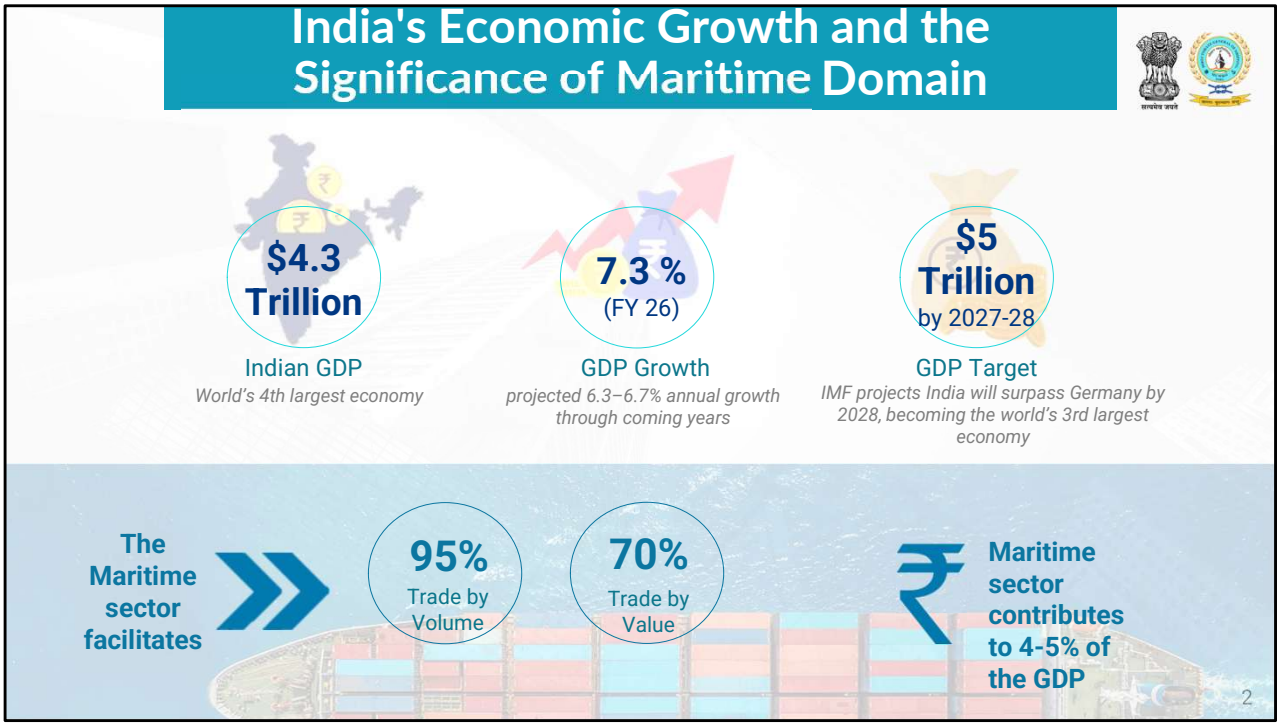

“It gives me great pleasure to be part of the 5th INSA Technical Paper Presentation Competition, a distinguished platform that brings together the brightest young minds from India’s maritime academies. This initiative reflects the growing maturity of our maritime training ecosystem, where academic rigor, innovation, and professional excellence converge to build the future of our seafaring community.

I commend INSA for consistently nurturing the culture of technical inquiry and critical thinking among aspiring maritime professionals. Competitions like these not only encourage innovation but also strengthen the essential bridge between academic learning and real-world maritime challenges. The insights gained here will undoubtedly shape safer, greener, and more efficient maritime operations for years to come.

To all the participants, I urge you to continue exploring, questioning, and innovating. The maritime sector awaits leaders who are not only skilled mariners but also thinkers, problem-solvers, and contributors to national and global progress.

I extend my best wishes to the organizers, institutions, faculty mentors, and above all, the cadets who make this event meaningful. May this competition

inspire a new wave of excellence and reinforce India’s position as a strong and forward-looking maritime nation.”

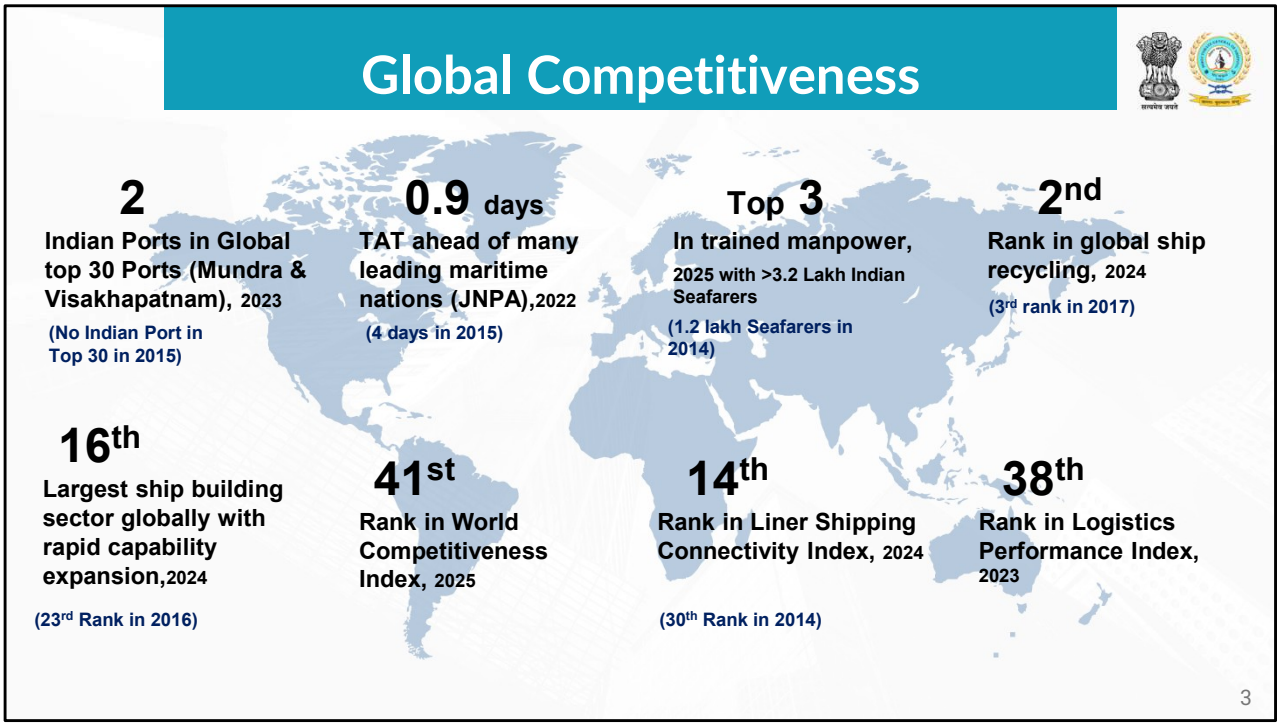



**India's Economic Growth and the Significance of Maritime Domain**

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.




## 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.

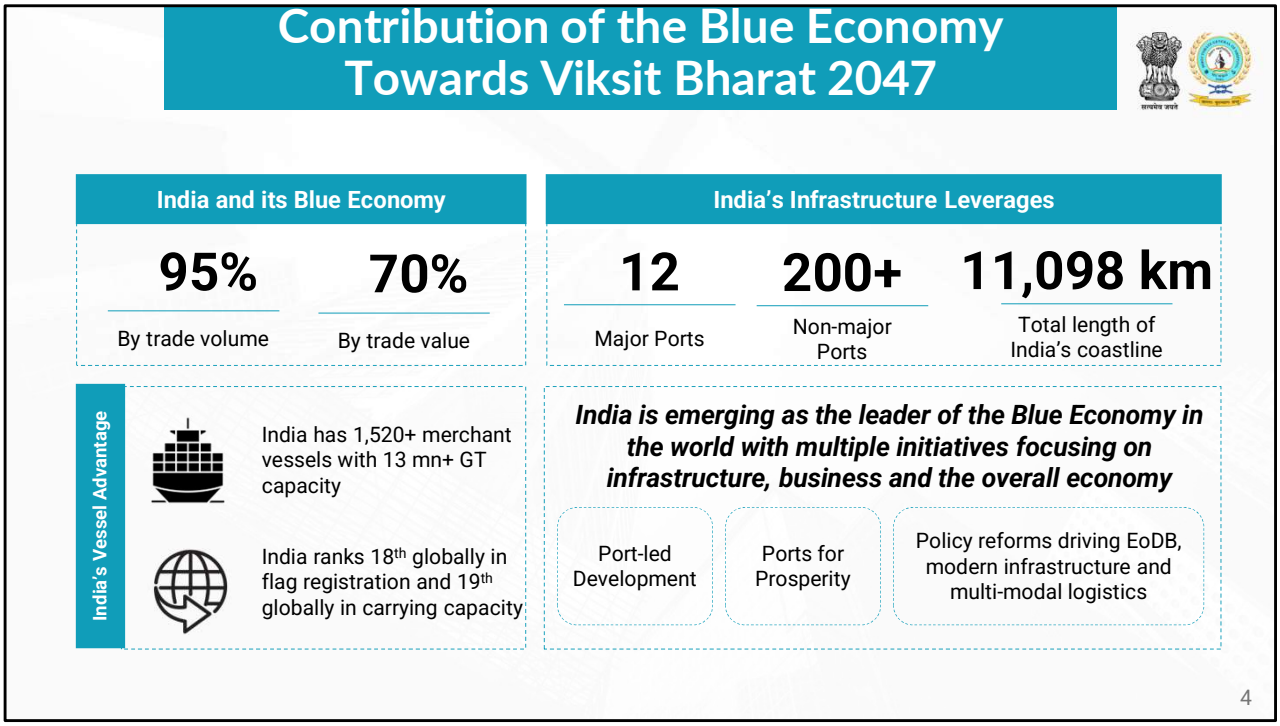
**Shipbuilding Sector**: India's shipbuilding industry has advanced from **23rd globally in 2016 to 16th in 2024**, backed by financing reforms, capacity expansion, and the recent ₹69,725 crore package aimed at building a globally competitive ecosystem.

**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**.



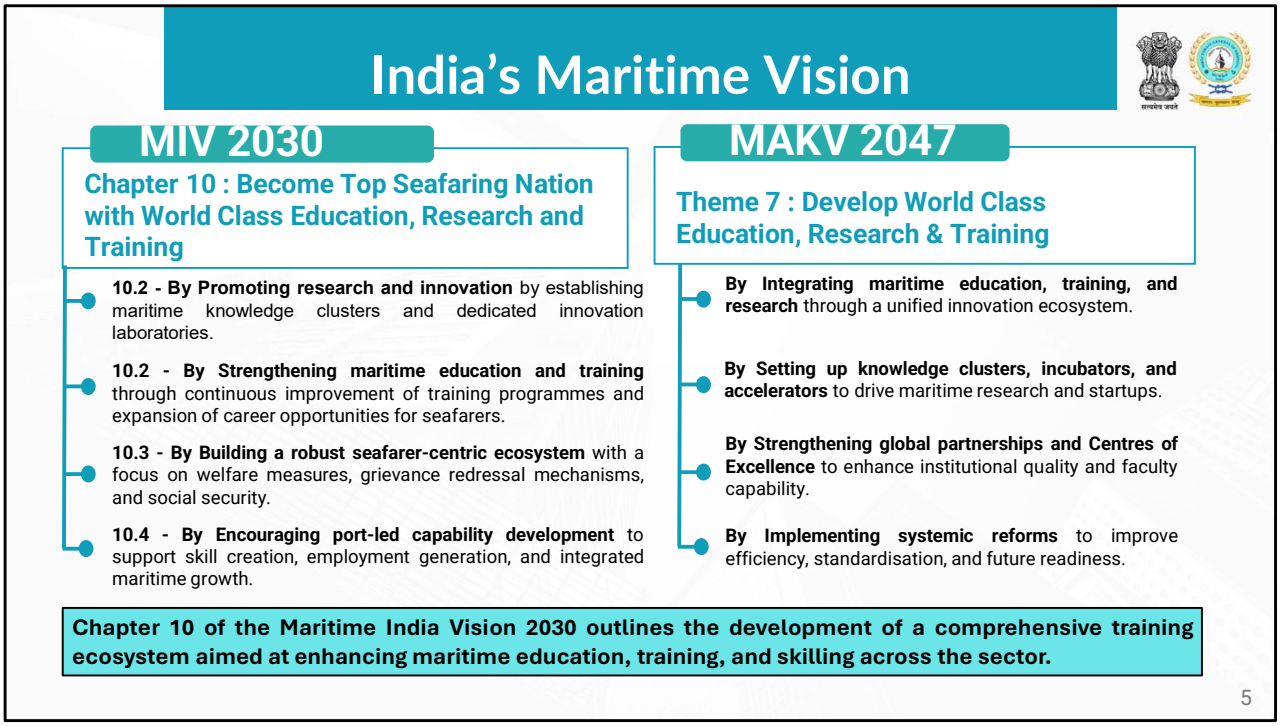

**Contribution of the Blue Economy**

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.




## India's Maritime Vision

India's Maritime Vision 2030 and Maritime Amrit Kaal Vision 2047 establish a long-term framework for strengthening maritime education, training, and research. The focus is on integration of education, training, and research through knowledge clusters, innovation ecosystems, and Centres of Excellence. The vision emphasizes institutional strengthening, global partnerships, standardisation, and systemic reforms to support capacity building, workforce development, and future readiness of the maritime sector. These measures are intended to support sustained maritime growth, employment generation, and global competitiveness.

# Facilitation through Legislation

Progressive policies and modernized regulations create an enabling environment for investment, ease of doing business, and global competitiveness.

**Merchant Shipping Act, 2025 –** Modernizes maritime regulations by broadening the definition of vessels, easing ownership norms, and aligning India's shipping framework with global standards, thereby strengthening maritime capabilities.

**Indian Ports Act, 2025 –** Replaces the century-old 1908 Act, introducing a modern regulatory framework for port operations, management, and environmental safeguards. It ensures tariff transparency and mandates pollution control and disaster management plans at ports.

**Coastal Shipping Act, 2025 –** Enhances the role of coastal and inland shipping, promoting efficient use of waterways as a sustainable, cost-effective transport mode that reduces logistics costs and congestion.

**Bill of Ladings Act, 2025** – Establishes a modern legal framework for electronic and physical bills of lading, enhancing transparency, traceability, and security in maritime trade documentation.

**Carriage of Goods by Sea Act, 2025** – Updates liability and carriage rules to align with international conventions, ensuring fair, efficient, and standardized practices for transporting goods by sea.

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## Facilitation through Legislation

Progressive policies and modernized maritime laws aim to create an enabling environment for investment, ease of doing business, and global competitiveness in India's shipping and port sectors.

