Decarbonising Shipping Industry

Mains syllabus: *GS3 - Indian Economy and issues relating to planning, mobilization of resources, development | Science and Technology- developments and their applications and effects in everyday life.*

Why in the news?

The recent developments shows that global shipping is on course towards decarbonisation by 2024-50 by means of using green fuels.

What are the green fuels?

- **Green Fuels** – These are energy sources *derived from renewable resources,* designed to minimize environmental impact compared to traditional fossil fuels.

Green Fuel Type	Production
Green hydrogen	It is made by electrolysis of water powered by renewable energy.
Green ammonia	It is produced by combining green hydrogen with nitrogen using renewable energy.
Green methanol	It is synthesized from green hydrogen and captured carbon dioxide.

- **Advantages** – It reduces greenhouse gas emissions, improves air quality, and enhances energy independence.

What are the green fuels used in shipping?

- **Existing fuels** – Merchant ships largely use *Very Low Sulphur Fuel Oil (VLSFO),* diesel, and methane gas stored in liquid form as fuel.
- **Transition fuel** - *LNG-powered engines* with their higher efficiency of some 5% are likely to be a transition fuel before shipping moves to green fuels.
- **Initial preferences of green fuel** – It is ***green methanol*** due to easier engine and storage adaptation and it *emits some 10% of carbon dioxide* only.
- It is almost *drop-in replacement for VLSFO* and can be stored as a liquid at ambient temperature.
    - Already, more than 360 ships capable of operating on methanol are either in service or in order.
- **Future preference** - ***Green ammonia*** is favored in long-term as it does *not emit greenhouse gases* during combustion.
- But requires significant onboard handling adjustments.
- **Rejected fuel** - Shipping will *not use green hydrogen* directly because of issues with storage and transportation of hydrogen, a highly volatile fuel.

What are shipping decarbonization plans in India?

- Transitioning to green hydrogen, methanol, and ammonia reduces shipping's carbon footprint, directly contributing to national targets—such as *India's net-zero by 2070 pledge*.
- **Green fuel potential** - India has the *land and expertise for solar power* to be a major supplier of green fuels to global shipping.
- India's aggressive push in creating 1.5 GW of local *electrolyser manufacturing capacity* and growing industrial CO2 sources (from steel and cement industries) positions India strategically to develop integrated green fuel hubs.
- **Green Fuel Hubs** - Development of green hydrogen hubs and green fuel bunkering stations at key ports like *Kandla, Paradip, and Tuticorin* support supply and export of sustainable marine fuels.
- **Export green fuels** – The efforts are underway in producing and supplying *green fuels to Singapore*.

> ***Singapore is a fuelling station*** *accounting for nearly one-fourth of all global ship fuelling.*

- **Challenges** - Solar panels and electrolysers to make green hydrogen need to be imported.

What are the implementation challenges?

- **Technology dependence** - Electrolysers and some key equipment still need to be imported, increasing capital costs.
- **Pricing discrepancy -** *Green fuel production is significantly more expensive* than conventional fuels, driven by the cost of renewables and CAPEX (Capital Expenditure) for production facilities.
    - A 100% sustainable e-methanol as bunker fuel costs USD 1,950 per tonne (of VLSFO equivalent) in February, 2025 in Singapore, while VLSFO averaged at USD560 per tonne.
- **Lack of regulations** - *Absence of standardized regulatory frameworks*.
- **Supply Chains** - Scaling up renewable energy and domestic electrolyser manufacturing remains a bottleneck.

How India can become a marine green fuel production hub?

- **Sovereign guarantees** – They have emerged as a powerful *de-risking mechanism for green methanol investments* that can considerably reduce prices.
- These ***government-backed assurances*** can fundamentally transform project economics by enabling access to international capital markets at significantly lower interest rates.
- **Production-linked incentive (PLI) schemes for electrolysers** – It can *relieve supply chain bottlenecks* by territorialising value chains and lessening transportation costs of raw materials.

- **Carbon capture, utilisation, and storage (CCUS) incentives** – They can increase the feasibility of the production of green methanol from sequestered CO2.
- **Leveraging Multilateral development bank funds** - They offer *financing at rates as low as 4%,* as opposed to 11-12% by domestic lenders.

What lies ahead?

- Governmental incentives and foreign partnerships (with Korea, Japan) can attract global shipbuilders and stimulate economies of scale.
- Integrated green fuel hubs and supportive policy frameworks can position India to revitalize its shipowning and shipbuilding industries while meeting decarbonisation targets.

Reference

The Hindu| Decarbonization in Global Shipping