



Decarbonising Steel Sector

This editorial is based on [“Decarbonising the steel sector will pay off”](#) which was published in The Hindu BusinessLine on 15/05/2023. It talks about the greenhouse gas emissions from the steel sector and the significance of decarbonising the steel sector - related challenges and efforts.

For Prelims: [India's steel industry](#), [GHG Emissions](#), [National Steel Policy 2017](#), [EU's Carbon Border Adjustment Mechanism \(CBAM\)](#), [Green Hydrogen](#)

For Mains: India's steel industry and greenhouse gas emissions, significance of decarbonising India's steel sector, National Steel Policy 2017, Green Hydrogen and Steel Production

Steel is one of the core pillars of today's society and one of the most important engineering and construction materials. However, the **steel industry is among the three biggest producers of carbon dioxide**. Consequently, steel players across the globe are increasingly facing a **decarbonisation challenge to reduce its carbon footprint** from both environmental and economic perspectives.

India is currently the world's 2nd largest steel producer after China. Various analyses show potential for a **multi-fold increase in steel consumption by 2050**. Production of steel in India is set to increase significantly over the next few decades, to meet the increasing domestic and international demand.

Decarbonisation of the steel sector has a big role to play in emission of low-carbon India as an essential ingredient for the country's green future.

What is the Current Scenario of India's Steel Sector?

- **Production Scenario:**
 - Steel is a key sector for the Indian economy (**responsible for 2% of the country's GDP in FY 21-22**).
 - India is the world's 2nd largest producer of crude steel and 2nd largest consumer of finished steel.
 - The [National Steel Policy 2017](#) has set a target to reach **300 million tonnes (MT) of annual production by 2030** from the existing level of 120 MT.
 - As the economy grows, **India's crude steel production is expected to increase to about 435 million tonnes (mt) by 2050**.
- **Emission Scenario: Direct emissions** (excluding emissions from purchased electricity use) from **iron and steel production** stood at approximately **270 million tonnes of CO₂ equivalent (MTCO₂e) in 2018**, comprising approximately **9% of total national greenhouse gas emissions**.
 - Steel contributes almost **1/3rd of direct industrial CO₂ emissions, or 10% of India's total energy infrastructure CO₂ emissions** and about **11% of the country's total emissions**.

What is the Significance of Decarbonising Steel Sector?

- In the accelerated transition, **forex savings of approximately \$500 billion would accrue by 2050 from reduced spending on coking coal alone.**
- A **greener steel industry** can enable **India to be a global green steel manufacturing hub.**
- Decarbonisation of steel making will also lead to **decarbonisation of allied industries** such as cars, infrastructure and buildings.
- Decarbonising the steel sector is also **important from the perspective of the emerging regulatory landscape internationally;** due to the **[EU's upcoming Carbon Border Adjustment Mechanism \(CBAM\)](#)**, Indian steel exports to the EU could fall by as much as 58% without any additional effort to decarbonize steel sectors.

What are the Initiatives to Decarbonise India's Steel Sector?

- The **[National Green Hydrogen Mission](#)** identifies a significant role for **green hydrogen in decarbonising the steel sector** to meet India's climate goals.
- The Ministry of Steel seeks to reduce CO₂ in the steel industry through **promotion of [Green Steel](#)** (manufacturing steel without using fossil fuels).
 - This can be done by using low-carbon energy sources such as hydrogen, coal gasification, or electricity instead of the traditional carbon-intensive manufacturing route of coal-fired plants.
- **[Steel Scrap Recycling Policy, 2019](#)** enhances the availability of domestically generated scrap to reduce the consumption of coal in steel making.
- India also joined the UK to co-lead the **[Industrial Deep Decarbonisation Initiative](#)** under the banner of the **Clean Energy Ministerial**. It is expected to **stimulate global demand for low-carbon industrial materials, including steel.**
- **[National Solar Mission](#)** launched by MNRE in January 2010 **promotes the use of solar energy and also helps reduce the emission of steel industry.**
- Recently government launched Kalyani Group's first green steel brand '**Kalyani FeRRESTA**'.

What are the Challenges to Decarbonising the Steel Sector?