### Major Legislative Reforms (2025)

### Merchant Shipping Act, 2025

- Modernizes maritime regulations.
- Broadens the definition of vessels.
- Simplifies ownership norms.
- Aligns India's shipping framework with global standards.
- Strengthens overall maritime capabilities.

### Indian Ports Act, 2025

- Replaces the Indian Ports Act, 1908.
- Introduces a modern regulatory framework for port operations and

management.
- Enhances environmental safeguards.
- Ensures tariff transparency.
- Mandates pollution control and disaster management plans at ports.

**Coastal Shipping Act, 2025**
- Promotes coastal and inland water transport.
- Encourages efficient use of waterways.
- Supports sustainable and cost-effective transportation.
- Helps reduce logistics costs and congestion.

**Bill of Ladings Act, 2025**
- Establishes a modern legal framework for bills of lading.
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**Carriage of Goods by Sea Act, 2025**
- Updates liability and carriage rules.
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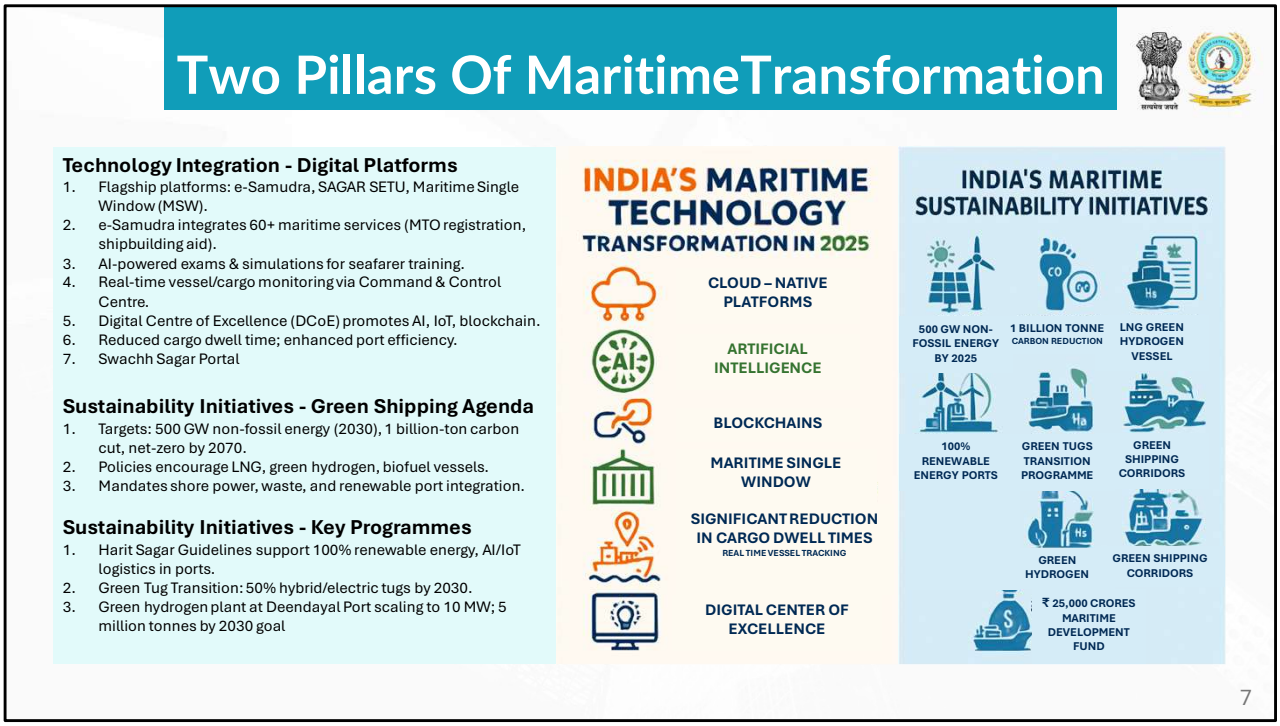



**Two Pillars of Maritime Transformation**

India's maritime transformation is being led through two parallel and reinforcing pillars, Technology integration and Sustainability adoption. On the technology front, flagship digital platforms such as e-Samudra, SAGAR SETU and the Maritime Single Window are reshaping port, fleet and regulatory services. These platforms integrate over sixty maritime functions, from vessel registration to shipbuilding support, while AI-powered exams, simulations and real-time command centres are modernising training and operational visibility.

The Digital Centre of Excellence is now promoting advanced technologies such as AI, IoT and blockchain, targeting reduced cargo dwell times, predictive logistics and enhanced transparency. Initiatives like the Swachh Sagar Portal and automated monitoring systems are creating a unified digital maritime ecosystem.

Parallel to this, India's sustainability pillar is anchored in national commitments — 500 GW of non-fossil energy by 2030 and one billion tonnes of carbon reduction. Maritime policies now actively promote LNG, green hydrogen and

biofuel-based vessels, alongside mandatory adoption of shore power, waste reception and renewable port integration.

Through programmes such as the Harit Sagar Guidelines, Green Tug Transition and the planned 10 MW hydrogen facility at Deendayal Port, India is aligning port infrastructure with future fuel readiness. Together, these two pillars position India not only to meet regulatory compliance but to emerge as a global leader in green, intelligent and future-ready maritime operations.


**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,

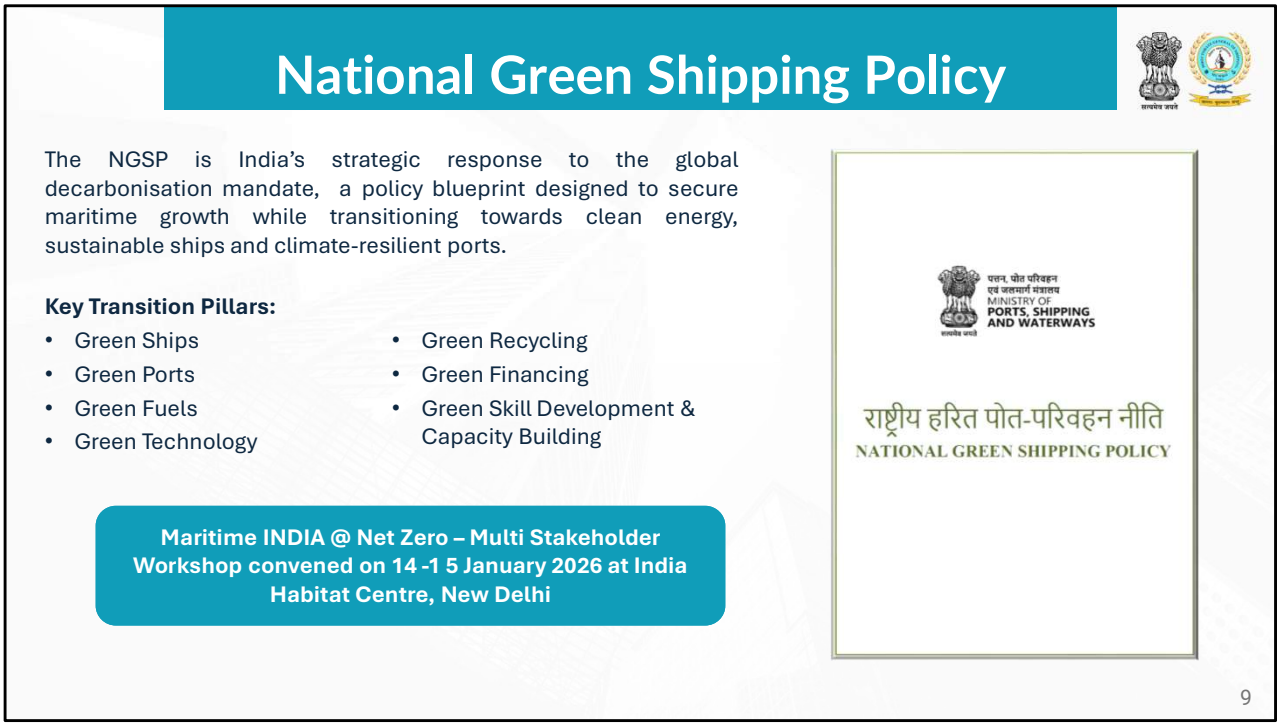
and green ammonia. These fuels are being introduced through detailed guidelines to support a phased shift from transitional to zero-carbon fuels.

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.




**National Green Shipping Policy (NGSP)**

The **National Green Shipping Policy (NGSP)** represents **India's comprehensive maritime decarbonisation roadmap**, designed to align the shipping and port ecosystem with global climate imperatives while simultaneously safeguarding economic growth, trade competitiveness and industrial development. As articulated in the consultative framework, NGSP is **not merely an environmental initiative**, but a **strategic transformation agenda** intended to position India as a **global hub for green ships, green fuels, green ports and maritime innovation**.

The policy draws momentum from **international drivers** such as the **IMO 2023 GHG Strategy** and India's **COP-26 Panchamrit commitments**, while remaining anchored in domestic maritime priorities. It adopts a **value-chain approach**, embedding sustainability across vessel design, fuel transition, port infrastructure, ship recycling, digital governance and financial mechanisms. Importantly, NGSP does not operate in isolation; it is structurally aligned with **Maritime India Vision 2030, Maritime Amrit Kaal Vision 2047, Sagarmala, and Harit Sagar guidelines**, thereby creating a **unified and forward-looking national maritime strategy** rather than fragmented initiatives.

**Key Transition Pillars**

**Green Ships**

Focuses on **energy-efficient vessel design, retrofitting of existing fleets, adoption of zero- and low-emission propulsion systems, and progressive green certification norms**. The long-term intent is to establish India as a **shipbuilding and retrofit hub** for next-generation low-carbon vessels serving both domestic and international markets.

**Green Ports**

Targets **port decarbonisation through shore power (OPS), electrification of cargo-handling equipment, renewable energy integration, emission monitoring systems, green corridors, and alternate fuel bunkering infrastructure**. Ports are envisioned as **multi-energy maritime hubs** supporting both operational efficiency and environmental stewardship.

**Green Fuels**

Promotes a **phased transition toward alternative marine fuels** including **biofuels, LNG, methanol, hydrogen and ammonia**, coupled with domestic production ecosystems and bunkering networks. The objective is to evolve India from a fuel importer to a **future global supplier of green marine fuels**.

**Green Technology & Innovation**

Encourages **digitalisation, data-driven maritime operations, hybrid propulsion systems, energy-saving devices, automation and indigenous technology development**, ensuring that innovation becomes a cross-cutting enabler across ships, ports and regulatory systems.

**Green Recycling**

Envisions **modernisation of ship recycling clusters such as Alang** through **Hong Kong Convention-compliant practices**, strengthened hazardous-waste management, circular-economy principles and safe labour standards, positioning India as a **global leader in environmentally sound ship recycling**.

**Green Financing & Collaboration**

Calls for **dedicated green maritime funds, ESG-linked financing, fiscal incentives, blended finance models, PPP structures and international cooperation frameworks** to de-risk investments and ensure equitable transition pathways for both large enterprises and MSMEs.

**Green Skill Development & Capacity Building**

Recognises that technological transition must be matched by **human capital readiness**, through structured training programmes, certification reforms, institutional strengthening and continuous professional development across seafarers, port personnel, recyclers and regulators.

**Strategic Intent**

At its core, NGSP seeks to **shift India's maritime sector from reactive regulatory compliance to proactive global leadership**. The emphasis is on creating a maritime ecosystem that **exports technology, services and green solutions rather than environmental externalities**. The policy underscores a **just and inclusive transition**, ensuring that industry stakeholders, labour forces, coastal communities, MSMEs and emerging enterprises are integrated into the transformation journey.

In summary, NGSP functions as **India's national reference framework for green maritime transformation**—linking sustainability with competitiveness, innovation with governance and environmental responsibility with long-term economic resilience.


**Maritime INDIA @ Net Zero**

This slide sets the overall context of the *Maritime INDIA @ Net Zero* initiative, which was conducted on **14–15 January 2026 at India Habitat Centre in hybrid mode**. The workshop was **jointly organised by the Directorate General of Shipping and NCoEGPS at TERI**, and it was designed not merely as a conference but as a **high-level, multi-ministerial action and governance platform**.

The primary objective of the workshop was to **translate the National Green Shipping Policy vision into phased, implementation-ready national pathways**. In other words, the focus was on moving from policy intent to actionable roadmaps aligned with **India's broader climate and sustainability commitments** rather than remaining at a conceptual discussion stage.

A key strength of the workshop was the **diversity of participation**. It brought together representatives from multiple ministries, regulatory bodies, ports, shipping companies, fuel providers, financial institutions, recycling stakeholders and international partners. This ensured that discussions covered the **entire**

**maritime value chain — ships, ports, fuels, recycling, finance and international collaboration** — instead of addressing them in isolation.

The workshop therefore functioned as a **coordination and convergence mechanism**, enabling different stakeholders to align priorities, identify gaps and accelerate India's transition toward a **sustainable and low-carbon maritime ecosystem**. It marked a shift from fragmented green initiatives toward a **structured and nationally coordinated decarbonisation pathway** for the maritime sector.

Moving to the **Way Forward**, the next steps are clearly sequential and execution-oriented:
First, the immediate priority is to **distil the workshop outcomes into session-wise action points and develop a consolidated implementation matrix**. This converts discussions into a structured planning tool.
Second, **focused stakeholder webinars** will be conducted to validate priorities, refine sequencing and ensure alignment before formal adoption.
Third, **inter-ministerial consultations** will be undertaken to finalise roles, timelines and coordination mechanisms. This step is critical to avoid siloed execution and ensure accountability.
Fourth, the **consolidated roadmap and action matrix will be submitted to NITI Aayog** for strategic guidance and national-level alignment, effectively linking maritime decarbonisation with broader national policy directions.
Finally, the emphasis shifts to **operationalising a governance and monitoring framework**, ensuring that implementation is measurable, coordinated and continuously reported rather than remaining policy intent on paper.

Overall, this slide reflects a transition from **dialogue to structured execution**, supported by institutional mechanisms and defined next steps.


**National Green Shipping Policy – The 7 Pillars**

*"To briefly place today's technical discussions in a broader policy context, I would like to touch upon the upcoming National Green Shipping Policy, which provides India's overarching framework for maritime decarbonisation."*

The National Green Shipping Policy is structured around **seven integrated pillars**, designed to build a **holistic green maritime ecosystem**, rather than addressing decarbonisation in isolation.

The first pillar focuses on **Green Ships**, where the emphasis is on **lifecycle-based decarbonisation**. This includes energy-efficient vessel design, fuel flexibility and low- to zero-emission ships, supported by green ship certification and lifecycle emissions accounting. The objective is to ensure that efficiency and emissions are addressed across the **entire life of a vessel**, not just at the point of operation.

