



## Green Steel

**For Prelims:** Green Steel, Pradhan Mantri Urja Ganga Project, National Hydrogen Energy Mission (NHM), Blue Hydrogen, Green Hydrogen, India's Commitments at the Conference of the Parties (COP26).

**For Mains:** Green Steel, Significance, Challenge and the Way Forward.

### Why in News?

A clean steel sector in Eastern India can become **essential for the country's transition to 'Green Steel'**.

- To move towards 'Green Steel', **the Petroleum and Natural Gas Ministry launched [Pradhan Mantri Urja Ganga Project in Eastern India](#)** in 2019 to provide gas to all steel plants located in the area.

### What is Green Steel?

#### ▪ About:

- Green Steel is the **manufacturing of [steel](#) without the use of 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.
- It eventually **lowers [greenhouse gas emissions](#), cuts costs and improves the quality of steel**.
- **[Low-carbon hydrogen \(blue hydrogen and green hydrogen\)](#)** can help **reduce the steel industry's carbon footprint**.
  - **[National Hydrogen Energy Mission \(NHM\)](#)** capitalizes on **hydrogen for a cleaner alternative fuel option**.

#### ▪ Ways of Production:

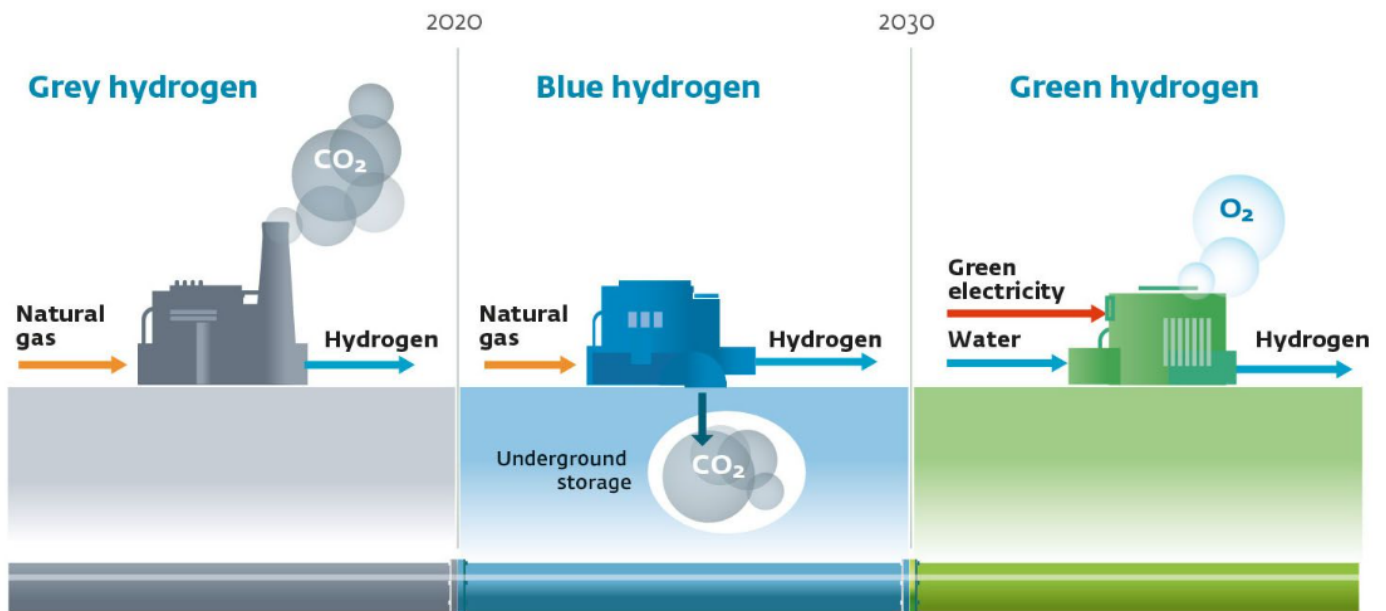
- **Substituting the Primary Production Processes with Cleaner Alternatives:**
  - **[Carbon capture, utilization and storage \(CCUS\)](#)**
  - Replacing conventional sources of energy with low-carbon hydrogen
  - Direct electrification through electrolysis of iron ore

#### ▪ Significance:

- The steel industry is the largest industrial sector in terms of intensive energy and resource use. It is one of the **biggest emitters of carbon dioxide (CO<sub>2</sub>)**.
- In view of commitments made at the **[Conference of the Parties \(COP26\)](#)** climate change conference, the Indian steel industry **needs to reduce its emissions substantially by 2030 and hit net-zero carbon emissions by 2070**.

#### ▪ Challenge:

- At present, the **country's iron and steel sector is financially weak**. However, Green Steel manufacturing is an expensive process involving high cost.



## What are the Types of Hydrogen?

- **Green hydrogen** is produced by electrolysis of water using renewable energy (like Solar, Wind) and has a lower carbon footprint.
- **Brown hydrogen** is produced using coal where the emissions are released to the air.
- **Grey hydrogen** is produced from natural gas where the associated emissions are released to the air.
- **Blue hydrogen** is produced from natural gas, where the emissions are captured using carbon capture and storage.

## What is the Status of Steel Production in India?

- **Production:** India is currently the world's 2nd largest producer of crude steel, producing 120 Million Tonnes (MT) crude steel during financial year 2021- 2022.
  - **Reserves:** More than 80 per cent of the country's reserves are in the states of Odisha, Jharkhand, West Bengal, Chhattisgarh and the northern regions of Andhra Pradesh.
    - **Important steel-producing centers are** Bhilai (Chhattisgarh), Durgapur (West Bengal), Burnpur (West Bengal), Jamshedpur (Jharkhand), Rourkela (Odisha), Bokaro (Jharkhand).
  - **Consumption:** India is the 2<sup>nd</sup> largest consumer of finished steel in 2021 (106.23 MT), preceded by China as the largest steel consumer as per World Steel Association.

## Way Forward

- **Cost-effective technologies must be adopted to decarbonize the steel sector.** Many old plants need to be refurbished and energy efficiency measures for electricity-based manufacturing have bright prospects for further investment.
- **Scrap can be utilized in lowering the energy used for making steel** for which a suitable infrastructure for recycling and the Steel Scrap Recycling Policy needs to be constructed.
- **The government and public sector should commit** to the purchase of environmentally sustainable green steel to drive the demand for the same.
- **Public and Private sectors need to generate green standards** and similar types of labels for the market growth of green steel.
- **Old and polluting plant facilities**, which have reached the end of their life, should be removed.

## UPSC Civil Services Examination Previous Year Question (PYQ)

### Prelims

**Q. 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)**

**Exp:**

- Steel industry creates pollution as it uses coal and Iron ore whose combustion releases various Polycyclic Aromatic Hydrocarbons (PAH) compounds and oxides into the air.
- In steel furnace, coke reacts with iron ore, releasing iron and generating major environmental pollutants.
- The pollutants released from steel producing units are:
  - Carbon Monoxide (CO), hence, 3 is correct.
  - Carbon Dioxide (CO<sub>2</sub>), hence, 4 is correct.
  - Oxides of Sulphur (SO<sub>x</sub>), hence, 1 is correct.
  - Oxides of Nitrogen (NO<sub>x</sub>), hence, 2 is correct.
  - PM 2.5,
  - Waste Water,
  - Hazardous waste,
  - Solid waste.
- However, technological interventions in the form of air filters, water filters and other water saving, power saving and closed container can reduce emissions. **Therefore, option D is the correct answer**

### 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)**

**Source: DTE**