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The Indian Institute of Metals
Delhi Chapter

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Brief on
International Metals & Metallurgy Summit
Smart Metallurgy: Digital Transformation and Automation
28 Feb. 2025

Delhi Chapter of The Indian Institute of Metals organized first edition of the **International Metals & Metallurgy Summit, *IMMM 2025,*** on the theme ***Smart Metallurgy: Digital Transformation and Automation***, in association with DIIA Event Solutions.

Inaugural session of the summit was graced by Shri L. Pugazhenthy, ED, ILZDA and Former President of The Indian Institute of Metals, Prof. Suddhasatwa Basu, FIPI Chair Professor, Dept. of Chemical engineering, IIT Delhi, Shri Navneet Singh Gill, Managing Director, Yogi JI Digi, and Shri U.K. Vishwakarma, ED, MECON Limited, Delhi Office.

Shri R.K. Vijayavergia, Chairman, IIM Delhi Chapter welcomed the gathering and gave a brief about IIM Delhi Chapter. He emphasized that the volume of data which could be collected in metal production and in metallurgical industries has increase exponentially, but digitalization systems are enabling us to efficiently process the data, make informed decisions and stabilize operations at every stage for efficient process control. He opined that the implementation of Digital Solutions has been possible through the collaboration between Information Technology experts and experienced process and quality control operators and experts of metal industry, with useful inputs from academia. Shri L. Pugazhenthy, Shri Navneet Singh Gill, Shri U.K. Vishwakarma and Prof. Suddhasatwa Basu, enlightened the gathering about the importance of the subject and importance of the summit in the present context. It was emphasized that the modern automation platform will be able to manage the entire industrial process, with the capabilities to integrate input and process control, safety and power management into one system. Shri Pugazhenthy also talked about membership of IIM and highlighted the need for bringing more metal industry professional as members of IIM. Prof. S. Basu said that since Digitalization is in nascent stage in India and AI is creeping in, more efforts on R&D in this sector is required. He emphasized that funds/grants to be provided by large organizations in Mining and Metal Sector and Government of India for this purpose. Shri Naveen Singh Gill, MD, YOGI Ji Digi emphasized that equal importance to be given to human inclusion in development of Digital Systems along with machine development.

Shri Deepak Jain, Vice Chairman, IIM Delhi Chapter presented vote of thanks in the inaugural session.

IMMS 2025 summit was attended by 72 delegates from different strata of the industry. Inaugural program was followed by three technical sessions viz.

1. Process Modelling Automation and AI technologies
2. Digital Transformation
3. Smart Manufacturing Technologies

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Theme - Smart Metallurgy:
Digital Transformation and Automation
28 February 2025

Distinguished speakers from various industries presented their papers in the three technical sessions. There were 10 technical papers from different industry sectors including primary steel sector, secondary steel sector, MCX, e-auction and digital software solution providers. Most recent innovations, trends, concerns as well as practical challenges encountered and possible solutions were deliberated. Delegates participated actively during discussions making the summit very interesting and useful for the audience. Salient points of deliberations in the technical sessions and key recommendations are given below.

Recommendations

Technical Session 1 emphasized automation and AI applications in secondary steel production. For enhancing Secondary Steel Sector performance through Smart Metallurgy:

- AI-driven smart metallurgy approaches should be explored for energy efficiency and waste reduction.

- AI-based failure detection systems should be expanded to various plant operations to reduce downtime.

Technical Session 2 highlighted the critical role of digitalization in improving operational efficiency. It is recommended that steel plants implement:

1. **Emphasizing Digital Transformation in the Steel Industry**
   - ***Pre-failure alert systems*** based on data analytics and video analytics to reduce equipment failures.
   - ***Computer vision-based slab profiling*** for optimizing yield and minimizing defects in the plate mill.
   - ***Integration of SAP with E-Auctions*** to streamline procurement and optimize costs.
2. **Adoption of Smart Manufacturing Technologies**
3. **Leveraging Commodities Derivatives for Risk Management**

The session on commodities derivatives underscored the importance of risk management in price volatility. It was recommended that:

- Market-based forecasting tools be integrated into financial planning.
- Steel plants should consider commodity hedging strategies to mitigate risks associated with fluctuating raw material costs.

Technical Session 3 showcased advancements in real-time data integration and AI-driven decision-making. Key takeaways include:

- Process Digital Twin Implementation for predictive modelling and real-time data analysis.
- AI-based operator guidance systems to optimize silicon content in hot metal from blast furnaces.
- Global digitalization trends from international experts, highlighting the need for technology adoption in Indian steel plants.


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28 Febr 2025
Ravi Shanker Pandey
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Conclusions

The Summit highlighted the need for digital transformation, AI integration, and smart manufacturing in the steel sector. Implementing these recommendations will enhance productivity, cost efficiency, and sustainability in steel production.

The conference was concluded with the vote of thanks by Shri K. R. Krishnakumar, Secretary, IIM Delhi Chapter.

This was the first conference in the IMMS series by IIM Delhi Chapter and it intends to organize more conference under the series in future.

ILZDA Conference at Nagpur

The Delhi Chapter would like to inform the esteemed members that India Lead Zinc Development Association (ILZDA) is organising International Conference on Galvanizing & Zinc Spraying - Technology, Environment & Markets at Nagpur on 5th & 6th May 2025.

The Conference will focus on latest developments in Galvanizing & Zinc spraying in respect of technology, current & emerging markets, quality assurance, waste minimization and environment protection. The conference will focus on & all types of galvanizing: steel sheet, general, tube and wire as well as Zinc spraying.

Members may like to participate in the Conference. IIM DC members will be treated as Guest Delegates at the ILZDA Conference. (For details please see advertisement below)

Steel Plant at Keonjhar

A joint venture between JSW Group and South Korean steel giant POSCO has announced to establish a mega steel plant in mineral-rich Keonjhar in Odisha.

