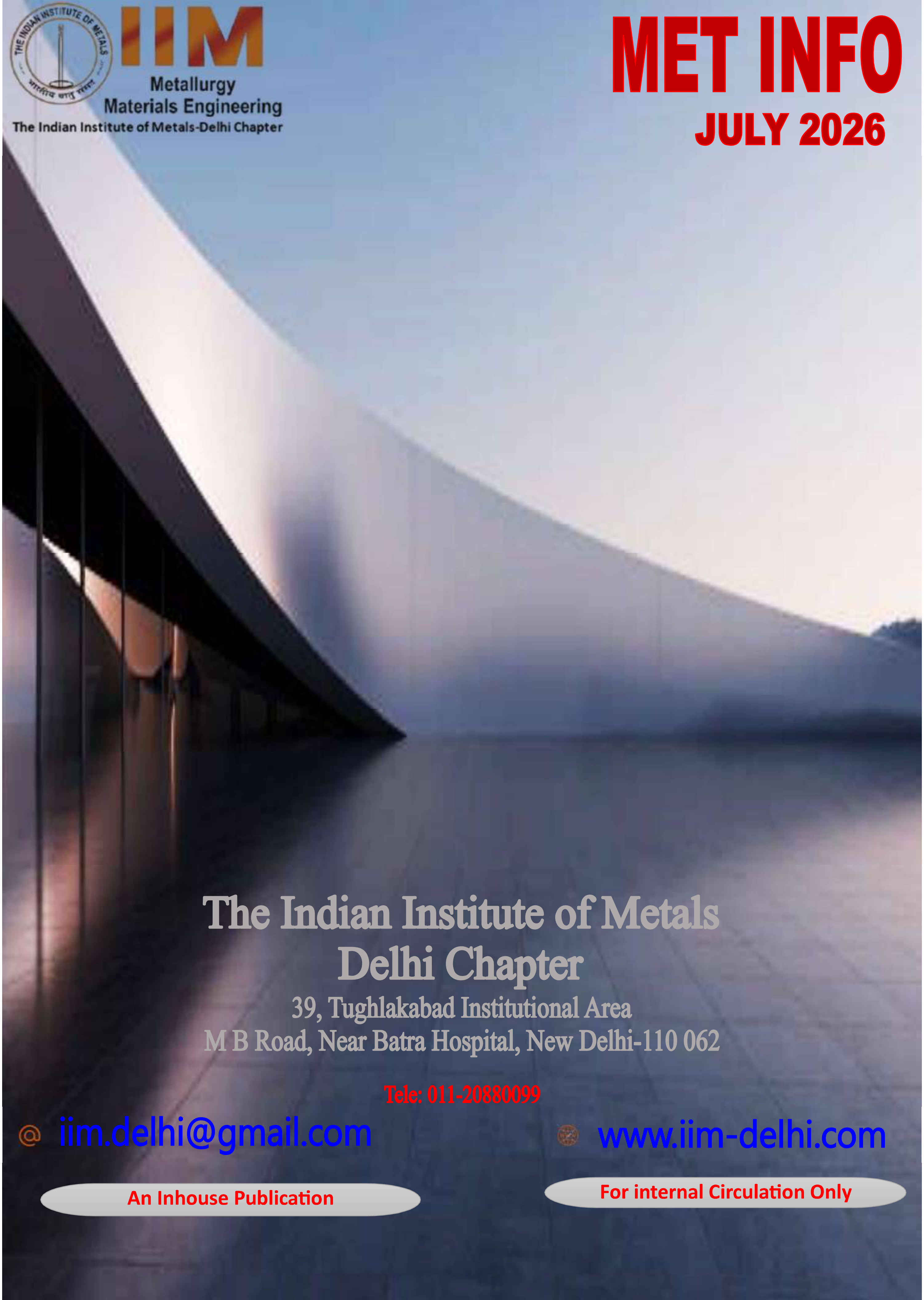

Metallurgy
Materials Engineering
The Indian Institute of Metals-Delhi Chapter

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Recycling Engineering

A new field of engineering within metallurgy and materials engineering, specifically process engineering, is needed that is closely related to other engineering disciplines and highly compatible with engineering ethics: **Recycling Engineering**.

The basic functions of recycling engineering can be listed as follows:

- A holistic approach to "product-centred" metal production processes
- Converting waste into secondary "new" raw materials
- Production process design to produce "new" products from secondary raw materials
- Adaptation of ore preparation processes in primary metallurgy (especially for polymineral and low-grade ores) to secondary metal production, or adaptation of scrap preparation processes in secondary metal production to primary metal production
- Application of mine tailings utilisation processes to scrap and secondary process waste (dross)
- Refining process design to produce "acceptable quality" products from secondary raw materials
- Application of CCUS projects to secondary metal production
- New recyclable alloys and product designs, or modification of currently used alloys to make them suitable for recycling
- Engineering studies aimed at improving the mechanical properties of recycled products through microstructure control
- Optimising economic and environmental costs while doing all these processes
- Use of digital tools in processes

This new field of engineering, using constantly evolving digital tools, can reconcile engineering and economic truths.

Designing the future

We are living in a period where long-term planning for a sustainable and secure world is critically important. The need for technological development and progress will continue. However, while some see economic growth as indispensable for a sustainable society, others view economic growth itself as a problem. Although the primary priority of policy decisions appears to be healthy economic growth that creates wealth to solve environmental problems, it is clear that the cost of repairing existing environmental damage will be far greater. Therefore, in all investments, improvement projects and new product and material designs in the coming period, "sustainability conditions" will increase in importance. Technological trends indicate a focus on renewable energy systems, lighter vehicles, low carbon emissions and greenhouse gas control and increased secondary metal production.

Everyone involved in the decision-making process regarding technical matters, especially engineers, should consider the advantages and disadvantages of various technological alternatives and make decisions not only based on technical criteria but also within the framework of long-term sustainable, desirable and high-quality life criteria. In other words, they must consider all the social, political, economic, environmental and even psychological impacts of technological choices. Because, to reiterate, technological choices shape not only the economy but the entire future.

In this context, changes in industrial design, inputs and processes are inevitable. Replacing fossil fuels, which are the main inputs of industry and produce significant emissions in both production and consumption phases, with energy-efficient products, services and processes and increasing the use of alternative renewable energy sources, is not a process that can be achieved in the short term. Undoubtedly, when the type of energy changes, systems and rules will change. When energy production begins from new sources, the infrastructure of industrial production must also change. This cannot be solved by simply purchasing new technologies, as has been the custom until now; scientific activities are necessary to implement these changes. In this context, the sustainable development model creates opportunities and time for change in the existing industrial infrastructure.

All of this has led to the birth of a new engineering discipline, although it has not yet been named: Recycling Engineering.

Science is the effort to perceive nature and the universe as a whole. The fundamental aim of technology, on the other hand, is not to comprehend nature, but to change it and then "produce something new." This new thing is first conceptually produced at the level of thought. Then, the concept moves to design. The next stage after design, if it is a "production method," is testing this new method in a pilot plant; if it is a newly designed "product," it is testing its prototype. With the success of these tests, the specific "technological production process" generally comes to an end.

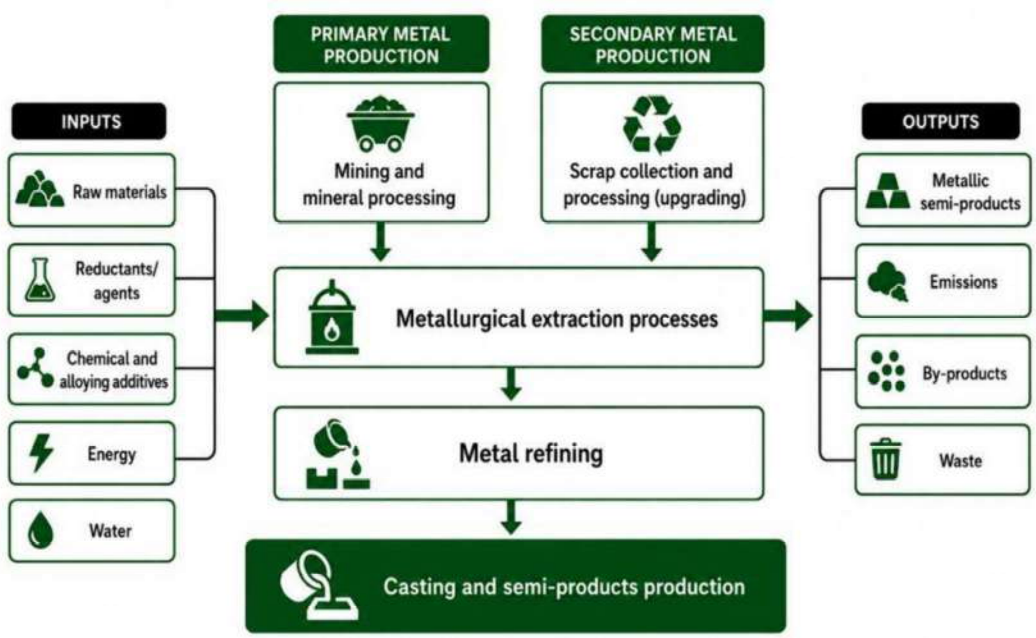
Scientific work is not purely "human-centred." That is, it attempts to explain events occurring in nature and the universe, whether or not humans are involved. Technology, however, is a "human-centred" concept and humans are present at every stage of technology. The history of technology begins with the history of humanity. The evolution of technology, which began with the Stone Age two million years ago when weapons, tools, and implements began to be made, gained a new meaning with the Industrial Revolution, following the Bronze and Iron Ages. The Industrial Revolution was also the period in which the discipline of "engineering", as we understand it today, emerged, a topic we will try to explain later.

Recycling: Beyond waste management, a new metallurgical paradigm

In practice, recycling is the process of returning products that have reached the end of their life cycle back to raw materials so that they can be reused in the production of new products. While end-of-life products are defined as "waste" in a linear economic understanding, they are "new raw materials" in a circular economic understanding. Therefore, recycling represents the step that closes the cycle, aiming to eliminate the need for virgin (primary) materials and conserve natural resources.

In contrast, from an engineering perspective, recycling, as a thermodynamic reality, is the physical and chemical "processing" of complex mixtures of products and materials that have reached the end of their useful life, transforming them into high-quality materials. Since modern products combine numerous variations (alloys, physical structures, etc.), recycling should be viewed as a rigorous industrial activity requiring energy and labour to overcome the high entropy (disorder) of mixed inputs.

In this context, waste symbolises disorder, while recycling describes a new order or a new integration.



