

Annual Issue

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The Future of the Indian Foundry Sector

Navneet Agarawal
President
Indian Institute of Foundrymen



Impact of Sustainability on Lead and Zinc

L. Pugazhenty
Executive Director
India Lead Zinc Development Association



India's Growing Copper Demand

Mayur Karmarkar
Managing Director,
International Copper Association, India

■ **Status of Aluminium Industry in India**

■ **Slight Drop in Lead Production Points to Opportunities for Innovation**

■ **Enhancing Cast House Safety with Fioscope**

■ **Impact of HIC on Metal Integrity**

■ **Effective Risk Mitigation in Base Metals**



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D. A. Chandekar
Editor

Dear Readers,

The Indian Union Budget 2025 has brought cheer to the metals industry, thanks to its focus on infrastructure development and measures to boost domestic manufacturing. The budget proposes a substantial increase in capital expenditure, with a significant portion allocated to infrastructure projects, which will drive demand for steel and other metals.

The government's continued emphasis on affordable housing is expected to boost demand for metals and cement, benefiting the entire construction and allied industries. The budget has also rationalized import duties on certain raw materials used in metal production, such as ferro-nickel and certain critical minerals, reducing input costs for domestic metal producers and making them more competitive.

In recent years, 'Green Manufacturing' has become the buzzword in the industry. The government has announced incentives to promote the production of green metal, which is a more sustainable and environmentally friendly alternative to conventional metal production. This will encourage the adoption of

Editorial Desk



cleaner technologies in the metallurgical industry and help India achieve its climate goals.

The budget includes several measures to support MSMEs, which are a crucial part of the metallurgical industry. This will help these businesses grow and create more jobs. The government's focus on supporting MSMEs is a step in the right direction, as these businesses are the backbone of the Indian economy.

The non-ferrous metals sector, in particular, is expected to benefit from the budget's focus on infrastructure development and domestic manufacturing. Copper, zinc, and aluminum demand is expected to rise, driven by growth in the construction, automotive, and renewable energy sectors. The annual issue of 'Metalworld' magazine provides a comprehensive overview of the metals industry, covering market trends, technological advancements, and industry insights. This year's issue is a must-read for anyone interested in the sector, offering valuable information and analysis on the opportunities and challenges facing the industry.

As the industry continues to evolve and adapt to changing market conditions, it is clear that the future looks bright for the Indian metals industry. With the budget's emphasis on growth and development, the metallurgical industry is poised to play a key role in India's economic growth story. ■

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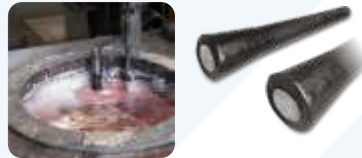
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The Future of the Indian Foundry Sector

Navneet Agarwal
President
Indian Institute of Foundrymen



Navneet Agarwal actively contributes to industry growth through his leadership roles as the President of the Institute of Indian Foundrymen (IIF) and Deputy Regional Chairman for EEPCC (ER). With nearly three decades of experience, he plays a key part in shaping the future of the foundry and infrastructure sectors in India. Through his involvement, he helps drive advancements, foster collaboration, and support the growth of Indian manufacturing on a global scale.

D.A.Chandekar, Editor & CEO of Metalworld magazine had an exclusive interaction with Navneet Agarwal President of the Indian Institute of Foundrymen (IIF) to get insights into the current landscape, future prospects, and how digitization and policy changes could shape the sector, the current situation in the Indian foundry sector, Can India become the global casting hub?, How important is digitization for the future of the foundry industry etc.

1. How do you assess the current situation in the Indian foundry sector?

The Indian foundry industry is undergoing a transitional phase. On one hand, traditional user segments such as automotive, trucks, tractors, pumps, and valves have been stagnant. However, with the recent budget, we expect increased liquidity in the market, which should drive growth in these sectors.

On the other hand, there is a strong surge in demand

from railways, defense, water infrastructure, and aerospace. This trend was evident at the recently concluded 73rd Indian Foundry Congress (IFC), where multiple B2B and individual meetings took place. Many new buyers from these emerging sectors



have shown keen interest in sourcing more castings.

Railway and wagon manufacturers, in particular, are expanding their capacity for both iron and steel castings. Additionally, we anticipate rising demand for engineered castings in the export market. However, the potential imposition of tariffs by the U.S. poses a threat to exports.

At the same time, we are witnessing a global shift in supply chains, with several companies relocating their manufacturing and sourcing bases from China to India. This trend is adding additional demand for Indian foundries. Overall, I am confident that the industry is in a “sunrise phase” and is poised to grow at an average annual rate of 10% over the next five years.

2. What are the short-term and long-term prospects for the Indian foundry sector? Can India become the global casting hub?

India is currently in a strategic sweet spot. With demand from North America and Europe shifting away from China, India is naturally positioned as a preferred alternative due to its

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Face to Face



technological capabilities, available capacities, and willingness to invest in equipment.

Several OEMs (Original Equipment Manufacturers) with existing operations in India are expanding their supply chains to source more castings. This trend is visible across sectors like automotive, trucks, defense, and valves. Even infrastructure castings, such as water fittings, are now moving their supply bases from China to India.

In response, many companies are establishing new greenfield foundries or expanding their existing ones to meet the demand. Based on current projections, India's total foundry capacity is expected to grow from 15 million metric tons to 21-22 million metric tons within the next 4-5 years.

Additionally, there is increasing demand for non-ferrous castings, particularly in aluminum and bronze. The Indian government's push to reduce imports and promote domestic manufacturing is also driving foundries to enhance their capabilities, further strengthening the sector. With all these factors in play, the Indian foundry industry is on track to grow by at

least 10% annually for the next five years, reinforcing India's potential as a global casting hub.

3. How important is digitization for the future of the foundry industry? How is IIF assisting its members in this transition?

Achieving Industry 4.0 is imperative for the foundry industry, and this cannot happen without digitization. Foundries must leverage data analytics, AI, and machine learning to optimize processes, improve efficiency, and reduce costs. IIF has taken significant steps to support its members in this digital transformation. We regularly host seminars and symposiums focused on the adoption of AI-driven tools in foundry operations. The National Centre for Technical Services (NCTS) in Pune is actively researching and publishing knowledge papers on the use of digital technologies.

At the recent Indian Foundry Congress, industry experts showcased their digitization journeys, sharing real-world examples of how AI and analytics have enhanced operational efficiency. Many of our members are already implementing these solutions and sharing their experiences, creating a collaborative knowledge base for the entire sector. However, we need to go beyond just digital adoption—our goal is sustainable digitization. This means using technology not just for efficiency but also to

reduce environmental impact, ensuring a responsible and competitive industry in the long run.

4. Can you share an overview of IIF's initiatives to support the foundry industry?

IIF's greatest strength lies in its 4,000+ members, with a 10-



15% growth rate annually. Our 24 chapters across India serve as regional hubs, supported by four Centers of Excellence, each focused on specific industry needs:

1. National Centre for Technical Services (Pune): Provides technical consultancy, problem-solving, and simulation services at affordable rates. Publishes knowledge-based books for industry professionals.
2. National Centre for Skill Development (Chennai): Focuses on workforce training at all levels, addressing the growing challenge of skilled labor shortages. Conducts "Train the Trainer" programs to enable foundries to continue skill development independently.
3. Foundry Informatics Centre (Delhi): Collects and compiles industry data for public and private stakeholders. Liaises with government

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ministries to advocate for policy improvements.

4. National Centre for Export Promotion (Kolkata):

Supports foundries



looking to expand into global markets.

Organizes international visits, trade fairs, and collaborations with global foundry associations like WFO.

In addition to these centers, IIF is also driving sustainability initiatives, cost benchmarking projects, and policy advocacy efforts to ensure the industry's long-term growth.

5. What policy changes does the industry need from the government?

There are several areas where policy intervention is critical for the growth of the Indian foundry sector:

1. Power Tariffs:

India has one of the highest power costs globally, making foundries less competitive.

Since power is the second-largest cost component after raw materials, we urge policymakers to reassess energy pricing and provide more competitive alternatives.

2. Sand Supply:

While some state governments have introduced sand supply policies, availability remains

an issue.

We encourage more states to streamline regulations to ensure uninterrupted supply.

3. Production-Linked Incentive (PLI) for Foundries:

Expanding foundry capacity in India requires



significant capital investment.

A PLI scheme would incentivize businesses to scale operations to a global level, boosting India's export potential.

IIF has been actively engaging with policymakers through our Policy Advocacy Committees at both national and regional levels. We are pleased with the

government's willingness to listen and act on industry concerns, but more reforms are needed to unlock the sector's full potential.

Conclusion: The Indian foundry industry stands on the brink of tremendous growth, driven by shifting global supply chains, domestic infrastructure demand, and digital transformation. With proactive industry initiatives, supportive government policies, and increased investment in technology, India has a unique opportunity to become the world's casting hub.

Through the efforts of IIF and its members, the sector is well-positioned to overcome challenges and capitalize on emerging opportunities, ensuring sustained progress for years to come. ■





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Impact of Sustainability on Lead and Zinc

L. Pugazhenthly

Executive Director

India Lead Zinc Development Association

L. Pugazhenthly is the Executive Director of the India Lead Zinc Development Association (ILZDA), an organization dedicated to promoting the sustainable development of lead and zinc industries in India. With extensive experience in the sector, Pugazhenthly plays a crucial role in advancing policies and initiatives that focus on the responsible use of these metals, enhancing their recycling, and addressing environmental concerns related to their production and consumption. Under his leadership, ILZDA works towards fostering innovation, improving industry standards, and ensuring the long-term growth and sustainability of the lead and zinc sectors.

D.A.Chandekar, Editor & CEO of Metalworld magazine had an exclusive interaction with Mr .L.Pugazhenthly Executive Director of the India Lead Zinc Development Association to get insights into the current landscape, future prospects, and how digitization and policy changes could shape the sector, the current status of Lead and Zinc, and how has it changed over the past few years?, the biggest challenge facing the Lead and Zinc industry today etc

Qn1 What is the current status of Lead and Zinc, and how has it changed over the past few years?

Ans At present, both Lead & Zinc are two major nonferrous metals & play vital roles in many countries in various applications like infrastructure (power, telecom, railways, highways, electric mobility, renewable energy), construction,

automobiles etc. During the last few years, the consumption of Lead & Zinc metals worldwide have consistently witnessed significant growths. India, being a fast growing economy with a high GDP, is seeing more growths in Lead & Zinc usage in the recent past and this trend is likely to continue in the coming years as well.

Qn2 What do you see as the biggest challenge facing the Lead and Zinc industry today?

Ans The biggest challenge facing the Lead & Zinc industry is the lack of awareness on the techno - economic advantages of these metals especially among the users as well as the policy planners, regulatory bodies etc. India Lead Zinc Development Association(ILZDA), on its part, regularly conducts seminars in various cities of India and invites the potential customers, officials from the Central & State Govt. departments to increase their awareness.



Qn3 What are some alternative materials that can replace Lead and Zinc in specific applications, and why?

In the case of Zinc, used for galvanizing mainly for corrosion protection of steel products and structures, paints, being cheaper on an initial cost basis, pose some challenges. Paints provide

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short term protection & they tend to peel off very soon.

In the case of Lead many alternative battery chemistries like Lithium ion



batteries, Zinc Air batteries, Aluminum Air batteries, Nickel Cadmium batteries etc., pose challenges. However, Lead Batteries are cheaper, most recycled, widely available and used globally for manufacture of new batteries endless number of times without any loss in properties or functions.

Qn4 How is galvanization related to Zinc, and why is it important?

Galvanizing is the major application of Zinc; in India more than 75% Zinc is used for this application alone. Steel products and structures are always prone to corrosion, with loss of strength very soon. In order to prevent corrosion, Zinc is applied on steel products through the hot dip galvanizing process. Zinc has excellent corrosion resistance property and provides a long, maintenance – free life for several decades. Hence Zinc is the most preferred choice for corrosion protection.

Qn5 How are sustainability and recycling regulations impacting the production and trade of Lead and Zinc?

In fact the world is talking about Sustainability, Circular economy, Green recycling etc. today only. On the other hand India started practicing Circular Economy from the 1970's by recycling & recovering Lead & Zinc from used Lead batteries, Zinc dross, Zinc ash/skimings etc., because in the 70's, 80's etc. India was largely dependent on imported metals and imports were not encouraged due to acute foreign exchange reserves, Lead & Zinc industry welcome new environmental regulations and best practices for environment protection as well as wellness of the society.



Qn6 What does the Lead & Zinc industry expect from the policy makers?

The government should make galvanizing mandatory to save the huge annual corrosion losses, about 4% of our GDP since the govt. sector is the largest user of steel.



In the case of two wheelers, three wheelers etc. the govt should encourage use of Lead batteries by creating massive public charging infrastructure as well as introducing swapping arrangement for charged batteries.



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India's Growing Copper Demand

Mayur Karmarkar

Managing Director,
International Copper Association, India



Mayur Karmarkar is the Managing Director of the International Copper Association (ICA) India. With a strong background in the copper industry, he plays a pivotal role in promoting the sustainable use of copper in India. Under his leadership, ICA India focuses on advancing the role of copper in key sectors such as energy, construction, and electronics, while driving initiatives related to innovation, sustainability, and environmental responsibility in the industry. His leadership has been integral to advancing the organization's goals of ensuring copper's positive impact on economic and environmental growth.

D.A.Chandekar, Editor & CEO of Metalworld magazine had an exclusive interaction with Mr. Mayur Karmarkar Managing Director of the International Copper Association India to get insights into the current landscape, future prospects, and how digitization and policy changes could shape the sector, the current trends in the copper market in India, the biggest challenges the copper industry is currently facing in India, How does ICA India work to educate the public about this

1. What are the current trends in the copper market in India?

While India, with 17.8% of the world's population, currently accounts for 3.4% of global GDP but has a low per capita copper consumption of 1.1 kg compared to the global average of 3.3 kg. However,

this is rapidly changing. India is approaching a critical economic juncture, mirroring China's position in early 2000s before the last commodity boom. With a population exceeding 1.4 billion and a growing middle class, copper demand is poised for substantial growth. This surge is already evident, with India's annual

copper demand rising by an average of 21% between FY2021 and FY2024, fuelled by economic expansion and key sector investments. In FY2024 alone, demand grew by 13% year-on-year, reaching 1.7 mntonnes. Building construction and infrastructure, traditionally consuming 43% of India's copper, continue to be the primary drivers. As per the latest GDP data, construction and infrastructure sector grew by 9.1% and 6.8%, respectively, in the first half of FY2025. The domestic copper cathode production increased by 8%, and net copper imports rose by 13% during the same period. Consequently, copper demand is projected to grow by 10-13% in FY2025, further propelled by increasing investments in renewable energy and electric vehicles.

Despite this rising demand, India's domestic copper mining contributes only about 2% of the total, highlighting the country's reliance on imports. While the government is taking steps to increase domestic mining, such as the expansion of two copper mines in Jharkhand, the impact will take time. In terms of cathode production, India has faced capacity constraints since 2018 due to the closure of Vedanta's Tuticorin smelters. Currently, roughly 32% of demand is met by domestic

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cathode production, primarily from Hindalco and Vedanta (which refines imported anode and blister). Another 30% is fulfilled by imported refined copper, including cathodes and semi-finished products. To reduce import dependence, domestic production is expanding. Adani's Kutch Copper smelter, commissioned recently, is projected to reach a 500K tonne capacity by end-2025, significantly boosting self-sufficiency. Fabrication capacity is also increasing, with Hindalco's copper tube plant and similar facilities from Mettube, Adani, and Global Copper (RR Kabel subsidiary) expected to become operational between 2025 and 2026. Hindalco has also announced investments in copper foil production for EV batteries.