With an initial capacity of 5 MTPA, this greenfield facility promises to drive industrial growth, create thousands of jobs, and attract significant Foreign Direct Investment (FDI). Two potential sites in Keonjhar—Patna and Taramakanta blocks — have been shortlisted for the project. Keonjhar, blessed with rich reserves of iron ore, manganese, chromite, and dolomite, is poised to become a key industrial hub.

Green Steel Research Project Receives €1.8m Grant from EU

A research project to establish decarbonization technologies for the steelmaking industry has been awarded a €1.8 million research grant from the European Union (EU) via the Research Fund for Coal and Steel (RFCS).

The programme aims to establish a process for injecting hydrogen using plant supplier Primetals Technologies' Sequence Impulse Process (SIP) technology directly into the blast furnace via the shaft. In addition to the grant, contributions will be made by each of the research partners, bringing the total project value to €3.5 million.

Building on the available SIP injection technology, as already utilized on a large blast furnace at thyssenkrupp Steel Europe's Schwelgern site in Germany, the research aims to simulate that hydrogen can be pulse-injected into the blast furnace shaft.

This project, which will conclude in 2028, brings together a consortium of major European players within the iron and steelmaking sector to take the concept from laboratory to industrial demonstration. The key technology will be designed and provided by thyssenkrupp with furnace integration design and full-scale economic evaluation by Primetals Technologies. Analysis and modelling will be conducted by the research institutes VDEh-Betriebsforschungsinstitut, which also is the project co-ordinator, and K1-MET. thyssenkrupp Steel Europe will provide the industrial scale laboratory work fabrications and material burdening capabilities, with steel and technology group voestalpine completing the consortium as the hosts for the trial process with helium injection in the shaft to prove the simulations for gas distribution to be placed on an operating blast furnace at its works in Linz, Austria.

Source: Weekly news from Steel Times International, 22 Jan 2025

Tenova Takes Part in Hydrogen Recovery Research

In July 2024, the European Union-funded LIFE H2Reuse project launched with the goal of significantly enhancing energy efficiency and reducing the environmental impact of the bright annealing process in seamless stainless steel and nickel alloy tube production. This initiative seeks to develop innovative solutions for hydrogen recovery and reuse. It is co-ordinated by DMV (Cogne Group, formerly Mannesman Stainless Tubes), a player in precision tube manufacturing, and its partners, including Tenova, a developer and provider of sustainable solutions for the green transition of the metals industry, with branches in Italy and Germany.

In the bright annealing process, 100% hydrogen is used in high-temperature furnaces to produce high-performance tubes with superior surface quality, corrosion resistance, and durability.

Currently, hydrogen is flared after each production cycle, leading to significant waste. The LIFE H2Reuse project aims to address this issue by developing two technical solutions: recovering the wasted hydrogen from the annealing process and reusing it as fuel in radiant tubes working 100% of hydrogen. This approach represents a market-first innovation, as the recovery of atmospheric gas for reuse in industrial processes is not yet commercially available.

While hydrogen burners are already on the market, they remain in a developmental phase.

The LIFE H2Reuse project will focus on enhancing their efficiency and effectiveness in real-world industrial environments. The project's expected outcomes include significant reductions in carbon footprint, energy consumption, and resource waste, all of which will be rigorously tested to demonstrate their technical, environmental, and socio-economic benefits.

With the support of its key partners, the project's innovations are expected to have far-reaching impacts, particularly in industries using high-hydrogen-content atmospheric gas. Among the beneficiaries are roller hearth furnace plants, which could apply the project's results to reduce their carbon footprint, optimize resource use, and lower operating costs.

Source: Steel Times International January/February 2025

Blue Hydrogen: A False Hope for Steel Decarbonisation

Steelmakers considering using "blue hydrogen" to decarbonise production will not significantly reduce their emissions, and could find themselves exposed to significant risks of being left behind in the decarbonisation race.

Over the last year, the hype around hydrogen has largely given way to a more realistic understanding of its potential future role and production costs. Applications have narrowed to a few key areas, including iron and steel, where electrification may not be able to decarbonise the sector completely. While green hydrogen (produced using renewable energy and electrolysis) has emerged as the primary pathway for green steel, its costs remain higher than anticipated.

As an alternative, a number of countries and corporates are considering "blue hydrogen" – produced from fossil gas coupled with carbon capture and storage (CCS) technology. Companies like POSCO, thyssenkrupp and Salzgitter have been exploring the use of blue hydrogen in ironmaking. Woodside's involvement in the NeoSmelt collaboration (focusing on a low-emissions ironmaking pilot plant) in Australia further highlights the future possibility of using fossil-based hydrogen in this initiative. Additionally, the German government is advocating for a less strict definition of clean hydrogen within the EU, aiming to facilitate the use of blue hydrogen for end users.

However, a range of problems are likely to severely hamper blue hydrogen's potential for decarbonising steel production. Any investment in fossil fuel-based hydrogen production risks trapping investors, as they may find themselves committed to a long-standing technology likely to become obsolete in the coming years.

One of the primary issues facing blue hydrogen is its reliance on carbon capture. Over a period of nearly five decades, CCS has amassed a track record of significant underperformance, with projects consistently falling short of achieving their targets for capturing carbon dioxide. Capture rates of the operating blue hydrogen plants fall well below the 95% often claimed by CCS proponents.

Moreover, blue hydrogen's emissions problem extends beyond carbon dioxide. The largest component of fossil gas is methane, emissions of which have a much stronger warming effect than CO_2. Methane leakage rates of gas production and transportation have been significantly underestimated in the reporting of blue hydrogen's total emissions.

It will be extremely challenging for blue hydrogen to meet the emissions intensity targets of key markets such as the US, the EU, Japan and South Korea. Major oil and gas companies like Shell and Equinor have abandoned their blue hydrogen projects, citing the challenges of meeting the EU's strict carbon emissions regulations and lack of demand. Stricter regulations will come into effect in the coming years, making it increasingly difficult for blue hydrogen to attract end-users including steelmakers.

