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4TH EDITION

INDIA PORTS & LOGISTICS CONFERENCE

5-6 MAY 2026
Hotel Four Seasons, Worli, Mumbai

Report on

Anchoring India's Maritime Renaissance:

Strategic Reforms for Ports, Logistics and Trade

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Executive Summary

The India Ports & Logistics Conference 2026, the two-day flagship event organized by Informa Markets India under the aegis of INMEX SMM India at the Four Seasons Hotel, Mumbai on May 5 & 6, 2026, brought together a distinguished gathering of policymakers, thought leaders, and industry stalwarts to chart India's path toward becoming a leading global maritime and logistics hub.

Under the compelling theme "India's Gateway to Growth: Revolutionising Ports and Logistics - Vision to Global Leadership," the conference featured an impressive lineup of 45 speakers who shared deep insights, strategic perspectives, and actionable takeaways across two days of intensive deliberations and discussions.

KEY THEMES FROM IPLC 2026

Discussions converged around five strategic themes that shape the future of India's ports, logistics, and maritime ecosystem.

Strategic Infrastructure & Investment Realism
Aligning long-term investments, leveraging asset utilization, and enabling inclusive industrial growth.

Digital Transformation & Intelligent Operations
Adoption of AI, IoT, Digital Twins, automation, and analytics to boost port competitiveness.

Multimodal Logistics & Supply Chain Integration
Seamless port, road, rail, waterway, and hinterland connectivity to reduce logistics costs.

Decarbonization & Green Transition
Advancing low-carbon ports with green operations, clean energy, and sustainable infrastructure.

Administrative Reforms & Human Capital Evolution
Strengthening reforms, ease of doing business, skilling, inclusion, and collaboration for future readiness.

This report captures and synthesizes the key insights, expert perspectives, and strategic recommendations that emerged from these comprehensive discussions, serving as a definitive record of the collective wisdom and forward-looking vision articulated by India's maritime and logistics leadership at the conference.

The conference convened senior policymakers, port authorities, logistics providers, investors, technology experts, and industry leaders to examine the future trajectory of India's maritime sector. Organized in alignment with the Government of India's Maritime India Vision 2030 and Maritime Amrit Kaal Vision 2047, the event explored the opportunities, challenges, and reforms essential to strengthening India's position as a premier maritime and logistics hub

while advancing the sector's long-term development goals against the backdrop of evolving global supply chains and India's maritime ambitions.

Transforming Ports into Integrated Economic Ecosystems

A central theme throughout the conference was the evolution of ports from traditional cargo-handling gateways into integrated economic ecosystems that catalyze manufacturing, trade, logistics, and industrial growth. Discussions emphasized the transformative potential of the Indian Ports Act, 2025, alongside digitalization, sustainability, and enhanced connectivity as key drivers of this transition.

Stakeholders underscored the importance of operational efficiency, asset optimization, and stronger coordination between government and industry, while recognizing the growing role of port-led industrialization and multimodal logistics in enhancing India's trade competitiveness.

Technology as a Critical Enabler

Technology emerged as a **critical enabler of future competitiveness.** Participants explored the transformative role of digital platforms, AI-driven operations, GIS-based planning, Digital Twins, automation, and data-driven decision-making in improving productivity and reducing logistics costs. Equally important was the recognition that cybersecurity, interoperability, and workforce readiness are essential prerequisites for successful digital transformation.

Discussions highlighted the urgent need for **integrated digital ecosystems** capable of supporting seamless information exchange across ports, shipping lines, logistics providers, customs authorities, and regulatory agencies. The adoption of predictive analytics, intelligent asset management, and real-time operational visibility was identified as pivotal in enhancing efficiency, reducing delays, and improving overall supply chain performance.

Sustainability as a Strategic Imperative

Sustainability was positioned not merely as a compliance requirement but as a **strategic priority** for long-term competitiveness. Industry leaders emphasized the growing importance of green fuels, renewable energy integration, shore power, and low-carbon logistics systems. As global ESG expectations continue to evolve, ports must increasingly balance operational efficiency with environmental responsibility to remain competitive in international trade.

The role of **green corridors, alternative marine fuels,** and sustainable infrastructure investments was underscored as integral to the sector's long-term transition. Participants noted that environmental performance is increasingly influencing investment decisions, trade partnerships, and access to international markets, making sustainability a core element of future maritime competitiveness.

Addressing Persistent Challenges

The conference also brought into sharp focus persistent challenges in **hinterland connectivity, multimodal logistics integration, containerization,** and supply chain efficiency. Addressing these bottlenecks is essential to reducing logistics costs, improving trade competitiveness, and strengthening India's maritime resilience.

Discussions further emphasized the importance of human capital, workforce development, inclusion, accessibility, and industry-academia collaboration in supporting long-term growth. Investment mobilization, regulatory certainty, and public-private collaboration were identified as critical enablers for accelerating infrastructure development and improving asset productivity.