Finally, approximately 38% of India's copper demand is met through direct remelted copper scrap and alloys. These direct remelting, if of low-grade scrap, can lead to quality issues when used in electrical applications. Recognizing the importance of this source, Hindalco has announced a 50K tonne per annum copper scrap



smelting & refining unit. These developments across the value chain, from mining and smelting to fabrication

and recycling, signal a significant transformation in India's copper market, positioning the country for greater self-sufficiency and enabling it to capitalize on the growing demand for this crucial metal.

2. What are the biggest challenges the copper industry is currently facing in India?

The Indian copper industry faces several key challenges despite recent investments in smelting and refining capacity. While capacity is increasing, with Adani's 500K tonnes Kutch Copper smelter and expected additions of ~1.5 million tonnes of various players by 2030, a major bottleneck is feedstock availability. India mainly relies on copper concentrate imports, may expose to supply chain disruptions risk due to geopolitical events. The recent Indonesian concentrate export ban, from which India imported roughly 27%, underscores this vulnerability. Therefore, India must not only intensify domestic mining efforts but also forge strategic partnerships with copper-rich nations in South America and Africa.

Another significant challenge lies in the quality of recycled copper through primitive remelting process as most of it is used in electrical applications where conductivity required is 100% IACS. While the Quality Control Order (QCO) is expected to improve quality over time, the transition period creates short-term challenges for

manufacturers. Finally, a lack of comprehensive data on the Indian copper industry hinders effective policymaking. Current government data focuses primarily on refined copper production of Hindalco, Vedanta, and Hindustan Copper, neglecting copper scrap. Efforts to collect and analyse more comprehensive data, including recycled material flows, are crucial for informed decision-making

3. What are the various activities in ICA? How does ICA India work to educate the public about this?

The International Copper Association India (ICA India) is a nonprofit organization dedicated to promoting the safe, efficient, and sustainable use of copper in sectors such as energy, infrastructure, and clean technology. Working closely with policymakers, regulators, industry bodies, and trade organizations, ICA India advocates for copper's role in enhancing safety, energy efficiency, and environmental sustainability. As part of India's 'Amrit Kaal' vision for 2047, ICA India is committed to strengthening the copper sector and aligning it with the country's sustainable development goals.

To engage and educate stakeholders, ICA India runs comprehensive awareness campaigns, workshops, and training programs tailored to electrical professionals, industry leaders, and consumers. The organization also acts as a collaborative platform, tackling critical issues such as quality standards, resource availability, and copper's vital role in India's energy transition. Through

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Face to Face

these efforts, ICA India works to unite industry voices, promote the responsible use of copper, and foster a more sustainable and resilient future for the country.

4. What are the New Applications are Developing?

Copper is playing an increasingly pivotal role in India's transition to a more sustainable, technology-driven future, with new applications emerging across several high-growth sectors.

1. Lithium Iron Phosphate (LFP) batteries are gaining prominence, driven by their superior safety, extended lifespan, and eco-friendly nature. LFP batteries are being used in electric vehicles (EVs). In order to be self-reliant on EV battery supply chain, manufacturing of very thin electro deposited (less than 10 microns) anode foil is need of the hour in India. Copper plays a vital role in LFP batteries, primarily as the current collector for the anode. The average copper required in a typical LFP battery (35 kWh) used in EV is 17.5 kgs of copper foil.

2. Smaller diameter, inner-grooved copper tubes, commonly known as microgroove tubes, are rapidly becoming the standard in the air conditioning industry, especially for room air conditioners. These tubes offer several key advantages, including enhanced heat transfer, improved energy efficiency, reduced refrigerant charge,

and lower material usage. As the global air conditioning industry focuses on adopting more environmentally friendly refrigerants while simultaneously striving for energy-efficient, corrosion resistant, durable, and cost-effective systems, these smaller diameter copper tubes have emerged as a preferred solution. The 5mm microgroove tube has already become an industry norm for heat exchangers, with over 60% of room ACs sold in India utilizing this size. A typical room AC (1.5 tons 3 Star) requires ~5 kgs 5 mm Microgroove copper tubes. Furthermore, leading Chinese and Japanese AC manufacturers are pioneering further reductions in diameter to 4mm and even 3mm, pushing the boundaries of energy and material efficiency.

5. What support does ICA needs from the Policy Makers?

Ensuring availability of the copper feedstock India's copper industry stands at a critical juncture. To ensure sustained growth and self-reliance, the industry requires continued support



from policymakers to meet the future demand. This includes establishing bilateral and multi-lateral

dialogue for feedstock security and expanding domestic exploration and mining.

Strengthening the copper recycling ecosystem

Concurrently, India needs policy to promote smelting and/or refining of copper scrap to reach the quality benchmark of refined copper. Furthermore, the effective implementation of the Quality Control Order (QCO) for copper and copper products will ensure the availability of refined copper for electrical applications and clean energy technologies.

Accelerating copper demand today to build urban mines Copper is one of the few metals which can be 100% recycled infinitely without losing its properties. Leveraging on this property and to reduce the long-term dependency on mined copper, it is necessary to build copper in-use inventory today. Accelerating the demand for copper in all end-use applications, we can build robust inventory of copper in-use for future need. By increasing copper's application in government procurement for power and infrastructure projects, India can build in-use copper inventory. This approach can reduce future dependence on mined copper, mitigating potential supply risk and managing the future cost of economic development. Because copper remains valuable for centuries, investing in a sustainable copper reserve today allows India to "have and eat its copper cake."



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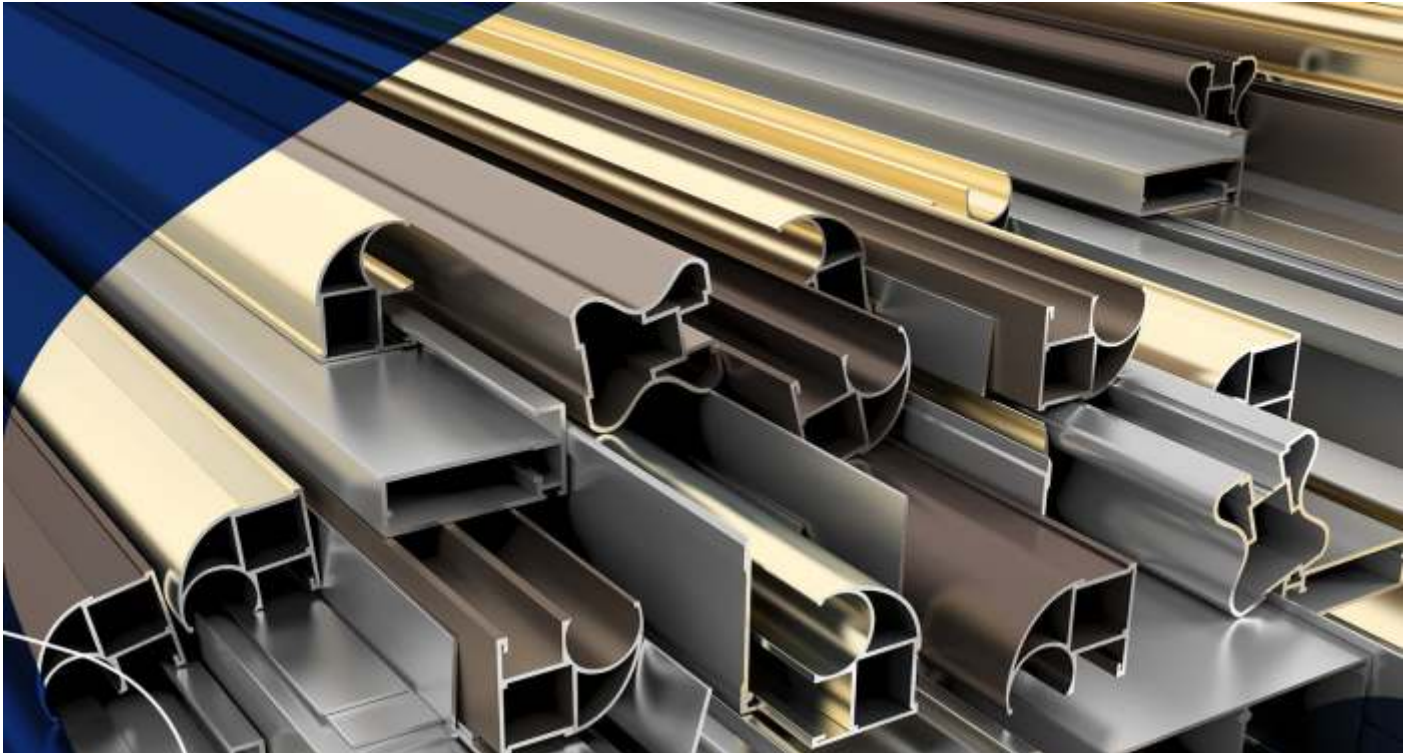
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Status of Aluminium Industry in India

Introduction: India Aluminium Market size was valued at USD 11.28 billion in 2023, and is predicted to reach USD 18.84 billion by 2030, at a CAGR of 7.6% from 2024 to 2030. The aluminum market includes the industry involved in the production, distribution, and use of aluminum, a lightweight, silvery-white metal. These features make it highly useful in sectors such as aerospace, automotive, construction, packaging, and electronics. Its low weight is especially beneficial for improving efficiency in transportation. The production process involves extracting aluminum from bauxite ore using the Bayer process and electrolysis. Advances in technology and recycling have improved the environmental sustainability

of production, supporting industry in India and aluminium market growth.

India's extensive infrastructure development plans significantly drive in India aluminium market demand. The construction of new airports, railways, highways, smart cities, and other projects require aluminum due to its lightweight, durability, and resistance to corrosion.

According to the National Investment Production and Facilitation Agency, the Indian government plans to invest USD 1.4 trillion in infrastructure from 2019 to 2023 to support sustainable national development. Since 2019, numerous road projects, gas pipelines, and industrial developments have been initiated. This focus on improving both urban and rural infrastructure generates

a strong demand for aluminum in India.

Factors affecting Aluminium production and demand: These are discussed below.

(1) Expansion of Airport Infrastructure Drives the Market Growth in India.

India's focus on expanding and modernizing airport facilities is significantly increasing the demand for aluminum in the construction of airport terminals, hangars, and other related components. According to the India Brand Equity Foundation, investments ranging from USD 5.99 to 6.41 billion are anticipated for India's airport infrastructure between FY18-23.

(2) Infrastructure Development Boosts Aluminum Demand in India.

India's extensive infrastructure development



Dhiraj K. Chauhan
(Director: METCON-Metallurgical Consultants)



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Analysis

plans significantly drive in the India aluminium market demand. The construction of new airports, railways, highways, smart cities, and other projects requires aluminum due to its lightweight, durability, and resistance to corrosion.

(3) Environmental and Regulatory Constraints Hinders the Growth of Aluminium Market.

The aluminum industry faces significant challenges due to stringent environmental regulations and sustainability requirements. Compliance with emissions control, waste management, and energy efficiency targets often results in higher operational costs for producers.

Meeting these strict standards requires substantial investments in technologies and processes aimed at reducing the environmental impact of aluminum production. While these measures are crucial for fostering a greener industry, they also increase the complexity and cost of production, affecting the overall efficiency and profitability of aluminum manufacturing.

(4) Growing Demand from the Automotive Industry.

The Indian automotive industry is a significant driver of the aluminium market, driven by the need for lightweight materials to enhance fuel efficiency and reduce emissions. Aluminium is extensively used in the manufacture of automotive parts such as

engine blocks, wheels, transmission housings, and body panels due to its high strength-to-weight ratio, corrosion resistance, and recyclability.

(a) The shift towards electric vehicles (EVs) has further accelerated the demand for aluminium. EVs require lightweight materials to maximize their range and efficiency, making aluminium an ideal choice. As India moves towards a greener future with policies supporting EV adoption, the aluminium market is set to benefit immensely. The government's FAME (Faster Adoption and Manufacturing of Hybrid and Electric Vehicles) scheme, which offers incentives for EV manufacturing and adoption, is a key policy propelling this trend.

(b) The growing middle-class population and rising disposable incomes in India have spurred the demand for personal vehicles. Urbanization and improved road infrastructure are additional factors driving automotive sales, further boosting the aluminium market. Major automotive manufacturers are investing heavily in expanding their production capacities in India, anticipating the surge in demand. This investment is creating a robust supply chain for aluminium components.

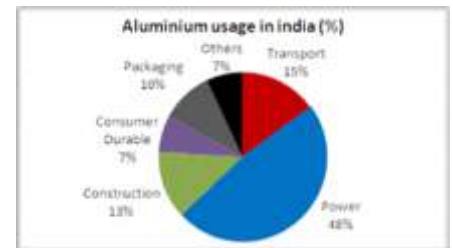
Market influencers:

Supply of primary aluminium is in excess as India is one of the largest producers of primary aluminium. However, due to limited scope of value

addition within the country, primary aluminium producers export large quantities of primary aluminium products and companies import a sizeable quantity of downstream products.

Aluminum consumption in India at 2.7 kg per capita is much below the global average of 11 kg per capita. Demand for the metal is expected to pick up as the scenario improves for user industries, like power, infrastructure and transportation.

Competition is primarily on quality and price, as being a commodity, differentiation is difficult. However, the recent spate of consolidation has reduced the competitive pressure in the industry.



Competitive Scenario:

Several key players operating in the India aluminium industry include Norsk Hydro ASA, Rio Tinto, Vedanta Aluminium And Power, Hindalco Industries Ltd., Jindal Aluminium Limited, BALCO (Bharat Aluminium Company Limited), National Aluminium Company Limited (NALCO), MANAKSIA ALUMINIUM COMPANY LIMITED (MALCO), Century Extrusions Limited, Global Aluminium, JM Aluminum, GAL Aluminium Extrusions Pvt. Ltd., Jupalco, Indo Alusys Industries Limited, SNALCO, and others. Demand in the domestic market is expected to grow by



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Foundry Fluxes, Ceramic Foam Filter
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Fused + Granulated fluxes



Analysis

8-10 per cent. As per provisional data, in the non-ferrous metal sector, primary aluminium production in FY 2024-25 (April-June) posted a growth of 1.2% over the corresponding period last year, increasing to 10.43 lakh ton (LT) in FY 2024-25 (April-June) from 10.28 LT in FY 2023-24 (April-June).



Figure 2: Aluminium Plant



Figure 3: Aluminium Extrusion profile

Installed Capacity of Indian Primary Aluminium Producers in India: It is shown in table 1 below.

Table 1

COMPANY	SMELTING CAPACITY (Lakh Tonnes)	LOCATION
NALCO	4.60	Angul (Odisha)
HINDALCO	13.54	Renukut (UP) & Hirakud (Odisha)
BALCO	5.75	Korba (MP)
Vedanta Ltd	17.40	Jharsugda (Odisha)
Total	41.29	

Production of Aluminium in India (Lakh Tonnes) is indicated in table 2.

Table 2

Company	2018-19	2019-20	2020-21	2021-22	2022-23
Nalco	4.40	4.18	4.18	4.60	4.60
Hindalco	12.96	13.13	12.41	13.03	13.21
Vedanta	19.59	18.88	19.59	22.69	17.22
Total	36.59	36.19	36.14	40.32	35.03

Die casting Industry: India has 400 die casting companies, making it one of the major suppliers of die cast parts in global market. Of these, over 25 units produce around 12000 tonnes of die cast parts per year.

Aided by the 1.3 million tons of aluminium production, the Indian industry consumes over 0.28 million tons of die-castings. In general, the die casting market is highly correlative to automobile industry. India's automobile industry is world's 5th largest, and is poised to become the third largest by 2020.

Availability of skilled, cheaper labor force and the government incentives for small and medium scale industries, stringent emission norms, and favorable domestic environment for automobile industry is expected to drive die casting market in India.