In the direct reduction (DR) ironmaking process, replacing gas with hydrogen produced from gas (grey hydrogen) does not lead to a reduction in gas consumption or carbon emission. The DR technology provider Tenova has emphasised that "… direct use of fossil gas followed by green hydrogen will be the efficient and economical approach versus blue hydrogen for carbon reduction."

Meanwhile, the cost advantage for blue hydrogen appears likely to be short-lived. In some countries well positioned for production, it will be possible to produce green hydrogen at a lower cost than blue hydrogen by the end of this decade. Meanwhile, blue hydrogen will continue to face challenges from high gas price volatility and the costs associated with CCS, which remain stubbornly high. In addition, blue hydrogen requires significant upfront investment in production facilities, gas infrastructure and carbon capture. In contrast, green hydrogen can be developed incrementally due to its modularity, reducing investment risks over time.

In the steel sector, continuing to use fossil fuels poses significant risks, especially given the unrealistic expectations of CCS as a means to eliminate emissions. Although costs have not declined as fast as forecasts suggested, green hydrogen remains the most effective long-term solution for addressing the decarbonisation of primary steelmaking.

Source: IEEFA Friday week in review, 24 Jan. 2025

European Steel Technology Transition in Danger of Slowing but Carbon Capture is Not the Answer

The steel technology transition away from coal has accelerated in recent years, with Europe leading the way. However, as 2024 drew to a close, two of Europe's leading steelmakers appeared to be slowing their planned shift to lower emissions technology.

This is partly because the cost of green hydrogen production hasn't declined as fast as over-optimistic forecasts suggested it would. Despite this, investors and governments should question any steelmaker suggesting carbon capture and storage (CCS) will play a meaningful role in decarbonising steel.

Transition slowing?

In November, Thyssenkrupp announced it would cut 11,000 jobs at its steel unit as it struggles amid global overcapacity and the resultant increase in cheap steel imports from China. Over the past two years, Thyssenkrupp has written down the value of its steel unit by €3 billion.

Thyssenkrupp Steel states that it "remains committed to the green transformation and carbon-neutral steel production" and that its under-construction direct reduced iron (DRI) plant – which is intended to eventually run on hydrogen – will be completed.

Yet, it seems that the company's overall DRI ambition has been scaled back. In 2022, Thyssenkrupp suggested that all four blast furnaces at its Duisburg site would be progressively replaced with four DRI plants. Now the company states that the first DRI plant will replace two blast furnaces, while another may be replaced by an electric arc furnace (EAF) at some point in the future.

Also in November, ArcelorMittal confirmed what had already been rumoured – that it is delaying final investment decisions (FID) across its portfolio of decarbonisation projects. This includes a number of hydrogen-ready DRI plants planned to replace blast furnaces.

It also seems likely ArcelorMittal will revise down its 2030 emissions intensity targets.

ArcelorMittal states that it "remains committed to all technologies that offer the potential to take steelmaking to near-zero. This includes carbon capture utilisation and storage (CCUS), although like green hydrogen, this technology is likely to only make a meaningful difference after 2030. It already has one industrial scale CCU facility operational at its plant in Gent, Belgium, and a further two pilot projects underway in Gent."

This "industrial scale" CCU (carbon capture and utilisation) facility is the Steelanol project, which captures less than 2% of the Gent plant's annual emissions.

The very low capture rate of the Steelanol CCU project helps illustrate why steelmakers that are planning or implementing low-carbon technology have turned to hydrogen-ready DRI instead of carbon capture. The 2030 pipeline of commercial-scale, low-carbon steel capacity is dominated by DRI projects totalling almost 100 million tonnes a year (Mtpa). Commercial-scale CCS projects remain stuck on 1Mtpa.

Some of the early hype surrounding green hydrogen is rightfully being questioned. In some ways it is unsurprising that steelmakers are rethinking their timetables. But in the medium to long term, green hydrogen-based DRI is far more likely to reduce steel emissions than CCS.

Green hydrogen-based DRI will outcompete CCS on performance and cost

CCS has a poor track record in all sectors where it has been applied with no signs of this changing on the horizon as the latest performance results from the world's largest CCS project attest.

The Gorgon CCS project in Western Australia captures CO_2 that is mixed with extracted natural gas for storage underground. CO_2 injection started in August 2019 – 3½ years late.

The plant was approved on the condition that it injected 80% of captured CO_2 underground but its performance is well below this level and getting worse. In recent years, it has injected about one-third of captured CO_2, and in the most recently released performance results, this dropped further to 30%. Any captured CO_2 not injected is vented into the atmosphere.

Gorgon isn't the only flagship CCS project to reveal worsening performance. Oil and gas producer Equinor recently admitted the performance of its flagship

Sleipner CCS project had been significantly over-reported due to faulty monitoring equipment. Advocates of CCS often point to Sleipner as proof of CCS's technical feasibility. In fact, the project further highlights the risks associated with carbon capture implementation.

Low capture rates are often glossed over. The world's only operational CCS plant for steelmaking – the Al Reyadah CCS project in the United Arab Emirates (UAE) only captures about 25% of the DRI-based steel plant's overall emissions.

For the steel industry, CCS faces the same issues experienced in other sectors with the added difficulty that an integrated, coal-based steel plant has several sources of carbon emissions. There are still no commercial-scale CCS plants for blast furnace-based steelmaking in operation anywhere in the world.

There is also the high cost of transporting captured carbon, questions over where carbon will be stored and uncertainty over the long-term effectiveness of underground storage.

Each carbon storage project faces different geological conditions and issues, making it difficult to take any learnings from one project to the next. This limits the potential for cost reductions.

The cost of CCS remains high despite decades of attempted deployment. Green hydrogen is expensive but the cost has a much better chance of declining through economies of scale and the falling cost of renewable energy.