Key similarities between primary and secondary metal production

A strong analogy can be drawn between primary and secondary metallurgical processes. In the context of circularity, it is a fact that end-of-life scrap metal can be described as a new type of “ore” obtained from an “urban mine” and that secondary technologies benefit greatly from the experience of primary technologies. **Processing Sequence:** Both primary and secondary production follow almost the same operational sequence. The process begins with the “mining” of the resource (either ore extraction or scrap collection), followed by mechanical beneficiation operations (crushing/grinding for ore, dismantling/shredding/separation for scrap) and finally metallurgical extraction (smelting and refining).

Common Thermodynamic Principles: Both primary and recycling metallurgy rely on the same fundamental laws of thermodynamics, physical chemistry and kinetics to separate and purify metals. The basic technologies used in recycling, for example, pyrometallurgy (decoating and smelting) and hydrometallurgy (liquid metal refining by flotation) are directly inherited from primary metal extraction.

Presence of “Gang” (Waste Material): In traditional mining, geological ores contain unwanted “gang” minerals that differ from the base metal. Scrap metal contains its own version of “gang” with contaminants such as non-metallic attachments, plastics, paints and materials containing different alloys.

Key differences and limitations between primary and secondary metal production

Despite these strong parallels, there are significant differences that make recycling metallurgy challenging compared to primary ore processing metallurgy:

Predictability and Composition: Natural ores have formed over millions of years under specific geological conditions, resulting in their composition being predictable and relatively stable. In contrast, “urban mining” is entirely man-made and constantly changing depending on evolving needs, technology and geography. For example, over 400 aluminium wrought alloys, over 200 aluminium casting alloys and over 50 types of scrap are defined in REMA’s ISRI specifications. This makes secondary raw materials extremely heterogeneous and statistically unpredictable.

Separation and Sorting Challenges: In traditional ore processing, mechanical enrichment processes such as crushing and grinding are quite effective. However, for scrap containing both physical and chemical impurities, pre-smelting enrichment processes are much more complex. Removing non-metallic impurities, separating other metal attachments and cleaning up paint, oil, lacquer and other components is a much more demanding technological process than traditional ore enrichment.

Final Products: While primary metallurgy generally focuses on extracting and producing pure metals from ores, recycling metallurgy typically produces alloys as the final product. This is because some alloying elements mixed in scrap cannot be separated economically or thermodynamically during the recycling process.

Therefore, it is difficult for products made from secondary raw materials to reach the quality of products made from primary raw materials.

Aluminium: The leading example of circular metal production

Secondary aluminium production is an excellent example of recycling engineering. Aluminium recycling engineering perfectly illustrates the transition to a product-centric from materials-centric approach and a thermodynamics-focused engineering era. Aluminium recycling saves approximately 92-95% of energy compared to primary production from bauxite ore, while significantly reducing greenhouse gas emissions and solid waste (such as red mud); however, the process is far more complex than simply melting scrap. The main challenge in secondary aluminium production processes is the downcycling risk, because aluminium is very rarely used as pure aluminium. Aluminium and its alloys, used in almost every sector, are generally used in alloy form for performance-enhancing reasons, primarily mechanical properties. A fundamental thermodynamic problem in aluminium recycling is that impurities, especially iron, dissolve easily in molten aluminium and are nearly impossible to remove through standard refining. Recycling engineering aims to recover, purify and seamlessly reintegrate materials into the global supply chain by treating products as complex material and energy flows, rather than simply managing waste.

Since impurities accumulate each time metal is recycled, there are two solutions in industrial practice:

- **Dilution:** Adding high-purity primary (unprocessed) aluminium to the scrap melt to reduce the overall concentration of impurities to acceptable levels.
- **Downcycling (Low Purity Recycling):** Directing high-purity processed alloy scrap (such as sheets and foils) to the production of lower-purity casting alloys (such as engine blocks); these alloys have a much higher tolerance to accumulated impurities such as iron and silicon.

Key characteristics of recycling engineering

Deep Interdisciplinary Integration: Recycling engineering requires integration with multiple fundamental engineering disciplines. Primarily, it must work in an integrated manner with mechanical engineering, chemical engineering, environmental engineering and, naturally, materials engineering.

Materials engineering provides the fundamental intellectual framework for recycling by explaining how a material's entire processing history affects its final structure and performance. In the context of recycling, a material's "processing" history does not simply mean how it was initially produced; it also includes the degradation it has been subjected to throughout its lifecycle and the extreme physical and chemical stressors applied during recovery. From a materials science perspective, recyclability is not an inherent property of a material itself, but rather a measure of our ability to return that material to its original state. This ability is determined by thermodynamic limits, kinetic constraints, and the structural integrity of the material after use.

Basic Thermodynamics Knowledge: Recycling engineering is closely tied to the laws of physics and thermodynamics. Standardising and identifying complex end-of-life waste (with high entropy) requires an enormous amount of work. Engineers use advanced metrics such as Gibbs free energy and exergy (the quality of useful energy) to calculate the absolute limits of what can be recycled and minimise energy dissipation.

Product-Oriented Systems Engineering: Unlike the traditional bulk-type material-focused recycling approach, recycling modern and complex consumer products such as smartphones, electric vehicles, and solar panels requires a product-oriented approach. This is because these complex products contain intricate and functional combinations of a large number of different materials. Recycling engineering uses a "product-oriented" systems approach that evaluates the entire life cycle of a product, from physical decomposition to complex metallurgical processing.

Recycling-Friendly Product Design: A defining characteristic of this era is that recycling is no longer an afterthought. Engineers are now using digital tools to estimate a product's full recycling rate, potential exergy losses, and environmental impact during the design phase, working to design materials in ways that allow for their later economical recycling.

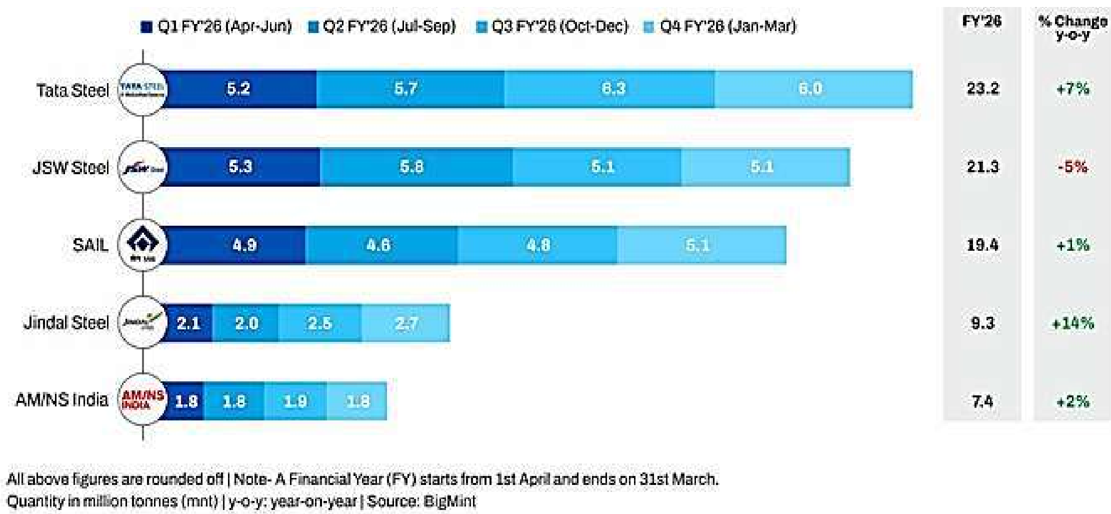
Conclusions

Choosing a recycling method is essentially an "economic and physics-based technological optimisation puzzle." Engineers must balance the thermodynamic effort, the energy and physical work required to separate complex, mixed materials, with the environmental compatibility of the secondary processes and, conversely, against the fluctuating market prices of the recovered metals. Recycling Engineering effectively closes the global materials cycle by transforming "waste," an environmental liability in a linear economic framework, into a critical strategic "new raw material" within a cyclical economic context. However, it should be remembered that this process must also be designed to be as environmentally friendly as possible.

Source: Al News Daily Newsletter, 19 May 2026

Production Growth in FY'26 for India's Leading Steelmakers

India's leading steelmakers reported mixed growth in crude steel production in FY'26 even as sales increased y-o-y. Among these steelmakers, which account for roughly half of India's crude steel output, only Jindal Steel recorded production growth above India's overall 11% increase in crude steel output.



Crude steel production of India's leading steelmakers

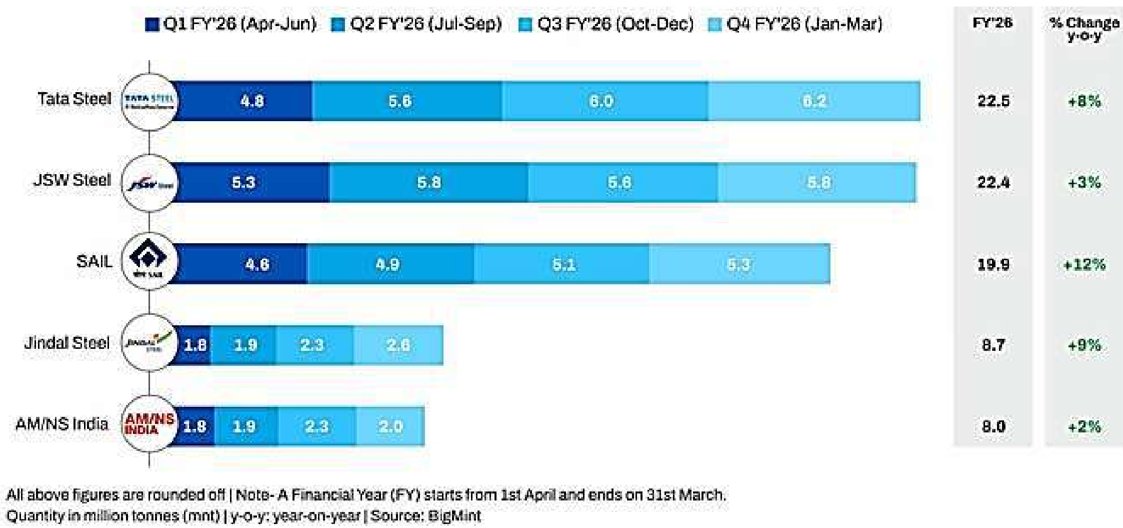
A prolonged demand downturn during the extended monsoon likely limited production growth during FY'26, along with slower capital expenditure disbursement. However, the broader industry narrative remains on capacity expansion, downstream integration, raw material security, and market positioning for the next decade of domestic demand growth.

Tata Steel posts mild growth, plans for downstream expansion

Considering standalone volumes, Tata Steel overtook JSW Steel to emerge as the country's largest crude steel producer in FY'26 with output of 23.2 million tonnes (mnt), up 7% y-o-y following the Kalinganagar expansion from 3 mnt/year to 8 mnt/year. Parallelly, the company's sales volumes rose 8% y-o-y to 22.53 mnt during FY'26.

