aspect of the logistics sector's role in the steel industry's growth is risk management. The steel industry is exposed to several risks, including supply chain disruptions, price fluctuations, and quality issues. The logistics service providers must have robust risk management systems in place to mitigate these risks and ensure continuity of operations.

The logistics sector's role in the steel industry's growth in India is not limited to domestic markets alone. With the increasing globalization of markets, the logistics sector will play a critical role in supporting the steel industry's exports. The logistics service providers must have a deep understanding of international trade regulations, customs clearance procedures, and transportation requirements to ensure smooth and efficient exports.

Technology Transforming Logistics Solutions

Technology is also changing the way in which IoT (Internet of Things), Machine Learning, a nd other technology tools are leading the way to Logistics 4.0. The adoption of technology, such as IoT, blockchain, and artificial intelligence, will revolutionize the logistics sector's operations. These technologies will enable logistics service providers to provide real-time visibility, optimize routes, and reduce transportation costs further. This will benefit the steel industry by reducing logistics costs and improving delivery times. Technology and automation like IoT, automated truck hauls etc. are being used to make the processes leaner and safer.

CJ DARCL is working to integrate the TES (Technology Engineering System & Solution) Technology in all its operations. This technology will enable operations like digital picking and sorting, smart packaging and cold chain delivery. The growing use of connected devices provide data intelligence that can be used to optimise operations. Use of drones for real time asset monitoring and inventory count is also becoming popular. Connected logistics gives the complete end-to-end visibility and picture at every stage

of the supply chain. Therefore, the supply chain manager is better equipped to optimize freight, shipping, and warehouse operations and take informed decisions.

The logistics sector's contribution to the steel industry's growth can be seen in various ways. For example, the logistics sector has played a crucial role in reducing transportation costs for the steel industry. The use of technology, such as GPS tracking and real-time visibility, has enabled logistics service providers to optimize routes and reduce transportation costs. Cost of operations can also be optimized by eliminating or reducing scrap which will indirectly lower down the insurance cost resulting in more cost-effective transportation. To prevent the road accidents scenarios, CJ DARCL installed AI Devices to the dashboards of the trucks that ensures the driver's sight whether it is focused on the road or not, while driving. CJ DARCL maintains the driver scorecard of each driver and incentivize them on basis of their driving skills, this will help the company to address the areas of concern and highlight the part of improvement while training. This has resulted in cost savings for the steel industry, which has allowed them to invest in other areas of their business.

The logistics sector has also played a critical role in improving the steel industry's delivery times. With the use of technology, logistics service providers can provide real-time visibility of shipments, enabling the steel industry to track their shipments' progress. This has enabled the steel industry to plan their production schedules better and ensure timely delivery of finished products to their customers.

Having a cut-throat competition in the logistics industry, the industry needs to adapt more extensive ways to drive its operations in a more cost-effective manner, but the innovation seems limited due to inter-linking of operations and implementing the change at ground-level where the front-line army of drivers and supervisors are under privileged to a sustainable lifestyle, facilities, and various welfare initiatives. There should be a strong urge in the industry to focus on upgradation of the welfare and living standards of loading supervisors, training staff and drivers to keep them motivated which will in turn, result in bringing a better sense of responsibility among them.

Also, as a fraternity, Logistics industry along with the OEMs in steel industry should work hand in hand while setting-up the benchmarks and policies towards Zero Tolerance for any lapses in safety and accidents. Standard Safety procedures and protocols needs to be reviewed & revised periodically to keep check on adherence of the norms and policies being set by the government and in any circumstances of violation the companies, should be penalized.

The logistics sector will continue to provide the necessary infrastructure to support the steel industry's growth, and India's steel industry is expected to become one of the largest in the world by 2030. As a major logistics service provider, CJ DARCL is committed to supporting the steel industry's growth in India and contributing to the country's overall economic development.

Note: Inputs & Views are personal of the author (s) and not necessarily of FICCI

CJ Darcl Logistics

SAFE, SMOOTH, SUCCESSFUL

MOVING YOUR BUSINESS ACROSS THE WORLD

Your business originates from point A, we ensure it reaches point B, safely. The movement is smooth without any hassles. And every delivery is successful when it comes to meeting timelines, locations and commitments.

Toll Free No.: 1800 212 4455
Email: reachus@cjdarcl.com
Website: www.cjdarcl.com

SCAN ME

Kemar Automation

KEMAR

AUTOMATION

An IT and Automation Company specialising in-plant Logistics and process automation solutions.

URGE TRUCK
Plant Automation

K-RESCARE

KEMAR GOS

Solution Offering

IT Infrastructure
includes core network setup, Wi-Fi & Mobility, surveillance, and Mobile computing.

Kemar GOS
Gate automation system for container ports and ICDs.

Box-at-Yard
YMS system for container and Coil yard.

Urge Truck
Truck turn around system , A logistic process automation system.

91-22-408 444 00
www.kemarautomation.in
B-713, Lodha Supremus,
Kolshet, Thane Mumbai, India.

Indian Steel Industry at the cusp of reaching the Escape Velocity!

Sh. R K Goyal
Managing Director
Kalyani steel

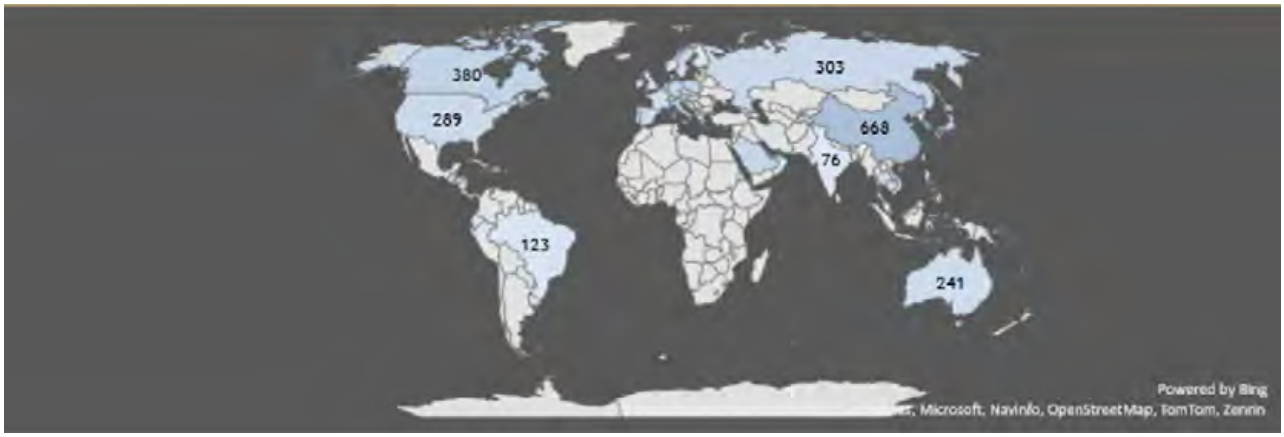
Steel is the backbone of today's modern economy. Be it Automotive, Infrastructure, Nuclear, Aerospace, Defense, Oil & Gas, or Railways steel drives the growth of these sectors. Moreover, historically, no country could achieve a higher level of per capita income without substantially increasing its per capita steel consumption.

India is world's 2nd largest steel producer. However, in terms of per capita consumption it is way below that of many developed countries. As per World Steel Association reports, India's per capita consumption in 2021 was 75.5 Kg which is 1/3rd of global average i.e. 232.6 Kg.

Considering per capita consumption lower than the global average, India's growth story has just begun! As per National Steel Policy (NSP) 2017, India envisages to reach an ambitious 300 mn tons of crude steel capacity & per capita consumption of 158 Kg by 2030-31 from a current level of ~143 mn tons of crude steel capacity.

Though it seems a challenging task, it is quite possible to achieve given appropriate enablers & essential support from the relevant stakeholders.

Graph 1: Apparent steel use per capita (finished steel products) in Kg, 2021. Source: World Steel Association



Further, adding mere the crude steel capacity will not take India onto the desired growth trajectory or say would not increase its contribution to country's GDP. Crude steel capacity increase coupled with significant value addition in finished & semi-finished steel products is need of the hour. It is, therefore, worthwhile to look at the opportunities, enablers & challenges as India embarks on this journey.

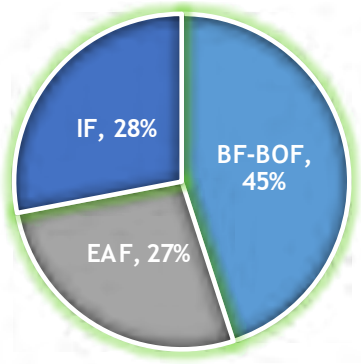
Decarbonization: A challenge as well as an opportunity

Developed countries are constantly updating their regulations to manage their carbon emissions. Take for example, EU's Carbon Border Adjustment Mechanism (CBAM) wherein it would levy tax on all the materials imported in EU equivalent to the embedded CO2 emission. While it seems a challenge for the domestic steel industry, it is also an opportunity to lead from the front by decarbonizing our operations. Unless we decarbonize our operations, entire steel export (along with export of the end use products, such as auto components etc.) would be at risk.

The next decadal global trend is Decarbonization. The extent of decarbonization would differentiate steel players globally! Steel industry is world's fifth largest CO2 emitter, contributing ~7-9% of total CO2 emissions, however, Indian steel industry contributes ~12% total India's CO2 emissions. Hence, it is prudent to increase the crude steel capacity with reduced carbon footprints. India has unique position when it comes to decarbonization because of its composition of different steelmaking routes. 45% of total steel is produced via BF-BOF route, 27% by EAF route while 28% by Induction Furnace route. Typically, 2.5-3 tCO2 is emitted per ton of crude steel produced via BF-BOF route whereas ~1.1-1.5 tCO2 is emitted per ton of crude steel produced via EAF / IF route.

Decarbonizing the EAF / IF route: It is a low hanging fruit since ~70% of total emission in this route is due to usage of fossil fuel-based electricity. If we switch over from fossil fuel-based power to renewable energy, then Indian steel industry can quickly reduce emissions by a whopping 39%! That leads to the golden question- 'What is stopping us from moving to renewable energy?'

Graph 2: Process Wise Crude Steel Production of India



There are few challenges which as a country we need to work on. Key challenges (among others) are discussed here:

1. Typically, small EAF / IF steel players' capacity ranges from 50,000 MTPA to 200,000 MTPA. Since the energy requirement is small, they can't invest in an RE power plant on their own because of high capex requirement. One of the possible solutions could be - the Government can develop RE power parks, on its own or under PPP mode, dedicated towards these small-scale steel players.

2. India's solar energy potential is scattered across the country whereas the demand is mostly concentrated in certain major industrial belts. Since it is a concurrent subject, we find different regulations in different states. To leverage the full potential of solar energy it is essential that, as a country, we have a uniform mechanism of charges levied per unit of electricity in the form of transmission, open access, electricity duty etc. This would enable us to take advantage of available solar energy for a maximum possible time since the Sun rising in East India till it sets in the West India.

Decarbonizing BF-BOF route: A commercial large scale & viable solution for decarbonization of BF-BOF route is under development wherein Iron ore pellets are reduce using Green H2 as reductant. Globally, many steel players are working on it and have announced to produce such green steel by 2026 onwards.

Global steel players such as Thyssenkrupp has recently announced its plan to produce 2.5 MTPA

green DRI using Green H2 at a capex investment of EUR 2 billion. Similarly, HYBRIT from SSAB & H2GREENSTEEL have announced to produce green H2 based steel by 2026. Interestingly, these projects are heavily subsidized by their respective governments. Currently, across world, H2 is used in Blast furnace by reforming methane into syngas to form H2 & CO. While this technology is well established, usage of 100% H2 is a technology under development. India needs a focused efforts to develop & establish such technologies in India. A quicker and efficient way of doing this can be a consortium-based approach where Government becomes a lead anchor and facilitator of the entire project whereas interested stakeholders join the consortium. Key research areas include:

1. Commercial large-scale production of Green H2.
2. Commercial large-scale storage of Green H2
3. Commercial large-scale production of Green DRI using Green H2
4. Steelmaking using green DRI in EAF / SAF.

Creating a green steel market – An enabler

While efforts are underway to decarbonize the steel industry, it is also important that sufficient market is available for such decarbonized products. Unless the business case is viable, steel players would not want to make those extra efforts & investment to decarbonize their steelmaking operations. It's a Chicken & Egg Story! Unless there is enough demand, steel producers will not see it as an attractive market. A simple step to mandate a small% of total steel purchases in government & PSU projects like construction, infrastructure etc. (to start with) would create enough demand for green steel in domestic market. Ministry of Steel, government of India is progressing steadily on this important topic, and we hope to see a concrete plan very soon.

Environmental Clearance (EC) – A challenge

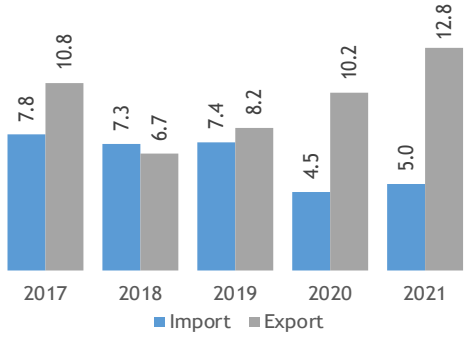
Typically, for a steel plant, EC takes around 1-2 years of time. Further, Erection & commissioning takes another minimum 3 years of time. Majority of times, delay in EC & execution escalates the cost of project making it unviable at a later point. Considering we need to add another ~150 million tons of capacity, India must clear EC equal to 150 MTPA latest by 2027 and the application process should start by end of 2023. Do we have a pipeline of projects equal to 150 MTPA already?

A small step from government, however, can drastically change the scenario. The Government should identify large land parcels suitable for 1, 3, 5, 10 MTPA steel plants well equipped with basic infrastructure facilities like EC, water, electricity, road, rail, port & air connectivity etc. Such identified land parcels can then be auctioned to interested steel players. This would make the entire process much faster, economical and hassle free.

Value Addition from domestic steel players – an opportunity

Russia-Ukraine geopolitical conflict has risen many key questions on resiliency of global supply chain. Sanctions, the energy crisis in the western world, fluctuations in key raw materials and what not. India has also felt the heat of the conflict in many ways. But a key lesson to be learnt and an opportunity knocking at our doors is moving away from commodity exporter to a high value-added steel supplier. Though, India is a net exporter of steel, we still import a significant amount of value-added finished steel. As per latest JPC report, India has imported 4.4 million tons of total finished steel (alloy/SS + non-alloy) during the period Apr-Dec 2022 as against 3.5 million tons during Apr-Dec 2021 representing a significant jump of 27.4%. This is another area of opportunity for the domestic steel industry. We have enough skills to produce the quality & quantity required for critical end use applications. However, what we need is a focused approach towards reducing imports by developing the desired grade & quality of steel.

Graph 3: Import & Export of Finished steel, Source: Ministry of Steel, Annual report 2021-22



Scrap Generation – A challenge & an opportunity

If India needs to achieve its 300 MTPA capacity by 2030 then we need an accelerated focus on making available enough scrap for domestic steel industry. Recycling scrap is also essential to achieve lower carbon emissions. Vehicle scrappage policy provides much needed impetus for this cause. However, the effectiveness of the scheme and thereby total available quality scrap for steel industry needs to be closely watched.

Financing – A Challenge

Capacity addition of the size of 150 MTPA would need a massive amount of investment from both PSUs and private sector players. The total investment envisaged in the NSP 2017 is to the tune of ~INR 10 Lac Crores (~USD 125 billion). Financing such a large capital at a competitive rate is itself a quite challenging task. Further, delays in the project tend to escalate the cost of the project further. Hence, it is imperative that we make our financing system (including foreign capital infusion) ready for such large financing along at a much competitive rates.

Taxes & Duties – A Challenge

As per NITI Ayog report, Indian steel industry faces disabilities to the tune of USD 80-100 per ton of steel as compared to its global counterparts. This includes import duty on raw materials, Taxes & duties on iron ore, logistics & infrastructure among others. India imports an average of 55 million tons of coking coal annually, and it is an essential raw material for producing steel. An import duty of 2.5% on coking coal and 5% on metallurgical coke creates an added cost for a raw material which is non-existent in India. Similarly, on iron ore, taxes & duties are to the tune of 20%. Therefore, we need to rationalize our taxes & duties structure on various raw materials to make Indian steel industry much competitive in global market.

