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

SAGARMALA
PORT-LED PROSPERITY

INDIA MARITIME
WEEK 2025

Global Connect
V.O.C Port Authority

BHARAT PRAVAH

igpp

SOUVENIR

ONE DAY CONFERENCE ON

GREEN PORTS & SHIPPING

CHARTERING SUSTAINABLE MARITIME FUTURE

ORGANISED BY:

THE V. O. C. PORT AUTHORITY & BHARAT PRAVAH

Published by:
Bharat Pravah, New Delhi
01st August, 2025

In Collaboration With:
V. O. Chidambaranar Port Authority, Tuticorin

Editors:
Dr. Manish Tiwari, Director, IGPP
Ms. Heena Goswami, Editorial Consultant, IGPP

Design and Layout:
Mr. Vansh Sachdeva, Graphic Designer and Video Editor, IGPP

INDIA'S

'PANCHAMRIT'

as envisioned by

Prime Minister Shri Narendra Modi @COP26

1. Reach non-fossil energy capacity to 500GW by 2030

2. Fulfil 50% energy requirements via RE by 2030

3. Reduction of total projected carbon emissions by one billion tonnes from now to 2030.

4. Reduce carbon intensity by 45% by 2030

5. Achieve the target of Net-Zero by 2070

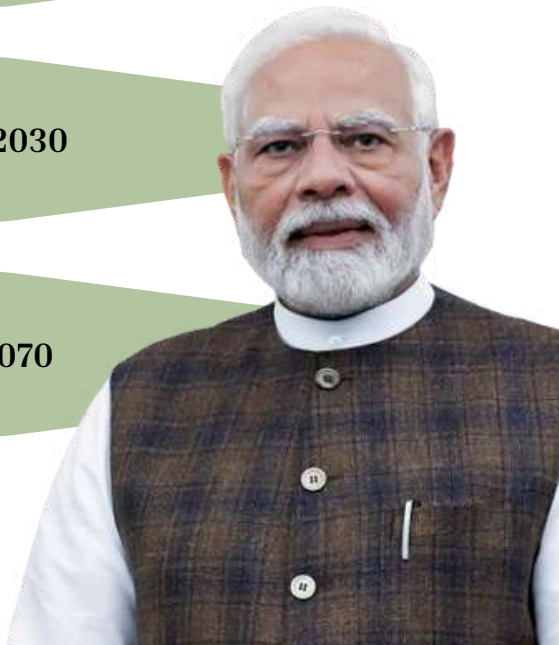


TABLE OF CONTENT

सर्बानंद सोणोवाल
SARBANANDA SONOWAL

सत्यमेव जयते

पत्तन, पोत परिवहन और जलमार्ग मंत्री
भारत सरकार
Minister of Ports, Shipping and Waterways
Government of India

FOREWORD

Indian maritime sector is undergoing a remarkable transformation not only as a gateway for commerce but also as a champion of climate resilience and environmental stewardship. Guided by the ambitious Maritime India Vision 2030 (MIV 2030) and the Maritime Amrit Kaal Vision 2047, our ports are embracing sustainable practices that are setting new benchmarks globally.

In the lead-up to India Maritime Week (IMW) 2025, and inspired by the Hon'ble Prime Minister Shri Narendra Modi's vision for a sustainable and self reliant India, the Neel Arth Vision Implementation Cell (NAVIC Cell) is leading the charge to sensitise regional stakeholders and general public about key achievements of our ports.

A shining example of this transformation is VOC Port, a beacon of India's Swadeshi spirit and maritime excellence. From generating over 12 million units of green energy through solar and wind power to pioneering the production of green hydrogen, the Port has set a benchmark for others to follow. Initiatives such as the deployment of electric vehicles, installation of rooftop solar systems and promotion of sustainable transport reflect a clear commitment to responsible growth. VOC Port is proving that economic progress can seamlessly align with environmental responsibility.

These pioneering initiatives are an evolving story of determination, innovation, and commitment to building a greener maritime ecosystem. Our efforts are more than milestones; they are stepping stones towards our collective journey of shaping a carbon-neutral, energy-efficient and future-ready port infrastructure.

Let this success serve not only as a record of achievements but as a lighthouse for all stakeholders, illuminating the path ahead as we work in unison toward a Swachh, Sashakt and Atmanirbhar Bharat.

Jai Hind.

Hon’ble Shri Sarbananda Sonowal,
Minister of Ports, Shipping & Waterways,
Government of India

शांतनु ठाकुर
SHANTANU THAKUR

राज्य मंत्री
पत्तन, पोत परिवहन और जलमार्ग मंत्रालय
भारत सरकार
Minister of State
For Ports, Shipping and Waterways
Government of India

FOREWORD

What began in 1866 as a modest wooden jetty at V.O. Chidambaranar (VOC) Port, Tuticorin, has today evolved into a dynamic engine of green growth, driving India's maritime transformation. As we move into the final phase before India Maritime Week (IMW) 2025, the Ministry of Ports, Shipping and Waterways (MoPSW) is committed to showcasing excellence in sustainable practices and innovation.

Under the visionary guidance of Prime Minister Shri Narendra Modi, and aligning with MoPSW's Harit Sagar Green Port and Harit Nauka Green Transition Guidelines, our ports are accelerating decarbonisation. The Neel Arth Vision Implementation Cell (NAVIC Cell) is leading this chargespearheading regional engagements and workshops to raise awareness of our progress and electrify public sentiment toward green shipping and port operations.

As the Port prepares to anchor India's first Coastal Green Shipping Corridor between Kandla and Tuticorin and expand into wind energy terminals, it reaffirms its place not only as a logistics hub but as a lighthouse of sustainable innovation. From the winds of freedom to the winds of change, VOC Port continues to steer India's maritime narrative anchored in legacy, propelled by vision.

As the NAVIC Cell and VOC Port come together to celebrate India's maritime accomplishments and explore future initiatives for a greener, more sustainable maritime sector, I extend my best wishes for a successful conference and enriching discussions that will shape our voyage ahead.

Jai Hind!

(Shri Shantanu Thakur)
Minister of State,
Ministry of Ports, Shipping and Waterways

SAGARMALA
कार्यालय : कक्ष सं. 211, परिवहन भवन, 1 संसद मार्ग, नई दिल्ली-110 001, दूरभाष : 91-11-23710189 / 356
Office : Room No. 211, Transport Bhawan, 1, Parliament Street, New Delhi-110001, Tel. : 011-23710189/356
ई-मेल / E-mail : shantanu.thakur20@sansad.nic.in

टी.के.रामचन्द्रन
T.K.Ramachandran

सत्यमेव जयते

सचिव
SECRETARY
भारत सरकार
GOVERNMENT OF INDIA
पत्तन, पोत परिवहन और
जलमार्ग मंत्रालय
MINISTRY OF PORTS,
SHIPPING AND WATERWAYS

FOREWORD

Ports are not just gateways to trade; they are catalysts for sustainable growth and innovation.

In preparation for India Maritime Week 2025, MoPSW is happy to see our NAVIC Cells leading the charge. Across the nation, these cells are organizing thematic workshops and roadshows, from June through September, focused on decarbonization, green ports, and environmentally responsible maritime practices. Their efforts are crucial for engaging regional stakeholders, industry partners, and the public in defining India's maritime future.

On similar lines, I am pleased to note the organisation of the national conference on 'Green Ports and Shipping: Chartering a Sustainable Maritime Future' on the 1st of August, being convened by the NAVIC Cell on green initiatives and VOC Port.

This conference comes at a critical juncture, as India's maritime sector undergoes a transformational shift to align with global sustainability goals. The move towards green port infrastructure, cleaner fuels, and smarter logistics is no longer a choice—it is a necessity driven by climate imperatives, economic efficiency, and our responsibility to future generations. MAKV 2047 of MoPSW which was released by Hon'ble Prime Minister in 2023 rightly therefore, envisages green transition as one of its key pillars.

For the Government of India, "green" is not limited to carbon reduction but reflects a holistic vision built on Climate Action, Environmental Health, and Ecosystem Vitality. Major Ports are leading this transformation through renewable energy adoption, electrification of equipment, Onshore Power Supply (OPS), and the Green Tug Transition Programme etc. guided by the Harit Sagar Green Port Guidelines. These initiatives, alongside measures to improve air and water quality and protect biodiversity, will ensure that India's port-led growth remains sustainable and future-ready.

VOC Port is a key port with several notable accomplishments in this area and is leading the change through a range of important green initiatives. It has been designated as India's first green hydrogen hub, with 500 acres earmarked and an MoU with NTPC in place for large-scale production pioneering a green ecosystem for ports as envisioned by Hon'ble Union Minister Shri Sarbananda Sonowal. Sustainability at the port extends beyond power generation. With a fleet of 20 electric vehicles, five EV charging stations, and even a CNG school bus donated under CSR, VOC Port integrates clean transport into daily operations. Its green hydrogen is already powering street lighting and EV charging within the premises, turning ambition into action.

Together, we sail onward, towards a maritime India that is greener, stronger and truly world-leading.

Jai Hind!

(**T.K. Ramachandran**)

SAGARMALA
PORT-LED PROSPERITY

परिवहन भवन, 1, संसद मार्ग, नई दिल्ली-110001, भारत
टेलि. : +91 11 23714938, 23716656, ई-मेल : secyship@nic.in
Transport Bhawan, 1, Parliament Street, New Delhi-110001, INDIA
Tel. : +91 11 23714938, 23716656, E-mail : secyship@nic.in

MESSAGE

India’s maritime sector stands at a crucial crossroads—where the twin goals of economic growth and environmental sustainability must converge. As we gather at this National Conference, we reaffirm our collective resolve to transition towards greener ports, cleaner fuels, and energy-efficient shipping practices.

The vision of a sustainable maritime future is not merely aspirational—it is an urgent necessity. From adopting shore power and LNG bunkering to retrofitting vessels with green propulsion technologies and ensuring port infrastructure aligns with international environmental standards, we are shaping a resilient and eco-conscious maritime ecosystem.

The vision of a sustainable maritime future is not merely aspirational—it is an urgent necessity. From adopting shore power and LNG bunkering to retrofitting vessels with green propulsion technologies and ensuring port infrastructure aligns with international environmental standards, we are shaping a resilient and eco-conscious maritime ecosystem.

The vision of a sustainable maritime future is not merely aspirational—it is an urgent necessity. From adopting shore power and LNG bunkering to retrofitting vessels with green propulsion technologies and ensuring port infrastructure aligns with international environmental standards, we are shaping a resilient and eco-conscious maritime ecosystem.

This conference serves as a platform to exchange ideas, showcase innovations, and commit to actions that will reduce carbon emissions, conserve marine biodiversity, and uphold India's commitment to global climate goals. Together, let us charter a course that not only powers commerce—but preserves our coasts, rivers, and oceans for generations to come.

Let this conference mark a milestone in our journey—towards greener harbours and cleaner horizons.

Shri Vijay Kumar, IAS
Chairman
Inland Waterways Authority of India

MESSAGE

The one-day national conference on, 'Green Ports and Shipping: Chartering a Sustainable Maritime Future,' spearheaded by the NAVIC Cell and V.O. Chidambaranar Port Authority, in collaboration with Bharat Pravah, an initiative of the IGPP, stands as a timely initiative in India's journey towards a sustainable maritime ecosystem.

India's maritime sector is at the cusp of a generational shift. The focus is no longer solely on growth, but on green growth, a future where efficiency, innovation, and environmental stewardship go hand in hand. Our ports are no longer just points of transit; they are platforms of transformation, pioneering decarbonisation, promoting clean fuel alternatives, and serving as testbeds for renewable energy solutions.

In alignment with the Harit Sagar Guidelines, the Ministry remains committed to enabling such leadership across all major ports. What is particularly commendable is VOC Port's ability to translate policy into practice—be it through solar and wind-powered energy systems, electric vehicle adoption, or regional partnerships for future-ready shipping corridors.

VOC Port from operating India's first plastic-free port and commissioning the nation's inaugural green hydrogen plant, to pioneering green methanol bunkering and championing electric mobility, VOC Port's efforts embody the very principles of sustainability and innovation. The allocation of over 500 acres for green hydrogen and ammonia projects, backed by substantial private investment, marks it as a beacon of India's clean energy future.

This conference, set in one of India's most progressive ports, arrives at a moment when global and national agendas are aligned in their urgency. It offers a platform not only to share progress but to inspire collaboration across sectors, government, industry, academia, and civil society.

This conference serves as a catalyst for actionable ideas and scalable innovations by bringing together diverse stakeholders around such a vital theme. As India advances towards greener and more sustainable maritime practices, platforms like these are essential for dialogue, innovation, and collective action.

Jai Bharat!

Shri Rajesh Kumar Sinha,
Special Secretary,
Ministry of Ports, Shipping and Waterways

MESSAGE

It gives me immense pride to share this message for the conference on “Green Ports and Shipping: Chartering a Sustainable Maritime Future.” As we deliberate on the critical challenges and immense opportunities in shaping a greener maritime sector in this conference, it is important to reaffirm our collective commitment to sustainable development and environmental stewardship.

V.O. Chidambaranar Port have embraced this commitment with conviction and clear sense of purpose. Guided by the ambitious goals of the Maritime India Vision 2030 and the Maritime Amrit Kaal Vision 2047, VOC Port is actively redefining what it means to be a green port, setting new benchmarks in the sector.

VOC Port is proud to be the first major port in India to demonstrate green hydrogen production, emerging as a pioneer in clean energy deployment. This green hydrogen is already being used to power EV charging stations and street lighting, and we are well on our way to establishing a comprehensive green methanol bunkering facility.

These efforts are not merely infrastructure upgrades, they are a conscious reimagining of how ports can serve as enablers of climate action, economic growth and technological innovation.

As we chart this path forward together, let us continue to share best practices, inspire innovation, and work collaboratively to build a maritime sector that is not only efficient and competitive, but also resilient and environmentally responsible.

On this occasion, I warmly extend my heartfelt greetings to all the delegates, industry experts, esteemed speakers and participants. May this platform inspire bold ideas, foster meaningful partnerships, and energize collective efforts towards a maritime sector that leads by example in sustainability and innovation.

Shri Susanta Kumar Purohit, IRSEE
Chairperson,
V.O. Chidambaranar Port Authority

MESSAGE

At V.O. Chidambaranar Port Authority, sustainability is not an afterthought—it is at the heart of our operational philosophy. As the maritime world transitions toward a greener future, VOC Port is proud to lead this change with purpose and measurable progress.

This special souvenir, released as part of the Green Ports & Shipping conference, brings together voices and visions aligned with one common goal—a clean, climate-resilient maritime sector.

Our journey so far reflects this vision. We have successfully met most of our energy requirements through renewable sources including solar, wind, and rooftop installations, resulting in a significant annual reduction in carbon emissions. The deployment of electric vehicles, plastic-free zone declaration, LED lighting, and launch of India's first green hydrogen pilot project mark bold steps towards decarbonization. Strategic plans are underway for a full-fledged Green Hydrogen and Ammonia Hub positioning VOC Port in the global map of Green Shipping and Green fuel corridor.

This conference is a timely platform to accelerate dialogue, spark innovation, and build international collaborations that reshape the future of maritime operations. I encourage all stakeholders to explore, exchange, and envision together, as we chart the course for a greener, smarter, and more sustainable maritime future.

Shri. Rajesh Soundararajan, IAS,
Deputy Chairperson,
V.O. Chidambaranar Port Authority

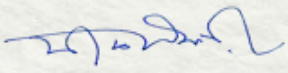
MESSAGE

India's maritime and riverine heritage is not just a story of trade routes or economic corridors, it is the very soul of our civilizational journey. From Dwarika in the west to Guwahati in the east, from the ghats of Varanasi to the southern tip of Rameswaram, our rivers and seas have silently shaped the ethos of the nation. They have nourished communities, carried spiritual significance, and connected hearts across generations.