As per provisional data, in the non-ferrous metal sector, primary aluminium production in FY 2024-25 (April-June) posted a growth of 1.2% over the corresponding period last year, increasing to 10.43 lakh ton (LT) in FY 2024-25 (April-June) from 10.28 LT in FY 2023-24 (April-June).

Conclusion: Thus, it is clear that Aluminium production in India is poised for a big jump on account of various factors such as automotive industry demand, Government programs on infrastructure development, Growth of Die casting industry, power industry and construction industry's growth.



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Slight Drop in Lead Production Points to Opportunities for Innovation

The International Lead and Zinc Study Group (ILZSG) released preliminary data for world lead and zinc supply and demand during the first ten months of 2024. A brief summary is listed in the tables below.

increases in Bulgaria, Germany and Italy that were partially offset by declines in Poland and Sweden.

Rises in refined lead metal usage in India, the Republic of Korea and Vietnam were more than balanced by falls

the large Antamina mine declined substantially. Production in Europe was also lower, primarily as a result of reductions in Ireland and Portugal. However, there were rises in Bolivia, Mexico, Sweden and Congo D.R., where Ivanhoe Mines commissioned the Kipushi mine in June.

Refined metal production was limited by the availability of concentrates and fell by 1.7%. This was mainly the result of reductions in China, Japan, the Netherlands, Peru and the Russian Federation that were partially offset by rises in France, India and Germany, where the Nordenham smelter resumed production in March.

Increases in apparent usage

World Refined Lead Supply and Usage 2019 - 2024											
000 tonnes						Jan - Oct		2024			
	2019	2020	2021	2022	2023	2023	2024	Jul	Aug	Sep	Oct
Mine Production	4,682	4,437	4,552	4,433	4,467	3,674	3,727	373.3	387.1	396.6	399.7
Metal Production	12,870	12,545	13,000	12,776	13,219	10,973	10,782	1,061.7	1,071.9	1,086.3	1,111.4
Metal Usage	12,848	12,392	12,954	12,963	13,110	10,936	10,761	1,094.6	1,076.8	1,116.5	1,095.0

Source: ILZSG

Provisional data reported to the ILZSG indicate that world refined lead metal was in surplus by 21kt during the first ten months of 2024 with total reported stock levels increasing by 60kt.

World lead mine production rose in Australia, Bolivia, Bulgaria, Kazakhstan, Peru, Sweden and the United States. These increases were partially balanced by reductions in Ireland, Portugal and South Africa resulting in an overall rise globally of 1.5%.

A 1.7% fall in global lead metal production was mainly a result of lower output in China and Canada, where a scheduled maintenance at Teck Resources' Trail operations impacted production during the second quarter. In Australia, India, Japan and the Republic of Korea, however, output was higher than in the first ten months of 2023. European production rose by 2.5%, mainly as a consequence of

in Europe, Türkiye and the United States resulting in an overall decrease globally of 1.6%.

Chinese imports of lead contained in lead concentrates increased by 7.5% to 590kt. Net imports of

World Refined Zinc Supply and Usage 2019 - 2024											
000 tonnes						Jan - Oct		2024			
	2019	2020	2021	2022	2023	2023	2024	Jul	Aug	Sep	Oct
Mine Production	12,817	12,264	12,793	12,489	12,230	10,049	9,666	975.9	975.1	995.0	1,007.5
Metal Production	13,582	13,855	13,956	13,416	13,921	11,556	11,359	1,124.0	1,134.0	1,130.4	1,118.4
Metal Usage	13,830	13,345	14,051	13,449	13,602	11,200	11,340	1,159.0	1,178.7	1,177.4	1,187.5

Source: ILZSG

refined lead metal totalled 118kt, compared to net exports of 153kt in the first ten months of 2023.

According to preliminary data recently compiled by the ILZSG, the global market for refined zinc metal was in surplus by 19kt over the first ten months of 2024 with total reported inventories increasing by 80kt.

World zinc mine production fell by 3.8%, influenced by decreases in Canada, China, South Africa and Peru, where output at

of refined zinc metal in Brazil, India, the Republic of Korea, Mexico, Taiwan (China), Thailand, Türkiye and Vietnam were partially offset by reductions in China, Europe and the United States, resulting in an overall global rise of 1.3%.

Chinese imports of zinc contained in zinc concentrates fell by 19.6% to 1523kt. Net imports of refined zinc metal totalled 366kt, an increase of 65kt compared to the first ten months of 2023.

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Enhancing Cast House Safety with Fioscope

Fioscope GmbH are a global pioneer in high temperature camera applications, image processing, machine learning and process control. Through RiA Cast House Engineering GmbH, an exclusive partner for the Aluminium industry, Fioscope has been providing air-cooled In-Furnace camera systems to the Aluminum Cast Houses since 2014. Through this partnership, Fioscope has assisted in advancing safety and productivity levels in numerous Cast Houses worldwide.

In typical operations, the melt cycle cannot be observed without opening the door and losing heat and energy, as well as the associated safety risk to the operators. Fioscope's air-cooled camera system – made in Germany – provides Cast House personnel with real time melt process feedback through a true colour, HD resolution video image capture (See figures 1 and 2). Giving Cast House personnel this feedback reduces the time and frequency of exposure to molten aluminum, a clear safety advantage. Reducing the amount of time the furnace door is open also provides extensive productivity benefits through keeping the furnace temperature higher,

therefore melting material faster and increasing the throughput of the melting furnace. Reduced energy consumption is also possible through keeping the combustion chamber of the melting furnace at higher temperatures by keeping the door closed, therefore reducing the time that energy sources are required to raise the temperature of the furnace to melting and casting temperatures.



James Tomkinson
Sales and Marketing Manager,
RIA Cast House Engineering GmbH

maintenance stops for example.

Fioscope's air-cooled camera systems have smart capabilities. Combining professional high resolution image acquisition with latest digital image processing technologies for accurate identification of process parameters. After an off-site training period on Fioscope's neural network the software is able to detect the height of the



Figure 1: Melt Cycle Observed Through Fioscope Camera System Enabling Door Closed Operation

All of the above benefits of increased safety and productivity levels can be further enhanced with the addition of storage and playback capabilities. Meaning, events that may occur in the furnace can be reviewed and preventative actions implemented to prevent them happening again. Similarly, over a weekend or a night shift for example, Cast House management can review footage from within the furnace over the last 7 days on a FIFO system. Additionally, 1 frame per hour can be stored for 6 months, meaning long term changes in refractory can be monitored without having to look into the furnace making it easier to track and plan for



Figure 2: Real time melt cycle feedback for operators in the safety of the control room

scrap heap or recognize dross on the molten bath and produce a PLC signal to indicate a certain action to the Cast House operator, such as "Furnace Ready to Charge" or "Furnace Ready to Skim". This leads to obvious productivity benefits as the furnace may have been ready to receive more material or to skim earlier, however the operators

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Monitoring refractory for signs of damage and wear as well as monitoring the combustion chamber for anomalous and potentially dangerous conditions to alert operators.

control box which can all be mounted to the furnace itself. Simply requiring a power supply and a compressed air feed to keep the lens dust free and the image clear, the Fioscope system can be installed with minimal alterations to the furnace and in a short downtime period.

Visit us at stand 6A32at Aluminium Dusseldorf to discuss how our air-cooled smart camera technology can increase the productivity of your Cast House whilst protecting your operators.

temperatures while delivering clear images, even in challenging conditions.

2. **Air Blower**: To protect the camera and keep it operating at optimal performance, an air blower is used to cool the probe and prevent overheating. This ensures the system remains functional in the high-temperature environments of furnaces.

3. **Pneumatic and Electrical Components**: These components are essential for controlling the movement and positioning of the camera probe. Pneumatic systems help control probe insertion and retraction, while electrical



Figure 3: Fioscope Retractable Camera Probe and Air-Blower Mounted to Furnace Side Wall.

Fioscope's air-cooled cameras can easily be retrofit to existing furnaces as shown in Figure 3. Fioscope's camera system consists of a camera probe, air blower as well as a pneumatic and electrical

Fioscope's air-cooled camera systems are designed to provide high-performance visual inspection for furnaces and other industrial applications. These systems are specifically built to withstand extreme temperatures, making them ideal for use in environments

like furnaces, kilns, or combustion chambers.

The core components of the Fioscope camera system include:

1. **Camera Probe**: This is the main visual component of the system, which features high-resolution optics and robust construction. The probe is designed to withstand high



systems handle power supply and communication between the components.

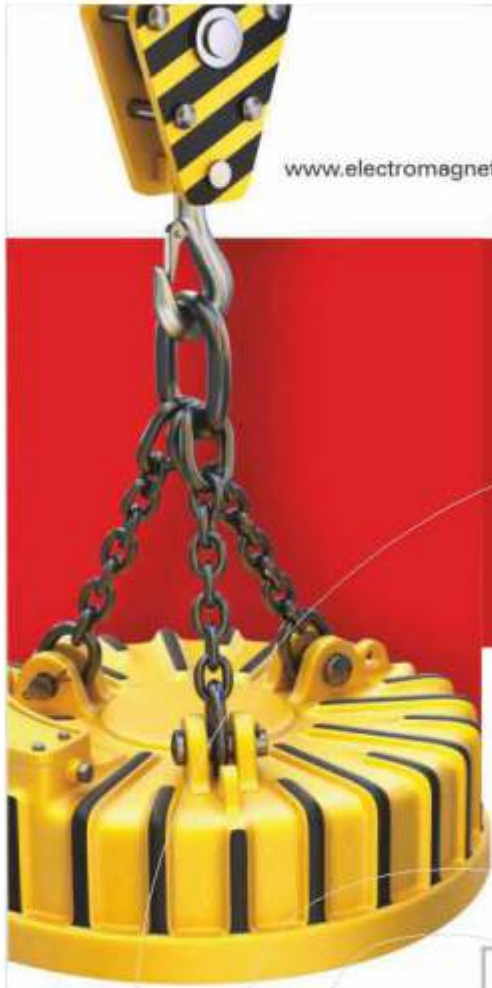
These air-cooled camera systems can be easily retrofitted to existing furnaces, making them a cost-effective solution for upgrading or replacing outdated inspection equipment. The integration of the camera system allows operators to perform detailed inspections in real-time without having to manually enter the furnace or interrupt operations, improving safety and operational efficiency. ■

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Impact of HIC on Metal Integrity

Hydrogen-induced cracking (HIC) is a type of corrosion that occurs when hydrogen atoms diffuse into a metal, causing it to crack. It's also known as hydrogen embrittlement. Hydrogen cracking may also be called cold cracking or delayed cracking. The principal distinguishing feature of this type of crack is that it occurs in ferritic steels, most often immediately on welding or a short time after welding.

Measurement of Diffusible Hydrogen Analysis in Weld Seams

Hydrogen contributes to material failures in weld seams by so-called hydrogen induced cracking, also described as delayed, under-bead or cold cracking, and can take place hours or sometimes days after welding. Hydrogen is the lightest element in the periodic table and has the smallest diameter, which makes it highly mobile. This mobility enables hydrogen to easily enter metal lattices and accumulate along grain boundaries and within the heat affected zone (HAZ) during welding. The solubility of hydrogen in the molten material is higher. During solidification of the weld seam, the solubility of hydrogen decreases, and hydrogen becomes trapped or supersaturated in the material, which can lead to failure of the material.

Three parameters contributing to hydrogen

induced cracking (HIC):

1. Presence of hydrogen (organic origin i.e., grease, oil, lubricants, hydrocarbons; moisture i.e., humidity, electrode coating)
2. Tensile stress of the material
3. Micro structure of the material



Figure 1: Examples of typical weld seam test samples.

To reduce the cracking susceptibility of completed welds, the amount of diffusible hydrogen should be reduced to a minimum. This can be achieved by controlling the welding environment (e.g., humidity), using only low hydrogen electrodes and by controlling pre-heating, inter pass and post-heating temperature conditions. For the determination of diffusible hydrogen in weld seams and welding materials according to EN ISO 3690 and AWS A4.3 the infrared heated furnace with a tube diameter of 30 mm is used.

The G4 PHOENIX from BRUKER AXS, Germany is a dedicated instrument for the fast and easy determination of diffusible hydrogen. The G4 PHOENIX was developed

for the determination of diffusible hydrogen in different sample matrices in the carrier gas hot extraction method. The analysis system comprises of a rapid heating and cooling in a furnace shell and/or a



Figure 2: G4 PHOENIX Sample resting at the front part of the quartz tube, ready to be inserted.



SUYASH NADKARNI
C.E.O. ,
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wire-heated tube furnace, both equipped with a quartz tube. The evolved analyte H₂ is transported by the carrier gas, N₂, to the highly stable and sensitive thermal conductivity cell (TCD) with two measuring ranges. Removal of interfering gases, like CO, is performed by oxidizing CO to CO₂ with Schüttere agent and subsequent adsorption of CO₂ on a molecular sieve. As simple and reliable calibration is guaranteed by the integrated automatic gas dosing unit with 10 different volumes. The tube diameter of 30 mm accepts even large samples according to ISO EN 3690 and AWS A4.3. Fast analysis makes this instrument the ideal tool for quality and process control, even in high sample throughput environments.

Sample measurement:



The sample is removed from the repository filled with liquid nitrogen or dry ice, cleaned, and weighed (gross weight). The gross weight defines the weight of the carrier material now including the weld seam and is assigned to net weight of the empty carrier in the software. The true sample weight of the actual weld seam (gross weight - net weight) is automatically calculated by the software. After the weight was added to the weight buffer, the analysis can be started, and the sample inserted into the quartz tube of the infrared furnace. Once the analysis is finished, the sample can be removed.

Summary:

control in welding and other industries affected by hydrogen induced embrittlement. The optional addition of a quadrupole mass spectrometer to the G4 PHOENIX allows to extend the measurement range to even lower concentration levels. As an alternative to the G4 PHOENIX, the G8 GALILEO with an external IR-furnace can also be used for diffusible hydrogen analysis, in addition to oxygen, nitrogen and total hydrogen determination by melt extraction

References and further reading



in weld seams should be programmed as follows:

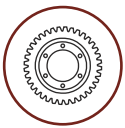
• EN ISO 3690 (2018): Welding and allied processes – Procedure for Determining the Hydrogen Content in Arc Weld Metal Max. of start comp.

• Kannegiesser, T.; Tiersch, N. 2013: Comparative study between hot extraction methods and mercury method – a national round robin test, Welding in the World 54, R108-R114 (2010).
 • Ström, C.; Elvander, J.: Calibration and verification of the hot extraction method including a comparison with the mercury method, IIW Doc II-1543-04, 2004.
 • Stremming, H. 2011: Carrier Gas Hot Extraction Method with Thermal Conductivity Detection and Mass Spectrometer - Survey of Principles, Options and Applications. Bruker Elemental GmbH, Kalkar



The G4 PHOENIX provides high precision, easy operation and fast results. It therefore is an ideal choice for quality and process

· Extract from the Lab Report CS/ONH 27 from Bruker AXS SE, Germany
 The method parameters for analyzing diffusible hydrogen



Effective Risk Mitigation in Base Metals

Effectively managing price risks in the base metals market is crucial, and this can be achieved through hedging strategies that utilize MCX derivatives and the Metal Index. Exchange-traded commodity derivatives and delivery through regulated exchanges provide significant benefits to all stakeholders and participants in the base metals value chain.

India plays a crucial role in the global industrial metals market, with diverse mineral resources. In FY24, the country produced 4.16 million tonnes of aluminum, about 6% of global production, and produced 509,000 tonnes of copper while importing nearly 1.18 million tonnes. India is a top producer of lead and zinc, the second-largest producer of crude steel, and the leading producer of sponge iron, contributing around 7% to global crude steel output. The manufacturing sector, especially in infrastructure, space, defence, automotive, and green energy, is growing and relies heavily on base metals like aluminum, copper, zinc, and lead. The production process involves mining, smelting, refining, and distribution, leading to end-user applications in construction, automotive, packaging, and electronics, with recycling companies promoting sustainability by reintroducing metals back into the market.

