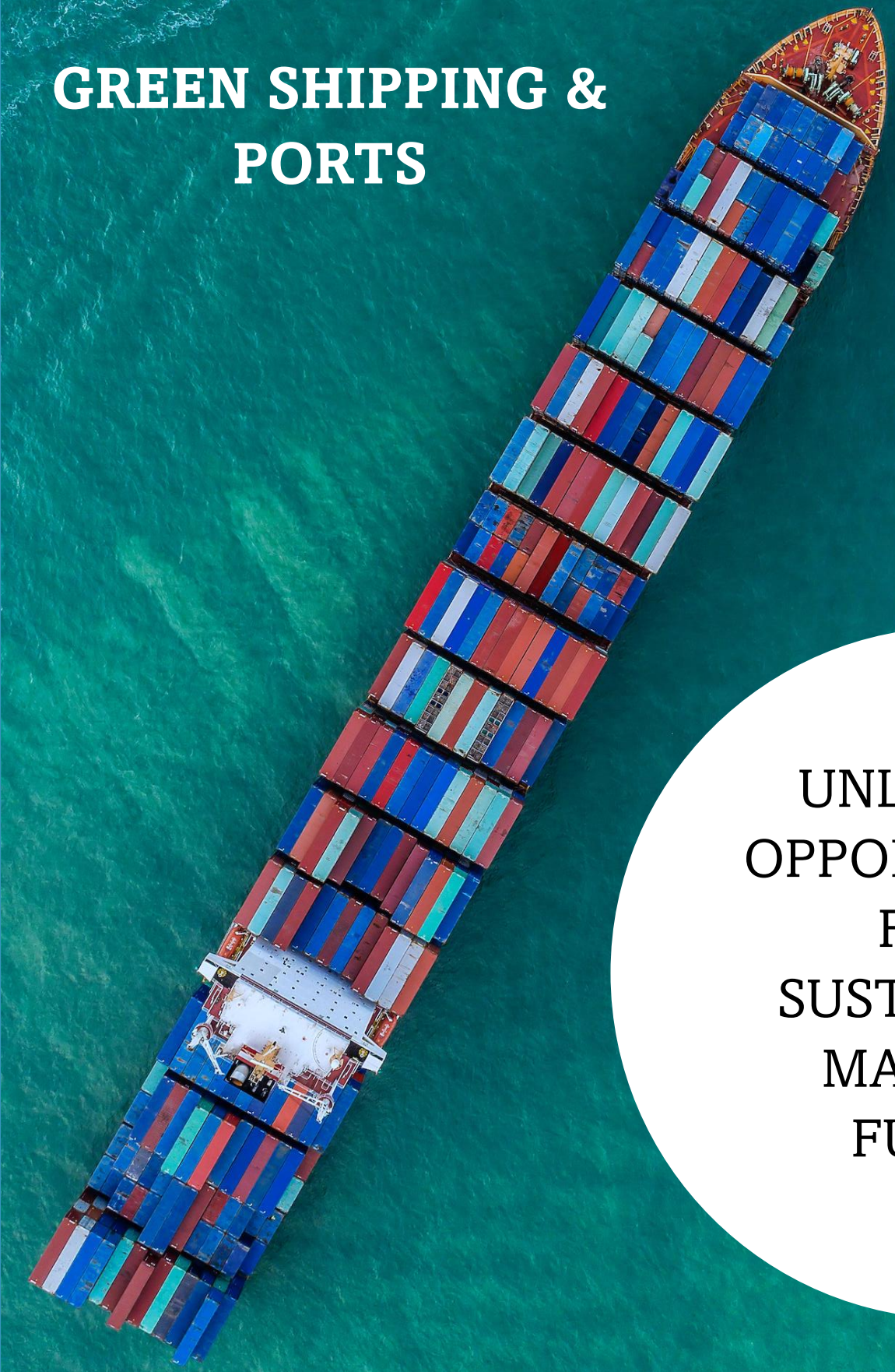
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FICCI