Summarizing the thoughts: Decarbonization of steel industry will have increased focus in near future whether we like it or not. With its unique position India can lead from the front and emerge as global leader of green steel manufacturing. Working on decarbonization of our steel operations, Saarloha Advanced Materials Pvt. Ltd., a Kalyani group company, has launched India's first green steel – KALYANI FeRRESTATM by the Hon'ble Minster of Steel & Civil Aviation, Shri Jyotiraditya Scindia in Dec'22.

Indian steel industry is at the cusp of reaching the much-desired escape velocity. The time is ripe. However, it needs that last push to remove some of the key hurdles, obstacles (discussed above) it is facing through government support through appropriate policy interventions, faster and hassle-free regulatory clearances, increased RE power usage, creating green steel market, improved infrastructure facilities and rationalizing its taxes & duties structure among others.

Note: Inputs & Views are personal of the author (s) and not necessarily of FICCI

आज़ादी का अमृत महोत्सव

G20 भारत 2023 INDIA

मेकॉन लिमिटेड
(भारत सरकार का संस्थान)
MECON Limited
(A GOVT. OF INDIA ENTERPRISE)

ISO 9001 Company

Intellectual Backbone of Indian Steel Industry Serving the Nation since six decades

Customer focused organization providing globally competitive value added multi disciplinary services :

- DEC
- PMC
- EPC
- EPCM
- EPMC
- Value Added Services

OUR 3 VERTICALS : • METALS • INFRASTRUCTURE • ENERGY

www.meconlimited.co.in @MECONLimited @meconranchi @meconranchi

Green Steel for Green Mobility

Commodore Sujeet Samaddar, NM (Retd)
Advisor, MRAI

Background

Steel, in its basic form, is an alloy of Iron and carbon. It's strength, durability and affordability make it versatile for a variety of applications across sectors and industries. China produces more than 50% of the global steel. India, producing only about 10th of what China does, is the second largest steel producer in the world. Of the total steel produced worldwide, the building and infrastructure segment accounted for 52%, whilst transportation consumed about 25% and 22% is utilised for manufacture of mechanical and electrical equipment and machinery.

However, steel production is energy and carbon-intensive and the iron ore mined in open cast mines does significant damage to the environment. The industry contributes about 7% of global greenhouse gas (GHG) emissions and 11% of global carbon dioxide (CO2) emissions. This will be difficult to mitigate in a business-as-usual scenario as the forecast demand for steel in the backdrop of the extant emissions and energy policy and technology regime is out pacing the incremental decreases in the energy and CO2 emissions that comes with improvements and innovations in production technology. A revolutionary intervention is required to dramatically reduce the energy and emissions associated with the steel industry. Decarbonisation of this industry will, therefore, be a key part of the overall effort towards achieving the committed net-zero emissions targets.

One such way forward is to promote Green Steel. A primary candidate for adoption of green steel products is green mobility in the automotive industry.

Overview of India's Automotive Sector

India has overtaken Japan as the third largest light vehicle market in the world in 2022 with a YoY growth of more than 28% compared to declines in the US, German and Japanese market ranging between 3% - 9%. India has retained its position as the fourth largest light vehicle producer with an output crossing a milestone of over five million units for the first time ever. The vehicle density in India is on the rise and has grown from 15 cars per thousand in 2010 to 36 cars per thousand in 2022. The International Energy Agency (IEA) reports suggest that the passenger car ownership in India will grow to 175 cars per 1,000 people in 2040 in line with India emerging as the second largest economy by then or thereabouts. That is roughly a threefold increase in vehicle density by 2030.

Therefore, by 2030, for a vehicle intensity of about 100 cars per thousand for a population of 1.45 billion would mean about 145 million cars on road requiring an annual production of about 12-15 million cars per year up from 3.6 million in 2021-22.

Whilst mobility is vital for economic development and for the provision of essential services in any country, it is resource and energy intensive and is often one of the highest contributors to pollution, contributing about 10% of the country's GHG emissions. Presently the target emissions for a 1.5oC global warming is to limit automotive emissions to 1.7 Gt from its present budget of 3.4Gt growing to 5.7Gt in a business-as-usual scenario by 2040. Mechanisms and strategies need to be developed to achieve this daunting target.

Steel and the Automotive Industry

A wide variety of steel can be produced to meet user defined requirements for automobiles through additives such as boron, chromium, manganese, molybdenum, nickel, silicon, tungsten, or vanadium during the production process. These alloying elements, increase strength, hardness, wear resistance, and toughness. Low Alloy steel have 1-5% alloying elements whilst high alloy steel contains 5-50% alloying elements by composition.

As per the World Steel Association (WSA) there are around 3,500 grades of steel in existence. Specifically for the automotive sector, different grades of steel are utilised for meeting various functional requirements of high temperature applications, corrosion protection, ruggedisation for safety etc. Based on the content of the alloying element almost all steel grades, termed as alloy steel, can be grouped into the following classifications and utilisation based on its core properties as mentioned below:

- Stainless Steel contains a minimum of 10.5% chromium to improve corrosion resistance while still retaining strength. Stainless steel is used in exhaust systems and as components which require use of materials that do not deform or melt under the prevailing temperature regimes in fuel-combustion engines.

- Advanced-high-strength steel (AHSS) is tough, ductile, light weight and has an exceptional fatigue rating and finds applications in vehicle bodies, frames, doors, bumpers, and undercarriages. Side impact beams are now commonly made using the high strength steels,

- High-carbon steel is produced by rapid quenching which makes it less ductile and more brittle but has high resistance to wear and tear making them suitable for vehicle frames, chassis, bushings, door panels, support beams, mufflers, etc. They are also used for making fasteners.

- Machine Parts like springs, connecting rods, axle, crankshafts, dies for forging etc. are made from medium carbon steel.

- Low-carbon steel has a much lower tensile strength and poorer yield-point runout. But, since it is cheap and easy to work on it is a material of choice for low cost low risk products particularly non-critical smaller components such as clutch housings, suspension parts, control arms, brackets, handles, wheel rims, covers, screws, washers, bolts, nuts, fastener etc.

- With its qualities and benefits of low cost, improved durability, self-healing strength, ductility, and corrosion protection galvanised steel is used for making body panels.

Therefore, steel will remain the preferred choice of metal for its many specific properties that align with the functional requirements of the automotive industry. As we have seen earlier, the automotive industry utilises a variety of steel grades. It is also worth noting that most of the grades are High Strength alloys which require various additives to give the steel the desired properties for its functional requirements of the component or part. What this means is together with ore or scrap other elements

notably chromium, nickel, molybdenum etc are also required to be recovered from end-of-life automotive products.

Demand Side Analysis for Steel in the Automotive Sector

An average car comprises about 100 systems (e.g. engine, transmission, cooling, steering, braking, etc.) and between 8,000 and 10,000 different components. In relation to the total mass, metals account for 75 percent of which Steel alone accounts for about 65 percent by weight. Assuming an average weight of 1000 kg per car the steel content is about 650kg/car. For 12-15 million cars the total requirement of steel would be about 9 Mt per year. And, if we add the other vehicles such as Trucks, Buses, 3 Wheelers, Tractors and two wheelers and even a nominal 10% of the production for exports, then the potential annual Steel requirement, from 2030 onwards, for the automotive industry in India, would be about 14-16 Mt.

Supply Side Analysis

The key challenge is where does this steel come from? As is well known there are two processes for the production of Steel namely the BF-BOF route or the EAF / IF route. The table below compares the two processes in terms of material energy and emission considerations per 1000 kg of Steel.

Parameter	BF-BOF	EAF/IF
Share of Production (%)	71	29
Iron Ore (kg)	1370	586
Scrap (kg)	125	710
Max Charging of Scrap (%)	30	100
Coal (kg)	780	150
Limestone (kg)	270	88
Direct production Energy (kg of Coal equiv)	-	80
Emissions (Tonnes of CO2)	1.91	0.7
Slag (kg)	400	170

Therefore, the route to control emissions and lower energy utilisation is clearly the EAF/IF route. For India the challenge is the limited availability of scrap. Indian imported 5.13 Mt of ferrous scrap in 2021 (a mere 7% of the global market) down from about 7.05 Mt in 2019. Domestic availability hovers at the 27-29 Mt mark. With the target to achieve a steel production of about 300Mt by 2030 – a tall ask at the moment – and the Governments intent to generate at least 30% through the EAF/ IF route the scrap requirement would be about 100 - 120 Mt by these metrics. For the planned total capacity of 300 Mt of which about 120 Mt is from the EAF/IF route the annual requirement for Oxygen is about 4,800,000,000 m3 of Oxygen may be required. With an average consumption of 750KwH/tonne of steel the energy requirement is 90,000,000,000 KwH.

Given that the longevity of steel is at least a few decades, as shown in the table below in the core consumption sectors of building and construction and machinery which accounts for about 75% of total steel consumption, domestic availability would not be any easier for the next decade atleast and the import of ferrous scrap will be vitally required to meet India's development needs without compromising excessively on its global commitments on environment, energy and emissions.

Lifespan of steel products

Major steel goods	Recycling rates (%)	Lifespan (years)
Vehicles	95	20
Industrial equipment	97	50
Cladding	85	40
Reinforced steel	50	50
Infrastructure	80	60
Structural steel	95	50
Packaging	60	1
Appliances	95	14
Other	85	20

Green Steel

The benefits of recycling metals are manifold. All types of steel are 100% recyclable and can be recycled infinitely without loss in quality. As per the Steel Recycling Policy, 'the use of every ton of scrap shall save 1.1 ton of iron ore, 630 kg of coking coal and 55 kg of limestone, specific energy consumption reduce from around 14 MJ/Kg in BF/BOF route to less than 11 MJ/ Kg in EAF/IF route, i.e. savings in energy by 16-17 percent. It also reduces the water consumption and GHG emission by 40 percent and 58 percent respectively'. However, Coke, not only provides the fuel but also acts as the direct reduction agent for reducing iron ore to iron. Hence, upto a point the emissions may be reduced but cannot be eliminated following this particular chemistry of steel making.

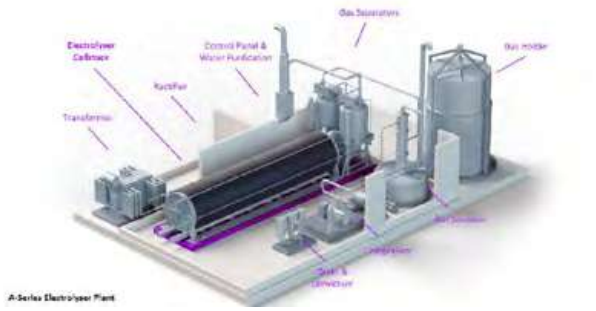
According to the Institute of Scrap Recycling Industries, recycling one car can save around 1,000 kg of iron ore, 560 kg of coal and 48 kg of limestone. Recycled steel for fabrication of various automotive parts is now a given as the quality and production cost make this a viable option.

However, recycled steel is not quite 'Green' as the energy requirements are met from either fossil fuels or electricity – which in India's case is mostly derived from coal and gas fired power plants.

Green Steel is the manufacturing of steel using renewable or low-carbon energy sources such as hydrogen, coal gasification, or electricity instead of the traditional carbon-intensive manufacturing route of coal-fired plants and using recyclable materials – notably scrap.

In case hydrogen is used as fuel then about 90 kg of H2 (with an energy value of about 3 MWh) is required to produce one tonne of steel. On the other hand, 780 kg of coal (1 kg coal equivalent

corresponds to a value specified as 7,000 kilocalories (7,000 kcal ~ 29.3 MJ ~ 8.141 kWh) is required to produce the same quantity of steel. Presently, the numbers don't stack up to adopt Hydrogen as the fuel given its higher cost and issues of storage and transportation.



Hydrogen is a clean fuel that, when consumed in a fuel cell, produces only water. Today, hydrogen fuel can be produced through several methods. The most common methods today are natural gas reforming (a thermal process), and electrolysis. Other methods include solar-driven and biological processes. India has not yet developed the technological and manufacturing capability to build Electrolysis Plants to scale.

Also, the use of Hydrogen in steel making is still not a matured technology. Sweden has taken the lead in developing a technology of Direct Reduction- Hydrogen as the substitute for coke. The major change is to replace the BF/BOF with an EAF capable of running on a charge of 100 percent scrap to supply sponge iron to the EAF. This requires local availability of Hydrogen at the site of the plant which can presently be only available through electrolysis plants which requires water. For India, water from STP/ETP maybe a viable option to generate hydrogen and oxygen. Renewable energy, mostly solar and fuel cells, could provide the power requirement for the electrolyser. It may also be noted that steel making requires industrial grade oxygen, mostly supplied in tankers and transferred to cylinders at site, at the rate of about 40m3 per tonne of steel.

Separately a Vacuum Pressure Suction Absorption (VPSA) unit which produces industrial grade oxygen and Nitrogen, also powered by renewable energy, is collocated at the site. This integrated design includes generating an over

capacity of hydrogen to charge fuel cells when intermittent renewable energy sources are not available. The Nitrogen and excess oxygen produced becomes an alternative source of revenue to offset hydrogen generation costs. In the future, Nitrogen from the VPSA and the Hydrogen from the Electrolysis process could be combined through the Haber-Bosch to generate Green Ammonia which carries three hydrogen atoms per molecule and is already a familiar and widely used industrial commodity and is the next generation fuel once a better process for its manufacture is invented. This project, as a system of systems, provides both the fuel and the oxygen requirements of about 40m3per tonne for smelting plants.

In addition, the storage of hydrogen in cryogenic conditions is also feasible and is part of the design of the electrolysis plant. To store hydrogen at scale, it must be compressed to up to 700 times atmospheric pressure, or cryogenically cooled to minus 423 Fahrenheit (minus 253 Celsius). Ammonia, while also a gas at room temperature and atmospheric pressure, can be turned into a liquid either by compression to just 10 atmospheres or cooling to minus 27F (minus 33C). Further detailed design could be made available to interested parties, on request. This design would provide the following benefits to the industry:

- Generates On site Online On Demand Green Hydrogen and Oxygen
- Hydrogen over capacity utilised for Energy to supplement renewable source
- Oxygen for production of steel

- Reduces Operating Cost due less corrosive and clean technologies
- Reduces Environmental Pollution
- Displaces Fossil Fuels
- No harmful emissions
- Makes the Recycling process Green

The figure below captures the alternatives for this model of generating oxygen and hydrogen.

Parameter	VPSA	Electrolysis	Cryogenic
Purity (%)	93	99.99	99.78
Medium	Gas	Gas and Liquid	Gas and Liquid
Product	Oxygen	Hydrogen	Oxygen, Nitrogen and Argon
Bi Product	Nitrogen and Argon (in traces)	Oxygen	
Energy (KwH/Nm3)	0.18	0.55	0.4
Capacity (TPD)	5-50	Upto 5	Variable
Space	Low	High	Compact
Cost	Low	High	Medium
Technology	Matured	Sate of the Art	Commercial

Action Plan

Though there are some initial challenges, but the future will be green steel. It would not be beyond the realms of imagination to conceptualise that Government will act to encourage the early transition to Green Steel so that India can meet its international obligations on emissions and energy use. To that end the following action plan is proposed for the early transition to Green Steel for Green Mobility:

- Improve scrap availability.
  - o Promote imports of scrap by
- Removing duty on ferrous scrap to ZERO.
- Strategize to increase global share of ferrous scrap imports from 9% to 30% by 2030.
- Encouraging shipbreaking and container recycling.
- Allowing imports of end-of-life automobiles by duly registered vehicle scrappers having own RVSF only.
- Set up aircraft reclamation facilities.
  - o Improve domestic sourcing of scrap through better collection systems.
- Dismantling end of life bridges and tunnels.
- Collection of railway scraps dispersed across railway tracks.
- Introduce EPR for locomotives and rail stock.
- Recovery of military vehicles including tanks and artillery pieces into the national scrap feedstock.
- Scientific recovery of ferrous scrap from Construction and Demolition waste and from defunct electrical installations.
- Further improve the Automobile Scrapping Policy to ensure better collection through the formal route by rationalization of GST, incentivizing Certificate of Deposits and introducing EPR on Automotive OEMs – and not on parts as that is not practical and quick disposal of accidented/abandoned vehicles – simply on the basis of finders keepers.
- Support EAF plants – disincentivize BF-BOF plants.

o Retire older, polluting plants – Set Maximum Emission limits/Tonne as criteria for retiring such plants in a time bound manner.

- Future-proof new capacity so that the transition to Hydrogen – Direct Reduction Plants is planned ab initio at the design stage itself.
- Explore Syngas and Plasma reduction technologies as substitutes for natural gas.