Furthermore, installing CCS at steel plants does nothing to tackle methane emissions from metallurgical coalmines that supply blast furnace-based steel plants. In 2024, the scale of the methane emissions issue has become more apparent. In Australia – the world's largest exporter of metallurgical coal – a new online methane emissions tool (Open Methane) was released by the Superpower Institute in October. Initial results suggest Australia's methane emissions may be far higher than official figures.

Source: IEEFA Friday week in review, 24 Jan. 2025

Atmospheric CO_2 Rise Now Exceeding IPCC 1.5C Pathways

The rate at which atmospheric CO_2 is increasing is now outpacing the pathways set out by the Intergovernmental Panel on Climate Change (IPCC) that limit global warming to 1.5C.

This is what the latest data shows from the Mauna Loa observatory in Hawaii, where measurements of CO_2 levels in the atmosphere have been collected for more than 60 years.

In 2024, the rise in atmospheric CO_2 was one of the fastest on record.

Emissions of CO_2 and other greenhouse gases from human activity have so far caused human-caused global warming to reach about 1.3C above pre-industrial levels.

If warming is to be limited to 1.5C, as set out in the Paris Agreement, the build-up of CO_2 and other greenhouse gases in the atmosphere will need to slow to a halt and then go into reverse.

And, yet, the rise in atmospheric CO_2 concentrations is still showing no signs of slowing.

Pathways to 1.5C

The third working group report of the IPCC's sixth assessment report (AR6), published in 2022, presented a set of seven "illustrative pathways" that highlight how different mitigation choices across major economic sectors translate into future greenhouse gas emissions and global temperatures.

In the three most-ambitious pathways, global warming has a 50% chance of either staying below 1.5C, or overshooting it by only 0.1C (for up to several decades) before then returning to below 1.5C:

- **Shifting pathways (IMP-SP):** Illustrates mitigation in the context of a broader shift towards sustainable development, including by reducing inequality and with a phase-out of fossil fuels.
- **Low demand (IMP-LD)**: Illustrates a strong emphasis on energy-demand reductions, and with a phase-out of fossil fuels.
- **Renewables (IMP-Ren):** Illustrates a future with a heavy reliance on renewable energy.

As the table below shows, the build-up of atmospheric CO_2 in these three scenarios slows from the 2010s average of 2.41 parts per million per year (ppm/year) to 1.33-1.79 ppm/year in the 2020s.

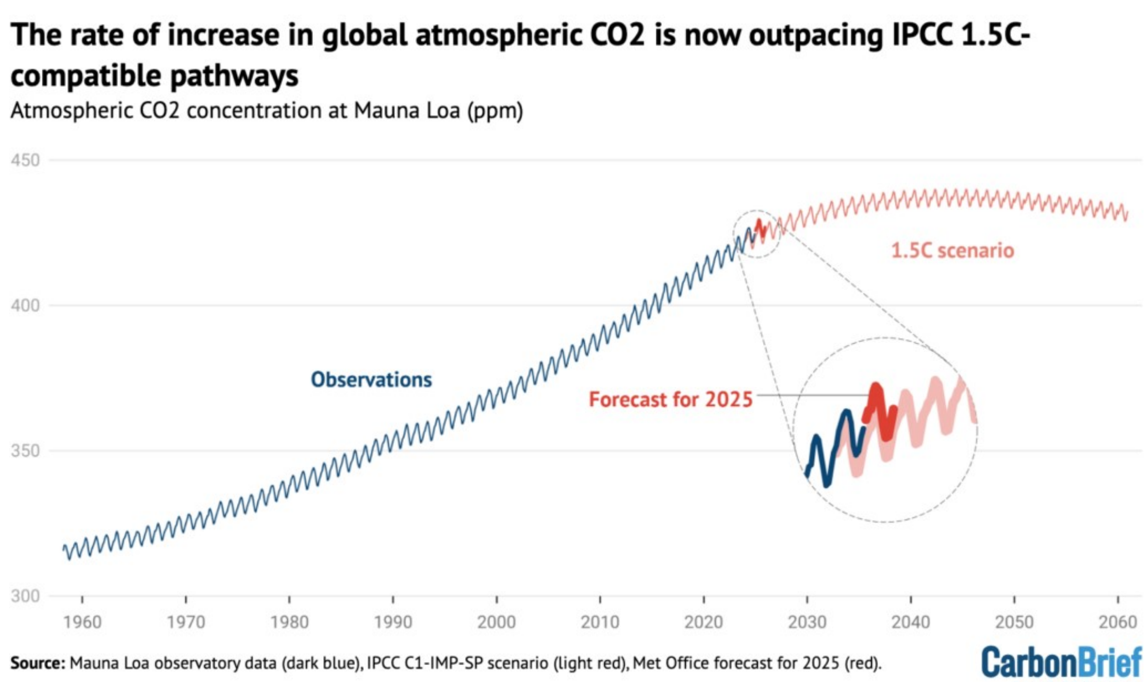
It then slows still further and goes into reverse either in the 2030s or 2040s – in other words, the level of CO_2 in the atmosphere actually begins to fall.

Decade	Projected average CO_2 rise (ppm/year) in scenarios limiting global warming to1.5C		
	C1-IMP-LD	*C1-IMP-REN*	*C1-IMP-SP*
2020s	*1.33*	*1.75*	*1.79*
2030s	*-0.14*	*0.13*	*0.57*
2040s	*-0.53*	*-0.46*	*-0.7*
2050s	*-0.65*	*-0.61*	*-0.41*

Large CO_2 rise in 2024

Yet, not only are atmospheric CO_2 concentrations still rising, the rate of rise is accelerating.

The build-up of CO_2 in the atmosphere has been monitored at the Mauna Loa observatory in Hawaii since 1958.



Monthly CO2 concentrations at Mauna Loa from observations up to 2024 (blue) and the IPCC C1-IMP-SP scenario consistent with limiting global warming to 1.5C (light red). Also shown is the Met Office forecast for 2025 (red).

As illustrated by the iconic Keeling Curve above, the increase has been accelerating over the decades (blue line) due to ongoing emissions of CO_2 from burning fossil fuels and changing land use.