Risks in Metal Prices and their Management

Fluctuations in metal prices significantly impact value chain participants (VCPs). Prices are highly volatile due to global supply and demand, geopolitical tensions, and currency changes, posing challenges for businesses. For instance, a cable manufacturer importing copper rods faces a 16.7% price volatility risk. If the copper price is ₹750 per kilogram for 10 metric tons, the raw material cost is ₹75 lakh. If prices increase to ₹875, costs rise to ₹87.5 lakh, creating an additional expense of ₹12.5 lakh. Conversely, if prices drop to ₹625, the cost reduces to ₹62.5 lakh, saving ₹12.5 lakh. Such fluctuations are risky, particularly if finished goods are pre-sold at fixed prices. Other metals also show similar volatility, affecting profitability. Table 1 displays the price volatility of various metals during the calendar year 2024.

Table1: Annualised Volatility in metals during 2024

The availability of

Commodity	Annualised Volatility CY 2024
Aluminium	16.2%
Copper	16.7%
Lead	10.5%
Nickel	18.2%
Steel	6.5%
Zinc	19.4%

exchange-traded derivatives has significantly simplified



Kamlesh Jogi
Manager – Strategy and Research, MCX

the management of risks associated with price volatility. The Multi Commodity Exchange (MCX), the leading commodity exchange in India, offers futures and options contracts on agriculture, bullion, energy, and metals. Within the metals category, futures contracts are available for aluminum, copper, lead, nickel, steel, and zinc. For smaller stakeholders, mini futures contracts are also offered for aluminum, lead, and zinc. Additionally, MCX provides options on the futures of copper and zinc. Let us take a look at the contract specifications of these products in **Table 2 below:**

Risk Management using commodity derivatives

Hedging is a popular price risk management strategy that uses Futures and Options to lock in prices and reduce exposure to market fluctuations. For instance, a cable manufacturer can secure copper prices at ₹750 per kg using exchange-traded derivatives. Futures contracts help stabilize prices for future transactions, while Options provide flexibility to capitalize on favorable market movements. With standardized contracts, high liquidity, and transparent pricing, MCX's base metal derivatives effectively serve as tools for hedging, speculation, and portfolio diversification for both industrial users and financial investors.

Index on Base metals

The MCX METLDEX® is an investment vehicle that tracks

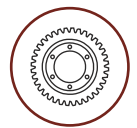


Table 2: Contract specification of metals futures at MCX*

	Copper	Aluminium	Lead	Zinc	Steel	Nickel
Trading Unit - Regular	2.5 MT	5 MT	5 MT	5 MT	5 MT	1.5 MT
Trading Unit - Mini	-	1 MT	1 MT	1 MT	-	-
Price Quotation	1 kg	1 kg	1 kg	1 Kg	1 MT	1 Kg
Price Quote excluding GST & Primarily delivery center	Ex warehouse at Thane district	Ex warehouse at Raipur district	Ex warehouse at Chennai district	Ex warehouse at Thane district	Ex warehouse at Raipur district	Ex warehouse at Thane district
Maximum Order Size	70 mt	150 mt	100 mt	100 mt	200 mt	24 mt
Initial Margin	8%	8%	8%	10%	8%	10%
Maximum Open Position (Individual)	7,000 MT or 5% of the market wide open position	25,000 MT or 5% of the market wide open position	3,500 MT or 5% of the market wide open position	7,000 MT or 5% of the market wide open position	1,20,000 MT or 5% of the market wide open position	1,000 MT or 5% of the market wide open position
Maximum Open Position (Member)	70,000 MT or 20% of the market wide open position	2,50,000 MT or 20% of the market wide open position	35,000 MT or 20% of the market wide open position	70,000 MT or 20% of the market wide open position	12,00,000 MT or 5% of the market wide open position	10,000 MT or 20% of the market wide open position
Additional Delivery Center	NCR, Chennai, Kolkata	Thane, NCR, Chennai & Kolkata	Thane, NCR, Kolkata	Kolkata, NCR, Chennai	Thane, Palwal (NCR), Chennai, Kolkata	Chennai NCR, Kolkata
Trading Period	Mondays through Fridays					
Trading Sessions	Monday to Friday: 09.00 a.m. to 11.30 p.m. / 11.55 p.m.* (* based on US daylight saving period)					
Delivery Logic	Compulsory Delivery (All Metals)					
Staggered Delivery Period	Last 3 working days including the last trading day (expiry day) of the contract.					

*Check MCX Website for exact product contract specifications and other delivery and trading details.

Table 3: Price Risk Management using Futures & Options

	Using Futures	Using Options
Objective	The manufacturer wants to lock the purchase price of copper to avoid the risk of prices rising above ₹750 per kg.	Protect against price increases above ₹750 per kg while benefiting from price drops.
Action	<ul style="list-style-type: none"> - The manufacturer enters a long position (buy) in a copper futures contract at ₹750 per kg on the commodity exchange. - Each futures contract specifies a quantity (e.g., 1 ton = 1,000 kg). 	<ul style="list-style-type: none"> - The manufacturer buys a call option with a strike price of ₹750 per kg. - The premium for the option might cost, say, ₹10 per kg.
Outcome	<ul style="list-style-type: none"> - If the price of copper rises to ₹800 per kg at the time of actual purchase, the manufacturer will profit ₹50 per kg from the futures contract, offsetting the increased cost of purchasing copper in the spot market. - If prices fall to ₹700 per kg, the manufacturer will incur a ₹50 per kg loss on the futures contract but can buy copper at the lower spot price, keeping the effective price close to ₹750 per kg. 	<ul style="list-style-type: none"> - If copper prices rise to ₹800 per kg, the manufacturer can exercise the call option, buying copper at ₹750 per kg, saving ₹50 per kg (minus the premium of ₹10). - If prices fall to ₹700 per kg, the manufacturer lets the option expire, losing the premium but purchasing copper at the lower market price.
Key Benefit	Futures provides certainty in price	Options offer flexibility to benefit from price drops
	<i>Both strategies mitigate the risk of unexpected price surges, helping the manufacturer maintain stable production costs.</i>	

a basket of base metals, including aluminium, copper, lead, and zinc, measuring their prices for performance assessment. This index offers transparent exposure to the base metals market and serves as a benchmark for investments. It diversifies portfolios and has the potential for attractive

returns with lower volatility compared to single commodity investments. Performance for CY2024 is shown in Chart 1. Based on the METLDEX[®]a futures contract is also available for trading at MCX, with one lot priced at Rs 50 and a daily price limit of 4%. The initial margin

requirement is around 5%, making it useful for investment, hedging, and benchmarking in commodities.

Deliveries at MCX

The objective of an efficient commodity exchange platform is to discover prices, leading to 'One India, One Price' for exchange-traded derivatives. To support this, MCX has expanded delivery centers across India, including Raipur, Kolkata, Palwal, Chennai, and Thane. Since converting to delivery-settled contracts in 2019, cumulative deliveries via exchange settlement have exceeded 4 lakh metric tons. Table 4 shows total deliveries by commodities.

India Good Delivery Initiative:

When Indian exchanges were established, it became necessary to align futures contract specifications with the London Metal Exchange (LME) standards to develop an ecosystem for quality testing and create standard parameters for Participants in Commodity Value Chains (PC-VCPs). However, domestic quality requirements differ from LME standards. In line with the Atmanirbhar Bharat initiative, MCX has developed its own good delivery standards and empanelled several players that meet these criteria. MCX offers derivative contracts for Aluminium, Copper, Lead, Nickel, and Zinc, and has empanelled domestic lead recyclers based on its standards.

Unique Advantage of Exchange traded derivatives and delivery at regulated exchanges:

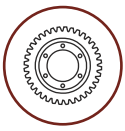
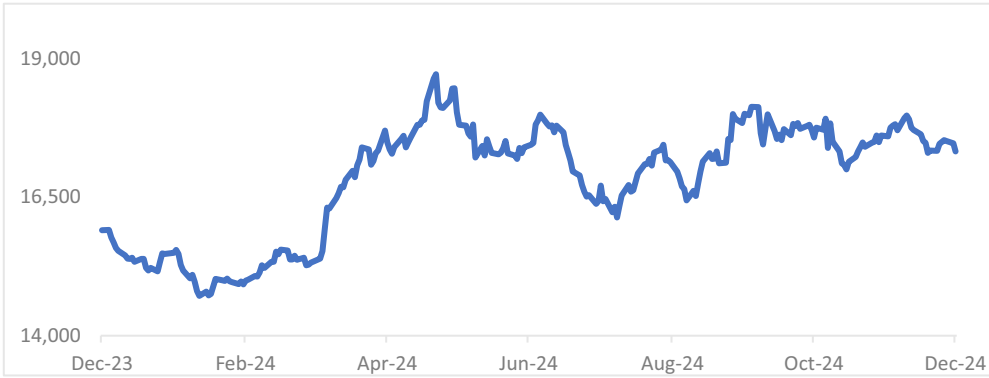


Chart 1: MCX iCOMDEX Base Metal (MCX METLDEX®)



navigate price fluctuations, optimize their operations, and contribute to a resilient commodities ecosystem.

Table 4: Cumulative Delivery Detail# (Since Inception i.e. 2019)

Commodities	Quantity (MT)
ALUMINIUM	1,51,229
COPPER	1,05,820
LEAD	54,851
NICKEL	11,409
ZINC	1,20,840
Total	4,44,149

#as on Dec 31, 2024

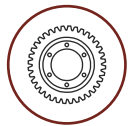
Exchange-traded commodity derivatives on regulated exchanges provide transparency, risk management, and reliability in the base metals market. They ensure fair price discovery and enable effective hedging against volatility. During the COVID-19 lockdown, MCX traders remained active and unaffected by disruptions that impacted physical players, showcasing the value of these platforms as a "market of last resort."

In conclusion, effective price risk management is crucial for participants in the base metals market. Tools such as MCX metals derivatives and the METLDEX® offer robust

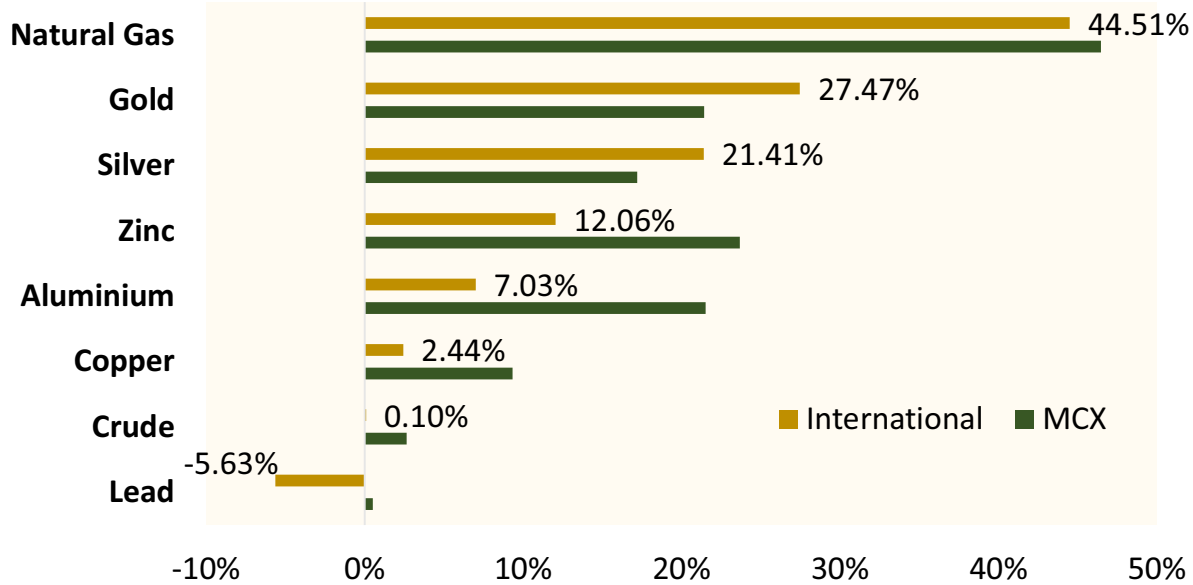
solutions for managing these risks. Implementing hedging strategies using futures and options can help mitigate volatility, ensuring financial stability for businesses. The MCX METLDEX® simplifies exposure to multiple base metals, providing both diversification and cost efficiency. Additionally, India's Good Delivery standards enhance trust and transparency within the metals market. Exchange-traded derivatives are notable for their liquidity, price discovery, and regulatory safeguards, making them a reliable choice for risk management. Together, these mechanisms empower stakeholders to

Research conducted by IIT Kharagpur found that with the empanelment of lead refiners, the influence of international prices on domestic prices has decreased. This means that price discovery in Indian markets has become more aligned with Indian demand and supply dynamics, leading to the establishment of an "India price" for lead.

Link to the study : https://www.mcxindia.com/docs/default-source/education-training/research-studies/atmanirbhar-bharat-gold-and-lead-final.pdf?sfvrsn=bff559e_2



Commodities Flashback 2024 and 2025 Outlook



2024 was a year of ups and downs for individual commodities, leading the S&P GSCI, a widely recognized benchmark commodity index, to end the year flat. Some commodities performed well as central banks began their easing cycles. It's for the sole reason – along with the geopolitical environment – that precious metals remained the best performing part of the complex, with gold hitting record levels repeatedly in the current year. Industrial metals also started the year on a strong footing, but ran out of steam and expectations persisted of short-term fundamentals remaining bearish especially for Copper.

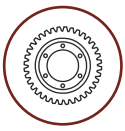
In the energy complex, Crude oil was relatively stable, despite various geopolitical events that arose throughout the year. While these events caused temporary price spikes, China's sluggish economic growth and rising U.S. oil production exerted downward pressure on prices. OPEC+ cuts sustained a price floor near

\$65. Natural gas led the commodities segment in 2024 with a remarkable 45% annual gain. The year began with mild winters, low heating demand, high stockpiles, and prices below break-even levels. However, by year-end, forecasts of colder U.S. winters, demand optimism and falling storage surplus drove a significant rebound in prices.

Looking ahead, we expect crude oil to trade with upward bias in 1Q 2025 as supply side remain restricted with OPEC+ cuts in place and potential tighter sanctions. However, Q2 onwards, focus will gradually shift to surplus Oil balances. Natural gas prices have begun the new year with host of factors on cards that would set direction for 2025. We see natural gas's positive undertone persisting, but since prices have risen significantly in the concluding weeks of December, prices should stabilize before taking a leap. The outlook for industrial metals looks somewhat cloudy, with trade frictions and potential changes to the Inflation Reduction Act in the

US weighing on metals. Metal markets to wait to see if recent support measures from China will finally feed through to the commodities complex, along with clues on further stimulus measures.

Overall, we hold a mixed view on commodities for 2025, backed by the fundamentals detailed in the report. Natural gas will remain in focus due to squeezing surplus stockpiles, while crude oil gains may be capped as markets shift into surplus. Precious metals are unlikely to see significant downside, supported by safe-haven flows amid geopolitical risks and trade war uncertainties. Among industrial metals, aluminum is expected to remain in focus due to a potential supply deficit. While a stronger USD may create headwinds for commodities, much will depend on how Trump's policies unfold across different segments and the economy as a whole. Any escalation in trade tensions could pose additional risks. Markets are also closely monitoring the impact of Chinese support measures, which could boost demand if they materialize effectively.