- "Go for Green" Campaign.
  - Create procurement alliances across upstream and downstream industries.
  - Introduce green product standards and process protocols.
  - Mandate minimum Recycled Ferrous Content in automobile, building and packaging industry.
  - Brand 'RemadeinIndia' as a distinct logo for recycled metal products endorsing the recycled content on it.

- Maximize energy efficiency.
  - Rationalize cost of power - remove differential pricing between consumers – industrial, domestic or agriculture.
  - Promote Renewable Energy plants – eg Mid Size Green Hydrogen Fuel Cell Plants collocated with EAF/IF. Quite like the transition to Solar, Government could incentivize the adoption of Hydrogen as a fuel through incentives and subsidies similar to the FAME and PLI schemes for renewable energy segment.

- Reduce Emissions
  - Incentivize adoption of advanced Technology systems for controlling particulate emissions such as electrostatic precipitators, fabric filters, wet scrubbers, and cyclones.
  - Reduce Import duties on Emission Control Equipment
  - Incentivize use of Hydrogen and Ammonia as the future fuel in various industries and the transportation sector

- Technology Development
  - Establish a National Center for Advancement of Green Steel Technology with an initial outlay of Rs 100 Crs in FY 2025-26.
  - Establish an annual Rs 100 Crore Corpus for Research Proposals for development of Green Steel commencing FY 2023-24.
  - Fund 20 PhD scholars for Research in the worlds top most universities annually for the next five years – Yearly Budget about Rs 20 Crs/Year – commencing FY 2024-24.
  - Set up one 200 TPD Pilot Plant to manufacture Green Steel through international bidding by 2024.

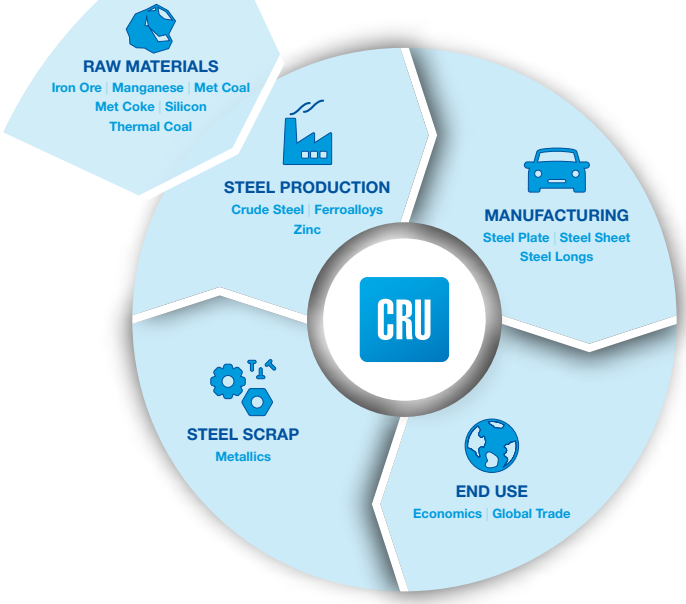
There is still some substantial ground to cover to truly transition to Green Steel. But the attempt must start now. The science is proven, the engineering is in place only the technology to convert the engineering to a minimum viable product is awaited. But the greater challenge would be to persuade the highly powerful lobby of steel manufacturers and automobile OEMs to take a leap of faith and make the transition to Green Steel for Green Mobility.

Note: Inputs & Views are personal of the author (s) and not necessarily of FICCI

CRU Steel

Ask an analyst

Get the answers you need



CRU provides comprehensive analysis across global steel markets and the entire value chain – from steelmaking raw materials to finished steel.

We deliver our insights, market intelligence and robust data through price and market analysis, forecasting and cost services.

CRU's global steel experts

65+ dedicated steel and steel raw materials analysts

We want to hear from you.

Visit CRUGroup.com to find out more email us at damodharan.nk@crugroup.com.

Get in touch

damodharan.nk@crugroup.com

CRU Steel Services

Steel Raw Materials

Market analysis and price assessments

Bulk Ferroalloys Monitor
Steel Metallics Monitor
Steelmaking Raw Materials Monitor

Five year market forecasts

Metallurgical Coal Market Outlook
Iron Ore Market Outlook
Manganese Market Outlook
Thermal Coal Market Outlook
Silicon Metal Market Outlook
Metallurgical Coke Market Outlook
Ferrosilicon Market Outlook
Metallics Market Outlook

Twenty year market forecasts

Iron ore Long Term Market Outlook
Metallurgical Coal Long Term Market Outlook
Steel Long Term Market Outlook

Asset by asset cost & emission analysis

Iron Ore Cost & Emission Service
Metallurgical Coal Cost & Emission Service
Thermal Coal & Emission Cost Services
Silicon Cost Data Service
Manganese Ferroalloys Cost Data Service
Manganese Ore Cost Data Service

Semi-Finished and Finished Steel

Market analysis and price assessments

Steel Sheet Products Monitor
Steel Long Products Monitor
Steel Monitor
Global Steel Trade Service

Five year market forecasts

Steel Sheet Products Market Outlook
Steel Long Products Market Outlook
Steel Plate Products Market Outlook
Crude Steel Market Outlook

Asset by asset cost & emission analysis

Steel Cost & Emission Services

Minerals for Effective Utilization –

Critical to Extract Sustainably, Transport & Utilize Resource Efficiently

Sh. Glenn Kalavampara
Secretary
Goa Mineral Ore
Exporters' Association

Mining can provide most of the materials we rely on to build infrastructures and instruments for daily use, to obtain energy, and to supply agriculture with fertilizers that enable most of foods produced.

At the same time, mining is the human activity that has been disturbing to environment and often linked to social impacts. There is a need to balance Needs and Wants. Sustainable Development is Key to ensure a mutually beneficial Mining Industry to prosper.

For any geologist, understanding the nature into how Minerals originate is deep but once identified & explored systematically it's the Science on How to extract this effectively & to convert into products essential for mankind.

Minerals can be found throughout the world in the **earth's crust** but usually in such amounts and topography that may hinder restrict extracting and only with the help of **careful extraction and processes,** resulting into economically viable deposits.

Mineral deposits can only be **extracted where they are occur** and hence Mining Activity **can't be relocated.** If they occur on lands having higher vegetative cover, then deforestation does take place. In more critical areas, if such lands are protected (sanctuaries / parks), mineral excavation itself is restricted or prohibited.

No Country have all the Mineral Deposits that the Nation requires within its geographical boundaries, because the formation of the planet itself has been a geologic evolution and human civilizations have over the centuries created and divided landforms into countries and boundaries .... This, no doubt will carry on in the future too at the cost of peace and security. However, minerals being site specific, Trade, is imperative and there is a need to maintain cordial relations with countries for imports / exports.

Mining in any state is not an easy task of Just extracting as the perception to a layman lies. Any greenfield activity with does come with a challenge of providing infrastructure, capabilities, finance and utilities and transporting. The addressal of

Infrastructure concerns can be relatively more effective if the conglomerate of Mining Units in the Region come together to Voluntarily engage rather than expect the Authorities to initiate.

But once initiated over years and evolvement, operations can get relatively less challenging. But Trust between competing units is necessary for common concerns. In Hindsight, Improving efficiencies amid social concerns, Initiations done by the early adapters are key in a complex and demanding economy for survival. With the experience of past operators, such hindsight should now be foresight.

As such, there are often concerns where brownfield projects are regranted earlier than estimated as there is an abrupt halt in business cycle. Quicker returns and smart work are replacing hard work and longer returns. There can be merits or demerits in either system however, the need to maintain trust is essential. To regain thrust is sometimes complex.

Requirements of resources become specific and price conscious from Buyers as Competition grows. Along with all this, Locally, challenges from Social Sector and their expectations also augment and pressures to develop gain momentum. Not forgetting inflationary rise in pricing.

The Geographical terrain of the land coupled with transportation too is rather unique and may vary from State to State, region to region - Transportation and logistics are key to any developments in the Industry. Unfortunately, the impetus to sync logistics to winning minerals is often missed out even at present times. A holistic plan, therefore, is essential. As indicated earlier a conglomerate approach is needed when multiple operators within a region.

At most times, there have been tangential approach between moving towards efficiencies in reducing carbon footprints environmentally due to social pressures. These must be addressed quickly to avoid hampering mining operations in long run. Fragmented approaches must be revisited and the solutions must have Government Support. Eg – Higher Capacity trucks can reduce carbon footprints or alternate mode of transport suited for efficient transport etc.

Further migration is expected for a greenfield large-scale operation during commencement and hence there can be pressures on the infrastructure and social culture too. There is often resistance from quarters as social licence to operate must be earned over time of patience and understanding. Sometimes the pressures to commence production quickly and penalties if operations delayed or production below a threshold value needs a revisit by the Government.

There can be concerns if benefits do not reach out to original Residents / Dwellers who are sometimes marginalized. Mutually inclusive solutions with a timeline are necessary where the Regulator too must play a responsible & justified role to avoid conflicts.

All such concerns affect sustainable growth.

Sustainability holds the key.

So one may argue, if beneficial, *how do we benefit? (State and Society)*. There are statutory provisions to enable any industry to run.

In the present case there has been exorbitant bidding to win assets. Sometimes Unrealistic but need the Authorities intervention to correct. Further, it is possible that once revenues go into the consolidated funds, it may not entirely be routed to the main concerns in the locality / region and the intention planned for get detached. This may lead to cross subsidization in allocating resources in affected regions.

Presently, unfortunately, Pan India, there appears to be a situation wherein there is a need to acquire assets desperately and thereby high bidding. This largely comes from insecurities.

Insecurities in terms on meeting requirements, inability to produce as expected, modernization, Non-Experienced in mining operators, delays as well as prohibitive taxes, expectation even beyond statutory payments in form of additional CSR etc or looking at the industry suspiciously

and lastly penalties if not producing to ensure State Revenue are rather conflicting and needs to be ironed out. Ease of doing business would need to ensure the industry enabling its operation without risk of avoidable stoppages / restrictions.

Further, there are evolving policies, disruption in demand and supplies even due to geopolitical concerns far away, thereby productions cannot be entirely planned and can be challenging too. This must be factored as it's an impediment to growth intended.

By no means is it the intent of the industry to be burdened in Litigations, however, non-clarity and delayed action can lead to this.

There is a need to find a solution which blends to concerns of both, Regulator and the Operator, so that the Country can benefit by the mineral wealth which is finite and must attain a justified return to the Government.

Way forward

- **Moving ahead**, the **grants of leases are in the hands of the Government** but at the same time, the Clarity , speed, transparency which allow the grant to get operational partly **also lies** in the hands of the Government. Many a times, there are bureaucratic delays. This must be addressed. The Need to evolve experienced operators for mines must be obligatory at the time of Grants. As initially intended, State Government must be encouraged to seek approvals even for a buffer period of 2/3 years before auctions are initiated can be inbuilt, so that the time taken to commence operations is quicker.

- There is a **need for efficiencies in logistics**, Separate Mining Roads – Less interference with Communities. Need for the Industry to be involved in this effort and more essential trust between operators to work jointly for efficiencies in solutions in case of multiple operators in each cluster. The Process and the Transport Sector for Mining can be considered to be inbuilt to Mining and thereby there may be a higher output on GDP factored from Mining Standalone, which is presently hovering around 2%. Hence, the Need the ancillary support sector which are essential to be clubbed before value addition is done.

- There must be a **justification on taxes imposed**. Any unreasonable taxes would hamper efficiency elsewhere or may not be viable. Further, any sector in the country should have **uniform taxes and these need to be reasonable too**. A reasonable tax will also lead to R&D to improvise and vice versa.

- In Certain States i.e Goa there are **additional taxes** levied towards Intergenerational equity, but such is absent for other than India, other than Iron. Eventually, this may extend. However, the moot question is Shouldn't there be uniform taxes across minerals across States? Such issues must be adequately addressed at a national level.

- The taxes paid to the Government be more accountable and transparent on Government Portals. Presently, the DMF is being paid by the industry but there are often delays in attributing it to the areas where it is intended and justified. Industry Involvement in DMF Constitutions is important.

- **Mining is Finite** ….till minerals last, post which Mines have to be reclaimed and such lands converted to other promising activities. The **Reserves / Resources available** block must be carefully estimated with an intend to win it scientifically. Concerns on Stamp duty payable for 50 years vis a vis the life expectancy of the block based on reserve must be addressed.

- If there is limited demand domestically, **is exports a bad option**? Given the fact that trade itself is essential. What are the **challenges and the demands for value added products** vis a vis the market realization / fair price? This requires a pragmatic consideration.

- Need for **media be more responsible in addressing factual** and positives of mining over gaining larger undue attention by negative news.

- In the long run there is a need to bring in Transparency so that concerns are addressed **and possibly a need of an ombudsman to bridge the gap between** extremes may be required.

- **Intellectual capital is welcome** and Education Academies and Universities should join and help R&D efforts undertaken by the Industry and also assist to help recovery.

    o *Can't land filling for roads be done from the waste dumps? Do we need to cut new hills for road filling work?*

- There is a need to **integrate Industry's inputs and practical suggestion** at State and Central Government level with an intent to implement Ease of doing business with tangential returns.

- Lastly any Industry to survive has to have Operators themselves having Transparency, Responsibility to Curtail Trust deficit amongst each other but on the contrary work for an mutually acceptable regional sector growth beneficial for the overall growth of the Nation.

Note: Inputs & Views are personal of the author (s) and not necessarily of FICCI

The Earth is our Workplace.

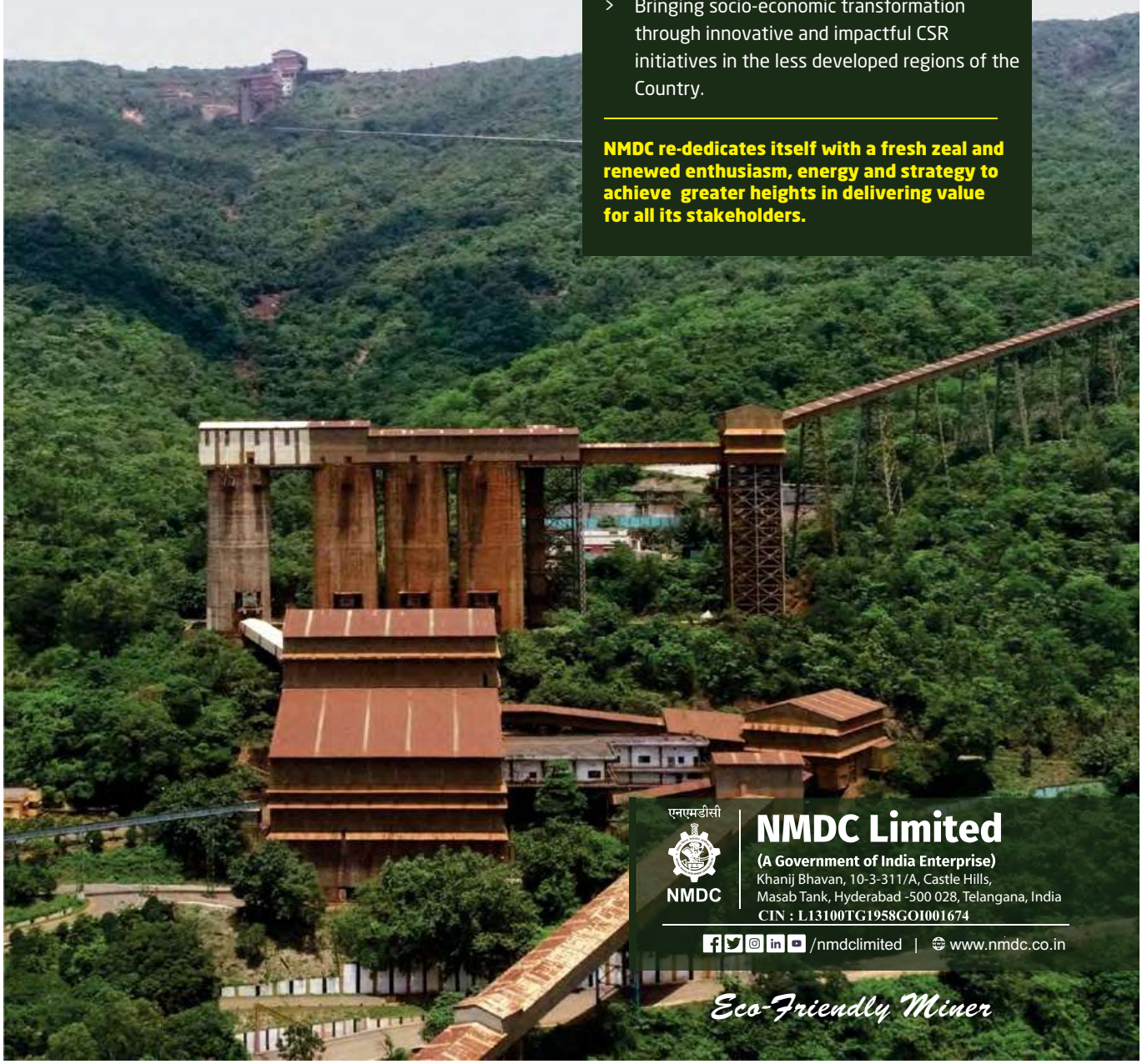
We Preserve and Protect it.