The second pillar addresses **Green Ports**, recognising that ports are critical enablers of maritime decarbonisation. This pillar focuses on integrating **clean**

**energy, electrification and efficient operations**, positioning Indian ports as competitive and low-carbon logistics gateways. Initiatives such as electrification of port craft, shore power and green port guidelines directly align with this pillar.

The third pillar relates to **Green Fuels**, which adopts a **safe, phased and technology-neutral approach** to alternative marine fuels. The focus here is on lifecycle performance, bunkering safety and infrastructure readiness, ensuring that fuel transition progresses in a structured and operationally viable manner.

*"Together, these first three pillars establish the foundation for the technical themes being discussed today — efficiency, propulsion performance, fuel readiness and port integration."*

*"The remaining pillars of the National Green Shipping Policy focus on enabling implementation and ensuring that the transition is safe, inclusive and sustainable."*

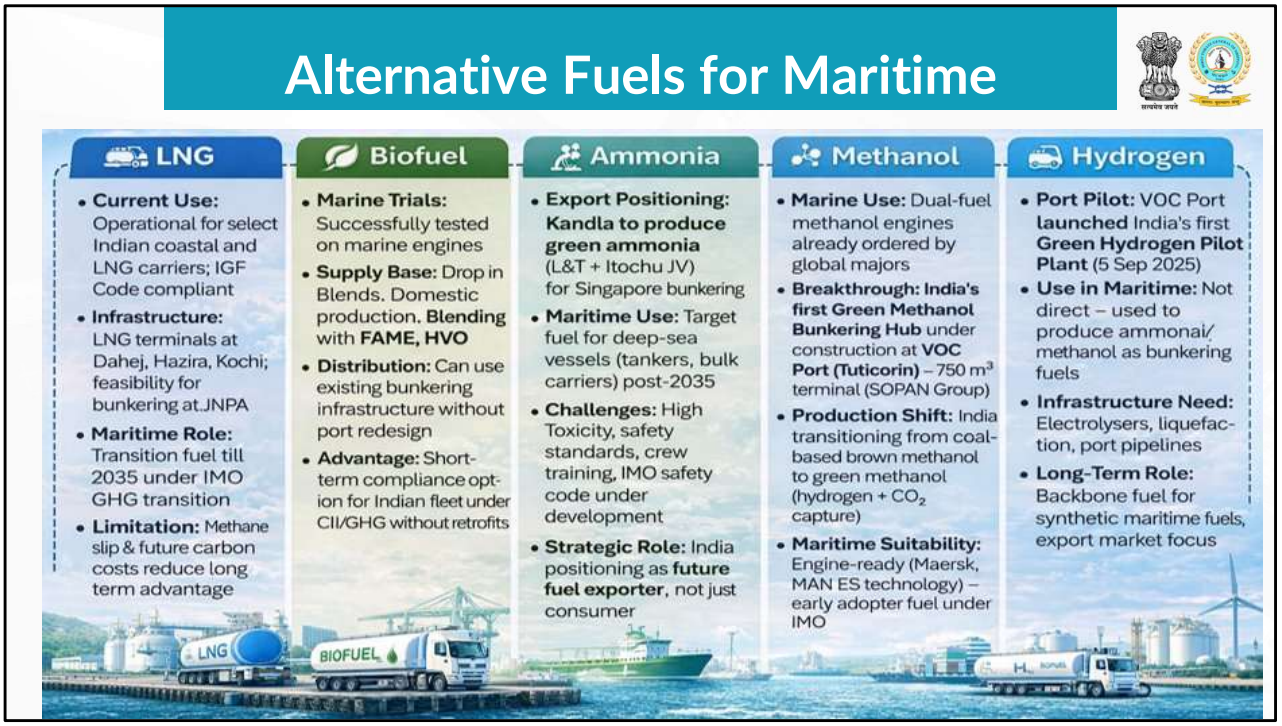
The fourth pillar addresses **Green Ship Recycling**, recognising the importance of closing the lifecycle loop. India is advancing **safe, environmentally sound and circular ship recycling**, aligned with the **Hong Kong Convention**, while strengthening worker safety, material recovery and digital transparency across recycling yards.

The fifth pillar focuses on **Green Finance**, which is critical for translating ambition into action. This pillar aims to **de-risk maritime decarbonisation** by mobilising affordable, long-term capital through blended finance, risk-sharing mechanisms and ESG-aligned investment frameworks, particularly for first movers.

The sixth pillar relates to **Green Skill Development and Capacity Building**. As new fuels, technologies and regulatory requirements emerge, preparing the **maritime workforce and institutions** becomes essential to ensure a just, inclusive and execution-ready transition.

The seventh pillar emphasises **Green Technology and Innovation**, encouraging the adoption and indigenisation of advanced maritime technologies. This includes the use of **digitalisation, pilot projects and innovation sandboxes** to enhance efficiency, safety and competitiveness across the sector.

*“Together, these pillars ensure that decarbonisation is supported by strong institutions, skilled people, accessible finance and innovation-led implementation.”*




**Alternative 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

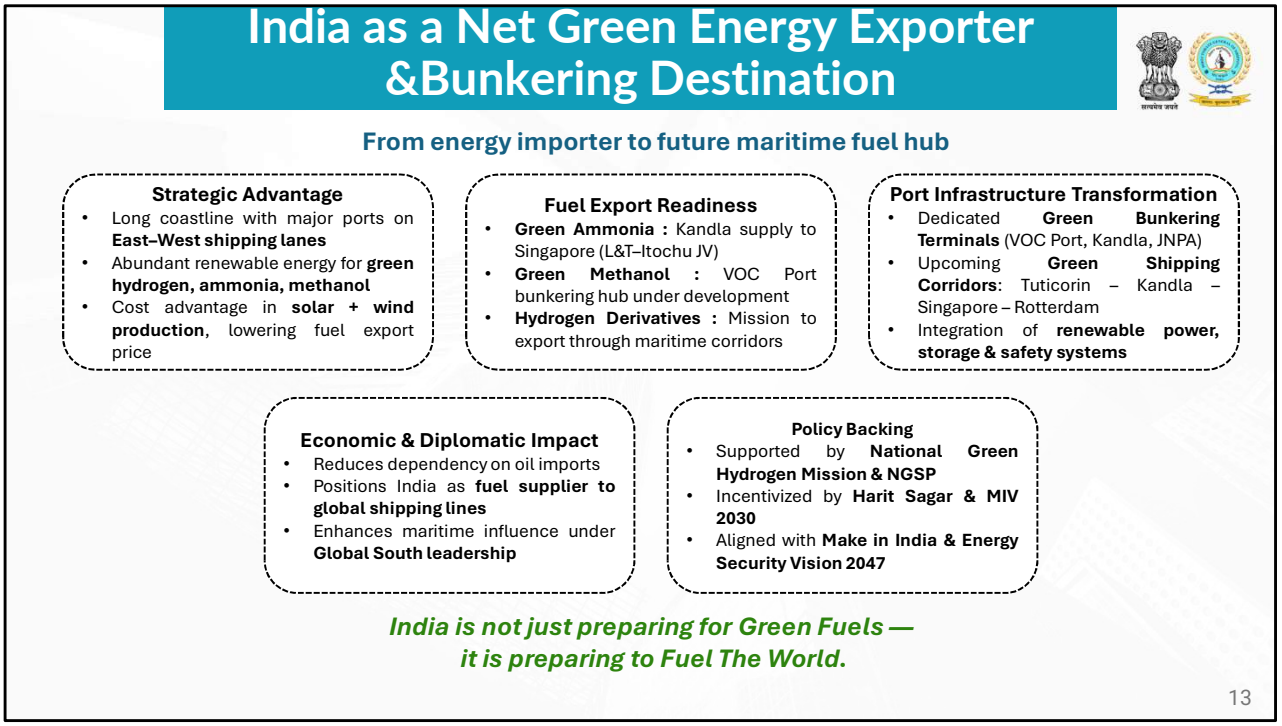
dedicated **safety code** and crew-training standards are finalised.
**Challenges :** High toxicity handling, new port safety zones, emergency response, and specialised storage/transfer systems.
**India's role :** Strong **export economics** (renewables + electrolyser scale). India can be a **fuel supplier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




**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**

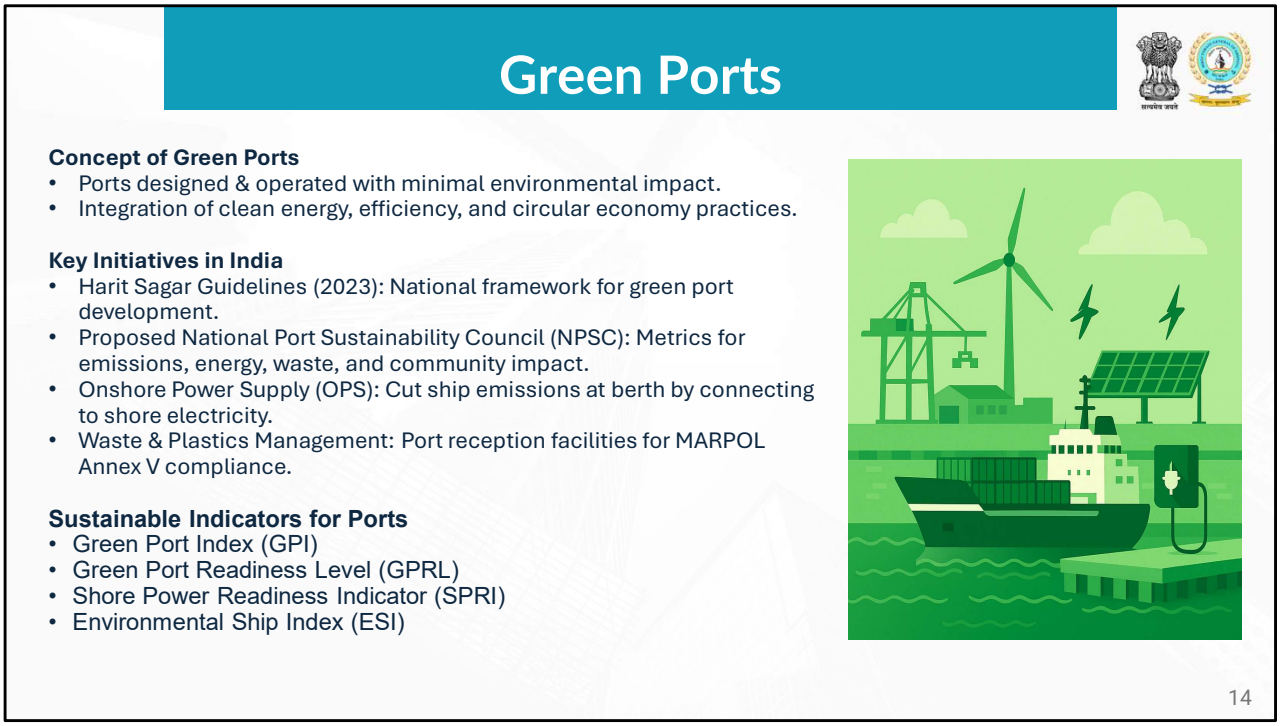
**4. Economic & Diplomatic Impact**
India's leadership in green fuel exports has a threefold strategic impact:
**Reduces dependence on crude oil imports** (currently 85% import-driven energy market)
**Positions India as a fuel supplier** to global shipping lines transitioning under IMO Net-Zero framework
**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*.**




**Green Ports – Driving Sustainable Maritime Growth**

*"Ports are the beating hearts of global trade, but they are also significant contributors to emissions. The idea of 'Green Ports' is to transform these engines of growth into anchors of sustainability."*

The **concept of Green Ports** focuses on designing and operating ports with **minimal environmental impact**. This means integrating **clean energy**, **resource efficiency**, and **circular economy practices** into every aspect of port planning, operation, and logistics.

India has already taken pioneering steps in this direction through several flagship initiatives.

The **Harit Sagar Guidelines**, launched in 2023, provide a **national framework** for green port development, setting out principles for clean energy adoption, pollution control, waste management, and biodiversity protection.

Building upon this, the **National Port Sustainability Council (NPSC)** ,

**envisaged**, will establish measurable **metrics for emissions, energy use, waste, and community impact**, ensuring that environmental performance becomes a benchmark for all Indian ports.

The next major enabler is **Onshore Power Supply (OPS)**, which allows ships at berth to connect directly to the grid and switch off their auxiliary engines. This single intervention can drastically reduce **$CO_2$, NOx, and SOx emissions** in port zones, improving air quality and public health in surrounding cities.

Complementing this, the Directorate is driving **Waste and Plastics Management** under **MARPOL Annex V compliance**, ensuring that port reception facilities can handle ship-generated waste and prevent marine pollution.

Together, these efforts yield tangible benefits:
**Reduction in greenhouse gas emissions and pollution**,
**Improved air quality** in port-adjacent areas, and
A major boost to India's **Blue and Green Economy transition**.
Importantly, these initiatives are fully aligned with **IMO's decarbonisation goals** and India's long-term national vision , **Viksit Bharat 2047**.

*"In essence, Green Ports are not just an environmental necessity — they are the next competitive advantage for India's maritime sector. They signal that economic growth and ecological responsibility can, and must, advance together."*

## Sustainable Indicators for Indian Ports

*To translate the sustainability vision into measurable action, a structured set of indicators has been developed to evaluate and benchmark the environmental and operational performance of Indian ports.*

*The first is the **Green Port Index**, which assesses ports on their overall carbon footprint, energy efficiency, use of alternative fuels, and adoption of sustainable logistics and waste management practices. This index provides a clear picture of how each port contributes to reducing emissions and improving environmental stewardship.*

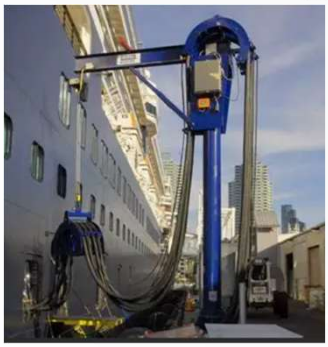
*The **Green Port Readiness Level**, or GPRL, measures how prepared ports are for the transition to cleaner energy systems and digital operations. It evaluates their compliance with global environmental standards and their readiness to adopt emerging technologies.*

*The third parameter is the **Shore Power Readiness Indicator**, which reflects the extent to which ports are equipped with shore-to-ship power infrastructure. This is a crucial enabler in reducing emissions from berthed ships, allowing vessels to draw renewable electricity instead of using onboard auxiliary engines.*

*Finally, the **Environmental Ship Index** encourages ship operators to voluntarily reduce emissions by adopting cleaner fuels and technologies. It introduces a transparent rating system that accounts for NOx, SOx, and $CO_2$ performance, rewarding environmentally responsible operations.*

*Collectively, these four indicators form a comprehensive framework for driving measurable sustainability across the Indian port ecosystem. By institutionalising these benchmarks, India is positioning its ports as global frontrunners in green logistics and opening pathways for participation in international green shipping corridors under its long-term Net Zero vision."*

## 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)
- **Paradip Port** - Newly commissioned. Delivered full load power to MV APJ Indrani at CB1 Berth.