In terms of future growth, Tata Steel is focusing on value-added and downstream capacity rather than pure upstream volume expansion. The company believes that future profitability will depend less on absolute steel volumes and more on product mix improvement and downstream penetration.

The company is attempting to structurally reduce dependence on basic grades such as hot-rolled coils (HRCs) by increasing exposure to galvanised steel, packaging steel, tubes, wires, colour-coated products, and advanced automotive grades. This reflects a wider trend emerging across Indian steelmakers as margins in basic flat steel grades remain vulnerable to Chinese exports and global steel price volatility.



Sales volumes of India's top steelmakers in 2025-26

Tata Steel already has the optionality to expand Indian capacity to 45-50 mnt using existing sites at Kalinganagar, Neelachal, Jamshedpur and Bhushan. A future Maharashtra project could add another 6-10 mnt. However, the company intends to pursue phased, disciplined expansion rather than aggressive volume growth.

Unlike some peers, Tata Steel explicitly rejected the idea of partnering with global steelmakers for India expansion. The company is instead consolidating ownership across its businesses by buying out joint venture partners and integrating operations.

JSW Steel's output dips, but capacity expansion plans accelerate

JSW Steel's crude steel production decreased by 5% y-o-y to 21.3 mnt amid the shutdown of Blast Furnace 3 (BF3) at Vijayanagar for expansion purposes. Despite this, sales increased by 3% y-o-y to 22.4 mnt.

JSW Steel is pursuing an aggressive growth model. The company now targets 62 mnt of standalone India capacity by FY'32 versus an earlier 50 mnt goal. Including proposed joint ventures with Japan's JFE Steel and South Korea's POSCO, total capacity could approach 78 mnt.

The company expects infrastructure spending, urbanisation, manufacturing growth, and rising flat steel consumption to support annual incremental steel demand growth of 12-14 mnt.

JSW Steel also appears bullish on flat steel demand. The company believes domestic supply growth will continue to lag demand growth, particularly in higher-grade products where entry barriers and project execution timelines remain high.

While port-based assets in Paradip would offer export opportunities, JSW believes that domestic demand will remain the primary outlet for new capacity.

Unlike Tata Steel's preference for independent expansion, JSW Steel views partnerships with JFE and POSCO as strategic tools for gaining access to advanced automotive steels, electrical steel, hydrogen-based steelmaking technologies, and decarbonisation expertise.

On decarbonisation, JSW Steel acknowledged that blast furnace-led growth will continue to dominate its Indian steelmaking operations because of domestic raw material dynamics and limited scrap availability. However, the company plans to gradually expand electric arc furnace and scrap-linked steelmaking, including the proposed Salav green steel project using DRI, scrap, and renewable energy.

SAIL lifts output, to focus on increasing capacity utilisation

The Steel Authority of India (SAIL) posted a minor 1% increase in crude steel production to 19.4 mnt, while sales rose by a sharper 12% y-o-y to 19.9 mnt.

SAIL's FY'27 strategy is centred on increasing utilisation at existing assets before large brownfield expansions begin contributing from FY'31 onward. SAIL maintained an aggressive sales guidance of 22 mnt for FY'27 versus around 20 mt in FY'26. The company believes operational efficiencies, productivity improvements, and debottlenecking can push production to over 22 mnt in FY'27, beyond its rated crude steel capacity of 21 mnt.

Jindal Steel posts strongest hike in output, targets sustained growth in FY'27

Jindal Steel recorded the strongest growth in production, up 14% to 9.25 mnt in FY'26 due to the doubling of capacity at Angul. The company's sales increased by a slower 9% to 8.67 mnt, indicating a slight lag between production and demand.

Jindal Steel announced an FY'27 production guidance of 11.5 mnt and sales guidance of 10.5-11 mnt, implying another year of strong volume growth.

Notably, the company indicated that flat products currently account for around 50% of sales and could rise towards 70% over time as HRC production ramps up further. However, management pushed back against concerns that the rising share of HRC could dilute realisations. Instead, downstream value-added projects and niche product development would support realisation growth over time.

AM/NS India's production inches up, Andhra expansion in focus

AM/NS India's production and sales rose slightly by 2% to each to 7.4 mnt and 8 mnt, respectively.

The company expects upward momentum to continue into Q2 amid favourable pricing environment. Unlike its blast furnace-based Indian peers, AM/NS India has relatively higher gas exposure because of its DRI configuration at Hazira. However, the company has implemented multi-year gas hedging programmes and currently does not expect significant cost pressure from higher prices. Additionally, gas procurement is diversified and not solely dependent on Middle Eastern supply sources.

The company also reiterated that its broader vision for 40 mnt/year of steelmaking capacity in India remains unchanged. Presently, the priority is the planned greenfield Andhra Pradesh project with proposed capacity of around 8 mnt/year. Once the first phase of Andhra is completed, the company could either expand Andhra further or revisit additional capacity expansion at Hazira.

EBITDA/t improves in Q4FY'26

Steel prices made a seasonal recovery in Q4FY'26, leading to a q-o-q surge in the EBITDA per tonne of all steelmakers. However, the Middle East conflict also lifted prices as supply concerns emerged and buyers made panic purchases, leading to a y-o-y EBITDA per tonne values, though at a more moderate pace. Spot prices of BF-route HRCs and rebars surged by 15% and 23% q-o-q, while iron ore rose a slower 7%. However, coking coal was up by 25% q-o-q.

Indian top steelmaker's EBITDA per tonne comparison

Company	Q4 FY'26	Q3 FY'26	% Change	Q4 FY'25	% Change (y-o-y)
JSW Steel	₹ 11,232	₹ 7,616	+47% q-o-q	₹ 8,894	+26% y-o-y
Tata Steel	₹ 15,245	₹ 13,090	+16% q-o-q	₹ 12,705	+20% y-o-y
SAIL	₹ 8,985	₹ 5,157	+74% q-o-q	₹ 7,133	+26% y-o-y
Jindal Steel	₹ 10,093	₹ 6,981	+45% q-o-q	₹ 10,587	-5% y-o-y

EBITDA per tonne in INR per tonnes | All above figures are rounded off | Note- A Financial Year (FY) starts from 1st April and ends on 31st March.
% change in quarter-on-quarter (q-o-q) | % change in year-on-year (y-o-y) | Source: Company reports comipled and maintained by BigMint

Y-o-y, BF-route rebar prices increased 9% and HRC rose 12%. However, both iron ore, up by 17%, and coking coal, up 36%, outstripped the growth in steel prices. This explains the largely slower increase in EBITDA per tonne y-o-y.

India: Steel and raw material quarterly average prices

	Q1 FY'25	Q2 FY'25	Q3 FY'25	Q4 FY'25	Q1 FY'26	Q2 FY'26	Q3 FY'26	Q4 FY'26
Iron ore Fines, Odisha Index (0-10mm, Fe 62%)	₹5,023	₹4,392	₹5,315	₹5,030	₹5,119	₹5,335	₹5,496	₹5,873
Pellet Index, DAP-Raipur (Fe63%)	₹10,169	₹8,979	₹9,661	₹9,758	₹9,677	₹9,980	₹9,796	₹10,360
Coking Coal, CNF Paradip (0-40mm, Premium HCC)	₹21,851	₹19,075	₹18,844	₹17,986	₹17,979	₹18,045	₹19,595	₹24,446
Non Coking coal, CNF Gangavaram, RB2 (5500 NAR)	₹9,895	₹9,645	₹9,456	₹8,669	₹8,100	₹8,000	₹8,470	₹10,244
Melting Scrap, DAP-Mumbai (HMS 80:20)	₹35,244	₹32,884	₹32,868	₹32,348	₹32,568	₹30,990	₹30,205	₹33,128
Sponge Iron Index, Pellet based (PDRI), Exw-Raipur	₹28,375	₹25,257	₹25,883	₹24,940	₹24,274	₹23,962	₹23,210	₹25,090
Sponge Iron, CDRI, Exw-Rourkela	₹29,413	₹26,264	₹27,313	₹26,205	₹25,586	₹25,668	₹24,370	₹26,886
Billet Index, Exw-Raipur (100*100mm, IS2831)	₹43,340	₹38,754	₹39,594	₹39,664	₹39,731	₹37,060	₹36,000	₹40,995
Rebar, Exy-Mumbai (12-32mm, BF Route, Fe500D, IS1786)	₹56,877	₹51,238	₹53,700	₹53,277	₹55,360	₹47,977	₹47,255	₹57,996
Rebar, Exw-Mumbai (12-25mm, IF Route, Fe500, IS1786)	₹51,356	₹45,927	₹47,534	₹48,084	₹47,364	₹44,303	₹43,355	₹50,044
HRC, Exy-Mumbai (2.5-8mm, IS2062, Gr-E250)	₹53,510	₹50,460	₹47,707	₹48,462	₹51,730	₹49,487	₹47,210	₹54,130

Prices in INR/tonnes | Average of Q4FY26 prices taken till 18 May 2026 | Source: BigMint

Outlook

Industry confidence in long-term domestic demand remains strong despite global steel market uncertainty and persistent Chinese export pressure. Most large steelmakers appear convinced that India's infrastructure-led growth, manufacturing expansion, and urbanisation cycle will support sustained steel demand growth through the decade.

Additionally, mills expect Q1FY'27 EBITDA/t to improve sequentially because steel price increases are currently exceeding the rise in coking coal, freight, and energy costs. Although construction demand is likely to decline as the monsoon arrives, flat steel continues to benefit from safeguard duties and higher import parity pricing.

Source: BigMint Updates, 21 May 2026

India's Crude Steel Capacity to Reach 300 mnt by FY'30

India's crude steel production capacity rose 10% y-o-y to 233 million tonnes (mnt) per annum in FY'26. Capacity is projected to rise further to 298 mnt by FY'30, in line with the National Steel Policy's long-term target of building a 300-mnt steel industry by 2030-31.

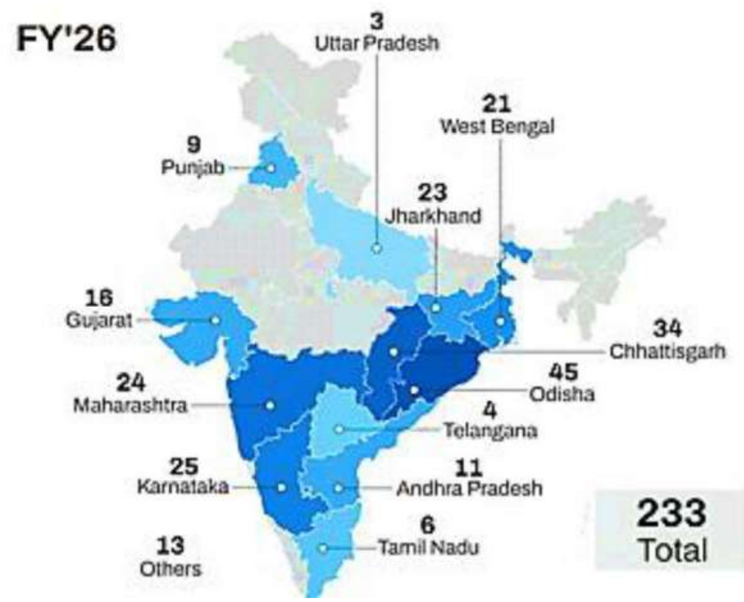
While FY'26 growth was led largely by secondary steelmakers, the next phase of expansion is expected to be dominated by integrated steel producers (ISPs) executing blast furnace-basic oxygen furnace (BF-BOF)-based projects, especially in eastern and coastal India.