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A Coordinated Vision for the Future

Overall, **IPLC 2026** reinforced the view that India's maritime future depends on the successful integration of **policy reform, technology adoption, sustainability, connectivity, investment,** and **talent development.** Achieving the ambitious objectives of **Maritime India Vision 2030** and **Maritime Amrit Kaal Vision 2047** will require coordinated efforts across government, industry, academia, and financial institutions to build a globally competitive, efficient, and future-ready maritime ecosystem.

The conference concluded with a renewed commitment from all stakeholders to collaborate, innovate, and invest in building an India that stands as a **global maritime and logistics leader**—one that is resilient, sustainable, technologically advanced, and strategically positioned to capitalize on the opportunities of the 21st century.

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Thematic Analysis

Introduction

The **India Ports & Logistics Conference 2026** convened port chairpersons, government officials, investors, lawyers, and international partners to address one central question: **How do we work together to realize India's maritime ambitions, and what needs to be done on the ground?**

There is growing recognition—backed by government policy, private investment, and global interest—that ports must evolve beyond cargo-handling facilities to become **drivers of industrial growth, job creation, and India's positioning as a serious player in global trade.**

Theme 1: Indian Ports Act 2025 - The Game changer for India's Maritime Sector:

The Indian Ports Act 2025 fundamentally transforms the regulatory framework under which India's ports have operated for decades. Speakers at the inauguration emphasized that this is not merely a legislative update but a structural transformation. For investors, the implications are substantial.

For over a century, India's ports have functioned under legislation drafted in 1908—a law designed for a colonial economy when private investment was not a consideration and sustainability was not part of the maritime discourse. The Indian Ports Act 2025 completely replaces that outdated framework. It represents the most significant legislative reform in India's maritime sector, and the conference devoted considerable attention to understanding its practical implications—for port operators, investors, the government, and the nation's broader maritime objectives.

Under the previous framework, the government's primary function was to control and regulate ports. Under the new legislation, the emphasis has shifted to facilitation and support. Ports are no longer viewed merely as assets requiring oversight. They are now recognized as critical drivers of economic activity—serving as engines of industrial growth, trade, and employment, and as integral components of India's expanding economic and geopolitical ambitions. The government has established cargo handling capacity targets of approximately **3,500 MMTPA by 2030** and **10,000 MMTPA by 2047.** These are not aspirational figures but are underpinned by a series of policy frameworks including **Sagarmala, Sagarmala 2.0, Maritime India Vision 2030, and the Maritime Amrit Kaal Vision 2047.**

When the government's role is to control, private capital remains cautious. When the government's role is to enable, private capital is encouraged to participate. The Act establishes the conditions for that shift — through clearer PPP frameworks, and expanded definitions of what constitutes port infrastructure. **As Davinder Sandhu (Primus Partners Pvt Ltd) put it: for too long, ports have faced the sea while keeping their backs to the land.** The Act begins to turn that around by pushing ports to integrate with their hinterlands, anchor coastal economic zones, and become genuine platforms for industrial growth rather than just loading and unloading points.

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Indian Ports Act 2025: Governance Shift

FROM CONTROL TO COLLABORATION. FROM COMPLIANCE TO COMPETITIVENESS.

	Earlier Framework	IPA 2025 / New Framework
1	Control-based regulation	Facilitation-based governance
2	Fragmented approvals and oversight	Better coordination and streamlined governance
3	Limited or narrower port definition	Wider and more modern port definition
4	Weaker or informal safety mechanisms	Stronger safety and compliance framework backed by the DG Shipping
5	Higher regulatory uncertainty	More investor confidence and regulatory clarity
6	Standalone port administration	Integrated port ecosystem with focus on logistics, trade facilitation and development
7	Traditional manual / slower processes	Push for modernisation, digital alignment and ease of doing business

What Changes After IPA 2025?

- **Governance modernisation**
- **Stronger coordination**
- **Clearer legal framework**
- **Improved safety and compliance**
- **Ease of doing business**

One of the most enduring and frustrating challenges in Indian port development has been the lack of coordination between central and state governments. The issue is straightforward: land is under state jurisdiction, while coastal waters and the **Coastal Regulation Zone (CRZ)** fall under central authority. This has been a persistent obstacle for both brownfield and greenfield projects and remains a concern today. The **Parivesh Portal** should be transformed into a comprehensive maritime clearance system that integrates land, water, CRZ, and environmental permits. By centralizing these functions, the government can eliminate jurisdictional overlaps and significantly reduce approval timelines for port expansions and coastal industrial projects.

Historically, every major port development project has required extensive negotiation between these two levels of government, without any formal framework to structure or mandate such coordination. The result has been delays, cost overruns, and investor uncertainty. A project might receive central approval only to stall at the state level, or vice versa. With the changes introduced by the Indian Ports Act 2025, the **Maritime State Development Council (MSDC)** now has regulatory backing. The government should further strengthen the legal and statutory authority of the MSDC to ensure seamless execution.

This creates a unified governance structure capable of overriding departmental silos to expedite national maritime priorities. Dispute resolution timelines have been clearly defined—with a maximum period of six months to one year for resolution. For investors, this is highly significant. It means that when disputes arise, there is now a mechanism with a defined timeline attached to it.