So while the curve needs to rapidly bend in the other direction to hold warming to 1.5C (light red line), the rate of rising CO_2 marches onwards and upwards.

The table below sets out decadal averages of the annual rise in CO_2 concentrations at Mauna Loa. The first half of the 2020s has seen an average CO_2 rise of 2.58 ppm/year, which is 44-94% higher than it needs to be to track the IPCC 1.5C-compatible scenarios.

Decade	**Observed average CO2 rise (ppm/year)**
1960s	*0.86*
1970s	*1.22*
1980s	*1.58*
1990s	*1.55*
2000s	*1.91*
2010s	*2.41*
2020s (2020-2024)	*2.58*

In fact, the annual rise of 3.58ppm/year between 2023 and 2024 at Mauna Loa was the fastest on record.

The global average, which has been monitored by satellite since 2003, also showed a large rise last year – and, at 2.9ppm/year, this was the second largest on record after 2015-16.

(While the rise at Mauna Loa mirrors the global rise over long periods, in the short term it can also be affected by localised effects, such as fires upwind or in the same hemisphere, before the CO_2 disperses more evenly across the globe.)

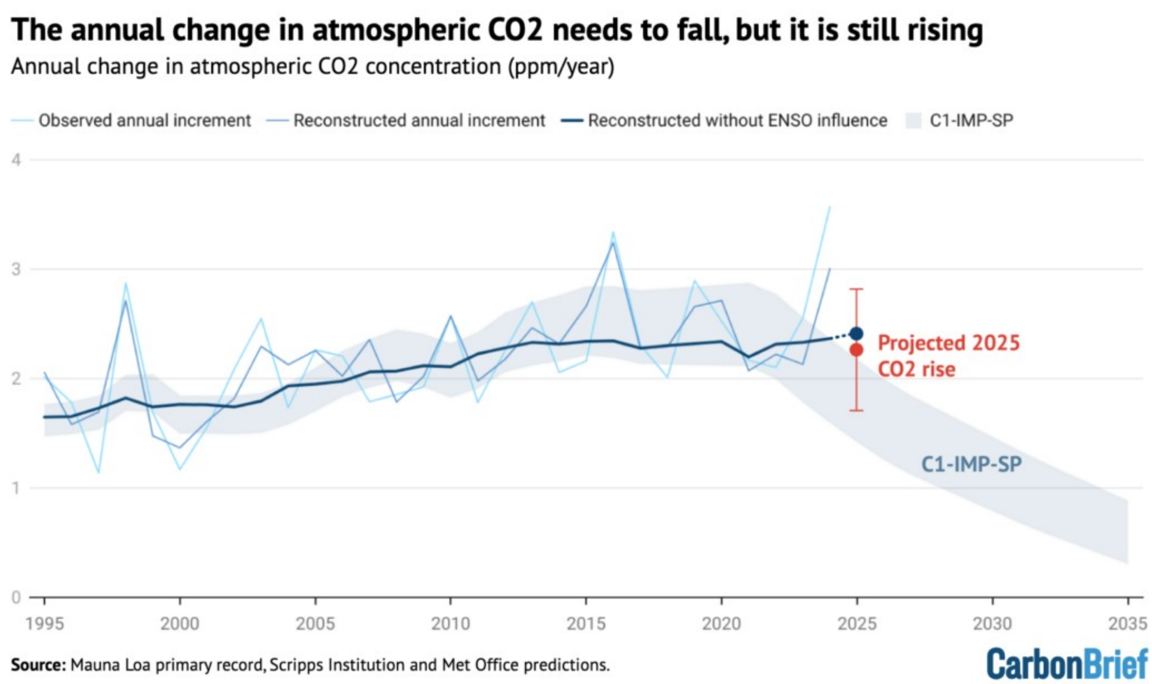
Global CO_2 emissions were also at a record high in 2024, but a further key factor was that natural land carbon "sinks" were substantially weaker, allowing more of the emitted CO_2 to remain in the atmosphere.

At least some of this weakening of land carbon sinks was associated with the El Niño conditions in the first part of the year. El Niño events shift weather patterns around the globe, leading to hotter, drier conditions in many parts of the tropics. This means that vegetation grows less well and more carbon is released from decay in soils and from wildfires, leading to land ecosystems removing less carbon from the atmosphere than usual.

With the El Niño now subsided and conditions shifting more towards the opposite pattern of La Niña, natural land carbon sinks can be expected to recover again, at least to some extent.

As a result, in our Met Office forecast of the CO_2 rise at Mauna Loa, we predict a slower rate of rise between 2024 and 2025 than between 2023 and 2024. The projected increase is 2.26 ppm (with an uncertainty range of ±0.56 ppm) – slightly slower than it would have been without the effects of La Niña.

However, even this is still too fast to stay on track with the IPCC 1.5C-compatible scenarios. This is highlighted in the chart below, which shows the annual change in CO2 levels at Mauna Loa since 1995 (blue lines) and how our forecast for 2025 (red point) exceeds a pathway consistent with 1.5C (grey plume).



Comparison of recent and forecast annual change in atmospheric CO_2 concentration with an illustrative scenario limiting global warming to 1.5C. Light blue thin line: Annual change in CO_2 concentration at the Mauna Loa observatory from observations. Mid-blue thin line: Annual increments in CO_2 concentration at the Mauna Loa observatory reconstructed using statistical relationship between concentrations, emissions and the El Niño-Southern Oscillation (ENSO). Red dot with vertical error bars: the 2025 forecast increment. Dark blue thick line and dark blue dot: estimated increments without the influence of ENSO. Grey plume: simulated CO_2 concentrations in the C1-IMP-SP scenario limiting global warming to 1.5C with >50% likelihood.

Faster rise than expected

The specific reasons for the very large increase in CO_2 in 2024 are not yet completely clear, although weaker land carbon sinks appear to be implicated.