***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)**.

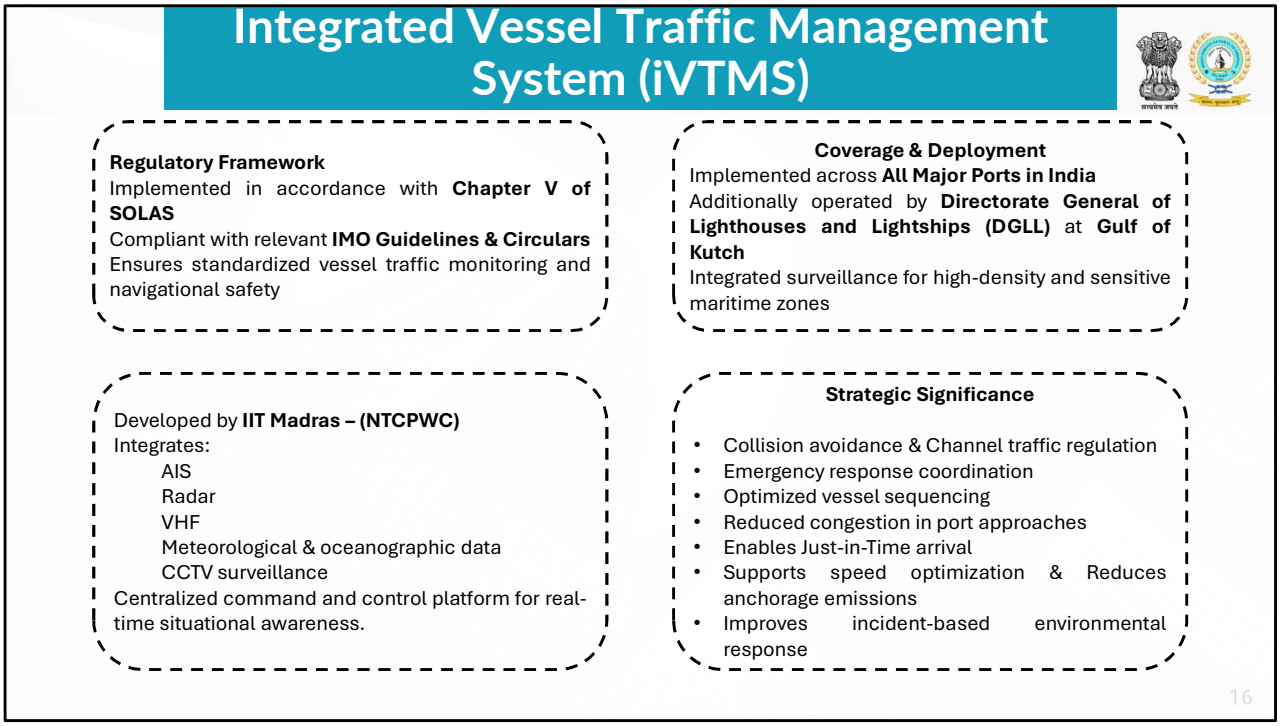
**VO Chidambaranar Port (Tuticorin)**
OPS installed at **Berths 2 & 3** (305 kW units), supporting auxiliary load supply and positioning VOC as a green maritime pilot port.

**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.

**Paradip Port** –
Newly commissioned.
Delivered full load power to MV APJ Indrani at CB1 Berth.

**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




**Integrated Vessel Traffic Management System (iVTMS)**

The Integrated Vessel Traffic Management System is a critical digital backbone for navigational safety and maritime governance in India.
It has been implemented in accordance with Chapter V of SOLAS and is fully aligned with relevant IMO guidelines and circulars. This ensures standardized vessel traffic monitoring and a harmonized approach to navigational safety across our ports.

From a deployment perspective, iVTMS has been implemented across all Major Ports in India. In addition, it is operated by the Directorate General of Lighthouses and Lightships in sensitive maritime zones such as the Gulf of Kutch. This enables integrated surveillance in high-density and strategically important coastal areas.

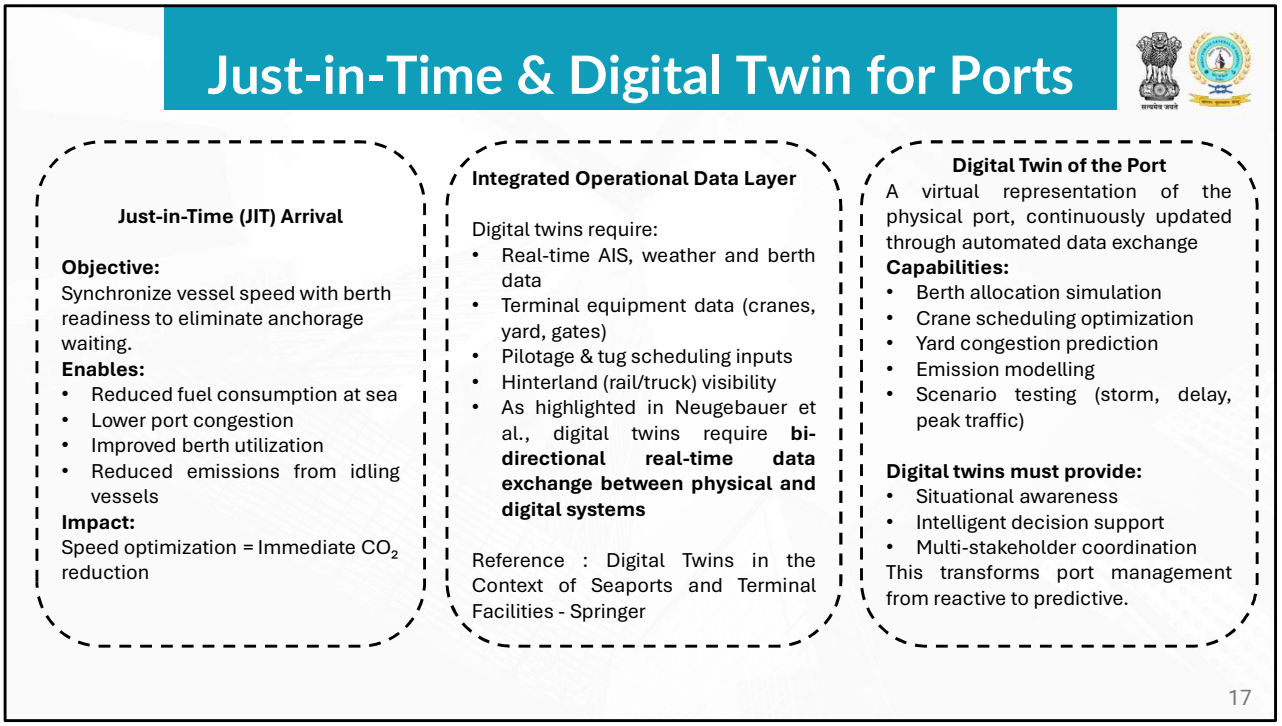
Technically, the system has been developed by IIT Madras under the NTCPWC framework. It integrates AIS, radar, VHF communication systems, meteorological and oceanographic data, and CCTV surveillance. All of this is brought together through a centralized command and control platform that provides real-time

situational awareness.
Strategically, the impact is significant.

It enhances collision avoidance and channel traffic regulation. It improves emergency response coordination and optimizes vessel sequencing to reduce congestion in port approaches. It enables Just-in-Time arrival, supports speed optimization, and reduces anchorage-related emissions.

Beyond safety and efficiency, iVTMS also strengthens environmental governance by improving incident-based environmental response and reducing unnecessary fuel consumption due to delays.

In essence, iVTMS is not just a traffic monitoring system — it is a digital enabler of safer, smarter, and greener port operations.




**Just-in-Time & Digital Twin for Ports**

This slide brings together two critical digital interventions — Just-in-Time arrivals and Digital Twin systems — both aimed at improving efficiency while directly reducing emissions.

First, on Just-in-Time arrival.
The objective is simple but powerful — synchronize vessel speed with berth readiness so that ships do not waste time waiting at anchorage. Traditionally, vessels arrive early and idle outside ports, leading to fuel wastage and avoidable emissions.

By enabling coordinated arrival planning, we reduce fuel consumption at sea, lower port congestion, improve berth utilization, and cut emissions from idling vessels.
Speed optimization alone results in immediate $CO_2$ reduction without requiring new fuel or new infrastructure. It is an operational efficiency measure with instant environmental impact.

Now, coming to Digital Twin.
A Digital Twin is a virtual representation of the physical port that is continuously updated through automated data exchange. But it is not just a visualization tool — it requires an integrated operational data layer.

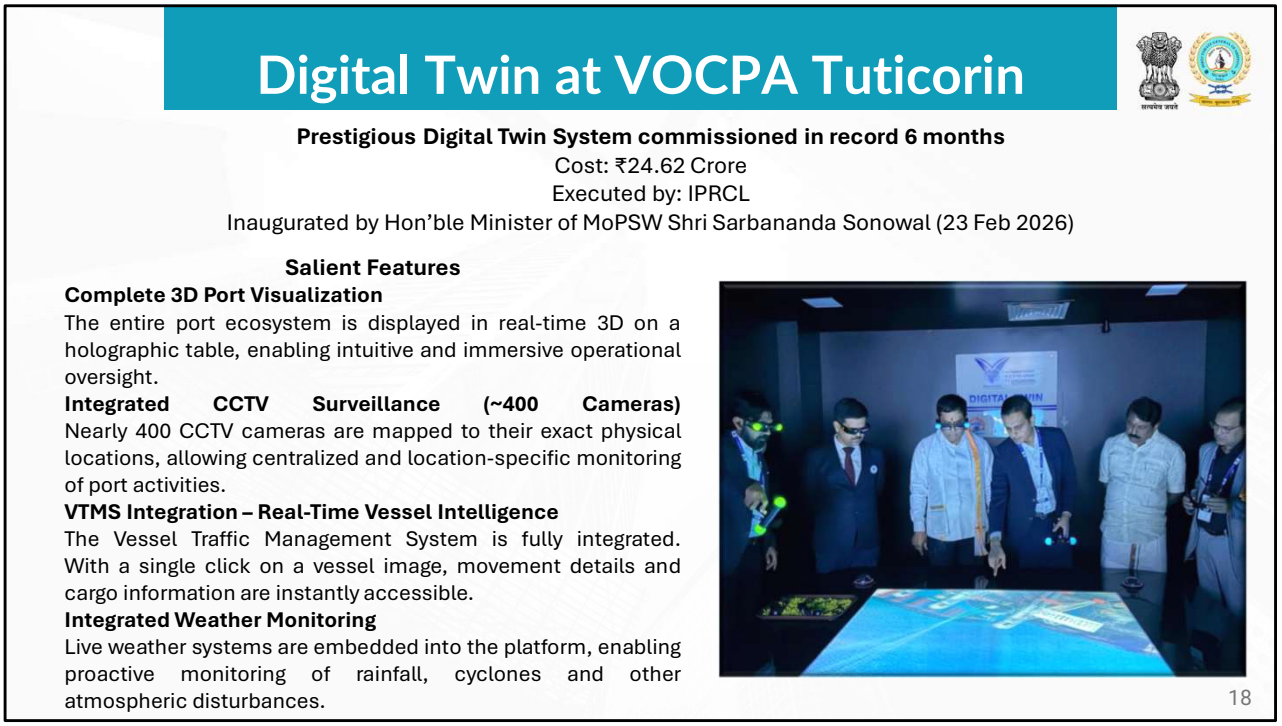
This includes real-time AIS inputs, weather data, berth status, crane and yard performance data, pilotage and tug scheduling, and even hinterland connectivity visibility.
Most importantly, digital twins function effectively only when there is bi-directional real-time data exchange between the physical port and the digital system. That is what enables predictive capability.

With such integration, ports can simulate berth allocation, optimize crane scheduling, predict yard congestion, model emissions, and test scenarios such as storms, delays, or peak traffic.

Digital twins must ultimately provide situational awareness, intelligent decision support, and multi-stakeholder coordination.

This shifts port management from reactive problem-solving to predictive, data-driven governance.

Together, Just-in-Time operations and Digital Twins represent the next phase of smart, green, and performance-driven port management aligned with our sustainability goals.




## Digital Twin at VOCPA Tuticorin

This slide presents a landmark initiative — the commissioning of the Digital Twin system at V.O. Chidambaranar Port Authority, Tuticorin.

This prestigious project was executed in a record time of six months at a cost of ₹24.62 crore and implemented by IPRCL. It was inaugurated by the Hon'ble Minister of Ports, Shipping and Waterways, Shri Sarbananda Sonowal, on 23rd February 2026.

The system reflects the Ministry's clear direction toward technology-driven, data-centric port governance.

One of its most striking features is the complete 3D visualization of the port ecosystem. The entire port area is displayed in real time on a holographic table, enabling immersive and intuitive operational oversight. This significantly enhances command-level situational awareness.

The system integrates nearly 400 CCTV cameras mapped to their exact physical

locations. This allows centralized monitoring while also enabling location-specific visibility of activities across the port premises.

The Vessel Traffic Management System is fully integrated into the Digital Twin platform. With a single click on a vessel image, real-time movement details and cargo information can be accessed instantly. This bridges vessel intelligence with port operations seamlessly.

In addition, live weather monitoring has been embedded into the system. Rainfall, cyclones and other atmospheric disturbances can be tracked proactively, strengthening disaster preparedness and operational resilience.

The Digital Twin at VOCPA demonstrates how Indian ports are moving beyond conventional monitoring toward predictive, integrated and intelligent port management.

It is a clear example of how digital transformation is being implemented on the ground — not just as a concept, but as an operational reality.