GREEN SHIPPING & PORTS



UNLOCKING OPPORTUNITIES FOR A SUSTAINABLE MARITIME FUTURE

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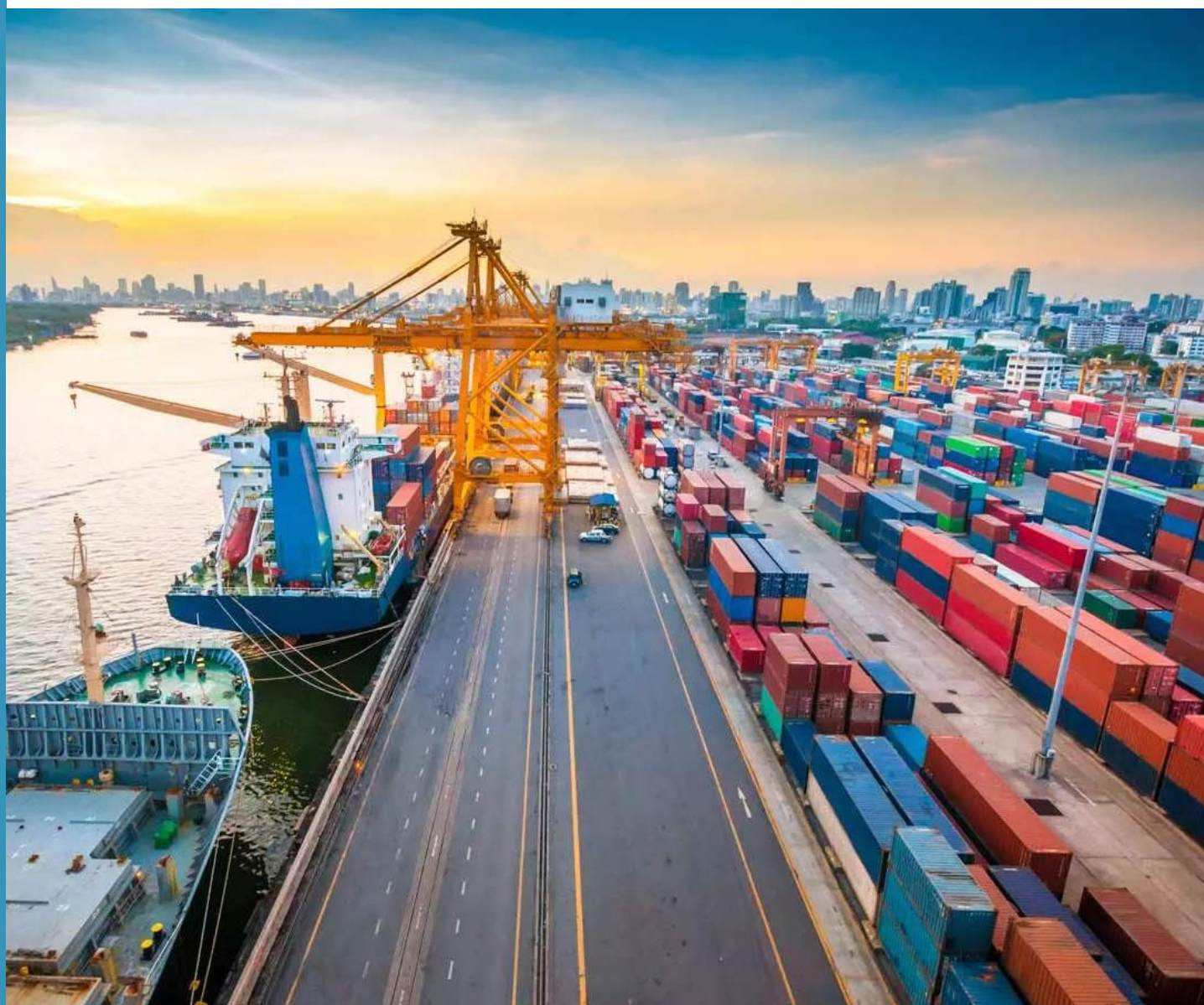


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FOREWORD



Mr Dhruv Kotak
Chairman – Ports & Shipping,
FICCI Committee on Transport Infrastructure
and Managing Director, JM Baxi Group

I am happy to share with you the FICCI-PwC Knowledge Report on 'Green Shipping & Ports – Unlocking Opportunities for a Sustainable Maritime Future' to be released at the Green Shipping & Ports Conclave 2024 organised by the Federation of Indian Chambers of Commerce and Industry.

Green shipping and ports are integral components of sustainable maritime transportation, underpinned by global initiatives aimed at driving maritime sustainability. Efforts to reduce greenhouse gas emissions, air pollutants, and noise pollution in maritime transportation involve adopting eco-friendly technologies like low-emission fuels, renewable energy sources, and energy-efficient designs. These initiatives extend to implementing sustainable practices in port operations, contributing to a healthier environment, and aligning with global sustainability goals.

India is committed to play an active role in maritime sustainability and has shared its vision through the National Action Plan for green shipping. This initiative promotes eco-friendly practices and incentives for low-emission ships, positioning India's maritime sector as environmentally responsible. The government's vision includes plans to quadruple port capacity, establish clean energy fuel hubs, and drive growth in cruise tourism. Recent achievements such as doubling major ports' capacity, expanding waterway networks, and advancing solar power adoption further demonstrate India's dedication to a prosperous and eco-conscious maritime future.

The FICCI-PwC Report outlines India's maritime sustainability efforts, including Green Port Guidelines, green vessel development, and creation of a green hydrogen hub. It presents a comprehensive view of the transformative initiatives like India's Green Voyage programme with IMO, policy measures, and the need for a centralised decarbonisation cell. It also emphasises incentivising green practices, boosting manufacturing, fostering innovation via startups, and investing in emission monitoring mechanisms.

I hope you will find this report useful. We welcome your suggestions and feedback.