(Going Green since 1958)

More than 6 decades of Responsible Mining and Sustainability

- One of the best performing Public Sector Enterprises of India
- The single largest producer of iron ore in India
- Venturing into steel by commissioning 3.0 MTPA Steel Plant at Nagarnar, Chhattisgarh
- Sole producer of Diamonds in India
- Bringing socio-economic transformation through innovative and impactful CSR initiatives in the less developed regions of the Country.

NMDC re-dedicates itself with a fresh zeal and renewed enthusiasm, energy and strategy to achieve greater heights in delivering value for all its stakeholders.



एनएमडीसी
NMDC

NMDC Limited

(A Government of India Enterprise)

Khanij Bhavan, 10-3-311/A, Castle Hills,
Masab Tank, Hyderabad -500 028, Telangana, India

CIN : L13100TG1958GOI001674

/nmdclimited | www.nmdc.co.in

Eco-Friendly Miner

WELSPUN CORP
Pipes & Steel

Welspun Corp Limited (WCL), one of the most-renowned line pipe manufacturers globally, has the distinction of completing some of the most critical pipeline projects, including the World's Heaviest Pipeline, World's Longest Pipeline, World's Deepest Pipeline. The company has a global footprint spanning across 3 continents and 6 countries, servicing several Fortune 100 Oil & Gas majors with a wide range of products & services and a strong technological backbone.

The company has forayed into the DI Pipes segment to cater to the growing water infrastructure requirements in the country in line with the GOI's Nal Se Jal initiative under the Jal Jeevan Mission. This will enable the supply of clean, drinking water to rural and urban households across the country.

WCL also manufactures BIS Certified Steel Billets and has also commissioned its TMT Rebars facility at an integrated facility in Anjar, Gujarat. The company additionally boasts of the manufacture of Stainless Steel Pipes, Tubes, and Bars at a boutique facility in Jhagadia, Gujarat.

The company's transformational growth strategy entails creating a diversified product portfolio, repurposing our business outlook to add new target segments, expanding our product offerings to address both the B2B and B2C markets, and making well-considered strategic acquisitions.

Stainless Steel is the Way to Go for Corrosion Resistant, Durability, Quality, Future Proof and Modernity

Sh. Rajamani Krishnamurti
President
ISSDA

Sh. Rohit Kumar
Director
ISSDA

Stainless steel is a special alloy of Iron with a minimum of 10.5% Chromium. It is the presence of Chromium which provides stainless steel its corrosion resistance property which makes it suitable for various applications. The level of value addition in stainless steel is much higher due to the addition of elements like Chromium, Nickel, Molybdenum and Titanium.

Stainless steel has emerged as metal of choice owing to its superior qualities, such as good strength to weight ratio, aesthetics, hygiene (it offers), resistance at high temperatures and complete recyclability. These properties enable its application across several end-use industries such as Architecture, Building and Construction (ABC), Automobiles, Railways, Transport (ART), Consumer Durables and Process Industries. The Stainless-Steel Industry is a very important one for the economy as a whole like the Carbon steel Industry. It can become the backbone of any industrial economy. Stainless Steel is also Environment Friendly, Reusable, Corrosion Resistant, Aesthetically Appealing and Fire Resistant and thus makes stainless-steel the ideal and preferred metal for many industries, viz., Railways, Coastal Areas, Airport Development, etc. The Stainless-Steel sector fits perfectly into the definition of a sustainable material. The concept of sustainability is based on three main pillars viz., Economic, Environmental and Social which can also be termed as Profits, Planets and People. Since stainless steel is corrosion resistant, requires little maintenance and can be recycled over and over again, it clearly is the metal of the future. Stainless-steel can withstand calamities and natural disasters like hurricanes and earthquakes much better than most construction and building materials.

The stainless-steel industry in India has a healthy mix of large and mid-sized corporates, including public sector and micro, small and medium enterprises (MSMEs), spread across the country.

India has an installed capacity of 6.6-6.8 million tonne (MT) of stainless steel with capability to produce a wide range of products as per national and international standards. Domestic demand for stainless steel (flat and long) clocked a compound annual growth rate of about 5.2% over fiscals 2016-2020 to reach 3.7 MT. However, the pandemic-led disruptions led to demand contracting by 14-15% on-year in fiscal 2021 to 3.2 MT. Stainless steel demand is expected to witness a volume growth of 19.5-21% to reach 3.7-3.9 MT in fiscal 2022 supported by a low base, a stable macroeconomic environment and normalised government spending.

In the medium term, ISSDA expects stainless steel demand to register a CAGR of 6.5-7.5% over fiscals 2022-2025 and reach 4.6-4.8 MT. Further, over the long term, as India aspires to become a $40 trillion economy by 2047, sectors such as construction, infrastructure, and manufacturing – key contributors to the gross domestic product – are expected to drive stainless steel demand growth. Thus, ISSDA projects stainless steel consumption to reach 12.5-12.7 MT and 19-20 MT by fiscals 2040 and 2047, respectively; consequently, the per capita consumption of stainless steel will reach 8-9 and 11-12 kg, from current ~2.5 kg. In order to meet the estimated demand, India needs to develop enough capacities, while improving capacity utilisation in the long run. This implies that we need to increase the capacity by 4.5 times over the next 25 years to reach 30-32 MT by fiscal 2047.

India continues to be the second-largest consumer of stainless steel globally. To achieve the desired growth by fiscal 2047, optimise the import-export balance and improve capacity utilisation, the Indian stainless-steel industry will need more support from the government in terms of policy interventions in areas such as raw material security, infrastructure and logistics support, downstream skill upgradation and technology upgradation, and research and development, to increase the intensity of usage across end-use industries and to encourage new-age applications.

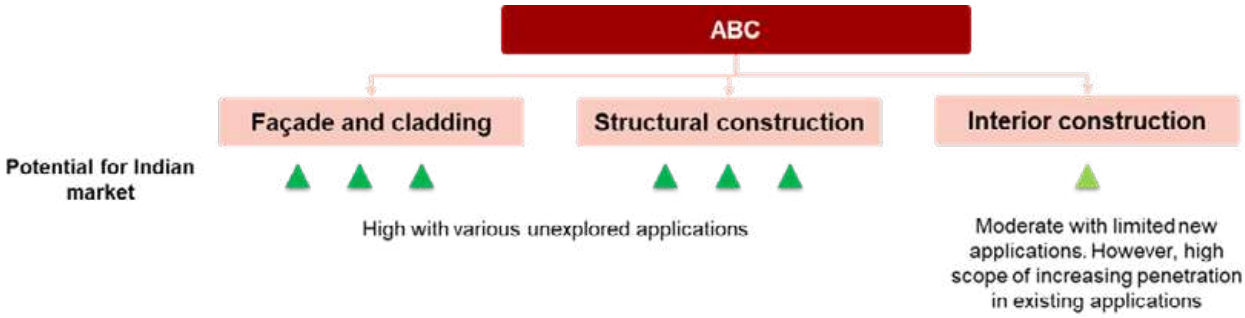
Stainless steel demand would be driven by the growing urbanization, Railways, urban infrastructure, process industries, consumer goods etc.

The key usage segments which will be drivers of growth are as follows:

New-age applications to boost domestic consumption of stainless steel

Stainless steel has enormous growth potential in India. To reiterate, consumption of the alloy is expected to grow with India realising its vision of becoming a $40-trillion economy by 2047. Some of the evolving and new-age applications of stainless steel that will drive demand in the long run are discussed below:

ABC (Architecture, Building and Construction)



Facade and cladding

Stainless steel façade and claddings are sustainable and cost-effective for buildings. They provide a cutting-edge, modern, contemporary and futuristic appeal as well as high durability and corrosion resistance.

Stainless steel façades are popular worldwide and have a wide range of applications in architectural constructions, such as museums, airports,

commercial complexes, and housing projects. However, in India, usage of stainless-steel facades is in the nascent stage. Transit buildings, such as airports and Mass Rapid Transport System (MRTS), have been using stainless steel in areas such as bollards, column claddings, ticket counters, benches, escalators, lifts, handrails, and canopies.

Construction (structural and interior)

Globally, stainless steel is preferred for the construction of load bearing structures and disaster-proof infrastructure as stainless steel offers high resistance to corrosion, good strength to weight ratio, and enhanced safety. Such applications are increasing in India as well and are likely to propel the future growth of stainless steels in the country. Some of such applications are:

- **Reinforcement bars for concrete structures:** On account of its ability to provide maintenance free long life to civil structures, stainless steel reinforcement bars are gaining acceptance in civil construction, especially near coastal regions. The government initiative to promote sustainable infrastructure based on the life cycle concept will provide impetus towards further usage of stainless-steel reinforcement bars in India. Going head, this application is expected to attract enormous demand for stainless steel in India

- **Stainless-steel for support structures:** Stainless steel is a popular material because of its durability and longevity. It also offers maintenance-free service life and advantages of safety as it retains structural strength even at elevated temperatures, like case of an accidental fire. As a result, structural stainless steel in used in road over bridges and foot over bridges. In future, use of stainless steel for support structures is likely to grow at a rapid pace.

- **Disaster-proof infrastructure:** Due to properties such as durability, reduced corrosion resistance and lower weight, stainless steel is extensively used in disaster-proof infrastructure such as dams, floodgates, earthquake-resistant structures, and seawalls.

- **Water tanks and plumbing applications:** Stainless-steel is resistant to oxidation by biocides and inert to water. It is low on maintenance and offers ease of cleaning. This material is most suitable for water storage such as overhead water tanks and plumbing applications. Water storage tanks and leak proof plumbing solutions made of stainless steel are expected to gain popularity in the country.

Other emerging stainless-steel applications across public infrastructure

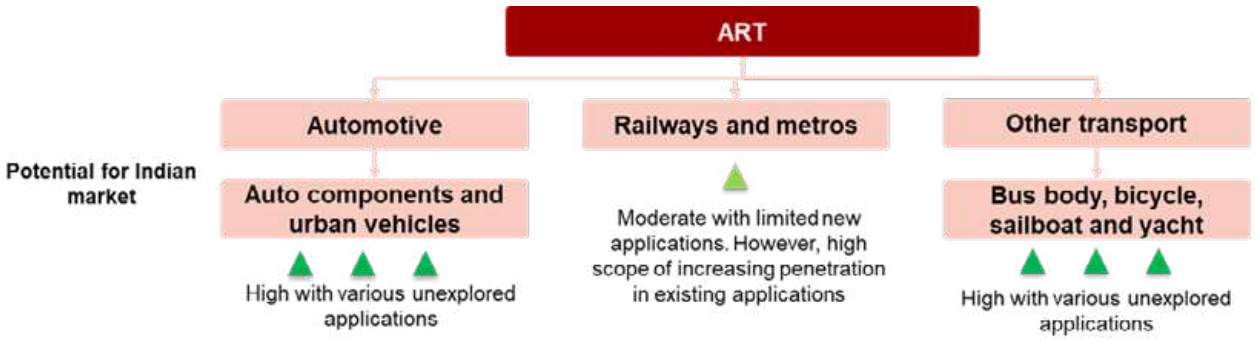
The government has rolled out ambitious programmes such as the Atal Mission for Rejuvenation and Urban Transformation; Smart Cities Mission; Swachh Bharat Mission; Sagarmala; and Transit Oriented Development for the expansion and modernisation of the metro rail network, railways, airports, and bus rapid transit. These programmes are aimed at improving rural and urban infrastructure. Because of the various advantages of stainless steel over other construction materials, its penetration is increasing across all modern infrastructure.

Currently, different state governments offer different incentives/benefits under their respective green building initiatives. Stainless steel is a green product. It is recyclable, does not produce toxic run-off, and offers durability and longevity. Even if the alloy finds its way to a landfill it is not detrimental to soil, water or air. Therefore, with increasing concept of green buildings in India and effective laws / policies on national level for the same, demand for stainless steel is expected to grow from this segment.

In India, we see many other growth opportunities for stainless steel. Some of them are:

Category	Application
Facades	Green and transit buildings, cladding
Construction	Support structures, public installations, enclosures, bus shelters, sanitation, water tanks, plumbing, water ATMs, smart poles in smart cities, FOBs and ROBs (foot and road over bridge)

Note: Key suppliers include both component and stainless-steel material suppliers



Stainless steel has a wide range of applications across automotive, railways and transport segments, as it offers better performance and is fire resistant. It has an aesthetic appeal for sustainable design, where long-term performance is expected.

In the global scenario, applications of stainless steel in ART include development in a direction to achieve lower weight and longer life using higher strength and longevity in areas such as electric vehicles, transportation containers, and other modes of transport.

In India, stainless steel is used in manufacturing for automobiles component, railway wagons and coaches, luxury bus bodies, and metro coaches. These applications of stainless steel are considered one of the most significant demand drivers and is likely to pick up pace.

Stainless steel in increasingly finding application in electric and renewable energy-based vehicles. With the government's increasing focus on promoting these vehicles to address the rising emission issues faced by the country, demand for stainless steel is bound to rise from this segment.

Other emerging stainless-steel applications

Other existing applications of stainless-steel gaining momentum include stainless steel electric vehicles, bus bodies, fuel tanks etc.

Some of the growth opportunities for stainless steel in India under ART segment are:

Category	Application
Automobile	Bharat-VI norms
Railways and MRTS	Metro projects, wagon and coaches in railways/ metro rail, stainless steel modular toilets, public seats

Note: Key suppliers include both component and stainless-steel material suppliers

Consumer durables

Properties of stainless steel, such as high toughness, ductility and low maintenance, have increased its utilisation in consumer goods such as cookware, washing machines, and refrigerators.

Stainless steel is used in white goods, as it is resistant to corrosion, can be easily fabricated, offers good mechanical properties over a wide range of temperatures, and can be given a range of exclusive finishes.

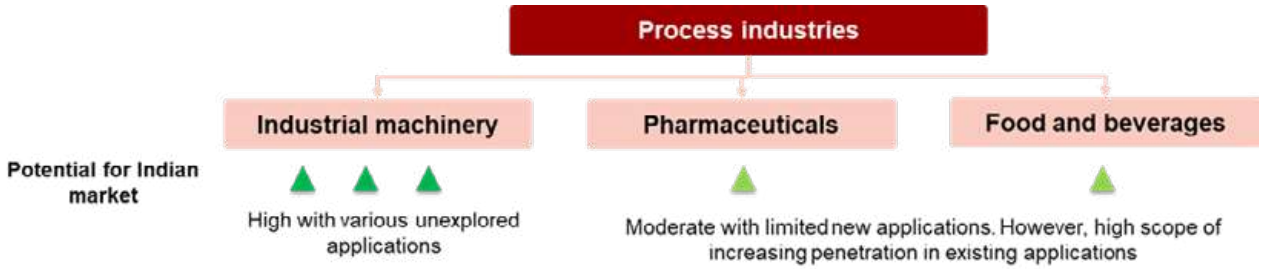
In India, stainless steel has been a dominant material in household kitchens in the form of utensils. It is being used in commercial and modular kitchens.

Some of the upcoming applications of stainless steel include reusable boxes and tri-ply cookware. Tri-ply cookware includes pressure cockers, frying pans, woks, and other cooking utensils. As the name suggests, these are made up of three layers of material sandwiched together; often, inner and outer layer of stainless steel with a middle layer of aluminium. These cookware are gaining popularity in Indian kitchens.

Following are the key growth opportunities for stainless steel under consumer durables industry:

Category	Application
Electronics	Washing machines, refrigerators, and microwave ovens
Kitchenware	Modular kitchen, reusable boxes, and tri-ply cookware

Process Industries



Stainless steel has a wide range of applications across process industries, such as use in pharmaceuticals for production of intravenous medications and industrial machinery due to high corrosion resistance and lower weight.

It is inert to most food environments and, hence, is an ideal material for the food industry.

Worldwide, it is a standard practice for dairy and meat industry equipment and processing plants to be made of stainless steel.

In India, it is widely used by the dairy sector. It is also used in meat, oil and beverage processing equipment.