We had forecast the 2023-24 CO_2 rise at Mauna Loa to be 2.84 ppm (±0.54) – faster than the average of the previous decade due to the El Niño. We had also highlighted the possibility that it could be the fastest annual rise on record.

However, the actual CO_2 rise of 3.58 ppm was even faster than expected. This was above the upper limit of our uncertainty range, which should include the forecast value 95% of the time.

Although carbon emissions from fossil fuel burning and deforestation were also at a record high in 2024, this does not fully explain the shortfall in our forecast.

Our forecast method uses the global emissions from the previous year as one of the inputs. The emissions in 2024 were estimated to have been 11.3 bn tonnes of carbon (GtC), slightly higher than the 2023 value of 11.1 GtC used in our forecast.

This 0.2 GtC difference is equivalent to about 0.09 ppm of CO_2 in the atmosphere. So, even if we had used the larger value in our forecast, the observed rise would still have been beyond our uncertainty range.

Therefore, the origin of the discrepancy must be related to natural carbon sinks, which must have been even weaker than the expected weakening that occurred as a result of the 2023-24 El Niño.

Weaker land carbon sinks

Scientists had already established that land carbon sinks were exceptionally weak in 2023, with very high temperatures worldwide playing a part in this.

2024 was then even hotter than 2023 – and indeed was the first calendar year where warming exceeded 1.5C above pre-industrial levels. It can be expected that the climatic conditions this warmer year once again led to weaker global land carbon sink.

Both North and South America saw high temperatures and exceptionally severe fires in 2024, including in regions not normally affected by El Niño such as Canada, and extending beyond the season of El Niño influence.

Global fire emissions were estimated as 1.6-2.2GtC over January-September 2024, 11-32% above the 2014-23 average for the same months.

Moreover, fire emissions in the northern hemisphere were 0.5-0.6 GtC per year, which was 26-44% above the average of 2014-23. Since Mauno Loa is in the northern hemisphere, this may explain why the local rise there was even larger than the global average.

A portion of these fire emissions may already be accounted for in the above estimate of land-use emissions, but it is not possible to quantify this. Nevertheless, widespread fire activity likely contributed to the large rise in atmospheric CO_2 concentrations in 2024. Further analysis is needed to quantify the size of this contribution.

Climate change itself may have played a role in enhancing fire emissions. For example, human-caused warming made the "unprecedented" wildfires that spread across Brazil's Pantanal wetlands in June 2024 between four and five times more likely.

Although land carbon sinks are generally increasing as a result of rising CO_2, Earth system model projections have long indicated that ongoing global warming would reduce this effect, leading to a greater proportion of human-caused emissions remaining in the atmosphere.

Calculations suggest that this has already been occurring in recent years, so a key question is whether the last two years have seen an acceleration. If natural carbon sinks weaken more than already expected, this would further increase the difficulty of slowing the rise in atmospheric CO_2 concentrations.

Alternatively, there are a number of historical years for which our CO_2 forecast procedure gives almost as large departures between predictions and outcomes as for 2024. For example, 2003 saw a large rise at Mauna Loa despite not being an El Niño year, due to large fires in Siberia. It will therefore be important to see whether there is a higher-than-expected rise in CO_2 in 2025, or whether the large exceedance in 2024 is a temporary phenomenon.

With global warming ongoing, extremely high temperatures will continue to occur more frequently and severely, so events such as those seen in 2023 and 2024 could play an ever more important role in the global carbon cycle.

The contribution of fires attributed to climate change is consistent with model simulations which suggest that global fire activity will already be weakening land carbon sinks. Further monitoring of the global carbon cycle will help to reveal whether this is indeed the case

Source: Carbon Brief, 29 Jan 2025.

Gerdau to Use Biofuel in Steel Production

Brazilian biodiesel producer Be8 has signed an agreement with steelmaker Gerdau for a new biofuel product to be utilised in the latter's production.

The patented product, named BeVant, is claimed by the company to offer both a low-carbon footprint and act as a replacement for fossil diesel without the need for process modifications. In a life cycle analysis (LCA), which measures emissions from production to engine combustion, BeVant emits 50% less carbon equivalent than diesel. As stated by Camilo Adas, Be8's energy transition director, its carbon footprint is 90% lower if only combustion emissions are considered.

In BeVant's first year of commercial operation, Be8 anticipates selling its entire annual production capacity of 50 million litres from the Passo Fundo (Rio Grande do Sul) plant.

Once current capacity is fully utilized, the company plans to invest in industrial expansion and is exploring opportunities with both domestic and international clients.

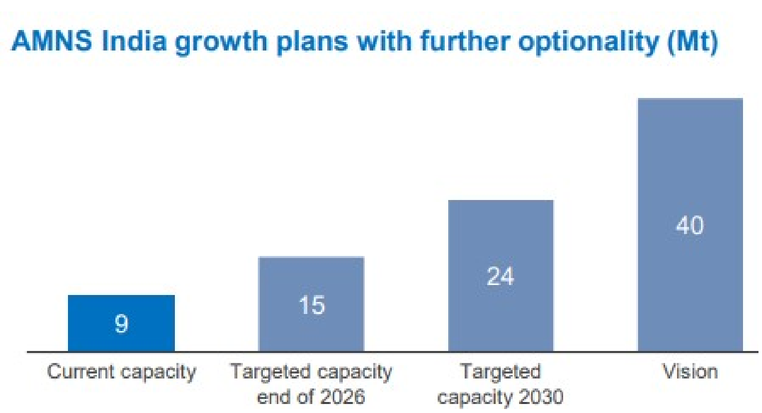
Be8 secured a spot in the official supply agreements at Casa Brasil, a space hosted by Brazilian companies alongside the World Economic Forum in Davos. Gerdau, one of the event's sponsors, plans to conduct initial tests of BeVant at its mining unit in Minas Gerais.

Be8 has also secured agreements with Ambipar, the Randon Technology Center (CTR), Congonhas Airport, and the Abreu Group, which manages São Paulo's largest bus fleet. These deals have already placed 2-3 million litres of the renewable fuel into the market.

