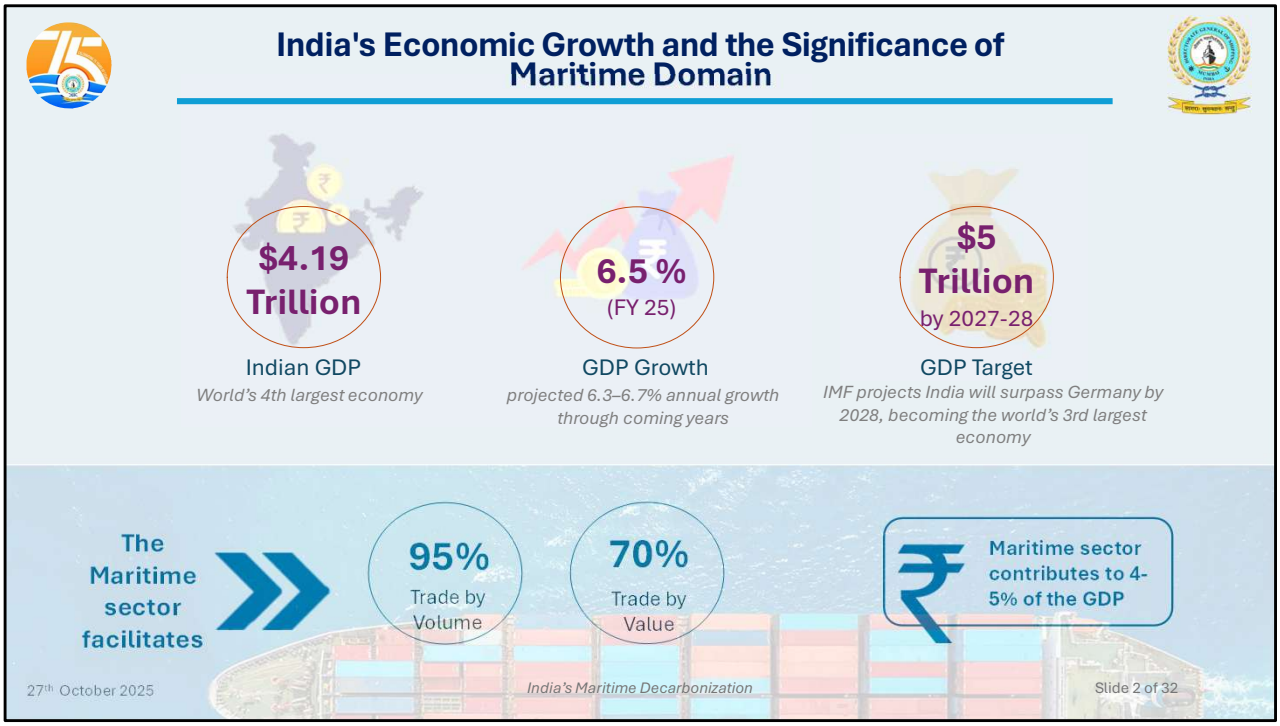
Good afternoon, ladies and gentlemen.

It's a privilege to be here at *ABB Maritime Decarbonization Day 2025* to present India's journey toward building a sustainable and low-emission maritime ecosystem.

India's decarbonization pathway for the maritime sector is guided by two complementary blueprints, **Maritime India Vision 2030** and **Maritime Amrit Kaal Vision 2047**. Together, they chart an ambitious course for reducing emissions, transitioning to green fuels, electrifying port operations and achieving carbon-neutral growth across ports and shipping.

The journey, however, began much earlier. **ABB's pioneering shore power installation at VOC Port, Tuticorin**, implemented well before the launch of MIV2030 and MAKV2047, stands as one of India's earliest decarbonization milestones. It allowed vessels to connect to the onshore grid while berthed, eliminating auxiliary engine emissions and improving local air quality. This project demonstrated the potential of **shore-to-ship power (SPS)** technology and set the stage for broader adoption under today's national maritime visions.

As we look ahead, initiatives like these, bridging technology, policy and industry collaboration, will remain critical for achieving **Net Zero**. Through continued partnerships with global leaders like ABB, India aims to become a **front-runner in green maritime innovation**, driving both national sustainability goals and international climate commitments.

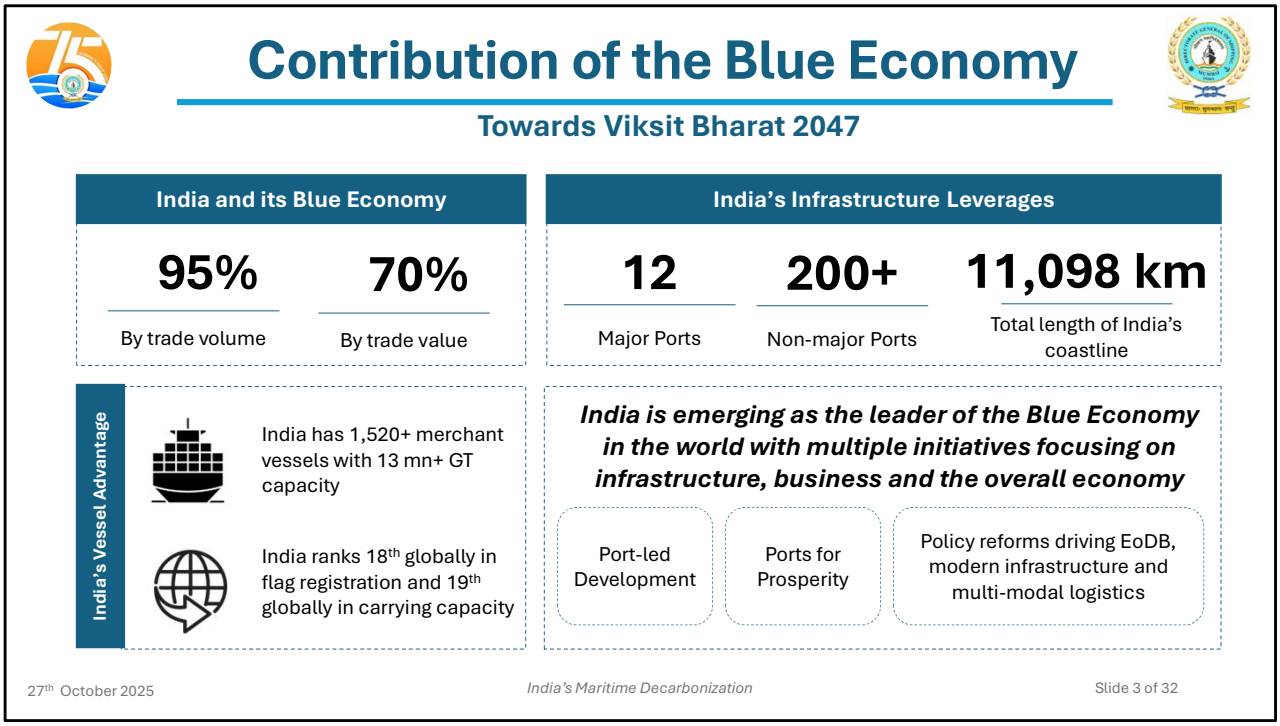


India's Economic Growth and the Significance of Maritime Domain

India today stands as the **world's fourth largest economy** with a GDP of **USD 4.19 trillion**, recording a growth rate of **6.5% in FY 2025**. With a projected growth trajectory of **6.3 - 6.7% annually**, the nation is firmly on course to achieve the **USD 5 trillion milestone by 2027 - 28**. The International Monetary Fund projects that by 2028, India will surpass Germany to emerge as the **world's third largest economy**, underscoring its growing global economic stature.

The maritime sector has been a critical enabler of this economic rise, **facilitating nearly 95% of India's trade by volume and 70% by value**. Beyond trade, the sector directly contributes **4–5% to the national GDP**, making it not only a backbone of India's commerce but also a strategic lever for sustained growth.

The synergy between economic expansion and maritime activity highlights a fundamental truth, India's economic ambitions are deeply intertwined with its maritime strength. As the country advances towards its vision for **Viksit Bharat @ 2047**, the maritime domain will continue to serve as the lifeline of trade, connectivity and strategic resilience.



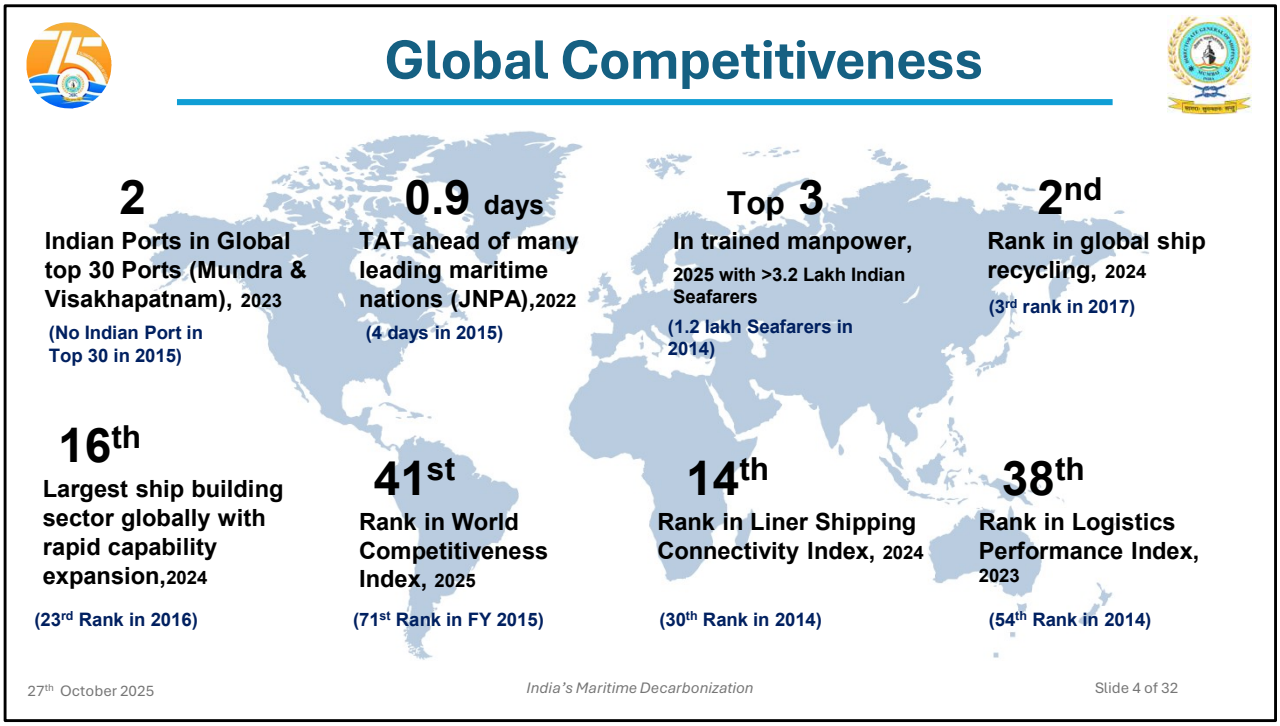
Contribution of the Blue Economy

The Blue Economy lies at the heart of India's economic and strategic rise, accounting for **95% of trade by volume and 70% by value**. With **12 major ports, 200+ non-major ports, and an extensive coastline of 11,098 km**, India possesses one of the largest maritime infrastructures in the world, giving it a natural advantage in connecting markets and enabling prosperity.

India's fleet strength has also grown steadily, with **1,520+ merchant vessels aggregating over 13 million GT capacity**. On the global stage, India now ranks **18th in flag registration and 19th in carrying capacity**, underscoring its expanding role in global shipping while contributing significantly to supply chain resilience.

The Government has positioned the Blue Economy as a **pillar of Viksit Bharat 2047**, with a strong emphasis on **port-led development, multimodal logistics, and ease of doing business reforms**. Initiatives under Sagarmala, Harit Sagar, and Maritime India Vision 2030 have transformed ports into hubs of efficiency, green practices, and integrated logistics.

Thus, India's Blue Economy is not just about scale, but about direction, moving towards sustainability, competitiveness, and strategic influence. As the world transitions towards cleaner and more resilient maritime operations, India's leadership in the Blue Economy offers a model of how infrastructure, business, and policy can be aligned to deliver long-term growth and global impact.



Global Competitiveness

India's maritime sector has undergone a significant transformation in global rankings, reflecting improvements in efficiency, manpower, recycling, and overall competitiveness. From ports and logistics to shipbuilding and seafarer supply, India today stands as a pivotal player in global maritime trade.

Ports in Global Top 30: In 2015, no Indian port featured among the world's leading container hubs. By 2023, **Mundra and Visakhapatnam** have both entered the **global top 30 ports**, a testament to capacity expansion, operational efficiency, and international connectivity.

Turnaround Time (TAT): Vessel turnaround time at **JNPA improved from 4 days in 2015 to just 0.9 days in 2022**, placing India ahead of many advanced maritime nations and showcasing the results of digitalisation and port modernisation.

Trained Manpower: With more than **3.2 lakh Indian seafarers in 2025**, up from 1.2 lakh in 2014, India ranks in the **global top 3 for maritime manpower**. This includes a growing strength of women seafarers, reinforcing India's role as the

second-largest supplier of trained seafarers worldwide.

Global Ship Recycling: India has strengthened its global leadership in ship recycling, moving from **3rd rank in 2017 to 2nd rank in 2024**. With over 115 Hong Kong Convention–compliant yards at Alang, India's recycling practices now directly contribute to safe and sustainable global tonnage disposal.

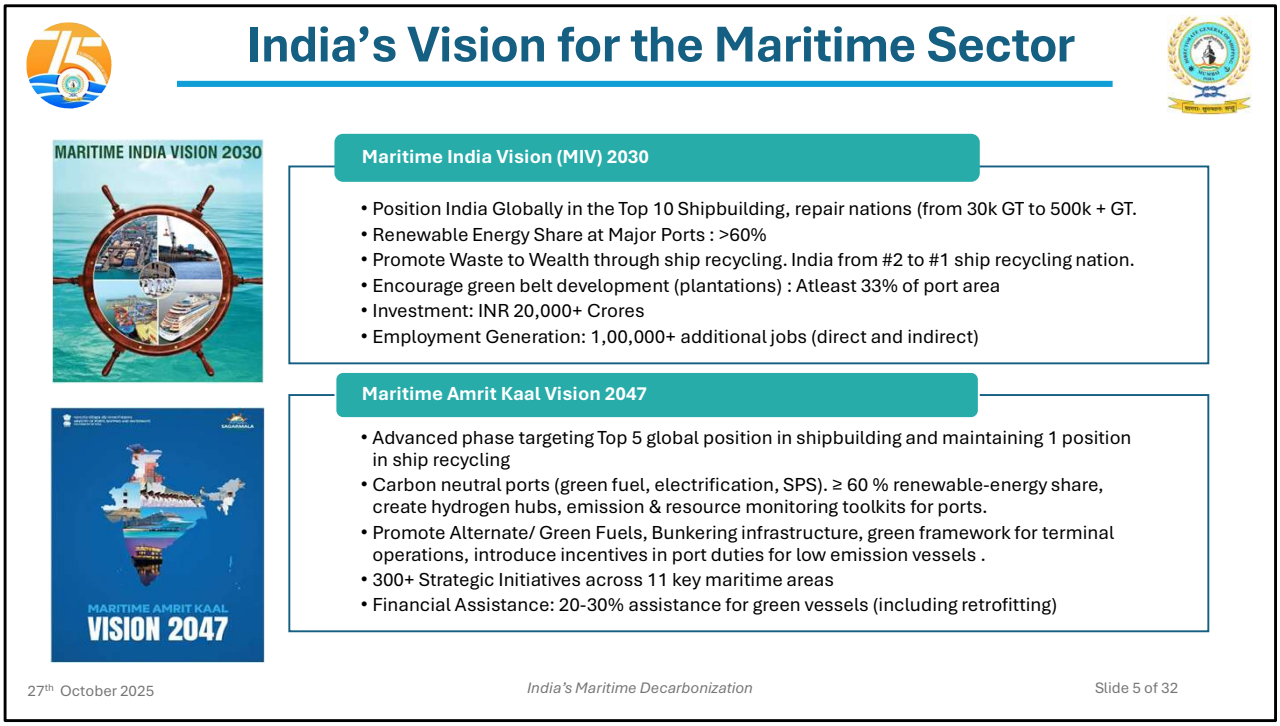
Shipbuilding Sector: India's shipbuilding industry has advanced from **23rd globally in 2016 to 16th in 2024**, backed by financing reforms, capacity expansion, and the recent ₹69,725 crore package aimed at building a globally competitive ecosystem.

World Competitiveness Index: India's steady economic reforms and maritime sector efficiencies have elevated its position from **71st in FY 2015 to 41st in 2025**, signalling stronger global competitiveness across infrastructure, logistics, and trade facilitation.

Liner Shipping Connectivity Index: India's connectivity to global trade routes has improved dramatically, climbing from **30th in 2014 to 14th in 2024**, driven by expanded port capacity, greater container handling efficiency, and integration into global liner networks.

Logistics Performance Index: On the **World Bank LPI**, India has risen from **54th in 2014 to 38th in 2023**, particularly excelling in vessel turnaround and port efficiency. This improvement enhances India's role in global supply chains and strengthens its credibility as a logistics hub.

Taken together, these eight indicators highlight a decade of **policy-driven transformation and operational improvements**. India has shifted from being a lagging participant to an emerging global maritime leader — building resilience, strengthening competitiveness, and aligning with its vision of becoming a top maritime nation by **Viksit Bharat 2047**.