Some of the growth opportunities for stainless steel in India under process industries:

Category	Application
Process industries	Containers, pipelines and tubes, heat exchangers, food contact equipment, storage tanks, condensers, processing and packaging machineries, processing and reaction vessels, accessories (includes the fittings, valve, pumps, and lab instruments), and other utilities (includes all other machinery and equipment used to clean/ purify air and water)

NEW-AGE APPLICATIONS: GLOBAL CASE STUDIES (This can be emulated in our country)

ABC (Architecture, Building & Construction)

Category	Application	Global example	Grade used
Facade cladding	Museum	Governador Plácido Castelo Stadium - Castelão Arena	444/2B
	Airport	Interior pedestrian hall at Mexico City international airport	304, with interior and exterior polished finish
	Housing project	New Gambetta Housing Complex, Nantes	EN 1.4307
Fixtures	Shower booths	Shower booths at Grand Hyatt, Fukuoka	Extra low-interstitial ferritic stainless steel – NSSCFW2
Construction	Earthquake-proof construction	Toride Naruto (museum in Japan)	Toughen Z (hot-dip, galvanised steel plate of SUS 430)
	Rehabilitation of historical heritage		Duplex stainless-steel rebar
	Electrical enclosures	Electric enclosures for BHP's Olympic Dam	316 with No. 4 finish
	Water reservoir	Reservoir in Changwon	STS304, STS444, STS 329 J3L/ 1D, 2B
	Dams and floodgates	Alloy saving duplex stainless steel has been used to improve the resilience of infrastructure facilities against natural disasters	NSSC 2120 (SUS 821L1), SUS 323
	Water tanks	3CR12 material used in municipal water storage tanks in rural areas	3CR12 No. 1
	Seawall against flood type disaster	A new technology called 'Flat Gate' has been advanced after the disaster	NSSC 2120
		9m-high seawall with 20 lock gates installed in Mikayo city	SUS821L1
	Rail bridges	Duplex stainless steel Forta LDX2404 in structural rail bridges	Forta LDX2404, EN 1.4662
	Bridge construction	Ferritic stainless-steel rebar was used for bridge construction	SUS 410- SD
	Pedestrian walkway and bicycle bridge	Stal and Rormontage AB in Solvesborg, Sweden, have designed a new pedestrian and bicycle bridge	Lean duplex Forta LDX2404

Note: Key suppliers include both component and stainless-steel material suppliers

ART (Automotive, Railways, Transport)

Category	Application	Global example	Grade used
Automotive	Grommet gasket	Grommet gasket for innovative diesel engine	SUS 301L equivalent
	Bipolar plate for hydrogen cell vehicle	Poss 470C for Hyundai Motors' fuel cell vehicle	Poss 470FC electrochemically modified surface
	Hydrogen fuelling receptacle	Toyota Mirai's fuel cell vehicle	AUS 316L- H2
	MaX	Aperam partnered with market leading companies to produce MaX – the only advanced high-strength stainless steel for body in white and chassis applications	MaX from 0.55 to 1.55
	Turbine hosing	Calsonic Kansei developed CK-SMiTH	Heat-resistant ferritic stainless steel
	Transportation container	Floor and walls of transportation containers are made of Outokumpu stainless steel	Outokumpu 316 plus
	Small electrified urban vehicles	Outokumpu – folded stainless steel for small electrified urban vehicles	Temper-rolled austenitic stainless steel
Transport	Bicycle	AISI 304 for bicycles	EN 1.4301 (AISI 304)
	Yacht	Stainless steel yacht	T316L 2D
	Stainless steel sailboat	Stainless steel used for deck, bathroom, sink, floor and furniture	316L

Note: Key suppliers include both component and stainless-steel material suppliers

Consumer Durables

Category	Application	Global example	Grade used
Consumer durables	Black stainless steel for premium appliances	Whirlpool, LG, Samsung manufacture a full range of black steel products, which account for 30% of sales	ASTM 430 anti-finger coated
	Refrigerators	PossFD for refrigerant piping	PossFD, No. 2D
	Hard disk drive (HDD) covers	Stainless steel is the best material for covers and other precision parts of HDD	SUS304, SUS430, SUS420
Boxes	Home delivery boxes	In such a case, boxes for home delivery have been introduced	SUS443J1
Kitchenware	Knife blades and cutting tools	Martensitic stainless-steel cutlery and kitchen utensils	MA5 (martensitic grade)

Note: Key suppliers include both component and stainless-steel material suppliers

Process Industries

Category	Application	Global example	Grade used
Pharmaceuticals	Anderson and pure magnetic mixer	For ultra-hygienic mixing and production of intravenous medications, which require high standards of hygiene	304, polished
Industrial machinery	Garbage truck hoppers	Floor of garbage truck hoppers	410 / #1
	Concrete mixer truck	Mixer bowl made of stainless steel	410 / #1
	Urban waste sorting container	For sorting waste	AISI 216
	Mining	For cable buckets	410/ NR°1
Food and beverages	Food, dairy and meat	Need to mandate the use of stainless steel in food processing industries, including food dairy and meat	
	Solar drier	Solar drier increases the life span of vegetables and fruits	3CR12 stainless steel with 2B finish
	Mobile kitchen	The Desert Wolf BOMA 250+ man – a mobile, smart kitchen	304
	Biomass stoves and pot skirt	Uses the familiar rocket design surrounded by a wire cage to improve the stove's stability and reduce burns	430

Note: Key supplier includes both component supplier and stainless-steel material supplier

Looking into the criticality of stainless steel in Nation building and for sustainable solution, it is strongly recommended to create an individual identity for the Stainless-Steel Sector, as it has been done in the case of Carbon Steel. Stainless-Steel is the default victim and suffers huge collateral damage as it is pegged along with the Carbon Steel under the HS Code 72, despite being completely different in terms of process, requirement of raw materials, etc, as compared to Carbon Steel. The 4 and 6-digit levels of HS Code are accepted universally and India cannot do much on these levels, but India can modify it at the 8 Digit Level to bring more clarity with respect to Stainless Steel Industry. This will not only help get authentic data, but will also go a long way in mitigating Under-invoicing, Tax Evasions, Sub-standard Imports and the likes.

Stainless Steel has traditionally been clubbed with Alloy steel for all reporting and policy making. The National Steel Policy 2017 also clubs Stainless and Alloy Steel under the clause 4.9. The Indian Stainless-Steel Industry has matured in last 10~15 years and the issue facing it are different from the rest of the alloy steel industry. Therefore, Stainless Steel deserves to be lineated as an independent industry segment for all policy and reporting.

By ISSDA Team comprising of Rohit Kumar and Rajamani Krishnamurti

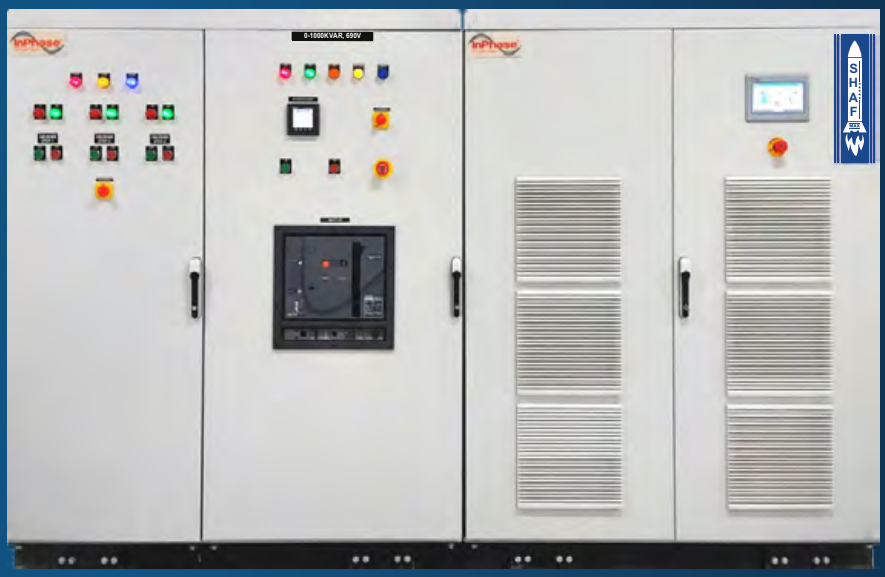
Note: Inputs & Views are personal of the author (s) and not necessarily of FICCI

InPhase®
The Power People

India's Leading Power Quality Company

IGBT Based PQ Solution for Power Factor, Harmonics and Unbalanced Load

ASTRA®
ACTIVE HARMONIC FILTER



SHAF®
SMART HYBRID ACTIVE FILTER

Applications: Steel, Cement, Paper, Railways, Metro, Airport, Floating Grid & Solar
Billing Mode: KWh + PF(Penalty/Rebate) or KVAh Billing

Made in India — Made for the World

Powerful Performance - Latest Technology - Economical Price

sales@inphase.in
+91 7760693303
www.inphase.in

InPhase®
The Power People

Register Office : InPhase Power Technologies Private Limited, No 59,Temple Road, Near Embassy Public School, Chikka Gollarahatti,Magadi Main Road, Bangalore-560091

Where there's steel, there's JSW.

The flagship company of the US$ 22 billion JSW Group, JSW Steel is one of India's leading integrated steel manufacturer. A diverse product portfolio enables our customers to use our steel in a plethora of applications, making JSW Steel an integral part of everything around us.

Scan to Watch

www.jswsteel.in
Toll-free No: 1800-225-225

JSW Steel
Always Around

Innovation Towards Sustainable Steel Production in India

Prof. Viswanathan N Nurni
Professor and Head
Department of Metallurgical Engineering and Materials Science
Professor In-Charge, Centre of Excellence in Steel Technology (CoEST)
Indian Institute of Technology, Bombay

India has emerged the second-largest steel producer on the planet, after China. Still our per capita steel consumption is only one third of the global per capita consumption of 225 kg. We are busy planning tripling our annual steel production within a short span of 7 to 10 years to 300 MT. At the same time, we also need to work towards bringing down CO2 emissions from the steel sector keeping in synch with our national goal on carbon emissions. This is quite a challenging task but can also be viewed as opportunity towards innovation.

Steel sector in India can be broadly classified based on production routes as a) Oxygen route (BF/BOF route) b) Electric route (Electric Arc furnace and Electric Induction Furnace). Oxygen route is typically followed by large integrated steel plants wherein operations such as coke making, production of hot metal through Blast Furnace or/and COREX or/and MIDREX and BOF or/and CONARC or/and EAF to produce crude steel. Typically, the oxygen route production units have 5 or more million tonnes per annum steel production from a single work location. On the other hand, electric route involves of production of DRI using rotary kiln process followed by Induction Furnaces (IF) or EAF. Typically, these plants produce 1 million tonnes per annum or less from a single location. Approximately 60% of crude steel production is through oxygen route and the balance 40% is though the electric route. In this brief article, some thoughts towards sustainable steel production on these two sectors are discussed.

Blast furnace continues and is expected to continue for at least 20 years, if not more, to be the major iron producing unit among large oxygen route steel sector in India. Blast furnace operates close to efficiencies which the second law of thermodynamics dictates. Blast Furnace also has very high thermal efficiencies. No other iron making processes which uses carbon is not expected to come close to these efficiencies. Further, whenever alternate iron making technologies that emerged as a challenge to the blast furnace technology, it could innovate and adopt to remain as the most preferred one. Author opines that till a world economy based on (green) hydrogen comes into existence, blast furnace is expected to continue as prime metal producer from iron ore.

However, there are still opportunities exist that can decrease carbon emission from blast furnace by utilizing more and more hydrogen containing fuels or even (green) hydrogen itself along with

other innovations which can indirectly bring down the carbon emissions. Most of Indian blast furnaces operate with coke made from imported coal. The pulverized coal used for injection through the blast furnace tuyeres are also mostly imported. Opportunity exists in replacing these imported coals with natural gas towards reduction of carbon emissions.

India has achieved 90 Million Metric Standard Cubic Meter per Day of domestic gas production in the recent years. There are plans in place to increase natural gas imports through more LNG terminals. Once natural gas becomes available without any interruptions at reasonable costs, Indian blast furnaces can start using natural gas. Additionally, with proper segregation in place, waste plastics that cannot be recycled any more, can be injected through blast furnace. Further, some of the gases available in the plant such as coke oven gas, syn-gas from coal gasification, etc can also be injected through the blast furnace tuyeres.

Many of the Indian blast furnace area also shifting towards more pellet-based operation. Please note that pellets are preferred for magnetite ore wherein beneficiation techniques, especially magnetic separation, can be used effectively. Owing to this reason, pellets from hematite typically has much more gangue content than pellets from magnetite. More gangue content calls for more flux to be added with the iron ore burden. Further, since the coke ash is released at the tuyeres, the additional flux that is needed to flux this coke ash also needs to be added with the iron ore burden. Unfortunately, unlike sinter, operating blast furnace with high basicity pellets is challenging owing to problems of swelling and other issues. Hence, there is a need to optimize the proportion of sinter and pellets in blast furnace operation so that maximum productivity with stable operation is achieved. As an alternative to flux the coke ash where it is released, injection of lime or slag containing lime through the tuyeres can be beneficial in terms of increasing the production rates as well as decreasing hot metal silicon.

It is high time that India has its own well instrumented experimental blast furnace so that these ideas and much more can be scientifically explored towards technological innovation within the country (Atmanirbhar Bharat).

Unlike blast furnace which demands high quality expensive coal, rotary kilns can be operated with relatively cheaper coal. However, fuel efficiencies one can obtain from rotary kilns are much lower than that from blast furnaces. Small steel plants with annual production of less than 1 million ton of steel prefer rotary kilns owing to their low investment costs. Theoretically, using gas-based reduction processes, such as MIDREX process, can be more effective in reducing the carbon emission for the production of DRI. Unfortunately, low production capacity gas based DRI plants calls for high investment costs that, economically they become challenging for small production units. Therefore, there is a need to improve fuel efficiencies as well as usage of more hydrogen containing fuel such as natural gas in rotary kilns needs to explored. If natural gas become available, there is also a possibility gradual emergence of medium scale DRI producers who use gas-based reduction process to produce DRI and supply to small steel plants producing crude steel using induction furnace process.

Gas based DRI process using hydrogen followed by EAF that uses steel scrap and DRI is expected to be the steel making technology when hydrogen economy kicks in. However, there are challenges in terms of higher reduction temperatures for the production of DRI using hydrogen which may lead to sticking issues. Further, some amount of carbon in the DRI is needed for efficient utilization of electrical energy during EAF steel making. There is an urgent need to work towards these technologies so that our steel sector can shift towards green steel production when (green) hydrogen economy become a reality.

Keeping these needs and challenges in mind, IIT Bombay with support of the Ministry of Steel, GoI, has formed a Centre of Excellence in Steel Technology. Tata Steel and JSW Steel has been supporting the centre. Recently, JSW signed an MoU with IIT Bombay to strengthen the CoEST by providing infrastructure support to host the centre and further strengthen the academia-industry collaboration. This centre hopes to

play a crucial role in the coming years towards man power training and innovation towards sustainable steel production for the country.

CoEST, IIT Bombay had conducted a few brain-storming sessions with members of industry and R&D labs to understand the challenges towards innovation in the steel sector. One of the important points emerged from these discussions are necessity to create engineering and design expertise (not just the research expertise) along with pilot scale facilities so that ideas from the lab scale can be transformed into innovations at the plant scale. Industrial organizations who may be competitors in the market, need to come together and constructively collaborate with R&D labs and academia may be through a consortium mode so that ideas at the lab scale can be upgraded to higher TRL levels. Once an idea comes to particular TRL level, one or more participating industrial organizations may take it further to higher TRL levels. These efforts also call for generous support from the government. Such models are existing elsewhere in the world for us to adopt.

I take this opportunity to thank all the faculty members and students of CoEST and the Department of Metallurgical Engineering and Materials Science, IIT Bombay, personnel from the Ministry of Steel, experts from various steel plants and R&D organizations for their valuable discussions based on which this article has been written.