NEED FOR GREEN SHIPPING & PORTS

NEED FOR GREEN SHIPPING & PORTS

Global shipping continues to confront multiple challenges, including heightened trade policy and geopolitical tensions and changes in globalization patterns. Additionally, shipping must transition to a more sustainable future, decarbonize, and embrace digitalization. Amongst all these, the key challenge for the sector is that the maritime industry must embark on a transformative journey towards decarbonization while sustaining growth. Balancing environmental sustainability, regulatory compliance and economic demands is vital for a prosperous, equitable and resilient maritime transport future.

The transport sector contributes approximately one quarter of all energy related greenhouse gas (GHG) emissions. Today's transport sector is predominantly based on the combustion of fossil fuels (~95%), making it one of the largest sources of both urban and regional air pollution [1]. The ports and maritime sectors have a great impact on the environment due to their reliance on energy-intensive operations and plying of large vessels and that cause pollution. GHG emissions from shipping currently represent around 2.8% of total global emissions and this share could increase up to three times by 2050 if measures to control it are not taken [2].

The world needs sustainable and green ports to support its economy and to address the environmental concerns. Over 80% of the volume of international EXIM is carried by sea route and handled at ports. Rapid growth in port infrastructure also has severe consequences such as pollution & GHG emission, biodiversity destruction etc. Therefore, there is an utmost need to adopt sustainable and green port development practices that will contribute to the overall sustainable development goals.

In line with the goals set out in the Paris Agreement to shift towards a net-zero emission world, International Maritime Organization (IMO) envisaged GHG Strategy 2023 that includes an enhanced common ambition to reach net-zero GHG emissions from international shipping by or around, i.e., close to 2050, a commitment to ensure an uptake of alternative zero and near-zero GHG fuels by 2030, as well as indicative checkpoints for 2030 and 2040 [3]. However, meeting the targets set out in IMO Revised Strategy on Reduction of GHG emissions from ships remains a challenge.

IMO GHG targets

1. 50% cut in overall GHG emissions and 70% cut in CO2 emissions by 2050
2. Zero GHG emissions by end of 2100
3. Gradually phase out conventional fuels and transition to cleaner fuels

The shipping industry faces uncertainty in determining the most effective way to reduce carbon emissions and transition to lower or zero-carbon fuels. Carriers need to modernize and renew their ageing fleets and switch to low carbon fuels whilst dealing with lack of clarity on the best alternative fuels and green technologies.

[1] https://www.unep.org/explore-topics/energy/what-we-do/transport#:~:text=The%20transport%20sector%20contributes%20approximately,urban%20and%20regional%20air%20pollution.

[2] UNCTAD, newsletter-2022

[3] https://www.imo.org/en/MediaCentre/PressBriefings/pages/Revised-GHG-reduction-strategy-for-global-shipping-adopted-.aspx



GLOBAL TRENDS

GLOBAL TRENDS

Globally, ports and shipping lines continue to grapple with meeting the greenhouse gas (GHG) emission targets as set out in the IMO Revised Strategy 2023. To achieve these targets at a global level, the sector is adopting a range of international best practices and measures, including operational improvement, technological innovation, and use of cleaner alternative fuels.

There is an increasing focus on decarbonisation and sustainable initiatives to mitigate the environmental impact of maritime activities. More than 130 countries have set or are considering targeting reduction of GHG emissions to net zero by 2050. Further, 193 UN countries are focusing on initiatives to achieve UN Sustainable Development Goals (SDGs) related to green and sustainable shipping.

Some of the key trends include adoption of cleaner alternative fuels such as green hydrogen, ammonia and biofuels to power vessels. Certain port authorities are also working on the development of shore power-based infrastructure to enable vessels to plug into electricity while docked, and enabling implementation of energy-efficient technologies and practices to improve energy efficiency.



FIGURE 1: ENVIRONMENT FOCUSED UN SDGS

Additionally, there is a growing emphasis on circular economy principles, promoting waste reduction, recycling, and reuse within port operations. Collaborative efforts between governments, industry stakeholders, and international organizations are driving the development of green port guidelines, incentives for eco-friendly practices, and the sharing of best practices and technologies to accelerate the transition towards greener and more sustainable maritime operations and transportation.

Various countries have developed green maritime visions, outlining ambitious goals and strategies to mitigate environmental impacts and promote sustainable practices in the maritime sector. These visions encompass a wide range of initiatives, including adoption of alternative fuels, implementation of emission reduction measures, promotion of energy efficiency, and enhancement of port infrastructure to accommodate green technologies. Nations across the globe are recognizing the importance of transitioning towards cleaner and more sustainable maritime operations to address climate change and preserve marine ecosystems for future generations.

BEST PRACTICES AND DEVELOPMENT ACROSS THE GLOBE

पत्तन, पोत परिवहन एवं जलमार्ग मंत्रालय
MINISTRY OF PORTS, SHIPPING AND WATERWAYS
सत्यमेव जयते

Kandla, Paradip, and Tuticorin Port *to be developed as hubs for production and export of* ***green hydrogen*** *by* ***2030***

TAPPING ON NATURE FOR FUEL



Wind and solar power in the ports

Available at various Indian and international ports



Green Hydrogen hubs

Being developed at Rotterdam Port & TUAS port

ENERGY MANAGEMENT



100% Electrification & smart Grid management

at Port of Singapore



Heat pipeline to transfer heat produced at Ports to industries and households for use - being developed at Rotterdam Port

INCENTIVIZING GREEN SHIPPING



Discount on Port dues

Port of Rotterdam, Vancouver, Singapore etc.