- **Challenges in Hydrogen replacing Conventional Ways:**
 - There are two basic steel production routes: - **Blast Furnace (BF) route**, where **coke is the primary fuel**, and **Direct Reduced Iron (DRI) route**, where the **fuel can be coal or natural gas.**
 - India presently produces around 90% of crude steel through the BF and coal based DRI routes. While hydrogen has the potential to fully replace coal or gas in the DRI process, it is seen to have a limited role in being able to substitute coke in the BF route.
 - **Hydrogen-based steel-making remains uncompetitive for hydrogen prices above \$1/kg**, especially in **absence of a carbon cost for emissions.**
- **Challenges in Scaling up Net-Zero Technologies:**
 - **Cost:** Global estimates suggest that the investment for setting up DRI steel plants with upstream green hydrogen generation could reach Rs 3.2 Lakhs/tonne.
 - Additionally, the **cost of green hydrogen at Rs 300-400/kg is higher** than the cost of grey hydrogen at Rs 160-220/kg.
 - Similarly, **Carbon Capture and Storage (CCS) plants** also have a **high capital cost.**
 - **Supporting Infra:** There is an **inadequate support network for the storage, production, and transportation of hydrogen.**
 - For CCS, there is a **lack of data on the availability of potential geological storage sites** and their capacities.
 - Limited use cases also pose a **challenge in scaling up CCS technology.**

What Steps can be Taken to Decarbonise the Steel Sector?

- **Introducing CO₂ Pricing and Rapid Development of Hydrogen:**
 - Introduction and calibration of CO₂ pricing in the next few years will **encourage investments in low carbon technologies** and **accelerate adoption of hydrogen-based steel-making**.
 - It will also accelerate investment in other green technologies in the steel value chain such as green hydrogen and renewables-based electricity.
 - A **carbon price of \$50 per tonne of emissions can make green steel competitive by 2030**, even at a hydrogen price of \$2/kg, and can catalyse the shift from coal-based to hydrogen-based steel-making.
- **Policies for Material Efficiency:**
 - **Scrap-based steel-making has the lowest carbon emissions** of all current commercial steel-making technologies, but is dependent on price and availability of quality scrap to be economic and to achieve scale.
 - **India relies on scrap imports**, which will become a challenge in the future as quality scrap demand increases globally for steel-making.
 - To **scale up domestic scrap-based steel-making, policies incentivising scrap collection and recycling** would need to be implemented, to set up dismantling, collection and processing centres.
- **Encourage Green Steel Consumption in End-Use:**
 - The government is **encouraging the use of green steel**, it shall **set up targets for embodied carbon in public and private construction**, and in automotive uses.
 - This will **support creation of a domestic green steel market for domestic steel-makers**, who can initially tap export markets where green steel commands a premium.
 - International regulations, such as the **CBAM**, can **provide further impetus to the private sector to accelerate the transition to green steel**.
- **Investing in Carbon Capture, Utilisation and Storage (CCUS):**
 - CCUS is currently an expensive but an important lever for reducing emissions.
 - To make it a viable decarbonisation solution for the steel industry, **more R&D efforts are required to reduce capture costs**, besides **creating hubs in steel producing centres like in Odisha and Jharkhand**.

Drishti Mains Question

“Considering much of the India envisioned for 2050 is yet to be built, an ‘accelerated steel industry decarbonisation’ offers a clear opportunity for India to build it right at the outset”. Comment.

UPSC Civil Services Examination, Previous Year Questions (PYQs)

Prelims:

Q1. In the ‘Index of Eight Core Industries’, which one of the following is given the highest weight? (2015)

- (a) Coal production
- (b) Electricity generation
- (c) Fertiliser production
- (d) Steel production

Ans: (b)

Q2. In India, the steel production industry requires the import of (2015)

- (a) saltpetre
- (b) rock phosphate
- (c) coking coal
- (d) All of the above

Ans: (c)

Q3. Which of the following are some important pollutants released by steel industry in India? (2014)

1. Oxides of sulphur
2. Oxides of nitrogen
3. Carbon monoxide
4. Carbon dioxide

Select the correct answer using the code given below:

- (a) 1, 3 and 4 only
- (b) 2 and 3 only
- (c) 1 and 4 only
- (d) 1, 2, 3 and 4

Ans: (d)

Q4. Steel slag can be the material for which of the following? (2020)

1. Construction of base road
2. Improvement of agricultural soil
3. Production of cement

Select the correct answer using the code given below:

- (a) 1 and 2 only
- (b) 2 and 3 only
- (c) 1 and 3 only
- (d) 1, 2 and 3

Ans: (d)

Mains:

Q. Account for the present location of iron and steel industries away from the source of raw material, by giving examples. **(2020)**

Q. Account for the change in the spatial pattern of the Iron and Steel industry in the world. **(2014)**