IF steelmakers drive FY'26 growth, ISPs to lead FY'30 ramp-up

In FY'26, the expansion was driven primarily by smaller, regional induction furnace (IF)-based steelmakers, whose total capacity rose 16% y-o-y to 91 mnt. The growth reflected continued expansion in construction-linked long steel production, supported by relatively lower capital requirements and strong regional demand.

Total BOF capacity increased 7% to 96 mnt in FY'26, supported largely by integrated steel producers. For example, Jindal Steel completed its 6 mnt expansion at Angul, Odisha, by commissioning its third BOF of 3 mnt.

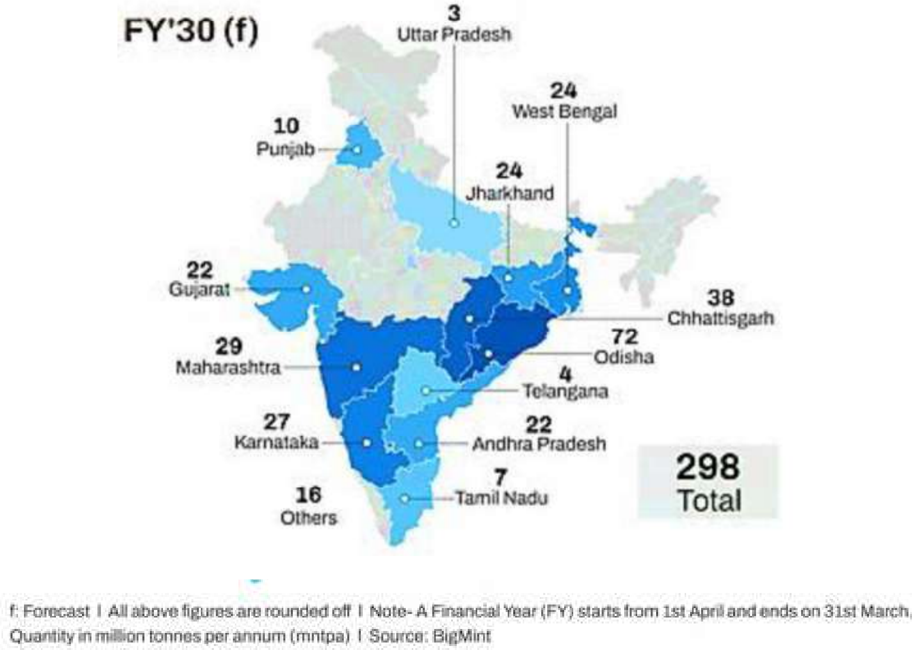
Meanwhile, electric arc furnace (EAF) capacity increased 6% to 46 mnt. Notably, in March 2026, Tata Steel commissioned its 0.75 mnt/year scrap-based EAF facility at Ludhiana.



India's state wise crude steel production capacity in FY'26

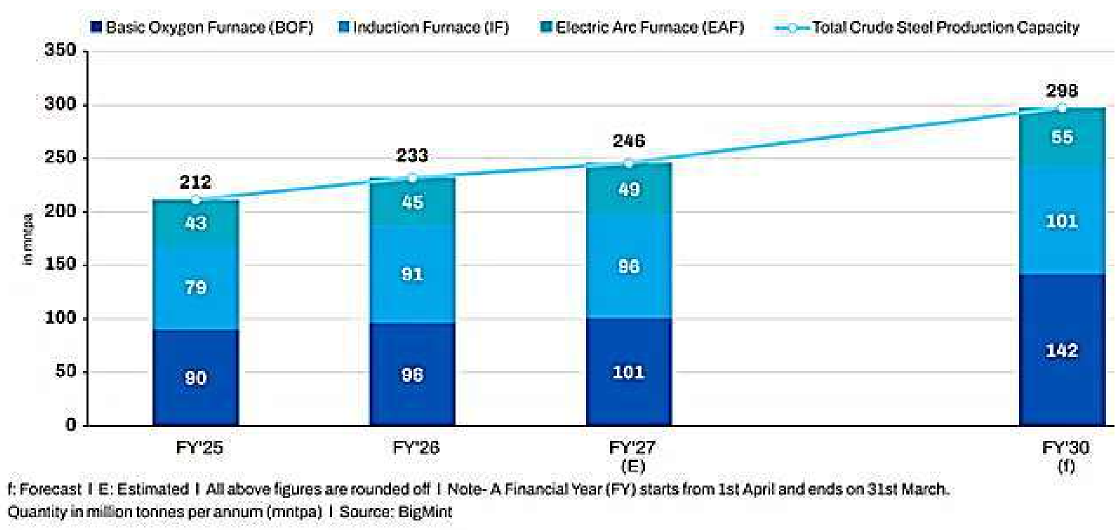
By FY'30, India's steelmaking mix is expected to tilt further towards BOF-based production. Total BOF capacity is projected to surge to 142 mnt, increasing its share in the overall steelmaking mix to 48% from 42% in FY'25.

This indicates that India's steel industry is prioritising scale, raw material integration, and higher-grade steel production capabilities through conventional integrated steelmaking routes. Such capacities are critical for automotive steel, pipelines, engineering-grade products, and renewable energy infrastructure.



India's state wise crude steel production capacity forecast for FY'30

In contrast, EAF capacity is projected to rise only modestly to 55 mnt by FY'30, while its share remains broadly stable at around 19-20%, reflecting structural constraints with scrap supply. IF capacity is expected to cross 100 mnt by FY'30, though its overall share may decline to 34% as integrated expansions accelerate at a faster pace.



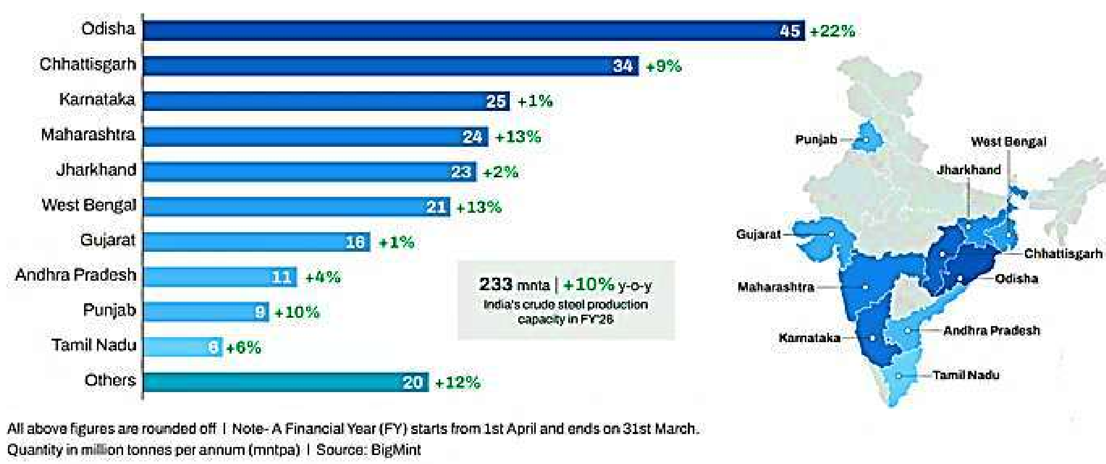
India's route wise crude steel production capacity

The data suggests India's decarbonisation pathway may differ from developed economies, where scrap-based EAF production dominates capacity additions. India's steel sector appears likely to remain iron ore-intensive over the medium term due to abundant domestic ore availability, lower scrap generation, and the need for rapid capacity creation.

Odisha strengthens dominance

At the state level, Odisha emerged as the largest contributor to India's steel capacity growth in FY'26. The state's capacity rose sharply by 22% y-o-y to 45 mnt, making it India's largest steel-producing state by installed capacity. Odisha continues to attract investments due to abundant iron ore reserves, port connectivity, lower logistics costs, and the presence of established steel clusters.

By FY'30, Odisha is projected to further consolidate its dominance, with capacity expected to rise to 72 mnt. This would account for nearly one-fourth of Indias total crude steel capacity. Odisha alone is expected to contribute about 40% of Indias total incremental steel capacity additions between FY'25 and FY'30.



Indian states with highest crude steel production capacity in FY'26

Among other emerging growth centres, Andhra Pradesh stands out, with capacity projected to more than double to 22 mnt by FY'30 as coastal greenfield complexes break ground. For example, AM/NS India will establish a new integrated steel plant at Rajayyapeta in Anakapalli, with production targeted by the first quarter of 2029.

Gujarat is also expected to see strong growth, with capacity rising to 22 mnt, supported by coastal industrialisation and downstream manufacturing demand.

The concentration of new projects in Odisha, Andhra Pradesh and Gujarat indicates a gradual shift toward coastal steelmaking hubs, where proximity to ports lowers freight costs for imported coking coal and improves export competitiveness.

Outlook

India's crude steel production capacity is set to rise 6% in FY'27 -- at a slower pace than in FY'26-with the total coming to 246 mnt. Expansion will be led by the BOF route, up 5% y-o-y, and by IF facilities, whose capacity is set to rise 6%.

The sharp rise in FY'26 approvals also reinforces the strong medium-term growth trajectory of the industry, with steel capacity approvals more than doubling y-o-y to 50 mnt. Much of the pipeline is concentrated in integrated BOF-based projects, indicating that large producers are accelerating long-term expansion plans.

However, capacity additions may outpace demand growth in some segments, particularly long products, increasing pressure on utilisation rates and margins among smaller secondary producers. Integrated steelmakers are likely to remain better positioned due to scale advantages, captive raw material linkages, and stronger exposure to flat steel demand.

At the same time, the BOF-led expansion cycle suggests carbon intensity will remain a long-term challenge as global markets increasingly move towards carbon-linked trade mechanisms and green steel standards.