	2024 Close	2024 Returns (% chg)	Deviation from 2024 High (%)	Deviation from 2024 Low (%)
Precious Metals				
Comex Gold(\$/oz)	2641	28.04%	-6.09%	35.18%
MCX Gold(Rs/10gm)	76748	21.43 %	-3.94%	20.27%
Comex Silver ((\$/oz)	23.78	22.97%	-19.93%	30.22%
MCX Silver(Rs/10gm)	87233	17.20 %	-14.73%	25.84%
Base Metals				
LME Copper (\$/tn)	8768	2.44%	-26.65%	7.31%
MCX Copper(Rs/kg)	795.75	9.34%	-18.87%	12.10%
LME Aluminum(\$/tn)	2551.5	7.03%	-9.70%	15.64%
MCX Aluminum(Rs/kg)	253.3	21.52%	-2.98%	23.43%
LME Zinc(\$/tn)	2978.5	12.06%	-10.26%	23.52%
MCX Zinc(Rs/kg)	284.05	23.69%	-5.70%	27.95%
LME Lead(\$/tn)	1952	-5.63%	-20.85%	1.79%
MCX Lead(Rs/kg)	176.4	-2.68%	-18.03%	2.01%
Energy				
Nymex Crude Oil(\$/bbl)	71.72	0.10%	-22.24%	8.98%
MCX Crude Oil(Rs/bbl)	6166	2.65%	-18.75%	11.14%
Nymex Natural Gas(\$/mmBtu)	3.633	44.51%	-15.63%	59.23%
MCX Natural Gas(Rs/mmBtu)	310.4	46.48%	-14.50%	58.60%

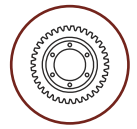
Source: AR Research, Bloomberg

Gold continued its exceptional performance in 2024 while delivering almost 27 % YTD returns, which was highest since 2010 – 2011 period. Some key reasons influencing gold prices in H1 2024 were central bank buying especially from China,

India & Eastern European economies. This buying momentum from central banks continued in second half of the year too except major Asian buyer China which paused its buying between May - Oct. Gold reached 40 new record highs

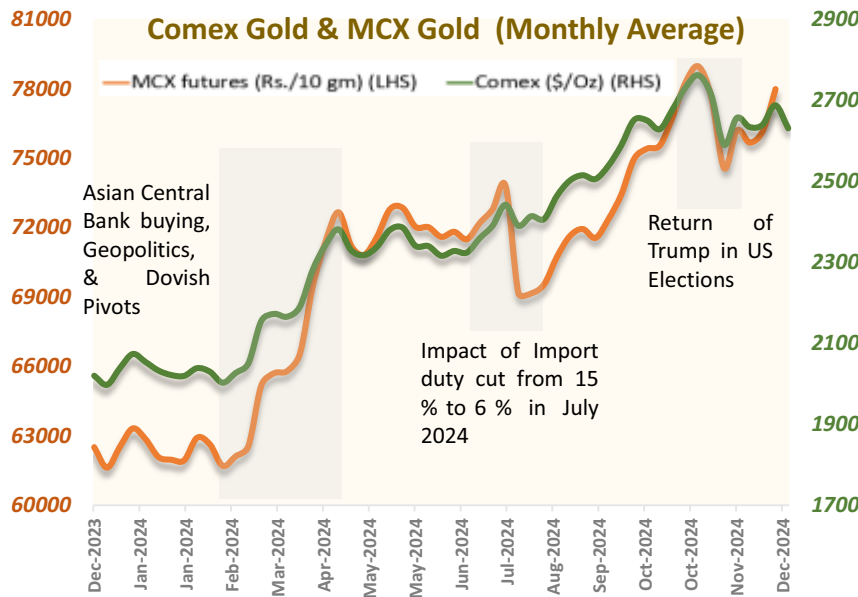
in 2024 and total gold demand in the third quarter surpassed US\$100 billion for the first time.

Investment demand, especially through over-the-counter transactions, was supported by an undercurrent of geopolitical risk and volatility in many regional



Gold : Recap 2024

Gold remained the most preferred Commodity of 2024



JAN - APR: Central Banks & Asian Investors augment gold to new highs offsetting concerns of sticky Inflation.

MAY – JUL: Inflation starts to recede to Fed 2 % target augmenting rate cut concerns in H2 2025. India Import duty cut impacts domestic prices.

AUG - OCT: Slowdown in Labour Market along with geopolitics & recession panic leads to start of rate cut cycle and new highs in Gold in Oct.

NOV onwards: Trump returns leading to strength in Dollar Index and fall in gold prices.

financial markets. For most of the third quarter, Western investors flocked back to gold as central banks started cutting interest rates. Meanwhile rising geopolitical tensions in middle east a mid start of rate cutting cycle across globe in the second half of the year aided the sentiments as gold continued to hit multiple new all time highs in Sep - Oct month. Behind this, central bank & investor buying were seen more than offsetting a notable deceleration in consumer demand in major Asian countries, as lower yields and a weakening US dollar in Q3 fuelled Western investment flows.

Finally Gold unprecedented rally halted in November after return of Donald Trump as new president of US which fuelled speculation of a wave of inflationary policies

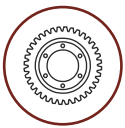
in 2025 leading to cautious stance by US Fed. Meanwhile with 40 new all time highs witnessed in 2024 mostly seen in Sep-Oct month, it was the second highest annual tally. However this rally failed to drive higher ETF demand as was seen in previous rallies in 2020 indicating the rally was more speculative driven especially by western investors in Sep-Oct period of 2024.

Gold Investors to remain focused on uncertainty around US monetary policy, Potential frictions from Trump's presidency, China's efforts to revive growth, & Global Central Banks asset diversification strategy remains the key for the metal

- Potential Trump tariff policies to put pressure on Asian Equities and lead to inflationary concerns.
- Likely slowdown in India

GDP growth in H1 FY'26 may put pressure on Consumer demand for Gold.

- US 10Yr. Yields to remain well supported in H1 2025 amid sticky inflation to persist in US.
- *Rising Indian Import demand for Gold may lead to rise in trade deficit in India.*
- The U.S. Treasury debta tall-time high of over \$36 trillion, leading to reduced spending by US Govt.
- Rise in US Debt to lead US to adopt strategic bit coin reserve leading to sell-off in gold prices in the long run.
- Finally a combination of higher than expected rates and lower growth by year end may negatively impact investors and consumer confidence especially in



Industry Update

Asian countries again leaning in favor of gold.

- Geopolitical concerns persisting in 2025 along with healthy central bank demand could continue to boost gold from lower levels in 2025.
- Our growth outlook for gold in 2025 remains cautiously positive, as pace of rise may moderate compared to 2024.

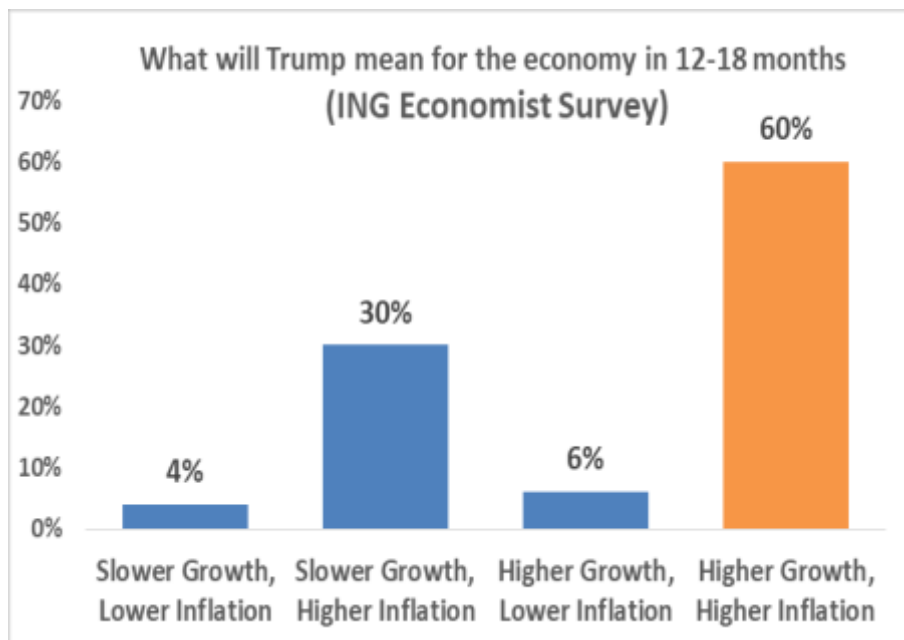
Gold delivered a record 27% returns in 2024. However the year 2025 comes with multitude of challenges for the safe haven metal to deliver similar kind of returns amid a slightly optimistic view still to persist. With Trump starting his second term in late January the optimism had being reflected in the US stock market with a near 7 – 8 % increase in S&P returns since early November. A more business-friendly policy environment

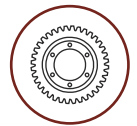
combined with an America-first agenda may likely improve sentiment among domestic investors & consumers in first quarter of 2025. Hence the sentiments could tilt more towards higher yields and dollar weighing on gold. Meanwhile Risk of trump policies resulting in inflationary pressures and disruptions to supply chains could also persist. In addition, concerns on European sovereign debt and continued geopolitical instability, could prove to be the positive trigger for gold in the current year. This along with Central banks strategy to continue to diversify into Gold needs to be closely watched out. Overall, a slightly dovish Fed may remain beneficial for gold, but a prolonged pause or policy reversal could likely put further pressure on investment demand in safe haven assets.

On Asian side with China and India remaining gold's

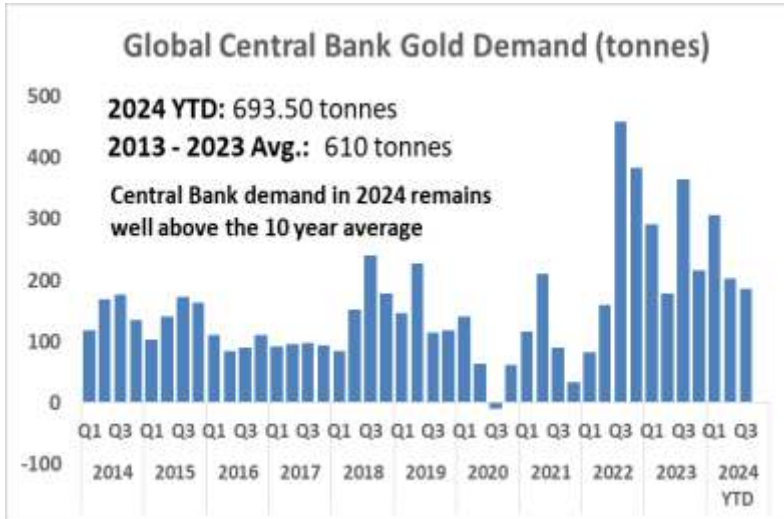
largest markets, the risk of trade wars looming large could significantly lead to weakness in domestic currency pairs keeping domestic prices to trade with less downside as compared to international prices. Chinese consumer demand may likely depend on the health of economic growth in 2025 – whether through normal means or through government stimulus. Meanwhile the same factors that influenced investment demand in 2024 may still remain, but gold to face competition from stocks and real estate in 2025 which could limit similar kind of returns seen in 2024. Overall we see gold prices in the range of \$ 2420 – 2750 per oz in Spot markets inQ1 2025 as we may remain cautiously positive on gold for H1 2025. Meanwhile buying momentum may pick up later in the year as global growth concerns intensify leading gold to deliver new highs towards the end of 2025 or in the start of 2026.

Gold Investors to remain focused on uncertainty around US monetary policy, Potential frictions from Trump’s presidency, China’s efforts to revive growth, & Global Central Banks asset diversification strategy remains the key for the metal





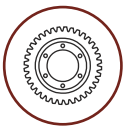
- Potential Trump tariff policies to put pressure on Asian Equities and lead to inflationary concerns.
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- Geopolitical concerns persisting in 2025 along with healthy central bank demand could continue to boost gold from lower levels in 2025.
- Our growth outlook for gold in 2025 remains cautiously positive, as pace of rise may moderate compared to 2024.



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gold's largest markets, the risk of trade wars looming large could significantly lead to weakness in domestic currency pairs keeping domestic prices to trade with less downside as compared to international prices. Chinese consumer demand may likely depend on the health of economic growth in 2025 – whether through normal means or through government stimulus. Meanwhile the same factors that influenced investment demand in 2024 may still remain, but gold to face competition from stocks and real estate in 2025 which could limit similar kind of returns seen in 2024. Overall we see gold prices in the range of \$ 2420 – 2750 per oz in Spot markets in Q1 2025 as we may remain cautiously positive on gold for H1 2025. Meanwhile buying momentum may pick up later in the year as global growth concerns intensify leading gold to deliver new highs towards the end of 2025 or in the start of 2026. ■



Union Budget FY26: Prudent and Pragmatic



Satish Pai,
Managing Director,
Hindalco Industries Ltd.

Despite a challenging global economic landscape, the Union Budget FY26 was able to strike a pragmatic balance between consumption, consolidation, and capex. I congratulate the finance minister for effectively managing these 3Cs. With an emphasis on clean energy, MSMEs, consumption, workforce upskilling and continued thrust on ease of doing business and public capex, the Budget sets a solid foundation for long-term growth and stability. Additionally, initiatives like the National Manufacturing Mission, Export Promotion Mission, Nuclear Energy Mission and measures to boost the EV and battery manufacturing ecosystem to support India's clean energy transition is a step in the right direction for sustainable manufacturing.

The government's commitment to fiscal consolidation by targeting a fiscal deficit of 4.4% of GDP in FY26 (from 4.8% in FY25) aligning with its fiscal consolidation road map to bring down India's debt to 50% (+/- 1%) of GDP by March 2031, is expected to strengthen investor confidence and ensure

macro stability.

In her speech, the FM highlighted that the Budget FY26 aims to initiate transformative reforms across six key domains: mining being one of them. These six domains are expected to augment our growth potential and global competitiveness over the next five years. Indian mining and metals sector forms the foundation of a strong industrial base given its vast linkages with downstream manufacturing and infrastructure sector. Endowed with significant mineral resources, the sector has seen substantial growth in the past decade, driven by infrastructure development, advancements in automotive and transportation, innovations in manufacturing, a shift toward green energy, and the increasing adoption of electric vehicles and battery storage.

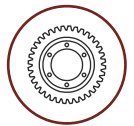
The Government of India has in the past decade undertaken significant policy reforms in the mining sector by way of amendments to the MMDR Act focusing on sustainable mining and critical mineral value chain. Reforms such as the Critical Minerals Mission, rationalisation of duty structures, auctioning exploration licenses (EL), removing six minerals from the list of twelve atomic minerals, time-bound operationalisation of mines, encouragement to commercial mining and auction of offshore mines highlight government's steadfast commitment towards the growth and modernization of the mining

sector. The Union Budget FY26 builds on previous budget announcements and reforms undertaken in the last decade to further accelerate the growth of the sector.

Union Budget FY26 continues the reform momentum

While coal dominates India's energy mix, the focus remains on balancing energy security with energy transition objectives. In the pursuit of achieving Net Zero emissions by 2070 and leading the global energy transition, the mining sector will be pivotal in securing the critical minerals essential for this transformation. Budget FY26 builds on past few Budgets and several structural reforms undertaken in the last decade providing further impetus to the metal and mining sector's competitiveness especially with respect to critical minerals and clean energy pathways. The rationalisation of import duties on scrap and waste of non-ferrous metal and critical mineral (such as cobalt powder and lithium-ion battery scraps) is expected to enhance recycling industries and attract investment in advanced technologies and strengthen supply chains. Last year's Budget had fully exempted import duty on 25 critical minerals that were not domestically available.

Further bolstering the objectives of the National Critical Mineral Mission of building self-reliant critical minerals supply chain, the announcement of a Tailings Policy in this year's Budget is expected to boost extraction of valuable critical minerals from mining tailings. While further details on this are awaited, a



well-designed policy is expected to provide further impetus to sectors like clean energy, semiconductors, defence, and space.

The Budget also announced the launch of the State Mining Index which shall encourage innovation and best practices in mineral exploration, auctioning, and sustainable mining in line with the spirit of competitive federalism.