India's Vision for the Maritime Sector

Focus: Decarbonization & Sustainability – MIV 2030 and MAKV 2047

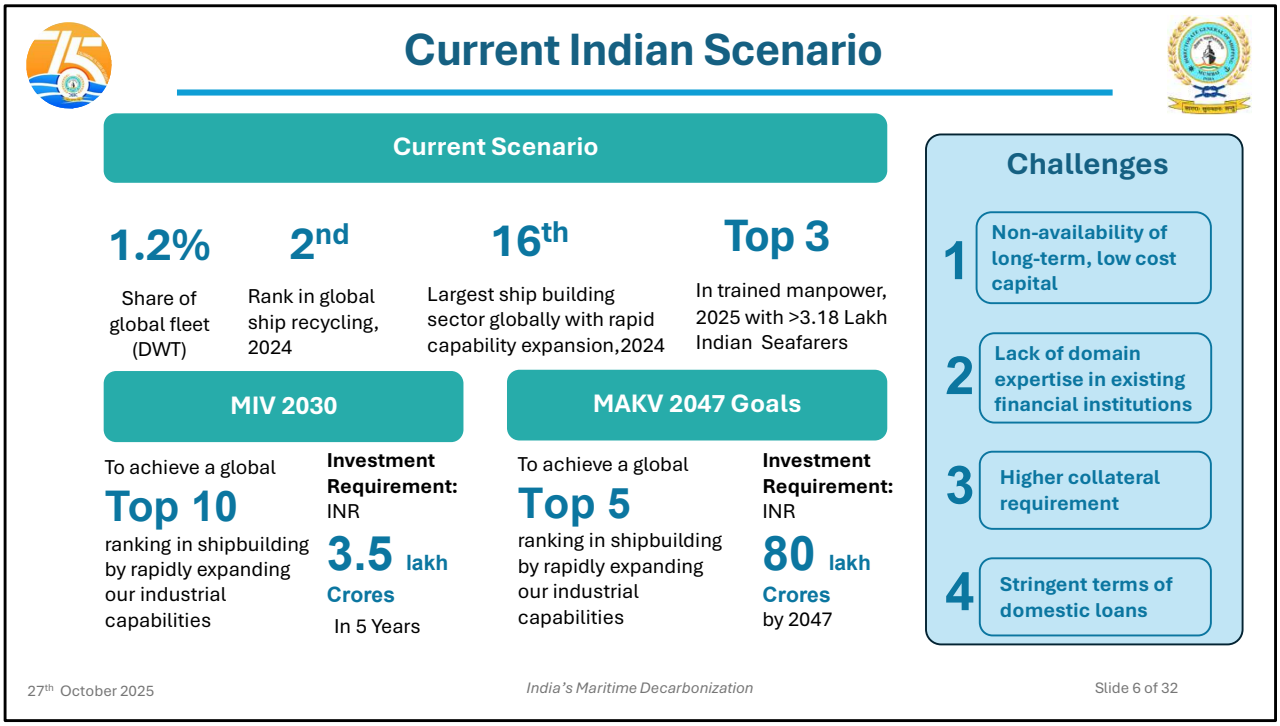
India's maritime growth strategy is deeply anchored in sustainability and green transition. Both the *Maritime India Vision 2030* and *Maritime Amrit Kaal Vision 2047* outline clear, actionable pathways to decarbonize the sector.

Under **Maritime India Vision 2030**, the focus is on immediate-term transformation, positioning India among the world's top ten shipbuilding nations while driving sustainability across ports and shipping. The plan calls for achieving **over 60% renewable energy share at Major Ports**, promoting **Waste-to-Wealth** through ship recycling, and **green belt development covering at least 33% of port areas**. These measures are aimed at reducing emissions, improving air quality, and making ports self-reliant in clean power.

Moving forward, **Maritime Amrit Kaal Vision 2047** builds on this foundation to deliver **carbon-neutral ports** powered by **green fuels, electrification, and shore power supply**. It envisions the creation of **Hydrogen hubs**, **emission and resource monitoring toolkits**, and strong **incentive mechanisms** such as **port**

dues discounts for low-emission vessels.

Both MIV & MAKV, emphasizes the integration of **alternate fuels**, including **LNG, biofuels, hydrogen, ammonia** and plan to extend **20–30% financial assistance for green vessels and retrofitting initiatives**. Together, these steps ensure that India's maritime sector transitions towards a low-carbon, resilient, and future-ready ecosystem , aligned with IMO's Net Zero 2050 ambition and India's national climate commitments.



Current Indian Scenario

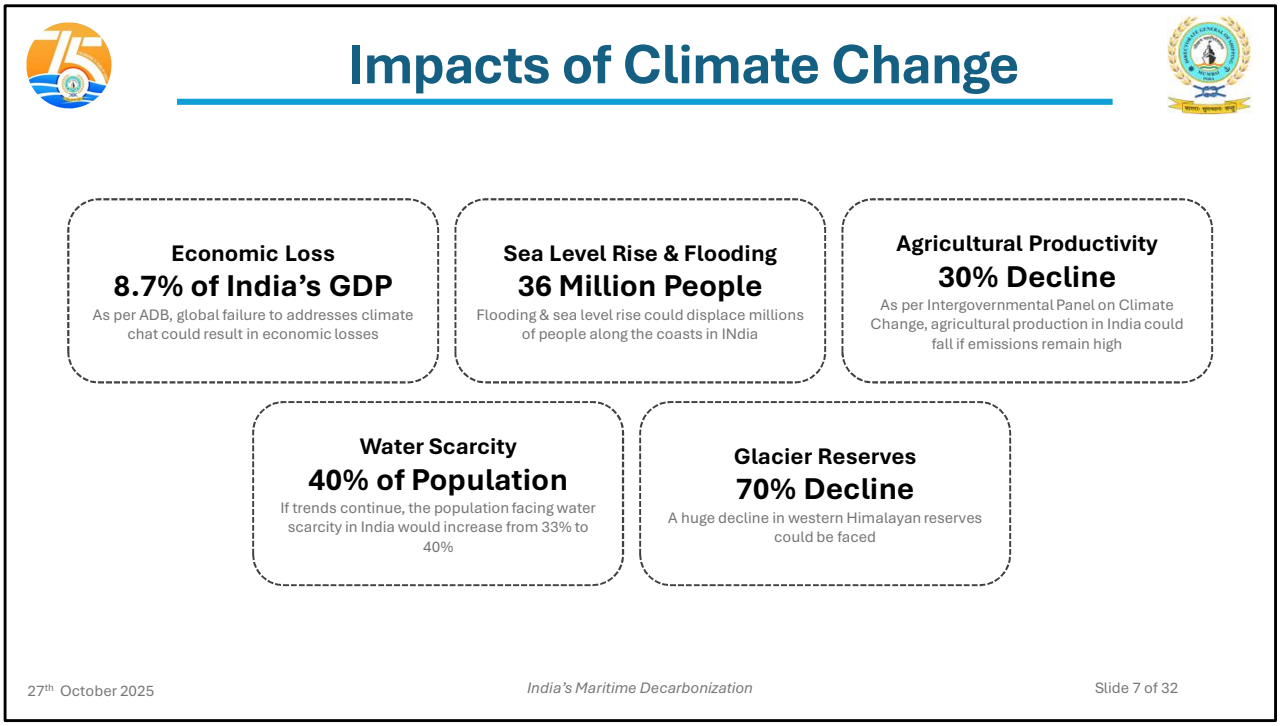
India stands today as a significant maritime nation with growing capabilities across fleet ownership, shipbuilding, ship recycling and seafaring manpower. While our share in the global fleet is currently at 1.2 percent (Dead Weight Tonnage) as per PIB 2021, India already ranks second in global ship recycling and is emerging as the 16th largest shipbuilding country with a rapid expansion trajectory. By 2025, India is positioned among the top three in the world for trained maritime manpower with over 3.18 lakh seafarers.

To achieve our long-term maritime ambitions under Maritime India Vision 2030, India targets entering the global top 10 in shipbuilding, which will require industrial scaling and an estimated investment of ₹3.5 lakh crore over the next five years. Looking ahead to Maritime Amrit Kaal Vision 2047, the goal is to reach the top five globally, supported by a cumulative investment of nearly ₹80 lakh crore by 2047.

However, the sector faces structural challenges in accessing finance. There is limited availability of long-term, low-cost capital, compounded by a lack of

maritime domain expertise within financial institutions. Higher collateral requirements and stringent lending conditions further restrict domestic shipbuilding growth.

This juncture presents both an opportunity and a challenge. India must bridge the gap between ambition and capital strength to fully position itself as a global maritime manufacturing and manpower hub.



Impacts of Climate Change

"When the coastlines retreat, so does the confidence of a maritime nation."

Climate change is no longer a future threat. it is a lived reality for India. As one of the world's most climate-vulnerable nations, India faces multidimensional risks that directly affect its economy, coastal communities, food security, water systems, and maritime infrastructure.

Economic Impact
The Asian Development Bank (ADB) estimates that unchecked climate change could reduce India's GDP by up to **8.7% by 2100**. Extreme weather events, disruption of supply chains, damage to coastal port assets, and loss of productivity will place immense pressure on national development goals.

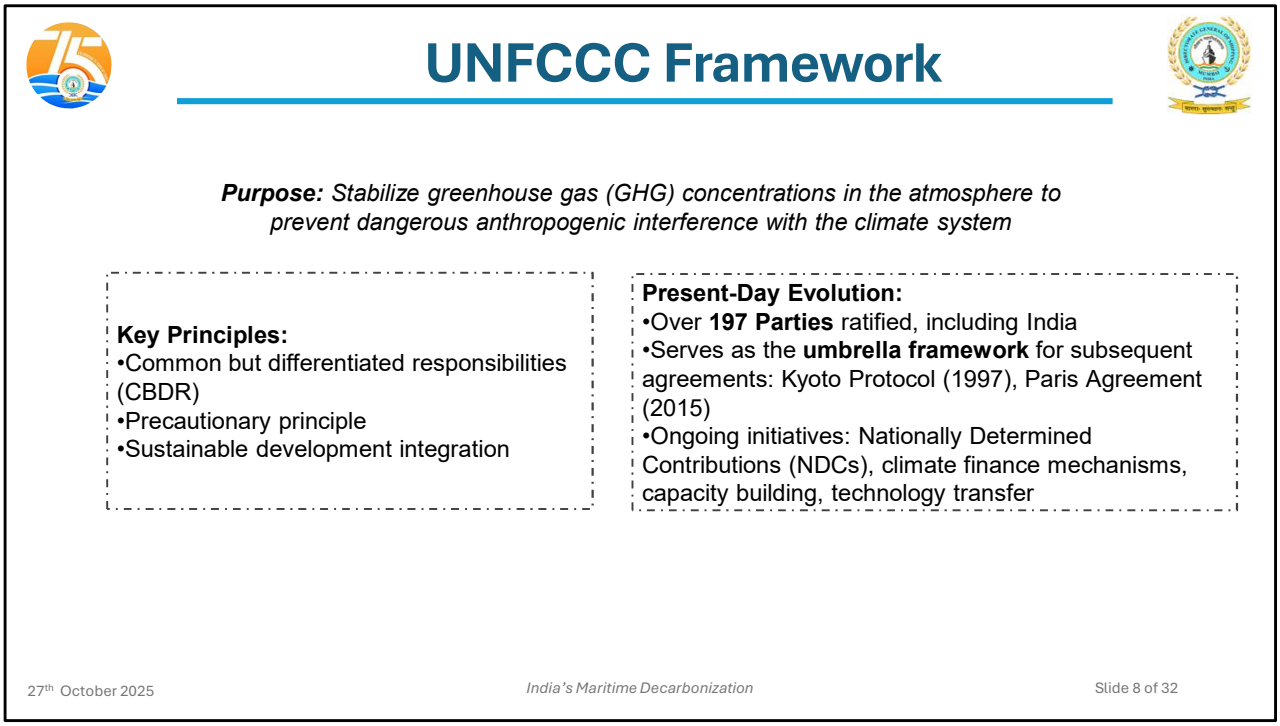
Sea Level Rise & Coastal Displacement
Over **36 million Indians** are at risk of displacement due to sea-level rise and coastal flooding, particularly in low-lying states such as West Bengal, Odisha, Tamil Nadu, and Gujarat. India's 7,500 km coastline and major ports are

increasingly exposed to storm surges and saline water intrusion, threatening maritime trade and livelihoods.

Agricultural Productivity Decline
The **IPCC projects a 30% decline** in India's agricultural output if high-emission trends persist. Heat stress, erratic monsoons, and shifting rainfall patterns endanger food security and rural incomes, further intensifying migration pressure on coastal and urban zones.

Water Stress
Today, one-third of India's population faces water scarcity. By 2050, this number could rise to **40%**, as Himalayan ice melt, reduced river flows, and rising evaporation diminish freshwater availability. Climate-linked water stress will aggravate interstate river disputes and strain urban water systems.

Glacier Loss & Himalayan Risk
The Western Himalayan glaciers may witness up to a **70% decline**, jeopardizing perennial river systems such as the Ganga, Brahmaputra, and Indus. This impacts drinking water, irrigation, hydropower, and ecological stability, directly affecting India's long-term maritime and riverine logistics.



UNFCCC Framework

The **United Nations Framework Convention on Climate Change (UNFCCC)**, adopted at the Earth Summit in 1992, serves as the foundational global treaty to address climate change. Its core mission is to stabilize greenhouse gas concentrations to prevent dangerous human interference with the climate system.

Core Principles of UNFCCC

Common But Differentiated Responsibilities (CBDR):
Recognizes that all countries share the responsibility to combat climate change, but developed nations must lead due to their historical emissions and greater capabilities.

Precautionary Principle:
Calls for preventive action against climate risks, even when full scientific certainty is lacking — prioritizing protection over delay.

Sustainable Development Integration:
Climate action must align with development goals, ensuring that economic growth, poverty eradication, and environmental protection proceed together.

Evolution Under the UNFCCC Umbrella
The UNFCCC acts as an umbrella legal framework, under which major climate agreements have been established:

Kyoto Protocol (1997):
Introduced legally binding emission reduction targets for developed countries.

Paris Agreement (2015):
Shifted to a universal pledge system, requiring all 197 Parties, including India, to submit **Nationally Determined Contributions (NDCs)**.

Ongoing Work Streams:

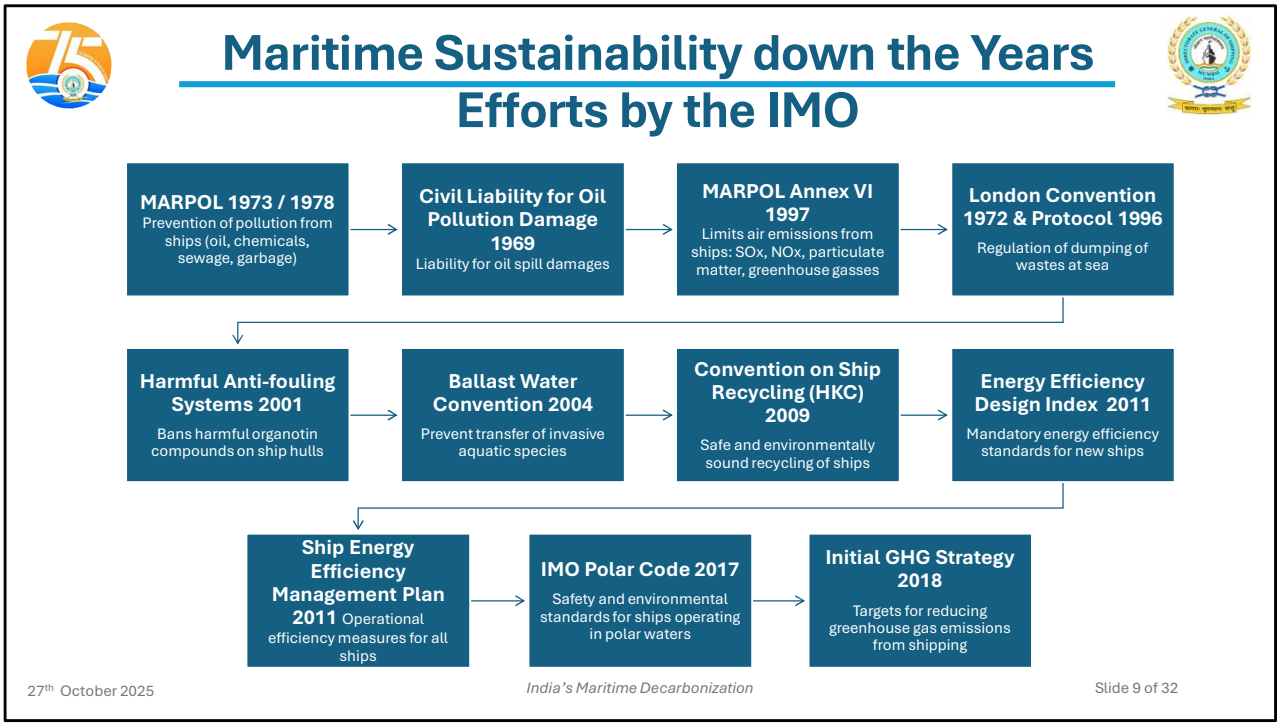
- Climate finance (Green Climate Fund)
- Technology transfer & capacity building
- Global Stocktake & mitigation adaptation balance

India's Role and Commitments
India has actively shaped the narrative of **climate justice**, asserting that development must not be compromised. Through its NDCs, India has committed to:

- 45% reduction in emissions intensity of GDP by 2030
- 50% installed power from non-fossil fuel sources
- Net Zero by 2070 commitment announced at COP26

India continues to uphold **climate equity** and the right to growth for developing nations.