Source: BigMint Bureau, 9 May 2026

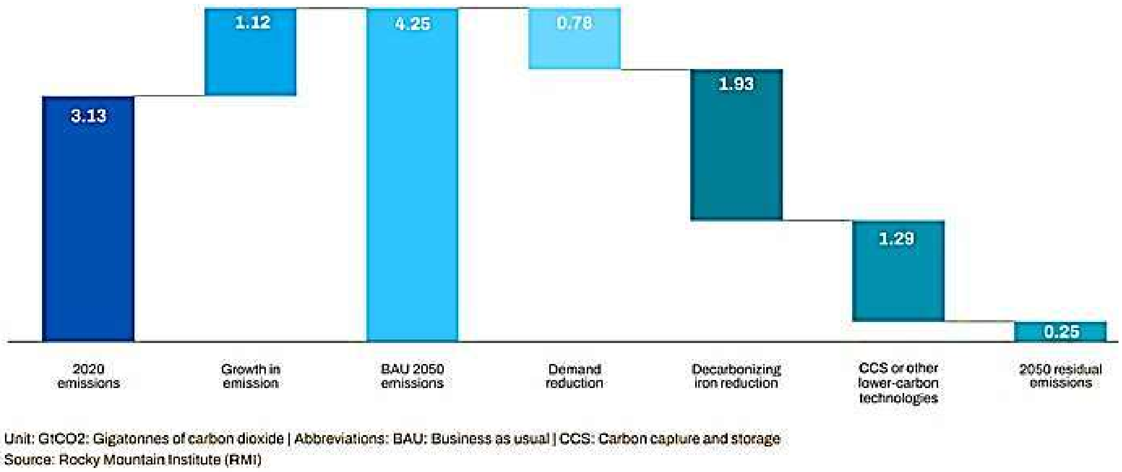
Steel Industry's Transition with the 1.5-degree Pathway

Aligning the steel industry's transition with the 1.5-degree pathway of the Paris Agreement now seems to be an almost lost cause. Limiting global temperature rise to below 1.5 degrees centigrade will call for limiting GHG emissions to between 130-235 gigatonnes of CO_2 ($GtCO_2$), which is also called the remaining carbon budget.

Carbon clock ticking

According to the IEA, energy related annual GHG emissions globally are close to 40 $GtCO_2$. Total emissions are around 52-55 $GtCO_2$ annually. Therefore, it is easy to calculate how quickly the remaining carbon budget is set to be exhausted.

Global steel industry's annual GHG emissions, as per RMI data, were around 3.13 GtCO2 in 2020. Subtracting the minor energy and material efficiency gains made in steelmaking, this annual figure is more or less static in the absence of rapid proliferation of disruptive low-CO_2 technologies such as H2-DRI or electrolysis and CCS.



Estimated annual carbon emission reduction

Emission reduction scenarios

RMI calculations show that in the absence of proliferation of low-CO_2 technologies, that is in a business-as-usual (BAU) scenario, the global steel industry's annual emissions may reach 4.25 $GtCO_2$ by 2050. The reduction strategies are demand management or demand reduction (0.78 $GtCO_2$), decarbonisation of iron reduction (1.93 $GtCO_2$), and CCS or other technologies (1.23 $GtCO_2$). These cumulatively lead to near-zero (0.25 $GtCO_2$) by 2050.

Now, in the context of developing economies such as India, demand reduction at the current juncture is a barely realistic assumption, with growth of 8-10% annually projected till at least 2035.

As far green iron, under the compliance mechanism of the CCTS, gradual reductions in emissions through efficiency measures and shift away from coal-based processes through fuel switch may become viable by 2035-40.

Electrolysis and other direct electrification processes may attain significant viability with the sharp reduction in energy costs amid proliferation of renewable energy. However, CCS costs are currently prohibitive, as per industry sources. In fact, in the steel industry there is only one existing facility in the Middle East which is currently operational. Therefore, significant R&D in this domain is required, particularly in the context of post-combustion capture technologies, for wider implementation.

Green coalition

As per the First Movers Coalition (FMC), expanding the pipeline of commercial-scale, near-zero emissions primary projects and progressing them to final investment decisions (FIDs) in the next five years becomes the critical task for putting the global industry on a 1.5 degrees Celsius-aligned pathway. Strategic interventions can create a viable investment case for breakthrough, near-zero emissions steelmaking technology.

In India, as per calculations, around 25-27 mnt of low-CO_2 steel demand has gained visibility by 2030 in the form of government CAPEX on infrastructure. Aligned with corporate targets and the urgency to reduce Scope 3 emissions, demand may be even higher.

The nearly 80 steel producers who have secured the steel ministry's Green Steel Certificates will be looking to reap the advantage that accrues to early movers and also gaining a premium on their products as the governments much-awaited green public procurement policy comes into effect.

Source: BigMint Bureau, 16 May 2026

India Drives Global Coal-based Steel Expansion

While China has started to moderate future coal-based steel expansion, India, Iran and Vietnam are continuing to add significant new capacity

A total of 319 million tonnes per annum (mtpa) of coal-based blast furnace capacity worldwide has either been announced or is under construction, marking a 5 per cent increase over the previous year, according to a new analysis by Global Energy Monitor (GEM).

The expansion comes despite mounting pressure on the steel industry to reduce emissions and transition toward cleaner production pathways.

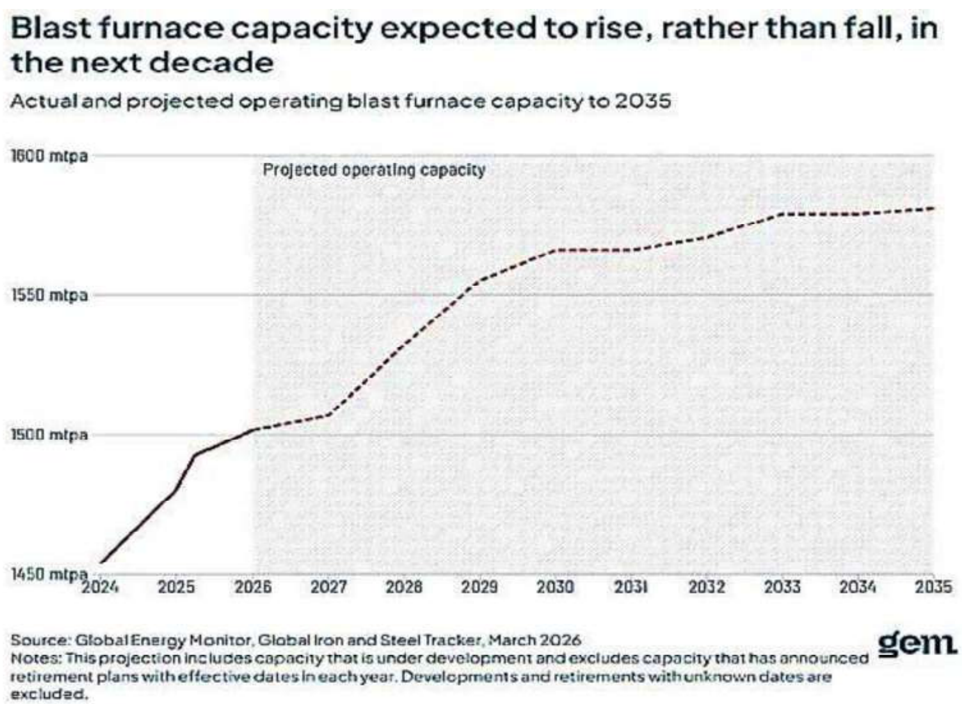
GEM found that planned new blast furnace investments, along with another 80 mtpa of capacity slated for relining to extend plant operations, far exceed the 141 mtpa of operating blast furnace capacity currently scheduled for retirement. As a result, global blast furnace capacity is projected to grow by a net 88 mtpa by 2035.

Coal-based steel production accounts for around 88 per cent of emissions from the steel sector, which itself contributes roughly 11 per cent of global carbon dioxide emissions. Yet the shift toward lower emissions technologies remains slow. Electric Arc Furnace (EAF) steelmaking increased its share of global operating capacity by just one percentage point over the past year, from 33 per cent to 34 per cent. Direct Reduced Iron (DRI) technology represents only 10 per cent of ironmaking capacity globally, and just 2 per cent of operating DRI capacity currently relies on green hydrogen instead of fossil fuels.

Global outlook for steel decarbonisation remains weak. The ball is in India and China's court, as the two countries plan 86% of new coal-based capacity. Shifting toward lower emissions technologies and making better use of existing EAF capacity could significantly change the sector's direction.

India emerges as centre of global steel expansion

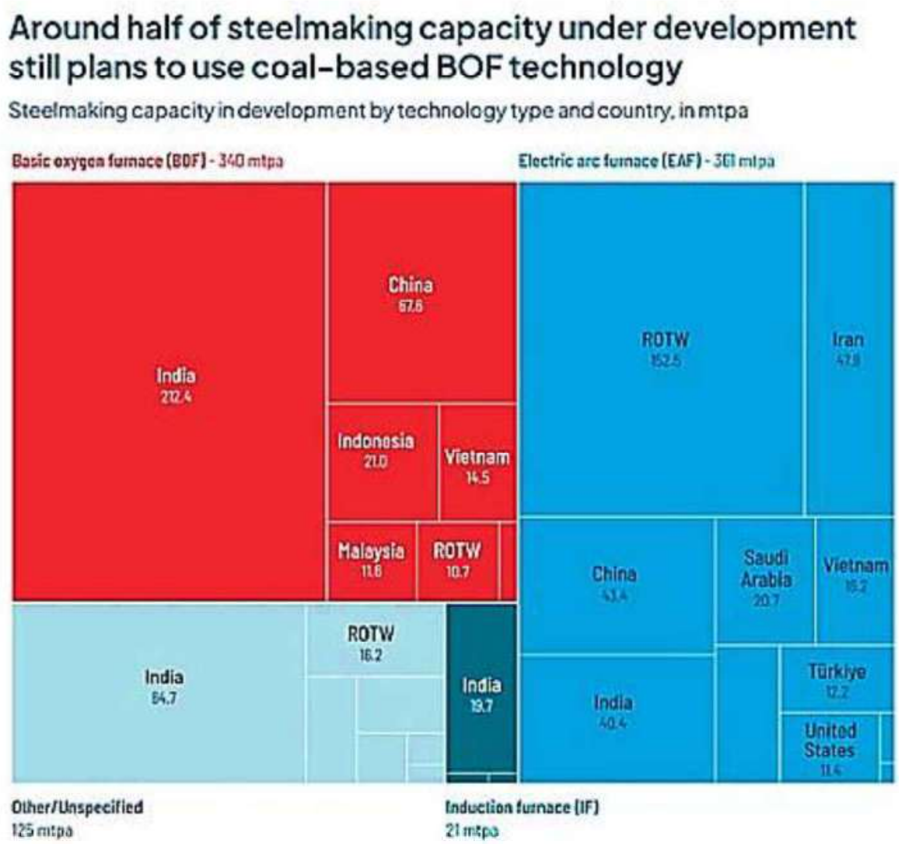
India is the largest driver of steelmaking expansion globally, accounting for 42 per cent or 357 mtpa of all steelmaking capacity under development worldwide, nearly three times China's 112 mtpa. Iran and Vietnam follow with 50 mtpa and 39 mtpa respectively.