To give further impetus to nuclear energy, the Budget allocated Rs. 20,000 crores for the launch of Nuclear Energy Mission which aims to develop indigenous Small Modular Reactors. Appropriate amendments to the Atomic Energy Act and Civil Liability for Nuclear Damage Act will be undertaken to facilitate private sector investment in nuclear power projects and to promote more conducive environment for investment and innovation. Allocations for solar energy (specially roof top solar scheme) also saw a significant increase in FY26 (60%) which is expected to further drive demand for metals.

The government's continued focus on public capex and infrastructure spending continued in FY26 as well with the FM emphasising the need for public private partnership in this space. Capex allocation continued to remain strong at Rs11.21 lakh crore (3.1% of GDP) for FY26a notch above the FY25 budget. Capex outlay has increased 5x over the last decade. This is projected to have a positive impact on the metals and mining industry, increasing demand for both ferrous and non-ferrous metals given the strong

backward linkages the sector has with infrastructure growth.

Overall, all these measures including continued impetus on infrastructure investment, securing critical minerals supply chains, rationalisation of custom duties on critical minerals and nonferrous metal scrap and waste are likely to enhance domestic value addition and production in metals and mining sector. Overall, the budget's focus on energy security, highlighting hard-to-abate sectors, backing renewable energy, and creating new opportunities for private involvement in nuclear power, is commendable.

Way forward

Going forward, improving logistics infrastructure in mineral-rich regions, clear set of guidelines on sustainable and responsible mining, rationalisation of high tax incidence on the metal and mining industry, providing economically viable greener sources of power for the metal industry and a holistic national level critical mineral strategy are areas where government and industry collaboration are required for the industry to move forward.

Overall, the Budget sets a solid groundwork for the future by prioritizing fiscal responsibility, investment, inclusive and sustainable growth, driving us closer to the goal of Viksit Bharat. The metals and mining industry is dedicated to working alongside the government in this transformative journey for the sector.

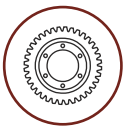
Perfect Blend of Consumption and Investment



Anil Agarwal
Chairman, Vedanta

Vedanta Chairman Anil Agarwal praised the Union Budget 2025, calling it a "visionary" approach that successfully combines a robust boost to consumption with accelerated investment growth, referring to it as a "perfect jugalbandi." He highlighted that the budget strikes the right balance by offering significant relief to the middle class, particularly by making incomes up to ₹12 lakh per annum completely tax-free. This measure, he noted, benefits the largest segment of the middle class. Additionally, the budget provides substantial tax relief for those earning up to ₹24 lakh, which further reduces the financial burden on a large section of taxpayers.

Agarwal also commended the government's shift toward a world-class tax system, which he believes will be simpler, more transparent, and more taxpayer-friendly. He expressed his delight that mining, an important industry, has been recognized as one of the six key domains identified for transformational reforms over the next five years. Along with mining, agriculture has been made a priority, especially with the goal of achieving self-sufficiency in essential sectors such as edible oils, which he described as a critical step toward long-term economic sustainability. Agarwal emphasized that these measures will drive significant growth and development, benefiting both the economy and the people of India.



Union Budget 2025: Boosting Recycling & Sustainability with Zero Import Duty



Sanjay Mehta
President, MRAI

The Union Budget 2025 has removed the basic customs import duty on non-ferrous metal scrap, lowering it from 2.5–5% to zero for metals like lead, zinc, brass, and copper. This move, welcomed by the Material Recycling Association of India (MRAI), is expected to boost the recycling and manufacturing sectors. Announced after discussions at MRAI's 12th IMRC Conference in Jaipur,

the reform aligns with India's push for sustainability. However, MRAI continues to urge the government to eliminate the 2.5% duty on aluminium scrap to create a level playing field for domestic recyclers. The budget's focus on sustainability is set to strengthen India's circular economy while generating employment, especially for blue-collar workers. MRAI President Sanjay Mehta praised the government's decision, highlighting its role in reducing costs, increasing competitiveness, and promoting sustainable practices. The budget also includes ₹11.11 lakh crore for infrastructure, green steel incentives, and expanded PLI schemes, further supporting the steel and recycling industries. Additionally, the Jawaharlal Nehru Aluminium Research Development and

Design Centre (JNARDDC) has been designated as a metal recycling authority, a key step toward policy-driven progress. MRAI welcomed new tax reforms, including a 2% TDS on non-ferrous scrap purchases and the Reverse Charge Mechanism (RCM) under GST, which will improve transparency in the recycling sector. Vice President Naveen Sharma emphasized the need to include e-waste and battery waste under RCM, while Senior Vice President Dhawal Shah highlighted the growing role of the non-ferrous metal industry in automotive and renewable energy. MRAI has proposed additional measures such as mandatory government procurement of 33% recycled materials, recycling-linked incentives, and circular economy parks in tier-1 and tier-2 cities, ensuring long-term sustainability and industry growth.

The Union Budget 2025-26

The Union Budget 2025-26, presented by Finance Minister Nirmala Sitharaman, introduced

several key measures impacting India's metallurgical sector: Customs Duty Reforms:

Elimination of Duties on Critical Mineral Scrap: The government has removed customs duties on waste and scrap of twelve critical minerals, including antimony, cobalt, tungsten, copper, lithium-ion battery waste, lead, zinc, and cobalt powder. This initiative aims to

secure the availability of these materials for domestic manufacturing.

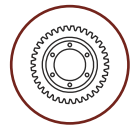
Green Steel Initiatives: Incentives for Low-Carbon Steel Production: The steel ministry has requested ₹150 billion (approximately \$1.74 billion) to incentivize mills to produce low-carbon steel. This move aligns with India's goal to decarbonize the steel industry and achieve net-zero emissions by 2070.

Infrastructure and Manufacturing Boost: Increased Capital Expenditure: The budget outlines a 10.08% increase in capital expenditure,

totaling ₹11.21 lakh crore, with ₹1.5 lakh crore allocated for state capital expenditure. This investment is expected to stimulate demand in the steel and metallurgical sectors.

National Manufacturing Mission: A new mission has been launched to provide policy support and a governance framework for industries of all sizes, aiming to enhance India's manufacturing capacity and position the country as a global manufacturing hub.





ICDC 2025: A Glimpse into the Future of Copper Technology

“The objective of any organization is to maintain quality and to set long term goal. This is of utmost importance for a company to survive for a long time in this competitive world”, said Shreegopal Kabra, Managing Director of RR Kabel Ltd., while delivering his Keynote Address during the Opening Session of “ICDC Copper Conference 2025” organized by Indian Copper Development Centre (ICDC) in Mumbai on 12th February, 2025. He also said that companies should not set short term goal and insisted on aiming for setting long term goal and create a brand of their products.

Prior to his address Umang Jain, Executive Director, Agrawal Metal Works Pvt. Ltd. welcomed the participants. He mentioned



developments and at the same time satisfy the requirements of Circular Economy, EPR & QCO.

B. K. Binani, Managing Director, Rashtriya Metal Industries Ltd. & Chairman, Board of Management, ICDC, delivered the Presidential Address during this Opening Session. As the main theme of the Conference was “Continuous Operations – Key to Quality & Productivity”, Binani mentioned why



that lot of opportunities are there for the growth of copper industry in the country but we need to keep pace with the technological

continuous operations have become popular in the metal industries. He also highlighted the present scenario of copper

production and usage in the country as well as in the world. He gave an overview of ICDC's activities for the last six decades of its existence and requested the representatives of the organizations present in the Conference to get involved with ICDC activities and utilize its services.

The Opening Session concluded with the Vote of Thanks proposed by Dr. D. De Sarkar, CEO, ICDC.

During the Conference there were two Technical Sessions where the following papers were presented. The First Technical Session was chaired by Mr. Mahendra Mehta, Managing Director, Mercure Metals and Alloys Pvt. Ltd. and I. Mukherjee, Technical Manager, ICDC assisted him.

Circular Economy Policies & Deciphering the Draft Indian EPR Policy in NF Metals

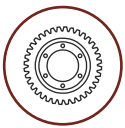
by Dr. Sandeep Vakharia, Aashumi Chemicals Pvt. Ltd., Mumbai

Standardization and QCO in the Field of Copper & Copper Alloys

by Vishal Kumar Rana, Bureau of Indian Standards, New Delhi

Driving Quality and Maximizing Products with Seamless Operations

by Stalin Stephen, Brightrod Engineering India Pvt. Ltd.,



Thane

Induction Billet Heater – Step Towards Green

by Vicky Kataria,
Jasch Gauging Technologies
Ltd., Sonipat

From Oxygen to



parts of the country. They represented primary copper producers, downstream semis manufacturers, cable & conductor manufacturers, technology & equipment suppliers including testing equipments and refractory manufacturers. There were also representatives from traders, commodity exchange organization and financial service providers. Eastern Bearings Pvt. Ltd., Sonipat displayed their products.

Revolution

by M. K. Rajjada,
Pioneer Furnaces Pvt. Ltd.,
Gujarat

Directube : An Economic Alternative for Production of Copper Mother Tubes

by Patrick
Schneider, SMS Group
GmbH, Germany
S. K. Mongia of Mongia
Tooltech Pvt. Ltd., chaired
the Second Technical
Session and he was
assisted by Dr. D. De Sarkar.

The following papers were
presented during this
session :

Innovation of Inline Scalping Machine in Horizontal Continuous Casting

by Mr. Anil Walchale,
Srishtech Metal Castings (I)
Pvt. Ltd., Chandigarh

Online Non-contact Thickness Measurement System

Trace : Advanced Analysis of Pure Copper and Alloys with Arc/Spark OES

by Mr. R. D. Suresh
Kumar, Metal Power
Analytical Pvt. Ltd., Mumbai

Eddy Current Testing on Copper Bars / Tubes and Components

by Shree Borgaonkar,
Foerster Instruments
India Pvt. Ltd.,
Mumbai

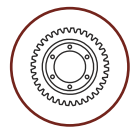
Challenges in Meeting Demand of CTC Conductors for Transformer Industry

by Yogesh Kharat,
APAR Industries Ltd.,
Silvassa

Each session was followed
by very lively discussions
where the speakers
interacted with the
participants and answered
their various queries.

The Conference was
attended by a large number
of participants from various





Conference on Magnesium Casting Manufacturing Technology

Great Diecasting Technology Forum organised the Conference on "Magnesium Casting Manufacturing Technology -Challenges & Opportunities" on 22-23 January 2025 at The Pride Hotel, Pune. Anil Kulkarni, President GDCTECH welcomed all delegates.

Shripadraj Ponkshe, Vice Chairman-Event, General Manager-Materials Engg.-WC, TATA MOTORS Ltd., briefed on the objective of the conference.

Chief Guest -Inauguration, Dr. Ing. Martin Tauber, European Representative, International Magnesium Association (IMA), inaugurated the Conference & Exhibition.

Key note address given by V. Bhagava Reddy, Deputy General Manager (Development), HAL on behalf of V.N.Anil Kumar, GM (F&F), HAL.

Guest of Honour Vinay Kumar, Joint Secretary, Dept of Science and Technology, Govt. of India, addressed the audience and released the Technical Volume of the Conference.

A panel discussion on

"Market & Challenges" was moderated by Dr. Sanjay Arole. The panelists were Revanth Katta, convenor of the event and Executive Director, BHAGYANAGAR MAGNESIUM PVT. LTD., V. Bhargava Reddy, Addl. GM (Mfg), HAL, Bangalore, Viswasai Konduru, Vendor Development, ROYAL ENFIELD, Vijay Dahiya, Asst. VP Operations, SANDHAR COMPONENTS, MANESAR, Hemant More, DGM, Tata Motors Ltd.

21 Technical papers were presented by eminent speakers on various subjects, like Methodizing & Design Aspects of Magnesium Alloy Sand Castings for Aero space Applications, Surface Treatment of Magnesium Alloys, Mg Die Casting - Opportunities And Manufacturing Challenges, Thixomolding of Magnesium-Efficient Process, Industrialization by Combining a Digital Twin and Systematic Casting Trials, Latest Developments in Magnesium Aerospace Technologies, Die Casting Machine for Magnesium, etc...

As exhibition was organised along with the conference. 12 companies participated as below

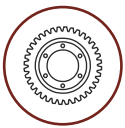
- Bhagyanagar Magnesium Pvt. Ltd.
- Hindustan Aeronautics Limited, Koraput, Odisha
- Hindustan Aeronautics Ltd, Bangalore
- G-Plast Pvt. Ltd / Bark Magnesium GmbH
- JDS Technologies
- Exclusive Magnesium Private Limited
- Hishinuma Machinery Co. Ltd
- Henkel Adhesives Technologies India Pvt Ltd
- Yizumi Precision Machinery Technical Center Pvt Ltd
- Musto Et Bureau Srl
- Lubrikote Specialities Private Limited
- L.K. Machinery India Pvt. Ltd.
- G.P. Srikanth, Managing Director, HCMIBEX ENGINEERING PVT. LTD, gave the Valedictory address and briefed on his experience of running Magnesium Casting unit. R. T. Kulkarni extended the Vote of Thanks. The conference was a Grand Success having 180 participants from all over India as well as from Germany, Austria, UK, Japan and Italy.



Panelists



Lighting the Lamp



Valedictory Chief Guest G.P.Srikanth,
Managing Director, HCM IBEX ENGINEERING PVT.LTD.



Convenor Revanth Katta, Executive Director,
BHAGYANAGAR MAGNESIUM PVT. LTD.



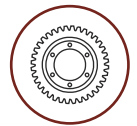
Chief Guest Inauguration, Ing. Martin Tauber, European
Representative International Magnesium Association (IMA)



Anil Kulkarni, President, GDC TECH FORUM



Enthusiastic Audience



MRAI's 12th IMRC 2025: A Global Convergence for Sustainable Recycling

Over 2,500 Delegates | 50+ Countries | 200 Exhibitors | 400 International Attendees

The 12th International Material Recycling Conference (IMRC) 2025, hosted by the Material Recycling Association of India (MRAI), brought together global leaders, policymakers, and industry experts to drive forward the agenda of sustainability and circular economy.

A Call for Pro-Planet Action

Sanjay Mehta, President of MRAI, emphasized the power of individual responsibility in advancing sustainability. Inspired by Prime Minister Narendra Modi's Mission LiFE (Lifestyle for Environment), he urged attendees to embrace recycling as a mindful practice rather than a mere obligation. "Change begins with us—by adopting responsible waste management at home, offices, and factories, we can ease the burden on nature," he stated.

Naveen Sharma, Vice President of MRAI, described the event as the "Mahakumbha of Recycling," underscoring its global significance in promoting sustainable practices.

Government's Vision for a Circular Economy

Key government representatives reinforced India's commitment to a sustainable future. Naresh Pal Gangwar, Additional Secretary, MoEFCC, highlighted India's ambition to become a Vikasit Bharat by 2040, stressing the need

for efficient resource management and a transition from a linear to a circular economy.

Vinod Kumar Tripathi, Joint Secretary, Ministry of Steel, emphasized strengthening recycling infrastructure, education, and policy support to build a sustainable ecosystem. Major General K Narayanan (NITI Aayog) linked recycling to economic growth and job



creation, calling for innovation, capacity building, and strategic collaboration.

Women's Leadership in Recycling

Dr. Soumya Gurjar, Mayor of Jaipur, called for greater participation of women entrepreneurs in the recycling industry, recognizing their role in driving innovation and fresh perspectives. Ms. Robin Wiener, President of ReMA, praised MRAI's advocacy efforts, while Ms. Susie Burrage OBE (President, BIR) and Mr. Arnaud Brunet (Director General, BIR) addressed challenges posed by new EU shipping regulations.