GREEN CONSTRUCTION



Using Green practices

GGBS* based construction & Green terminal building in TUAS Port

*GGBS: Ground Granulated Blast Furnace Slag

EMISSION MONITORING



Electronic sensors at Port premise to track down hazardous emissions installed at Rotterdam Port

SUSTAINABLE BUSINESS

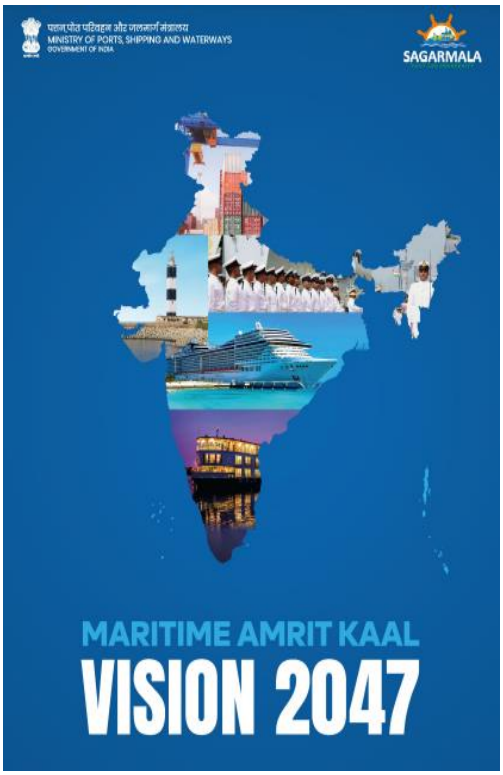


Sustainable procurement, circular economy & recycling programs at various international ports

INDIA’S VISION FOR GREEN SHIPPING AND PORTS

INDIA'S VISION FOR GREEN SHIPPING AND PORTS

The country's maritime sector plays a crucial role in the overall trade and growth with 95% share in trade volume and 65% share in trade value. Indian ports are well positioned to significantly advance the nation's decarbonization agenda. A majority of these ports have initiated a range of initiatives in line with the International Maritime Organization's (IMO) ambitious decarbonization goals for 2030 and 2050.



India's shipping sector is also experiencing a notable rise in the use of vessels powered by alternative fuels. Solar and hybrid electric ferries are already operational, and shipyards are now gearing up for developing vessels utilizing clean fuels such as green hydrogen and ammonia.

As part of the Maritime Amrit Kaal Vision 2047 that has been recently launched by Hon'ble Prime Minister, a comprehensive strategy for achieving carbon neutrality in maritime sector has been developed. This strategy places strong emphasis on establishment of eco-friendly ports equipped with state-of-the-art infrastructure to promote efficient, sustainable and resilient operations.

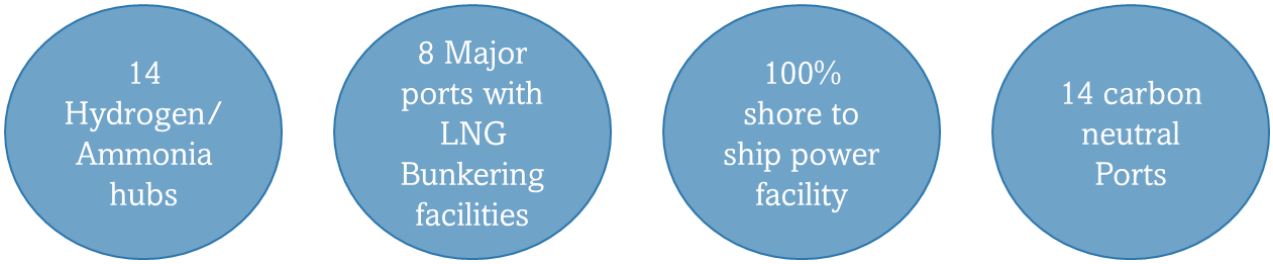


FIGURE 2: STRATEGIC ASPIRATIONS OF MARITIME AMRIT KAAL VISION 2047

INDIA'S FIRST CENTRE OF EXCELLENCE FOR GREEN PORTS & SHIPPING

The country aims to develop a regulatory framework and alternate technology adoption road map for Green Shipping to foster carbon neutrality and circular economy (CE) in shipping sector in India. In this regard, India has launched its first **National Centre of Excellence for Green Port & Shipping (NCoEGPS)**, a major initiative by the Ministry of Ports, Shipping towards providing solutions to a variety of problems being faced in the industry, through scientific research. It will also carry out valuable education, applied research and technology transfer in maritime transportation at the local, regional, national and international levels.