Note: Inputs & Views are personal of the author (s) and not necessarily of FICCI

आज़ादी का अमृत महोत्सव

G20 भारत 2023 INDIA

सेल SAIL

INDIA'S FIRST STEEL CHAT BOT

AAPKA SAATHI - SAIL SARATHI

YOUR ASSISTANT TO SAIL STEEL

सेल सिक्योर टीएमटी बार्स

आपके घर को दे लम्बी उम्र

#AbNishchintHoJayein

Order online: www.sailsuraksha.com

SeQR TMT BARS FOR SAFE HOMES

स्टील अथॉरिटी ऑफ इण्डिया लिमिटेड
STEEL AUTHORITY OF INDIA LIMITED

@ SAILsteelofficial @SAILsteel @steelauthority @SAILsteel @steel-authority-of-india-limited

Danieli QLP®
Quality
Long Products

Danieli Universal Direct Rolling Technology

info@india.danieli.com

QLP® Just one powerful casting strand for the most flexible and competitive production

Danieli Universal Direct Rolling technology sets a new standard in the production of long products. The unique capability of Danieli Octocaster to cast billets at speeds up to 10 m/min for quality rebar, and with 99% plant yield achieved at industrial installations, makes possible productivities up to 250 tph per strand. Danieli Universal Direct Rolling technology is the only technology where up to three rolling modes are performed in a single line: billet-to-billet, semi-continuous or continuous, with production capacities ranging from 100,000 to over 2,000,000 tpy.

Danieli QLP® casting and rolling plants are available as:

> NANO QLP®

> REGIONAL QLP®

> JUMBO QLP®

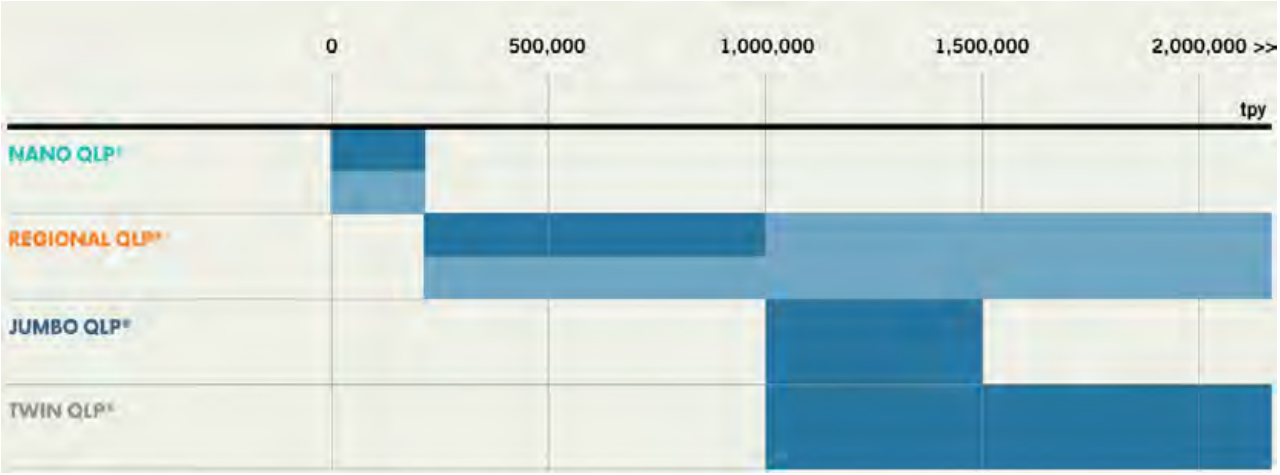
> TWIN QLP®

Choose your QLP® layout configuration

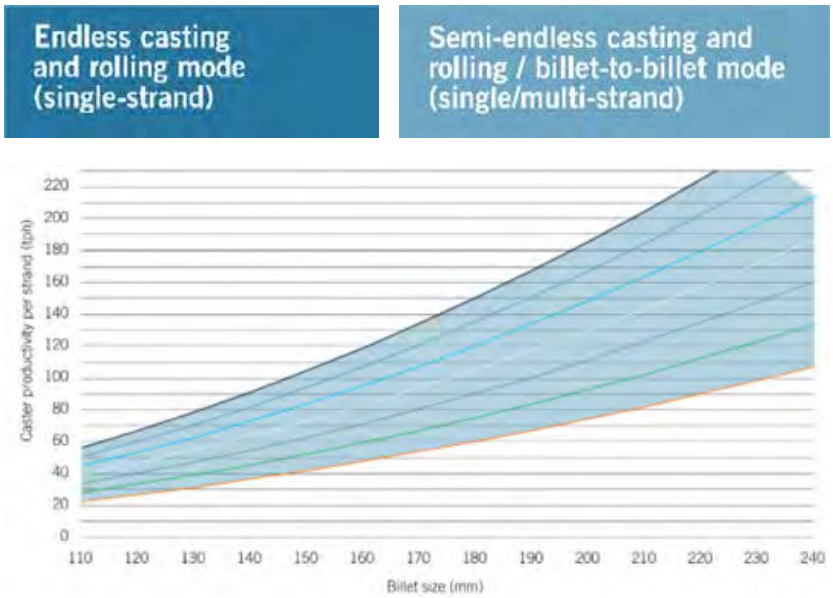
QLP® Added-Value Products and Layout Solutions

Available in four configurations –Nano, Regional, Jumbo and Twin– Danieli QLP® Universal Direct Rolling plants produce straight and spooled bars, wirerod and light sections in capacities from 100,000 to more than 2,000,000 tpy. Any product combination is possible in steel grades, ranging from ULC to mild steels and up to SBQ, with quality and production consistency.

Featuring Danieli Universal Rolling, each configuration offers the most competitive CapEx and OpEx, giving tangible advantages over traditional minimills. Energy savings up to 1.2 GJ/t, and maximized efficiency up to 99% yield, along with 5% runlight as well as less manpower, lead to operating cost savings of about 20%. The absence of reheating furnace makes it possible to generate zero NOx, Sox and CO2 direct emissions during casting-rolling. No billet stocking or handling, along with smaller plant dimensions, contribute to lower capital costs. QLP® plants are available as endless, semi-endless and billet-to-billet casting and rolling that are chosen based on the customer requirement and market demand. In endless casting and rolling, the steel billet flows from a single-strand caster and is directly rolled after solidification, without any interruption or delay in the process. Semi-endless production is still performed on a single-strand caster, where the billet is cut in customized lengths before entering the in-line rolling mill. Billet-to-billet mode is performed by a multi-strand caster feeding the rolling mill, still without the need for a reheating furnace or intermediate billet storage.



QLP® Universal Direct Rolling configuration diagram: plant capacities and rolling modes.



QLP® Universal Direct Rolling configuration diagram: plant capacities and rolling modes.

In all three cases an induction heater can be provided at the rolling mill entry for billet temperature equalization when required by the process.

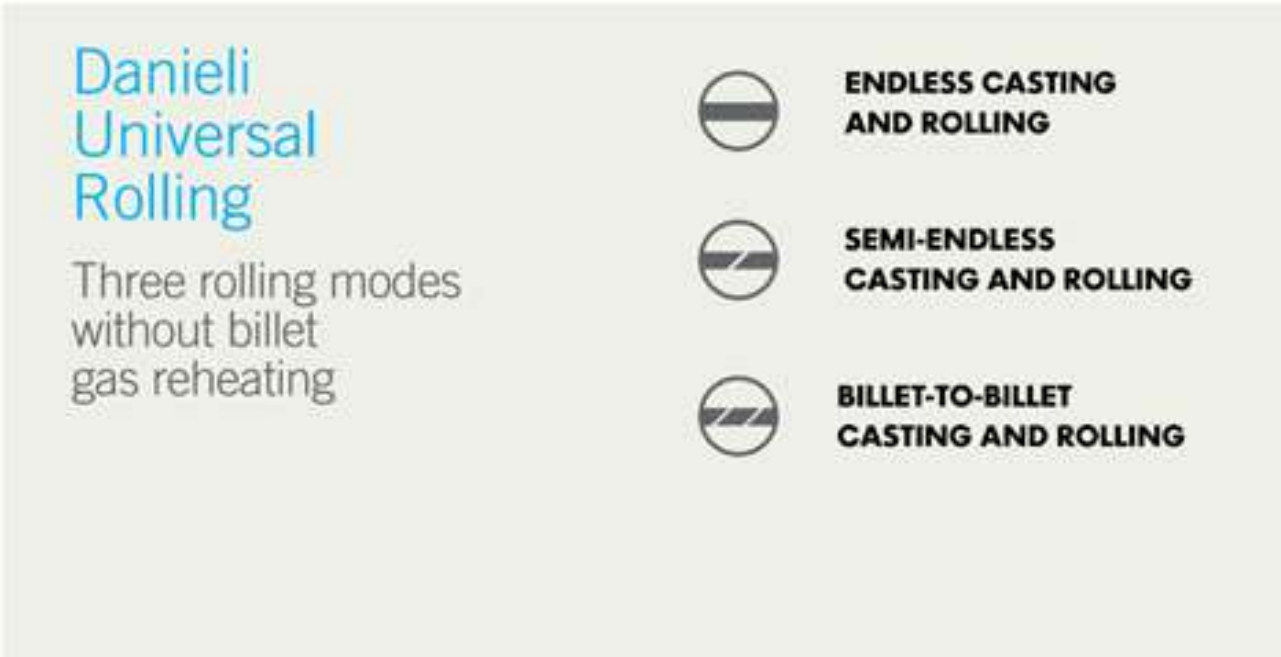
Endless casting and rolling mode is the preferred solution, providing the highest operational savings and the lowest emissions, together with the best process stability and final product quality. However, semi-endless mode can be selected when process requirements of casting and rolling speed cannot match each other, or when the logistics of the meltshop and rolling mill do not allow the direct connection between the caster and the rolling mill. Finally, billet-to-billet mode is an effective option for revamping programs that involve space constraints.

Most Danieli QLP® plants are based on singlestrand casters –endless or semi endless– as they can produce up to 1.5 Mtpy with one strand only. Up to 200,000 tpy, NANO QLP® provides the most cost-effective solution starting from small billet sections, typically 100x100 mm. From 300,000 to 1,000,000 tpy, single-strand REGIONAL QLP® performing in endless or semi endless mode, offers the lowest OpEx and emission solution at very competitive CapEx.

Above 1 Mtpy and up to 1.5 Mtpy, single-strand JUMBO QLP® performing in endless or semi endless mode, operates with larger billet sections. TWIN QLP®, featuring two casting and rolling lines performing in endless or semi endless mode, produces up to 2 Mtpy.

Finally, billet-to-billet multistrand casters are typically selected with commercial-size billets from 130x130 to 165x165 mm, to cover the production range from 300,000 tpy to over 2 Mtpy.

Each configuration offers the most competitive CapEx and OpEx, giving tangible advantages over traditional minimills.



QLP® Technologies

DIGIMELTER® intelligent melting unit

Danieli developed and patented the Digimelter®, a revolutionary melting unit consisting of a unique combination of power, intelligence, and environmentally friendly equipment to achieve 15,000 heats per year with minimal OpEx, lowest environmental impact, and high flexibility for raw materials. Power is generated by the innovative Danieli Q-One® digital power-feeding system, which overcomes the limitations of traditional transformers. Q-One® digitally controls both current and voltage, independently for each electrode, providing the highest power factor and lowest disturbances, with unmatched advantages towards both the feeding line and to the furnace process.

Q-Melt™ intelligent automation minimizes OpEx and provides consistency of operation. It controls automatically and in real time each chemical and electrical working parameter in a consistent and adaptive way, achieving the best performances with reduction of process variability.

Flexibility on raw materials is ensured by the Zerobucket system. In combination with the new concept of sealed “Eco-Pro” furnace design, it drastically reduces by half the direct CO2 footprint and by 25% the overall carbon emissions, optimizing transformation costs compared to conventional EAFs.

Zerobucket® continuous scrap charge

Hytemp continuous hot DRI charge

Q-Melt™ automatic furnace

Digimelter® Performances Compared to Conventional EAFS

DANIELI 1.3-MTPY TWIN MIDA QLP®, CHINA

The one installed in Guiling Pinggang's plant is the world's first twin MIDA QLP minimill, designed to produce top-quality rebar grades in bundles and wirerod in endless mode. Featuring two endless casting and rolling lines in a single continuous casting machine, and starting from 190×190-mm square billets, it can conveniently produce two different finished products at the same time, in a most efficient and cost-effective way.

DANIELI THE TEAM

Renewable Energy - Greening Steel Industry

Sh. Shiromani Kant
General Manager (Business Development - Green Hydrogen & Ammonia)
ACME Group

Introduction

The steel industry is an important sector that plays a significant role in various economies, worldwide. It is used in many sectors, like construction, transportation, energy, and infrastructure to name a few. India is currently the second largest steel producer in the world and has become one of the major steel hubs in the world for both the production and consumption of steel. India's per capita consumption of steel @ 78Kg is one of the lowest against global average of 228Kg. Being a developing country, steel demand set to increase. The Ministry of Steel has planned for the creation of a steel production capacity of 300 MT by 2030, and 500 MT by 2047 from an existing Gas based Direct Reduced Iron (DRI) Capacity of 90 Lakh tonne / Annum, While the demand for steel grows, it is important to note that the Steel sector is major energy guzzler and a huge emitter of CO2, and has a significant impact on the environment.

The Steel sector contributes to 8-9% of the country's total greenhouse gas emissions, making it one of the largest contributors to climate change. The steel industry is the largest industrial sector in terms of intensive energy and resource use, it accounts for one-fifth of industrial energy consumption. India is a signatory of the Paris agreement and in Conference of the Parties (COP26) on climate change has announced ambitious targets of reduction of carbon emissions by 2030 and hit net-zero carbon emissions by 2070. To achieve the climate goal, India is promoting decarbonization of the steel sector and transitioning towards the production of 'Green Steel' in the country. This write-up intends to explore the concept of environment-friendly green steel and the transition toward its production.

What is Green Steel?

As per BusinessWire, Green steel is environmentally friendly steel that has a lower carbon footprint than traditional steel-making processes. The implementation of non-coal-based alternative technologies results in a reduction in this footprint. In most cases, green steel production uses green hydrogen instead of the traditional carbon-intensive manufacturing route of coal-fired plants. Experts are focusing on Green Hydrogen as the future fuel for producing Green Steel.

Green steel is also produced using recycled scrap metal instead of virgin iron ore, reducing the need for mining and extraction activities. The concept of green steel is relatively new and still evolving. However, as the world seeks to reduce carbon emissions and combat climate change, it is gaining popularity.

Transition Towards Green Steel

Green Steel manufacturing is an expensive process involving high cost. The transition towards green steel requires significant changes in the way steel is produced, starting from raw materials to the production processes. The transition involves the following:

- **New Technological Developments**

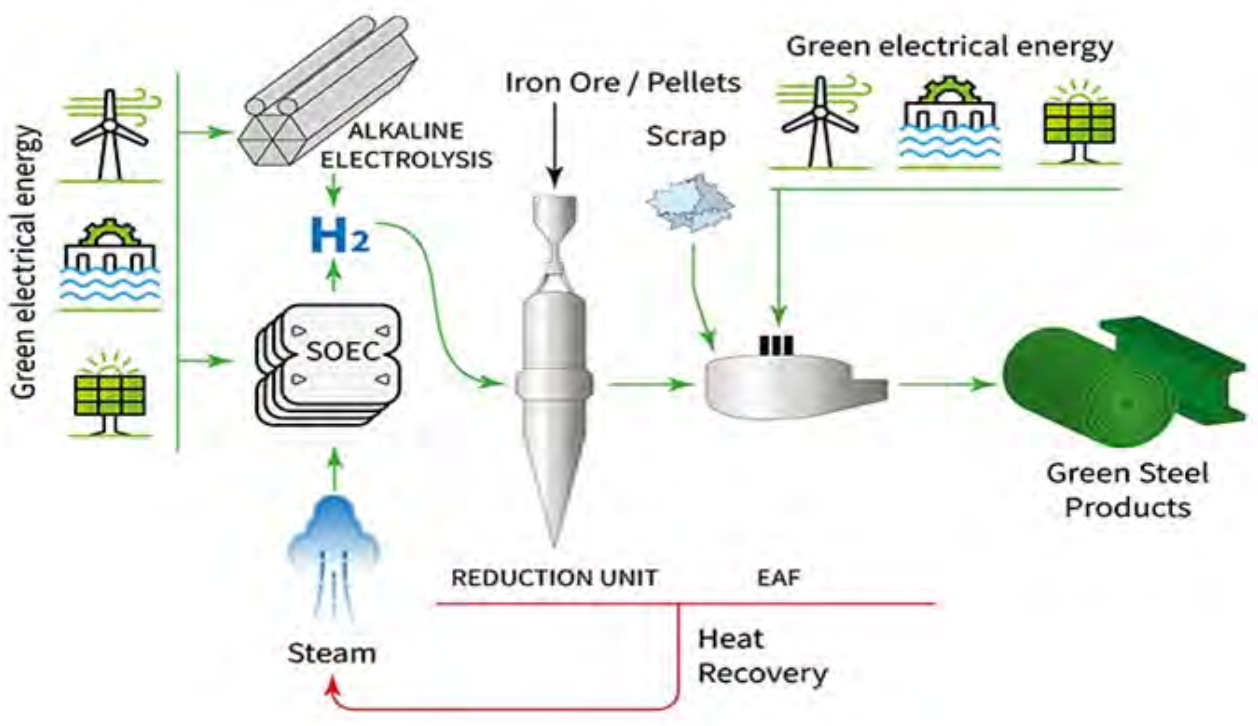
  Green steel making process is similar to the conventional Direct reduced iron (DRI)-Electric Arc Furnaces (EAF) route of steel making with the following major changes in the process:

  - Instead of coke, green hydrogen is used to reduce iron ore in the DRI process to generate iron. Green hydrogen is also utilized as a fuel source to provide heat for the iron-making process.