Relevance to Maritime Sector
UNFCCC principles, especially CBDR, now influence negotiations at the **International Maritime Organization (IMO),** where India advocates that developing countries should have fair transition timelines and access to green fuel technologies.



Maritime Sustainability down the Years
Efforts by the IMO

The journey of maritime sustainability under the International Maritime Organization (IMO) reflects a progressive evolution, from controlling visible marine pollution to addressing invisible emissions and ultimately steering global shipping toward decarbonization. Each milestone represents a deliberate expansion of responsibility: from oil spills, to toxic chemicals, invasive species, ship recycling, operational efficiency, and today, climate change.

Foundation Years : collectively established that oceans are not dumping grounds. Neither for waste, nor unregulated emissions. IMO's role evolved from navigational safety to environmental stewardship.

- **MARPOL 1973/78** laid the very foundation of maritime environmental regulation. It sought to prevent the discharge of harmful substances — oil, chemicals, sewage, garbage — and established pollution control as a core shipping obligation.

- **The Civil Liability Convention (1969)** introduced legal and financial accountability for oil pollution damage, marking a critical shift from mere prevention to compensation for environmental harm.

- **MARPOL Annex VI (1997)** extended IMO's mandate into the **air pollution domain**, setting limits on sulphur oxides (SOx), nitrogen oxides (NOx), and particulate matter from ships, and laying early groundwork for greenhouse gas control.

- **The London Convention (1972) and London Protocol (1996)** regulated **dumping of wastes at sea**, using a 'reverse list' approach that bans dumping unless explicitly allowed. Later, the Protocol expanded to address new risks like **Carbon Capture and Storage (CCS)** and **marine geoengineering**.

Targeted Ecological Protections - From Sea Life to End-of-Life : IMO transitioned from land-sea protection to tackling environmental harm *across the life cycle of a ship,* covering design, operation and dismantling.

- **Anti-Fouling Systems Convention (2001)** prohibited harmful organotin compounds like TBT from ship hulls due to their toxic impact on marine life, forcing the industry to shift to environmentally safe coatings.

- **Ballast Water Management Convention (2004)** addressed one of the most silent global threats — transportation of invasive aquatic species. It introduced the D-1 and D-2 discharge standards and mandated onboard treatment systems.

- **Hong Kong Convention (2009)** brought sustainability full circle by ensuring that ships are safely and responsibly recycled at the end of their operational life, requiring inventoried hazardous materials and certified recycling yards.

- **Energy Efficiency Design Index (EEDI) – 2011** became the first global legally binding climate standard on any industrial sector, requiring all *newbuild* ships to meet minimum energy efficiency performance.

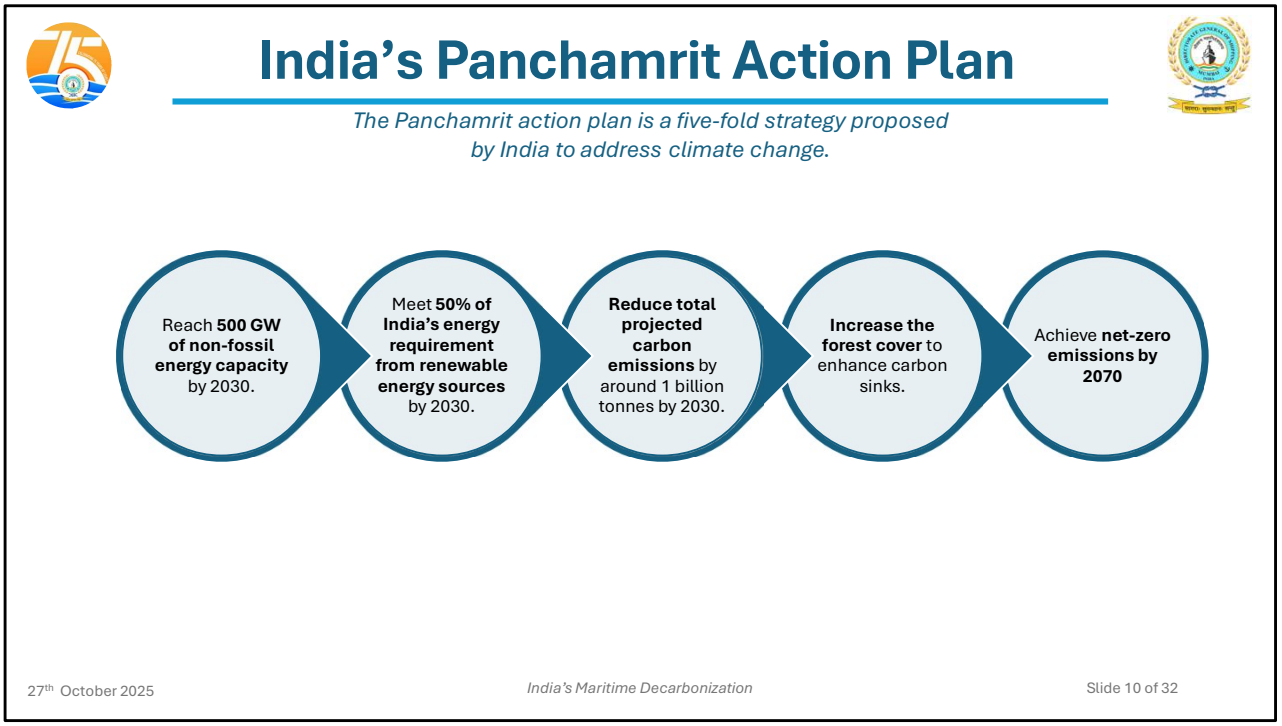
Operational & Climate Governance - The Decarbonisation Era : The environmental journey moved from cleanup and containment, to efficiency and accountability, to systemic decarbonisation. IMO is today the only UN agency with a sector-wide Net Zero transition underway.

- **Ship Energy Efficiency Management Plan (SEEMP) 2011** introduced

operational controls, making every voyage accountable through better planning, speed management, and performance monitoring.

- **IMO Polar Code (2017)** expanded IMO's jurisdiction to ecologically fragile polar regions, setting stringent ship safety and environmental protection norms in newly accessible waters due to ice melt.

- **Initial IMO GHG Strategy (2018)** marked a historic turning point calling for at least **50% reduction in total GHG emissions** from international shipping by 2050, on a pathway to **zero**. This strategy paved the way for ongoing development of the **IMO Net Zero Framework**, including measures such as GFI (fuel intensity limits), CII (carbon intensity indicator), and GHG pricing mechanisms.



India's Panchamrit Action Plan at COP-26

India's announcement of the *"Panchamrit"* at COP-26 in Glasgow marked a defining moment in global climate negotiations, positioning the country not as a reluctant participant, but as a proactive leader among developing nations. Rooted in the principles of *equity, climate justice,* and *Common but Differentiated Responsibilities (CBDR-RC),* the Panchamrit provides a strategic, five-fold blueprint for India's long-term transition towards a low-carbon economy.

The first commitment is to achieve **500 GW of non-fossil energy capacity by 2030**, demonstrating India's intent to become one of the world's largest renewable power generators. Parallelly, India pledged that **50% of its total energy requirements will come from renewable sources** by 2030, signalling a structural shift away from coal dependency. These targets align with major domestic initiatives such as the National Solar Mission, Green Hydrogen Mission, and large-scale offshore wind development.

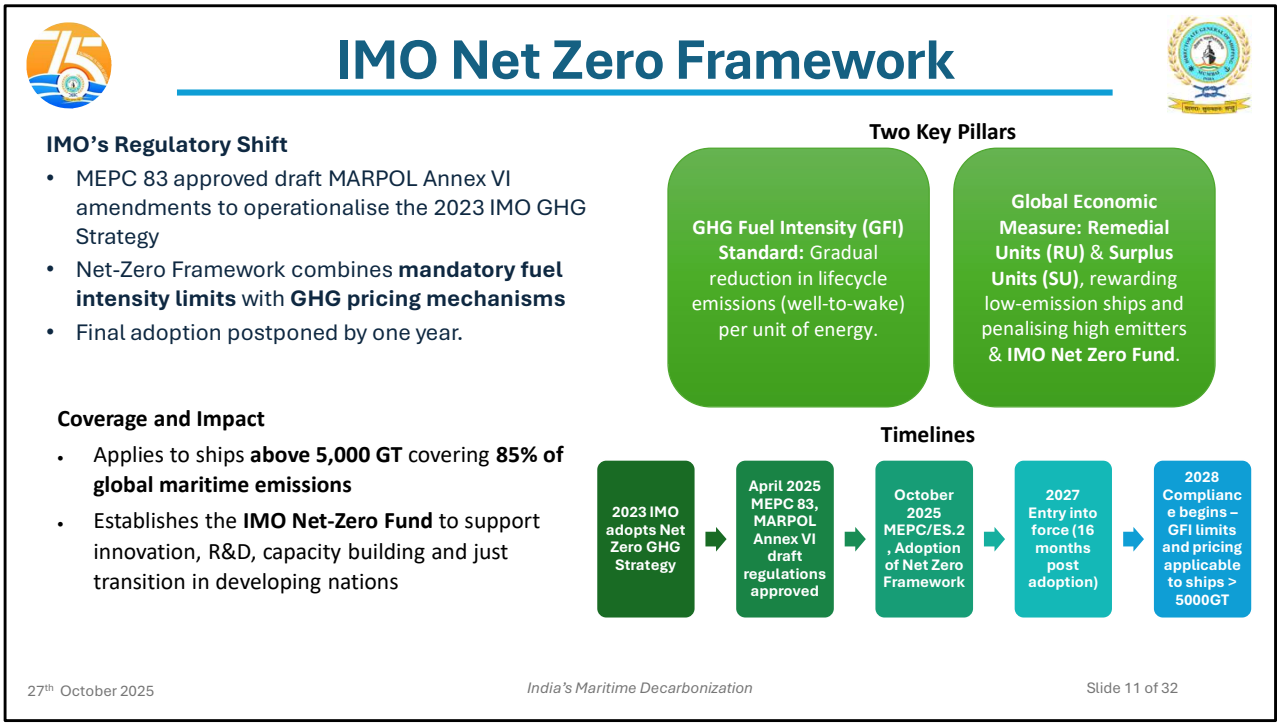
In quantitative terms, India has committed to **reducing projected carbon**

emissions by 1 billion tonnes by 2030, indicating a measurable contribution towards the global carbon budget. This is reinforced by a pledge to **reduce the carbon intensity of its GDP by 45% from 2005 levels**, reflecting a focus on economic efficiency rather than absolute caps, essential for a developing economy still pursuing growth and poverty eradication.

The long-term anchor of Panchamrit is the goal of reaching **net-zero emissions by 2070,** a timeline that balances developmental imperatives with climate responsibility. India has argued at COP forums that developed nations must reach net-zero well before 2050, as they have historically consumed a disproportionate share of the global carbon budget.

Beyond mitigation, India used the Panchamrit platform to highlight systemic concerns faced by developing countries. India firmly reiterated that **climate finance and technology transfer must be tracked as seriously as emissions reductions**, calling for accountability on the USD 100 billion annual pledge by developed countries. The concept of **LIFE – Lifestyle for Environment** was introduced as a behavioural movement, encouraging mindful consumption and sustainable living as a collective global responsibility.

Through Panchamrit, India has effectively linked climate action with climate justice, committing to ambitious goals while demanding an equitable global framework that neither penalises development nor ignores historical responsibility. The international response to Panchamrit has been largely positive, with multiple nations acknowledging India's pragmatic yet visionary approach.



IMO Net Zero Framework

The **IMO Net-Zero Framework** marks a pivotal regulatory shift in international shipping. Developed as a follow-up to the **2023 IMO GHG Strategy**, it introduces mandatory measures under **MARPOL Annex VI** to decarbonize global shipping through enforceable emission standards and market mechanisms.

The framework **applies to ships above 5,000 GT**, covering nearly **85 percent of global maritime emissions**. It brings together two core regulatory elements — a **GHG Fuel Intensity (GFI) standard**, which gradually reduces lifecycle (well-to-wake) emissions per unit of energy, and a **Global Economic Measure** that rewards low-emission ships and penalises high emitters through the **IMO Net-Zero Fund**.

Under this system, ships operating below their assigned GFI limit earn **Surplus Units (SU)**, while those exceeding must purchase **Remedial Units (RU)** to offset excess emissions. The Net-Zero Fund will channel these revenues to support **R&D, capacity building, and fuel-transition projects** in developing nations, ensuring a just and inclusive global transition.

At **MEPC 83 (April 2025)**, the draft amendments to **MARPOL Annex VI** were approved to operationalise this framework. However, the **final adoption at MEPC/ES.2 (October 2025)** has been **deferred by one year** to allow further technical and policy discussions. **Compliance will begin post the final adoption of the framework, once GFI limits and pricing mechanisms are brought into effect.**

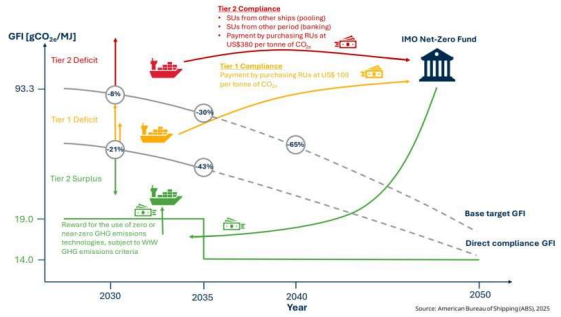
For India, this framework represents both **regulatory obligation and strategic opportunity**. Alignment of national policies, port infrastructure, and fuel ecosystems will be crucial, but India also stands to benefit by developing **green-fuel bunkering hubs**, exporting **green ammonia and methanol**, and shaping equitable funding mechanisms within the IMO Net-Zero Fund.

IMO GFI Mechanism

Greenhouse Gas Fuel Intensity Mechanism

What is GFI?

- GFI measures **lifecycle greenhouse gas emissions per unit of energy (gCO_2e/MJ)**
- It accounts for emissions *from fuel production to combustion* (**well-to-wake**)
- Objective: **Reduce carbon intensity of marine fuels progressively from 2028 onward**



Two Tier Mechanism

Tier 1 – Minor Non-Compliance

- Ship exceeds GFI limit marginally
- Must purchase **Tier 1 Remedial Units (RU)**
- **Price: USD 100 per tonne of CO_2 equivalent**

Tier 2 – Significant Non-Compliance

- Ship exceeds GFI limit substantially
- Must purchase **Tier 2 Remedial Units (RU)**
- **Price: USD 380 per tonne of CO_2 equivalent**

Ships performing **better than required** generate **Surplus Units (SU)**, which can be:

- Traded to other ships
- Banked for future compliance
- Used to offset deficits

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IMO GFI Mechanism (Greenhouse Gas Fuel Intensity)

The Greenhouse Gas Fuel Intensity (GFI) mechanism is a core technical element of the IMO's Net-Zero Framework and marks a major shift in how emissions from ships are regulated. Unlike earlier efficiency-based measures, GFI evaluates the **entire lifecycle emissions** of marine fuels, from extraction and production to final combustion on board, through a **"well-to-wake"** approach. It is measured in **grams of CO_2-equivalent per megajoule (gCO_2e/MJ)**, capturing not just carbon dioxide but also methane and nitrous oxide impacts, thereby discouraging fuels with high upstream or combustion emissions such as conventional LNG.

By enforcing progressively stricter GFI limits from **2028 onwards**, IMO aims to reshape fuel choices globally. Operators will no longer be judged solely on vessel design or operational efficiency — they will be judged on the actual carbon performance of the fuels they burn. This transition places responsibility on both shipowners and fuel suppliers, signalling a new regulatory era driven by decarbonization outcomes.

Two-Tier Compliance Mechanism (Embedded Within GFI)
To ensure flexibility and fairness, IMO has introduced a market-based compliance structure built around two levels of non-compliance:

Tier 1 - Minor Non-Compliance
Applies when a ship marginally exceeds its GFI limit.
Must purchase **Tier 1 Remedial Units (RU)**.
Cost: USD 100 per tonne of CO_2-equivalent.
Treated as corrective adjustment, not punitive.

Tier 2 - Significant Non-Compliance
Triggered when emissions substantially exceed limits.
Requires purchase of **Tier 2 Remedial Units (RU)** only.
Cost: USD 380 per tonne of CO_2-equivalent.
Intended to make sustained high emissions economically untenable.

Surplus Units (SU) - Reward for Cleaner Ships
Ships performing better than required GFI standards generate **Surplus Units (SU)**, which can be:
Traded to other ships/operators,
Banked for future use (within a limited period),
Used to offset future compliance deficits.

This creates an internal maritime carbon economy, incentivising early adoption of **zero/near-zero fuels (ZNZ)** such as methanol, ammonia, or advanced biofuels. Over time, low-carbon ships become revenue-generating assets, fundamentally altering fleet investment strategies.

Strategic Significance
The GFI mechanism represents a decisive move from regulation to economics. By attaching an explicit cost to carbon intensity and a reward to decarbonisation, the IMO is structurally steering fuel markets towards green alternatives. Rather than mandating a specific technology, it incentivizes performance. those who decarbonise early gain financial advantage, while laggards incur rising costs.

