



## 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 2<sup>nd</sup> 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 2<sup>nd</sup> largest producer of crude steel and 2<sup>nd</sup> 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 CO<sub>2</sub> equivalent (MTCO<sub>2</sub>e) in 2018**, comprising approximately **9% of total national greenhouse gas emissions**.
  - Steel contributes almost **1/3<sup>rd</sup> of direct industrial CO<sub>2</sub> emissions, or 10% of India's total energy infrastructure CO<sub>2</sub> 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 CO<sub>2</sub> 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 CO<sub>2</sub> Pricing and Rapid Development of Hydrogen:**
  - Introduction and calibration of CO<sub>2</sub> 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)**

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**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)**