



Green Hydrogen and Carbon-Neutral Future

This article is based on [“A green promise: On the National Green Hydrogen mission”](#) which was published in The Hindu on 06/01/2023. It talks about National Green Hydrogen mission and related challenges.

For Prelims: Green hydrogen, Renewable energy, Greenhouse gas emissions, Chemical industry, Steel industry, Fossil fuels, Nationally Determined Contribution (NDC) Targets, Paris Climate Agreement, Electrolysis.

For Mains: Significance of Green Hydrogen, Challenges Related to Green Hydrogen in India.

In India, there is growing interest in [green hydrogen](#), which is hydrogen produced using [renewable energy](#) sources. Green hydrogen has the potential to significantly reduce [greenhouse gas emissions](#), as it does not produce any carbon dioxide when burned. This makes it a particularly attractive option for India, which is committed to reducing its [carbon footprint](#) and mitigating the impacts of [climate change](#).

The use of green hydrogen in India is still in the early stages, and there are several **challenges that need to be addressed in order to scale up its production and use**. These include the high cost of production, the lack of infrastructure for the distribution and storage of hydrogen, and the need to develop suitable technologies for its use in different applications.

Despite these challenges, the potential for green hydrogen in India is significant. It has the potential to play a **key role in the country's energy mix**, helping to reduce reliance on fossil fuels and **contribute to a cleaner, more sustainable energy system**. With the right policies and investments, **green hydrogen** could become a major part of India's energy future.

What is Green Hydrogen?

- **Green hydrogen** is a type of hydrogen that is produced through the **electrolysis of water using renewable energy sources** such as solar or wind power.
- The **electrolysis process splits water into hydrogen and oxygen**, and the hydrogen produced can be used as a clean and renewable fuel.
- **Uses:**
 - **Chemical industry:** Manufacturing ammonia and fertilisers.
 - **Petrochemical industry:** Production of petroleum products.
 - Furthermore, it is starting to be used in the **steel industry**, a sector which is under considerable pressure in **Europe because of its polluting effect**.

What is the Significance of Green Hydrogen?

- **Achieving Emission Target:** Green hydrogen energy is vital for India to meet its [Nationally Determined Contribution \(NDC\) Targets](#) and ensure regional and national [energy security](#), access and availability.
 - Under the [Paris Climate Agreement](#), India pledged to reduce the emission intensity of its economy by **33-35% from 2005 levels by 2030**. Green hydrogen can drive India's transition to clean energy, **combat climate change**.
- **Energy Storage and Mobility:** Green Hydrogen can act as an **energy storage option**, which would be essential to meet intermittencies (of renewable energy) in the future.
 - In terms of mobility, for **long distance mobilizations** for either urban freight movement within cities and states or for passengers, **Green Hydrogen can be used in railways, large ships, buses or trucks**, etc.
- **Reducing Import Dependence:** It will reduce India's import dependency on [fossil fuels](#). The **localisation of electrolyser production** and the development of green hydrogen projects can **create a new green technologies market** in India worth **USD 18-20 billion** and thousands of jobs.

What are the Challenges Related to Green Hydrogen?

- **High Production Costs:** Currently, the **production of green hydrogen** is more expensive than hydrogen produced from fossil fuels.
 - This is because the **process of electrolysis**, which is used to produce green hydrogen, requires a large amount of **electricity**, and the cost of **renewable electricity** is still relatively high in India.
- **Lack of Infrastructure:** There is currently a lack of infrastructure in India for the **production, storage, and distribution of green hydrogen**.
 - This includes a lack of hydrogen refuelling stations and pipelines for transporting **hydrogen**.
- **Limited Adoption:** Despite the potential benefits of green hydrogen, there is currently **limited adoption of this technology** in India.
 - This is due to a **lack of awareness** and understanding of green hydrogen among the general public, as well as a **lack of incentives** for businesses to switch to this technology.
- **Economic Sustainability: Extraction of green hydrogen** is one of the biggest challenges facing the industry for using hydrogen commercially.
 - For transportation **fuel cells, hydrogen must be cost-competitive** with conventional fuels and technologies on a per-mile basis.

What Should be the Way Forward?

- **Increase the Capacity to Generate Renewable Electricity:** In order to reduce the cost of **green hydrogen production**, it is necessary to increase the capacity to generate renewable electricity in India.
 - This can be done through the **expansion of renewable energy sources** such as solar and wind power.
- **Developing Hydrogen Infrastructure:** There is a need to develop infrastructure for the **production, storage, and distribution of green hydrogen** to make this technology more accessible. This includes building **hydrogen refuelling stations and pipelines for transporting hydrogen**.
- **Implement Regulatory Incentives:** The government can play a key role in promoting the adoption of green hydrogen by implementing **regulatory incentives, such as tax credits and subsidies**, to encourage the production and use of this technology.
- **Raise Awareness and Understanding of Green Hydrogen:** It is important to educate the public about the **benefits of green hydrogen** and the role it can play in helping to reduce **greenhouse gas emissions**.
 - This can be done through public awareness campaigns and educational initiatives.

What are the potential benefits and challenges of implementing green hydrogen production and how India can utilise this clean and renewable energy source in achieving its energy and climate goals?

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