**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**.


**Just Transition in Maritime**

**This slide brings in a very important dimension of maritime decarbonisation — the human dimension.**

**Decarbonisation is not merely a fuel shift. It is fundamentally a workforce shift.**

**India today has approximately 3.23 lakh seafarers, accounting for nearly 12 percent of the global maritime workforce. This means that any global transition in fuels, propulsion systems, or operational models directly impacts Indian seafarers and maritime professionals.**

**Alternative fuels such as ammonia, hydrogen, methanol and low-flashpoint fuels introduce new safety considerations. They require different handling procedures, emergency protocols and technical competencies. Therefore, the transition demands structured and large-scale upskilling.**

**Under the Skills and Training pillar, the focus must be on modernizing STCW**

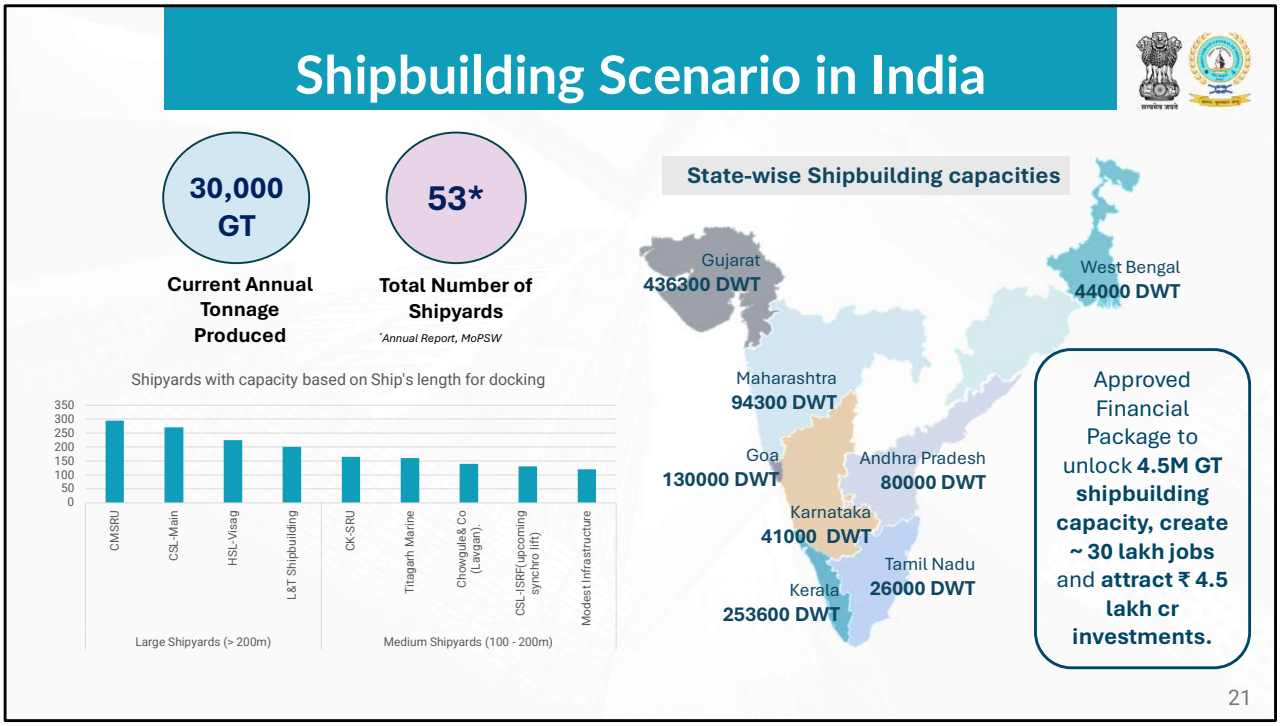
**frameworks, strengthening maritime training infrastructure and ensuring that our seafarers are future-ready for green fuels and digital systems.**

**From a Safety and Standards perspective, the approach has to remain health-and-safety first. Handling new fuels cannot compromise crew welfare. Alignment with MLC 2006 and global labour standards remains essential.**

**Equity and inclusion are equally important. The transition should not widen global skills gaps or marginalize developing maritime nations. Instead, it should create opportunities, promote diversity and ensure that the benefits of green transition are shared fairly.**

**In essence, a green transition must also be a fair transition.**

**If decarbonisation policies are designed with people at the core, we can ensure that sustainability strengthens both environmental performance and human dignity in the maritime sector.**




**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**

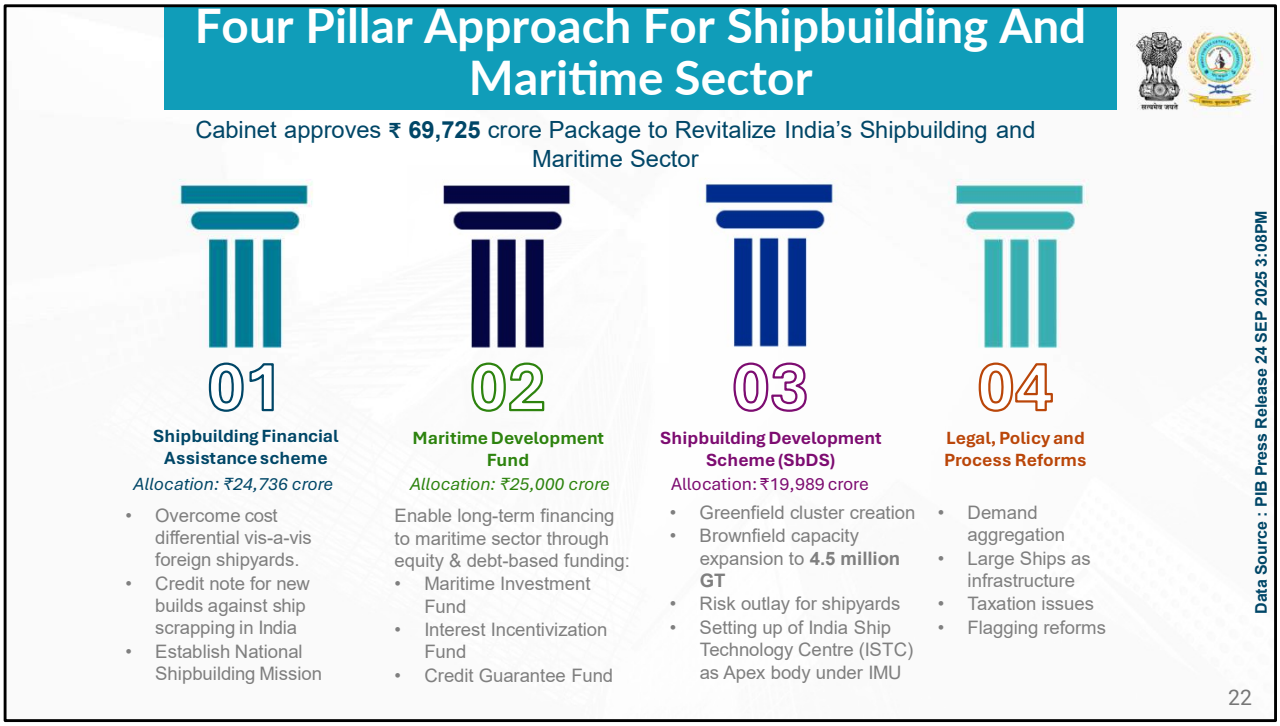
India has a handful of large shipyards capable of handling vessels >200m in length — such as **Cochin Shipyard Limited (CSL), Hindustan Shipyard Ltd. (HSL), L&T Shipbuilding, and**

**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:

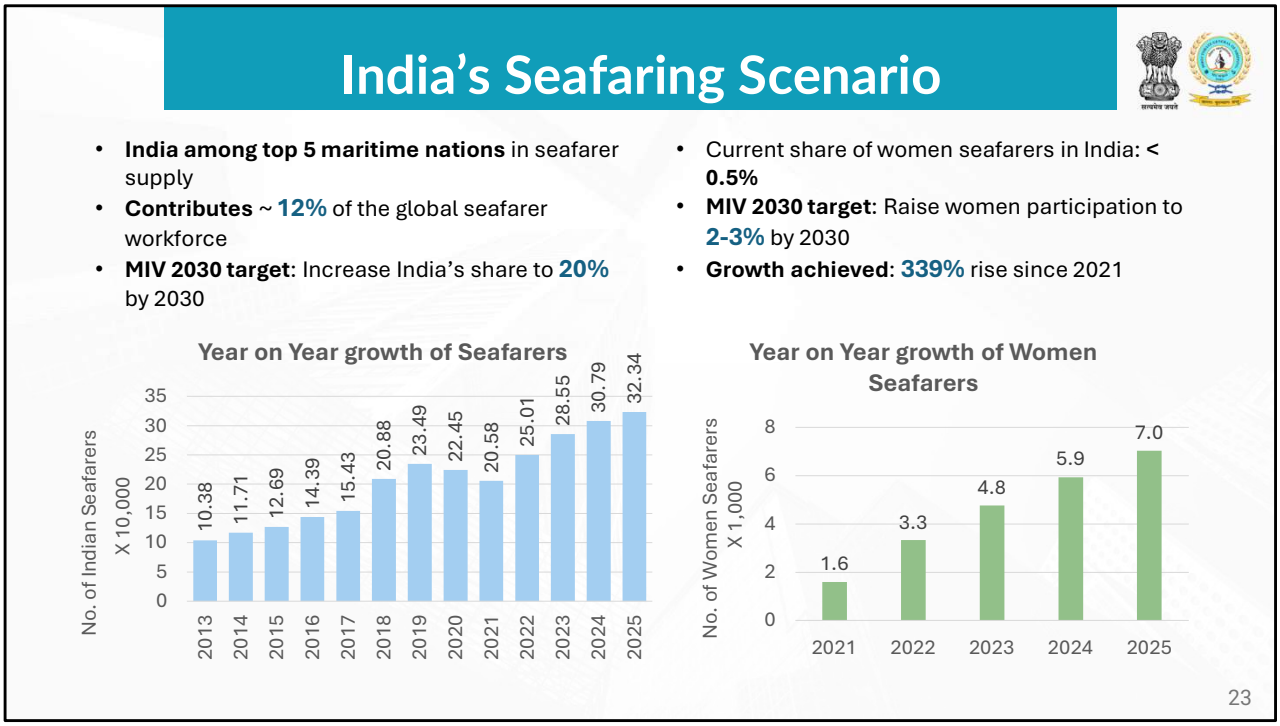
**Maritime Investment Fund** – to channel capital into greenfield projects.
**Interest Incentivization Fund** – to reduce borrowing costs for shipyards.
**Credit Guarantee Fund** – to reduce lender risk and unlock financing for vessel owners and builders.

**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.




**India's Seafaring Scenario**

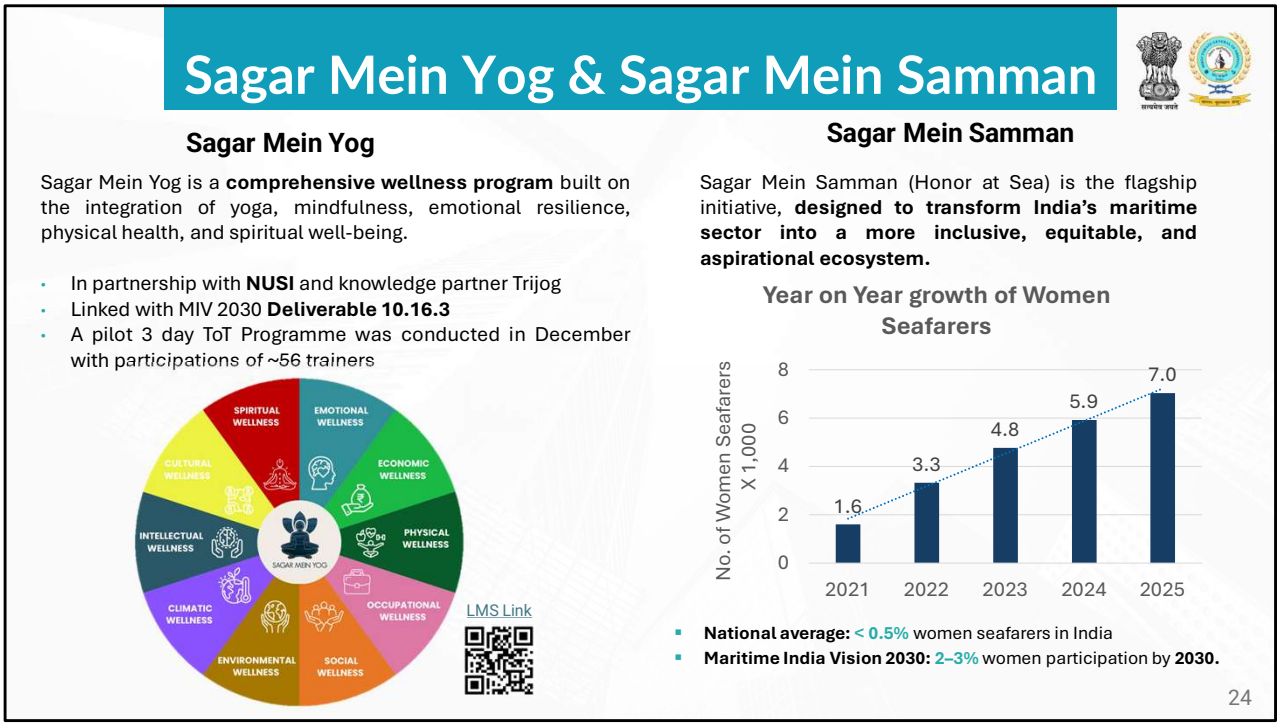
India is currently positioned among the **top five maritime nations** in terms of supplying seafarers to the global shipping workforce. The country contributes nearly **12%** of the world's seafarers, and under the **Maritime India Vision (MIV) 2030**, the target is to further increase this share to **20%** by 2030.

Over the past decade, India has witnessed **steady year-on-year growth** in the number of seafarers, as reflected in the bar chart. The seafarer pool has expanded significantly, showcasing India's increasing relevance in global maritime operations.

In terms of gender participation, the current share of women seafarers stands at **less than 0.5%**, but the growth trajectory is highly encouraging. MIV 2030 aims to raise this participation to **2–3%**. Notably, India has already achieved a **339% increase** in women seafarers over the last 5 years, as shown by the green chart.

Overall, the data highlights India's expanding maritime talent pool, strong global positioning, and focused efforts toward enhancing both workforce size and

gender inclusivity in the sector.




## Sagar Mein Yog

This slide introduces **Sagar Mein Yog (SMY)** as a **holistic wellness initiative for the maritime sector**, designed not merely as a yoga programme but as a **comprehensive mental, physical and emotional well-being framework** for seafarers and maritime professionals.

### Concept and Rationale

Sagar Mein Yog integrates yoga, mindfulness, emotional resilience, physical fitness and spiritual well-being into a structured programme tailored for maritime life.

The maritime profession involves long isolation at sea, irregular work cycles, high stress, fatigue and mental health challenges, and SMY is positioned as a preventive and corrective wellness mechanism rather than a recreational activity. It is therefore framed as a structured capacity-building and human sustainability initiative, not a standalone fitness module.

**Institutional Linkages**
Implemented in partnership with NUSI with Trijog as the knowledge partner, bringing domain expertise in counselling and mental wellness.
Linked to Maritime India Vision (MIV) 2030 – Deliverable 10.16.3, which focuses on seafarer welfare and well-being.
The programme is also being presented at the 136th IMO Council, indicating international visibility and positioning India as a leader in seafarer wellness frameworks.