A National Movement for Recycling

Dhawal Shah, Sr. Vice President, MRAI, called for a "Recycling India" campaign, aiming to position India as a global leader in sustainable



resource management. Zain Nathani, Vice President, MRAI, stressed the critical role of the recycling industry in achieving India's steel production, carbon neutrality, and waste management goals. He advocated for policies promoting domestic scrap generation, the Vehicle Scrap page Policy, and duty-free ferrous scrap imports.

Shaping Policy & Overcoming Trade Barriers

Amar Singh, Secretary General, MRAI, shed light on global policy developments affecting the recycling trade. He assured stakeholders that MRAI is actively working with MoEFCC, trade bodies in India, the EU, the USA, and the UK to navigate regulatory changes and ensure compliance with evolving global trade norms.

A Roadmap for a Greener Future

The conference reinforced the need for a collaborative, policy-driven, and innovation-led approach to recycling and sustainability. With a strong commitment from industry leaders, government officials, and global stakeholders, MRAI's 12th IMRC 2025 set the stage for transformative actions towards a circular economy and a greener future.



News Update

Nelcast: Celebrating 40 Years of Excellence



The year 2025 kicked off with a warm reception from our valued customers, starting with Nipha Group and followed by Nelcast. Nelcast is a prominent name in India's casting industry, with support from GARGI HÜTTENES ALBERTUS PVT. LTD. for their Ferrous Foundry operations. We congratulate Nelcast on their remarkable 40 years of

business success. They operate three state-of-the-art production facilities and maintain a 40% export business, serving major clients like Tata Motors and Ashok Leyland.

Our partnership with Nelcast spans over a decade, during which we have consistently supplied Cold Box Resins. This long-standing collaboration has fostered a strong, mutually beneficial business relationship. We take pride in our team for their dedicated support to Nelcast.

Gargi has received a prestigious BEST SUPPLY PARTNER AWARD from Nelcast Limited on the occasion of their "40th Anniversary" on Jan 21st, 2025.



From Gargi Huttenes Albertus – K Senthilvelan and Gokul received this award from Deepak Reddy – Managing Director, Nelcast Limited.

Bühler reports good performance in 2024



Bühler Group achieved a strong financial performance in 2024, with a profit

increase and a stable turnover despite a challenging market. The company reported an EBIT of CHF 227 million, achieving an EBIT margin of 7.6%, and improved its equity ratio to 52.8%. This was driven by increased profitability, better cash flow, and a boost in liquidity. While orders declined, Bühler's turnover remained stable, and its market share either stayed steady or grew. Key contributors to this success were Milling Solutions,

Leybold Optics, and Customer Service. CEO Stefan Scheiber credited the company's employees for their vital role in achieving success during a demanding year.

In terms of performance, Bühler's turnover was CHF 3.0 billion (-0.8%), with order intake at CHF 2.8 billion (-9.9%). However, turnover increased by 2.5% when adjusted for foreign exchange fluctuations, reaching CHF 3.1 billion. Focus on productivity improvements helped raise EBIT and net profit, while the company's equity ratio increased for the sixth consecutive year. Notably, Bühler reduced net working capital by 15.8%, enhancing its cash flow to CHF 379 million and doubling its net liquidity to CHF 503 million.

The Milling Solutions segment saw a strong performance with a 2.0% increase in turnover to CHF 2,249 million, aided by record results in Milling Solutions. On the other hand, Advanced Materials turnover dropped by 8.5% due to a post-pandemic slowdown in investment and uncertainties in the global automotive sector. Leybold Optics, however, showed strong results, particularly in coating and sputtering technologies.

Customer Service was a significant growth driver, with turnover rising 9.4% to CHF 1,057 million. This segment now represents 35.4% of Bühler's overall turnover. Bühler expanded its service offerings, helping customers improve business efficiency, reduce costs, and achieve better sustainability through modernization projects and long-term service agreements.

Bühler continued to invest in innovation and research and development, spending CHF 138 million in R&D, and launched 40 new products and services. The company also opened three new research and training centers in Switzerland, Nigeria, and Canada to support customers in testing and scaling new products.

Regionally, Bühler saw growth in the Middle East and Africa, while experiencing declines in China. The company maintained a balanced global presence, with its turnover shares in key regions remaining steady.

Looking ahead to 2025, Bühler expects stable volume growth, backed by an order book of CHF 1.9 billion. The company's strategy will focus on maintaining reliability and innovation, continuing to offer world-class services, and investing in future-ready workplaces for its employees. CEO Stefan Scheiber emphasized that Bühler's dedication to innovation, training, and creating value for customers will remain a central focus for the coming year.

Copper Futures Rise Amid Strong Spot Demand



Copper futures rose by Rs 1.95, reaching Rs 868.15 per kilogram on Tuesday, driven by a notable increase in spot demand. On the Multi Commodity Exchange (MCX), the March delivery copper

contract saw a gain of 0.23%, trading at Rs 868.15 per kg.



The positive price movement was accompanied by a trading volume of 3,564 lots, indicating strong investor participation.

The rise in copper prices comes as spot market demand remains robust, especially in key industrial sectors like construction and electronics, which are major consumers of copper. The tightening supply and the global push for clean energy and infrastructure development further contributed to the upward price trend. Additionally, concerns about potential supply disruptions from major copper-producing countries have added further upward pressure on prices.

As the demand for copper continues to strengthen, experts expect these upward trends in futures markets to persist, with future contracts potentially reaching higher levels if the supply-demand dynamics stay favorable. This surge is also seen as a positive signal for the overall commodities market, reflecting broader economic recovery prospects.

BHP's Profit Hits 6-Year Low, But Sees Demand Revival



BHP reported a 23% decline in its first-half profit, amounting to \$5.08 billion, slightly exceeding the consensus estimate of

\$5.01 billion. Despite lower iron ore earnings, which dropped 26% due to a fall in prices, the company declared an interim dividend of 50 cents per share, the lowest in eight years. This result, however, was in line with expectations. BHP's CEO Mike Henry indicated that the company is focusing on organic growth, with no plans for acquisitions at the moment.

The company also noted signs of an economic recovery in China, supported by central bank rate cuts that could boost demand for steel and copper. However, BHP remains cautious about potential global growth risks, particularly from trade tensions.

Iron ore earnings were impacted by a 26% drop in operating earnings to \$7.2 billion, as prices for the commodity fell to \$81.11 per metric ton from \$103.7 a year ago. Additionally, following cyclones that disrupted shipments from Australia's west coast, BHP warned that its full-year iron ore output would likely fall short of the expected range of 282-294 million metric tons.

Aluminium Prices Boosted by Supply Shortages



Aluminium prices increased by 0.17%, settling at ₹258.4, driven by supply constraints and the expectation that U.S. President Donald Trump's proposed

reciprocal tariffs would be delayed until April. However, gains were limited by a post-holiday inventory buildup. Aluminium stocks in Shanghai Futures Exchange warehouses fell 4.9% compared to last Friday. In Japan, the bargaining power in aluminium premium negotiations weakened due to slow imports and the sale of smelting assets abroad.

The People's Bank of China (PBoC) reaffirmed its commitment to supporting economic stability by using various monetary tools, including interest rate adjustments, to address weak domestic demand and external risks.

In 2024, China's aluminium production reached a record 44 million tons, nearing the government's 45 million-ton cap to prevent oversupply and reduce emissions. Despite the rising supply, U.S. aluminium premiums surged 60% since Trump's re-election, reaching 35 cents per pound. China's production increased by 4.2% YoY to 3.77 million metric tons in December, although daily output dropped by 1.7% from November. New capacity in Xinjiang boosted production, but rising costs led to industry losses for the first time in three years, with producers averaging a loss of 687 yuan per ton.

On the technical side, the market saw short covering, with open interest falling 7.57% to 2,355 contracts. Aluminium has support at ₹257.2, with further downside at ₹256, while resistance is at ₹259.2, with a potential breakout towards ₹260.

US Tariffs to Affect Aluminium Manufacturers in India

The US's recent tariff increase on aluminium imports poses a risk to global aluminium prices, with potential negative effects on the margins of domestic aluminium producers. On 11 February 2025, the US raised tariffs from 10% to 25% and eliminated country-specific exemptions under the Trade Expansion Act. This change will affect aluminium imports from all countries, which could lead to a rise in the US regional premium, making aluminium prices more expensive and harming industries like automotive and manufacturing.

The tariff is expected to dampen aluminium demand in



the US, particularly as China struggles to revive its economy. This could lead to lower aluminium prices globally, with additional pressure from potential US smelter restarts. While Canada is a major source of aluminium imports to the US, this could shift to European countries, raising premiums in those regions.

Although India's exports to the US account for only 2% of its aluminium trade, the uniform tariff could provide an opportunity for Indian producers to increase their exports. However, a decline in LME aluminium prices could impact the profitability of Indian aluminium manufacturers, reducing margins in the near-to-medium term. If aluminium prices fall significantly, domestic producers' profitability could drop from USD 750/MT to USD 500/MT by FY2026.

Hindustan Zinc Drives STEM Revolution for Women



Hindustan Zinc is transforming the manufacturing and metals industries by increasing female representation in science, engineering, and mining. The company employs over

700 women, including more than 200 women engineers, setting a strong example for gender equality and inclusivity.

Leading the way in gender diversity, Hindustan Zinc boasts a 25% female workforce, surpassing many peers in India's manufacturing and mining sectors. The company also introduced India's first female mine managers for underground mining and established the country's first all-women mine rescue teams, marking significant milestones in the industry.

Women at Hindustan Zinc play a vital role in areas such as engineering, research, geology, and lab sciences, with over 70% holding science backgrounds. Their contributions are driving innovation in mining and

operations.

The company promotes career advancement through flexible policies, night shifts, and equal opportunities, enabling women to excel in high-tech industries.

CEO Arun Misra emphasized the company's goal of increasing female representation to 30% by 2030. Mentorship programs and specialized training help women overcome challenges and progress into leadership positions. Additionally, Hindustan Zinc's Zinc Kaushal Kendra initiative has trained over 500 women, empowering them with skills and financial independence. Through its focus on diversity, the company is setting new standards for inclusion and innovation in the mining and metals sectors.

Aluminium Recycling: Hydrogen Fuel Cuts CO2e by 90%

Novelis Inc. has successfully reduced CO2e emissions by up to 90% at its aluminium recycling plant in Warrington, UK, by replacing natural gas with hydrogen fuel in its melting furnace. The trial, part of a UK government decarbonisation initiative, involved installing new burners, regenerators, and furnace linings at the Latchford plant. This project, backed by a £4.6 million grant from the £1 billion Net Zero Innovation Portfolio and the regional HyNet project, aims to help industries shift from natural gas to low-carbon hydrogen. Novelis is transforming Latchford into a model for producing high-recycled, low-carbon aluminium.

The tests included blending hydrogen with natural gas in varying amounts to assess its impact on infrastructure and equipment. Several hundred tonnes of scrap aluminium were remelted and cast into sheet ingots. Moving forward, Novelis plans further processing at its European plants to refine the hydrogen-based, recycled alloy production process. A detailed evaluation report will be released later this year as part of the UK government's Industrial Fuel Switching programme.





National Mineral Scenario

National Mineral Scenario 2.1 Minerals are valuable natural resources. They constitute the vital raw materials for many basic industries and are a major resource for development. The history of mineral extraction in India dates back to the days of the Harappan civilization. The wide availability of the minerals provides a base for the growth and development of the mining sector in India.

2.2 The country is endowed with huge mineral resources of fuel, metallic and nonmetallic minerals including minor minerals. Mining sector is an important segment of the Indian economy. Since independence, there has been a pronounced growth in the mineral production both in terms of quantity and the value as well. India produces as many as 95 minerals, which includes 4 fuel, 10 metallic, 23 non-metallic, 3 atomic and 55 minor minerals (including building and other materials).

Index of Mineral Production 2.3 Presently the base year of index of industrial production covering mining sector is 2011-12. Based on the overall trend so far the index of mineral production (base 2011-12) for the year 2024-25 (up to Nov-24) is estimated to be 124.9 as compared to 128.9 of previous year showing a negative growth of 3.1%. The trend of index of mineral production and trend in value of mineral export and import is depicted in Figure 2.1 and Figure 2.2 respectively. The value of minerals produced by groups for the last five years is given in Figure 2.3.

The total value of mineral production (excluding atomic, fuel minerals and minor minerals) during 2024-25 has been estimated at `141061 crore, which shows a decrease of about 0.47% over that of the previous year. During 2024-25, estimated value for metallic minerals is `128261 crore or 91% of the total value and non-metallic minerals is `12800 crore or 9% of the total value. Information on production and value of selected minerals from 2020-21 to 2024-25 (Estimated) is given in Annexure 2.1. The details of Export and Import of Minerals during the period 2019-20 to 2023-24 are given at Annexure 2.2 and Annexure 2.3. The trend of value of mineral exports and imports for last five years is depicted in Figure 2.2. The value of Minerals by groups for the last five years is given in Figure 2.3.

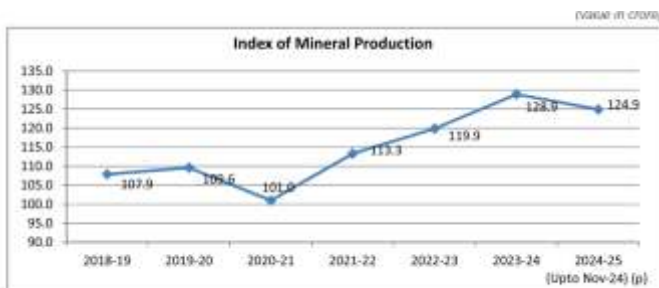


Figure 2.1: Index of mineral production (Base 2011-12=100)

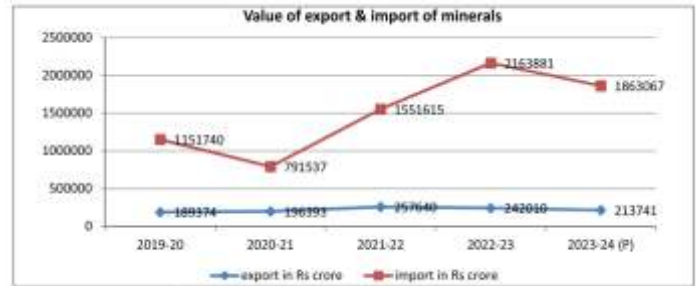


Figure 2.2: Trends in Value of Mineral Exports & Imports

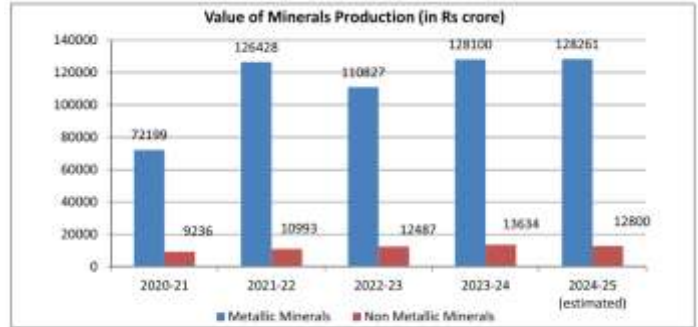


Figure 2.3: Value of Minerals Production (by groups) (excluding atomic, fuel minerals and minor minerals) (2024-25 figures are estimated)

Price Trend 2.5 Presently the base year for Wholesale Price Index covering minerals is 2011-12. The WPI for minerals (base 2011-12 = 100) stood at 228.5 in November 2024 and the corresponding index was 215.8 for November, 2023. 2.6 The minerals included in the wholesale price index are bauxite, chromite, iron ore, copper conc, lead conc., garnet, zinc conc, manganese ore, limestone, phosphorite, and sillimanite.

The wholesale price index for metallic minerals was 220.1 in November, 2024 as compared to 205.8 in November, 2023 and that of other minerals was 258.1 in November, 2024 as compared to 250.6 in November, 2023. Source of this particular information is www.eaindustry.nic.in.