The Bharat Pravah initiative was conceived to rekindle this living legacy. It is an effort to highlight how our water bodies both coastal and inland, are not just environmental assets but cultural and emotional lifelines that require careful nurturing. Through policy dialogues, public engagement, and grassroots storytelling, we aim to re-anchor the maritime narrative within the national consciousness.

The theme of this conference, "Green Ports & Shipping: Chartering a Sustainable Maritime Future", echoes the same values. In today's climate-aware world, ports and shipping must go beyond their traditional economic roles to become models of green transition and climate resilience. Whether through renewable energy adoption, cleaner fuels, digitization, or circular resource use, the sector has both the responsibility and the opportunity to lead the sustainability movement. Public-private partnerships, green infrastructure and community participation are the cornerstones of this transformation. As we align ourselves with the Maritime India Vision 2030 and the broader Amrit Kaal Vision 2047, we must ensure that sustainability is not an afterthought but a foundational principle guiding our maritime future.

Let this conference serve not only as a platform for policy and practice but also as a reminder that in safeguarding our ports and waters, we are safeguarding our collective future— our Janmanas, our culture, our economy, and our environment.



Warm regards,
Dr. Manish Tiwari,
Director, Institute for Governance, Policies & Politics (IGPP)

OVERVIEW OF THE CONFERENCE

India's maritime sector is at a monumental juncture poised between tradition and transformation, balancing growth and responsibility. In alignment with the national vision for a green economy of Hon'ble Prime Minister Shri Narendra Modi, and in the leadership of Cabinet Minister, MoPSW Hon'ble Shri Sarbananda Sonowal, the V.O. Chidambaranar Port Authority, Tuticorin, in collaboration with Bharat Pravah, is hosting a landmark conference with the theme: 'Green Ports & Shipping – Chartering a Sustainable Maritime Future'

This one-day conference, in the run upto the India Maritime Week, 2025, organized under the aegis of the Ministry of Ports, Shipping & Waterways and curated by NAVIC Cell–3 (Green Initiatives and Pollution Control), brings together distinguished stakeholders. From top government functionaries and port authorities to environmental researchers, green finance experts, private infrastructure developers and innovators in clean energy. The conference aims to facilitate an honest, ambitious and forward-looking dialogue on sustainable maritime development

SESSION I: DECARBONIZATION IN THE MARITIME SECTOR

The inaugural session sets the stage for a transformative dialogue by emphasizing the urgency and opportunity in decarbonizing maritime operations. Senior dignitaries and subject-matter experts will explore strategies to reduce greenhouse gas emissions in port ecosystems and shipping corridors. Discussions will include:

KEY THEMES:

Green Initiatives and Pollution Control for Port Sector

Greening India's Shipping Sector

Sustainable Transition of Inland Waterways

SESSION II: GREEN FINANCING AND POLICY FRAMEWORKS

This session focuses on unlocking the financial and regulatory architecture required to scale sustainable maritime infrastructure. With panelists from the renewable energy sector, global port developers, and strategic policy circles, the session will have speakers on the following issues:

KEY THEMES:

Incentivizing Clean Fuel Adoption

ESG Investments for Port Projects/ Mobilizing Green Capital for a Sustainable Maritime Future

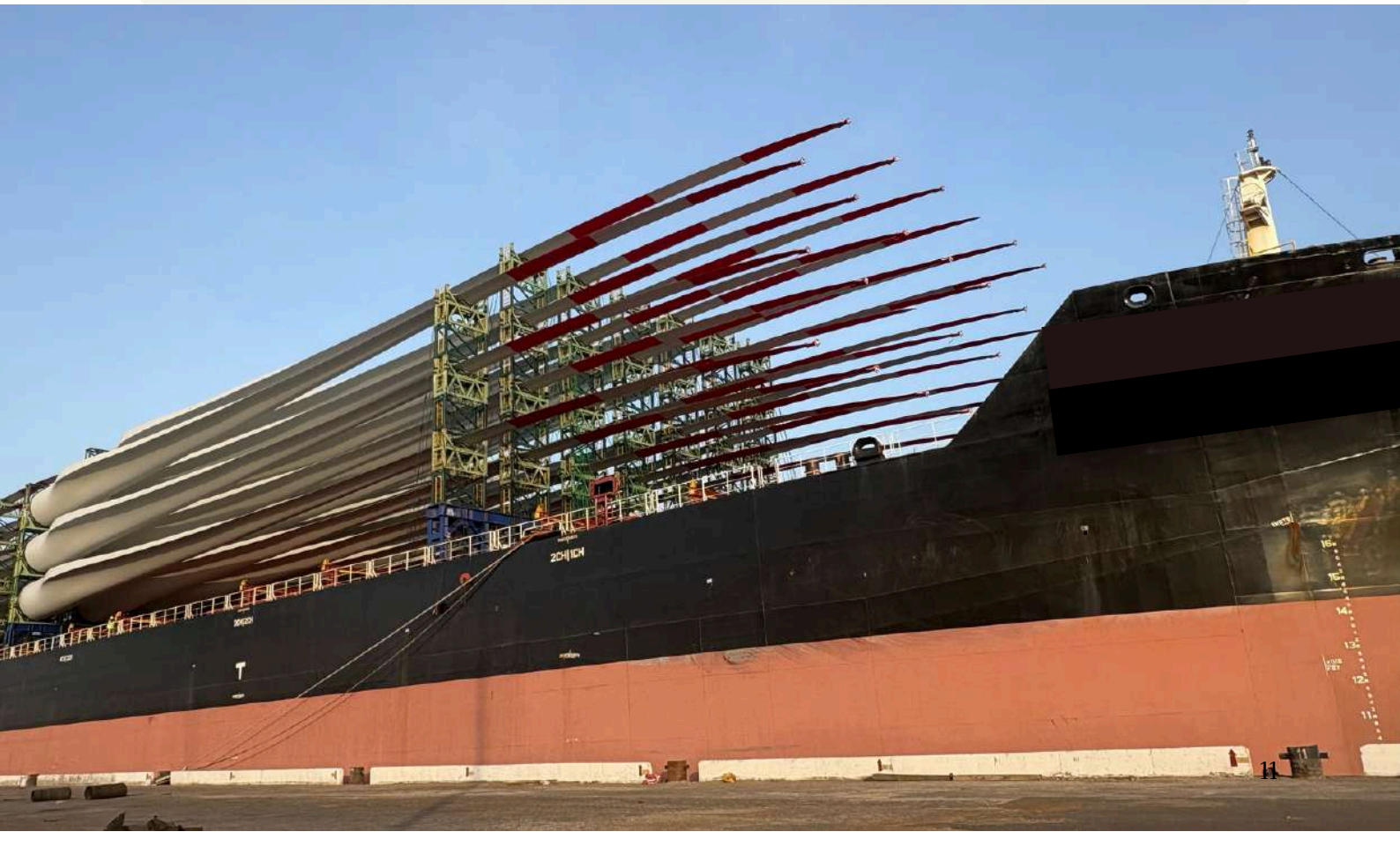
Public-Private Partnerships for Sustainability

SESSION III: TRANSFORMING INDIA'S MARITIME SECTOR FOR THE NEXT DECADE

This forward-looking session envisions India's maritime sector by 2035, focusing on the adoption of low-emission fuels such as LNG, methanol and green hydrogen. Discussions will cover the development of green shipping corridors, dedicated bunkering and refueling hubs, and port-based renewable energy systems. This session aims to articulate a clear roadmap for operationalizing Net Zero goals in the maritime space, integrating innovation, international cooperation, and robust capacity-building as cornerstones of transformation.

KEY THEMES:

- Transition to Low-Emission Fuels (LNG, Methanol, Hydrogen) and Net Zero Goals
- Green Shipping Corridor and Bunkering & Re-Fueling Facilities
- Strengthening Institutional Capacity for Green Maritime Transition



INDIA'S TARGETS FOR GREEN TRANSITION

30%	Reduction in Carbon emission per tonne of cargo by 2030.
60%	Of the total power demand to come from renewable energy by 2030 at each of its major ports up from current 10%.
33%	Increase in green belt area at all major Indian ports by 2047.
>90%	Electrification of vehicles and equipment by 2047 under MIV 2030 / Blue Economy 2047 .
100%	Recycling of wastewater to be achieved by 2030, guided by the concept of Working with Nature.
20%	Reduction in freshwater consumption per ton of cargo at Indian ports by 2030.
>50%	GHG emission reduction in all coastal/ EXIM vessels by 2047
>20%	Reduction in energy consumption / ton of cargo (Baseline Year 2023).
1	LNG bunkering station by 2030.

GREEN INITIATIVES BY THE MINISTRY OF PORTS, SHIPPING AND WATERWAYS

GREEN SHIPPING CONCLAVE 2025

Policy & tech roadmap for decarbonizing India's maritime sector, boosting green fuels, green tugs & ports.

01.

HARIT SAGAR GREEN PORT GUIDELINES

Making Indian ports eco-friendly through renewable energy, green buildings & electric cargo equipment.

02.

GREEN TUG TRANSITION PROGRAMME

Moving towards fully electric & hybrid tugs to cut carbon emissions in port operations.

03.

NATIONAL GREEN HYDROGEN MISSION

Accelerating adoption of green hydrogen & ammonia as clean fuels for ships & port operations.

04.

₹25,000 CRORE MARITIME DEVELOPMENT FUND

Massive green investment push for cleaner ships, modern ports & sustainable ship recycling.

05.

INDIA MARITIME WEEK 2025

India Maritime Week 2025, to be held from 27th to 31st October, 2025 in Mumbai seeks to celebrate India's 'Maritime Virasat' and 'Maritime Vikaas'. This bi-annual global maritime gathering that will be one of the largest in the world and will see representation from 100 countries and 100,000 delegates.

India Maritime Week will address gaps in physical achievement of infrastructure projects, investments and trade facilitation by bringing together the maritime community and the government. Conferences, trade forums and round tables will address specific issues all leading to the overall objective of facilitating trade through India's ports, shipping and logistics sectors.

Glimpses from India Maritime Week 2024.

NAVIC Cells (Neel Arth Vision Implementation Cells)

The Ministry of Ports, Shipping & Waterways (MoPSW) has established NAVIC Cells to focus on implementing the Maritime India Vision 2030 (MIV 2030) and Maritime Amrit Kaal Vision 2047.

- They provide a theme-based, focused approach to effectively monitor and implement the Ministry's objectives.
- The cells operate with a two-tiered framework. ViBhaS members (senior officers from the ministry) are primarily responsible for review, monitoring, and coordination, while NAVIC members are focused on implementation.
- NAVIC Cells cover areas such as traffic and cargo, projects, PPPs, shipbuilding, repair, recycling, maritime finance, technology, and legal and HR aspects.

Glimpses from the NAVIC (Neel Arth Vision Implementation Cells) recently held in Delhi.

ADVANCING SUSTAINABILITY THROUGH GREEN INITIATIVES

In an era marked by accelerating climate change and ecological degradation, ***green initiatives*** *have emerged as critical instruments for building a sustainable and resilient future. These initiatives, spanning across sectors—from energy and transport to industry and agriculture—aim to reduce environmental impacts, conserve resources, and promote a circular economy. Governments, businesses, and communities worldwide are increasingly investing in green solutions to ensure long-term environmental and economic security.*

Understanding Green Initiatives

Green initiatives refer to a wide range of programs, policies, technologies, and practices designed for:

a) Reducing carbon emissions and pollutants.

b) Enhancing energy and resource efficiency.

c) Promoting renewable energy and sustainable materials.

d) Protecting biodiversity and ecosystems.

e) Fostering climate-resilient infrastructure and behaviour.

Shri Vijay Kumar, IAS
Chairman, IWAI

These efforts align with global frameworks such as the **Paris Agreement**, the **UN Sustainable Development Goals (SDGs)**, and national climate action plans.

Key Areas of Green Initiatives

a) **Renewable Energy Adoption:** Transitioning to electric (battery), hydrogen, methanol, , solar, wind, hydro, and bioenergy reduces dependence on fossil fuels and lowers greenhouse gas emissions. India has set ambitious renewable energy targets under the National Solar Mission and Green Hydrogen Mission.

b) **Green Transportation:** Promotion of electric vehicles, hybrid propulsion systems for inland and coastal vessels, public transport improvements, and non-motorized mobility (cycling, walking) contribute significantly to reducing urban air pollution and fuel consumption.

c) **Sustainable Infrastructure and Buildings:** Green buildings incorporate energy-efficient designs, sustainable materials, rainwater harvesting, and solar panels. Smart cities also integrate waste-to-energy systems, EV charging infrastructure, and green open spaces.

d) **Water and Waste Management:** Initiatives include recycling, zero-waste policies, water conservation technologies, and river rejuvenation programs such as the Namami Gange Mission.

e) **Water Conservation:** Implementing water-saving technologies, reducing water usage, and promoting responsible water management practices.

f) Greening Supply Chains and Industries: Industrial sectors are adopting clean technologies, green certification standards, carbon neutrality commitments, and ESG (Environmental, Social, Governance) frameworks to enhance sustainability across production cycles.

g) **Afforestation and Biodiversity Conservation:** Reforestation drives, mangrove restoration, and eco-sensitive zone protection contribute to carbon sequestration and preservation of critical habitats.

h) **Reducing Carbon Footprint:** Transitioning to renewable energy sources, improving energy efficiency, and adopting sustainable transportation options.

i) **Government Initiatives:** Implementing policies to incentivize renewable energy adoption, promoting sustainable infrastructure development, and enforcing environmental regulations.

Benefits of Green Initiatives

a) **Environmental:** Lower emissions, reduced waste, and improved air and water quality

b) **Economic:** Long-term cost savings, green jobs, and innovation in clean technology

c) **Social:** Healthier living environments, inclusive development, and improved quality of life

Green Initiatives in India

India has demonstrated a strong commitment to green development through flagship programs like:

a) National Action Plan on Climate Change (NAPCC).

b) Faster Adoption and Manufacturing of Electric Vehicles (FAME).

c) Swachh Bharat Abhiyan (Clean India Mission).

d) Gati Shakti for sustainable logistics and infrastructure.

e) National Electric Mobility Mission Plan.

f) Green Shipping and Inland Waterways Green Corridors.

Public sector undertakings, ports, and inland water authorities are also implementing energy-efficient dredging, shore power systems, and biofuel pilots.

Target Dates as per MIV 2030

Sl	Initiative	Target
a)	Renewable Energy (60%)	2030
b)	Onshore power supply	2030
d)	Energy Efficient Equipment's	2026
e)	Green Belt (33%)	2030
f)	Fresh water consumption reduction (20%)	2030

g)	Reuse and recycle waste water	2030
h)	National Green Shipping Policy	2025
i)	Green Shipping Corridor (Pilot Project)	2027

Challenges and Way Forward

Despite the momentum, green initiatives face hurdles such as funding gaps, lack of awareness, and technological bottlenecks. Addressing these requires:

- Stronger policy enforcement and incentives
- Public-private partnerships and international cooperation
- Capacity building, research, and digital innovation
- Behavioural change and community engagement

Green initiatives are not just environmental imperatives—they are key to resilient economic growth and social equity in the 21st century. A coordinated effort by stakeholders at every level is essential to accelerate the transition to a sustainable, low-carbon future.

INDIA'S JOURNEY IN MARITIME DECARBONIZATION A YEAR OF ACTION, ENGAGEMENT, AND LEADERSHIP

The past year has been a pivotal period in India's maritime decarbonization journey — one that has brought together national ambition, international engagement, and institution-wide coordination to lay the foundations of a sustainable maritime future.

Anchored in India's Nationally Determined Contribution (NDC), outlining India's commitment to reduce emissions intensity by 45% by 2030 (from 2005 levels) and achieve net-zero emissions by 2070, MoPSW in coordination with allied agencies and stakeholders, has pursued this goal through a well-rounded approach that combines policy, pilots, partnerships, and institutional capacity building.

At the global level, India continued to play a constructive and influential role at the International Maritime Organization (IMO), particularly in shaping the implementation pathway of the IMO Greenhouse Gas Strategy 2023.