**Wellness Dimensions Covered**
The circular graphic on the right illustrates that SMY is not limited to physical yoga but covers multi-dimensional wellness, including:
Emotional wellness – stress management and psychological balance
Physical wellness – fitness, stamina and lifestyle discipline
Occupational wellness – work satisfaction and fatigue management
Social wellness – interpersonal relations and onboard harmony
Environmental and climatic wellness – adaptability to sea conditions
Intellectual and cultural wellness – cognitive engagement and awareness
Spiritual wellness – inner balance and mindfulness
Economic wellness – financial awareness and long-term security mindset

This makes SMY a 360-degree human performance and resilience model for maritime professionals.

**Way Ahead / Implementation Path**
The next steps are structured and regulatory-aligned:
Formal STCW approvals for both Training of Trainers (ToT) and Yoga curriculum to ensure global acceptability.
Conduct of ToT programmes for MTIs, covering both pre-sea and post-sea phases, so trainers are standardised.
Integration of yoga and wellness modules into existing maritime training curricula, rather than creating parallel systems.
Phased rollout plan – starting with pre-sea institutes, then post-sea courses, and eventually at-sea deployment.
Monitoring and evaluation mechanisms to measure impact, collect feedback and allow course correction.

Sagar Mein Yog is positioned as a human-centric maritime reform, aiming to improve seafarer mental health, productivity, safety performance and long-term career sustainability.

It signals a shift from purely technical competency frameworks to balanced human wellness and resilience in the maritime ecosystem.

## Sagar Mein Samman - Gender Inclusion in Maritime

This slide highlights the progress and policy direction of gender inclusion in the Indian maritime sector, with a specific focus on the rise in women seafarer participation and the institutional initiatives driving this change.

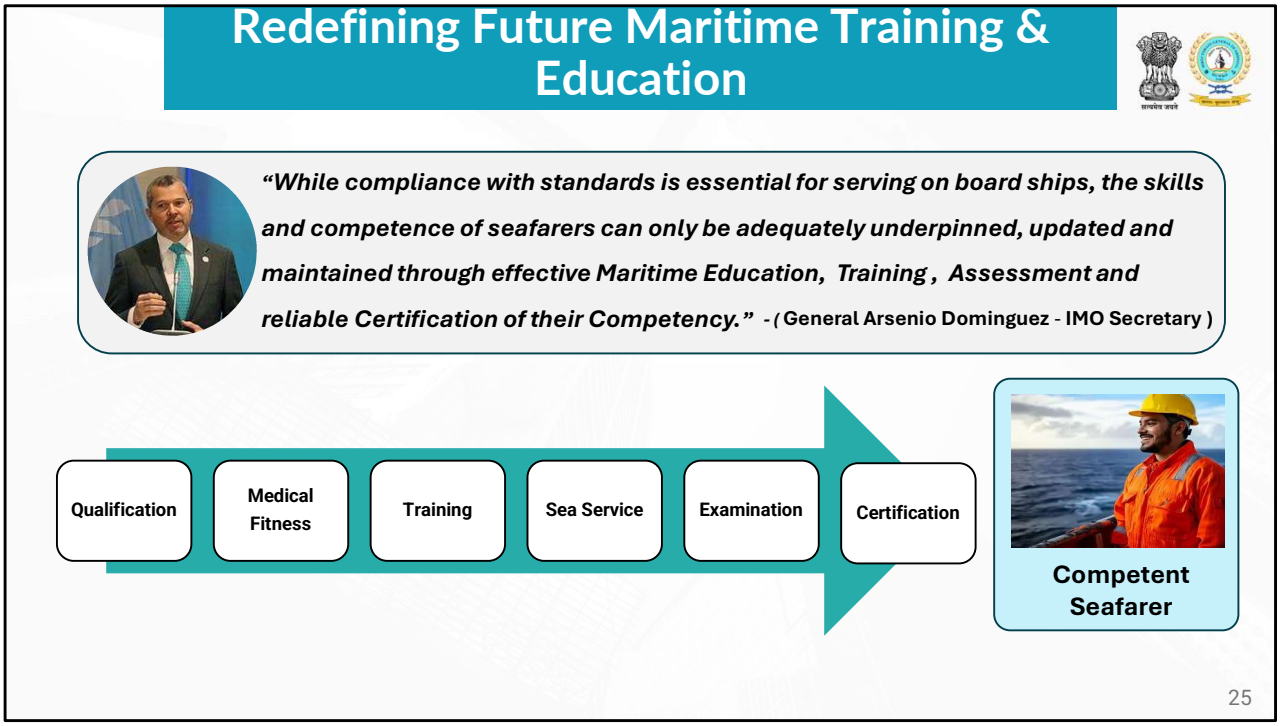
**Overall Seafarer Growth Context**
On the left side, we see the year-on-year growth of total Indian seafarers from 2013 to 2024.
The numbers indicate a steady expansion of India's maritime workforce, crossing 30 thousand seafarers by 2024.
This broader growth is important because gender inclusion is not happening in isolation — it is occurring alongside overall sectoral expansion, which provides more employment opportunities and capacity for diversification.

**Women Seafarer Growth Trend**
The central chart specifically captures **women seafarer growth**:
**2021 – 1.6 thousand**
**2022 – 3.3 thousand**
**2023 – 4.8 thousand**
**2024 – 5.9 thousand**
This shows **almost a four-fold rise in just four years**, indicating that targeted policy measures and awareness programmes are producing **visible and measurable impact**.
A key statistic reinforcing this trend is the **739% increase in registered women seafarers**, rising from **1,699 in 2015 to 14,255 in 2024**.
This reflects not just participation, but a **structural shift toward inclusivity and acceptance** within the maritime ecosystem.

**Institutional Financial Support**
To actively encourage entry into maritime careers, the Directorate General of Shipping provides **₹1,00,000 financial assistance** through the **Maritime Training Trust** for women cadets and ratings enrolling in pre-sea courses.
This is significant because financial barriers are often the **primary deterrent**, and this incentive directly addresses accessibility and affordability.

**Sagar Mein Samman – Structural Inclusion Initiative**
On the right side, the slide introduces **Sagar Mein Samman (Honor at Sea)** as the **flagship inclusion initiative** designed to transform India's maritime sector into a **more inclusive, equitable and aspirational ecosystem**.
Its goal is to build a **resilient and diverse maritime workforce**, and it operates through **six structural pillars**:
**Planning & Strategy**
**Training & Development**
**Research & Innovation**
**Governance & Compliance**
**Communications**
**Community Outreach**
These pillars ensure that gender inclusion is not treated as a one-time programme but as a **continuous, system-wide reform** embedded in policy, training, industry engagement and monitoring.

**Key Message**
The slide collectively conveys that **gender inclusion in maritime is transitioning from awareness to institutionalisation**.
Through **data-backed growth trends, financial incentives and structured initiatives like Sagar Mein Samman**, India is positioning its maritime workforce to be **diverse, future-ready and globally competitive**, rather than merely compliant with equality norms.



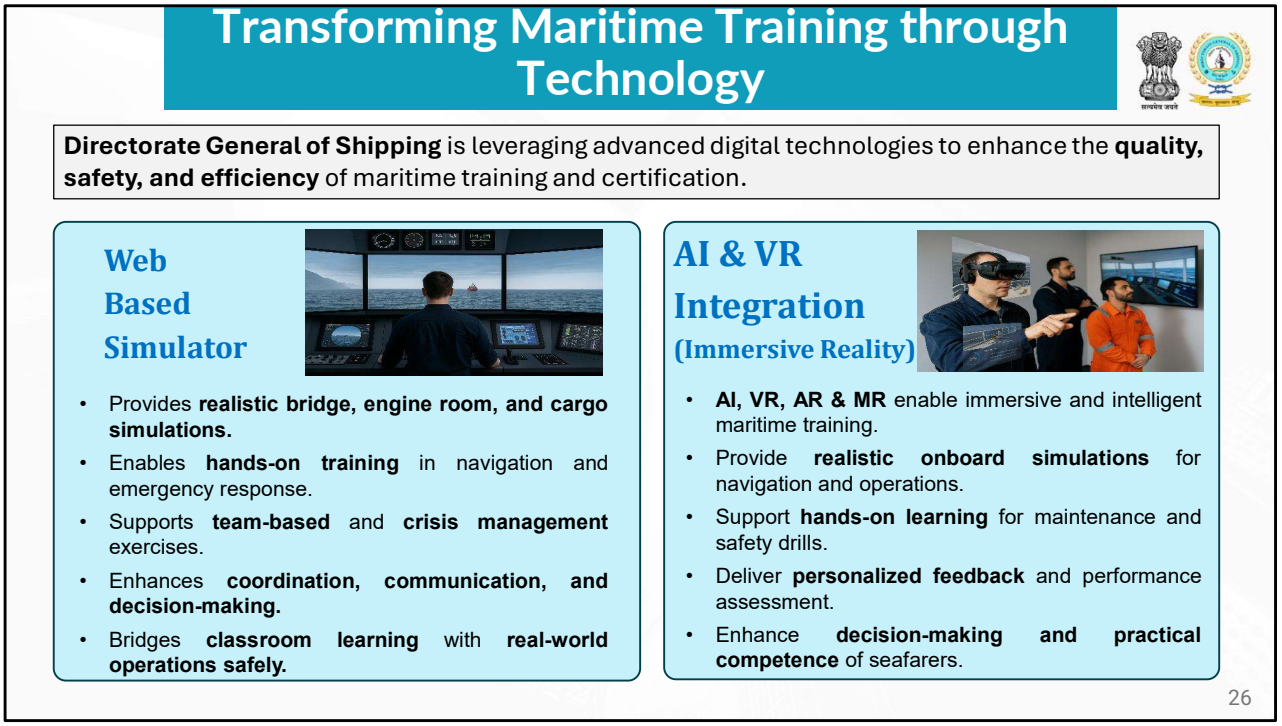

**Redefining Future Maritime Training & Education**

The future of global shipping will be shaped not only by technology and regulation, but fundamentally by the competence of the seafarer. As highlighted by the IMO Secretary, compliance with minimum standards is no longer sufficient. The real test lies in how effectively maritime nations educate, assess and certify their human capital in an evolving operational environment.

India's training ecosystem is built on a structured competency pipeline, beginning with qualification and medical fitness, followed by training, sea service, examination and certification. Each stage must now be reoriented to meet new industry demands such as smart navigation systems, alternative fuels, autonomous operations and stricter safety obligations.

Our focus is shifting from certificate-based eligibility to skill-based readiness. This requires modernised MET institutions, integration of simulation, digital learning platforms and closer alignment with shipping companies to ensure employability.

As India expands its seafarer footprint globally, redefining maritime education is central to maintaining global trust in Indian officers and ratings. Competence will remain our greatest competitive advantage in the next era of maritime transformation.



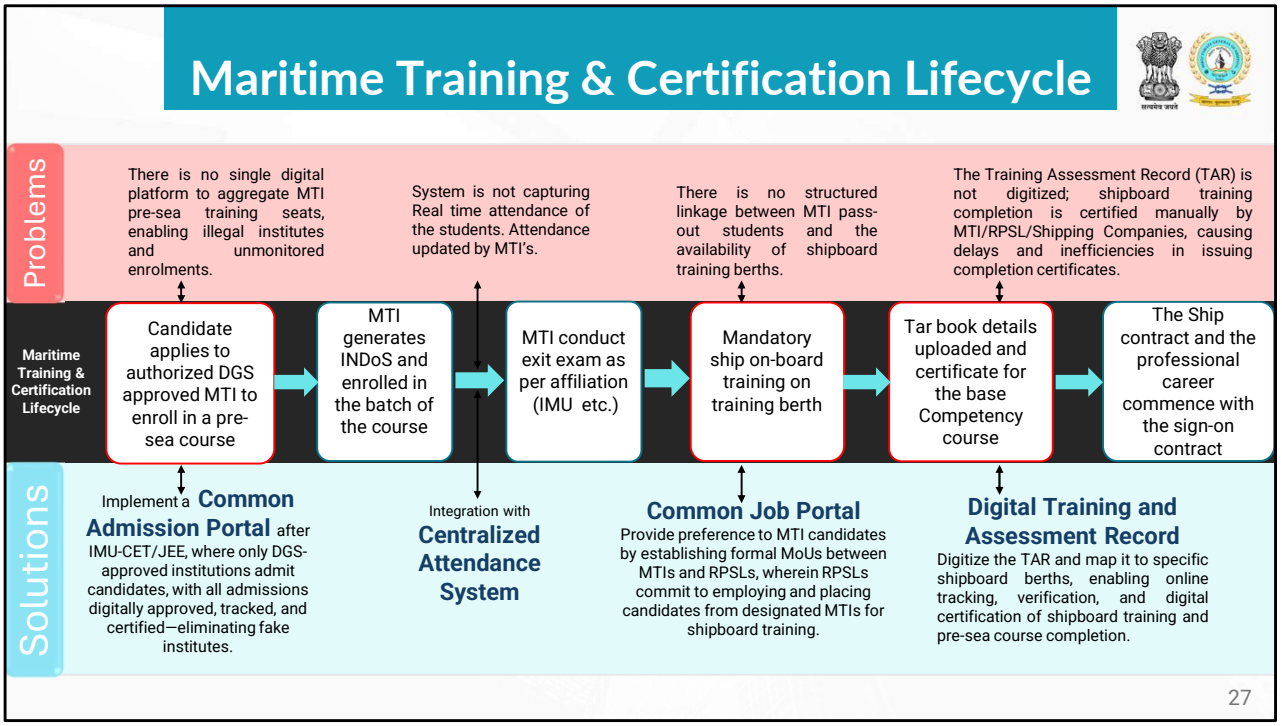

**Transforming Maritime Training through Technology**

The Directorate General of Shipping is redefining maritime training by integrating digital tools that go beyond classroom instruction to build real-world competence. Web-based simulators now replicate bridge, engine room and cargo scenarios with high fidelity, enabling trainees to practise navigation, manoeuvring and emergency response in a controlled virtual environment. These platforms support team-based crisis exercises and strengthen communication, coordination and decision-making , all critical skills onboard ship.

Alongside simulation, AI and immersive technologies such as VR, AR and mixed reality are being deployed to offer realistic onboard experiences without physical risk. Trainees can undertake maintenance routines, safety drills and complex operational procedures with personalised feedback and performance tracking.

By merging simulation with intelligent systems, maritime education is transitioning from theoretical learning to skill-based readiness. This technological shift ensures officers and ratings are not only certified, but operationally prepared to meet the demands of modern, digitally enabled

vessels. It strengthens safety culture, improves retention of critical procedures and aligns Indian seafarers with the future of global fleet operations.