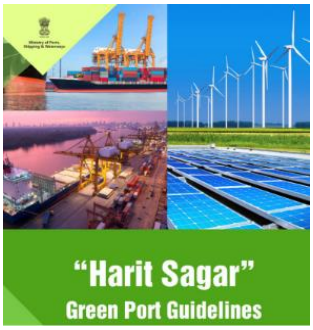
Furthermore, as part of India's first National Centre of Excellence for Green Port & Shipping (NCoEGPS), the Government of India launched the **Green Tug Transition Program (GTTP)** to convert at least

50% of its tugs to 'Green Hybrid Tugs' by 2030[4]. These tugs will be powered by Green Hybrid Propulsion systems, and subsequently adopting non-fossil fuel solutions like (Methanol, Ammonia, Hydrogen). The target has been set for the initial Green Tugs to start working in all major ports by 2025.

GREEN PORT GUIDELINES

To achieve the overarching objective of attaining a net-zero emission goal, the Ministry of Ports, Shipping & Waterways, Government of India, launched 'Harit Sagar,' the Green Port Guidelines.

The guidelines align with the broader government initiatives aimed at transforming ports into environment friendly hubs, fostering innovation and ensuring a greener, and a more resilient future for the shipping industry. They aim to envisage ecosystem dynamics in port development, operation and maintenance while aligning with 'Working with Nature' concept and minimizing impact on biotic components of the ports ecosystem. The guidelines lay emphasis on use of clean/green energy in port operations, developing port capabilities for storage, handling and bunkering greener fuels viz. Green Hydrogen, Green Ammonia, Green Methanol / Ethanol, etc.



As part of Harit Sagar guidelines, the key focus areas that can help in achieving the "Green ports" benchmark are shown below:

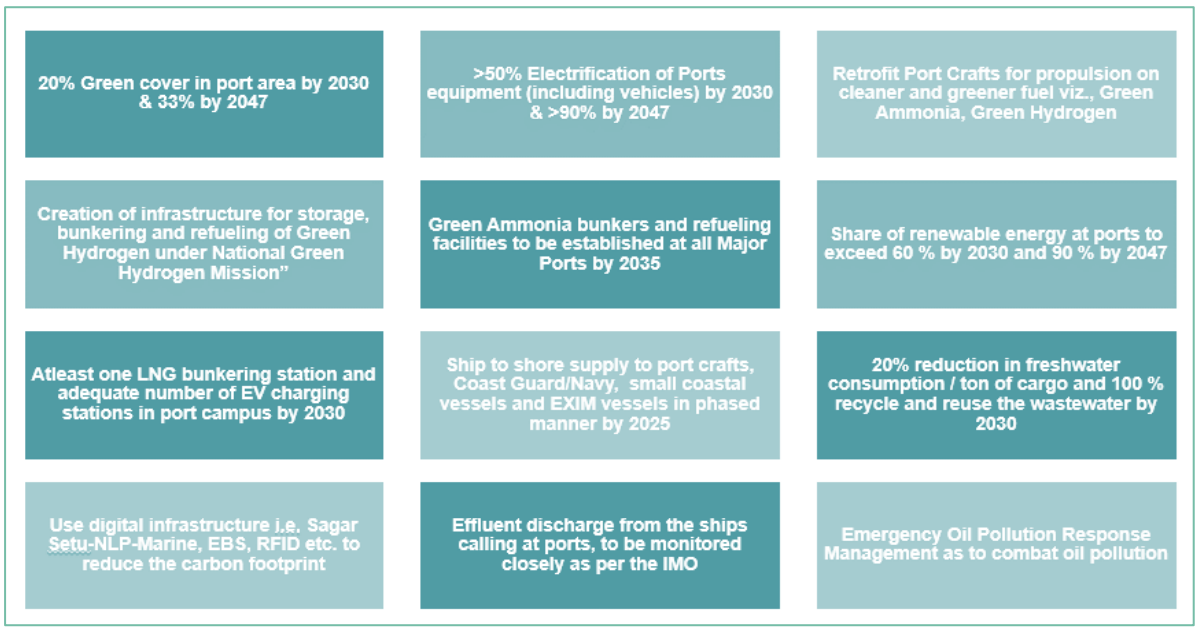


FIGURE 3: HARIT SAGAR GUIDELINES – KEY FOCUS AREAS

India's current share of renewable energy at major ports is less than 10 percent. As envisaged in Maritime Amrit Kaal 2047, share of renewable energy at ports to exceed 60 percent by the year 2030 and 90 percent by year 2047. In this regard, the major ports in India are adopting renewable energy measures at the port premises. Over the past couple of years, the renewable energy capacity at major ports has increased substantially by 1300 percent. It is interesting to note that currently around 140 MW of

[4] https://pib.gov.in/PressReleaseIframePage.aspx?PRID=1909599

renewable energy (solar and wind) is being generated through major ports. Ports such as Vishakhapatnam Port, Deendayal Port and New Mangalore Port have surplus renewable energy wherein New Mangalore Port is 100% solar powered.