Shri Rajesh Kumar Sinha,
Special Secretary,
Ministry of Ports, Shipping and Waterways

India had the honour of hosting the IMO Secretary-General on an official visit in early 2025 — a milestone that reaffirmed India's growing leadership in maritime decarbonization and global trust in its capabilities to pilot and scale green shipping initiatives.

The **Green Shipping Conclave 2025** brought together key stakeholders from the industry, government, and academia to deliberate on transition pathways, cross-border collaborations, and financing mechanisms. The conclave served as a high-impact platform for policy dialogues, technical discussions, and roundtable meetings. The conclave also saw the release of the **Consultative document** on the **proposed National Green Shipping Policy (NGSP)** for India. This document, after being subjected to extensive stakeholder consultations, will help shape the NGSP, a guiding framework to steer India's maritime sector towards low and zero-emission development.

For MoPSW, "green" goes beyond carbon reduction—it encompasses a holistic commitment to environmental responsibility across three interlinked policy objectives: **Climate Change, Environmental Health**, and **Ecosystem Vitality.**

Under **Climate Change,** MoPSW is spearheading initiatives to reduce greenhouse gas emissions through the adoption of renewable energy (RE)—now contributing approximately 15% of total energy use across Major Ports—via both captive generation and power purchase agreements. The phased implementation of Onshore Power Supply (OPS) infrastructure is underway, allowing ships to plug into shore-based electricity while at berth, reducing emissions and noise pollution from auxiliary engines.

A major milestone in this space is the launch of the SOP for the **Green Tug Transition Programme (GTTP)** in August 2024. The GTTP sets a clear roadmap for all Major Ports to transition from conventional diesel tugs to electric or alternative-fuel-powered tugs; Deendayal Port has already awarded a contract for a battery-electric tug. These efforts are further supported by the **Harit Sagar Green Port Guidelines**, launched in May 2023, which provide Major Ports with a comprehensive framework to achieve carbon neutrality without disturbing surrounding ecosystems. Complementing these efforts, ports are investing in the electrification of port equipment and replacement of legacy systems with energy-efficient machinery, contributing significantly to emissions reduction.

The objective of Environmental Health focuses on improving air and water quality within port environments. Major Ports are now equipped with real-time environmental monitoring systems, tracking air, harbour water, noise, and effluent parameters.

On-ground interventions like dust suppression systems, spill-proof conveyors, and mechanized road sweeping are being scaled up to control unintended emissions and improve safety and hygiene.

The third pillar, **Ecosystem Vitality**, ensures that maritime growth proceeds without compromising the health of surrounding ecosystems.

Ports are adopting practices such as the reuse of dredged material in line with the 2021 Dredging Guidelines, minimizing disposal impacts. Additional initiatives include expansion of green cover, mangrove restoration, rainwater harvesting, water reuse, sewage treatment, and waste-to-energy conversion, collectively aimed at **preserving biodiversity and natural resource** cycles within and around port zones.

These efforts are underpinned by strong institutional support. The **National Centre of Excellence for Green Port and Shipping**, established in 2022, provides technical guidance, global benchmarking, and policy support. The **Directorate General of Shipping (DGS)** has issued enabling regulatory framework. The **NAVIC Green Cell**, in collaboration with technical experts and think tanks, has facilitated cross-port learning, data-driven planning, and pilot implementation of green technologies.

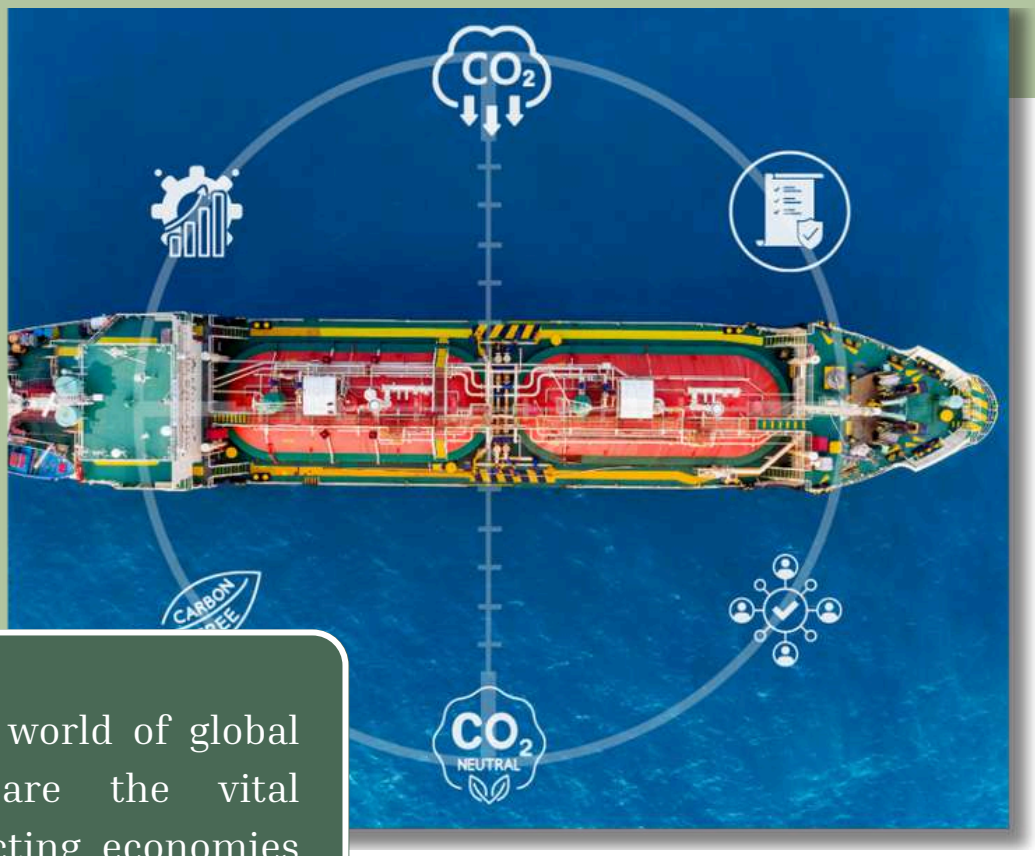
India has also taken its first steps toward becoming a **green hydrogen hub.** Kandla, Paradip, and Tuticorin have earmarked over 4,000 acres of land for hydrogen production and storage infrastructure. Tuticorin Port has successfully commissioned a pilot green hydrogen production facility (10 cubic meters capacity), while a 1 MW electrolyzer project is underway at Kandla, expected to be operational this year.

Simultaneously, feasibility assessments for **green shipping corridors**—both international and coastal—are underway. Tuticorin and Kandla have emerged as promising nodes for international green corridors, with support from global partners.

This souvenir is both a record of collective effort and a recognition of the growing ecosystem of stakeholders working together for a greener maritime future. It reflects India's commitment to align economic growth with environmental stewardship, and its readiness to lead as a responsible maritime nation.

With gratitude to all institutions, officers, technical partners, and international collaborators who have shaped this journey — we look ahead with renewed purpose, guided by partnership, pragmatism, and the principles of sustainable development.

FROM BLUE TO GREEN: HOW V.O. CHIDAMBARANAR PORT IS LEADING INDIA'S MARITIME DECARBONIZATION



In the bustling world of global trade, ports are the vital arteries, connecting economies and facilitating the flow of goods. However, these hubs of commerce have traditionally been associated with significant carbon footprints. V.O. Chidambaranar Port Authority (VOCPA) in Tuticorin, one of India's 12 major ports, is aggressively rewriting this narrative.

Shri Susanta Kumar Purohit IRSEE, Chairperson, V.O. Chidambaranar Port Authority

The Foundation: An Audit-Driven Conservation Plan

The first step in any successful transformation is understanding the baseline. VOCPA’s green journey began not with grand gestures, but with a meticulous Energy Audit and Conservation Plan. Recognizing that you cannot manage what you do not measure, the port authority conducted a comprehensive audit of its entire operational landscape. This deep dive identified key areas of energy consumption, from high-mast lighting and administrative buildings to power-intensive cargo handling equipment.

The audit's findings became the bedrock of VOCPA's strategy, leading to the implementation of immediate, high-impact conservation measures. All conventional lighting across the port premises, including high-mast lights, streetlights, and indoor fixtures, were systematically replaced with energy-efficient LEDs. This simple yet effective move resulted in a drastic reduction in electricity consumption for illumination. Furthermore, high-capacity pumps were replaced to optimizing power usage based on real-time load requirements and preventing energy wastage. These foundational steps created a culture of conservation and provided the initial momentum for the port's larger green energy transition.

Powering Progress: The Green Energy Transition

The cornerstone of VOCPA's decarbonization effort is its decisive shift towards renewable energy. Moving beyond mere conservation, the port has invested significantly in harnessing the abundant solar and wind resources of the region.

A landmark project is the port's 5 MW ground-mounted solar power plant, which generates a substantial portion of the port's daily energy requirement. This has been supplemented by another 1.4 MW solar installation and a strategic push for rooftop solar panels across its numerous administrative buildings, substations, and warehouses. By transforming passive rooftops into active energy generators, VOCPA is maximizing its land use and decentralizing its power generation.

Complementing its solar capacity is a 2 MW wind farm, tapping into the strong coastal winds. The synergistic combination of solar and wind power ensures a more stable and reliable supply of green energy, mitigating the intermittency of a single renewable source. The cumulative impact of these initiatives is staggering: the generation of millions of units of clean electricity has enabled the port to **offset over 10,000 tonnes of CO2 emissions annually.**

Building Green, Operating Clean: Infrastructure and Policy

This achievement is not just a number on a report; it is a tangible contribution to India's climate goals and a testament to the port's commitment. This data-backed success story has directly contributed to a **36 percent reduction in CO2 emissions per unit of cargo handled,** showcasing remarkable operational efficiency and environmental responsibility.

VOCPA's green philosophy extends beyond energy generation to the very fabric of its infrastructure and daily operations.

Green Building Transition: All new construction within the port is now mandated to adhere to green building principles. The administrative building is being retrofitted in line with IGBC norms, incorporating features like passive solar design for maximum natural lighting, enhanced ventilation, rainwater harvesting systems, and the use of sustainable and recycled construction materials. This ensures that the port's physical expansion is as sustainable as its operations.

Plastic-Free Campus and Policy: Recognizing the menace of plastic pollution in marine ecosystems, VOCPA has implemented a robust plastic-free policy. A complete ban on single-use plastics, including bags, cups, and bottles, has been enforced across the entire port premises.

This policy is supported by awareness campaigns for employees, stakeholders, and visitors, alongside the promotion of sustainable alternatives. This initiative demonstrates a holistic understanding of environmental responsibility, tackling not just air pollution but also land and marine pollution.

Creating Green Infrastructure: The concept of "green infrastructure" is woven into all aspects of port planning. This includes the installation of Sewage Treatment Plants (STPs) to recycle wastewater for horticulture and dust suppression, the development of extensive green belts, and the implementation of smart lighting systems that dim automatically during periods of inactivity.

Beyond the Gates: Ecosystem Restoration and Community Engagement

A truly sustainable organization recognizes its role within the broader ecosystem. VOCPA has passionately embraced this responsibility through large-scale afforestation and community-led environmental drives.

Afforestation Efforts: The port has undertaken massive afforestation drives, planting over cumulative 100,000 saplings in and around its premises.

Further, VOCPA is exploring to Utilizing techniques like the Miyawaki method, to create dense, native forests that act as vital carbon sinks, improve local air quality, and enhance biodiversity. These green lungs serve as a natural buffer against industrial activity and stand as a living symbol of the port's commitment to nature.

Beach Cleaning Drives: As a coastal entity, VOCPA is acutely aware of its duty to protect the marine environment. The port regularly organizes and participates in beach cleaning drives, often in partnership with local communities, under the national 'Swachh Sagar, Surakshit Sagar' (Clean Coast, Safe Sea) campaign. These drives not only remove tonnes of waste from the coastline but also foster a sense of environmental ownership among the local population.

Seeding the Future: The Green Warriors Education Initiative

While investing in green technology and infrastructure is critical for immediate impact, V.O. Chidambaranar Port Authority (VOCPA) understands that the most profound and lasting transformation is cultural. True sustainability is not just implemented; it is ingrained.

To this end, the port has launched a pioneering educational program within its own schools, aiming to do more than just teach environmental science—it aims to cultivate a generation of "future-ready Green Warriors." This holistic initiative is designed to permeate the entire school ecosystem, empowering students, training teachers, and engaging parents to create a powerful ripple effect that sensitizes the larger community.

The Future is Now: Pioneering the Next Wave of Decarbonization

While its current achievements are commendable, VOCPA is already charting a course for a more ambitious, zero-emission future. Its roadmap is focused on tackling the next frontier of decarbonization: operational emissions and future fuels.

Green Hydrogen Production Pilot: In a move that positions it at the cutting edge of maritime technology, VOCPA is set to establish a green hydrogen production pilot plant. Green hydrogen, produced using renewable energy and water, is a clean fuel with the potential to power heavy-duty equipment like cranes, trucks, and reach stackers, which are difficult to electrify. This pilot project will serve as a crucial testbed, providing invaluable insights for scaling up hydrogen infrastructure and making VOCPA a first-mover in the hydrogen economy.

Electrification of Transport and Equipment: The port has a clear roadmap for the complete electrification of its assets. This includes phasing out diesel-powered vehicles and introducing a fleet of electric buses for staff transportation and electric cars for official use. More critically, the plan involves the systematic electrification of all port equipment, from gantry cranes to forklifts, which will virtually eliminate Scope 1 emissions from its internal operations.

Green Trucking through PPP: A significant portion of a port's emissions comes from the thousands of private trucks that transport cargo to and from its gates. To address this, VOCPA is pioneering a Green Truck Policy by onboarding Public-Private Partnership (PPP) partners.

This collaborative model will systematically incentivize and eventually mandate the transition of its logistics ecosystem to cleaner trucks, starting with BS-VI standards and moving towards CNG, LNG, and ultimately, electric trucks. This phased, partnership-driven approach is a pragmatic solution to a complex challenge.

A Hub for Green Bunkering: Looking ahead, VOCPA aims to play a pivotal role in decarbonizing global shipping itself.

The ultimate ambition is to become a major hub for bunkering of green methanol and green ammonia, the leading candidates for the future fuels of the global shipping fleet. By developing the infrastructure and capabilities to refuel the green vessels of tomorrow, VOCPA is positioning itself not just as a sustainable port, but as a critical enabler of a green global supply chain.

Conclusion: A Model for a Sustainable Maritime Future

V.O. Chidambaranar Port Authority's greening journey is a powerful case study in strategic, multi-faceted environmental action. It is a story of how data-driven audits, bold investments in renewable energy, forward-thinking infrastructure policies, and a commitment to ecosystem restoration can converge to create profound change. The results—a 36% reduction in emissions per cargo unit and an annual offset of 10,000 tonnes of CO2—are not just milestones but a Launchpad for an even more ambitious future. As VOCPA powers ahead with its plans for green hydrogen, full electrification, and green bunkering, it is not just reducing its own carbon footprint; it is charting a course for all of India's ports to follow, proving that the future of maritime trade is, and must be, green.

V.O.CHIDAMBARANAR PORT: LEADING THE WAY TOWARDS A GREENER FUTURE

EV INFRASTRUCTURE IMPLEMENTATION

Installation of five EV charging stations and deployment of 20 electric vehicles.

01.

CSR FOR SUSTAINABLE TRANSPORT

Donation of a CNG-powered bus to the Harbour Higher Secondary School as part of its CSR efforts, encouraging sustainable transportation.

02.

GREEN HYDROGEN TECHNOLOGY DEMONSTRATOR

Completion of pilot project for green hydrogen production, making it the first Indian port to generate green hydrogen as a technology demonstrator.

03.