*Source: Weekly News from Steel Times Inter*national, Feb 5, 2025

AMNS India Tripling Capacity by End of the Decade

- ♣ Crude steel capacity expansion to 15 Mt by end 2026 is on track.
- ♣ Further planned expansion to 24 Mt by end of the decade in preparation
- ♣ Long term vision of 40 Mt capacity through greenfield projects
- ♣ Automotive downstream complex to be fully commissioned by end of 2025



Source: ArcelorMittal Press Release 06 Fb. 2025

India Secures Permission' to Explore Copper and Cobalt Deposits in Zambia

India has recently obtained permission to explore copper and cobalt deposits across a 9,000-sq-km area in Zambia, with exploration activities scheduled to begin in the coming month. The exploration team, led by the Geological Survey of India (GSI), will initially invest around ₹15-20 crore, which will largely come from the Mines Ministry's budget.

Copper and cobalt have been identified as strategic and critical minerals by the Ministry, underscoring the importance of this venture.

The exploration process, which will involve prospecting, drilling, mapping and sampling, is expected to take two-three years before a clear report on the viability of commercial mining can be produced. Following the final report, to be presented by GSI, discussions regarding the acquisition of mining rights will be initiated.

This exploration agreement is part of a broader effort by India to secure critical mineral resources. The arrangement with Zambia follows a previous memorandum of understanding (MoU) and the formation of a joint working group that facilitated India's access to the greenfield area in Zambia's North Western Province.

Other Tie-Ups

India is also exploring additional opportunities for critical mineral resources across the African copper-cobalt belt, particularly in the Democratic Republic of Congo. It is also negotiating partnerships with nations in the Commonwealth of Independent States (CIS), West Asia – Saudi Arabia and Israel, and countries like the US and Canada.

Efforts are being ramped up to secure lithium resources, particularly in Australia. State-owned Coal India, NMDC and ONGC Videsh are actively involved in exploring these resources.

Lithium, a cornerstone for India's energy transition and carbon footprint reduction, remains a priority. India is still in the process of developing its own lithium processing technology, an area where China currently holds a significant lead.

Source: The Hindu Businessline, 27th February 2025

Generative AI Vs. Agentic AI: The Key Differences

Artificial intelligence (AI) is a term that often conjures images of robots and self-learning machines, but in reality, AI is a broad umbrella with many distinct subfields. Two of the most talked-about developments today are *generative AI* and *agentic AI*. The crucial thing to grasp is that they function in distinctly different ways.

Generative AI: The Creative Powerhouse

Generative AI is all about creation. Think of it as the imaginative side of artificial intelligence. These systems are designed to produce content—text, images, music, code, and even video. At its core, generative AI learns from existing data and uses that knowledge to generate new, original outputs that mimic human creativity.

The rise of tools like ChatGPT, DALL•E, and MidJourney has catapulted generative AI into the mainstream. These systems rely on advanced machine learning models, particularly neural networks, to analyze and replicate patterns in the data they are trained on.

But generative AI isn't perfect. Its outputs are only as good as the data it's trained on. Feed it biased or incomplete data, and it will reflect those flaws. Moreover, it doesn't truly "understand" the content it creates. It's simply predicting what might come next based on patterns it has seen before. Despite this limitation, generative AI is already revolutionizing industries, from marketing to entertainment.

Agentic AI: The Autonomous Problem-Solver

While generative AI focuses on creating, agentic AI is all about doing. This type of AI is designed to act autonomously to achieve specific goals. Agentic AI systems don't just generate outputs; they make decisions, take actions, and adapt to changing environments.

Think of agentic AI as the brains behind autonomous vehicles, robotic process automation, or smart assistants that can schedule your meetings and order your groceries. These systems are equipped with sensors, algorithms, and actuators that enable them to perceive their environment, process information, and execute actions. What sets agentic AI apart is its ability to act with purpose. It's not just reacting to input but considering objectives and making choices to achieve them. For instance, an autonomous drone delivering packages must navigate obstacles, optimize its route, and adapt to unforeseen circumstances—all without human intervention. However, the autonomy of agentic AI also raises critical questions about ethics and accountability. Who's responsible when an autonomous system makes a mistake? How do we ensure these systems act in ways aligned with human values? These are some of the challenges that need addressing as agentic AI becomes more prevalent.

The Core Differences Between Generative And Agentic AI

The easiest way to differentiate generative AI from agentic AI is to think of their primary functions. Generative AI is about producing something new, while agentic AI is about achieving something specific. One creates, and the other acts.

Generative AI is largely static. It produces outputs based on the data it has learned but doesn't adapt in real-time or interact dynamically with the world. It operates within predefined boundaries. In contrast, agentic AI is dynamic. It's constantly processing new information, learning from its environment, and adjusting its actions accordingly.

Another key distinction lies in the complexity of their objectives. Generative AI typically works on tasks that are narrow and well-defined, such as generating a paragraph of text or a digital painting. Agentic AI, on the other hand, often tackles broader, multi-step goals that require continuous decision-making and adaptation.

Where They Intersect And Complement Each Other

Despite their differences, generative AI and agentic AI aren't mutually exclusive. In fact, they often work together in powerful ways. For instance, an agentic AI system could use generative AI to help it communicate more effectively or create custom content on the fly.

Consider a virtual customer service agent. The agentic AI handles the real-time interaction, making decisions based on user input and guiding the conversation. Meanwhile, a generative AI component could craft nuanced and personalized responses to specific questions.

This synergy is also evident in areas like robotics. Imagine a robot chef equipped with both generative and agentic AI. The generative AI could devise new recipes based on user preferences and available ingredients, while the agentic AI handles the actual cooking process, ensuring everything is prepared to perfection.

Why Understanding These Differences Matters

As AI becomes more integrated into our lives, understanding its various forms is crucial. Generative AI and agentic AI serve different purposes and come with distinct benefits and challenges. Recognizing these nuances can help businesses and individuals make informed decisions about how to leverage AI effectively.