For India, this means shipping policy must evolve beyond compliance monitoring to active **transition planning,** enabling Indian vessels to generate surplus units rather than pay deficits, and ensuring ports are ready to support low-GFI fuels. Countries that align their ports, shipyards and fuel producers with GFI

trajectories can convert this regulation into opportunity.

Participation in the MEPC Extraordinary Session (MEPC/ES.2)

14 - 17 October 2025, IMO Headquarters London.

- **Objective :** Formal adoption of **MARPOL Annex VI amendments** (***IMO Net-Zero Framework***), requiring a **two-thirds majority of Annex VI Parties**, representing at least **50% of global gross tonnage**.

India's Strategic Position & Expectations

- **CBDR-RC Principle** Common But Differentiated Responsibilities - Respective Capabilities: Framework must recognize differentiated capabilities and transition pathways for developing countries
- **GFI-Based Mechanism with Tier Structure**
  - *Tier 1* - Global compliance baseline (Minor Non Compliance)
  - *Tier 2* - Enhanced compliance with market-based measures (Significant Non Compliance)
  - **Transparency & Equity** : Clear governance for revenue use and no disproportionate burden on the Global South

Update on MEPC/ES.2 Proceedings :

- **Adoption of the draft amendments to MARPOL Annex VI and the IMO Net-Zero Framework has been deferred by one year**, pending further review and consensus among Member States.
- The **ISWG – GHG 20 Working Group** is continuing deliberations to develop the **policy and regulatory frameworks** necessary for implementation of the IMO Net-Zero strategy.

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Participation in the MEPC Extraordinary Session (MEPC/ES.2)

The second Extraordinary Session of the Marine Environment Protection Committee, MEPC/ES.2, convened from 14 to 17 October 2025 at IMO Headquarters in London, with a singular focus on the adoption and operationalization of the IMO Net-Zero Framework under MARPOL Annex VI. This session follows approval at MEPC 83 and seeks a two-thirds majority, representing at least half of global gross tonnage, for formal adoption.

India's position at this session is firmly guided by **the principle of Common But Differentiated Responsibilities and Respective Capabilities**. We will emphasise that any global framework must recognize differing national capabilities and provide equitable transition pathways for developing countries. **India will continue to support the GFI-based hybrid mechanism with a two-tier structure: Tier 1 establishing a universal compliance baseline, and Tier 2 with enhanced compliance with market based measures.**

A critical focus for India will be ensuring transparency and equity in fund governance, particularly over the use of revenues collected through the pricing

mechanism. India will call for clear eligibility criteria that enable access to the Net-Zero Fund for infrastructure development, technology transfer and capacity building in developing maritime nations.

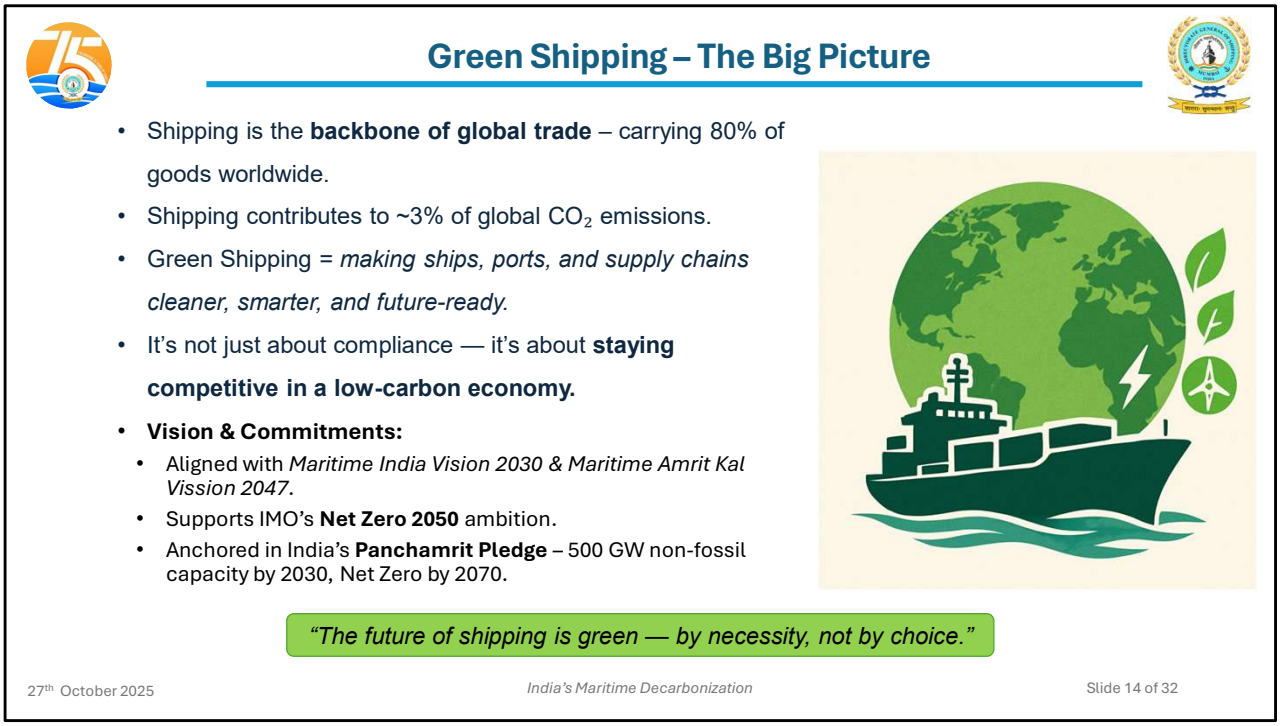
Strategically, India will reinforce its stance against unrestricted levy-based models by advocating for capped cost exposure and fair reward structures. Approximately 20 percent of India's internationally trading fleet may fall within scope, and India will seek to safeguard domestic shipping, cabotage operations and national food and energy security.

Update on MEPC/ES.2 Proceedings

The deliberations at MEPC/ES.2 concluded with Member States unable to reach full consensus on the adoption of the draft amendments to **MARPOL Annex VI** and the **IMO Net-Zero Framework**. Consequently, **formal adoption has been deferred by one year** to allow additional technical consultations and policy harmonization among Parties.

During this extended period, the **ISWG–GHG 20 Working Group** will continue its work on developing the **policy and regulatory frameworks** that will underpin the implementation of the IMO Net-Zero Strategy, including detailed provisions on fuel sustainability standards, verification processes, and governance of the Net-Zero Fund.

India has reiterated the importance of ensuring **transparency, equity, and differentiated responsibilities**, emphasizing that global decarbonization must proceed in a manner that supports developing maritime nations and prevents disproportionate economic impact on the Global South.



Green Shipping – The Big Picture

Shipping is the backbone of world trade, carrying nearly **80% of global goods**. But it is also responsible for **~3% of global CO_2 emissions**, making decarbonisation one of the most pressing challenges of our time.

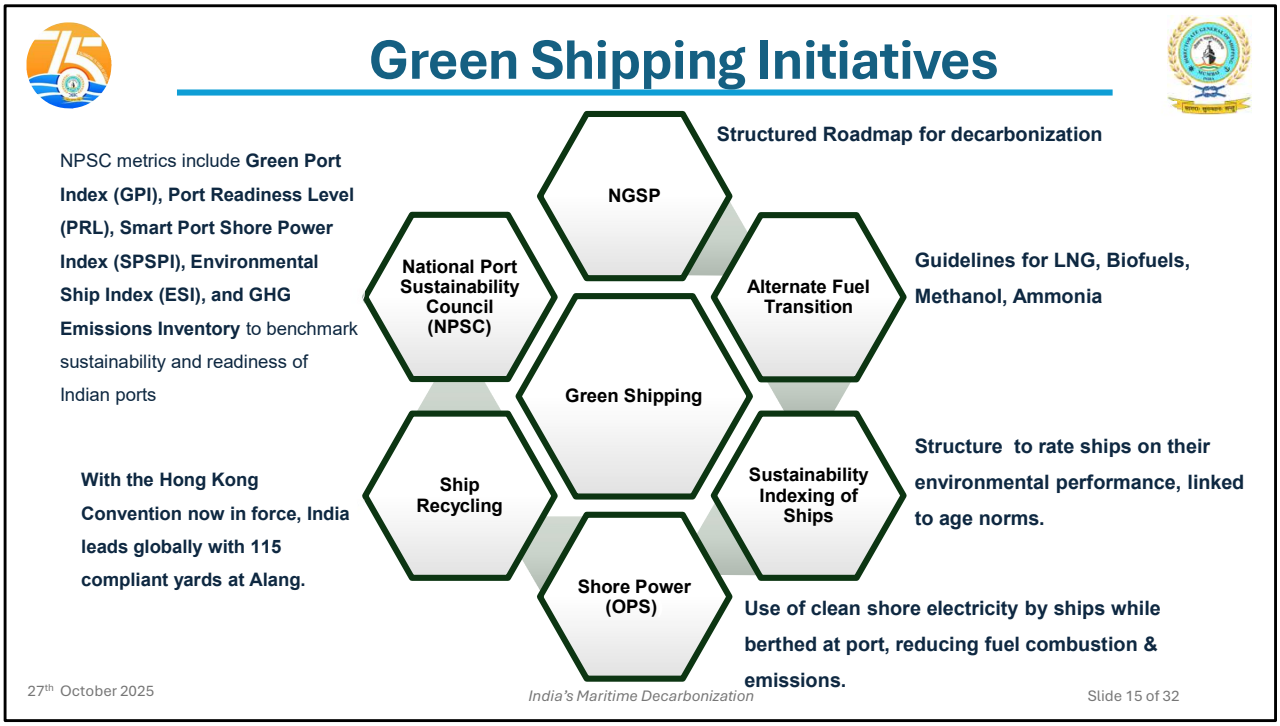
Green Shipping is not just about compliance, it is about transforming **ships, ports, and supply chains into cleaner, smarter, and future-ready systems**. In a low-carbon economy, sustainability is synonymous with competitiveness, and the maritime sector cannot afford to lag behind.

India's approach aligns ambition with action:

Maritime India Vision 2030 and **Maritime Amrit Kaal Vision 2047** embed sustainability into long-term growth strategies.
India supports the **IMO's Net Zero 2050** ambition, strengthening its role as a responsible maritime nation.
Through the **Panchamrit Pledge**, India has committed to 500 GW of non-fossil capacity by 2030 and Net Zero by 2070, anchoring maritime decarbonisation

within the national clean energy agenda.

The **future of shipping is green by necessity, not by choice.** Green shipping is not a burden but an opportunity: to reduce costs, attract green finance, and ensure India remains at the forefront of global maritime competitiveness.



India's Green Shipping Initiatives

India's maritime decarbonization roadmap is evolving from isolated compliance measures into an integrated national strategy under the broader vision of *"Samudra Shuddhih, Rāṣṭrasya Vṛiddhih."* This transformation is being driven by coordinated initiatives that target vessels, ports, fuel ecosystems, and regulatory governance.

At the institutional level, the formation of the **National Port Sustainability Council (NPSC)** reflects a shift toward performance-based benchmarking in port operations. The council employs indicators such as the *Green Port Index (GPI), Port Readiness Level (PRL), Environmental Ship Index (ESI)* and *GHG Emissions Inventory*, ensuring Indian ports are globally aligned on sustainability, electrification, and green infrastructure standards.

A central pillar of green transition is the **National Green Shipping Plan (NGSP)**, which provides a structured roadmap for decarbonisation of both ports and ships. The plan not only sets targets for reducing port emissions but also outlines future bunkering corridors for alternative fuels such as LNG, biofuels, methanol,

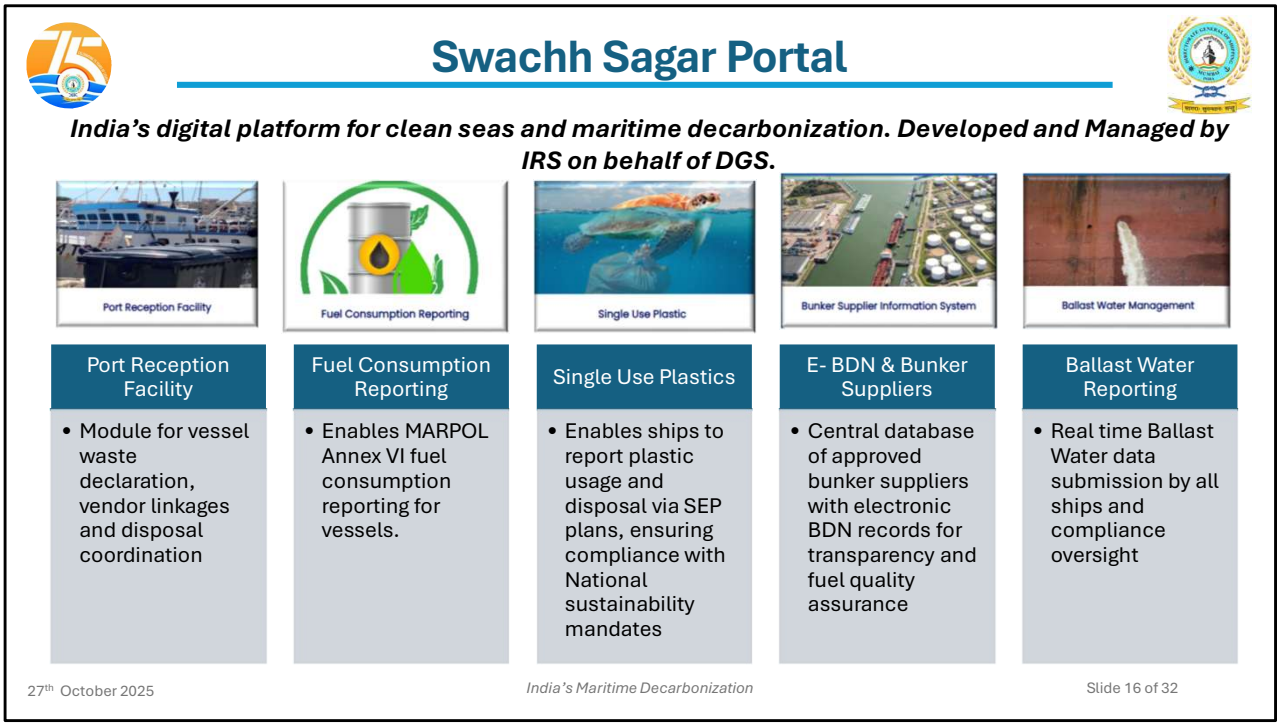
and green ammonia. These fuels are being introduced through detailed guidelines to support a phased shift from transitional to zero-carbon fuels.

On the vessel front, **Sustainability Indexing of Ships (SIS)** is being introduced to rate ships based on environmental performance, integrating parameters such as fuel type, age, emissions, and onboard energy efficiency. This index will be directly linked to regulatory incentives and port access policies, encouraging shipowners to modernise fleets and retire obsolete, high-emission tonnage.

Shore Power (Onshore Power Supply - OPS) forms another critical component, aimed at eliminating auxiliary engine use while ships are docked. By supplying clean electricity directly at berth, OPS significantly reduces particulate emissions, sulphur oxides, and carbon output in port cities. Pilot installations at major ports such as VOC and JNPA are now being expanded to create OPS-enabled green corridors.

Ship recycling also contributes to India's green leadership. With the Hong Kong Convention now in force, India leads the world with over **115 HKC-compliant recycling yards at Alang**, integrating environmentally safe dismantling practices and hazardous waste management. This positions India as a responsible global hub in the circular economy for ships.

Together, these initiatives illustrate India's transition from a compliance-driven maritime nation to a climate-responsible maritime power. By integrating policy (NGSP), infrastructure (OPS), market readiness (alt-fuels), and regulatory reform (SIS, NPSC), India is preparing not only to meet IMO's 2050 targets but to set new benchmarks for green maritime leadership.



The Swachh Sagar Portal is India's unified digital platform for maritime environmental compliance, developed to support clean seas, transparent reporting and decarbonisation efforts. It consolidates all pollution control and sustainability mandates under a single national system, enabling ships, ports, and regulatory authorities to operate within a structured, real-time governance framework. Each module within the portal addresses a specific environmental obligation under MARPOL and IMO conventions, ensuring data integrity, traceability and enforcement consistency.

Port Reception Facility (PRF) Module

The Port Reception Facility module establishes a structured digital system for vessels to declare ship-generated waste prior to port arrival. It links ships with authorised waste collection vendors and enables real-time approval, tracking and disposal coordination, reducing delays and eliminating informal handling. By digitally recording every waste transaction, it ensures full transparency under MARPOL Annex V and prevents sea dumping. This module supports State Maritime Boards, Port Authorities and Pollution Control Boards in monitoring compliance, while creating auditable records for IMO and port State control inspections.

Fuel Consumption Reporting
This module captures fuel consumption data for all vessels required to report under DGS regulations, including those below the IMO's global Data Collection System threshold of 5,000 GT. It enables national compliance with MARPOL Annex VI carbon intensity and energy efficiency requirements. All operational fuel data, type, quantity, voyage consumption, is digitally lodged, enabling India to build a national emissions database. This data will support policy development for future MBM mechanisms and ensure readiness for IMO's Net-Zero Framework implementation.