HYDROGEN FOR STREETLIGHTS & EV CHARGING

Installation of the 10 Nm^3/hour plant, powered by the Port's renewable energy through electrolysis, will supply hydrogen to selected streetlights and electric vehicle charging stations.

04.

MAJOR INVESTMENT IN GREEN FUEL INFRASTRUCTURE

VOC Port has designated 501 acres for green hydrogen and ammonia production and storage,

05.

GREEN HYDROGEN BUNKERING FACILITY

A pilot green-hydrogen bunkering and refuelling facility (750 m^3 storage), funded by a ₹35 crore MNRE grant, is under development and expected by January 2026.

06.

SUPPORT FOR WIND ENERGY AND GREEN SHIPPING

VOC Port is building two berths for windmill components to support 20 GW wind energy and launching a Green Shipping corridor between Kandla and Tuticorin.

07.

INCENTIVES FOR GREEN FUEL SHIPS

The Port offers dues concessions for IAPH-ESI vessels and is in talks with IMO to operate green fuel ships from Rotterdam and Singapore, with a feasibility study ongoing.

08.

PARADIP PORT:
FORGING INDIA'S GREEN MARITIME FRONTIER

Paradip Port, situated along the Bay of Bengal in Odisha, is one of India's most strategically important maritime gateways. Commissioned in 1966, it has grown to become the No.1 major port in the country in terms of cargo throughput, recording over 150 million tonnes in FY 2024–25. Its geographic location enables efficient access to the mineral-rich hinterlands of Odisha, Jharkhand, and Chhattisgarh, making it a vital node for the export of dry bulk cargo like coal and iron ore, and the import of crude oil, fertilisers, and other industrial goods.

However, with the increasing scale of operations and the nature of cargo handled—much of which comprises fossil fuels and heavy minerals—Paradip Port faces a growing responsibility to mitigate its environmental impact. As India moves steadily toward its goal of achieving net-zero emissions by 2070, the role of ports in facilitating decarbonised logistics has become more critical than ever. Environmental, Social, and Governance (ESG) compliance is also emerging as a key determinant of global competitiveness in trade.

Shri P.L.Haranadh, IRTS
Chairperson, PPA

In this context, Paradip Port has embraced a strategic and comprehensive green transformation, aligning its growth trajectory with sustainable development principles.

One of the most ambitious initiatives under this transformation is the port's foray into the green hydrogen and ammonia sector. During the Global Maritime India Summit 2023, Paradip Port signed Memoranda of Understanding worth ₹50,800 crores with few of the major green hydrogen developers in India. As part of this initiative, the port is developing a dedicated 4 million tonnes per annum green hydrogen/ammonia export terminal along with ancillary facilities for the nearby to be set up green hydrogen/ammonia plants. This terminal will not only boost India's green fuel exports to global markets in Southeast Asia and Europe but also pave the way for future green bunkering capabilities for vessels calling at Paradip.

In tandem with the shift to green fuels, Paradip Port is also taking robust steps toward electrifying its operations. Complete electrification of cargo handling equipment is underway to phase out diesel-based systems such as diesel locomotives. Around 30 km of rail line electrification has been completed at Paradip Port and by 2024 the Port aims at electrifying its entire rail network. Similarly, diesel locomotives will be phased out in years to come.

The port is also implementing shore-to-ship power supply systems, which will allow berthed vessels to switch off their engines and reduce emissions significantly during port stays. Under the Green Tug Transition Program (GTTP), the port is set to procure green tugs. Further the Technologies such as unmanned weighbridges, automated gates, and sensor-enabled cargo tracking have been deployed to enhance efficiency and reduce idle time, which indirectly contributes to emission reduction.

To address emissions and environmental degradation from dry bulk cargo, Paradip Port has committed to achieving 100% mechanisation of cargo handling by 2030 from current level of 80% of berth mechanisation. This includes advanced mechanised shore handling equipment, covered conveyor belts, and enclosed handling zones that minimise particulate emissions. These measures are expected to make a tangible impact in curbing both air and noise pollution in and around the port premises.

Renewable energy integration is another cornerstone of the port's green roadmap. With the port aiming for high levels of mechanization by 2030, the corresponding surge in electricity demand necessitates sustainable energy solutions.

In response, the Port has initiated the development of a 10 MW solar power plant, for which the contract has already been awarded and is slated for completion by March 2026. Additionally, the Port is planning further solar installations to achieve its target of meeting 60% of its electricity requirements through renewable energy. Any remaining demand will be fulfilled by sourcing green power via the open access mechanism from renewable producers within Odisha. Through this integrated approach, Paradip Port aspires to evolve into a fully solar-powered, mechanized green port by 2030.

Paradip Port has implemented a range of dust mitigation measures to improve air quality within and around the port. These include installation of net barriers around the port perimeter, deployment of covered conveyor belts and enclosed pipelines from nearby industries, and the use of water sprinklers and dry fog dust suppression systems at berths, railway sidings, and the mechanised rail wagon handling plants. Additional initiatives such as mist cannons, mechanical road sweeping machines, and truck tyre washing units have been set up to control road dust emissions.

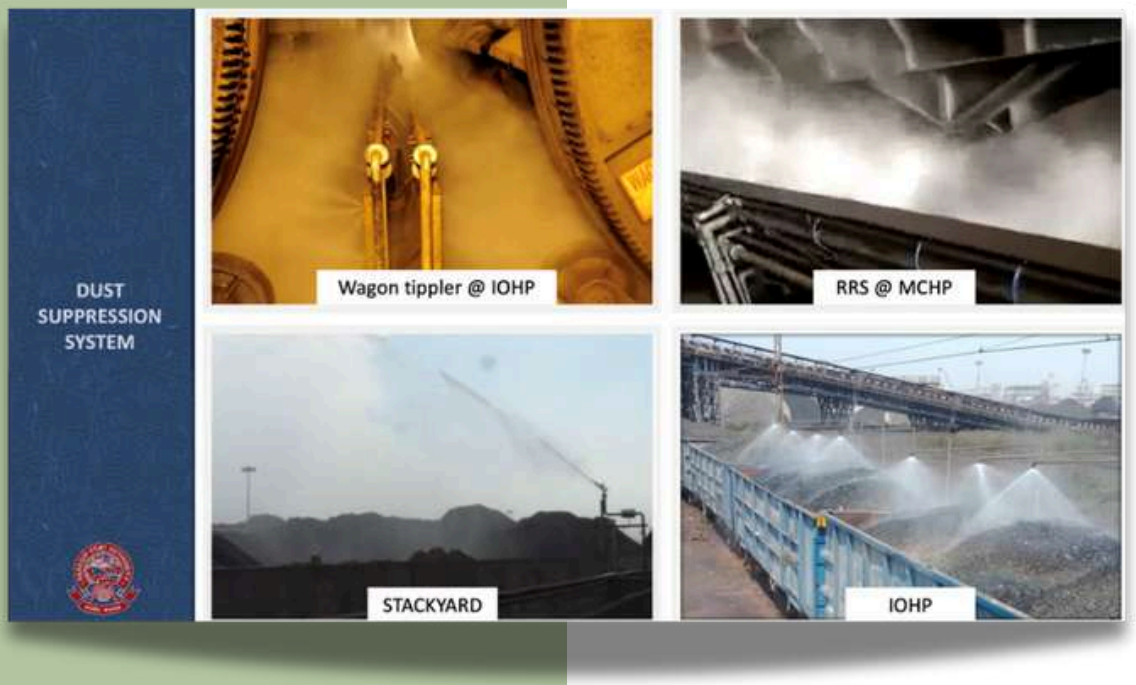
Paradip Port is adopting sustainable water and waste management practices to minimize environmental impact. Zero liquid discharge systems are being ensured through its 6.5 MLD sewage treatment plants, enabling wastewater reuse for dust suppression systems and gardening purpose. The Port has also partnered with Numaligarh Refinery Limited to use 2.3 million m^3 of dredged material for land reclamation in its upcoming crude oil terminal.

Green infrastructure is a key focus, with all new terminals being built to green building standards. Rainwater harvesting, large-scale afforestation, and bio-shielding are being implemented to mitigate cyclonic risks and rising sea levels, while modern stormwater drainage systems are enhancing climate resilience.

Since the devastating 1999 super-cyclone, Paradip Port has made significant strides in afforestation. Over the past four years, nearly 4 lakh trees have been planted, with a goal of reaching one million by 2025. The initiative also extends to greening cargo handling zones with the help of horticulture experts. These efforts have transformed the port into a vibrant urban forest, reflecting its strong commitment to environmental sustainability.

→ Urban Forestation at Paradip Port

As international shipping transitions toward sustainable operations, Paradip Port is emerging as a pioneer among Indian ports in enabling this green evolution. It is not merely a port handling cargo; it is a port leading change—toward a cleaner, greener, and more sustainable maritime future.



INDIAN PORTS SPEARHEADING A SUSTAINABLE FUTURE: THE NAVIC CELL #3 VISION

NAVIC Cell #3 "Green Initiatives & Pollution Control" is a pivotal engine for transformation in India's maritime sector, dedicated to charting a sustainable trajectory for the country's ports in line with pressing national and global imperatives. Conceived as part of an overarching strategy to decarbonize maritime trade and operations, the cell provides the vital coordination, monitoring, and policy direction required to realize the Government of India's vision for net-zero emissions and climate resilience.

Its work is deeply aligned with landmark national initiatives such as Harit Sagar, Maritime India Vision 2030, and the Net Zero 2070 commitment, reflecting a broad mandate that transcends operational interventions and seeks systemic, long-term change in port management and development.

Shri Rajesh Soundararajan, IAS
Deputy Chairperson
V.O. Chidambaranar Port Authority

Integral to NAVIC Cell #3's function is the implementation of a comprehensive approach to greening Indian ports. This includes developing robust frameworks for the adoption of clean energy, instituting best practices for decarbonizing port infrastructure, and cultivating a culture of continuous improvement and environmental responsibility. The cell is committed to regular assessment and transparent reporting of decarbonization progress, an effort that not only holds stakeholders accountable but also encourages knowledge sharing and peer learning across the sector.

Policy formulation under the cell's guidance emphasizes both strategic investments and granular operational change. Renewable energy integration is one of the top priorities, with an eye on reducing dependency on fossil fuels and establishing ports as hubs of clean energy generation and utilization. This involves advocating for the expansion of solar and wind energy infrastructure within ports and promoting innovative energy solutions such as hydrogen. Decarbonizing logistic chains, optimizing energy efficiency, and electrifying port equipment and vehicles form key elements of the cell's operational blueprint. Such, initiatives are systematically tracked and refined to maximize their practical impact and cumulative value.

Capacity building is recognized by the Cell as vital to ensuring the success of green policies.

The cell liaises with esteemed research and academic organizations to roll out specialized training programs that instil best-in-class sustainability practices, cultivate environmental awareness, and empower port officials and stakeholders to participate proactively in the green transition. Investments are also made to support the adoption of advanced technologies and digital solutions, which streamline environmental data collection and foster more precise interventions at every operational tier.

A significant milestone in the cell's work is the creation of a Green Rating Framework. Developed in collaboration with expert industry partners, this benchmarking system evaluates the environmental performance of ports against comprehensive criteria, promoting healthy competition and facilitating the identification of best practices. By making sustainability performance a visible and objective metric, the rating framework drives continuous improvement and underpins efforts to achieve international standards in responsible maritime operations.

It also provides a transparent foundation for green capital allocation, making it easier to attract investment aligned with environmental objectives.

Investment mobilization forms another core pillar for NAVIC Cell #3. The cell is instrumental in ensuring that environmental and sustainability priorities are fully integrated with port financial strategy. This includes supporting proposals for green capital investments, catalyzing public–private partnerships and advocating for innovative financing models that can unlock the resources required for ambitious green port projects across the country. Such coordinated funding efforts ensure that environmental and economic objectives progress in tandem, cementing ports' role as strategic assets for sustainable national development.

The practical impact of the cell's policies and strategic vision is exemplified by the initiatives undertaken by V.O. Chidambaranar (VOC) Port Authority in Tuticorin. VOC Port stands as a model for sustainability in action. It has systematically integrated renewable energy into its infrastructure, operating a 5 MW ground-mounted solar plant, a 2 MW wind farm, and over 1 MW of rooftop solar capacity.

VOC Port is pioneering India's leap into the frontier of green fuels.

As the first Indian port to operationalize an in-house green hydrogen pilot project, VOC port has demonstrated that ports can and must lead on fuel innovation. Our green hydrogen plant, powered entirely by renewables, now supplies clean energy for selected operations such as street lighting and electric vehicle charging. This pilot is but the first step. We have earmarked a portion of our land for the development of a major green hydrogen and ammonia manufacturing ecosystem and have already attracted significant investment interest from major industry players. By embracing hydrogen, methanol, and other alternative fuels, we aim to catalyze a vibrant campus of research, production, and bunkering services, thereby empowering both Indian and international shipping lines to decarbonize their fleets.

Looking beyond our gates, we take seriously our responsibility to foster green shipping corridors and incentivize sustainable vessels. Our port is actively working with national authorities and international partners to develop green corridors along the Indian coastline, with the intention of making the Tuticorin–Kandla axis a pioneering showcase for carbon-neutral logistics. Our ongoing dialogue with ports in Rotterdam, Singapore, and other global green leaders aims to streamline best practices and develop seamless networks for clean fuels bunkering and green shipping technologies.

A sustainable port is fundamentally defined by stakeholder engagement and social responsibility. We invest considerably in educating our employees, port users, and neighboring communities about the environmental imperatives of our time. Through capacity-building, outreach programs, and meaningful collaborations with academia, we strive to expand the circle of green leadership far beyond our own operations.

NAVIC Cell #3 exemplifies how India's ports, can become leaders in green energy, innovation, and environmental stewardship, setting the pace for the nation's evolving green economy. As events like Indian Maritime Week convene the sector, these achievements reveal the power of forward-thinking policies and active partnerships among government, industry, and citizens. With perseverance and creativity, India's ports are positioning themselves as beacons of responsibility, inspiring the world toward a cleaner, brighter future.

NAVIGATING THE NET-ZERO HORIZON: THE GLOBAL MARITIME SECTOR'S TRILLION-DOLLAR TRANSFORMATION

Shri D.P. Dash, Principal Advisor, V.O. Chidambaranar Port Authority

Introduction

For centuries, the maritime sector has been the silent, indispensable engine of global commerce. Carrying over 90% of the world's trade by volume, it is the lifeblood of our interconnected economy, ensuring that goods move seamlessly from producer to consumer across vast oceans. Yet, this vital industry, a cornerstone of global prosperity, now stands at a historic crossroads. Its reliance on fossil fuels has made it a significant contributor to global greenhouse gas emissions, placing it at the center of the world's urgent decarbonization agenda.

The challenge is monumental: to transform a sector with over 100,000 vessels, long asset lifespans, and immense energy needs into a sustainable, net-zero enterprise, powered by conventional heavy fuel oil (HFO) or marine gas oil (MGO) in 98% of the fleet and 1.5 to 2% of the fleet by alternative fuels.

This article explores the multifaceted journey of this transformation, examining the global and Indian regulatory landscapes, the revolutionary shift to green fuels, the trillion-dollar financing puzzle, and the ultimate role of the maritime sector in achieving a sustainable planet.

The Scale of the Challenge: Emissions, Growth, and a Widening Gap

To understand the journey, one must first grasp the scale of the challenge.

The global maritime sector emits over 1 billion tonnes of CO2 annually, accounting for approximately 2.7% of total global CO2 emissions. This figure places the industry's footprint on par with that of a major industrial nation like Germany.

This challenge is compounded by relentless growth. The International Maritime Organization (IMO) uses 2008 as its baseline year, when global seaborne trade stood at 8.2 billion tonnes. By 2025, this volume is projected to surpass 13 billion tonnes, and by 2035, it could well exceed 17 billion tonnes, effectively doubling the demand for shipping services from the baseline.

This creates a fundamental conflict: how can an industry drastically reduce its absolute emissions while the demand for its services continues to surge? The answer is clear: incremental efficiency gains are no longer sufficient. A paradigm shift is required.