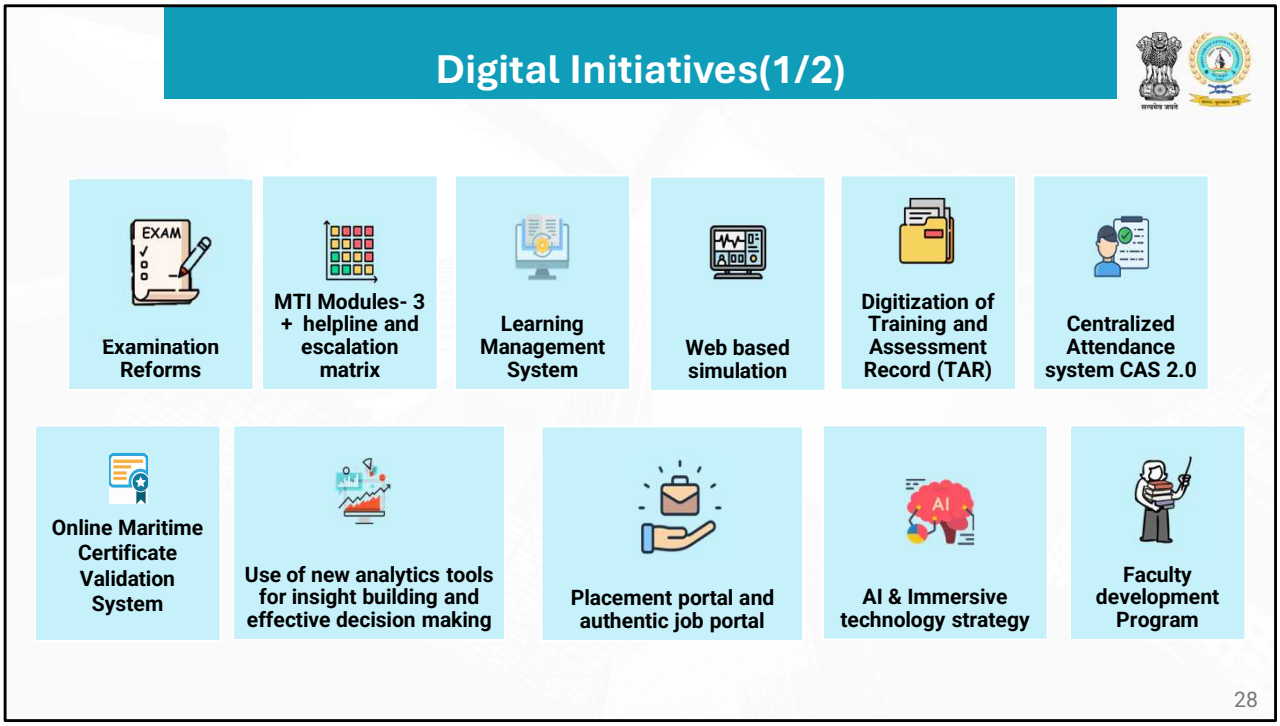

**Maritime Training & Certification Lifecycle**

The maritime training and certification ecosystem currently faces several challenges, including the lack of a unified digital platform for aggregating MTI pre-sea training seats, absence of real-time attendance tracking, weak linkage between MTIs and shipping berths for onboard training availability, and a manual, non-digitized Training Assessment Record (TAR) system that delays certification. These issues lead to unregulated admissions, inefficiencies, and gaps in tracking candidate progress across the training lifecycle.

To address these challenges, a structured digital lifecycle has been proposed. The process begins with candidates applying only through a centralized Common Admission Portal, ensuring admissions are restricted to DGS-approved MTIs. Once enrolled, MTIs digitally generate INDoS numbers and manage course batches. Attendance is recorded through an integrated Centralized Attendance System, while exit examinations are conducted as per institutional affiliations. A Common Job Portal strengthens industry linkage by enabling RPSLs to prioritize candidates from approved MTIs for shipboard training. Digitizing the Training and Assessment Record further ensures accurate tracking of onboard training, timely

verification by shipping companies, and faster issuance of competency certifications.

Together, these reforms aim to establish a transparent, digitally connected, and efficient maritime training pathway—from admission to certification—enhancing oversight, accountability, and career progression for seafarers.




## Digital Initiatives

### Examination Reform

End-to-end digitized examination system covering registration to certification, including CBT/hybrid exams with secure, transparent processes , Features biometric verification, encrypted question papers, online proctoring, and standardized evaluation for improved integrity and efficiency.

### MTI Module

The new MTI Module is DG Shipping's centralized digital platform to regulate, monitor, and govern Maritime Training Institutes across India.
It enables real-time compliance, inspections, and integration with CIP, STCW, and Digital TAR Book to improve transparency, training quality, and global credibility.

### LMS

The LMS is a secure, DGS-compliant e-learning platform for standardized maritime training which ensures training integrity through real-time tracking, anti-cheating controls, and assessment access only after full course completion.

**Web Based Simulation**

A web-based simulator provides an immersive, interactive platform that replicates real-world maritime scenarios for effective learning and assessment.

**Digital Tar**

The Training and Assessment Record (TAR) Book is a mandatory document that records and verifies a seafarer's structured onboard training and practical competencies.

**CAS 2.0**

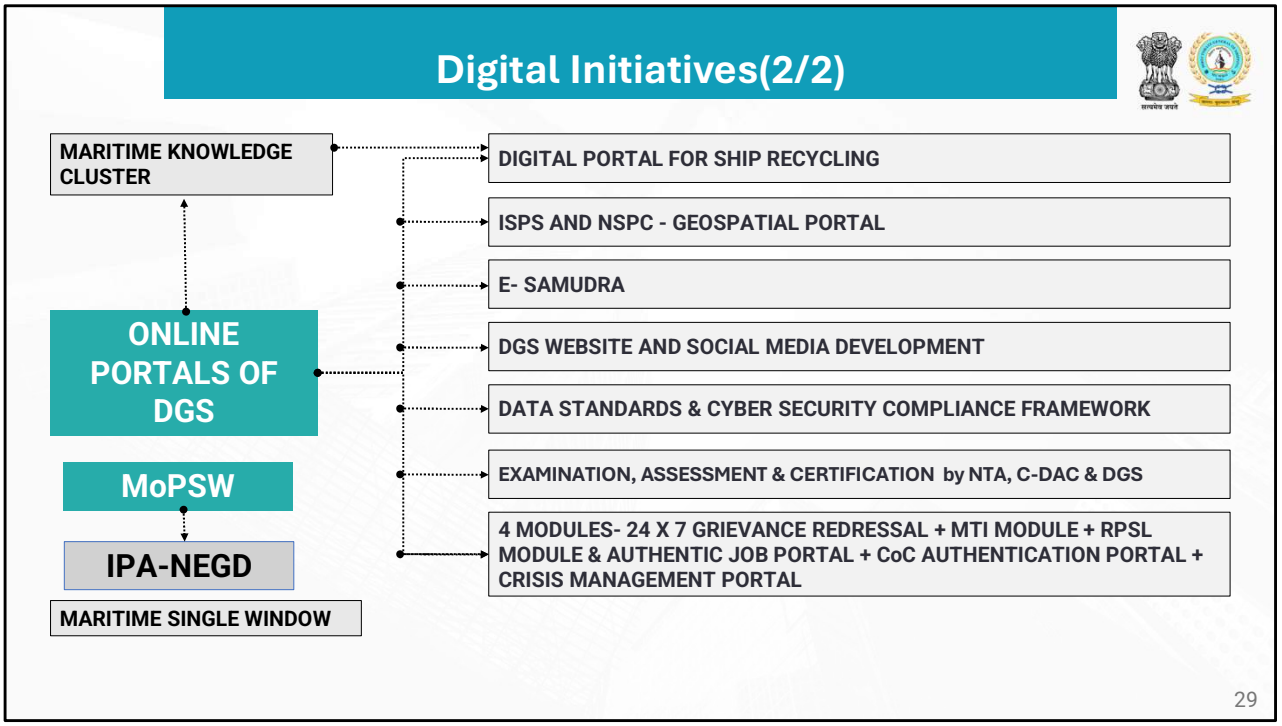
The Centralized Attendance System (CAS) uses facial biometrics to securely verify thepresence of candidates, faculty, and administrators across Maritime Training Institutes.

**OMCV**

Online Marine Certificates Verification (OMCV) is a digital platform that enables secure upload, verification, and digital stamping of maritime certificates to ensure authenticity.

**FDP**

A Faculty Development Program (FDP) is a structured initiative designed to upgrade teaching skills, subject expertise, and professional competencies of faculty members through continuous learning and assessment.




**Digital Initiatives(2/2)**

The digital initiatives under the Directorate General of Shipping (DGS) are part of the Maritime Knowledge Cluster and the Maritime Single Window framework, aligned with the Ministry of Ports, Shipping and Waterways (MoPSW) and integrated with the India Port Authority – National e-Governance Division (IPA-NeGD). These initiatives aim to enable transparent, efficient, and paperless governance across the maritime ecosystem.

The initiatives encompass the development of specialized digital portals for ship recycling, maritime security through ISPS and NSPC geospatial systems, and stakeholder interaction through E-Samudra. Enhancements to the DGS website and social media platforms support timely dissemination of information and improved stakeholder engagement.

Standardized data protocols and cybersecurity compliance frameworks have been implemented to ensure secure, interoperable, and resilient digital operations. The examination, assessment, and certification processes have been digitized in

collaboration with the National Testing Agency (NTA) and C-DAC to strengthen credibility, efficiency, and transparency.

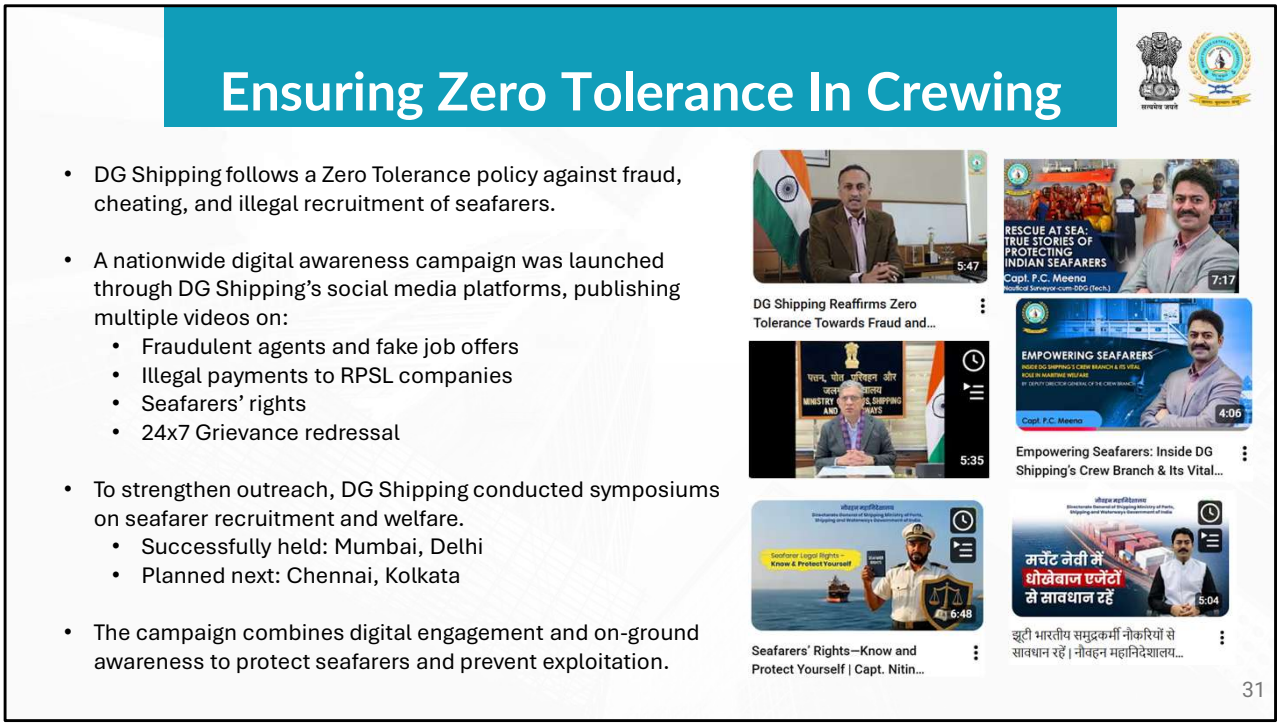
A comprehensive multi-module digital system provides 24×7 grievance redressal, services for Maritime Training Institutes (MTIs) and Recruitment and Placement Service Licensees (RPSLs), job authentication, Certificate of Competency authentication, and crisis management, contributing to the realization of a unified Maritime Single Window and enhanced ease of doing business in the maritime sector.


**Transparency and Zero Tolerance for Fraud**

Transparency and Zero Tolerance for Fraud Analysis & Correction and recurrence Transparency, accountability, and ethical conduct are fundamental to effective maritime governance and public trust. In line with these principles, a zero-tolerance approach to fraud and malpractice has been adopted to ensure fairness, integrity, and credibility across maritime education, training, certification, and regulatory processes. A structured grievance redressal mechanism has been established to enable stakeholders to raise concerns through multiple accessible channels, including call, SMS, and digital platforms. The process is supported by defined helpline hours, clear escalation pathways, timely follow-up, and corrective action to ensure that issues are addressed efficiently and transparently. Systematic analysis of complaints further helps in identifying root causes and preventing recurrence. In parallel, proactive awareness initiatives are undertaken through social media and digital outreach to educate stakeholders on legitimate processes, caution against fraudulent practices, and promote responsible engagement.