Single Use Plastics (SUP) Module
The Single Use Plastics module operationalises DGS Order No. 05 of 2019 by mandating ships to submit a Ship Execution Plan (SEP) identifying plastic items onboard, their phase-out measures and disposal methods. It enables tracking of plastic usage, recycling and substitution with sustainable alternatives. By capturing ship-level data, this module enforces India's national ban on certain plastic categories and contributes to IMO's Action Plan on Marine Litter. It shifts plastic control from advisory to mandatory digital reporting, enhancing accountability.

e-BDN & Bunker Supplier Information System
This module creates a national registry of licensed bunker suppliers and mandates issuance of electronic Bunker Delivery Notes (e-BDN) for every fuel transaction. Each e-BDN is time-stamped, digitally signed and serialised, preventing manipulation or use of unregistered suppliers. It improves traceability of marine fuels and helps detect off-spec or adulterated bunkers. By integrating supplier verification and fuel documentation, the portal strengthens maritime fuel governance and directly supports enforcement of fuel quality standards under MARPOL Annex VI.

Ballast Water Reporting Module (BWM Convention Alignment)
The Ballast Water module requires all ships, Indian and Foreign Flagged, to electronically report ballast operations upon every arrival and departure. It captures data on ballast uptake, exchange, treatment and discharge, enabling continuous monitoring in line with IMO's experience-building phase. This allows authorities to assess invasive species risk, treatment plant functionality and compliance behaviour. By linking with GISIS reporting, it elevates India's oversight role under the Ballast Water Management Convention and prepares ports for future biological discharge standards.

Together, these five modules establish India’s first end-to-end maritime environmental registry , shifting compliance from manual declarations to auditable, technology-driven oversight. By integrating reporting on waste, fuel, plastics, bunkers and ballast water, the portal strengthens India’s role in global maritime regulation and positions the country to lead international initiatives on green shipping corridors, blue economy and marine pollution control. Swachh Sagar is not just a compliance tool, but a strategic instrument for India’s transition to a cleaner, future-ready maritime ecosystem.

National Green Shipping Policy

Maritime Vision for a Green Future

The NGSP is India's strategic response to the global decarbonisation mandate, a policy blueprint designed to secure maritime growth while transitioning towards clean energy, sustainable ships and climate-resilient ports.

Key Transition Pillars:

- Green Ships
- Green Ports
- Green Fuels
- Green Recycling
- Green Financing & Collaborations

Strategic Intent

To position India as a **global hub for green shipping and future fuels**, enabling industry to move from regulatory compliance to global competitiveness and leadership.

Draft NGSP Document under Review

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National Green Shipping Policy

The National Green Shipping Policy (NGSP) is India's comprehensive roadmap to align the maritime sector with global decarbonisation goals while ensuring economic growth and competitiveness. As highlighted in the consultative document (2025), NGSP is not just an environmental initiative, but a strategic shift to position India as a global hub for **green shipping, green fuels, green ports, and maritime innovation**. It builds on international mandates such as the IMO's 2023 GHG Strategy and domestic commitments announced under COP-26 *Panchamrit*.

The policy integrates sustainability across the maritime value chain, focusing on low-emission vessel technologies, alternative fuel infrastructure, regulatory reform, and green financing mechanisms. It also aligns with major national frameworks – **Maritime India Vision 2030, Amrit Kaal Vision 2047, Sagarmala and Harit Sagar guidelines** – creating a unified and future-ready maritime strategy.

Key Transition Pillars

Green Ships:
Promotion of energy-efficient vessel designs, retrofits, zero-emission propulsion, and mandatory green certification. NGSP envisions India becoming a shipbuilding and retrofit hub for low-carbon vessels.

Green Ports:
Port decarbonisation through shore power (OPS), electrified equipment, green corridors, emission monitoring, and renewable integration (solar, wind, hydrogen bunkering).

Green Fuels:
Adoption of biofuels, LNG, methanol, hydrogen and ammonia under a phased fuel transition plan. The policy promotes domestic fuel production and bunkering hubs to make India a **future fuel supply nation**.

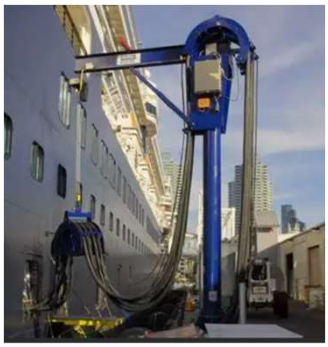
Green Recycling:
Modernisation of Alang and other ship recycling yards under HKC-compliant practices, with circular economy principles, hazardous waste control, and global recycling leadership.

Green Finance & Collaboration:
Creation of national green maritime funds, tax incentives, ESG-linked financing, PPP models, and international partnerships to support innovation and equitable transition.

Strategic Intent
The core objective of NGSP is to **shift India from regulatory compliance to global leadership** in green shipping. By integrating technology, sustainability, and economy, India seeks to become a maritime nation that exports *solutions, not emissions*. The policy emphasises a just and equitable transition, ensuring inclusion of industry, labour, MSMEs, and coastal communities.

Shore to Ship

What is Shore Power?
Electricity supplied from the shore to berthed ships, allowing engines to be switched off and eliminating fuel combustion while docked.



Why It Matters
- Cuts **CO_2, NOx, SOx and Particulate Matter** emissions in port zones
- Improves **Air Quality and ESG scores** for Indian ports
- Supports compliance with **IMO CII, GHG & Green Port Index**

Implementation Status in Indian Ports
- **Kamarajar Port** - 500 kW, 400V, 50-60 Hz in Coal Berth 1 & 2
- **VO Chidambaranar Port** - 305 kW, 400V 60Hz in VOC Berth 2 & 3
- **Jawaharlal Nehru Port Authority** - SPS used for Tugs. SPS for all terminals planned (45MVA; INR 600 crore expected)

Possible Financing options

Blended finance → *govt + MDBs + private capital.*

Green/blue bonds → *specifically earmarked for OPS infra.*

PPP models → *private players co-invest in OPS roll-out.*

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Shore-to-Ship Power (OPS)

Shore-to-Ship Power (Onshore Power Supply – OPS), commonly referred to as *cold ironing*, enables vessels to switch off their diesel auxiliary engines and draw electricity directly from port infrastructure while berthed. This significantly reduces emissions of **CO_2, NO_x, SO_x and Particulate Matter**, addressing one of the most concentrated sources of pollution in port cities.

OPS is central to India's maritime decarbonisation strategy under *Harit Sagar*, supporting compliance with IMO's CII and aligning with national climate commitments under the Panchamrit and Net Zero 2070 vision. Beyond emissions reduction, OPS improves **ESG scores, port sustainability ratings**, and promotes health benefits for coastal communities.

Implementation Progress in Indian Ports

Kamarajar Port (Ennore) – 2024 Commissioning
Commissioned OPS facility in **November 2024**, at a cost of **₹20.5 crore**.

Capacity: **500 kW, 400V, 50–60 Hz**, serving **Coal Berths 1 & 2**
Developed under **Harit Sagar Guidelines**, promoting green port practices.
KPL is actively encouraging vessels to retrofit and connect, supported by trials and coordination with Paradip Port for a **Green Shipping Corridor (Paradip–Ennore)**.

VO Chidambaranar Port (Tuticorin)
OPS installed at **Berths 2 & 3** (305 kW units), supporting auxiliary load supply and positioning VOC as a green maritime pilot port.

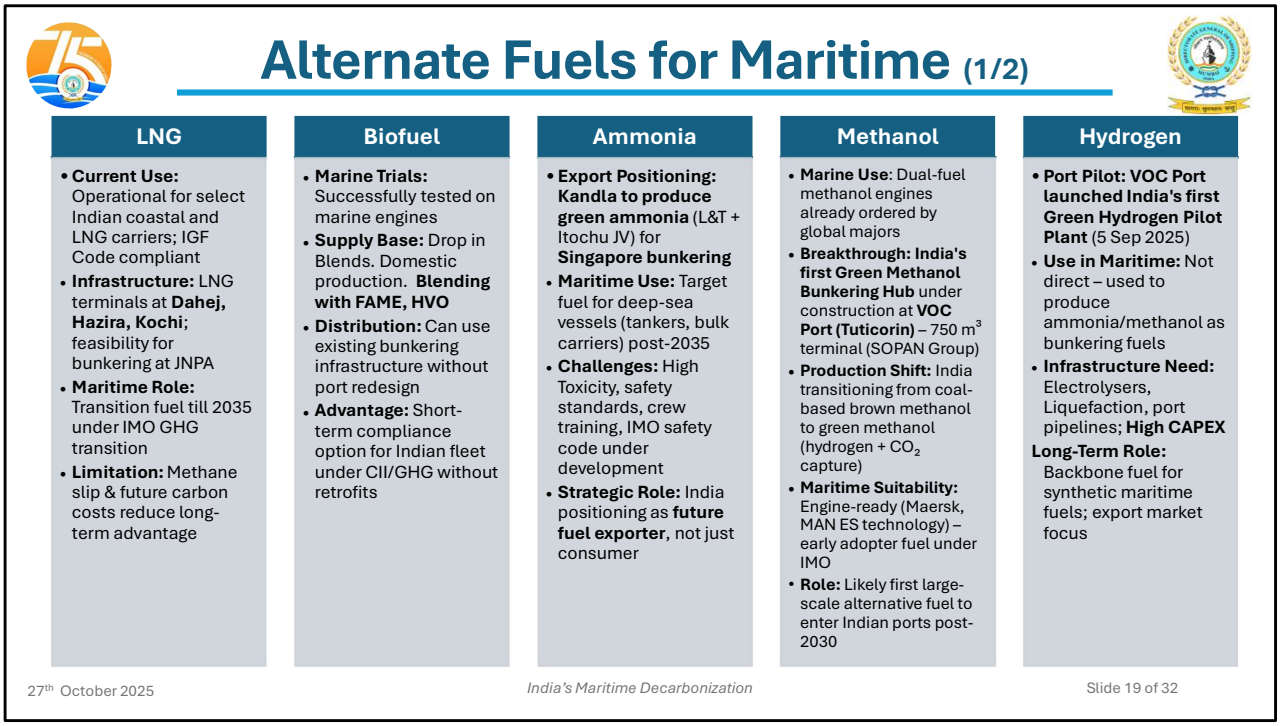
Jawaharlal Nehru Port Authority (JNPA)
Currently uses OPS for port tugs.
₹600 crore, 45 MVA national terminal OPS plan under formulation to become India's largest cold ironing hub.

Challenges & Opportunities
While ships are currently hesitant due to retrofitting and administrative costs, OPS offers long-term operational benefits:

- Reduced fuel consumption and engine wear
- Lower carbon intensity scores (CII/GHG Index compliance)
- Eligibility for global green incentives and carbon credits

Financing the Transition

- **Blended Finance** – Government + MDBs + private capital
- **Green/Blue Bonds** – Infrastructure-specific debt mechanisms
- **PPP Models** – Terminal operators & energy companies co-investing



Alternate Fuels for Maritime

India's maritime fuel transition will not be "one fuel for all," but a **sequenced multi-fuel pathway** that matches IMO's Net-Zero Framework and the Green Fuel Intensity (GFI) curve. Near-term compliance will lean on drop-in **biofuels** and limited **LNG**; the first scalable alternative expected in Indian ports is **green methanol**; **ammonia** follows for deep-sea ships post-2035; and **green hydrogen** underpins methanol/ammonia production and long-term export play. The strategy links three levers: (i) **domestic fuel manufacture**, (ii) **bunkering hubs & safety codes**, and (iii) **demand signals** created by IMO pricing (RUs) and India's NGSP/Harit Sagar policies.

1) LNG - Transitional Fuel

Current role : Deployed on select Indian coastal/LNG carriers; compliant under IGF Code.

Infrastructure : Import/LNG terminals at **Dahej, Hazira, Kochi**; feasibility for marine bunkering studied at **Kochi & JNPA**.

Why transitional : LNG reduces CO_2 but faces **methane-slip.**

Methane slip is the escape of unburned methane gas into the atmosphere, typically from engines running on natural gas, where incomplete combustion occurs. This phenomenon is a significant concern because methane is a potent greenhouse gas, with a much higher global warming potential than carbon dioxide over the short term. It can occur in a wide range of applications, including marine engines, stationary engines, and across the entire natural gas supply chain

2) Biofuels - Immediate, Drop-in Compliance
Technical fit : Blends (B20–B100) run on existing marine engines; trials by **Indian Navy & fleet operators** demonstrate operational feasibility.
Supply base : Domestic streams from **ethanol, biodiesel, HVO , FAME** under the National Biofuel Policy; strongest near-term pathway to lower well-to-wake GHG without retrofits.
Ports : Minimal infrastructure change. can use current bunkering networks with sustainability certification.
Role : Near-term CII/GFI relief for Indian fleets; ideal for tugs, OSVs, coastal and inland segments while methanol/ammonia scale up.

3) Methanol
Breakthrough project : India's first Green Methanol Bunkering & Refuelling Hub is **under construction at VOC Port, Tuticorin - 750 m^3 terminal (SOPAN Group)**. This is the country's first dedicated maritime methanol node and a key plank of the **Coastal Green Shipping Corridor (Kandla–Tuticorin)**.
Why methanol first : Dual-fuel engines are commercially available (MAN ES, widely ordered by global liners), handling is simpler than ammonia/hydrogen, and safety codes are mature.
Production shift : India must pivot from **coal-based "brown" methanol** to **green methanol** (renewable H_2 + captured CO_2). VOC's **port-based green hydrogen pilot** is a feeder step.
Role & Timing : Likely the **first large-scale alternative marine fuel** to appear regularly in Indian ports **post-2030**, enabling ships to meet tightening GFI thresholds at competitive abatement cost.

4) Ammonia (Green Ammonia)
Strategic positioning : Kandla is being developed by **L&T Energy GreenTech with ITOCHU** to produce **green ammonia (~300 KTPA)** with **offtake for bunkering in Singapore**. ITOCHU is also developing a **5,000 m^3 ammonia bunkering vessel (2027) ,** evidence of real demand creation in the region.
Maritime use : Target fuel for deep-sea tankers/bulkers **post-2035**, once IMO's

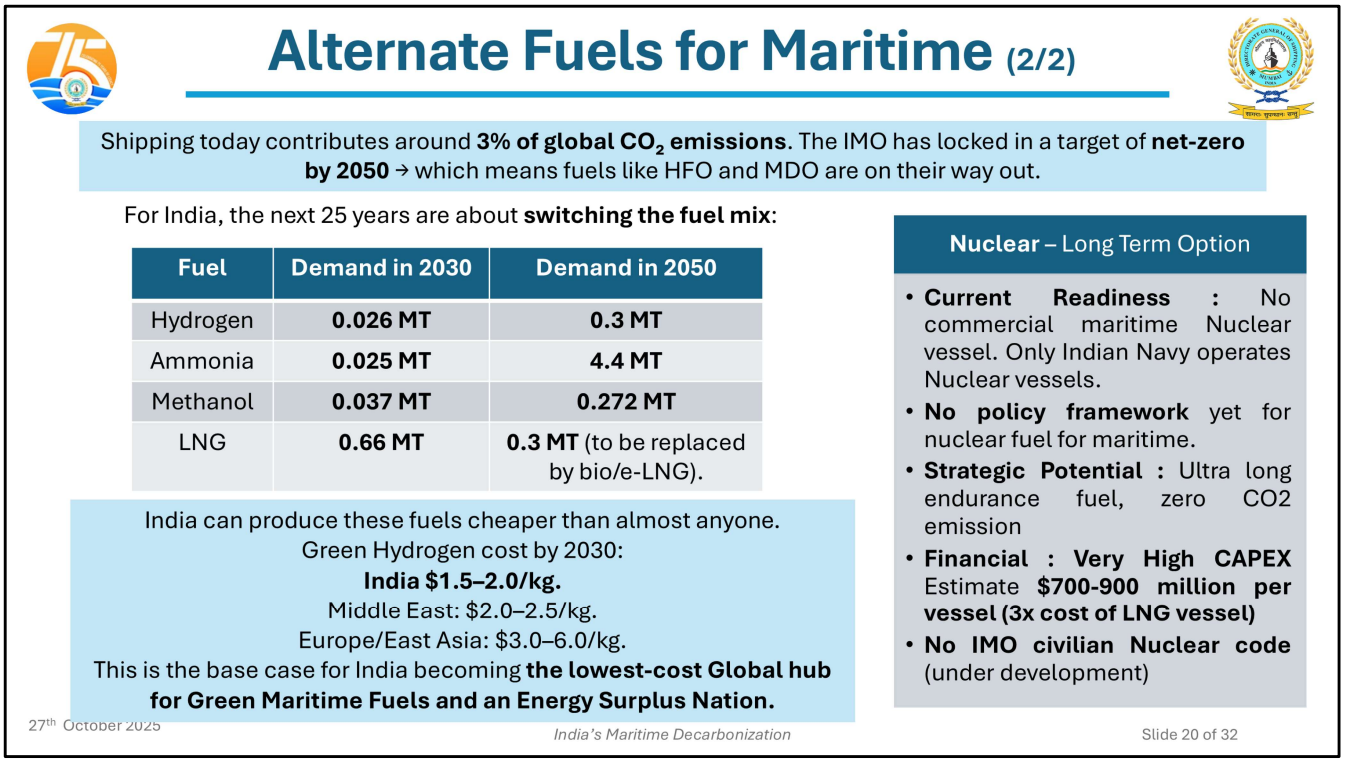
dedicated **safety code** and crew-training standards are finalised.
Challenges : High toxicity handling, new port safety zones, emergency response, and specialised storage/transfer systems.
India's role : Strong **export economics** (renewables + electrolyser scale). India can be a **fuel supplier to Asian bunkering hubs** while gradually enabling domestic corridors.