The Global Compass: IMO's Regulatory Framework

Recognizing this urgency, the IMO has established a robust regulatory framework to guide the industry's transition. The cornerstone of this effort is the 2023 IMO Strategy on Reduction of GHG Emissions from Ships (Resolution MEPC.377(80)). This landmark strategy sets a clear, non-negotiable course:

- **The Ultimate Goal:** Achieve Net-Zero GHG emissions by or around 2050.
- **Critical Checkpoints:**
  - Reduce total annual GHG emissions by at least 20% (striving for 30%) by 2030.
  - Reduce total annual GHG emissions by at least 70% (striving for 80%) by 2040.
- Fuel Uptake Target: Ensure that zero or near-zero emission fuels represent at least 5% (striving for 10%) of the energy used by shipping by 2030.

To enforce these goals, the IMO has implemented short-term measures that are already in effect:

- **EEXI (Energy Efficiency Existing Ship Index):** A one-time technical requirement for existing ships to improve their energy efficiency.
- **CII (Carbon Intensity Indicator):** An annual operational rating (from A to E) that measures a ship's carbon intensity. Ships with poor ratings are required to implement corrective action plans.

Verdict: While the industry is largely on track to meet its initial 40% carbon intensity reduction goal for 2030, it is **significantly off track** for the more critical absolute emission reduction targets. The current trajectory of emissions is not declining fast enough, making the next five years pivotal for accelerating action.

The Fuel Revolution: Charting a Course to Green Energy

The core of the transition lies in replacing conventional heavy fuel oil with a new generation of green fuels. This is no longer a distant prospect; it is an active industrial revolution.

- **The Order Book as Evidence:** The most telling sign of change is the global order book for new vessels. For the first time in history, over 50% of new vessel tonnage on order is designed to be technology ready alternative-fuel capable (30%CNG, 7% LNG, 10 % Methanol, 1 to 2% Ammonia/Hydrogen)

- **A Multi-Fuel Future:**

  - **Transitional Fuels (Lower Carbon):** Liquefied Natural Gas (LNG) has been the most mature alternative, offering CO2 reductions of ~20-25%. However, its status as a fossil fuel and issues with methane slip position it as a bridge, not a destination.

  - **Net-Zero Pathways (Green Fuels):**

    - **Green Methanol:** Has emerged as the leading contender, particularly for container lines. It is easier to handle than other alternatives and has a clear pathway to net-zero when produced from renewable sources (e-methanol).

    - **Green Ammonia:** Offers a completely carbon-free molecule but presents challenges in terms of toxicity and engine technology. "Ammonia-Ready" designs are becoming common.

    - **Green Hydrogen:** The ultimate clean fuel, but its low energy density makes storage a major obstacle for deep-sea shipping.

The primary challenge has shifted from building the ships to securing the fuel. The production, storage, and bunkering infrastructure for these new fuels requires a massive, coordinated global effort.

The Trillion-Dollar Question: Financing the Transition

This green revolution comes with a colossal price tag. Leading industry analyses estimate the total capital required by 2050 to be between $1.4 trillion and $3.4 trillion.

(Ref: "Maritime Forecast to 2050" Det Norske Veritas, "Review of Maritime Transport 2023" UNCTAD, Global Maritime Forum & UMAS (University College London): "The scale of investment needed for shipping's transition to zero carbon fuels, Clerkson's Research; "Shipping and the Energy Transition").

Such a sum cannot be borne by shipping companies alone. Consequently, a new ecosystem of **innovative financing** is taking shape:

- **Market-Based Measures (MBMs):** A global carbon levy is a leading proposal at the IMO. It would create a price signal against pollution and generate billions in revenue that can be recycled to subsidize green fuels and ensure an equitable transition for developing nations.

- **The Poseidon Principles:** A groundbreaking initiative where over 30 leading banks, representing a significant share of global ship finance, agree to align their lending portfolios with IMO climate targets. This links the cost of capital directly to a ship's environmental performance.

- **Green Corridors:** Public-private partnerships that focus on de-risking investment on specific, high-traffic shipping routes (e.g., Singapore-Rotterdam). By concentrating bunkering infrastructure and vessel deployment, they create viable mini-markets for green shipping.

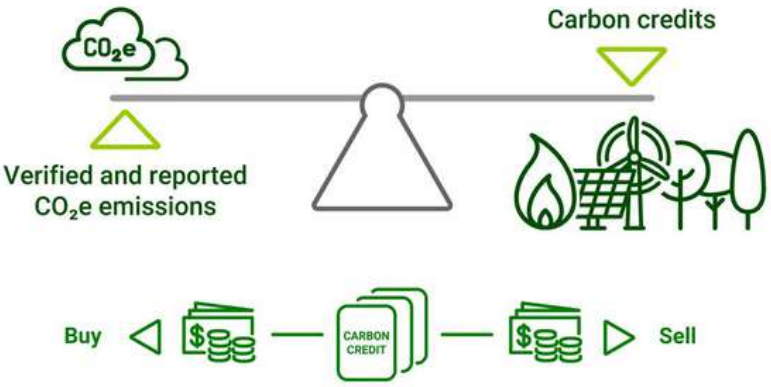
- **Blended Finance:** Using public or philanthropic funds to absorb risk and attract larger pools of private capital, especially for projects in developing countries.

The Indian Horizon: Decarbonizing Amidst Unprecedented Growth

India's maritime sector presents a unique and compelling case study. Unlike mature shipping nations focused on reducing from a high baseline, India's primary challenge is to **decouple its exponential growth from its emissions**. Guided by the **Maritime India Vision 2030** and the overarching **Maritime Amrit Kaal Vision 2047**, India is pursuing massive capacity expansion. Its strategy is not to halt growth but to ensure that this new growth is fundamentally green. Key government initiatives include:

- **Green Port Guidelines:** Mandating major ports to source over 60% of their power from renewables by 2030. Many ports are on track, with significant investments in solar and shore power.

- **The Green Tug Transition Programme (GTTP):** An ambitious plan to make India a global hub for building green ships by 2030, starting with the deployment of green-fueled tugboats in its major ports.



- National Green Hydrogen Mission: This policy designates major ports like Deendayal (Kandla), Paradip, and V.O. Chidambaranar (Tuticorin) as Green Hydrogen Hubs, positioning them as future centers for producing and exporting green ammonia and hydrogen.

India's approach is a long-term play: build a world-class, efficient, and "green-ready" maritime infrastructure today, so that when green fuels become available at scale, the nation can decarbonize rapidly from a much larger economic base, aligning with its national goal of achieving Net Zero by 2070.

Conclusion: A Shared Voyage on Uncharted Waters

The global maritime sector has embarked on the most profound transformation in its history.

The voyage from a fossil-fueled past to a net-zero future is complex, expensive, and fraught with challenges. Yet, for the first time, the course is becoming clear.

The destination is set by global and national regulations. The technology, in the form of green-capable ships and alternative fuels, is being deployed. The financial world is creating new tools to fund the journey. The success of this epic undertaking will hinge on unprecedented collaboration between policymakers, financiers, energy producers, shipowners, and cargo owners. The silent engine of commerce must now become a vocal leader in climate action. The voyage has begun, and there is no turning back.

ESG INVESTMENTS IN PORT INFRASTRUCTURE : UNLOCKING GREEN CAPITAL FOR SUSTAINABLE GROWTH

India's maritime sector, the lifeline of its international trade, is witnessing a major transformation with sustainability at its core. With nearly 70% of India's trade by value passing through its ports, the maritime sector is vital to the country's economic growth. Key initiatives include:

01. VOC Port's green initiatives have contributed to a reduction of 10.37 million kilograms of carbon dioxide emissions.

02. Cargo handled at major ports rose from 819 million tonnes in FY 2023–24 to 855 million tonnes in FY 2024–25, reflecting a 4.3% annual growth rate and highlighting the rising demand for efficient, green port infrastructure.

03. This consistent cargo growth underscores the urgency of integrating low-carbon solutions to support both economic and environmental objectives.

GREEN SHIPPING CORRIDORS: STEERING MARITIME TRADE TOWARDS A SUSTAINABLE FUTURE

Over 80% of global trade by volume is carried by sea, making maritime shipping a cornerstone of the global economy. However, this vital industry is heavily reliant on fossil fuels, contributing approximately 2–3% of global CO_2 emissions — a figure that could rise to 5-8 % by 2050 if unregulated (1). As climate change accelerates, causing rising sea levels and extreme weather events, the maritime sector finds itself under increasing pressure to decarbonise.

In support of the United Nations' Sustainable Development Goal 13: Climate Action and the Paris Agreement, the International Maritime Organisation (IMO) has pledged to reduce greenhouse gas (GHG) emissions from global shipping. This includes its 2023 GHG strategy, which targets a 40% reduction in carbon intensity by 2030 (compared to 2008 levels), and a minimum of 5% of international shipping energy to come from zero or near-zero emission sources by the same year.

Shri P Raveendran, Principal Advisor, V.O. Chidambaranar Port Authority

What is a Green Shipping Corridor?

Green shipping corridors are designated maritime routes that prioritise the use of **low or zero-emission fuels and clean technologies.** These corridors are created through collaboration between ports, shipping companies, fuel suppliers, and governments, aiming to fast-track the decarbonisation of the shipping industry. They serve as innovation zones to pilot alternative fuels like **LNG, methanol, green hydrogen,** and **ammonia**, along with shore power infrastructure and digital emissions monitoring.

Green shipping corridors have now become prominent as global trade routes are aligning with climate goals, enabling zero-emission vessels, green fuel infrastructure, and policy support to decarbonize maritime logistics.

The Shift in Marine Fuel Trends

Historically, maritime shipping relied on Heavy Fuel Oil (HFO) due to its affordability, despite its high sulphur and carbon content. In the 2000s, Marine Diesel Oil (MDO) emerged, especially in sensitive coastal regions. With the IMO 2020 regulation, sulphur content in fuels was capped at 0.5%, leading to a widespread shift to Low Sulphur Fuel Oil (LSFO).

Recently, the industry has begun transitioning toward cleaner alternatives like Liquefied Natural Gas (LNG) and experimental fuels such as methanol and hydrogen, which are now at the heart of green corridor initiatives.

Green Fuels: Promise and Practical Problems

Several challenges hinder large-scale adoption. Green fuel production is currently limited and needs to be scaled up significantly. At present, green fuels are costlier than fossil fuels, especially due to low production volumes. It's crucial to ensure that biomass and renewable energy inputs are sourced responsibly. Since the current fuel infrastructure is designed for conventional fuels, switching to green alternatives will demand heavy investments. Clear long-term regulations and supportive incentives are essential to attract investment and build stakeholder confidence.

Nonetheless, green fuels offer a viable pathway to d**ecarbonise hard-to-abate sectors**, bolster **energy security**, and catalyse **new economic opportunities.**

Along with the fuel, building new vessels or retrofitting, for that matter, involves lots of capital investment. A Reuters article dated June 4, 2025, reports that Maersk currently operates 13 dual-fuel (methanol/LNG) container ships, with another 20 on order.

It also notes that only 25 dual-fuel ammonia-powered ships are on order globally—a limited rollout due to technical and fuel supply constraints.

Currently, many ports are designed for conventional fuels. Transition in the fuels needs major investments in the infrastructure, like bunkering facilities, storage farms/tanks, and safety mechanisms. The major challenge lies in coordinating with the Stakeholders, who are often fragmented. Currently, Singapore aims to install pilot bunkering infrastructure for ammonia by 2027, while in April, Rotterdam completed a trial transfer of ammonia between ships.

International Collaborations:

Globally, ports and shipping lines are joining hands to develop green corridors:

Notable examples include routes from Montreal to Antwerp, Los Angeles to Shanghai, and Singapore to Rotterdam. Others, such as the Nordic Green Corridor, the Singapore–Australia Digital Corridor, and the US–South Korea Corridor, highlight the worldwide momentum.

Recently, India and Singapore have also signed a Letter of Intent to establish a Green and Digital Shipping Corridor, promoting low-emission trade routes and enhanced digital connectivity.

These initiatives align with IMO goals and serve as templates for developing countries.

India's Green Shipping Vision

India has made steady progress through policy and infrastructure upgrades. The Maritime India Vision 2030 and the Harit Sagar Guidelines (2023) underscore the country's intention to develop eco-friendly ports, promote electrification, and encourage the use of alternative fuels. India is part of the Clydebank Declaration and is exploring international green corridor collaborations with Japan, Norway, and Singapore.

On the domestic front, ports are being modernised for LNG bunkering and are evaluating their readiness for methanol and hydrogen-based fuels. The Chennai–Colombo corridor is under consideration as a pilot for cross-border collaboration.

Launching India's First Green Shipping Corridor

In a landmark development, India is set to launch its first coastal green shipping corridor connecting Kandla (Deendayal Port, Gujarat) and Thoothukudi (V. O. Chidambaranar Port, Tamil Nadu). Announced during the Chintan Shivir Programme in the month of May, the corridor is expected to go live in FY 2026. This corridor is being jointly developed by the Deendayal Port Authority, the VOC Port Authority, and the Shipping Corporation of India.

VOC Port has already started pilot green hydrogen production, while Kandla Port aims to generate 1 MW of green hydrogen by early next year. These vessels will act as testbeds for clean shipping, and the corridor's success could pave the way for future international green corridors, including possible routes to Singapore and Europe.

The Road Ahead

India's green shipping corridor is a strategic move to position the country as a regional leader in sustainable maritime logistics. With its cost-efficiency, coastal shipping is well-suited for green transformation and holds the potential to scale both domestically and globally.

As part of India's commitment to achieving net-zero maritime emissions by 2070, this corridor marks a significant milestone in aligning with the IMO's 2050 decarbonisation goals and pushing forward a cleaner, greener maritime future.

As India sails ahead in its green maritime mission, collaborative innovation and policy alignment will be key to turning vision into reality.

DIRECTORATE GENERAL OF SHIPPING'S ROLE IN ADVANCING GREEN SHIPPING ALIGNED WITH IMO'S GHG REDUCTION STRATEGY

> *The revised strategy introduces a series of concrete, staged emission reduction targets designed to create a predictable regulatory framework for industry planning and investment. Most notably, it mandates reducing carbon intensity by at least 40% by 2030 compared to 2008 levels, with progressive intensification of targets thereafter. A particularly innovative aspect is the introduction of fuel transition targets, requiring that zero or near-zero emission fuels constitute 5-10% of the energy used by ships by 2030, laying groundwork for broader adoption of alternative fuels.*

IMO's 2023 GHG Strategy and Global Maritime Decarbonization Goals

The International Maritime Organization (IMO) took a landmark step in July 2023 by adopting a revised and more ambitious Greenhouse Gas (GHG) Strategy for the global shipping industry.

J Senthil Kumar
Principal Officer cum Joint DGS (Tech) Mercantile Marine Department, Kochi

This strategy represents a significant escalation in climate ambition, establishing a clear pathway toward net-zero greenhouse gas emissions from international shipping by around 2050. This bold target acknowledges the shipping sector's substantial contribution to global emissions—approximately 3% of global GHG emissions—and its responsibility to align with the Paris Agreement's temperature goals

Achievement of net-zero GHG emissions from international shipping

The IMO strategy emphasizes that maritime decarbonization must be achieved through a just and equitable transition that considers the varying capabilities and circumstances of different nations. This recognition is particularly important for developing maritime nations like India, which must balance environmental goals with economic development priorities. The strategy thus incorporates substantial provisions for capacity building, technical cooperation, and innovation support, especially for developing countries and Small Island Developing States (SIDS).

For member states like India, the IMO framework serves as both a challenge and an opportunity. It necessitates comprehensive regulatory reforms, operational improvements, and technological innovations across the maritime sector.

Countries must now develop and implement national policies and measures that facilitate compliance with IMO's targets while supporting their shipping industries through this transformative period. The Directorate General of Shipping, as India's maritime administration, bears primary responsibility for translating these international commitments into national action.