An effective approach to decrease emissions is to provide shore to ship power facilities that allow ships to connect to the electrical grid at ports while berthed, enabling them to turn off their onboard generators and draw power from cleaner, onshore sources. This significantly reduces emissions, particularly in the vicinity of ports where air quality can be adversely affected by ships' exhaust emissions. Currently, all the major ports are providing shore to ship power facilities to port crafts and tugs. Going forward, all the major ports shall be equipped with shore to ship power facility for EXIM vessels.

India is already supplying shore power to ships with power demand less than 150 KW[5] and targets to supply shore power to all visiting ships.

As the maritime sector seeks to decarbonize and meet sustainability goals, LNG bunkering facilities are crucial in supporting the transition to more eco-friendly and economically viable shipping operations. Currently, Cochin Port has LNG bunkering facilities and going forward, at least eight major ports shall have LNG bunkering facilities as part of Amrit Kaal Vision 2047.

As part of Harit Sagar guidelines, the electrification of port equipment is deemed a crucial necessity. Several ports are now installing electric cranes, highlighting their significance in significantly reducing environmental impact and enhancing efficiency. By replacing traditional diesel-powered cranes with electric ones, ports can drastically reduce air pollution and GHG emissions.



[5] https://www.pib.gov.in/PressReleasePage.aspx?PRID=1758924

GREEN VESSEL DEVELOPMENT

Indian shipyards are employing technologies such as eco-friendly propulsion systems to enhance efficiency and reduce environmental impact, adopting sustainable practices and adhering to stringent environmental standards.

Indian shipyards are actively developing ferries and vessels (passengers/cargo) that will ply on various alternate fuels such as Hydrogen/ Ammonia, Biofuels, electric and battery-powered, etc. Below figure shows a few achievements of Indian shipyards in recent years. Our Hon'ble Prime Minister recently launched India's first indigenous green hydrogen fuel inland waterway vessel which is set to be deployed in Varanasi in some time.



FIGURE 4: INDIA'S FIRST INDIGENOUS GREEN HYDROGEN FUEL CELL INLAND FERRY

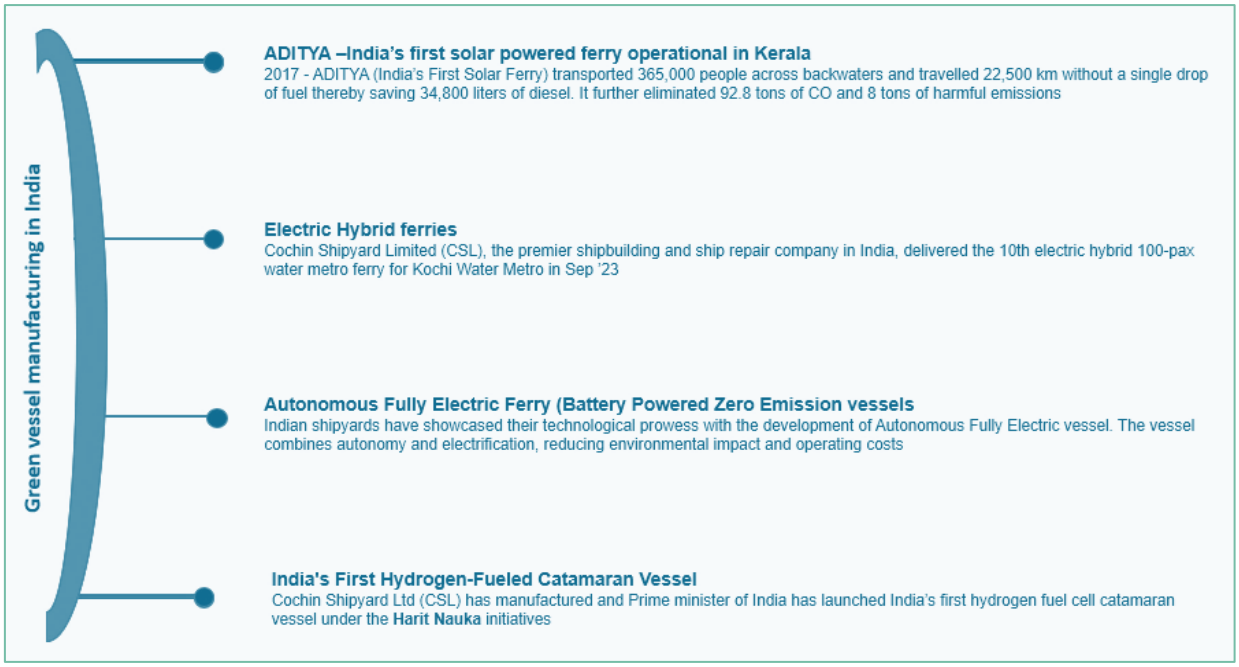


FIGURE 5: GREEN VESSEL MANUFACTURING IN INDIA

Indian shipyards are also developing indigenous Green vessel technology for the world. Some of the international orders include:

- Hybrid vessel with Diesel-Methanol Dual Fuel Engines
- General Cargo Vessels "Future Proof" with provisions for converting to Hybrid mode with Wind Assisted Sailing
- World's First Zero Emission Feeder Container Vessel on hydrogen fuels
- Autonomous Fully Electric Ferry
- Battery-Powered Zero Emission vessels

ADVANCING THE DEVELOPMENT OF GREEN HYDROGEN HUB

With world's commitment to decarbonize their economies, the production of green hydrogen is gaining global significance. India, in particular, is taking proactive measures to establish itself as a green hydrogen production and export hub. The Government has set an ambitious production target of 5 million metric tons per annum by 2030. As part of Maritime Amrit Kaal Vision, all ports are envisaged to have green hydrogen hub facilities. In this direction, the first three locations for these hubs have already been identified Ministry of Ports, Shipping and Waterways. These include Paradip Port, Deendayal Port and V.O. Chidambarnar Port.

INDIA'S GREEN VOYAGE PROGRAMME WITH IMO

India has been selected as pioneer lead country for International Maritime Organization **Green Voyage 2050** Project which is funded by the Government of Norway. This initiative aims to aid developing countries in their efforts to reduce GHG emissions from ships.

Furthermore, India has been designated by IMO Green Voyage to be the first country for piloting green shipping projects under the coordination of the Directorate General of Shipping. Among the five projects that were selected under Green Voyage 2050, Assam Inland Water Transport Development Society (AIWTDS) has been selected for passenger ferries procurement including development of alternate fuel solution in these ferries. To facilitate these efforts, a working group has been established under coordination of DG Shipping and IMO Green Voyage 2050 team that also includes members from the World Bank and AIWTDS. The group is tasked with finding a suitable alternate fuel for such ferries and assess their availability and supply along with exploring ship technologies capable for operating on such fuel in India.

INDIAN VESSELS GREEN TRANSITION PROGRAM

The Government of India, with a focus on promoting Inland Waterways, has also launched the "*Harit Nauka*", the inland vessel green transition guidelines. The government envisions complete transition to Green Vessels by 2047 with the objectives of:

i. Developing and operationalising new age vessels with standardised designs/infrastructure that are green and safe

ii. Creating an enabling ecosystem for the operation of such Green Vessels

iii. Promoting safe, convenient and green inland waterway-based passenger transport

iv. Developing indigenous capacity and promoting "Make in India" policy in shipbuilding

v. Enabling financial assistance for development of Green Vessels and related ecosystem

OTHER POLICY INITIATIVES

Apart from infrastructural interventions, the Government is also taking a series of policy reforms to support the green maritime initiatives.

- Government of India has permitted use of sustainable biofuels and its blends as fuels in Indian vessels with the objective to reduce fossil fuel usage and to encourage renewable energy in vessel operations.

- As part of its digitalisation efforts for the maritime sector aimed at emission reduction, a digital platform for the marine environment management for ships operating in Indian coast has been launched. The digital portal facilitates the ships to have simple, paperless online reporting of fuel oil consumption, ballast water exchange and all pollution related information, including the ship generated marine wastes, single use plastics, etc.

- The Ministry of Ports, Shipping & Waterways is also planning to incentivise the development of green vessels. As part of the "*Panch Karma Sankalp*", the Ministry has announced to provide 30% financial support for the promotion of Green Shipping.





THE WAY FORWARD

This Knowledge Paper has analysed and baselined the current state of green shipping at Indian ports & their ecosystem, outlining the major initiatives to promote greening of the Indian maritime sector and reduce its environmental carbon footprints. The governments' focus on green shipping is evident from initiatives such as Green Port Policy, Carbon Neutral Ports, Maritime India Vision 2030, the Harit Sagar and more.

The Paper also highlights the opportunities that the sector can leverage from achieving environmental sustainability and using green fuels and alternate fuel engines.

India's maritime sector stands at the forefront in embarking on a transformative journey towards sustainability. Achieving carbon neutrality in this journey necessitates a holistic and comprehensive approach, integrating policy frameworks, regulatory mechanisms, and technological innovations. As India endeavours to reach this ambitious goal, it becomes imperative to design a thorough roadmap that directs our collective efforts toward sustainability and environmental stewardship.

NEED FOR A CENTRALISED DECARBONISATION CELL

While the decarbonisation targets are set and roadmap is developed, to effectively implement it, the establishment of a centralised body, a cell, dedicated to formulating phase-wise green plans and specific policies and regulations is imperative. The cell will ensure each port has a phase wise carbon neutrality implementation plan. Drawing inspiration from successful international decarbonisation institutions, this centralised entity will provide strategic direction and coordination in India's transition towards carbon neutrality.

The cell will help in preparing policies, regulatory frameworks that will support carbon reduction; propose initiatives for greening of ports and shipping sector; propose green technology enablement; conduct R&D, etc. by leveraging global best practices and tailoring them to India's unique context, that can then be approved by a high-level committee to be posed to Ministry of Ports, Shipping & Waterways for implementation.