5) Hydrogen (Green H_2)
Port pilot : VOC Port commissioned **India's first port-based Green Hydrogen pilot (10 Nm^3/hr)** on **5 Sep 2025**; foundation stone also laid for the **750 m^3 methanol facility**.
Maritime : Direct shipboard hydrogen (LH_2 at −253 °C or high-pressure gas) is niche in the near term; the **primary role is upstream**, as feedstock for **green methanol and green ammonia**.
Infrastructure : Electrolysers, renewable power, desalination, compression/liquefaction and pipelines. H**igh CAPEX** but central to India's export ambition under the **National Green Hydrogen Mission**.
Role : Backbone energy for synthetic maritime fuels; supports India's positioning as a **net green energy exporter**.

Cross-cutting Enablers India Must Move On
Standards & Safety : Fast-track Indian codes (storage, transfer, firefighting, crew competence) harmonised with IMO/IGF; publish methanol and ammonia bunkering SOPs for pilot ports.
Fuel Certification : Well-to-wake sustainability verification to claim **GFI reductions** and generate **Surplus Units (SU)** under the IMO scheme.
Finance : Use **green/blue bonds**, viability-gap/interest subvention, and **PPP** to de-risk first terminals; align with **NGSP** and **Harit Sagar** incentives.
Domestic Manufacture : Anchor **H_2, CO_2 capture, and e-fuel plants** near high-renewables clusters and port industrial estates to reduce delivered fuel cost.
Early-Mover Demand : Government-linked charters (PSU cargoes, coastal programs) to specify **biofuel/methanol blends** from FY26–27 to seed predictable offtake.

How This Meets IMO GFI Trajectory
2028–2030: Biofuels and limited LNG provide immediate GFI relief; pilots for methanol bunkering (VOC) mature.
2030–2035: Methanol scales in Indian ports; India begins **green ammonia exports**; OPS and efficiency measures cut berth emissions.

Post-2035: Ammonia fuels deep-sea segments; hydrogen-based derivatives dominate; India emerges as a **regional bunker/export hub** for future fuels.



Green Fuel Transition

The maritime sector, responsible for **nearly 3 percent of global CO_2 emissions**, is entering a decisive phase of energy transition to align with the IMO's Net Zero 2050 ambition. This transition demands a structured exit from conventional fuels such as HFO and MDO, and an accelerated shift towards a diversified portfolio of green fuels.

For India, the coming 25 years represent a carefully sequenced fuel substitution strategy. By 2030, LNG is expected to dominate with an estimated demand of **0.66 MT**, before gradually transitioning to bio/e-LNG. Simultaneously, emerging fuels such as hydrogen, ammonia and methanol will scale significantly, with **hydrogen rising from 0.026 MT to 0.3 MT**, and **ammonia from 0.025 MT to 4.4 MT by 2050** , reflecting both global decarbonization trends and domestic industrial capability.

India's strategic advantage lies in fuel economics. By 2030, **green hydrogen production costs in India are projected at $1.5–2.0/kg**, far below Europe and East Asia. This cost leadership positions India to become a global hub for green maritime fuels, enabling both domestic fleet transition and export opportunities.

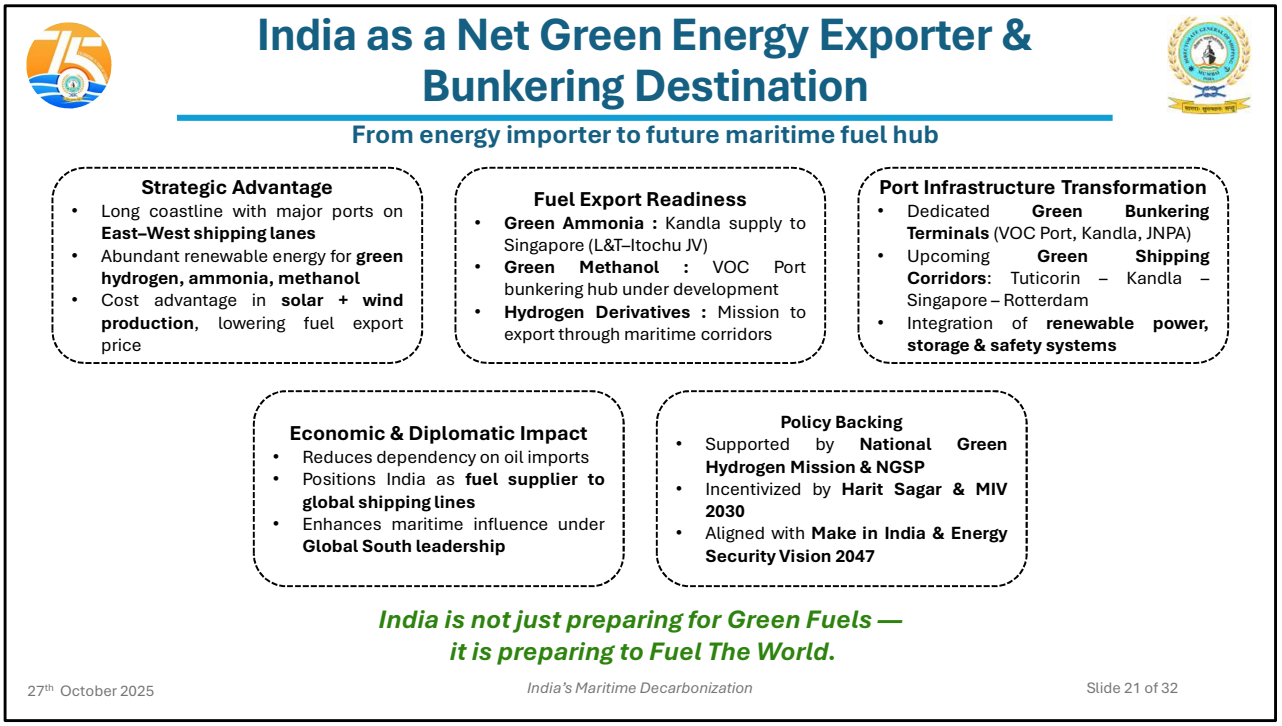
Looking further ahead, nuclear marine propulsion is emerging as a potential long-term

option for deep-sea and high-endurance operations. With unmatched energy density and zero operational emissions, nuclear could complement the green fuel mix for specific vessel categories — subject to future international regulatory frameworks on safety, liability and waste management.

Therefore, India's fuel transition is not only a compliance response but a strategic opportunity — to secure energy autonomy, build green shipping supply chains and lead the global maritime decarbonisation narrative.

Nuclear Propulsion - Long-Term Strategic Prospect for India

Nuclear propulsion remains a long-term, exploratory option for maritime decarbonisation, with *no commercial nuclear vessels currently operating under the Indian flag*. India's only experience with nuclear-powered ships lies within the defence sector, through the Indian Navy's nuclear submarines (INS Arihant class), which demonstrates indigenous capability in naval nuclear engineering. However, there is **no existing policy or regulatory framework** under DG Shipping or MoPSW for the civilian use of nuclear fuel at sea. While nuclear propulsion offers unmatched strategic potential- **ultra-long endurance and near-zero CO_2 emissions** without the need for refuelling. it comes with significant barriers. The **capital expenditure is extremely high**, estimated at **USD 700–900 million per vessel**, almost *three times the cost of LNG-powered ships*, making commercial viability a major concern. Additionally, **IMO has not yet finalised a civilian nuclear safety code**, with guidelines for Small Modular Reactors (SMRs) still under development. For India, nuclear remains a speculative option beyond 2040, contingent upon global regulatory consensus, public acceptance, liability legislation, and strong international safeguards.



India as a Net Green Energy Exporter & Bunkering Destination

India is at the crossroads of a major strategic shift, from being one of the world's largest **importers of fossil fuels** to emerging as a **future global supplier of green maritime fuels** such as **green ammonia, green methanol, and hydrogen derivatives**. This transition is not isolated; it is rooted in domestic policy reforms, renewable energy leadership, and a geopolitical push for *energy independence by 2047* and *Net Zero by 2070*.

1. Strategic Maritime Advantage

With its extensive coastline and central position on **major East–West shipping corridors**, India is geographically primed to become a bunkering and refueling hub for global shipping.

India has one of the world's largest solar and wind power expansion programmes, which provides a **cost advantage in producing green fuels**, making exports competitive.

2. Fuel Export Capacity in Motion
India is already laying the groundwork for maritime fuel exports:
Green Ammonia (Export-Oriented Production)
At **Kandla**, a JV between **L&T and Itochu (Japan)** is setting up a large-scale green ammonia plant (~300 KTPA), with committed offtake to Singapore's bunkering market.
Green Methanol (First Bunkering Hub in India)
At **VOC Port, Tuticorin**, construction of a **750 m^3 green methanol bunkering terminal** is underway (SOPAN Group). This is India's first dedicated alternative fuel facility for shipping.
Hydrogen Derivatives for Maritime Corridors
Under the **National Green Hydrogen Mission**, India targets **5 MMT green hydrogen** by 2030, largely to convert into **exportable derivatives** (ammonia/methanol) through maritime corridors like **Kandla–Singapore**, **Tuticorin–Rotterdam**, etc.

3. Port Infrastructure Transformation
Ports are evolving from cargo hubs to **energy export platforms**:
Dedicated **green fuel terminals** at **VOC Port, Kandla, JNPA**
Coastal **Green Shipping Corridors** being piloted (Tuticorin–Kandla–Singapore–Rotterdam)
Integration of **renewable power, desalination, safety systems**, and bunkering pipelines into port estates under **Harit Sagar Guidelines** and **NGSP**

4. Economic & Diplomatic Impact
India's leadership in green fuel exports has a threefold strategic impact:
Reduces dependence on crude oil imports (currently 85% import-driven energy market)
Positions India as a fuel supplier to global shipping lines transitioning under IMO Net-Zero framework
Strengthens India's diplomatic role as a provider of clean energy to the **Global South**, reinforcing leadership at forums such as OPEC, G20, and COP

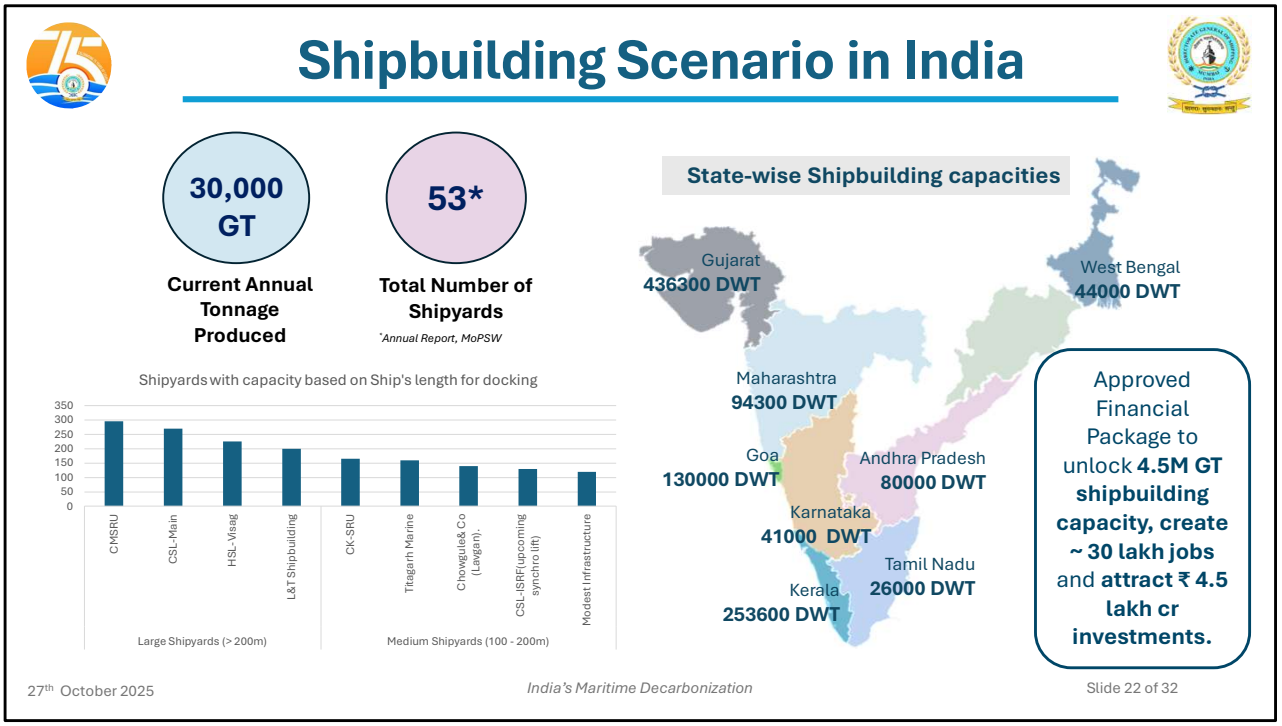
5. Strong Policy Backing
Backed by **National Green Hydrogen Mission** and **Draft National Green Shipping Policy (NGSP)**
Incentives via **Harit Sagar**, **Maritime India Vision 2030**, and **Make in India–Energy Security 2047**
PIB statements (July 2025, OPEC Summit):

“India will not only be energy independent by 2047, but will also fuel the world with green energy exports.”

Conclusion

India is not simply decarbonizing its ports and ships, it is **building a green energy export economy** around its maritime sector. With methanol bunkering, ammonia export hubs, and hydrogen corridors already initiated, India is setting the stage to become the **refuelling station of a net-zero maritime world.**

India is not just preparing for Green Fuels…… It is preparing to Fuel the World.



Shipbuilding Scenario in India

India's shipbuilding sector is at a **nascent but strategically critical stage**. Despite having a long coastline and 53 shipyards (as per MoPSW Annual Report), the country currently produces only **30,000 GT annually**, which is a small fraction compared to global leaders like China, South Korea, and Japan.

State-wise Capacities

Gujarat leads the sector with **436,300 DWT**, thanks to strong industrial clusters and its coastal industrial base.

Kerala (253,600 DWT) and **Goa (130,000 DWT)** follow, with a mix of public and private yards catering to both defence and commercial orders.

Other contributors include **Maharashtra (94,300 DWT)**, **Andhra Pradesh (80,000 DWT)**, **West Bengal (44,000 DWT)**, **Karnataka (41,000 DWT)**, and **Tamil Nadu (26,000 DWT)**.

This distribution highlights both the **geographic spread of capacity** and the under-utilisation of existing infrastructure.

Yard Capacities & Capabilities

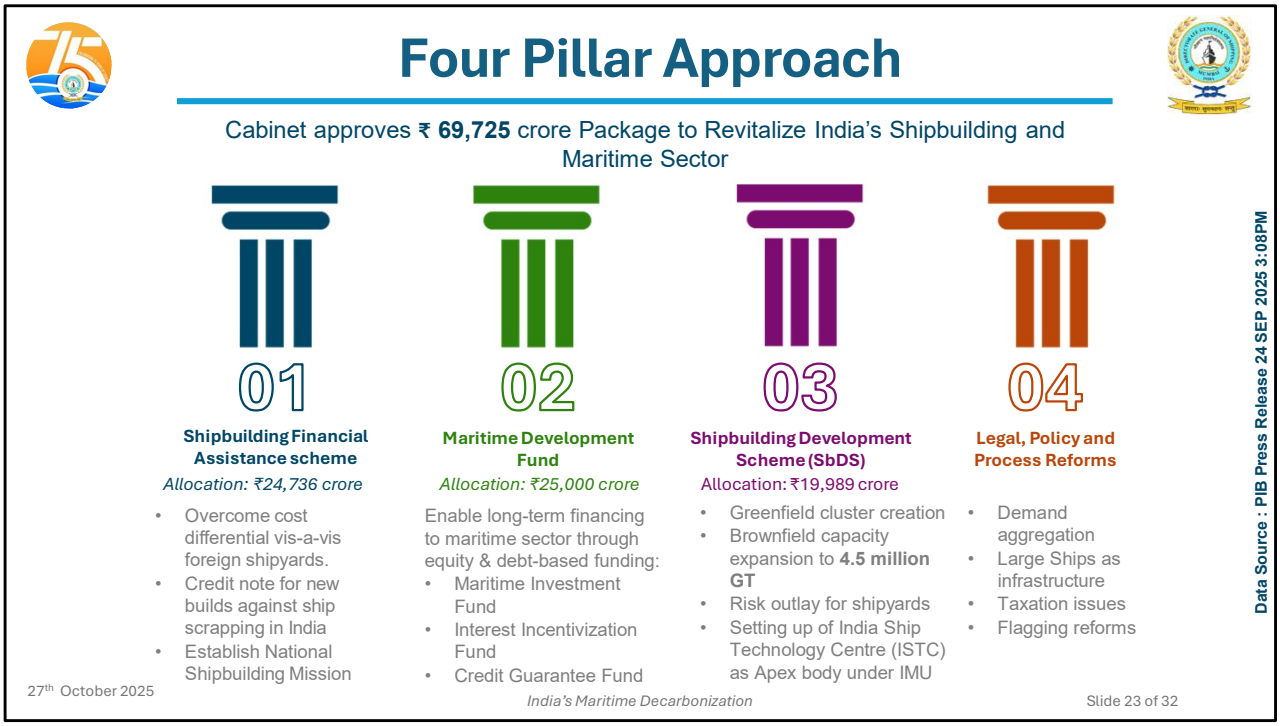
India has a handful of large shipyards capable of handling vessels >200m in length — such as **Cochin Shipyard Limited (CSL), Hindustan Shipyard Ltd. (HSL), L&T Shipbuilding, and**

Central/State-run units like CMSRU and CKSRU.
Medium shipyards like **Timblo, Chowgule, Titagarh Marine, CSL's smaller yards** and others handle repair, retrofits, and mid-sized vessels.
However, compared to international peers, India suffers from **low productivity, high financing costs, and limited scale economies**.