More than 60 per cent of new coal-based blast furnace basic oxygen furnace capacity under development globally is located in India. Around 93 per cent of the country's ironmaking capacity under development relies on coal-based technology. However, only about 5 per cent of this planned capacity has broken ground, leaving substantial room for policy intervention and technology shifts before projects become operational.

India's steel sector is also facing growing international pressure. The European Union's Carbon Border Adjustment Mechanism (CBAM), which came into effect in January 2026, imposes a carbon price on imported steel based on embodied emissions. Indian exports could face a 32 per cent increase in costs under the mechanism, pushing some producers to explore lower emissions steelmaking for European markets.

At the same time, foreign investment in coal-based steel production in India continues to rise. Japanese steelmaker JFE Steel Corporation plans to invest $2 billion in India through a coal-based joint venture with JSW Steel, aiming to become the country's largest foreign steel producer.



India has introduced several policies aimed at reducing emissions in the sector. The Union Ministry of Steel released a green steel roadmap and revised the National Scrap Recycling Policy to gradually increase scrap use in steel production to the global average of 31 per cent. In 2024, India also became the first country to introduce a formal Green Steel Taxonomy, defining green steel as steel produced with emissions below 2.2 tonnes of carbon dioxide equivalent per tonne of finished steel.However, the threshold remains only slightly below the average emissions intensity of coal-based steelmaking globally, limiting its ability to drive major technological transformation.

India's dependence on imported metallurgical coal also remains a concern. The country consumes around 77 per cent of the 287 mtpa of iron ore it mines domestically but uses nearly three times the 24 mtpa of metallurgical coal it produces. Continued expansion of coal-based steelmaking could therefore deepen dependence on coal imports and expose the industry to global market volatility.

India still has a major opportunity to pivot toward green hydrogen-based ironmaking and greater use of scrap-based EAF technology before coal-based projects move ahead.

China, Iran and Vietnam remain major contributors

China remains the world's dominant steel producer and the second-largest developer of coal-based blast furnace capacity after India. The country operates around 60 per cent of existing global blast furnace basic oxygen furnace capacity, making it central to the future emissions trajectory of the steel sector. Nearly 94 per cent of China's operating blast furnace capacity still has no announced retirement plans, even as the country begins to slow the pace of new coal-based additions.

Although China has expanded Electric Arc Furnace capacity in recent years, blast furnaces continue to dominate its steel production system.

China and India together account for 86 per cent of all new coal-based steelmaking capacity under development globally, underscoring how decisions taken in the two countries will shape the sector's global decarbonisation pathway.

Iran has emerged as the third largest centre of steelmaking expansion globally, with around 50 mtpa of capacity under development. Unlike most of the world's leading steel producers, Iran relies more heavily on Direct Reduced Iron technology rather than blast furnaces. The country has also rapidly expanded Electric Arc Furnace capacity in recent years, adding around 9 mtpa in 2024 alone, according to Global Energy Monitor data. However, fossil fuel dependence remains deeply embedded in Iran's steel sector because most DRI production is gas based rather than powered by green hydrogen.

Vietnam, with 39 mtpa of steelmaking capacity under development, is also becoming a major growth centre for the global steel industry. The country's rapid industrialisation and rising construction demand are driving large scale investments in new steel facilities, much of which still relies on conventional coal-based technology. Continued expansion of blast furnace capacity in emerging Asian economies could lock in high emissions infrastructure for decades unless investment patterns shift toward lower emissions alternatives.

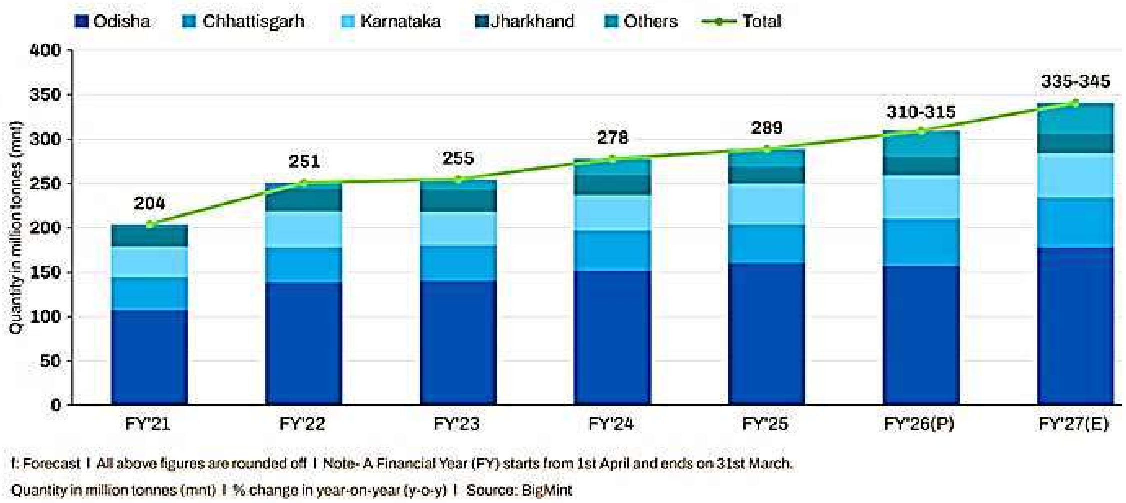
While China has started to moderate future coal-based steel expansion, India, Iran and Vietnam are continuing to add significant new capacity, raising concerns that global steel emissions could remain elevated well beyond current climate targets.

Source: Down to Earth, 11 May 2026

India's Iron Ore Production to Rise 8% y-o-y in FY'27

India's iron ore production is projected to rise to 340-345 million tonnes (mnt) in FY'27 from around 316 mnt in FY'26, indicating growth of 8% y-o-y. However, supply expansion is expected to exceed incremental demand from the steel sector, with additional volumes unlikely to be fully absorbed domestically.

Production growth continues to be driven by mine ramp-ups and capacity additions, while steel output growth remains moderate. As a result, incremental supply is likely to move into inventories or require diversion to export markets, indicating a shift from demand-led expansion to capacity-driven growth and creating early pressure on domestic market balance.



India's iron ore production: FY'21 – Fy'27

Top producing states

Odisha is expected to remain the primary driver of production growth, with output projected to increase to around 178 mnt in FY'27 from 162 mnt in FY'26. This implies that a bulk of incremental volumes will continue to originate from a single state, further increasing its contribution to India's total iron ore production.

Production in Chhattisgarh is likely to increase to around 56 mnt, while Karnataka may see limited growth to about 50 mnt. Jharkhand's output is expected to remain largely unchanged at around 22 mnt. Maharashtra is expected to contribute around 26 mnt, while Goa remains marginal at around 2 mnt.

This concentration increases structural dependence on Odisha not only for production, but also for evacuation and logistics. As incremental supply builds in a single region, any disruption in transportation or policy changes at the state level could have a disproportionate impact on overall supply availability.

Supply expansion remains capacity-led

Production growth is being driven by higher utilisation levels and ramp-ups across both merchant and captive mines, particularly in Odisha. Incremental volumes are being led by private sector players, with Rungta expected to ramp up output from its Sanindpur mine, along with the commencement of production from the Pureibahal and Chandiposhi blocks. JSPL is also likely to see a rise in output as operations at its Roida mine resume, while Lloyds is expected to move toward full capacity utilisation of 26 mtpa.

JSW is likely to add incremental volumes from its Goa operations and the Vyasanakere mine in Karnataka, further contributing to supply growth. At the same time, state-owned producers continue to provide baseline supply, with OMC's output increase expected to be driven by higher production from its Jilling and Guali mines.

However, this expansion is not being matched by equivalent demand growth. Steel production is expected to increase at a moderate pace, sustaining baseline consumption but falling short of absorbing the rise in iron ore output. As a result, additional volumes are entering a system where demand is not expanding proportionately, increasing reliance on either inventory build-up or price adjustments to clear the market.

Export prospects

Exports may provide an outlet for surplus production if domestic demand remains insufficient. India's exports of fines and pellets have historically supported market balance, particularly through shipments to China.

However, export absorption is contingent on global demand conditions and price competitiveness. If international prices do not support Indian cargoes, surplus volumes are likely to remain within the domestic system, increasing downward pressure on prices.

Outlook

India's iron ore production is expected to continue expanding in FY'27, supported by capacity additions and mine ramp-ups. However, with supply growth exceeding demand, the system is likely to face increasing pressure. While volumes rise, the adjustment mechanism is likely to shift toward inventory build-up and pricing pressure rather than demand expansion. This indicates that the sector is expanding in scale, but with increasing strain on pricing power, cost structures, and cash flows.

Source: BigMint forecast 24 April 2026,

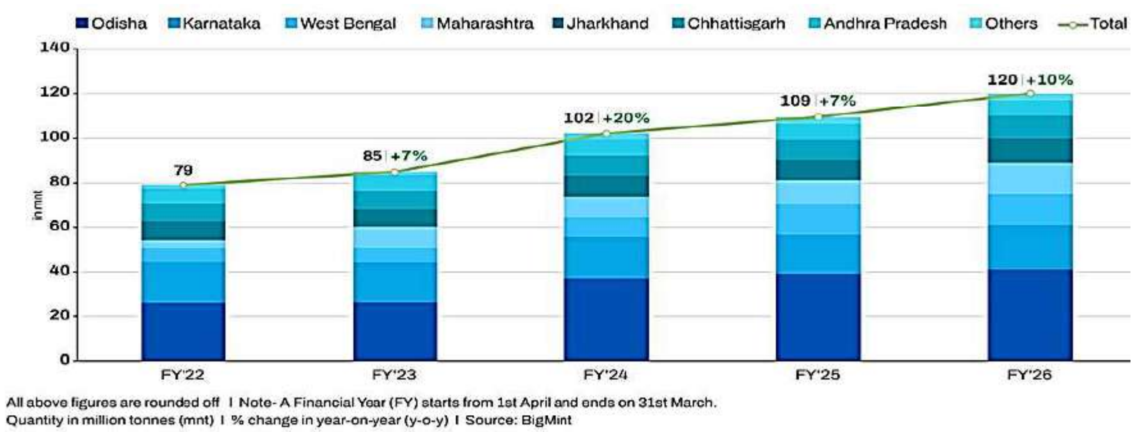
India’s Pellet Production

India's iron ore pellet production increased to 120 mnt in FY'26 (provisional), up from 109 mnt in FY'25, extending the structural growth recorded in recent years. Rising crude steel production and higher pellet usage in steelmaking have supported demand, while capacity additions have enabled output growth.