Directorate General of Shipping's Contributions to Green Shipping

The Directorate General of Shipping (DGS) has emerged as the cornerstone of India's maritime decarbonization efforts, implementing a comprehensive strategy that spans regulatory frameworks, technological adoption, and stakeholder engagement. As the primary maritime administration of India, DGS has developed a multi-faceted approach to align India's shipping sector with the IMO's ambitious GHG reduction targets while addressing the unique challenges and opportunities within the Indian maritime landscape.

Beyond compliance activities, DGS has established specialized divisions focused on environmental protection and green shipping initiatives. These units work to develop India-specific guidelines that account for the unique characteristics of the national fleet while maintaining alignment with international standards.

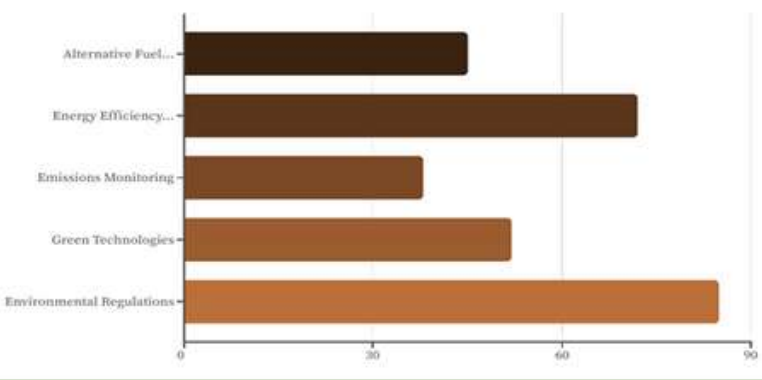
This balanced approach ensures that environmental progress does not come at the expense of the competitiveness of Indian shipping in global markets.

Policy Alignment and Regulatory Framework

DGS has systematically incorporated IMO's environmental regulations into India's maritime governance structure, mandating compliance with the Energy Efficiency Design Index (EEDI) for new vessels and the Ship Energy Efficiency Management Plan (SEEMP) for existing fleet. Additionally, DGS has implemented a robust monitoring, reporting, and verification (MRV) system to track GHG emissions from Indian-flagged vessels, creating accountability and transparency in the decarbonization journey. A National Green Policy document is in advance stage and will be released soon.

Maritime Education and Training Initiatives

Recognizing that the human element is critical to environmental compliance and innovation, DGS has revised maritime education and training curricula to incorporate green shipping competencies. The Directorate oversees maritime training institutes across India, ensuring that future seafarers and officers are equipped with the knowledge and skills required to operate increasingly complex low-emission vessels and technology.



Green Shipping Conclave Initiatives

The organization of the landmark Green Shipping Conclave in 2022 and 2025 demonstrated DGS's commitment to fostering industry dialogue and knowledge exchange. This flagship event brought together shipowners, technology providers, regulators, and financial institutions to catalyze green shipping innovations. The upcoming 2025 conclave will further advance collaborative solutions for sustainable maritime operations, positioning India as a thought leader in maritime sustainability.

Capacity Building and Technical Cooperation

DGS has established strategic partnerships with global initiatives such as the Global Maritime Energy Efficiency Partnerships (GloMEEP) and Maritime Technology Cooperation Centres (MTCCs) to enhance knowledge transfer and technical capabilities.

These collaborations have enabled specialized training programs for maritime professionals, development of greenhouse gas emission baselines, and implementation of pilot projects demonstrating energy-efficient technologies appropriate for Indian shipping conditions.

Promotion of Alternative Fuels and Technologies

DGS has taken proactive steps to accelerate the adoption of alternative marine fuels and propulsion technologies in India's maritime sector. By establishing a regulatory sandbox for green shipping technologies, DGS provides a controlled environment for testing innovative solutions before full-scale deployment. This initiative has facilitated trials of biofuel blends in Indian vessels, exploration of LNG bunkering infrastructure, and preliminary studies on hydrogen and ammonia as future marine fuels.

The organization has also collaborated with research institutions to develop India-specific roadmaps for alternative fuel adoption, considering factors such as domestic production capacity, infrastructure requirements, and safety standards. Through these efforts, DGS is helping bridge the gap between global decarbonization ambitions and practical implementation in the Indian context.

Industry Engagement and Stakeholder Collaboration

Recognizing that maritime decarbonization requires collective action, DGS has established multiple platforms for industry consultation and collaboration. The Green Shipping Advisory Committee brings together representatives from shipping companies, ports, shipyards, and financial institutions to provide input on policy development and implementation strategies. This inclusive approach ensures that decarbonization policies are both ambitious and practically feasible.

Conclusion: Steering India's Maritime Sector Towards a Sustainable, Net-Zero Future

The Directorate General of Shipping stands at the helm of India's maritime decarbonization journey, navigating the complex transition toward a sustainable, net-zero future. Through its comprehensive implementation of the IMO's 2023 GHG Strategy, DGS has positioned India as a proactive participant in the global effort to mitigate climate change through maritime sector reforms.

This leadership role demonstrates India's commitment to balancing economic growth with environmental stewardship, ensuring that its expanding maritime trade contributes positively to global sustainability goals.

The success of DGS's initiatives can be attributed to its integrated approach that combines regulatory frameworks with practical support mechanisms. By simultaneously developing compliance standards and providing the tools, knowledge, and resources necessary to meet those standards, DGS has created an enabling environment for green shipping innovations. This balanced strategy acknowledges the challenges faced by industry stakeholders while maintaining ambitious environmental targets aligned with international expectations.

Policy Development

Creation of comprehensive regulatory frameworks aligned with IMO standards while addressing India-specific maritime challenges

Technology Adoption

Facilitation of energy-efficient technologies and alternative fuels through research support, pilot projects, and regulatory incentives

Industry Collaboration

Engagement with maritime stakeholders to ensure practical implementation pathways and shared responsibility for decarbonization.

Global Leadership

Positioning India as a responsible maritime nation contributing meaningfully to international climate action through shipping sector reforms.

Looking forward, DGS faces several critical challenges that will require sustained attention and innovation. The significant capital investments needed for fleet modernization, infrastructure development, and alternative fuel production present financial hurdles for industry stakeholders. Additionally, the development of specialized human resources capable of operating and maintaining new green technologies will be essential for successful implementation. DGS will need to expand its capacity-building programs and financial support mechanisms to address these challenges effectively.

The path to achieving IMO's 2030 and 2050 targets will require heightened collaboration across government agencies, industry sectors, and international partners. DGS must strengthen its coordinating role, bringing together environmental regulators, energy ministries, port authorities, and private sector stakeholders to create coherent, mutually reinforcing policies. International partnerships will remain crucial for accessing global best practices, emerging technologies, and financial resources to support India's maritime transition.

The maritime sector's decarbonization journey represents not only an environmental imperative but also an economic opportunity. By positioning India at the forefront of green shipping innovation, DGS is helping create new industries, skills, and competitive advantages that will benefit the nation beyond mere regulatory compliance. The development of domestic manufacturing capabilities for green technologies, creation of specialized maritime services, and establishment of alternative fuel production could generate significant economic value while contributing to environmental sustainability.

As India continues its ascent as a major maritime nation, the initiatives led by the Directorate General of Shipping to decarbonize the sector will play an increasingly important role in shaping the country's global reputation and environmental impact. Through continued commitment to the principles and targets established in the IMO's GHG Strategy, supported by practical implementation measures, DGS is helping ensure that India's maritime growth aligns with the imperative of environmental protection, securing a sustainable blue economy for future generations.

GREEN INITIATIVES INCLUDING POLLUTION CONTROL MEASURES UNDERTAKEN BY SCI

> *The PBCF breaks up the hub vortex, a swirling mass of water that forms behind a propeller as it rotates. This vortex represents lost energy. By reducing the energy loss associated with the hub vortex, the PBCF helps the propeller operate more efficiently, leading to a reduction in fuel consumption.*

The Shipping Corporation of India Ltd. has embarked on fitting PBCF on its Tankers and Bulk carriers in a phased manner. PBCF has been fitted on one of its Tankers "Desh Ujaala", a Very Large Crude Carrier, resulting in expected reduction in Greenhouse Gas Emissions.

***1. Propeller Boss Cap Fins (PBCF)** is an energy-saving device attached to the propeller of a vessel that helps recover energy loss due to propeller hub vortex. This leads to a reduction in fuel consumption, typically about 2%, which in turn lowers equivalent amount of Greenhouse Gas (GHG) Emissions.*

Shri. Nikhil Raj,
DGM,
Shipping Corporation of India

PBCF fitted on SCI VLCC- DESH UJAALA

Effect of PBCF fitment shown pictorially

Without PBCF- Hub Vortex

With PBCF- No Hub Vortex

2. Silicon paints: Silicon-based anti-fouling paints are being used on ships' hulls to reduce drag and improve fuel efficiency, ultimately leading to lower emissions. These paints create a very smooth, low-friction surface that marine organisms struggle to adhere to, reducing biofouling. This reduces hull resistance, which in turn lowers fuel consumption and, consequently, Greenhouse Gas Emissions. SCI's Suezmax tanker, "Desh Abhimaan" currently undergoing layup is applied with Silicon based anti-fouling paint in dry-dock which is expected to reduce Greenhouse Gas Emissions by about 4% - 6%.

Silicon paint applied on underwater portion of SCI tanker DESH ABHIMAAN

3. Biofuel: Biofuels have lower carbon intensity compared to traditional fossil fuels, making them a potential pathway for decarbonizing the maritime sector. Biofuel blend B24, comprising 24% Biofuel blended with Very Low Sulphur Fuel Oil (VLSFO), has been tried out successfully on one of the SCI Bulk Carriers on pilot basis. As per the International Sustainability and Carbon Certification (ISCC), Used Cooking Oil (UCO), entirely of plant origin was used as raw material for production of biofuel. The GHG fuel intensity of the Biofuel used was 14.9 gCO2eq/MJ leading to a saving of about 19% GHG Emissions. Based on this success story, SCI plans to adopt this measure on other vessels in a phased manner. Bunker tanks on various ships are being prepared for carriage of biofuel blends.

4. Ballast Water Treatment System (BWTS): Ballast Water Treatment Systems are being installed on existing vessels of SCI in a phased manner in order to comply with the IMO regulations. BWTS has been installed on 44 Nos. existing vessels and on remaining vessels it is in different stages of installation based on their dry dock schedule. Through BWTS installation, Company has minimized the transfer of Non-indigenous harmful aquatic organisms and pathogens from one region to another through the ship's ballast water system thereby contributing to improvement in marine environment.

BWTS installed on SCI VLCC DESH VIRAT

BWTS installed on SCI VLCC DESH VIRAT

BWTS installed on SCI Container vessels SCI Chennai & SCI Mumbai

HYDROGEN FUEL-CELL POWERED ELECTRIC VESSEL

Hydrogen fuel cell systems are increasingly being adopted in marine applications as a clean and efficient alternative to traditional fossil fuels. In marine environments, hydrogen fuel cells offer significant advantages, such as reduced greenhouse gas emissions, quieter operation, and the potential for extended range without the need for refueling. Their modular design allows for flexibility in installation, making them suitable for various types of vessels, from small boats to large ships. As the maritime industry seeks to reduce its carbon footprint, hydrogen fuel cells are emerging as a key technology for sustainable marine transportation.

Cochin Shipyard Limited has designed, developed and constructed India's first fully indigenous hydrogen Fuel Cell powered battery-operated ferry vessel running on Low Temperature Proton Exchange Membrane Technology (LT-PEM). This project is India's first Hydrogen powered Electric ferry. By implementing this technology, the only by products of the reaction will be water and heat. This is a quick start technology and works at ambient temperatures.

Cochin Shipyard Limited

This vessel is intended for carrying 50 Pax seating and operating at a speed of 6.5 knots. Hydrogen Fuel cell vessel are electric vessels which do not use conventional batteries as primary storage of electrical energy. The Fuel cell convert the hydrogen into electricity.

Cochin Shipyard Limited has designed, developed and constructed India's first fully indigenous hydrogen Fuel Cell powered battery-operated ferry vessel running on Low Temperature Proton Exchange Membrane Technology (LT-PEM). This project is India's first Hydrogen powered Electric ferry. By implementing this technology, the only by products of the reaction will be water and heat. This is a quick start technology and works at ambient temperatures. This vessel is intended for carrying 50 Pax seating and operating at a speed of 6.5 knots. Hydrogen Fuel cell vessel are electric vessels which do not use conventional batteries as primary storage of electrical energy. The Fuel cell convert the hydrogen into electricity.

The LT-PEM Fuel cell and its associated components, known as Fuel Cell engine, produces constant electrical power by using Hydrogen as the fuel. The fuel cell engine is supported by 2 nos of LFP batteries to take care of surge load and flexible load demand of the vessel.

The electrical power produced by Fuel cell engine will be used for propulsion load and hotel load requirements and the excess power produced from the Fuel cell engine will also charges to the LFP batteries onboard. The operation is silent and since there are no moving parts, the maintenance is also low as compared to combustion engine vessel. The vessel also equipped with CCS2 DC charging and AC shore charging to charge the batteries at harbour.

Hydrogen gas with purity 99.997% is stored at 350 bar pressure in onboard cylinder. The vessel has five hydrogen cylinder which can carry 40 kg of hydrogen and supporting 8 hours of operation. The use of hydrogen as a fuel source eliminates greenhouse gas emissions, making the vessel a model for green and sustainable maritime transportation. The vessel is also fitted with a 3kW solar panel and associated system to contribute to the auxiliary power supply. The Fuel cell engine is developed and manufactured indigenously including the LTPEM membrane technology. By successfully implementing hydrogen fuel cell technology, CSL has set a new benchmark in India's maritime industry. This project aligns with the Government of India's vision for a sustainable and carbon-neutral future, supporting global efforts to reduce dependency on fossil fuels in marine transportation.

Technical specification.

General:

Fully Indigenized 'Home Grown Technology
Vessel name: FCV PILOT-01
Classification: IRS
Vessel type: Passenger ferry
Passenger capacity: 50 PAX
Construction: Aluminium Hull & FRP Superstructure, Fully airconditioned passenger area

Fuel Cell:

Type: LT PEM
Fuel Cell power: 48 kW
H2 Purity: 99.997%
H2 Cylinders: 5 cylinders with total of 40 kg at 350 bar

Electrical System:

Battery: LFP type battery
640 V DC Grid Power system
Solar power: 3 kW

Propulsion:

Propulsion: 2 Nos of 20 kW each motors
Service speed: 7 kn
Endurance: 8 Hours per day

CLEAN FUEL ADOPTION IN MARITIME SECTOR: FINANCIAL INCENTIVES AND REGULATORY PATHWAYS

The shipping industry is a major contributor to global greenhouse gas emissions, and its environmental impact has steadily grown. In response, the International Maritime Organization (IMO) adopted a revised strategy in 2023, targeting net-zero emissions from international shipping by 2050. To align with this vision, India has introduced several key initiatives to support greener maritime operations and boost domestic shipbuilding.

01. The government provides up to 30% financial support for ships using cleaner fuels like methanol, hydrogen, or ammonia, and 20% for electric or hybrid vessels.

02. The Green Tug Transition Programme, announced on May 22, 2023, by the Union Minister of Ports, Shipping, and Waterways, aims to deploy at least one green tug at every major port by 2025 and convert 50% of the tug fleet to green alternatives by 2030.

03. Ports like Kandla and Tuticorin are emerging as early refueling hubs for green hydrogen and ammonia.

CHARTING A NEW COURSE: INDIA'S EVOLVING INLAND WATER TRANSPORT SECTOR

The Inland Waterways Authority of India (IWAI), established by an Act of Parliament in 1985 and operational since October 27, 1986, under the Ministry of Ports, Shipping and Waterways, is spearheading the development and regulation of national waterways for shipping and navigation in the country.