GREEN INCENTIVISATION

While cleaner fuels generate less emission, the capex cost of development of such vessels is 20-30% higher than traditional fuel vessels. Recognizing the financial challenges associated with transitioning to sustainable practices, incentivizing shipowners will be needed to ensure their investment in environmentally friendly solutions.

The 30% financial support for the green vessel development is a great move, introducing operational incentives for ships demonstrating emissions reduction will further boost the adoption of green technologies. Various international ports have introduced incentive programs to encourage ships calling at their ports to use cleaner marine fuels. On similar lines, a green incentive program may be implemented with rebate in port dues, tonnage tax and vessel registration fees for vessels demonstrating better Energy Efficiency Design Index (EEDI).

BOOSTING MANUFACTURING SECTOR

The manufacturing sector plays a pivotal role in India's journey towards carbon neutrality. With a focus on green technologies and sustainable practices, the manufacturing industry has the potential to drive significant environmental impact reductions while fostering economic growth. The upcoming hydrogen fuel cell technology holds immense promise for India's manufacturing sector. By positioning itself as a hub for hydrogen fuel cell manufacturing, India can tap into a growing market driven by the transition towards clean energy solutions. This strategic move will not only bolster domestic manufacturing capabilities but also contribute to global efforts in combating climate change.

To facilitate the growth of the manufacturing sector in green technologies, the Government’s support in the form of incentives, subsidies, and policy frameworks shall be critical. Initiatives such as Production Linked Incentive (PLI) schemes tailored to the renewable energy sector can incentivize investments and promote domestic manufacturing of green technologies.

The Production Linked Incentive Scheme (PLI) offered a production linked incentive to boost domestic manufacturing and attract large investments through incentive of 4% - 6% on incremental sales. The scheme supported Photo voltaic cells and thus supported the solar energy production. Similar scheme may be launched to support Marine (Hydrogen) fuel cells and Ammonia marine engines development.

MARITIME STARTUPS DRIVING INNOVATION

With green maritime initiatives, the industry will witness a surge for digital technologies and green innovative solutions, optimizing operations for both environmental and sustainability. Digital technologies such as Internet of Things (IoT), Artificial Intelligence (AI), and Big Data Analytics, renewable energy technologies, waste management solutions etc. will play a pivotal role in enabling sustainability efforts across sectors.

Maritime startups are at the forefront of developing such innovative technologies and solutions to address the evolving challenges faced by the maritime industry. From green propulsion systems to digitalization solutions, these startups can bring fresh perspectives and creative solutions to enhance efficiency, reduce emissions, and promote sustainability in maritime operations.

Hence, providing these startups with an enabling ecosystem is essential to catalyze their growth and unlock their potential in developing cutting-edge technologies and solutions for a greener maritime industry. Implementing a dedicated startup policy tailored for the maritime sector is essential to provide startups with the necessary support, incentives, and regulatory framework. This policy should encompass provisions for funding, mentorship, regulatory simplification, and access to infrastructure, enabling a conducive environment for startup growth and innovation.

RESEARCH AND DEVELOPMENT COLLABORATION

Encouraging research and development (R&D) initiatives in collaboration with academia and industry stakeholders shall also be crucial for driving innovation in green manufacturing. Encouraging collaboration between maritime startups, research institutions, and academia can facilitate technology development and innovation. Establishing partnerships for joint research and development projects, technology validation, and knowledge sharing can accelerate the pace of innovation and drive the adoption of cutting-edge solutions in the maritime industry. By fostering an ecosystem conducive to R&D, India can accelerate the development and deployment of cutting-edge technologies that contribute to sustainability goals.

EMISSION MONITORING MECHANISM

While various initiatives are being planned to make Indian ports and shipping carbon neutral, there is also a need to effectively monitor emissions and resource consumption at ports. Hence, a sustainability monitoring toolkit will be imperative to monitor performance of ports. Various areas such as Land Use Planning, Air Quality, Soil & Ground Water Quality, Modalities & Connectivity, Dredging Impacts, Sound Impacts, Climate Adaptation, Habitat & Species Health, Surface Water & Sediment Quality, Ship Related Waste Management, Sustainable Resource Management, Landscape Management & Quality of Life, Energy & Climate Change Mitigation may be monitored. The exercise may be repeated at regular intervals (6-12 months) or after every significant intervention to assess the impact.

About FICCI

Established in 1927, FICCI is the largest and the oldest apex business organisation in India. Its history is closely interwoven with India's struggle for independence, its industrialisation, and its emergence as one of the most rapidly growing global economies.

A non-government, not-for-profit organisation, FICCI is the voice of India's business and industry. From influencing policy to encouraging debate, engaging with policymakers and civil society, FICCI articulates the views and concerns of industry. The organisation serves its members from the Indian private and public corporate sectors and multinational companies, drawing its strength from diverse regional chambers of commerce and industry across states, reaching out to more than 2,50,000 companies. FICCI provides a platform for networking and consensus building within and across sectors and is the first port of call for Indian industry, policymakers, and the international business community.