Production gains are concentrated in select regions, particularly Odisha and Maharashtra, while others such as West Bengal and Andhra Pradesh have stabilised. As a result, growth is increasingly clustered rather than uniform.

Demand drivers remain intact, with higher steel and sponge iron output supporting pellet consumption. Secondary steelmakers continue to rely on sponge iron due to cost advantages over imported scrap, while blast furnace producers have increased pellet usage. At the same time, demand is gradually shifting toward higher-grade and DR-grade pellets, reflecting efficiency gains and tightening environmental norms.

This creates a structural imbalance. While production continues to rise, utilisation remains constrained at around 65%, weighed down by weak export demand, limited availability of high-grade ore, and margin pressures.



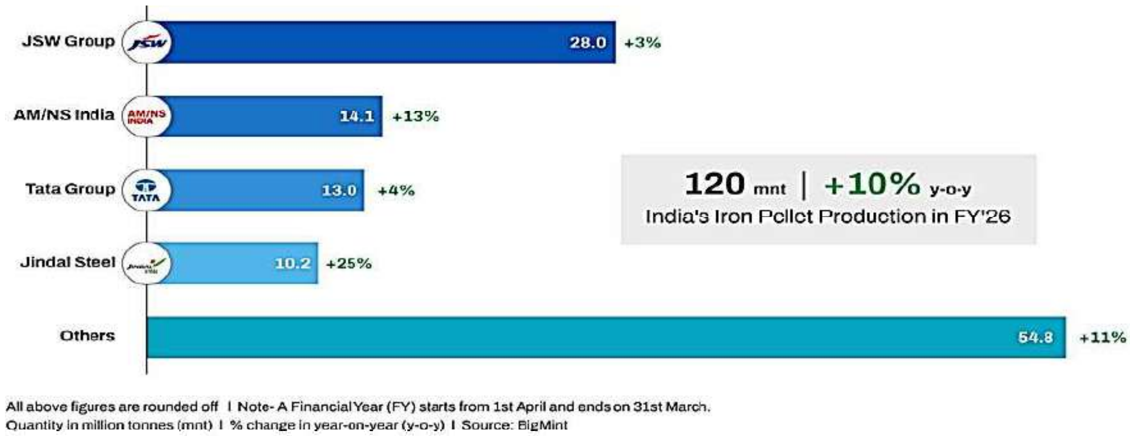
State-wise iron ore pellet production trend

State-wise production

Odisha remained the largest producer, increasing output from 39 mnt to 41 mnt, supported by strong ore availability. Maharashtra recorded the sharpest growth, rising from 11 mnt to 14 mnt on capacity ramp-ups.

Chhattisgarh and Jharkhand posted steady gains, while West Bengal stabilised at 14 mnt and Andhra Pradesh remained unchanged at 7 mnt. Karnataka also saw limited movement. Growth, therefore, remains concentrated in select clusters.**Top producers**

JSW Group remained the largest producer at 28 mnt, followed by AM/NS (14 mnt) and Tata Group (13 mnt). Jindal Steel Ltd increased output to 10 mnt.



Company-wise pellet production in FY'26

The "Others" category rose sharply from 49 mnt to 55 mnt, accounting for the largest share of incremental output. While large producers continue to expand, growth is increasingly driven by smaller and mid-sized players.

Higher crude steel output has supported pellet demand, while sponge iron production has sustained consumption, though competition from higher-quality scrap in electric routes continues to cap incremental demand.

Capacity additions have enabled output growth, but have also led to underutilisation in several regions. At the same time, fragmented expansion has increased competition and weighed on margins.

Outlook

Pellet production is expected to rise further, supported by steel demand and higher pellet usage in blast furnace operations. The increasing shift toward DR-grade pellets and low-carbon steelmaking routes is also likely to support structural demand.

However, low utilisation, weak exports, and raw material constraints will continue to limit efficiency. The key challenge will be improving utilisation and balancing supply with demand, rather than expanding capacity further.

Source: BigMint Updates, 07 May2026

India Needs More Scrap to Boost Green Steelmaking

Steel scrap has become an increasingly strategic resource for countries and their steelmakers as a key input for emissions reductions. India, the world's second largest steel producer, has set ambitious targets to double the share of scrap use in its total steel output in the coming decades. The question is: where is the scrap?

Scrap steel can significantly reduce emissions in steelmaking when used to feed electrified furnaces.

The coal-powered blast furnace route accounts for nearly 60 per cent of Indian crude steel capacity – a share set to rise with planned expansions. This process drives the iron and steel sector's contribution of roughly 10 per cent to the country's total carbon emissions. The potential benefits of greater scrap usage is obvious, but supply constraints represent a significant hurdle.

The Indian government aims for scrap to feed 50 per cent of its steel production by 2047, a figure that currently stands at 23 per cent. It is also seeking to more than double its crude steel output in the next decade, to reach 400 million tonnes per year.

With domestic scrap metal availability tight, and systems for its collection still developing, India is currently reliant on imports to meet the shortfall. Roughly a quarter of its 41 million tonne ferrous scrap consumption in the 2024-25 financial year was met with imports.

The companies building integrated domestic scrap supply chains now will be in a stronger position than those that remain dependent on imports as global availability tightens.

But this flow of steel scrap is being squeezed by rising global barriers: as of March 2025, 48 countries had imposed some form of restrictions on scrap exports. By 2030, the global scrap trade is expected to shrink by 15 per cent. India's key suppliers, the US and the European Union, are expected to see a drop in exports of 39 per cent and 23 per cent, respectively.

Supply constraint of scrap is a big challenge – not just for India, for the world over. Countries don't want any kind of metal scrap to go out because they have realised in the last seven, eight years that it's an essential commodity for reducing carbon emissions.

Developing domestic systems

India will find more scrap, but not enough to fully meet both its steel growth targets and the decarbonisation needs. The country is expected to face a scrap supply deficit of 40-50 million tonnes by 2050 "even under optimistic scenarios".

Nonetheless, domestic scrap stock is anticipated to grow by 6-8 per cent a year through to 2050. There is a need to focus on improving scrap recovery and processing to reduce import dependence. The long-term answer must be domestic ecosystem building.

Much of the steel consumed during India's rapid growth in recent decades is still locked up in infrastructure, buildings and vehicles that are in active use. The large end-of-life scrap volumes that advanced economies now enjoy reflect steel installed generations ago.

Establishing the systems to capture increasing volumes of domestic scrap has been a policy focus since 2019, when the national steel scrap recycling policy was launched. Alongside a 2021 vehicle scrappage policy and a 2019 ship recycling act, this created "a more coherent regulatory environment for scrap than existed before.

These policies have sought to coordinate a fragmented system largely dominated by the informal sector.

Progress has been made in setting these scrap policies. But they also pointed out that measures such as goods and service tax (GST) and collection procedures have made formal recyclers more expensive.

The informal sector avoids this tax, allowing it to undercut formal recyclers while disincentivising formal participation. This is holding back scrap from moving up supply chains to the steelmakers.

Other challenges include a lack of uniform national quality standards, with a need to strengthen systems for scrap grading and certification, as well as a lack of traceability systems linking scrap origin to end use.

Ministry of Steel is currently finalising a new policy that will replace the 2019 scrap steel recycling guidelines, alongside a proposed national steel policy.

Vehicle scheme highlights challenge

India's vast fleet of vehicles has been seen as a promising domestic source of scrap steel. There has been a vehicle scrapping policy in place since 2021, but progress toward its goals has been slow.

This policy established a system for registered vehicle scrapping facilities (RVSFs), which were tasked with processing a total of 500,000 vehicles annually by 2026. However, between August 2022 and July 2025, only around 350,000 vehicles were scrapped of an estimated eligible pool of 12 million.

The constraint is not the policy architecture but the physical infrastructure required to deliver it - a lack of testing stations, regional dismantling centres and processing facilities, the lack of incentives, and mandates, for drivers to take vehicles to these registered facilities. Once the material starts flowing to registered vehicle facilities, there will be a huge turnaround in this sector. It is projected that vehicle recycling could grow by around 13 per cent by 2030, supported by such policies.

Finding new sources

Other sectors as potential sources of scrap steel for India include its growing manufacturing sector, alongside construction, infrastructure and shipbreaking.

Construction and demolition sector is at a "very nascent stage" as a scrap source. Due to these projects' long lifecycles, this source will only deliver significant scrap steel volumes in the medium to long-term.

Scrap from shipbreaking, meanwhile, has received some policy and research attention.

India scraps roughly a third of the world's end-of-life vessels, mostly in its western state of Gujarat. Scrap steel from shipbreaking accounted for as little as 0.5 per cent of India's steel production.

This sector is projected to expand in the coming decade, as a vast swathe of the global fleet is due to reach retirement. But this, too, is bound up in international scrap dynamics: notably, some European organisations have called for the restriction of end-of-life vessel exports, in favour of retaining the material internally.

New scrap-based production is also coming online in India, signalling growing efforts towards scrap use among key steelmakers. Tata Steel has started electric arc furnace-based facilities in Ludhiana, with plans to only use scrap steel as the feedstock. 40 per cent of the required scrap will be sourced from the company's recycling plant in Haryana, approximately 200 km south of Ludhiana. The remainder will be sourced from within a 300 km radius. 50 per cent of the facility's power will come from renewable sources, with an expected carbon footprint of less than 0.3 tonnes of CO_2 per tonne of steel. This compares to approximately 2.2 tonnes for Tata's typical Indian operations.

If steelmakers could collect, aggregate, dismantle and process scrap themselves it could not only secure supplies but also capture margins of up to 16 per cent – which, currently, go to intermediaries. The companies building integrated domestic scrap supply chains now will be in a stronger position than those that remain dependent on imports as global availability tightens.

Looking ahead

The gap between India's scrap ambitions and its scrap reality will persist. But with the policy revision on the horizon and growing industry momentum, there is a real opportunity to close it.

Scrap should be looked to as a short-term lever, while the major decarbonisation routes to produce steel would be through green hydrogen-based direct reduction of iron, alongside scrap-based electric arc furnaces powered by renewables.

Source: MRAI News Updates: 07th May, 2026

Two Very Different Bets on India's Steel Future

India's two biggest private steelmakers are taking different paths to capitalise on the country's next phase of steel demand growth, with JSW Steel pushing for global scale while Tata Steel focuses on premium products and downstream expansion.

The divergence in strategy comes as both companies accelerate expansion plans amid expectations that India's steel demand will continue to outpace global markets over the next decade.

JSW Steel has outlined an aggressive capacity roadmap that could take its India capacity, including joint ventures, to 78 million tonnes by FY32. Tata Steel, meanwhile, said it wants leadership in specific high-margin segments such as automotive steel, branded retail products and value-added steel instead of chasing overall market share.