As India seeks to leverage its extensive network of rivers, canals and backwaters, the modern resurgence of inland water transport (IWT) signifies a strategic pivot in the country's transportation and logistics framework, offering a sustainable, cost-effective, and environment-friendly alternative to road and railways. With its ancient roots and modern potential, IWT is poised to emerge as a game-changer in India's transportation landscape.

Shri. Sanjay Varma, Sr. Consultant (Marine), IWAI

India's Inland Waterways

India boasts an extensive network of over 20,000 kms of national waterways, with the National Waterways Act, 2016 declaring 111 (including five existing and 106 new) National Waterways (NWs). Of these, 29 are operational and being development by IWAI. These waterways criss-cross the country, strategically connecting key industrial, agricultural, and commercial centres.

Unlike road or rail transport, which often requires extensive land acquisition and heavy construction, inland water transport leverages existing natural resources, offering numerous benefits, including fuel efficiency, lower emissions, and cost savings. This makes it an ideal mode of transportation for bulk cargo such as coal, cement, fertilizers, food grains and automobiles.

In the previous decade, several initiatives have been taken to improve the inland water transport sector:

- The total number of National Waterways in the country has gone up from 5 to 111.
- The annual budget for development of National Waterways has increased from Rs. 183 crores to Rs. 1,767 crores.
- The number of multi-modal terminals on National Waterways has increased from one to four.
- Over 70 Community Jetties have been set up around National Waterway-1 in four States of Uttar Pradesh, Bihar, Jharkhand and West Bengal.

Recent Milestones and Strategic Projects

The government has made significant strides in revitalizing the inland waterways sector through several key initiatives, including:

- Jal Marg Vikas Project (JMVP): A flagship project aimed at developing a 1,390 km long stretch of National Waterway-1 (Ganga River) from Varanasi to Haldia, with the financial and technical assistance of the World Bank. This project includes the development of dedicated terminals at Varanasi, Sahibganj, Kalughat and Haldia to handle large vessels.
- Eastern Waterway Grid Connectivity: Efforts are underway to improve the link between NW-1 (Ganga), NW-2 (Brahmaputra), and NW-16 (Barak), creating a unified water transport grid in the eastern region. This grid will enhance connectivity and facilitate seamless cargo movement.

- Ro-Ro and Ro-Pax Services: Successful rollouts in Assam, Kerala, Bihar and West Bengal are improving regional connectivity and reducing road congestion. These services enable the transportation of vehicles and passengers across rivers.

- Public-Private Partnerships: The government is promoting public-private partnerships in terminals, cargo handling, and fleet development, opening up the sector to investment and innovation. A digital portal, “Samriddhi” has been launched to streamline approvals for setting up jetties and terminals on national waterways.

- Naudharshika (National River Traffic and Navigation System): Launched to enhance operational efficiency, safety and real-time river information for vessels, it facilitates smoother navigation and improves the overall efficiency of transportation through waterways.

Unprecedented Cargo Growth and Emerging Trends

Cargo movement through national waterways has witnessed remarkable growth, surging from 18.07 MMT in 2013-14 to 145.84 MMT in 2024-25, reflecting a CAGR of more than 20%. The government aims to further accelerate this growth, targeting 200 MTPA by 2030 and 500 MTPA by 2047.

Luxury River Cruises take centre stage

In addition to cargo growth, river cruise tourism has also seen significant expansion. From just five vessels on three NWs in 2013–14, river cruise vessels have expanded to 25 vessels across 13 NWs in 2024–25.

IWAI has signed MoUs with various state governments to develop sustainable river navigation infrastructure on national waterways. The initiatives include promoting cruise tourism on the Narmada and Yamuna rivers, developing eco-tourism practices in the Ravi, Chenab and Jhelum Rivers in Jammu and Kashmir, and developing cruise terminals in Varanasi, Kolkata, Patna and Guwahati on the Ganga and Brahmaputra rivers. IWAI is also exploring urban water transport systems in 18 cities, modelled after the Kochi Water Metro, aiming to promote sustainable tourism and contribute to India's economic growth.

Policy and Legal Framework

Several key reforms have been introduced to promote the growth and development of the IWT sector. These include National Waterways Act, 2016; Inland Vessels Act, 2021 that provides a framework for the regulation and operation of inland vessels; vision documents like Maritime India Vision 2030 and Maritime Amrit Kaal Vision 2047

India's Inland Waterways

India boasts an extensive network of over 20,000 kms of national waterways, with the National Waterways Act, 2016 declaring 111 (including five existing and 106 new) National Waterways (NWs). Of these, 29 are operational and being development by IWAI. These waterways criss-cross the country, strategically connecting key industrial, agricultural, and commercial centres.

Unlike road or rail transport, which often requires extensive land acquisition and heavy construction, inland water transport leverages existing natural resources, offering numerous benefits, including fuel efficiency, lower emissions, and cost savings. This makes it an ideal mode of transportation for bulk cargo such as coal, cement, fertilizers, food grains and automobiles.

In the previous decade, several initiatives have been taken to improve the inland water transport sector:

- The total number of National Waterways in the country has gone up from 5 to 111.
- The annual budget for development of National Waterways has increased from Rs. 183 crores to Rs. 1,767 crores.
- The number of multi-modal terminals on National Waterways has increased from one to four.
- Over 70 Community Jetties have been set up around National Waterway-1 in four States of Uttar Pradesh, Bihar, Jharkhand and West Bengal.

Recent Milestones and Strategic Projects

The government has made significant strides in revitalizing the inland waterways sector through several key initiatives, including:

- Jal Marg Vikas Project (JMVP): A flagship project aimed at developing a 1,390 km long stretch of National Waterway-1 (Ganga River) from Varanasi to Haldia, with the financial and technical assistance of the World Bank. This project includes the development of dedicated terminals at Varanasi, Sahibganj, Kalughat and Haldia to handle large vessels.
- Eastern Waterway Grid Connectivity: Efforts are underway to improve the link between NW-1 (Ganga), NW-2 (Brahmaputra), and NW-16 (Barak), creating a unified water transport grid in the eastern region. This grid will enhance connectivity and facilitate seamless cargo movement.

- Limited Fleet Availability: The IWT sector requires a significant increase in vessels, including hybrid and green propulsion vessels. To address this, the Ship Building Financial Policy 2.0 and Maritime Development Fund are being developed to encourage vessel owners and shipbuilders. Further, IWAI has signed an MoU with Rhenus Logistics to operate their 100 barges on NW-1, NW-2 and IBP routes. The first batch of 20 barges and six pusher tugs is expected by the end of this year.

- Institutional Coordination: Synchronization among central, state and local authorities is crucial for seamless IWT operations. Efforts are being made to institutionalise coordination and streamline processes.

The Green Imperative

India's quest for net-zero emissions by 2070 is driving innovation in the inland water transport sector, positioning it as a key player in the country's green logistics landscape. With a focus on sustainability, the sector is witnessing the emergence of cutting-edge technologies, including battery-electric barges, solar-powered vessels, biofuel integration, hydrogen vessels, and shore power facilities.

Retrofitting old vessels and transitioning toward hybrid propulsion are being actively promoted through policy incentives like the Harit Nauka guidelines and international collaborations. These initiatives underscore India's commitment to reducing its carbon footprint and achieving a greener future through sustainable transportation solutions.

Capacity Building for a Thriving IWT Sector

The inland water transport sector requires specialised knowledge and skills to navigate its complexities, from inland navigation and terminal operations to river conservancy and management. As India aims to develop its waterways and enhance inter-country transport connectivity, it's crucial to build a workforce with expertise in these areas. The Inland Vessels Act, 2021,underscores the need for stakeholders to understand the rules and regulations for safe, efficient, and environmentally friendly transportation.

With multiple activities, including vessel design and building, vessel operations, fairway maintenance, terminal operations, river cruises and ancillary services, the IWT sector demands a skilled workforce with specific competencies.

Given the sector's nascent stage and ambitious development targets under Maritime India Vision 2030 and Maritime Amrit Kaal Vision 2047, IWAI has developed a capacity-building plan to address the manpower requirements and skill gaps. This plan includes setting up Regional Centres of Excellence (RCoEs) across India, with initiatives like the National Inland Navigation Institute (NINI) at Patna and RCoE at Bogibeel already underway. By investing in capacity building, IWAI aims to create a robust framework for the sector's growth and development.

Strategic Targets for the Inland Water Transport Sector

(a) Cargo Growth: 200 MTPA by 2030 and 500 MTPA by 2047.

(b) Eco-Innovation: Adopting electric and green vessels and infrastructure.

(c) Geographic Reach: Operations in 23 states and 4 UTs, with an expanded IWT grid.

(d) Tourism: Developing 100+ cruise terminals and urban water metro transport.

(e) Community Impact: Riverine community development and local economic growth.

(f) **Capacity Building:** Establishing nine Regional Centres of Excellence for skill development and training.

Future Outlook

India's inland waterways sector stands at a transformative juncture, poised to revolutionise logistics and drive sustainable economic growth. With a potent mix of policy support, public-private investments, and technological innovation, the sector can unlock unprecedented opportunities, easing the burden on existing modes of transportation, fostering inclusive growth and driving green and resilient development.

Over the past decade, IWAI has propelled the country’s inland waterways from obscurity to prominence. As the IWT sector continues to evolve with modern infrastructure, green initiatives, digital tools and strategic funding, inland waterways are set to become a backbone of eco-friendly, efficient logistics and tourism, aligning with India's ambition of sustainable economic growth and shaping a cleaner, connected, and more competitive future for the nation.

(The article aims to capture the essence of India's inland waterways sector, highlighting its growth, development, and potential for sustainable transportation.)

THE RICH LEGACY OF THE VOC PORT

Tuticorin, in ancient times, was a famous transshipment centre in maritime Trade linking China in the East, Greece and Rome in the west.

It continued to remain significant in the medieval times as small ships sailed to Chennai, Colombo and other Maritime centres.

The Portuguese sailed into Tuticorin in 1532, the Dutch in 1649 and the English East India Company took over the administration of Tuticorin in June 1825.

It was recommended to establish a Major Port at Tuticorin with alongside berths and modern handling facilities during the year 1960.

The Tuticorin Port was declared the 10th Major Port of India on 11th July, 1974.

As a mark of paying tribute to the legendary freedom fighter V.O. Chidambaranar Port, Tuticorin Port Trust was renamed as V.O. Chidambaranar Port on 19.02.2011.

V.O. Chidambaram Pillai

The historic port in Tuticorin, Tamil Nadu has been named so after the legendary freedom fighter, Valliappan Olaganathan Chidambaram Pillai. Also known as Kappalottiya Tamilan "The Tamil Helmsman", VO Chidambaram was a Tamil political leader and launched the first indigenous Indian shipping service between Tuticorin to compete against the British ships. Born on 5th September, 1872, to an eminent lawyer Olaganathan Pillai, he was trained as a lawyer himself. But fate had other plans as towards the end of 1905, VOC visited Madras and was drawn closer to the Swadeshi Movement initiated by Bal Gangadhar Tilak and Lala Lajpat Rai. Inspired by the spirit of swadeshi in 1906, VOC established the Swadeshi Steam Navigation Company. Today, where his Swadeshi Company began, stands tall the VOC Port as a nod to his legacy and as the pride of our nation.

ANCHORING SUSTAINABILITY: THE GREEN EVOLUTION OF INDIAN PORTS

Revathi Rambhatla, Fellow, TERI Environmental and Sustainability Expert, Ports and Shipping Sector

As the world steps into an era of climate urgency, Indian ports stand at a defining moment—transitioning from traditional modes of operation to green, sustainable, and climate-resilient infrastructure. This article highlights the need for a structured Environmental Management Framework (EMF) and charts a path for Indian ports towards a low-carbon, sustainable future aligned with global and national decarbonization goals.

Introduction

Ports are the synaptic nodes of spinal network of global trade and national development. In India, they serve as power systems of economic growth, connecting industries to international markets and shaping coastal livelihoods. However, with this immense potential comes an equally significant environmental responsibility.

Ports and the Environmental Imperative

Port activities—ranging from dredging, cargo handling, and ship movement to hinterland transport—inevitably impact the environment. These include air and water pollution, waste discharge, habitat destruction, and carbon emissions. To address these multifaceted challenges, ports must adopt proactive environmental strategies instead of reactive compliance measures.

India's commitment to achieving net-zero emissions by 2070, along with the revised IMO GHG strategy calling for net-zero emissions from shipping by 2050, sets a compelling context. Port operations must reflect these ambitions through integrated environmental management and green innovation.

Pollution Control: The First Line of Environmental Defense

Pollution control in Indian ports has traditionally focused on regulatory compliance and mitigation of immediate environmental risks. It includes a suite of measures aimed at air, water, and waste management, all governed by national environmental statutes and port-specific environmental management systems.

Some of the major efforts include:

Air Emission Controls: Curbing emissions from ships, cargo-handling equipment, and on-road vehicles by promoting cleaner fuels, energy-efficient equipment, and operational efficiencies.

Ambient Air Quality: We may take the liberty of rejecting spoiled food and dirty water and may live for a certain period of time with no food and water but despite being hazy and dusty there is no choice given because with or without such degraded air we may die in no time.

That is where and why the attention of each and everyone need to be paid and the industries must shoulder the responsibility voluntarily to maintain the Ambient air quality strictly adhering to the stipulated standards. There are only four primary parameters to take care of maintaining like PM 10, PM 2.5, SOX and NOX.

Effluent & Wastewater Management: Installation of oil-water separators, sewage treatment plants, and strict enforcement of MARPOL Annex requirements.

Solid and Hazardous Waste Handling: Establishment of port waste reception facilities, aligned with the Port Reception Facility Rules and CPCB guidelines.

Dust and Noise Suppression: Covered storage, conveyor-based cargo handling, and use of mist spray systems, particularly for coal, clinker, and other dusty materials.

Environmental Monitoring: Ports are adopting real-time ambient air and water quality monitoring systems, ISO 14001 certification, and rigorous audit mechanisms.

Environmental Management Framework: A Structured Response

The Environmental Management Framework (EMF), as conceptualized by PIANC and adapted for Indian conditions, offers a tiered, dynamic system that integrates environmental considerations into every facet of port operations. It consists of four essential pillars:

1. Policy Development System
2. General Management System
3. Implementation System
4. Audit and Review System

Understanding the Environmental Management Framework (EMF)

A comprehensive Environmental Management Framework (EMF) or Environmental Management System (EMS) is crucial to embed sustainability into the operational DNA of ports. Globally, leading ports such as the Port of Rotterdam, Port of Los Angeles, and Singapore Port have implemented robust EMSs that integrate environmental accountability with business strategy. These frameworks go beyond compliance and focus on innovation, resilience, and stakeholder inclusion.

Key elements of a globally recognized EMS for ports typically include:

Leadership Commitment: Executive-level endorsement and allocation of resources ensure that EMS implementation is taken seriously and adequately supported.

Baseline Environmental Review: Identification of all environmental aspects and impacts of port operations, including emissions, discharges, noise, and waste.

Stakeholder Engagement: Regular consultation with community members, regulators, port users, and NGOs to ensure inclusive and equitable planning.

Performance Indicators and Benchmarks: Metrics such as carbon footprint, energy consumption per TEU, and biodiversity indices help monitor progress.

Risk Assessment and Preparedness: Integrated risk mapping and response strategies for spills, accidents, and climate-related hazards.

Digital Tools and Automation: Use of AI, IoT sensors, and satellite data for real-time monitoring and predictive maintenance of environmental systems.

Third-party Certification: ISO 14001 and ECOPORTS PERS certification validate performance and build credibility.

Some notable global practices include:

Port of Rotterdam: Operates under a climate-neutral port strategy, with extensive integration of hydrogen, circular economy models, and nature-based solutions.

Port of Los Angeles: Implements a Clean Air Action Plan (CAAP) focusing on zero-emission cargo handling, electric trucks, and community air monitoring.

Port of Singapore: Prioritizes innovation through a Smart Port initiative, incorporating green port dues and digital twin technology for environmental planning.

