National Green Hydrogen Mission (NGHM)

Mains: *GS-III – Economy - Infrastructure: Energy.*

Why in news?

India is reducing fossil fuel dependence and ramping up domestic clean energy production, in line with its vision of achieving Net Zero by 2070. In this transition, Green hydrogen is emerging as a scalable, clean fuel to decarbonize hard-to-abate sectors.

What is Green Hydrogen?

- **Definition –** Hydrogen produced ***using renewable energy***, such as solar or wind power, instead of fossil fuels.
- **Process –** Water is split into hydrogen and oxygen via electrolysis powered by clean energy from solar panels or wind turbines.
- **Emission Standard –** As per Indian norms, it qualifies as "green" if emissions is very low, ***not more than 2 kg of CO_2 equivalent for every 1 kg of Hydrogen produced***.
- **Alternate Source –** Green Hydrogen can also be produced by converting biomass (like agricultural waste) into hydrogen, as long as emissions remain below the same limit.

What is National Green Hydrogen Mission?

- **Launch –** In 2023, as an umbrella programme to develop a Green Hydrogen ecosystem (announced by the Prime Minister in ***2021's Independence Day speech***).
- **Aim –** To catalyse a systemic response to sectoral opportunities and challenges and making India a global hub for the production of green hydrogen.
- **Nodal Ministry –** Ministry of New and Renewable Energy (MNRE).
- **Objectives**
  - Enhance industrial competitiveness, import reduction, and long-term energy security—linking sustainability with self-reliance.
  - Build the capacity and ecosystem required to position India as a global leader in clean hydrogen.

What are India's targets for Green Hydrogen by 2030?

- **Renewable Energy Expansion & Investment** – Develop ***125 GW of renewable energy capacity*** exclusively for green hydrogen production along with investments exceeding Rs. 8 lakh crore.
- **Employment generation –** Expected to create for over 6 lakh people through sectoral

expansion.
- **Import Reduction –** Reduce fossil fuel imports by ***more than Rs. 1 lakh crore***, and avoid nearly 50 MMT of greenhouse gas emissions every year by 2030.

What are the sectoral innovation & implementation under NGHM?

- The National Green Hydrogen Mission has an initial outlay of Rs. 19,744 crore till Financial Year 2029-30.
- **4 key pillars –**
  - **Policy & Regulatory Framework** – Enabling rules, standards, and incentives for green hydrogen adoption
  - **Demand Creation** – Sectoral pilots in steel, mobility, shipping, and fertilizers
  - **R&D & Innovation** – Strategic Hydrogen Innovation Partnership (SHIP) with BARC, ISRO, CSIR, IITs
  - **Infrastructure & Ecosystem Development** – Electrolyser manufacturing, renewable energy integration, certification systems.
- **Implementation Progress** (as of May 2025) -
  - 19 companies allocated 862,000 TPA green hydrogen production capacity.
  - 15 firms awarded 3,000 MW electrolyzer manufacturing capacity.
  - Pilot projects launched in steel, mobility, and shipping sectors.

What are the schemes and initiatives taken by the Government to accelerate production and use of green hydrogen?

- **Strategic Interventions for Green Hydrogen Transition (SIGHT) Scheme –**

  - A ***financial incentive mechanism*** with an outlay of Rs. 17,490 crore up to 2029-30 provides incentives for the manufacturing of electrolysers
  - Purpose – Financial incentives to boost domestic manufacturing of electrolysers that are used for production of green hydrogen.

- **Development of Green Hydrogen Hubs –**

  - In October 2025, the MNRE has announced the recognition of ***3 major ports*** – will serve as integrated centres for production, consumption, and future export.
    - Deendayal Port Authority (Gujarat),
    - V.O. Chidambaranar Port Authority (Tamil Nadu), and
    - Paradip Port Authority (Odisha).

- **Green Hydrogen Certification Scheme of India (GHCI) -**

◦ **Launched -** In April 2025 to certify hydrogen as "green" based on lifecycle emissions to ensure transparency, traceability, and credibility for producers, consumers, and export markets.
◦ **Criteria –** Hydrogen must be produced using renewable energy and emit ≤ 2 kg CO_2 equivalent per kg H_2.
  ◦ **Mandatory Certification –** Required for facilities that receive government subsidies/incentives, or sell or use hydrogen domestically in India.
  ◦ **Nodal Authority –** Bureau of Energy Efficiency (BEE) accredits agencies for monitoring and certification.

- **R&D initiatives under NGHM**
  ◦ **Dedicated R&D Scheme -** Rs. 400 crore allocated to support 23 cutting-edge projects in - hydrogen production, storage, safety systems, and industrial applications.
  ◦ **Start-up Support -** Rs. 100 crore Call for Proposals launched to fund start-ups innovating in hydrogen production, transport, storage, and utilization with funding up to Rs. 5 crore per project to promote cost-effective, scalable technologies.

What are the sectoral applications of green hydrogen under NGHM?

- **Fertilizers** – Replacing fossil-fuel-based feedstocks with Green Ammonia, the recent auction for 7.24 lakh metric tonnes per annum supply at Rs. 55.75/kg concluded.
- **Petroleum Refining** – Facilitating the replacement of fossil-based hydrogen with green hydrogen in refineries to reduce carbon footprint.
- **Steel** – 5 pilot projects was launched with public-private collaboration to focus on iron reduction, process innovation, safety, and cost-efficiency in Indian conditions.
- **Road Transport** – 5 pilot projects, 37 hydrogen vehicles (15 fuel cell + 22 ICE), 9 refueling stations across 10 different routes.
- **High-Altitude Mobility (Leh) –** NTPC in 2024 commissioned the world's highest green hydrogen mobility project at 3,650 m, which includes 5 intra-city buses and a fueling station.

What are India's global partnerships in the green hydrogen sector?

- **World Hydrogen Summit 2024 –** India debuted with its 1st India Pavilion in Rotterdam, signaling global investment readiness.
- **EU–India Collaboration –** Over 30 joint proposals under the Trade and Technology Council on hydrogen production from waste.
- **India–UK Standards Partnership –** Workshop held in Feb 2025 to harmonize Regulations, Codes, and Standards (RCS) for safe and scalable hydrogen trade.
- **India–Germany (H2Global) –** SECI signed MoU with H2Global Stiftung (Nov 2024) to design market-based mechanisms and enable green hydrogen exports.
- **India–Singapore (Sembcorp)** – MoUs signed (Oct 2025) with V.O. Chidambaranar & Paradip Ports to build green hydrogen–ammonia hubs for production, storage, and export.

What lies ahead?

- Green hydrogen is central to India's clean energy strategy, promoting a low-carbon and self-reliant economy.
- The National Green Hydrogen Mission boosts domestic production, innovation, and global market access.
- It reduces fossil fuel dependence, drives industrial transformation, and strengthens India's leadership in the global energy transition.

Reference

PIB | Unlocking India's Green Hydrogen Production Potential