  - Renewable Energy (RE)-based electricity is used to supply energy for steel production in EAF and other plant power needs.

The aforementioned modification renders the green steel substantially emission-free.

Figurer 1: Depiction of Green Steel Production



- **Production of Green Hydrogen**

  Green Hydrogen technology is based on the electrolysis of water (H2O) to produce hydrogen (H2) and oxygen (O2) by Electrolysers. This approach separates the hydrogen from the oxygen in water using an electric current generated from renewable sources like solar, wind, etc which is an environmentally friendly and carbon emission-less process. Broadly, there are four types of electrolyzer technologies available—Alkaline Electrolysis (AE), Proton Exchange Membrane (PEM) Electrolysis, Anion Exchange Membrane (AEM) Electrolysis, and Solid Oxide Electrolysis (SOE). To promote the development of Green Hydrogen economy, India has published its Green Hydrogen Mission Policy document. Many companies have made announcements for establishing Green Hydrogen Projects in the country some of the prominent ones are Reliance Group, NTPC, ACME, IOCL, Greenko, Renew, etc.

- **Shifting to Renewable Energy Sources**

  In the transition towards green steel, the industry needs to shift to renewable energy sources such as solar, wind, and hydrogen. These sources of energy do not emit CO2, making them environmentally friendly thereby helping in reducing carbon footprints.

- **Reusing Scrap Metal**

  Green steel is produced using recycled scrap metal instead of virgin iron ore. The use of scrap metal reduces the need for mining and extraction activities, which are energy-intensive and emit large amounts of CO2. Recycling also reduces waste and conserves natural resources.

Green Steel – Challenges

Currently, the production of Green Steel is being undertaken in a pilot project mode the commercial production of conventional steel at competitive prices is anticipated at a later stage. There are however several challenges that need to be addressed for the financial viability of sustainable production of green steel.

- In DRI-based facilities, there is a high demand for high-grade iron ore (Fe content 66%). The availability of such high-grade iron ore is not only limited but has been declining due to the heavy exploitation of high-grade ore resources. Promoting beneficiation and palletization to yield DR-grade pellets that can be utilized in a DRI plant can be a way out. R&D is required for the creation of technologies that permit the use of low-grade iron ore.

- 50-55 kWh is required to produce 1 kg of hydrogen and theoretically 54 Kg and practically around 70-80 Kg of Hydrogen is required to produce each tons of steel. Therefore, infrastructure development on a massive scale is necessary to support the enormous quantity of green hydrogen generation.

- At current estimates Green Steel is 50 to 120% costlier than conventional steel production. The primary reason for the prohibitive cost is the high Levelized cost of Hydrogen (LCOH) . Of the total cost of production of green hydrogen, 50-55 % can be attributed to Renewable energy (RE) power cost and 30 -35 % to the electrolysers, and rest 10-20% to others. The cost of RE-RTC (round the clock) power from sources such as solar, wind power and battery are relatively high, and the technology for producing green hydrogen is still in its early stages thereby making it more expensive than grey hydrogen.

Way Forward

In the decarbonization journey, the transition from grey to green steel would require groundwork with a clear road map to have a substantial influence on the acceptance of green steel. Some of the key focus areas could be as under:

- Availability of RE RTC: The availability of RE sources is intermittent and dependent on weather conditions. This makes it difficult to rely solely on RE sources for consistent hydrogen production and it will limit the efficiency of electrolyser to the RE generation hours only. Therefore, in order to increase the efficiency of electrolyser, RE RTC power is required at cheaper cost so that the electrolyser can be operated for higher number of hours throughout the day and low-cost green hydrogen can be produced.

- Robust transmission infrastructure: Green hydrogen and ammonia projects requires significant quantum of power throughout the day without any interruption. Therefore, a robust evacuation infrastructure is required to make sure that reliable power is made available to Green hydrogen and ammonia projects

- Ramping up production and efficiency of Electrolysers: Improving the efficiency of electrolysis and achieving economies of scale to reduce the LCOH will make it competitive with respect to grey hydrogen. R&D in the electrolytic process technologies would make them more efficient.

- Development of Infrastructure: Specialized infrastructure is required for hydrogen production, storage, and distribution which currently is based on fossil fuels. Significant investment and planning are required to replace or adapted to accommodate green hydrogen.

- Addressing safety issues: Hydrogen is highly flammable and safety concerns will have to be addressed to ensure the safe and effective use of green hydrogen during its production, storage, and transportation.

- Collaboration and Investment: To drive the demand for Green Steel and to make investments in Green Steel production profitable for the steel manufacturers, there is a need for collaboration between industry players, governments, and investors. Collaboration is necessary to develop new technologies, share knowledge and resources, and create policies that support the transition. Investment in research and development, infrastructure, and training is also essential to facilitate the transition.

- Policy & Regulatory Support: To generate the initial demand for green steel production in India, the government may introduce various regulatory policies for reducing emissions from the iron and steel sector in a phased manner. Considering the higher costs of Green Hydrogen at present, natural gas based DRI Steel plants could begin by blending a small percentage of Green Hydrogen in Natural gas. The blending proportion could be progressively increased as cost-economics improve and technology advances. Further, it may be mandated at an appropriate stage that any upcoming natural gas based DRI steel plants should be able to operate with Green Hydrogen. This would ensure that these plants are competitive in future global Steel markets.

DRI technology using hydrogen will be essential to the future manufacture of high-purity steel. The availability of green hydrogen, access to reliable RE power, and detailed policy & regulatory support that incentivize the low emission steel making would go a long way in achieving India's net-zero targets.

Disclaimer: The views and opinions expressed in this article are those of the writer and do not necessarily reflect the views or positions of any entities.

Note: Inputs & Views are personal of the author (s) and not necessarily of FICCI

Steel in Construction: Development of Codes and Standards

Sh. Manas Mohon Ghosh
Institute for Steel Development & Growth, Kolkata

Economy and Consumption of Steel

Infrastructure sector is a key driver for the Indian economy. The sector is highly responsible for propelling India's overall development and enjoys intense focus from Government for initiating policies that would ensure time-bound creation of world class infrastructure in the country.

Infrastructure sector includes Power, Bridges, Ports, Airports, Railways, Irrigation, Water Supply, Sanitation, Roads, and Urban Infrastructure Development. It drives the growth of the allied sectors like rural development, job creation, logistics, etc.

India's aim is to reach a US$ 5 trillion economy by 2025. Infrastructural development is a major booster. The government has launched the National Infrastructure Pipeline (NIP) combined with other initiatives such as 'Make in India' and the Production-Linked Incentives (PLI) scheme to augment the growth of infrastructure sector. Prime Minister has a vision to make India a developed nation by 2047. There is a target of INR 110 trillion in NIP alone. Centre's Capex is to reach INR 10 trillion in FY 2024.

Historically, more than 80% of the country's infrastructure spending has gone toward funding for transportation, electricity, and water & irrigation.

Some of the recent government initiatives and investments in the infrastructure sector are as follows:

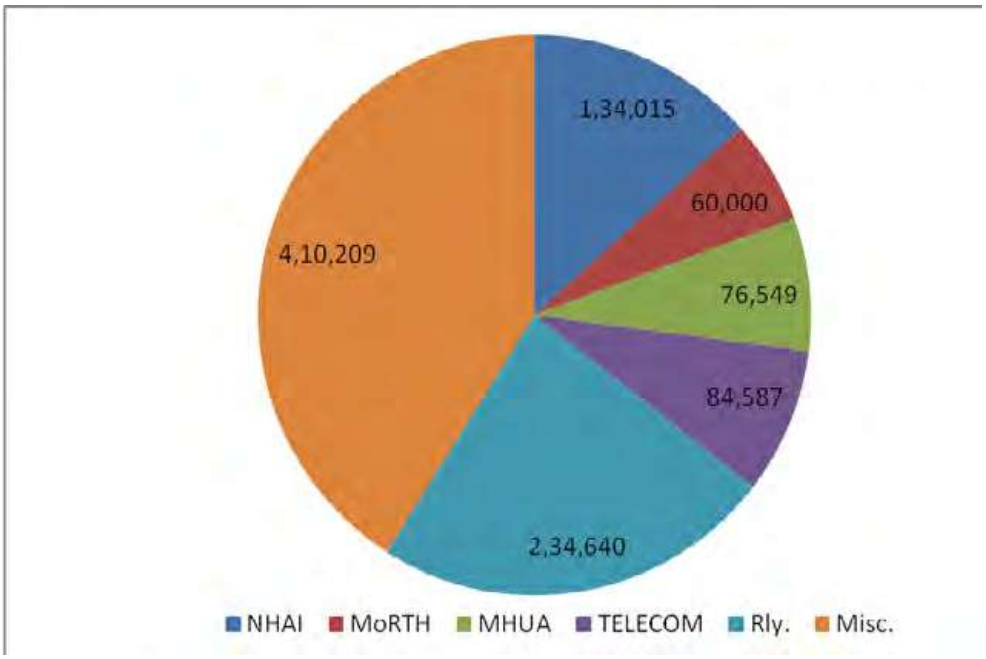
- **In Union Budget 2022-23:**
    - The government has given a massive push to the infrastructure sector by allocating Rs.10 lakh crore (US$ 130.57 billion) to enhance the infrastructure sector.
    - The government allocated Rs.134,015 crore (US$ 17.24 billion) to National Highways Authority of India (NHAI).
    - The government announced an outlay of Rs.60,000 crore (US$ 7.72 billion) for the Ministry of Road Transport and Highways (MoRTH).
    - The government announced Rs.76,549 crore (US$ 9.85 billion) to the Ministry of Housing and Urban Affairs (MoHUA).

- The government allocated Rs.84,587 crore (US$ 10.87 billion) to the Department of Telecommunications to create and augment telecom infrastructure in the country.

- The total revenue expenditure by Railways is projected to be Rs.234,640 crore (US$ 30.48 billion).

- 100 PM-GatiShakti Cargo Terminals for multimodal logistics facilities will be developed over next three years.

- Focus was on the PM GatiShakti - National Master Plan for multimodal connectivity to economic zones. Everything, from roads to trains, from aviation to agriculture, as well as many ministries and departments, will be integrated under the PM GatiShakti National Master Plan.



Source: Govt of India Portal

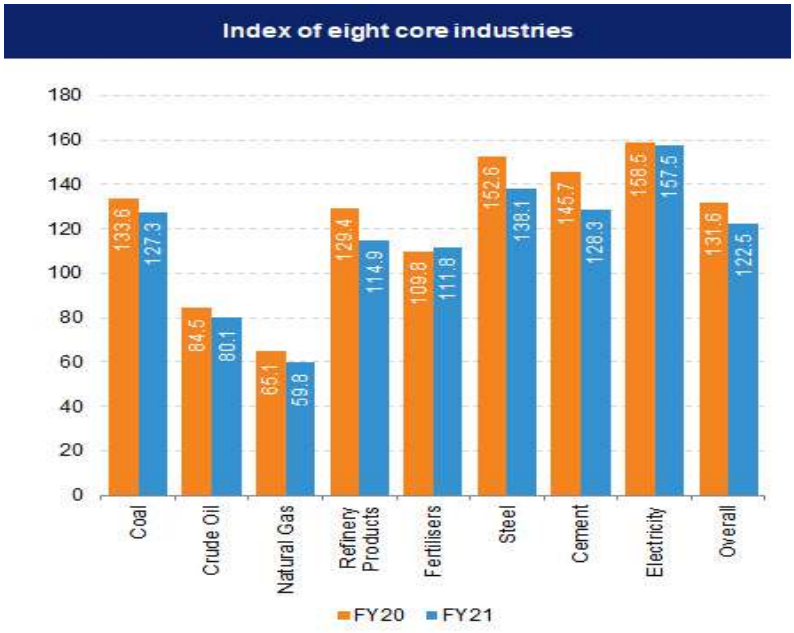
Role of Steel

Here comes the importance of steel and its consumption pattern.

Steel and Cement ratio, as it stands out in India is approximately 0.3. In many developed countries the same is as high as 1.5. So, apparently there remain a space where steel may find its use. That leaves ample room for promotion to increase the consumption of steel in infrastructure in the country.

The bar chart delivers a comparative position of Steel sector vis-a-vis all other seven core industry in the manufacturing side.

Consumption / Demand in Building and Construction (in Million Tons)



Source: Govt of India Portal

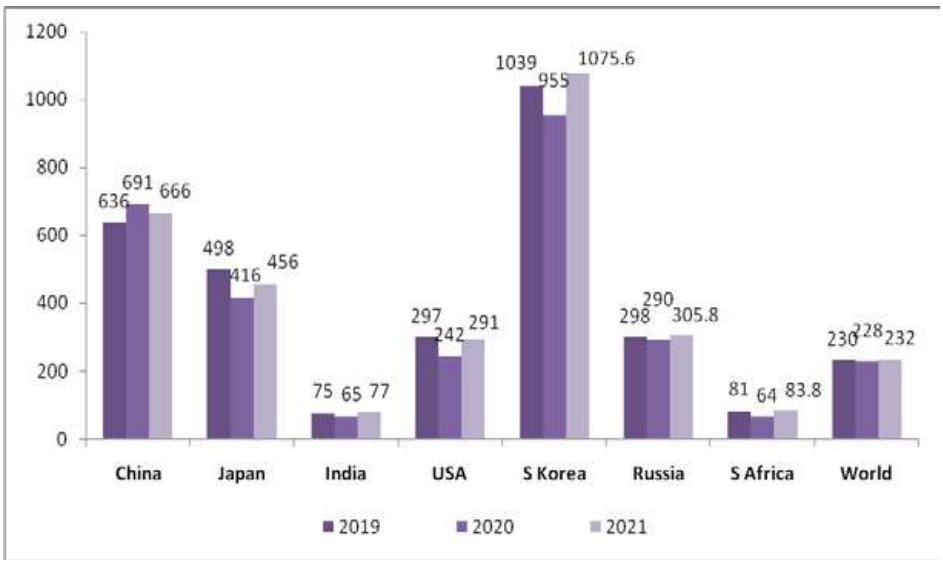
The bar chart is impressive and shows Steel industry's impact on Indian Economic scenario.

Though the per capita of consumption of steel in the country is very low in comparison to world average, the recent plans of Infrastructure development keep a huge scope of use of steel. However, the per capita consumption in such a populus state may an aberration; the figures of actual consumption may be considered the reference point of economic indices of this sector.

Consumption in the rural sector is abysmally low, 21kgs in 2022 as per the data available from JPC. However, the same in urban sector has shown signs of development. The overall consumption is around 77.2 kgs. in 2022.