For businesses, this knowledge is invaluable for strategic planning. Do you need AI to create compelling marketing content? Generative AI is your go-to. Do you need AI to automate complex processes or manage tasks? Agentic AI is the answer. Knowing which type of AI fits your needs can save time, money, and resources.

Understanding these differences can help society navigate the ethical, social, and economic implications of AI. From job displacement to data privacy, the rise of AI presents challenges that require thoughtful consideration and action. Autonomy boundaries and goal alignment are particularly critical when designing and deploying AI systems. By clearly defining the limits of autonomy and ensuring AI objectives are aligned with human values, we can address these challenges responsibly and effectively.

The Future of Generative And Agentic AI

The lines between generative and agentic AI will blur further as these two types of AIs evolve and improve. Advances in technology could lead to systems that seamlessly integrate creation and action, combining the best of both worlds. Imagine an AI that not only generates innovative ideas but also implements them autonomously - a game-changer for industries ranging from healthcare to manufacturing.

But with this potential comes responsibility. We must ensure that these technologies are developed and deployed ethically, with transparency and accountability. By understanding the differences between generative and agentic AI, we can better appreciate their unique strengths and work towards a future where AI serves humanity in meaningful and transformative ways.

In the steel industry, "agentic AI" refers to advanced artificial intelligence systems that can autonomously make decisions and adjust processes in real-time based on data analysis, essentially acting like intelligent agents to optimize production, improve quality control, predict maintenance needs, and manage raw material sourcing, all with the goal of enhancing efficiency and reducing costs across the manufacturing process.

Key applications of agentic AI in the steel industry:

- ***Real-time process optimization:***

Continuously monitoring furnace temperatures, pressure, and chemical composition to make immediate adjustments, ensuring consistent product quality and minimizing defects.

- ***Predictive maintenance:***

Analyzing sensor data from machinery to predict potential failures before they occur, allowing for preventative maintenance and minimizing production downtime.

- ***Raw material sourcing optimization:***

Analyzing market trends and supplier data to identify the best raw materials at the most competitive prices, optimizing inventory management.

- ***Energy efficiency:***

Monitoring energy consumption throughout the production process and identifying areas for improvement to reduce energy waste.

- ***Quality control inspection:***

Utilizing computer vision to automatically detect surface defects on steel products, enhancing quality standards.

How agentic AI works in the steel industry:

- ***Data collection:*** Sensors throughout the production process gather real-time data on various parameters like temperature, pressure, and chemical composition.
- ***AI agent decision-making:*** The AI system analyzes this data and uses complex algorithms to make autonomous decisions, such as adjusting furnace settings or initiating maintenance actions.
- ***Continuous learning and adaptation:*** The AI agents are designed to learn from new data and adjust their decision-making strategies over time, optimizing performance based on changing conditions.

Benefits of using agentic AI in steel production:

- ***Increased efficiency:*** By automating process adjustments and optimizing resource allocation, agentic AI can significantly boost production efficiency.
- ***Improved product quality:*** Real-time monitoring and control can lead to more consistent and high-quality steel products.
- ***Cost reduction:*** Minimizing waste, reducing energy consumption, and optimizing raw material usage can lead to significant cost savings.
- ***Enhanced operational flexibility:*** Agentic AI systems can adapt to changing market demands and production requirements.

Source: https://www.forbes.com › bernardmarr › 2025/02/03 › g

Know Your Members

Shri Ajoy Chandra Ram Das
Consultant & Expert in Iron & Steel Sector
Ex Industrial Adviser, Ministry of Steel, Govt. of India
Metallurgical Engineer from IIT Kanpur (1979), Post Graduate Diploma in Business Management (PGDBM) and Post Graduate Diploma in Financial Management (PGDFM).

- Shri ACR Das started his career as a Quality Control Engineer at Usha Martin Ltd., Ranchi in 1979. Subsequently, worked in SAIL, Rourkela Steel Plant and Bureau of Indian Standards for a few years.
- Thereafter, he Joined Ministry of Steel, Government of India as Assistant Industrial Adviser in the Ministry of Steel and worked in the Ministry for over 35 years in different capacities, dealing with all technical/ environment and quality related issues viz. Promotion/Growth of Indian Steel Industry, Administration of Research & Development under SDF Funding Scheme/Government Budgetary Scheme, Formulation of Indian Standards on Iron and Steel Products and Administration of Quality Control Scheme, Management of Energy & Environment matters in steel sector, Administration of NMD (National Metallurgists' Day) Awards for Distinguished Metallurgists and Prime Minister's Trophy Scheme for the Best Integrated Steel Plant etc. Contributed significantly in formulation of National Steel Policy-2005 as well as National Steel Policy-2017.
- Superannuated from the post of Industrial Adviser in MoS in June 2013. Post superannuation, was reappointed by MoS as Consultant w.e.f. July 2013 till May 2018
- Subsequently, Shri Das was associated with Maruti Suzuki India Ltd (Supply Chain Dept.) as Consultant facilitate procurement of automobile grade steel products covered under the Steel and Steel Products (Quality Control) Orders issued by MoS under the BIS Act.
- Mr ACR Das has widely travelled and represented India as Co-Chair of Steel Task Force (STF), Asia Pacific Partnership on Clean Development & Climate Change (APPCDC). Also represented India as a Member of the Steel Working Group, Global Superior Energy Performance Partnership (GSEP). As Co-chair of STF, APPCDC, steered ways and means for adoption of clean and green energy and environment in Indian steel sector which led to the publication of the State-of-the-art Clean Technologies Handbook.
- While in MoS, he was also appointed as the National Project Coordinator of UNDP-GEF (Steel) Project as well as UNDP-AusAid (Steel) Project launched /implemented with financial assistance of Global Environment Facility/Australian Govt Aid and Ministry of Steel for energy efficiency improvement in Steel Re-rolling Mills/ Secondary Steel Sector.

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