The contrast marks a shift in the rivalry between the two groups. The last time JSW Steel overtook Tata Steel in installed capacity was in 2009, when JSW Steel surpassed Tata Steel to become India's largest private sector steel producer with installed capacity of 7.8 million tonnes.

JSW Steel plans to expand its standalone India capacity to 62 million tonnes by FY32, while joint ventures with Japan's JFE Steel and South Korea's POSCO would add another 16 million tonnes. Including its Ohio operations, the company said total capacity would approach 80 million tonnes.

Vijayanagar facility would become the world's largest single-location steel plant after a planned five-million-tonne expansion lifts capacity at the site to 25 million tonnes.

India remained central to JSW's growth plans as domestic steel demand continues to expand. India could add 12 million tonnes to 14 million tonnes of incremental steel demand in FY27 alone.

Tata Steel Outlined A Different Approach

Rather than overall market share Tata Steel is looking at specific segments where they want to be number one. Tata Steel would focus more on downstream businesses, premium steel products and high-end markets instead of pursuing overall scale. Tata Steel will be more and more focused on downstream value-added high end markets, and aim to be at number one w.r.t. market share in auto sectors.

Tata Steel remains focused on increasing market share in segments such as automotive steel, oil and gas, branded retail products and downstream businesses including tubes, wires and coated steel.

Tata Steel already has the option to expand domestic capacity to 45 million tonnes to 50 million tonnes through existing sites including Kalinganagar, Meramandali, Neelachal and Jamshedpur. A proposed Maharashtra project could add another five million tonnes to 10 million tonnes of capacity.

Tata Steel said India would remain its main growth engine, accounting for 74% of total crude steel production in FY26.

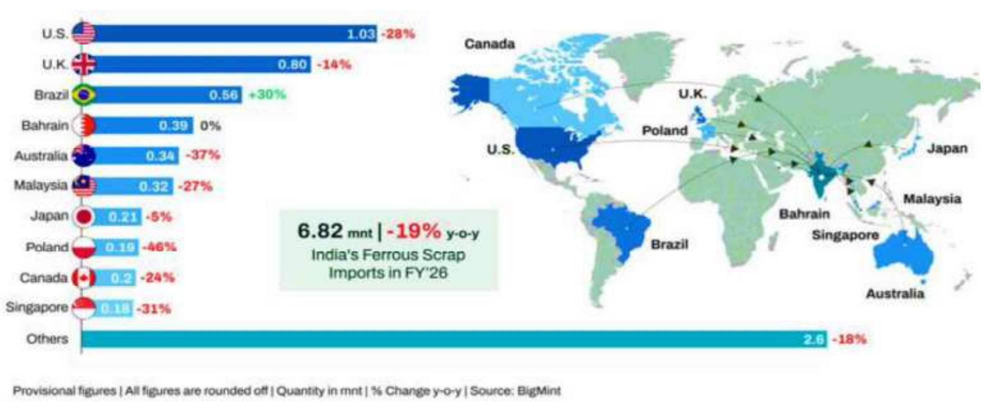
The company also said it plans to raise the share of downstream and value-added products in its overall sales mix to reduce exposure to commodity steel cycles.

Both companies said India's infrastructure spending, manufacturing growth and automotive demand continue to support steel consumption growth despite geopolitical uncertainty and volatile raw material prices.

Source: MRAI News Updates: 19th May, 2026

India's Ferrous Scrap Imports in FY'26

India's imported ferrous scrap fell sharply by 19% y-o-y to an estimated 6.82 million tonnes (mnt) from 8.45 mnt in FY'25. The drop marks one of the steepest y-o-y declines in the last four years, driven by compressed mill margins, surging domestic scrap generation, and lower import competitiveness.



India’s country-wise ferrous import in FY’26

Source: BigMint Updates, 15 May 2026

Boosting Aluminium Consumption in India

Aluminium is one of the most transformative materials of modern civilisation. Lightweight, corrosion-resistant, highly conductive, durable and infinitely recyclable, it has become indispensable across sectors ranging from transportation and construction to renewable energy, defence, packaging and consumer electronics. From the humble kitchen foil to spacecraft components, aluminium is woven into nearly every aspect of contemporary life.

Today, aluminium is a strategic metal driving industrial growth and technological advancement worldwide.

Global aluminium scenario and India's position

Global primary aluminium production exceeds 120 million tonnes annually, with China accounting for nearly 60 per cent of total output. India, with production of approximately 4 million tonnes annually, ranks as the world's second-largest producer. Yet, despite this strong production base, India's domestic consumption remains significantly below global standards.

India's per capita aluminium consumption is approximately 3.2 kilograms compared to the global average of around 11 kilograms and China's nearly 25 kilograms. This gap reflects not a weakness but a tremendous growth opportunity.

Why Aluminium is Critical for Viksit Bharat 2047

As India advances toward its vision of becoming a developed nation by 2047, increasing aluminium consumption must become a strategic priority.

The importance of aluminium in nation-building lies in its wide-ranging applications.

The construction sector presents one of the largest opportunities. Globally, construction accounts for nearly one-fourth of aluminium consumption, whereas in India it contributes only about 13 per cent. Aluminium offers significant advantages over traditional materials due to its strength, corrosion resistance, low maintenance requirements and design flexibility. It is increasingly being used in facades, windows, doors, roofing systems and modern architectural structures. Substituting conventional materials such as wood and certain plastics with aluminium can improve durability, reduce lifecycle costs and support sustainable construction practices.

The transportation sector is another critical growth driver. Globally, aluminium is central to lightweight vehicle design, helping improve fuel efficiency and reduce emissions. Indian vehicles currently use significantly less aluminium than global averages. With the rapid growth of electric mobility, aluminium will become indispensable for battery casings, structural components and lightweight chassis systems that extend vehicle range and improve performance.

India’s expanding power and electrification sector also relies heavily on aluminium. Nearly half of India’s aluminium consumption already comes from electrical applications such as transmission conductors, cables, and transformers. As electricity demand rises and grid expansion accelerates, aluminium will remain vital to affordable and efficient power infrastructure.

The renewable energy transition further strengthens aluminium’s strategic importance. Solar panel frames, mounting structures, wind turbine components and grid connectivity systems all depend extensively on aluminium. India’s ambitious renewable energy targets, including 500 GW of non-fossil fuel capacity by 2030, will substantially increase demand for aluminium-intensive infrastructure.

In defence and aerospace, aluminium’s high strength-to-weight ratio makes it indispensable for aircraft, missiles, naval systems, armoured vehicles and advanced defence platforms. As India pursues self-reliance through Atmanirbhar Bharat, domestic capability in high-performance aluminium alloys will become increasingly critical. The consumer durables sector also offers substantial growth potential. Rising incomes, urbanisation and changing lifestyles are expected to significantly increase demand for aluminium in appliances, modular kitchens, electronics and household products.

Challenges the metal faces

Despite these opportunities, several challenges remain. Competition from low-cost imports, substitution by plastics and UPVC, underutilised extrusion capacity and limited downstream value addition constrain domestic growth. Equally significant is the environmental challenge associated with primary aluminium production, which is highly energy-intensive and in India still heavily dependent on coal-based power. Availability of used metal for recycling in our country is also limited due to the relatively low per capita consumption of the metal and the long service life of many aluminium-containing products.

Way forward for increasing the consumption of aluminium

To unlock aluminium’s full potential, India requires a coordinated national strategy.

First, public procurement policies should prioritise aluminium-intensive designs in infrastructure, transportation and housing projects.

Second, downstream manufacturing and extrusion industries must be strengthened through incentives and protection against unfair imports.

Third, aluminium recycling infrastructure must be significantly expanded. Recycling aluminium requires only about 5 per cent of the energy needed for primary production, making it central to sustainable growth.

Fourth, the industry must accelerate its transition toward green aluminium through renewable energy integration, cleaner smelting technologies and exploration of emerging solutions such as small modular reactors for captive power.

Finally, innovation in alloy development and product applications must be encouraged through stronger collaboration among industry, research institutions and policymakers.

Conclusions

India possesses abundant bauxite reserves, strong production capability and rapidly expanding end-use sectors. What it now needs is a deliberate push toward increasing domestic aluminium consumption.

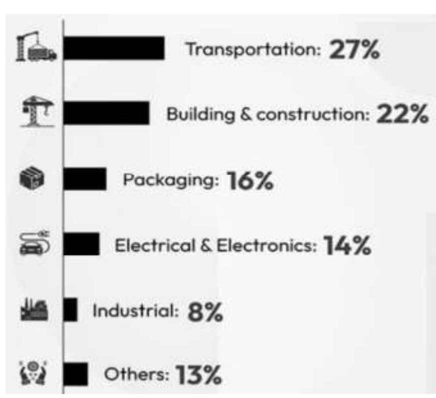
Boosting aluminium consumption is not merely an industrial objective. It is a strategic imperative for building sustainable infrastructure, enabling clean energy, strengthening defence manufacturing, supporting mobility transformation and driving economic growth.

What is required now is a deliberate national effort to accelerate domestic aluminium consumption through policy support, technological innovation, sustainable production and market development.

Aluminium can become one of the foundational materials of India's journey toward **Viksit Bharat 2047**. The opportunity is immense and the time to act is now.

Source: AL Circle, 26 May 2026

Global Aluminium Usage by End-use Sectors (2025)



IIM Delhi Chapter Supported Technical Programmes

1. **PHD Chamber of Commerce and Industry** (PHDCCI) organised a Conclave on "Raw Material Securitisation for Metals & Minerals" on 13th May 2026 at New Delhi. IIM Delhi Chapter was requested to be a Supporting Association. Some members of Delhi Chapter participated in the Conclave.

2. Metalogic Projects Management Services organised *Steel Technology Festival* on 26th May 2026 at New Delhi. IIM Delhi Chapter supported this Conference as Association Partner. Some members of our Chapter participated in the Conference.

3. Steel & Metallurgy organised a Two Days Conference at New Delhi on 5th & 6th June 2026 on the theme "Towards Atmanirbhar Bharat by 2047 - Decarbonisation and Energy Saving Initiatives in Steel Industry". IIM Delhi Chapter was a Co-Partner in the Conference. Some members participated in the Coinference.

   Dr. Ramen Datta Past Secretary IIM Delhi Chapter, Shri L. Pugazhanthy Past President IIM, and Shri R K Vijayavergia, Past Chairman, IIM Delhi Chapter, chaired the sessions during the Conference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4. The Association of Corrosion Professionals organised. 2nd International Conference & Exhibition on "Corrosion Management" on 18th & 19th June 2026 at New Delhi. IIM Delhi Chapter was invited to be a Knowledge Partner in the Conference. Shri K R Krishnakumar, Hon. Secretary & Shri R K Narang Hon. Treasurer, IIM Delhi Chapter participated in the Conference.