Collectively, these measures reinforce a culture of transparency, safeguard

stakeholder interests, and strengthen confidence in the maritime regulatory ecosystem

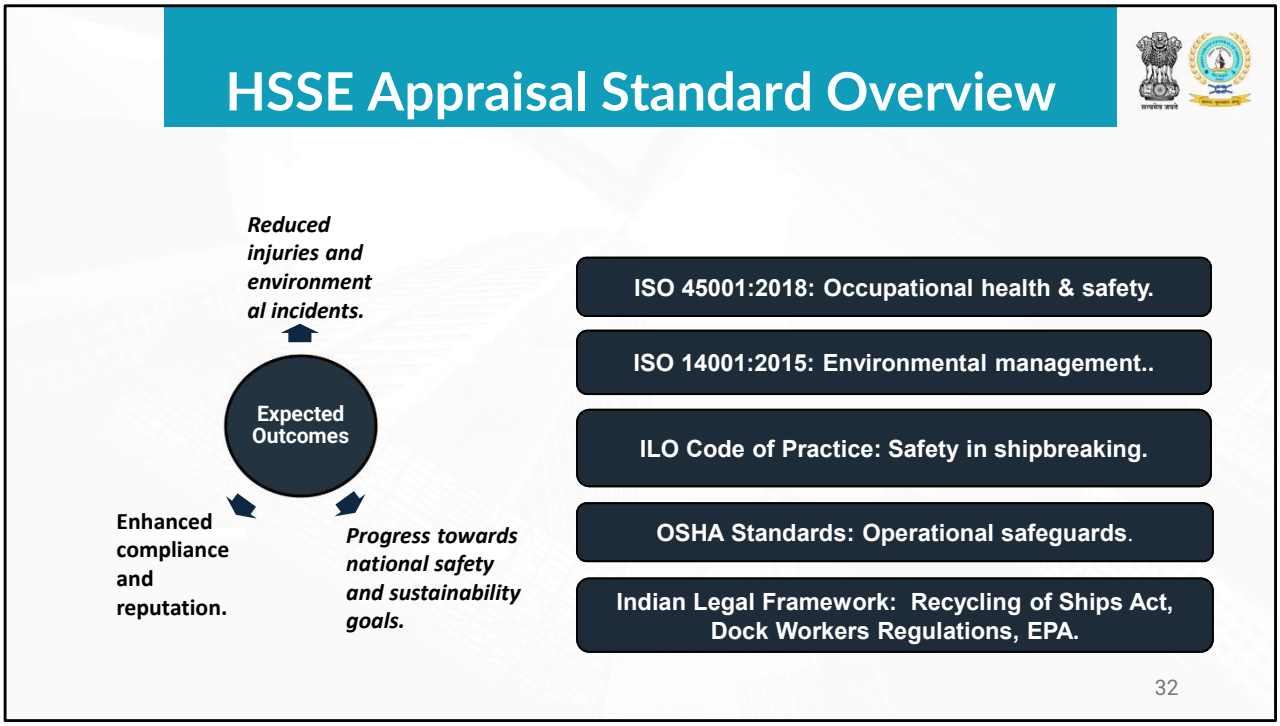



## Ensuring Zero Tolerance In Crewing

Ensuring fairness, transparency, and ethical conduct in seafarer recruitment and crewing is a core priority of India's maritime administration. The Directorate General of Shipping (DG Shipping) follows a strict zero-tolerance policy against fraud, cheating, and illegal recruitment practices to safeguard the rights, welfare, and professional interests of seafarers. To strengthen awareness and preventive action, a nationwide digital outreach campaign has been launched through DG Shipping's official communication channels. The campaign focuses on educating seafarers about fraudulent agents and job offers, unauthorized payments to recruitment and placement service providers, statutory rights and entitlements, and the availability of 24×7 grievance redressal mechanisms. These initiatives are designed to empower seafarers with accurate information and enable informed decision-making. In addition to digital engagement, DG Shipping has complemented the campaign with on-ground symposia and stakeholder interactions focused on seafarer recruitment and welfare.

By combining policy enforcement, awareness generation, and structured grievance redressal, the initiative aims to prevent exploitation, promote ethical

crewing practices, and reinforce confidence in India’s maritime regulatory framework



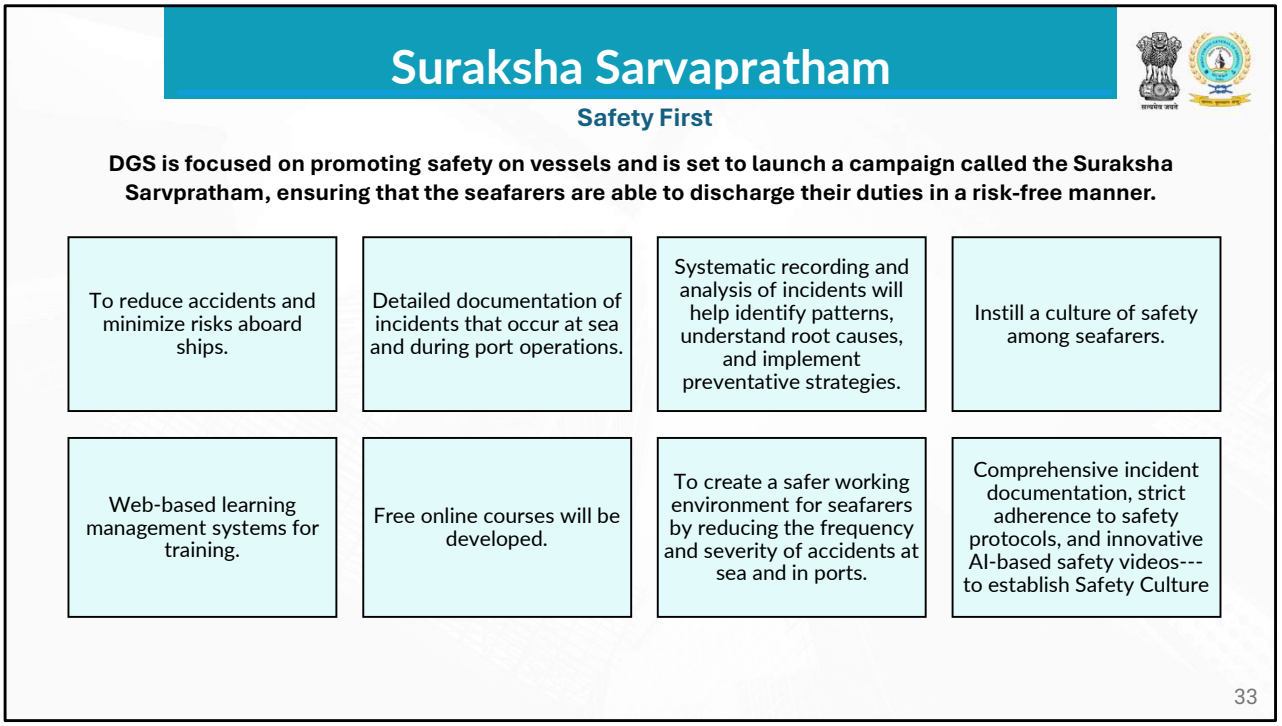

**HSSE Appraisal Standard Overview**

Shipbuilding, ship repair, and ship recycling are critical components of a nation's maritime capability, contributing significantly to industrial growth, employment generation, and strategic self-reliance. However, these activities also involve high-risk operations with potential impacts on occupational health, safety, and the environment. Ensuring robust Health, Safety, Security, and Environment (HSSE) standards is therefore essential to achieving sustainable and responsible maritime industrial development.

The HSSE appraisal framework draws upon globally recognized standards and best practices, including ISO 45001 for occupational health and safety, ISO 14001 for environmental management, ILO codes of practice, and OSHA operational safeguards, complemented by India's legal and regulatory framework governing ship recycling and dock operations. Together, these standards provide a structured approach to risk management, regulatory compliance, and continuous improvement.

Effective implementation of HSSE standards leads to reduced workplace 15

injuries and environmental incidents, improved compliance and institutional reputation, and measurable progress toward national safety, sustainability, and environmental protection goals




**Suraksha Sarvapratham**

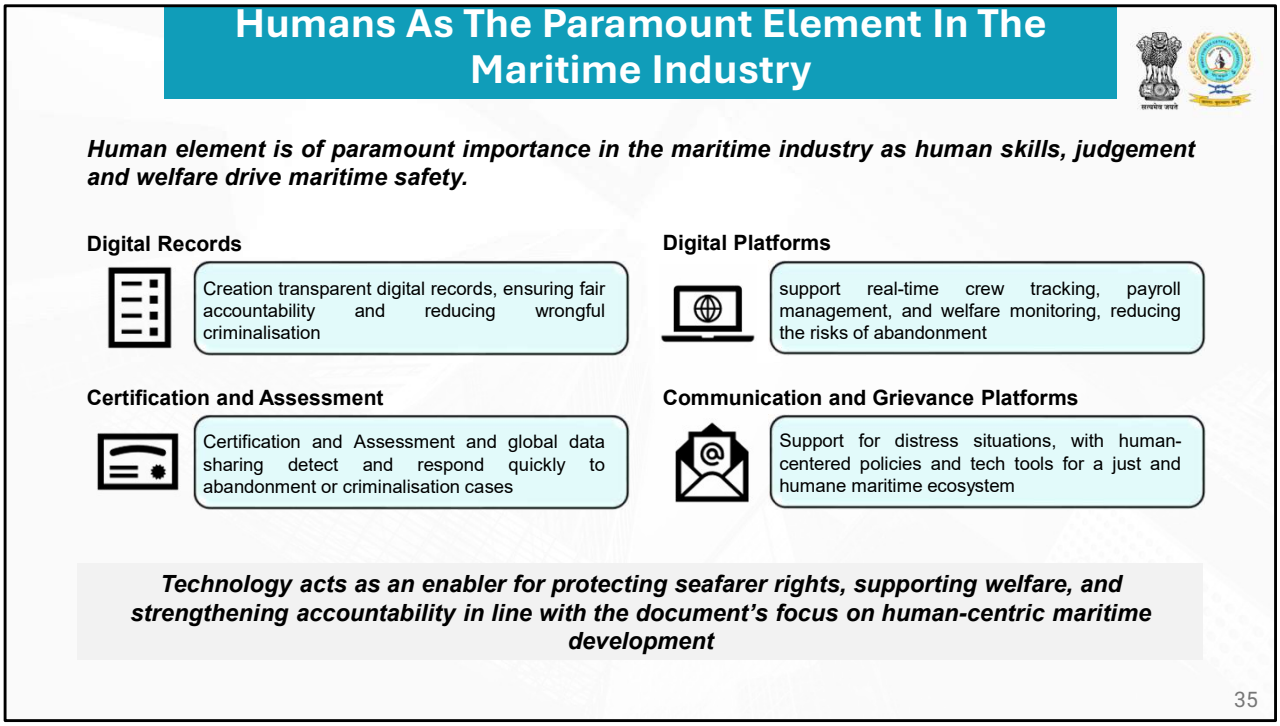
Safety of life at sea is a fundamental priority of India's maritime administration. Recognizing the need to strengthen safety practices and reduce operational risks, the Directorate General of Shipping (DGS) is launching the "Suraksha Sarvapratham" campaign, reinforcing a Safety First culture across the maritime sector. The initiative is aimed at ensuring that seafarers are able to discharge their duties in a safe, secure, and risk-free working environment, both atsea anddduringport operations. The campaign emphasizes a structured and proactive approach to safety management through systematic incident reporting, documentation, and analysis. By identifying patterns, understanding root causes, and implementing preventive measures, the initiative seeks to reduce the frequency and severity of maritime accidents. A strong focus is placed on capacity building through web-based learning management systems, free online courses, and innovative training tools, including technology-enabled safety learning

Suraksha Sarvapratham also aims to instil a sustained culture of safety among seafarers by promoting strict adherence to safety protocols, comprehensive

incident documentation, and continuous learning. Collectively, these measures are expected to enhance operational safety, minimize risks, and contribute to safer maritime operations aligned with national and international safety objectives


**Indian Global Maritime Safety Platform**

The increasing scale and complexity of maritime operations necessitate a technology-enabled, integrated approach to safety management. In alignment with India's maritime vision and international safety standards, the Indian Global Maritime Safety Platform is envisioned as a unified digital ecosystem to enhance maritime safety, promote risk-free professional practices, and strengthen regulatory oversight. The platform aims to consolidate safety information, regulatory guidance, training resources, and incident data into a single, accessible interface. By leveraging real-time analytics, multilingual content, and AI-driven insights, it seeks to support informed decision-making for seafarers, operators, regulators, and training institutions. The integration of animated safety training modules and a centralized maritime incident database will enable proactive risk identification, continuous learning, and data-driven safety interventions. Through real-time monitoring, compliance support, and capacity-building 22 22 tools, the Indian Global Maritime Safety Platform is designed to advance the national objective of "Zero Incidents", fostering a strong safety culture while ensuring alignment with IMO conventions and global best practices




## Humans as the Paramount Element in the Maritime Industry

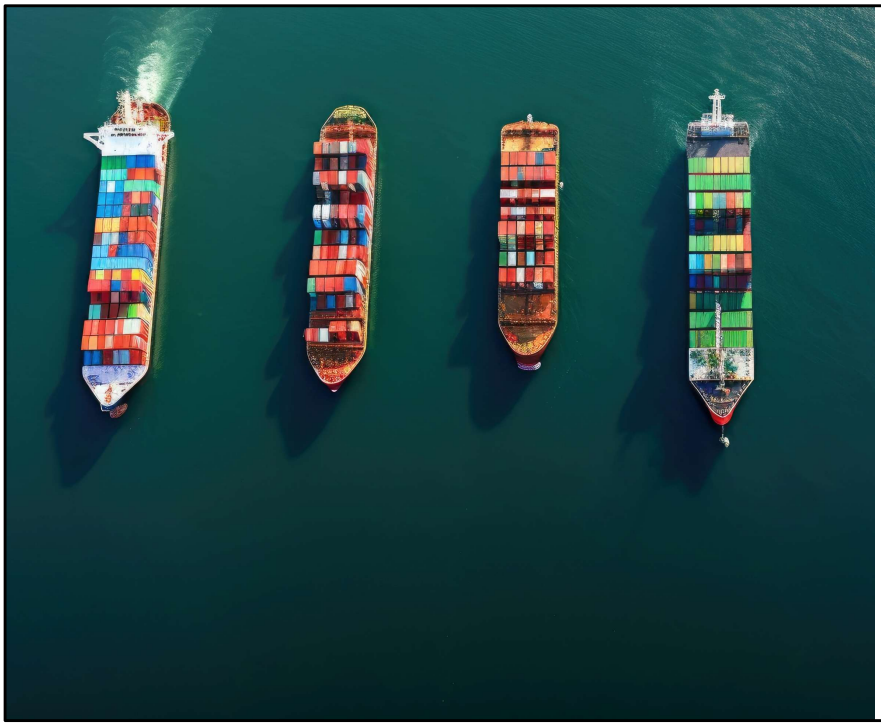
The maritime sector ultimately depends on the human element, the judgement, resilience and competence of seafarers who operate vessels across complex global environments. While technology and regulation continue to evolve, the protection of seafarer rights and welfare remains central to maritime safety and sustainability.

India has taken a proactive approach through digital records, real-time crew tracking and grievance platforms. By creating transparent digital logs of incidents and service history, wrongful criminalisation can be contested with authenticated data. Certification and assessment systems, integrated with global databases, enable quick intervention when seafarers report abandonment or wage disputes.

The impact of these efforts is measurable. As of July 2025, DG Shipping successfully safeguarded **468 seafarers**. In 2024 alone, repatriation assistance was extended to crew from **113 vessels**, supporting **807 out of 916 affected seafarers**, marking an **88% resolution rate**. These results reflect the strength of

India’s digital welfare platforms, rapid response mechanisms and human-centric maritime policy.

Technology, when aligned with humanitarian principles, is becoming a critical enabler in ensuring dignity, safety and justice for every seafarer — reaffirming that human welfare is not an adjunct, but the foundation of maritime development.



**संगच्छध्वं**
**संवदध्वं**
**सं वो मनांसि**
**जानताम्।**

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

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