Policy & Investment Push
The Government has approved a **financial package to unlock 4.5 million GT of shipbuilding capacity**, with the potential to:
Generate **~30 lakh direct and indirect jobs**,
Attract **₹4.5 lakh crore in investments**,
Enable India to become a **competitive global player** while reducing dependence on foreign-built ships.

Strategic Importance
Shipbuilding is not just an industrial sector, it is a **strategic enabler**:
Strengthens national security by ensuring **domestic capacity for defence and merchant fleets**.
Boosts **exports of vessels and green technology** in the long run.
Creates linkages with allied industries — **steel, engineering, design, marine electronics**, and services.
Positions India to capture a share of the **$70 billion global shipbuilding market**.

India's shipbuilding potential is large but untapped. With policy support, financing reforms, and capacity unlocking, the sector can shift from a marginal 30,000 GT output today to millions of GT tomorrow, creating jobs, saving forex, and boosting strategic autonomy.



Four Pillar Approach

The Government of India has approved a **₹69,725 crore revitalization package** for the shipbuilding and maritime sector. This approach rests on **four strategic pillars**, each addressing a critical gap in India's maritime ecosystem- finance, infrastructure, capacity building, and regulatory reform.

Pillar 1: Shipbuilding Financial Assistance Scheme (₹24,736 crore)
Designed to **bridge the cost differential** between Indian and foreign shipyards, ensuring domestic yards remain competitive.
Provides **credit notes** for new shipbuilding linked to ship recycling in India, integrating sustainability with incentives.
Includes the establishment of a **National Shipbuilding Mission** to provide long-term policy continuity.

Pillar 2: Maritime Development Fund (₹25,000 crore)
Aims to enable **long-term, low-cost financing** for the maritime sector via equity and debt funding.

Includes sub-funds such as:

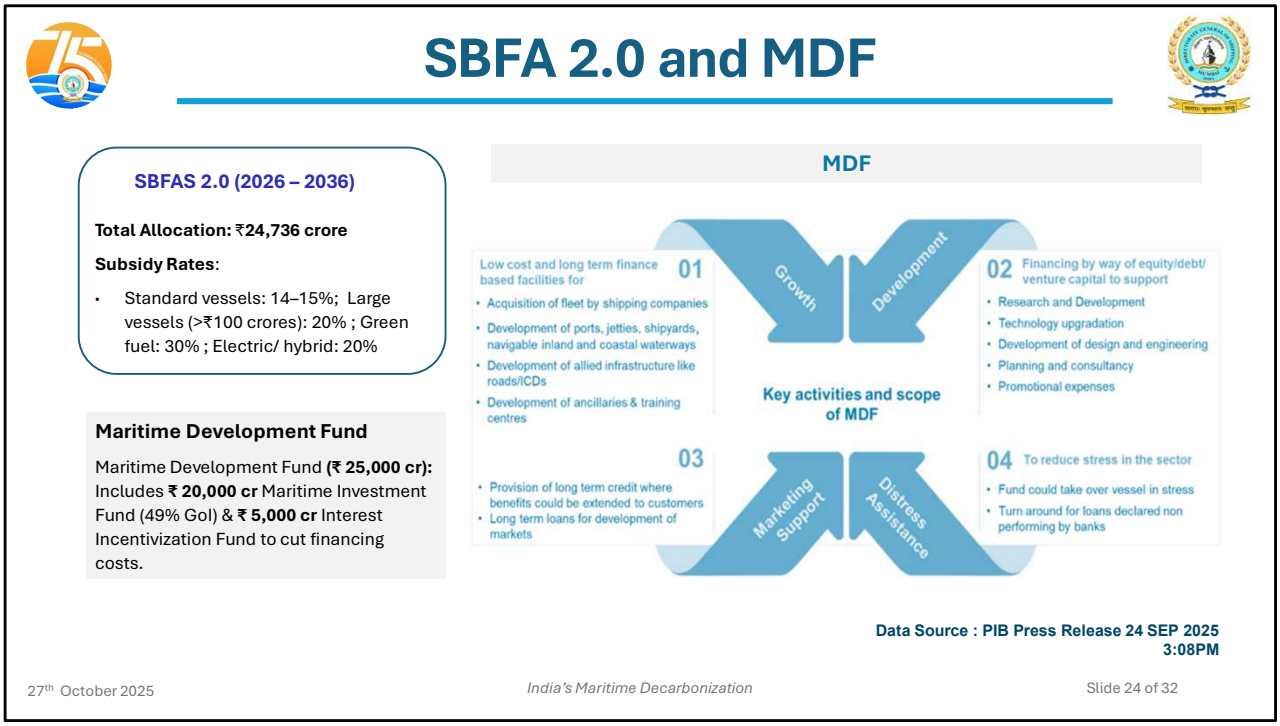
Maritime Investment Fund – to channel capital into greenfield projects.
Interest Incentivization Fund – to reduce borrowing costs for shipyards.
Credit Guarantee Fund – to reduce lender risk and unlock financing for vessel owners and builders.

Pillar 3: Shipbuilding Development Scheme (SbDS) (₹19,989 crore)
Focused on **capacity expansion and technology development**:

Establishment of **greenfield shipbuilding clusters**.
Brownfield expansion to raise capacity to **4.5 million GT**.
Risk outlay provision to protect shipyards from financial exposure.
Setting up the **India Ship Technology Centre (ISTC)** under IMU as an apex R&D and training body for advanced shipbuilding technologies.

Pillar 4: Legal, Policy, and Process Reforms
Demand aggregation across PSU, defence, and private shipping to secure consistent order books for Indian shipyards.
Recognition of **large ships as infrastructure**, unlocking easier access to long-term credit and incentives.
Addressing **taxation anomalies** and simplifying GST/customs regimes for shipbuilders.
Flagging reforms to incentivize Indian ownership of ships and reduce outflow of foreign exchange.

The four-pillar approach provides a **holistic framework** for India's shipbuilding revival. With financing support, capacity expansion, institutional R&D, and regulatory reforms, the package seeks to transform India into a **globally competitive shipbuilding hub**, aligned with Maritime India Vision 2030 and Maritime Amrit Kaal Vision 2047.



SBFA 2.0 and MDF

The Government has announced **two major financial interventions**—the **Shipbuilding Financial Assistance Scheme (SBFAS 2.0)** and the **Maritime Development Fund (MDF)**—to reduce cost disadvantages, incentivize green shipbuilding, and unlock long-term financing for the maritime sector.

SBFA 2.0 (2026–2036)
Total Allocation: ₹24,736 crore over 10 years.
Purpose: To make Indian shipyards globally competitive by addressing cost differentials with foreign yards.
Subsidy Rates:

- **Standard vessels:** 14–15% subsidy.
- **Large vessels (>₹100 crore):** 20%.
- **Green fuel-based vessels:** 30%.
- **Electric / hybrid vessels:** 20%.

Impact: Directly reduces build costs for shipowners, incentivizes investment in next-generation and sustainable vessels, and creates demand for domestic shipbuilding.

Maritime Development Fund (MDF)

Total Allocation: ₹25,000 crore.

₹20,000 crore **Maritime Investment Fund** (Govt. share 49%).

₹5,000 crore **Interest Incentivization Fund** to reduce financing costs.

Scope and Activities:

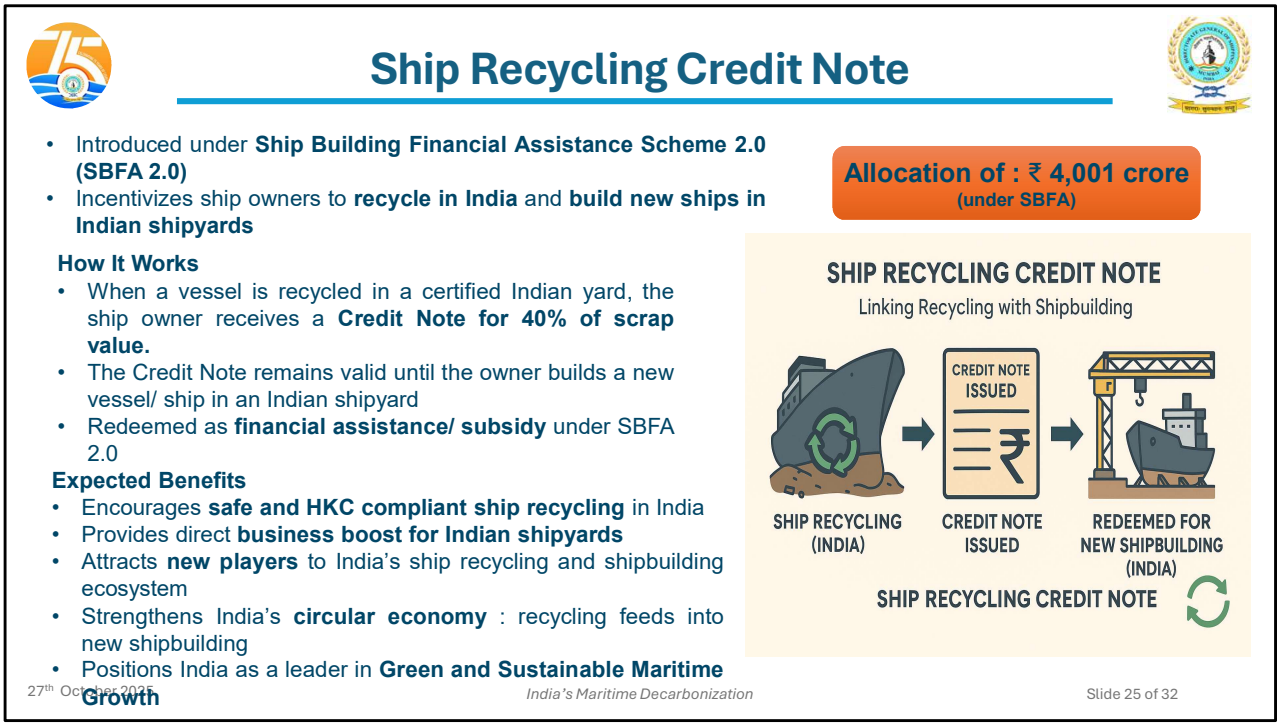
Growth & Development – Financing fleet acquisition, shipyards, ports, jetties, inland/coastal waterways, and allied infrastructure like roads and training centres.

Equity/Debt Support – R&D, technology upgradation, design and engineering, planning & consultancy, promotional expenses.

Market Support – Long-term credit facilities for market development, expansion of ancillary industries, and customer-side financing.

Distress Assistance – MDF can step in to rescue vessels or shipyards under stress, refinance loans declared NPAs, and stabilize the sector.

Together, **SBFA 2.0 and MDF** provide a **two-pronged strategy** :one that directly reduces shipbuilding costs via subsidies, and another that enables **affordable, long-term financing** to fuel growth, innovation, and resilience in India's shipbuilding ecosystem. These measures mark a **transformational shift** from ad-hoc incentives to a **structured financial framework** aligned with Maritime India Vision 2030 and MAKV 2047.



Ship Recycling Credit Note

The **Ship Recycling Credit Note (SRCN)** is one of the most innovative financial instruments introduced under the **Shipbuilding Financial Assistance Scheme 2.0 (SBFA 2.0)** with an allocation of **₹4,001 crore**. It directly links India's ship recycling strength with the growth of its shipbuilding industry.

How It Works

When a vessel is dismantled in a **certified Indian ship recycling yard**, the shipowner is issued a **Credit Note worth 40% of the vessel's scrap value**. This Credit Note remains valid until the shipowner invests in building a **new vessel in an Indian shipyard**.
The note is then **redeemed as financial assistance/subsidy** under SBFA 2.0, lowering the effective cost of new builds in India.

Expected Benefits

Boosts HKC-compliant recycling: Encourages safe, environmentally sound, and **Hong Kong Convention (HKC) aligned ship recycling** practices.
Strengthens shipbuilding: Directly channels recycling activity into **new orders**

for Indian shipyards, ensuring business continuity.
Expands ecosystem participation: Incentivizes **new players**—both domestic and foreign—to engage with India's recycling and shipbuilding ecosystem.
Promotes circular economy: Scrap steel and materials from recycling feed into the production of new ships, cutting raw material dependence.
Sustainability leadership: Positions India as a **global leader in green and sustainable maritime growth**, combining recycling, green steel, and shipbuilding.

Strategic Importance
SRCN acts as a **bridge policy**, ensuring that India's dominance in recycling (30–35% of global share) translates into a **thriving shipbuilding industry**.
It enhances India's image as the **only country with over 100 HKC-compliant yards** while simultaneously supporting its ambition to become a **shipbuilding hub**.
By tying together **scrap recovery, circular economy, and green shipbuilding**, it creates a **self-sustaining maritime growth cycle**.

The Ship Recycling Credit Note is a **game-changer**, as it uniquely integrates recycling with new construction, creating a **virtuous cycle of sustainability, industrial growth, and employment**.

Ship Recycling – India's Global Leadership

Ship recycling is not just an industry - it is a **strategic pillar of India's maritime economy** and the global circular economy. The process dismantles end-of-life ships to recover steel and other valuable materials, reducing the demand for virgin raw inputs while cutting costs and emissions.

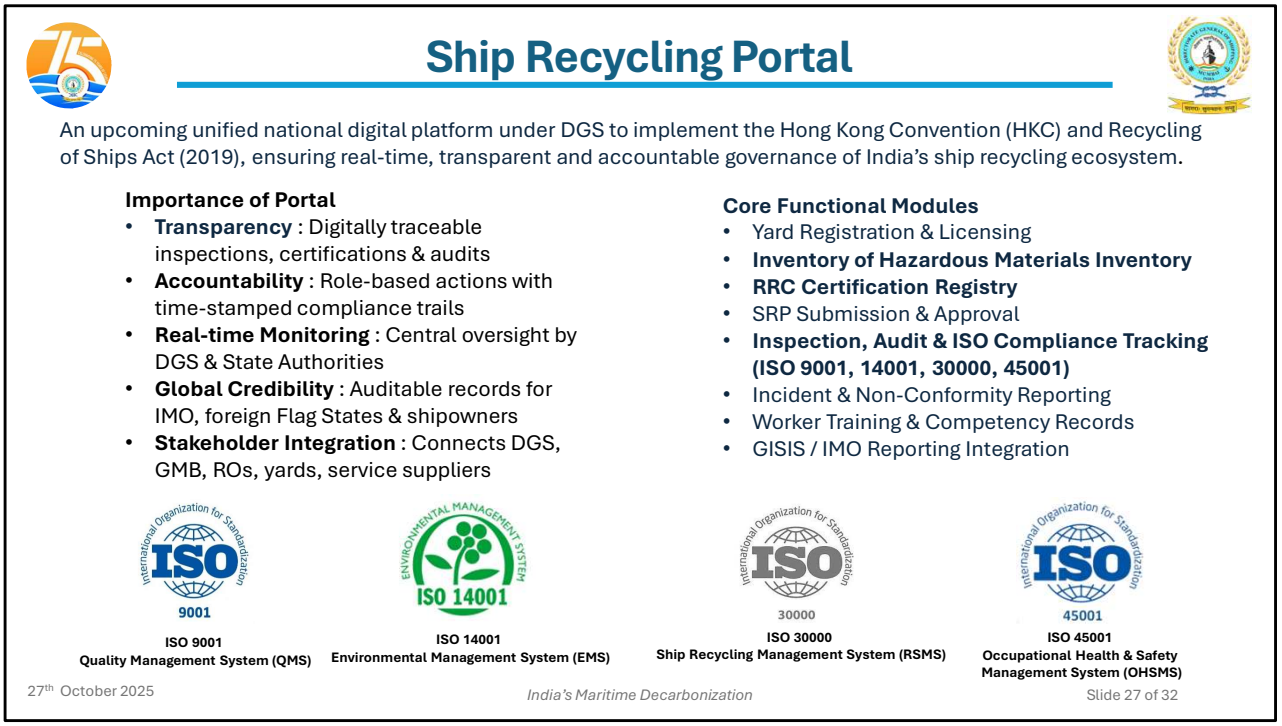
India today stands as the **global leader in ship recycling**, with the Alang–Sosiya cluster in Gujarat being the world's largest ship recycling facility. The entry into force of the **Hong Kong Convention (HKC) on 26 June 2025** has further elevated India's role, as it is the **only nation with more than 100 HKC-compliant yards (115 facilities)**.

This sector contributes significantly to India's industrial ecosystem by:
Handling **30–35% of global ship recycling tonnage annually**, consolidating India's leadership.
Meeting **20–25% of India's ferrous scrap demand**, reducing import dependency and saving valuable forex.
Feeding the **Green Steel ecosystem**, providing low-carbon inputs that align with

India’s net-zero ambitions.

The impact is equally socio-economic. Ship recycling directly employs **15,000+ workers**, while creating indirect livelihood opportunities for thousands more in logistics, scrap processing, and allied services. The industry has become a driver of **inclusive growth**, while embedding high safety and environmental standards under HKC compliance.

By anchoring itself as the hub of HKC-compliant recycling, India not only ensures **sustainable resource recovery** but also strengthens its position as a **global leader in maritime sustainability**.