Key Takeaways for Indian Major Ports:

1. Institutionalize EMS as part of core governance, not a compliance add-on.

2. Link EMS targets with national commitments like Net Zero 2070 and SDGs.

3. Invest in digital infrastructure and green technology.

4. Develop port-specific climate adaptation plans.

5. Facilitate training, upskilling, and green culture building among port staff.

6. Promote transparency by publishing annual environmental performance reports.

By internalizing these principles, Indian ports can become pioneers in the global green port movement and act as enablers of sustainable maritime growth.

The Environmental Management Framework (EMF) is a systematic approach that enables ports to integrate environmental responsibilities into their core operational and strategic decisions. It aligns with international standards like ISO 14001 and serves as a roadmap for continual improvement across all environmental dimensions —from pollution control and biodiversity conservation to resource efficiency and climate mitigation.

Formulating an EMF for ports involves four key steps:

1. Policy Development: Identifying environmental risks and opportunities, consulting stakeholders, and establishing a guiding policy.

2. Planning and Strategy: Setting environmental objectives and SMART goals aligned with compliance and sustainability targets.

3. Implementation: Executing the plan through training, monitoring systems, operational controls, and green technologies.

4. Audit and Review: Evaluating progress, identifying gaps, and making improvements to drive performance.

In the context of Indian ports, an EMF is essential for meeting regulatory expectations, enhancing global competitiveness, safeguarding coastal ecosystems, and achieving national decarbonization commitments.

It also fosters transparency, boosts investor confidence, and contributes to the broader goals of the Blue Economy and sustainable maritime growth.

Ports and the Environmental Imperative Port activities—ranging from dredging, cargo handling, and ship movement to hinterland transport—inevitably impact the environment. These include air and water pollution, waste discharge, habitat destruction, and carbon emissions. To address these multifaceted challenges, ports must adopt proactive environmental strategies instead of reactive compliance measures.

India's commitment to achieving net-zero emissions by 2070, along with the revised IMO GHG strategy calling for net-zero emissions from shipping by 2050, sets a compelling context. Port operations must reflect these ambitions through integrated environmental management and green innovation.

Green Transition and Decarbonization: India's Pathway

India is among the few countries that have proactively mapped out a green maritime future. Strategic documents such as the Harit Sagar Guidelines (2023), Maritime India Vision 2030, and the National Hydrogen Mission reinforce this effort.

Green Initiative	Target Year	Aligned Policy
Carbon-neutral ports	By 2047 (select ports)	Net Zero 2070 Vision
Shore power adoption	50% of berths by 2030	MIV 2030
Renewable energy share	≥ 60% by 2030	Harit Sagar, ISA
Electric cargo equipment	≥ 50% by 2028	Energy Conservation Act
LNG/Alt-fuel infra	All major ports	National Hydrogen Mission
Biodiversity management plans	All CRZ ports	CRZ Notification, Blue Economy Vision

Stakeholder Engagement and Local Action

India's coastal geography and community dependence make stakeholder engagement non-negotiable. Environmental governance must be inclusive—engaging port users, local residents, fisherfolk, NGOs, and academic institutions. Initiatives like Green Port Committees, community-based monitoring, and public disclosure of sustainability performance can enhance transparency and trust.

Conclusion: Anchoring Sustainability in Port Development

Ports are no longer mere transit hubs—they are becoming hubs of sustainability, innovation, and resilience. With the right environmental management systems, technological interventions, and policy coherence, Indian ports can not only reduce their ecological footprint but also emerge as global benchmarks for green maritime infrastructure.

The future of Indian ports lies in balancing growth with green goals, where every tonne of cargo handled contributes not just to GDP, but also to planetary wellbeing.

Let our ports not only move goods but begood enough moving India towards a greener tomorrow.

VOC PORT'S PLASTIC-FREE JOURNEY: NAVIGATING TOWARDS A CLEANER TOMORROW

Lavanya Kapoor,
Assistant Director- Strategic Management, V.O. Chidambaranar Port Authority

At a time when environmental responsibility is no longer optional but essential, V.O. Chidambaranar Port has taken commendable steps to align itself with sustainable practices. A standout initiative among its green efforts is its transformative mission to become the first **plastic-free port**.

Why Go Plastic-Free?

The impact of plastic waste is not limited to aesthetic degradation. It leads to blocked drainage systems, threatens marine biodiversity, contaminates food chains, and even endangers port operations by clogging critical waterways. With rising global attention on plastic pollution, and in alignment with the **Swachh Bharat Abhiyan, Harit Sagar Green Port Guidelines**, and **SDG 14: Life Below Water**, VOC Port took decisive steps to tackle the issue head-on.

The Beginning of the Transition

The spark was ignited during planning for World Environment Day 2025. With the year's theme being "Beating Plastic Pollution," the port's leadership took the opportunity to go beyond symbolic gestures. A bold proposal emerged: what if VOC Port became completely plastic-free? The idea, though ambitious, captured the spirit of meaningful change.

The first milestone was the creation of a detailed **Plastic-Free Policy** tailored to the port's complex ecosystem. It outlined restricted items, recommended eco-friendly alternatives, and defined the roles and responsibilities of departments and stakeholders. Once approved, the policy was disseminated across every operational unit- from administrative blocks and terminals to the port-run school, hospital, and shopping complex.

Community engagement was at the heart of this campaign. **Street plays** are performed in the local language- Tamil. It carried powerful stories illustrating the real dangers of plastic pollution. Targeting employees, students, and families, these performances struck an emotional chord and sparked genuine reflection.

One of the first visible changes was the shift from packaged, disposable plastic water bottles to reusable **glass bottles** and tumblers at meetings and events, a move that was both symbolic and practical. From there, momentum built quickly. Departments implemented the policy with dedication, while awareness drives through signage and informational banners kept the message alive across the port.

Traders, contractors, and shopkeepers were not only informed of the new norms but were also shown the long-term benefits- environmentally, socially, and even economically. **Presentations** and dialogue reinforced the message that a sustainable workplace is a better workplace.

Each employee received a r**eusable jute bag** from the Port as a thoughtful nudge toward personal sustainability beyond the workplace. No corner of the port was left behind. The VOC **Port Hospital** phased out single-use plastic, and the **Canteen** adopted aluminium-based packaging, demonstrating how institutional shifts can drive cultural change.

Students were brought into the movement through the creation of a Green Committee at the VOC **Port School**. These young champions took on real responsibilities of monitoring plastic use, assessing water and energy practices, and promoting green behaviour among peers.

Perhaps the most heartfelt moment came during a **Beach Clean-Up Drive**, where employees and their children joined hands to clean the coast. It wasn't just an act of service; it was a moment of learning, pride, and legacy-building.

On June 5, 2025- World Environment Day, VOC Port officially declared itself a Plastic-Free Port. To sustain this status, regular compliance audits and surprise inspections have been planned, with penalties in place to enforce adherence.

Takeaway

This initiative has proven that going plastic-free is not just a policy, it's a shared journey. Through leadership, grassroots engagement, and a belief in collective responsibility, VOC Port has shown how meaningful change is possible when intention meets action.

As the port continues navigating towards a greener future, its plastic-free milestone stands as an inspiring model for others in the maritime and industrial sectors.

As India moves forward in its green transition, VOC Port stands as a shining example of how environmental sustainability can be embedded into core port operations, one step at a time.

CARBON CREDITS IN PORTS: CONVERTING GREEN EXPENDITURE INTO INVESTMENT

In an era defined by climate urgency and international trade acceleration, the maritime industry, responsible for nearly 80% of global trade is navigating the choppy waters of sustainability. As cargo volumes surge and pressure mounts to reduce environmental impact, the sector faces a critical question: Can economic growth and ecological responsibility sail in tandem?

The answer is increasingly found in innovation - both technological and financial. From shore-to-ship power supplies and renewable energy installations to carbon capture and storage (CCS) systems, ports across the globe are adopting green measures. Yet, these initiatives come at a high cost. The key to turning this expense into a strategic asset lies in a powerful instrument: Carbon Credits.

Carbon credits are tradable certificates awarded to entities that reduce greenhouse gas (GHG) emissions. Each credit represents one metric ton of CO_2 or equivalent GHG emission reduced or removed.

Krishna Deepthi Rallabhandi,
Assistant Director-
Strategic Management,
V.O.Chidambaranar Port Authority

These credits can then be traded, offering a potential return on green investments.

Carbon markets are broadly categorized into two types: Compliance Markets and Voluntary Carbon Markets (VCMs). Compliance markets are mandatory schemes enforced by regulatory bodies, such as the EU Emissions Trading System (EU-ETS), where participating industries are legally required to limit their greenhouse gas emissions within set caps. These markets operate under government-imposed obligations and typically involve penalties for non-compliance. In contrast, voluntary carbon markets cater to entities that are not bound by regulation but still choose to offset their emissions as part of their environmental, social, and governance (ESG) commitments or sustainability goals. Through VCMs, businesses and organizations can demonstrate climate leadership by purchasing carbon credits to compensate for their carbon footprint.

India currently operates a compliance mechanism through the Carbon Credit Trading Scheme (CCTS), covering few energy-intensive sectors, including paper & pulp, cement, iron & steel, and petrochemicals. However, the port sector is not yet included under CCTS or the Perform, Achieve, and Trade (PAT) scheme. This leaves ports to rely on voluntary mechanisms to monetize their sustainability efforts.

For ports seeking to capitalize on voluntary carbon credits, the journey begins with project registration under recognized global standards such as Verra's Verified Carbon Standard (VCS), The Gold Standard, the Global Carbon Council (GCC) etc.. This process requires the submission of detailed documentation that outlines the project's scope, baseline emissions, chosen methodology, and anticipated emission reductions. Once the project is registered, a third-party verification agency conducts a thorough audit to ensure compliance with the selected standard. Upon successful validation, the carbon credits are issued and become eligible for trading in the voluntary carbon markets.

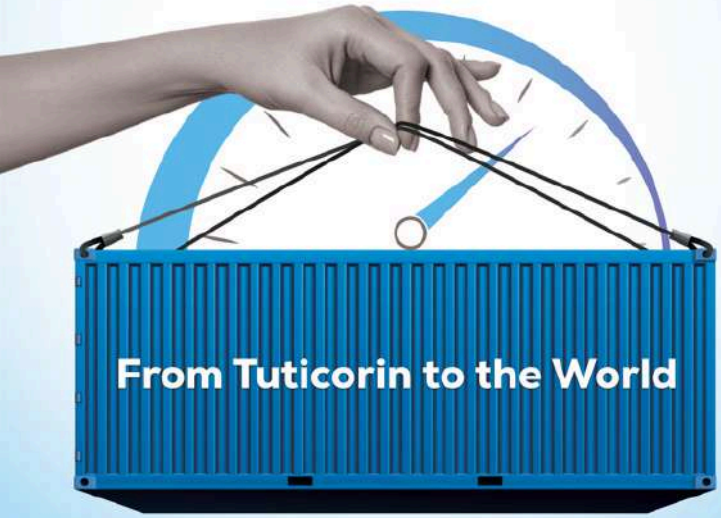
Carbon credits offer ports a powerful avenue to align profitability with sustainability. By transforming green expenditures into tradable assets, ports can not only recover investments but also reinforce their commitment to environmental stewardship. As the maritime industry steers toward a low-carbon future, early adoption of carbon credit mechanisms especially through voluntary markets can position ports as leaders in climate action. Embracing this shift is not just about meeting global expectations; it's about securing long-term relevance and resilience in a rapidly evolving world.

TUTICORIN TERMINAL
INDIA

DBGT

DAKSHIN BHARAT GATEWAY TERMINAL PVT LTD

Timely Transfers **Trusted Performance**



DBGT Celebrates 4 Million TEUs Milestone Achievement on 19th July 2024 and Counting...

CUSTOMER SERVICE:	OPERATIONS:	MARKETING:	WEBSITE:
+91 461 2382241	+91 95970 88152	+91 77080 05972	www.dbgt.in

adani

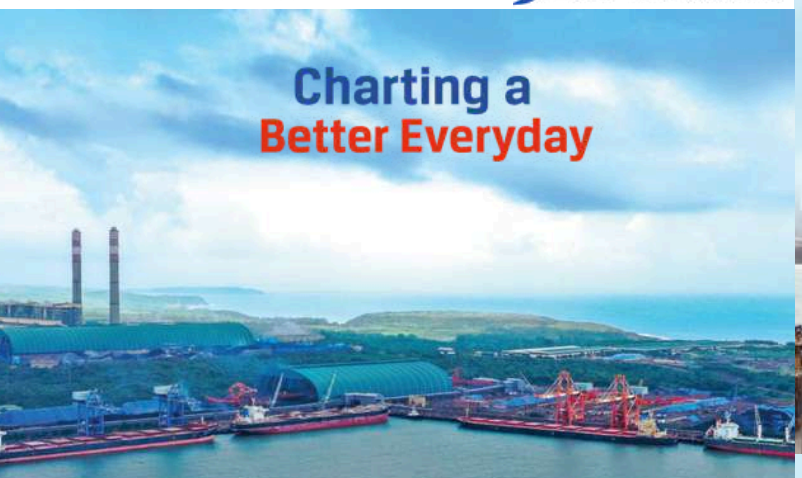
WE MAKE IT HAPPEN

We connect people, are friends with nature, and contribute to a brighter future. We love, we care, we respect. We give wings to every dream and light up a million smiles. We know it takes each one of us to build a nation, and anything can be achieved if we come together as one.

www.jsw.in/infrastructure

JSW Infrastructure

Charting a Better Everyday



Proud to build efficient logistics with VOCPA

SW Infrastructure is proud to partner with V.O. Chidambaranar port, leveraging its efficient maritir
nd inland connectivity to optimise lead times and logistics costs across India's southern hinterlan

JSW INFRASTRUCTURE LIMITED
3 PORTS: Jaigarh | Dharamtar | PNP + 3 UPCOMING PORTS
9 TERMINALS: Mangalore Coal Terminal | Mangalore Container Terminal | Ennore Coal Terminal | Ennore Bulk Terminal | Paradip Terminal - Iron Ore | Paradip East Quay Coal Terminal | South West Port (Goa) | JSW JNPT Liquid Terminal | JSW Tuticorin Multipurpose Terminal
INTERNATIONAL OPERATIONS: 2 O&M CONTRACTS & 1 TERMINAL, UAE

JMBAXI
THE PORT SPECIALIST
PORTS & LOGISTICS

Tuticorin Container Terminal: Your Direct Route to Global Trade

Terminal Capacity

- 0.6 million TEU handling capacity annually
- 1800 ground slots
- 210 reefer points

Seamless Connectivity

- Supported by 16 CFSs and 1 ICD within 16 km of the terminal
- Superior road and rail links for seamless transport
- The port is well-connected to major industrial and commercial centres via NH-38 and NH-45B provide crucial road links

Excellence In Operation

- Acceptance of export carting till last hour completion of vessel operations
- Semi-automated gates for efficient access
- Fastest turnaround for vessels and trucks

Robust Infrastructure

- Berth length: 370 meters (4 truck lanes under quay)
- Depth alongside: 14.2meters
- Average crane productivity of 28 moves per hour
- Equipped with three super post panamax rail-mounted quay cranes
- Features 9 electric rubber- tyre gantry cranes
- Equipped with one electric reach stacker

Commitment To Diversity & Sustainability

- The terminal workforce comprises 50% women, demonstrating a significant commitment to gender balance
- All electric equipment, reducing emission by 556 tons per annum

Your Gateway To East-West Trade!

TUTICORIN INTERNATIONAL CONTAINER TERMINAL PRIVATE LIMITED

B6 World Trade Avenue, Harbour Estate, Tuticorin 628004, Tamil Nadu, India.
T: +91 8925958727
E: cs_tict@jmbaxi.com
W: www.jmbaxi.com

வ.உ.சி துறைமுக ஆணையம்
वी.ओ.सी पत्तन प्राधिकरण
V.O.C Port Authority

Global Connect