Below is the Country-wise per capita consumption of crude steel – year-wise

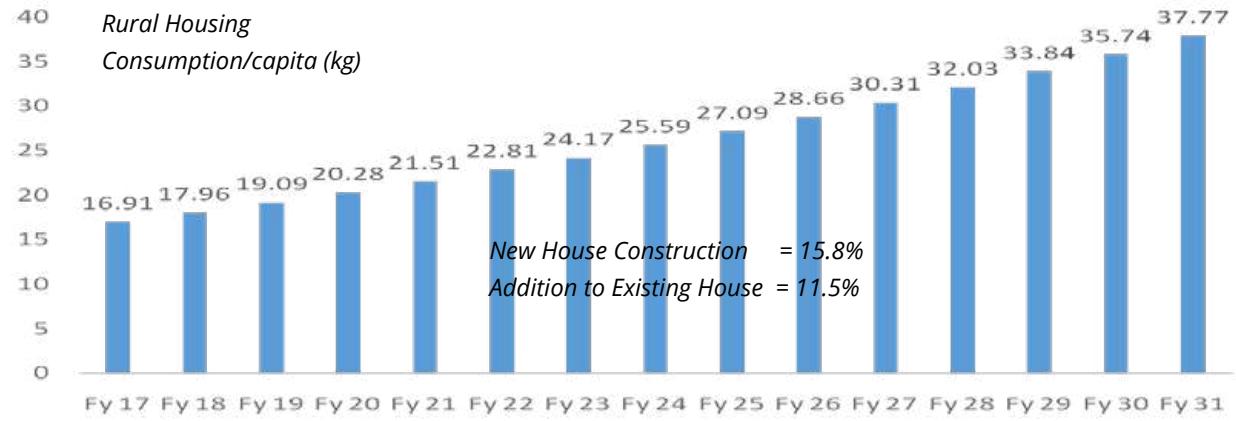
Per Capita Consumption of Steel- in kgs- 2019, 2020, 2021



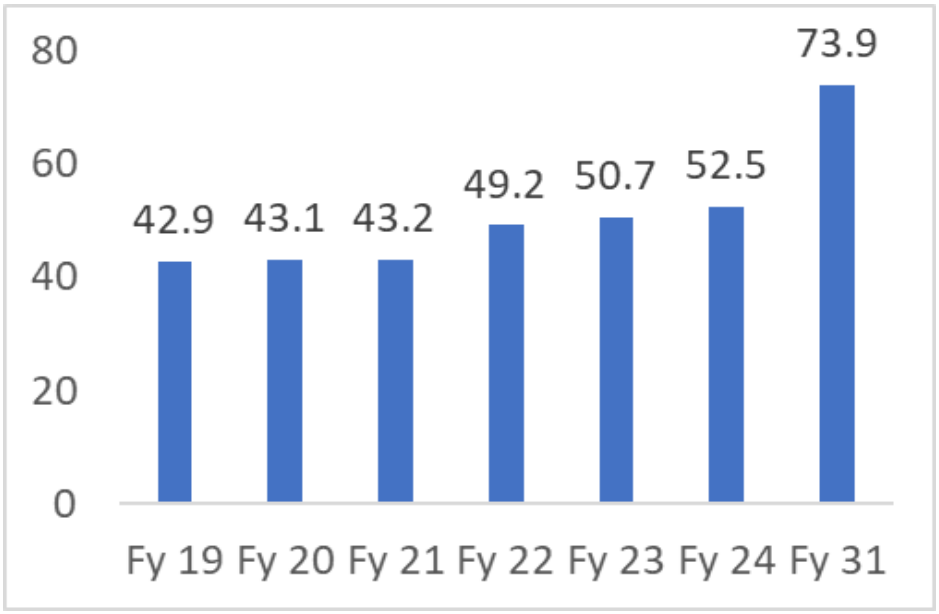
The National Steel Policy has set a target of 130 kgs per capita consumption by 2030.

The per capita consumption of steel for rural housing has been projected as below:

Rural Housing – Consumption per capita



Source:
JPC End Use Segment-wise Steel Demand, FY 19 Study by CRISIL



Source: JPC Steel Demand in Rural Areas, FY 19 Study by IMRB

Study of these graphs leads to the assumption that the consumption of steel in the infrastructure has a ample space for high growth. The Government spending via central schemes like Bharatmala, Sagarmala, Railway (Metro and Dedicated Freight Corridor (DFC)), Civil Aviation, Jal Jeevan to name a few are the boosters and avenues for spending and development.

However, consumption of Steel in India is not taking off in a desired pace. Some of the factors are – lack of awareness among the deciding authorities about the long-term benefit of Steel, lack of focus on Steel in Govt Tenders, lack of thrust on Steel vis-a-vis other construction materials. In addition, in terms of structural design and ease of use, Bureau of Indian Standards (BIS) needs to address adequately in simplistic fashion (without creating ambiguity) explanations which will make use of Steel easy among architects and Engineers.

Preparedness of Codes developed under Bureau of Indian Standards (BIS), Indian Road Congress (IRC)

With this punch in demand boosting, actual implementation will be a combination of actual output of all stake holders, both from supply side and demand side. In between are the codal provisions which also play a silent but important conduit for smoothening this developmental process. Its role and importance can be gauged when a technically qualified product is served.

The importance of codes is well defined in BIS document itself, reproduced here which is as follows:

- Codes and Standards ensure the safety, Quality and reliability of products and services. They facilitate trade and protect our health and the health of our environment.

- It serves various purposes for businesses, for customers, for Government.

A review and the status of some handpicked codes and standards have been made which basically have influenced the more use of steel.

Revolutionary Revisions

Codes	Title	Earlier Revised	Last Revised
IS 800	General construction in steel – Code of practice (third revision)	1984	2007
IS 875 Part 3	Code Of Practice Design Loads (Other than Earthquake) for Buildings and Structures- Code of Practice: Wind Loads	1987	2015
IS 1893 Part 1	Criteria for Earthquake Resistant Design of Structures: General Provisions and Buildings	2002	2016
IS 808	Hot Rolled Steel Beams, Columns, Channels, and Angle Sections- Dimensions and Properties	1989	2021
IS 2062	Hot Rolled Medium and High Tensile Structural Steel - Specification	2006	2011
IS 1786	Specification for High Strength Deformed Steel Bars and Wires for Concrete Reinforcement (amended)	2008	2019
IS 11384	Code of Practice for Composite Construction in Structural Steel and Concrete	1984	2022
IRC 6	Standard Specifications and Code of Practice For Road Bridges: Loads and Stresses	2016	2017
NBC	National Building Code	2008	2016
IRC 22	Standard Specifications and Code of Practice For Road Bridges: Steel Concrete Composite Construction	2010	2015

The BIS code: IS 800

This code has been a major revolution in structural steel design since 2007. It transformed the theory of designing from Working Stress Method (WSM) to a much-developed Limit State Method (LSM). This concept was a paradigm shift and Structural Design Engineers had to unlearn and then relearn the concept. It brought rationale in the designing system. In view of the developments and production of new varieties of medium and high tensile structural steel in the country, the scope and the standard of the code have been modified permitting the use of another variety of structural steel provided the relevant provisions of the standards are satisfied. Certain physical properties like plastic moment of inertia, torsional cross section properties have been added which are required in Limit State method of calculation.

The BIS code: IS 801

This code is undergoing revision currently. Incidentally, it was revised last 45 years back and has been due for an update long time back. The code is Use of Cold Formed Light Gauge Steel Structural Members In General Building Construction. Here also the concept of designing is being changed, which again will be a huge deviation from the earlier theory. The pre-Engineered Building (PEB) sector using cold formed steel will be highly benefited with this development.

The BIS code: IS 875 Part 3

This code which provides the guidelines for quantifying loads generated from the effects of wind on structures has been revised in 2015 has considered all the developments like identifying and factoring cyclone prone areas, revising Terrain Category, incorporating Terrain and Height Multiplier, revising Gust Factor method to name a few. The Wind Map of India was also updated.

The BIS code: IS 1893 Part 1

This code quantifies external load developed due to tectonic movement of the earth's crust leading to earthquake which affects structure. Experiences from certain major earthquakes and the data generated thereafter have been included in the code. The values of Design spectra were modified, bases of various load combinations were streamlined, temporary structures were brought in its fold, importance factors were modified, provisions of Torsion was simplified. The earthquake map of India was revised, Zone 1 was eliminated.

The Indian Road Congress (IRC) code: IRC 6

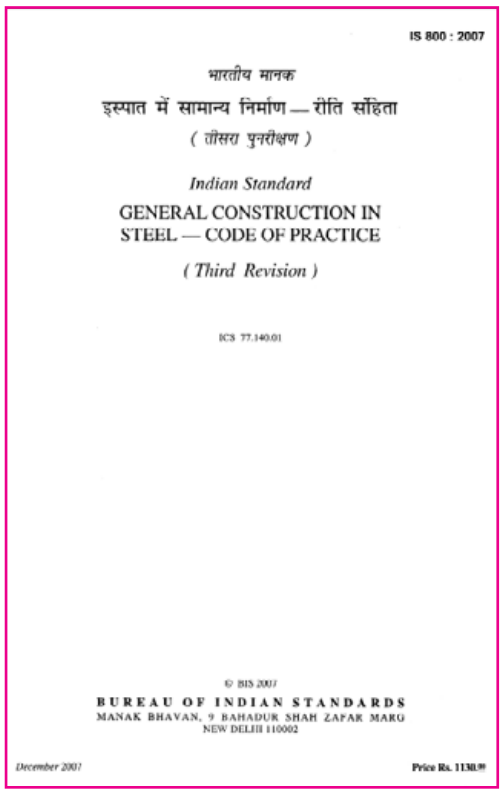
This code dealing with quantification of external loads and stresses developed on Bridges due to vehicular movements has incorporated all the new developments of vehicles and its loading aspects. This is again a revolutionary revision.

Some of the codes of great importance, basically for designing has been reviewed and is been discussed here.

Selected codes under consideration for Revision/ Reaffirmation

BIS	Earlier Revised	Title	FOR	Last Revised
801	1975	Code of Practice for Use of Cold Formed Light Gauge Steel Structural Members In General Building Construction	*****	
802	1978	Code of practice for use of structural steel in overhead transmission line towers: Part 2 Fabrication, galvanizing: Inspection and packing	*****	*****
803	1976	Code of Practice for design, fabrication and erection of vertical mild steel cylindrical welded oil storage tanks (first revision)		*****
804	1973	Specification for rectangular pressed steel tanks (first revision)		*****
805	1968	Code of practice for use of steel in gravity water tanks	*****	
806	1968	Code of practice for use of steel tubes in general building construction (first revision)	*****	*****
2314	1986	Specification for steel sheet piling sections (first revision)		*****
2713	1980	Specification for tubular steel poles for overhead power lines (second revision)	*****	*****
2750	1964	Specification For Steel Scaffolding	*****	
4000	1992	High strength bolts in steel structures – Code of practice (first revision)		*****

BIS	Earlier Revised	Title	FOR	Last Revised
4014	1967	Code of Practice For Steel Tubular Scaffolding	*****	
6533	1989	Design and construction of steel chimney – Code of practice	*****	*****
9178	1979	Criteria For Design of Steel Bins For Storage of Bulk Materials	*****	


IS 800 : 2007

भारतीय मानक

इस्पात में सामान्य निर्माण — रीति संहिता

(तीसरा पुनरीक्षण)

Indian Standard

GENERAL CONSTRUCTION IN STEEL — CODE OF PRACTICE

(Third Revision)

ICS 77.140.01

© BIS 2007

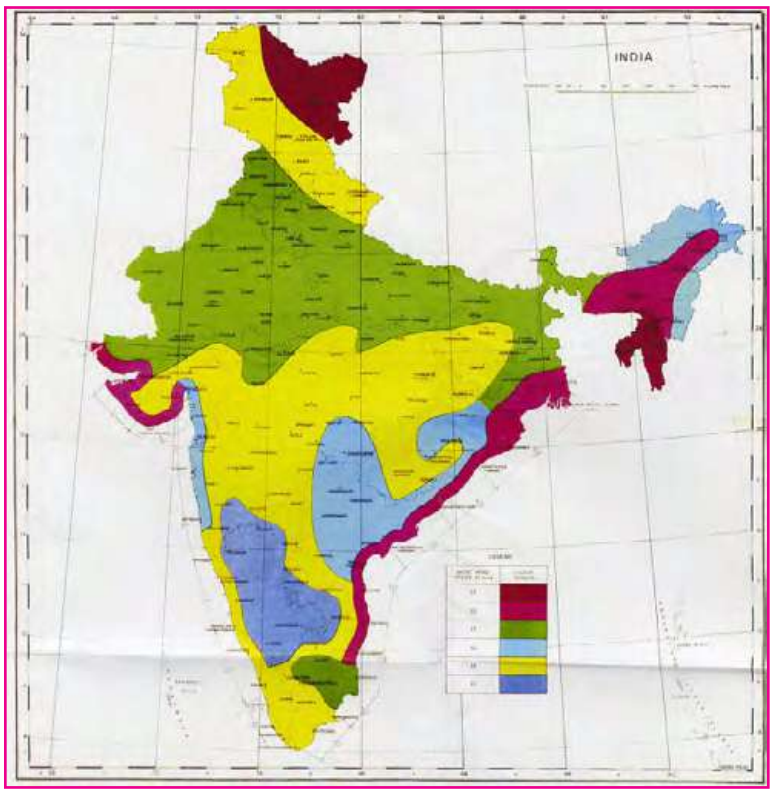
BUREAU OF INDIAN STANDARDS

MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG NEW DELHI 110002

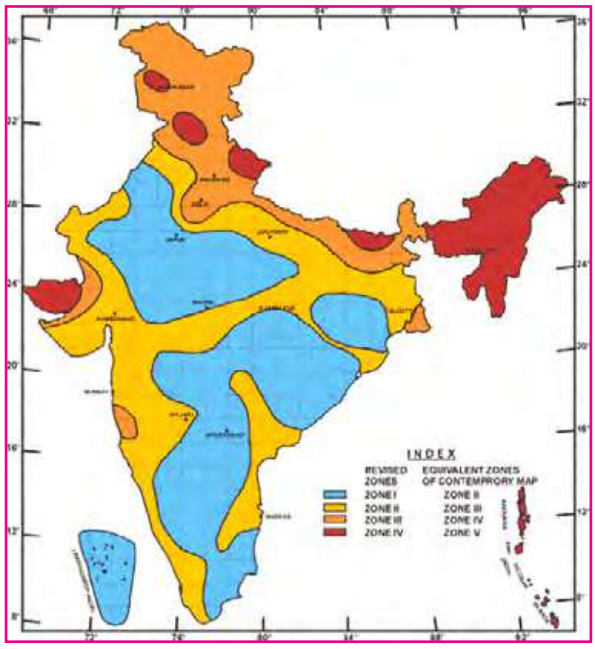
December 2007

Price Rs. 1130.00

Cover: IS 800-2007: General construction in steel - Code of practice (third revision)



Wind Map: IS: 875 Part 3 – 2015: Code of Practice Design Loads (Other than Earthquake) for Buildings and Structures- Code of Practice: Wind Loads



Seismic Map: IS 1893 Part 1: 2016 Criteria for Earthquake Resistant Design of Structures General Provisions and Buildings


IRC:22-2015

STANDARD SPECIFICATIONS AND CODE OF PRACTICE FOR ROAD BRIDGES

SECTION VI

COMPOSITE CONSTRUCTION (LIMIT STATES DESIGN)

(Third Revision)

INDIAN ROADS CONGRESS

INDIAN ROADS CONGRESS 2015

Cover: IRC 22 - 2016 Standard Specifications and Code of Practice For Road Bridges: Steel Concrete Composite Construction

INSDAG's Initiatives in New Code Formation / Revision

INSDAG has been instrumental in the process of development of codes related to steel trough BIS and IRC and its revisions since long. It has contributed largely the developments of IS 800, IS 801 which are the backbone of structural steel designing with Hot rolled and cold formed respectfully. Apart from that INSDAG has contributed to codes of IRC 22, IRC 24, IS 808, IS 11384 and is convening the code IS 806 presently.

Conclusion

The complete ecosystem of infrastructure and construction has high space of use of steel at places where steel is most suited and useful. Some of the important codes which may catalyse the infra development is already in place and some more have been identified for revision.

The Challenges and its solutions are well within reach and may be undertaken with proper initiative in a collective fashion. Only then will the target of 300 MTPA production will see a rational use and consumption. The nation is optimistic, and all stake holders look forward for achieving the same.

References: Online data from Public Domain/ JPC Portal/ World Steel Portal/ BIS and IRC portal

Acknowledgements: Shri Shiladitya Chanda, Asstt General Manager INSDAG.
Shri P K Mishra- Director General INSDAG.

Note: Inputs & Views are personal of the author (s) and not necessarily of FICCI

NOTES

NOTES

Established in 1927, FICCI is the largest and oldest apex business organisation in India. Its history is closely interwoven with India's struggle for independence, its industrialization, and its emergence as one of the most rapidly growing global economies.

A non-government, not-for-profit organisation, FICCI is the voice of India's business and industry. From influencing policy to encouraging debate, engaging with policy makers and civil society, FICCI articulates the views and concerns of industry. It serves its members from the Indian private and public corporate sectors and multinational companies, drawing its strength from diverse regional chambers of commerce and industry across states, reaching out to over 2,50,000 companies.

FICCI provides a platform for networking and consensus building within and across sectors and is the first port of call for Indian industry, policy makers and the international business community.

Contact Us

Mines, Metals & Cement Division

Federation of Indian Chambers of Commerce and Industry
Tel: +91-11-23487536
Email: minesandmetals@ficci.com
www.ficci.in