Ship Recycling Portal

The Ship Recycling Portal is being developed as India's national digital command platform for implementing the Hong Kong Convention (HKC) and the Recycling of Ships Act, 2019. Its purpose is to centralise every regulatory, safety and environmental function into a unified digital architecture, replacing fragmented documentation and manual oversight with real-time, auditable governance. Post-HKC entry into force, digital traceability will be essential to retaining India's leadership in global ship recycling.

The portal will enable complete life-cycle governance, from yard registration and licensing to issuance of Ready-for-Recycling Certificates (RRC), monitoring of hazardous materials and oversight of ISO-certified processes. Role-based access and time-stamped actions will ensure accountability by DGS, Gujarat Maritime Board and State Pollution Control Boards. Integration with GISIS and IMO reporting systems will provide global credibility by ensuring transparent access for foreign Flag States, classification societies and shipowners.

Beyond compliance, the portal institutionalises digital monitoring of inspections,

surveillance logs, incident reporting and corrective actions. Worker training records, safety drills, waste disposal data and non-conformity reports will be digitally stored, building a permanent regulatory archive. This transition marks a strategic shift from physical inspection dependency to data-driven environmental governance, positioning India as the first digitally governed ship recycling nation under HKC.

ISO Standards

To operationalise HKC requirements, Indian recycling yards are adopting a comprehensive ISO framework that strengthens transparency, worker safety and environmental stewardship.

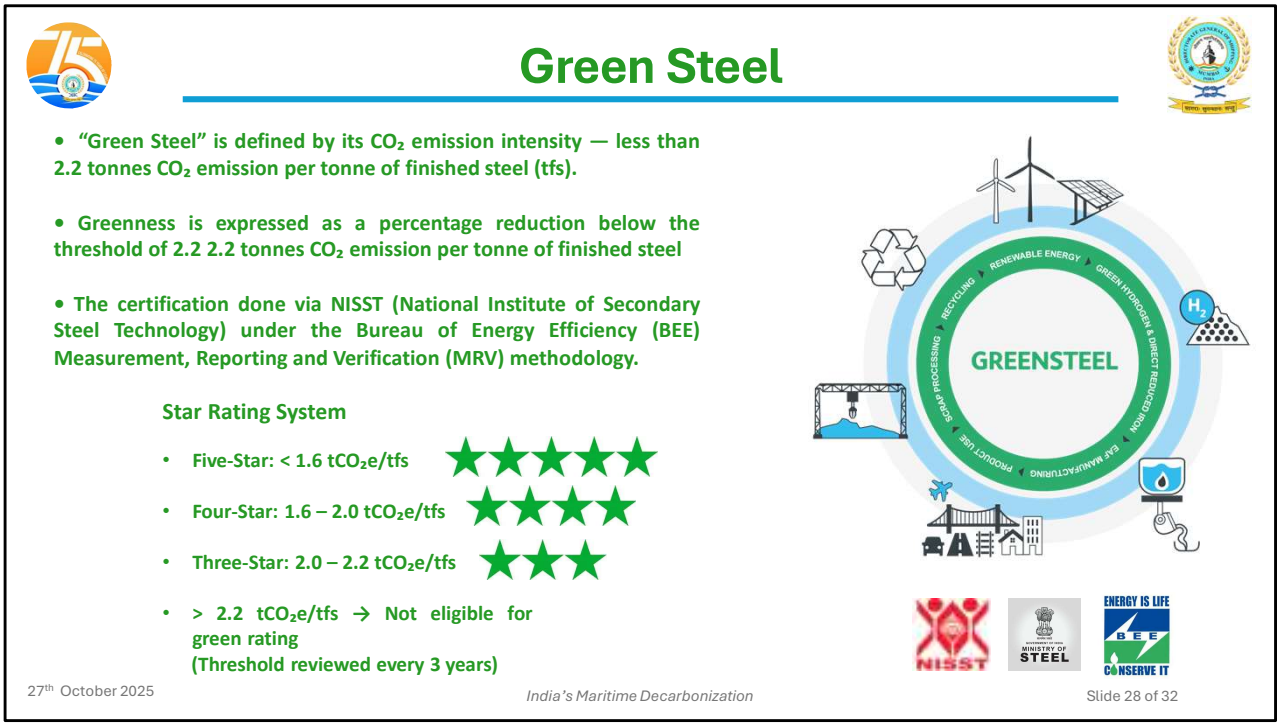
ISO 9001 – Quality Management System
Ensures procedural discipline, documentation integrity and continuous improvement across recycling operations. It is the baseline for demonstrating reliability to international shipowners.

ISO 14001 – Environmental Management System
Addresses pollution prevention, hazardous waste handling and resource control. It demonstrates alignment with global expectations for safe dismantling and coastal environmental protection.

ISO 30000 – Ship Recycling Management System
The core ISO standard specific to ship recycling under HKC. It governs implementation of IHM, Safe-for-Hot-Work certifications, containment of toxic substances and controlled dismantling protocols.

ISO 45001 – Occupational Health & Safety Management System
Protects workers through structured risk assessment, PPE enforcement, emergency response planning and health surveillance. It elevates human safety to audit-ready international standards.

Collectively, these ISO certifications move Indian yards from compliance demonstration to institutional credibility, assuring shipowners, classification societies and global regulators that end-of-life vessels are dismantled with full environmental and human safety assurance.



Green Steel : Driving Low-Carbon Industrial Transition

Steel is the backbone of infrastructure and shipbuilding, but it is also one of the most carbon-intensive industries. The concept of **"Green Steel"** aims to transform this challenge into an opportunity by reducing the **CO_2 emission intensity below 2.2 tonnes of CO_2 per tonne of finished steel (tfs)**.

Greenness is measured as the percentage reduction in emissions below this threshold. Certification is carried out by the **National Institute of Secondary Steel Technology (NISST)** under the **Bureau of Energy Efficiency (BEE)**, using global-standard **Measurement, Reporting and Verification (MRV) methodologies**.

A **star rating system** makes this framework transparent and globally competitive:
Five-Star: < 1.6 tCO_2e/tfs
Four-Star: 1.6 – 2.0 tCO_2e/tfs
Three-Star: 2.0 – 2.2 tCO_2e/tfs
Above 2.2 tCO_2e/tfs: Not eligible for green certification

The threshold will be reviewed every three years, ensuring constant ambition in line with climate goals.

Green Steel is not just about lowering emissions,it is about **embedding recycling, renewable energy, hydrogen and energy efficiency** into steel production, linking ship recycling and scrap recovery directly with India's **circular economy vision**. This makes India's maritime sector a critical contributor to the **Green Steel ecosystem**, reinforcing both industrial competitiveness and sustainability.

Emissions Covered :
Scope 1 : Direct emissions from steel making
Scope 2 : Indirect emissions from purchased electricity
Scope 3 : Agglomeration, pellet making, coke making, beneficiation, raw materials

Technology Demonstration by CSL

Hydrogen Propulsion Vessel

Vessel Overview – Built by Cochin Shipyard Ltd (CSL)

- **Type:** Green Hydrogen Fuel Cell Inland Passenger Vessel
- **Design:** 24-metre twin-hull *Catamaran*
- **Capacity:** 50 passengers, fully air-conditioned
- **Propulsion:** Hydrogen fuel cell drivetrain (CSIR + KPIT collaboration)

Operation & Deployment

- Launched under **Harit Nauka Initiative** by PM in Feb 2025
- Reached **Varanasi (IWAI Terminal, Jalhupur)** for river trials on Ganga
- Service between **Kashi and Prayagraj** during **Mahakumbh**
- Trial speed: **20–25 km/h**, monitored under IWAI & CSL supervision

Strategic Impact for India

- First practical demonstration of **zero-emission passenger vessel** in India
- Validates hydrogen fuel cell technology for future coastal & sea vessels
- Positions CSL as a future **builder of green ships for domestic and export markets**

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Hydrogen Propulsion Vessel by CSL (Cochin Shipyard Ltd.)

1. India's Push for Green Marine Technology

India has entered a transformative phase in maritime innovation with the launch of its **first indigenously developed hydrogen fuel cell inland vessel**. This milestone aligns with India's broader **Atmanirbhar Bharat**, **Harit Nauka**, and **Net Zero 2070** commitments, showcasing the nation's ability to pioneer future-ready green shipping technologies.

2. Vessel Overview - Indigenous Hydrogen Fuel Cell Ferry

This vessel, launched by **Cochin Shipyard Ltd. (CSL)**, represents a technological breakthrough in clean inland navigation.
FeatureSpecificationType : Green Hydrogen Fuel Cell Inland Passenger Vessel
Design : 24-metre Twin-Hull Catamaran
Capacity: 50 Passengers (Fully Air-Conditioned)
Propulsion: Hydrogen Fuel Cell Drivetrain (CSIR–KPIT Collaboration)

The fuel cell system is based on **PEM (Proton Exchange Membrane)** technology

jointly developed under **CSIR's NMITLI Programme**, manufactured by KPIT.

The vessel is designed for **zero-emission, noise-free, vibration-free navigation**, making it ideal for ecologically sensitive inland routes.

3. Development & Deployment
Launched under *Harit Nauka Initiative* by Hon'ble PM in **February 2025**
Between *Varanasi (IWAI Terminal, Jalhupur)* and *Kashi–Prayagraj* stretch during *Mahakumbh*
Operational Speed: 20–25 km/h
Supervision: IWAI & CSL monitoring real-time performance

4. CSIR–KPIT Collaboration & National Innovation Ecosystem
This project stems from breakthroughs under **CSIR's New Millennium Indian Technology Leadership Initiative (NMITLI)**, India's largest publicly funded R&D programme.
CSIR-NCL & CSIR-CECRI developed the core fuel cell technology
KPIT Technologies engineered marine integration
CSL designed and built the vessel platform

Dr. Jitendra Singh (MoST & CSIR Vice President) hailed this as a "success story emerging from India's public-private innovation ecosystem."

5. Strategic Impact for India

First Practical Demonstration of Hydrogen Marine Propulsion in India
Proves viability of hydrogen fuel cells in real-world inland water transport.

Foundation for Future Ocean-Going Zero-Emission Vessels
Although tested inland, the vessel paves the path for scaling hydrogen technology to coastal and ocean shipping.

Positions CSL as a Future Global Builder of Green Vessels
Exports to South Asian/African inland waterways and ferries.

Supports National Hydrogen Mission
Demonstrates maritime application pathways for green hydrogen produced under MNRE's mission.

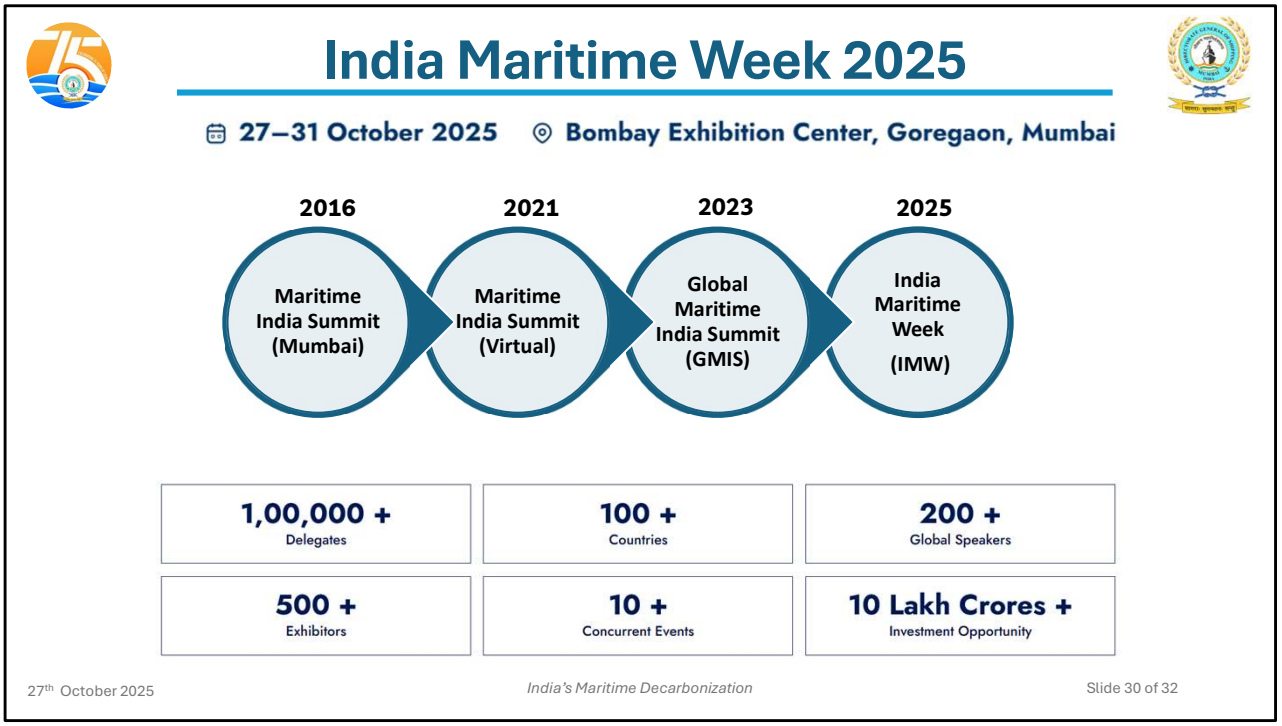
6. National Vision & Next Steps

This technology demonstration directly contributes to India's maritime decarbonisation roadmap:

- Integration into **National Green Shipping Policy (NGSP)**
- Future deployment on **National Waterways (NW-1, NW-2)**
- Scaling to **freight barges, coastal ferries, patrol vessels**
- Future export to **Global South partners** under "Make for World"

This hydrogen vessel is not just a prototype, it is a **signal of India's maritime transition**, from conventional diesel fleets to **clean, indigenous, export-capable hydrogen vessels**. It bridges **R&D to real deployment**, making India a frontrunner in zero-emission shipbuilding.

"From Harit Nauka to Hydrogen Ships - India is designing the future of green navigation."



India Maritime Week 2025, taking place from 27th to 31st October at the Bombay Exhibition Center in Mumbai. This week builds on the legacy of the Maritime India Summits held since 2016. We progressed from Mumbai and virtual formats to the Global Maritime India Summit, and now usher in India Maritime Week.

This event will host over 1,00,000 delegates from more than 100 countries, bring together 200+ global speakers, showcase 500+ exhibitors, and feature 10+ concurrent events.

Most importantly, it represents an investment opportunity of over 10 lakh crores—a testament to India's maritime growth and vision.

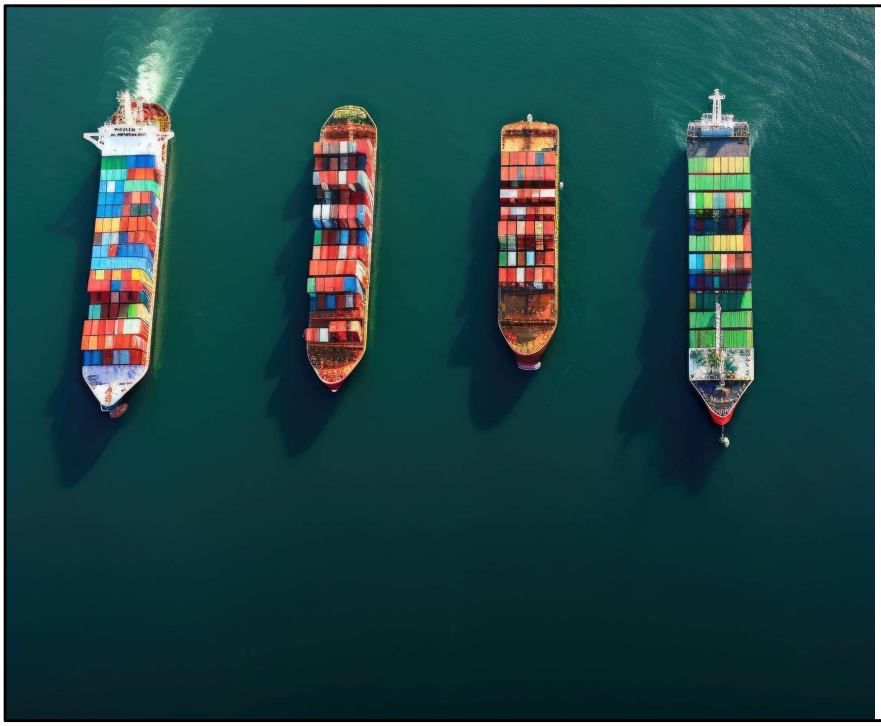
India Maritime Week 2025 is where the world's maritime leaders, innovators, and investors converge to shape the future of progressive, sustainable, and globally integrated maritime logistics.

Highlights include the Green Maritime Day focusing on maritime decarbonization, the Blue Economy Finance & Investment Forum, and the India Maritime Heritage showcase that celebrates our rich maritime legacy.

The sessions include the Maritime Leader's Conclave, Ports of the Future Partnership under the Quad Initiative, and the Maritime Digitalization & Future Tech Summit, emphasizing the role of innovative technologies.

Discussions such as SAGARMANTHAN—the Great Oceans Dialogue, the Global Maritime CEO Forum, and the Women in Maritime SheEO Conference, empowering female leadership.

I encourage all stakeholders and participants to actively engage in this dynamic forum, helping to steer India's maritime future toward resilience, sustainability, and global competitiveness.



संगच्छध्वं
संवदध्वं
सं वो मनांसि
जानताम्।

"Move together,
speak together,
may your minds
be in harmony."
(Rigveda 10.191.2)

Ministry of Ports,
Shipping & Waterways
Government of India