Mining 2.7 Indian mining industry is characterized by many small operational mines. The number of mines which reported MCDR Returns of mineral production (excluding atomic, fuel and minor minerals) in India was 1426 (estimation) in 2023-24 as against 1457 (Provisional) in the previous year. 2.8 Out of 1426 reporting mines, 322 were in Madhya Pradesh followed by Gujarat (162), Karnataka (130), Odisha (122), Andhra Pradesh (120), Chhattisgarh (112), Rajasthan (104), Tamil Nadu (96), Maharashtra (95) and Jharkhand (41) etc. 2.9 The numbers of mines reported in MCDR Returns are given in Table 2.1. Area-wise distribution of Mining Leases all over India pertaining to all minerals excluding fuel, atomic and minor minerals is given in Table 2.2



Table 2.1

Number of Mines Reported MCDR Returns

Sector	2023-24	2024-25 (P)
All Minerals*	2046	1973
Metallic Minerals	799	772
Non-Metallic Minerals	1247	1201

*Excluding atomic minerals, fuel mineral and minor minerals. (P): Provisional

Table 2.2

Area Wise Status of Lease (Frequency In Hect.) (Other than Atomic, Hydro Carbons Energy and Minor Minerals)

As on 31/03/2023(P) (All India)

Frequency (Hectare)	No. of Leases	Lease area (Hectare)
0 to 2	368	477.95
>2 to 5	809	3135.74
> 5 to 10	353	2594.36
> 10 to 20	319	4661.15
<20 to 50	388	12680.12
<50 to 100	231	16707.48
<100 to 200	182	26016.43

Frequency (Hectare)	No. of Leases	Lease area (Hectare)
>200 to 500	197	64146.87
Above 500	160	151936.44
Total	3007	282356.54

Sources: Information received from respective State Government Departments and Regional Offices of IBM for minerals (excluding atomic minerals, hydrocarbon energy minerals and minor minerals).

2.10 The number of underground mines in operation mineral wise (excluding fuel, atomic and minor minerals) is given in Table 2.3.

Table 2.3

Number of Underground Mines 2023-24 @ (By Principal Minerals)

Mineral	Cat. A	Cat. B	Total
Chromite	4	-	4
Copper	4	-	4
Gold	4	-	4
Lead & Zinc Ore	8	-	8
Manganese	14	5	19
Rock salt	-	1	1
Vermiculite	1	3	4

@ excluding fuel, atomic & minor minerals; Data is based on the List of Mines as on 01.04.24 provided by the CCoM Office

'A' Category: Mechanized Mines: >150 labour in all or >75 labour in workings below ground; 'B' Category: Other than 'A' category

2.11 For the year 2024-25, the estimated mineral production (excluding Atomic, Fuel and Minor Minerals) would be from 20 States of which the bulk of value of mineral production of about 97.70% was confined to 8 States only. The order was Odisha with a share of 43.49% followed by Rajasthan (16.26%), Chhattisgarh (13.69%), Karnataka (12.42%), Maharashtra (4.76%), Jharkhand (3.26%), Madhya Pradesh (2.78%) and Andhra Pradesh (1.04%) in the total value of mineral production (excluding Atomic, Fuel and Minor Minerals). Remaining states contributed 2.30%. The estimated contribution of States/UTs in the value of mineral production for 2024-25 is pictorially shown in Figure 2.4.

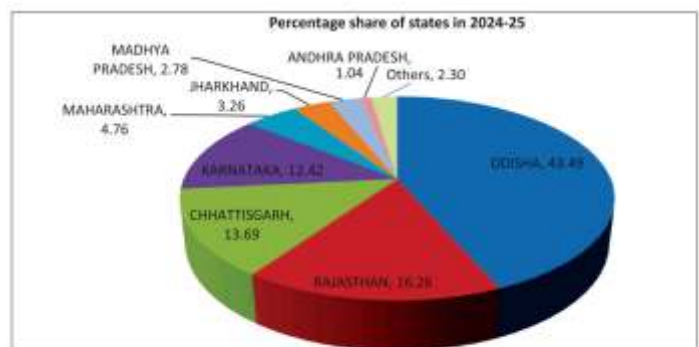


Figure 2.4: Share of States in Value of Estimated Mineral Production 2024-25 (Excluding Atomic, Fuel Minerals, minor minerals)

Source: Statutory returns submitted to IBM.



2.12 The principal mineral producing States, which have indicated an increase in the value of mineral production during 2023-24 with respect to 2022-23, are Maharashtra (64.49%), Uttarakhand (49.8%), Bihar (26.12%), Karnataka (20.12%), Odisha (17.23%), Madhya Pradesh (16.3%), Meghalaya (15.21%), Andhra Pradesh (13.56%), Jharkhand (12.78%), Tamil Nadu (11.86%), Himachal Pradesh (9.59%), Chhattisgarh (8.55%), Assam (7.6%), Jammu And Kashmir (5.14%), Rajasthan (4.88%), Gujarat (4.33%) and Uttar Pradesh (1.7%). However, some of the principal mineral producing States revealed decrease in value of mineral production and those include Telangana (-1.8%) and Kerala (-3.88%).

2.13 All India Reserves and Resources of various minerals as on 01.04.2020, as per parameters of UNFC System are given in Annexure 2.4.

2.14 During the year 2023-24, the Private Sector contributed for 61.4% or Rs. 87028 crores (including metallic and non-metallic) in the total value. The minerals which were wholly mined/ recovered by the private sector in 2023-24 were Lead concentrate, Limeshell, Siliceous earth, Sillimanite, Wollastonite, Zinc

concentrate, Marl and Moulding sand. In 2023-24, the Private Sector accounted for sizeable 93.2% of Limestone, 52.3% of Chromite, 54.5% of Iron Ore, and 46.7% of Bauxite. During the year 2023-24, the Public Sector contributed for 38.6% or Rs. 54706 crore (including metallic and non-metallic) in the total value. The minerals which were wholly mined / recovered by the public sector in 2023-24 were Copper ore and concentrate and Diamond. In 2023-24, the Public Sector accounted for sizeable 74.3% of Fluorite (graded), 91.2% of Tin concentrate, 99.2% of Phosphorite and 98.2% of Gold Ore.

2.15 As per World Mineral Production, 2018-22, British Geological Survey, India's ranking in 2022 in world production in term of quantity was 2nd in steel (crude/liquid) and lead (refined); followed by 3rd in zinc (slab) and chromite ores & concentrate; 4th in iron ore and graphite; 5th in aluminium (primary); 6th in manganese ore and bauxite; 10th in copper (refined); and 16th in apatite & rock phosphate and magnesite.

Table 2.4 Contribution and Rank of India in World Production of Principal Minerals & Metals, 2022

Sector	Unit	Production quantity		Contribution (Percentage)	India's rank in World order\$
		World	India*		
Metallic Minerals					
Bauxite	'000 tonnes	401500	23844	5.94	6 th
Chromite	'000 tonnes	37900	3557	9.39	3 rd
Iron ore	'000 tonnes	2516000	258364	10.27	4 th
Manganese ore	'000 tonnes	54200	2826	5.21	6 th
Industrial Minerals**					
Magnesite	'000 tonnes	32200	108	0.34	16 th
Apatite & Rock phosphate	'000 tonnes	222000	1978	0.89	16 th
Metals					
Aluminium (primary)	'000 tonnes	67200	4066#	6.05	5 th
Copper (refined)	'000 tonnes	258001/	554#	2.15	10 th
Steel (crude/liquid)	million tonnes	1873	125	6.67	2 nd
Lead (refined)	'000 tonnes	125002/	211#	1.69	2 nd
Zinc (slab)	'000 tonnes	13400	821#	6.13	3 rd

Source: World Mineral Production, 2018-2022, British Geological Survey for world production and MCDR returns & individual plants for production with respect to India.

Source: World Mineral Production, 2018-2022, British Geological Survey for world production and MCDR returns & individual plants for production with respect to India. *: Figures relates to financial year 2022-23 (P) **: Minerals declared as minor minerals vide Government of India Notification S.O. 423(E) dated 10th February, 2015, are not included due to non-availability of production with respect to India. \$: India's rank based on India's production as per MCDR return and world production mentioned in World Mineral Production 2018-22, British Geological Survey. #: As per World Mineral Production,

2018-22, the production of Aluminium (primary), Copper (refined), lead (refined) and Zinc (Slab) during 2022 are 2322 thousand tonnes, 542 thousand tonnes, 966 thousand tonnes and 684 thousand tonnes, respectively. 1/ Figures relate to both primary and secondary refined copper, whether electrolytic or fire refined. Metal recovered from secondary materials by remelting alone is excluded. 2/ Figures related to both primary & secondary refined lead and include the lead content of antimonial lead.



Statistics

Primary Aluminium Production for January 2023 to December 2024 (Thousand MT)

Period	Africa	North America	South America	Asia (ex China)	Western & Central Europe	Russia & Eastern Europe	Oceania	Gulf Cooperation Council	China (Estimated)	Estimated Unreported to IAI	Total	Daily Average
Dec-24	* 138	338	130	409	248	359	157	* 540	* 3,734	201	6,254	201.7
Nov-24	* 134	327	126	397	238	352	150	* 522	3,606	194	6,046	201.5
Oct-24	137	335	130	* 407	246	* 363	153	* 541	3,733	201	6,246	201.5
Sep-24	134	324	124	392	237	346	146	* 519	* 3,600	194	6,016	200.5
Aug-24	138	333	130	406	243	354	* 155	* 535	3,715	201	6,210	200.3
Jul-24	* 133	334	130	407	242	353	162	* 533	3,710	201	6,205	200.2
Jun-24	129	* 325	125	394	234	340	154	* 517	3,565	194	5,977	199.2
May-24	131	338	129	407	236	348	* 162	* 535	* 3,652	201	6,139	198
Apr-24	125	331	123	393	226	335	156	* 519	3,499	194	5,901	196.7
Mar-24	128	341	127	* 410	232	346	161	* 537	3,606	201	6,089	196.4
Feb-24	122	318	120	382	216	324	147	* 507	3,371	187	5,694	196.3
Jan-24	* 127	339	127	408	230	348	160	* 541	3,605	201	6,086	196.3
Dec-23	132	339	126	403	231	345	162	530	3,565	220	6,053	195.3
Nov-23	133	329	123	392	224	332	157	510	3,450	213	5,863	195.4
Oct-23	137	336	127	403	230	344	162	529	3,655	220	6,143	198.2
Sep-23	133	322	124	386	223	327	155	511	3,536	213	5,930	197.7
Aug-23	135	332	125	396	230	338	160	528	3,642	220	6,106	197
Jul-23	136	330	124	395	230	337	159	527	3,601	220	6,059	195.5
Jun-23	131	321	121	383	223	327	153	510	3,387	213	5,769	192.3
May-23	136	329	122	396	229	340	160	529	3,480	220	5,941	191.6
Apr-23	129	320	118	382	224	329	153	511	3,342	213	5,721	190.7
Mar-23	131	326	122	396	230	343	158	526	3,424	220	5,876	189.5
Feb-23	123	292	111	356	209	310	144	481	3,120	198	5,344	190.9
Jan-23	138	321	123	385	230	344	161	525	3,464	220	5,911	190.7

Source : IAI

India's MCDR Mineral Production : 2020-21 to 2023-24

Mineral	UNIT	2020-21		2021-22		2022-23		2023-24	
		Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Bauxite	TONNE	2,03,80,548	1,67,93,447	2,24,94,049	2,52,84,168	2,38,44,337	2,73,71,722	2,39,30,885	2,68,73,624
Chromite	TONNE	28,30,413	2,18,62,796	37,85,624	4,79,69,166	35,57,289	4,61,74,178	31,47,954	4,88,63,434
Copper Concentrate	TONNE	1,08,718	85,33,354	1,15,314	1,10,24,312	1,12,745	1,14,38,445	1,25,230	1,31,41,478
Copper Ore	TONNE	32,72,915	-	35,69,632	0	33,26,337	0	37,82,256	0
Gold Ore	TONNE	4,37,669	-	4,74,994	0	6,33,514	0	7,60,252	0
Gold Primary	KG	1,127	54,75,470	1,407	67,61,018	1,433	76,54,670	1,552	96,54,301
Iron Ore	THT	2,05,042	52,72,92,469	2,54,099	1,01,00,00,000	2,58,364	83,41,01,762	2,75,479	98,23,01,911
Lead & Zinc Ore	TONNE	1,54,55,342	-	1,63,38,564	0	1,67,44,080	0	1,65,21,284	0
Lead Concentrate	TONNE	3,76,923	1,88,10,483	3,68,040	2,20,25,747	3,76,666	2,47,61,930	3,80,800	2,54,73,522
Manganese Ore	TONNE	27,03,313	1,74,15,460	26,92,408	2,20,67,826	28,26,481	2,33,69,237	33,73,943	2,47,28,209
Silver	KG	7,05,796	4,26,64,424	6,47,156	4,21,26,921	7,13,768	4,38,14,376	7,45,980	5,35,59,386
Tin Concentrate	KG	16,865	10,413	26,301	32,619	45,429	51,850	0	0
Zinc Concentrate	TONNE	15,13,996	6,31,27,101	15,94,085	7,87,27,813	16,70,208	9,23,06,379	17,10,144	8,56,54,297
Metallic Mineral	**	72,19,85,416	**	1,26,60,19,590	**	1,11,10,44,548	**	1,27,02,50,162	**
Apatite	TONNE	-	-	0	0	0	0	0	0
Diamond	CARATS	13,917	1,47,696	266	18,051	388	61,473	347	23,738
Fluorite (Graded)	TONNE	1,052	8,018	1,237	9,430	1,155	6,468	6,042	5,716
Garnet	TONNE	7,114	26,378	8,182	24,660	10,324	3,58,917	23,838	95,837
Graphite	TONNE	35,386	87,147	62,888	1,22,148	94,789	1,80,152	1,68,341	2,24,558
Iolite	KG	16	73	27	191	0	0	0	0
Kyanite	TONNE	4,925	9,251	9,320	17,267	2,765	5,320	3,324	10,514
Limeshell	TONNE	-	-	100	231	240	628	891	2,633
Limestone	THT	3,49,120	8,64,84,125	3,92,034	10,20,22,623	4,05,552	11,08,80,666	4,50,456	11,85,47,400
Magnesite	TONNE	74,661	3,14,677	1,13,497	5,54,771	1,07,525	5,02,587	1,32,005	6,11,598
Marl	TONNE	22,16,414	4,17,183	18,53,482	3,83,279	14,61,668	3,16,762	16,06,380	3,01,431
Moulding Sand	TONNE	14,363	4,150	17,583	5,256	17,260	5,322	24,494	7,277
Phosphorite	TONNE	14,55,829	46,94,525	13,94,959	66,48,070	19,78,450	1,23,54,618	15,57,763	1,13,09,762
Rock Salt	TONNE	486	14,156	286	712	1,002	4,849	0	0
Selenite	TONNE	402	602	716	902	9,659	36,217	33,524	1,09,788
Siliceous Earth	TONNE	23,823	14,686	33,898	22,837	32,070	17,368	58,047	33,720
Sillimanite	TONNE	11,110	13,987	3,432	7,973	1,437	3,757	771	2,616
Sulphur	TONNE	7,37,337	-	8,80,857	-	9,25,663	-	-	-
Vermiculite	TONNE	1,260	2,157	3,060	3,765	2,303	1,610	1,129	781
Wollastonite	TONNE	1,03,902	1,22,210	1,08,335	1,49,156	1,10,793	1,51,761	1,10,596	1,56,108
Non-Metallic Mineral	**	9,23,61,022	**	10,99,91,323	**	12,46,88,474	**	13,14,43,478	**
Grand Total	**	81,43,46,438	**	1,37,60,10,913	**	1,23,59,33,022	**	1,40,16,93,640	**

Source : MCDR Returns, Ministry of Mines

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