However, some jurisdictional complexities persist. **Captain Harish Khatri** provided an example: a ferry service operating between Ferry Wharf in Mumbai, which falls under Mumbai Port Authority jurisdiction, and Mandwa, which is governed by the Maharashtra Maritime Board—two agencies, two sets of regulations, for a single short-distance service. While the Act has substantially improved the framework, the on-ground operational realities of overlapping jurisdictions will require ongoing attention.

One of the more complex changes introduced by the Act relates to tariffs. Under the previous framework, port authorities exercised oversight over the charges levied by private terminal operators. Under the Indian Ports Act 2025, private terminal operators at non-major ports are now free to set their own tariffs with minimal regulatory intervention.

In a competitive market, this approach is logical. Competition naturally regulates pricing. However, port terminals do not always operate in competitive environments. In many instances, a terminal operator is the sole option available for a particular catchment area—granting them considerable pricing power. Without adequate regulatory oversight, this can result in tariff abuse.

Mr. Aditya Krishnamurthy (Bose & Mitra & Co) raised this concern explicitly, noting that the legal question of whether a private terminal operator can impose penalty charges—such as detention fees on vessels—requires further clarification. The analogy he offered was straightforward: a parking facility can legitimately charge higher rates for extended stays to promote efficiency—that is commercial pricing. However, a private entity cannot impose penalties.

A specialized **Maritime Antitrust & Tariff Oversight Wing** should be established within the Competition Commission, focused exclusively on the maritime sector. This wing should be empowered to regulate tariffs and prevent monopolistic practices, ensuring a transparent marketplace that protects smaller stakeholders and shippers. The Wing should possess the authority to implement rigorous oversight mechanisms to identify and address predatory pricing or exclusive port-access agreements. By promoting fair competition, this framework will encourage diversified private investment and enhance the overall attractiveness of Indian port assets.

Before the enactment of IPA 2025, navigational safety at non-major ports was managed through informal committees lacking legal authority, with regulations applied inconsistently across major and non-major ports. This resulted in uneven and potentially unsafe standards.

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The Act directly addresses this issue by formally assigning navigational safety responsibilities to the Director General of Shipping across all ports—both major and non-major. Port Community Systems, emergency response protocols, and safety standards will now be implemented uniformly. This is a straightforward yet critical improvement that aligns India's port safety framework with international standards.

The Act has not only revised operational regulations but has also accelerated the digitalization of the maritime sector.

Key Takeaways:

- **The Indian Ports Act 2025 replaces the outdated 1908 framework and repositions ports as engines of trade, industrial growth, employment and economic development.**
- **The Act shifts the government's role from regulator to facilitator, establishing a more conducive environment for private investment, PPPs, and port-led industrialization.**
- **Enhanced governance through the Maritime State Development Council and clearly defined dispute resolution timelines can reduce center-state coordination delays and strengthen investor confidence.**
- **Increased tariff flexibility for private terminal operators may enhance commercial viability but also necessitates safeguards against monopoly pricing and tariff abuse.**
- **Uniform navigational safety oversight under the Director General of Shipping will help standardize safety protocols, emergency response systems, and digital infrastructure across major and non-major ports.**

Acknowledgement:

Session: Indian Ports Act 2025 – A Game Changer for India's Maritime Future

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Theme 2: Digitalising the Sector:

Complementing policy reform and system overhaul is the development of a **Maritime Single Window System**—a unified digital platform through which all regulatory agencies will process approvals and permissions. This initiative has the potential to significantly reduce processing times and create a seamless experience for port operators, shipping lines, and logistics providers.

Ravish Kumar Singh (JNPA) emphasized how Indian ports are transitioning from traditional infrastructure providers into digitally integrated smart-port ecosystems. There is a need for the government to redefine the institutional role of Port Authorities from "Infrastructure Landlords" to "Efficient Ecosystem Creators." This requires a national mandate to integrate AI-powered berth intelligence and digital twins into core operations, fundamentally redesigning business logic rather than merely digitizing manual processes.

Indian Ports Act 2025: Governance Shift

PCS • BLOCKCHAIN • PAPERLESS TRADE

From Fragmented Port Systems to Integrated Smart-Port Ecosystems

- Manual / Paper-Based Processes
- PCS 1.0
- PCS 2.0
- MSW 2.0 / PCS 3.0
- Smart-Port Ecosystem

Core Technologies

- AI / ML
- IoT
- Blockchain
- Digital Twin
- Predictive Intelligence

Key Outcomes

- Efficient
- Connected
- Transparent
- Secure
- Competitive

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Rabindra Sah (Indian Register of Shipping) drew an important distinction that often gets lost in policy discussions. **Digitization**, he explained, is the foundation layer—converting paper and analog processes into digital formats. **Digitalization** is the process layer—using digital data to improve how work gets done. **Digital transformation** is the strategic layer—fundamentally changing how a port operates, competes, and creates value. Most Indian ports, he implied, are still navigating the first two stages. The third is where global leadership is determined. True digital transformation extends beyond digitizing paperwork; it involves reconfiguring and restructuring the entire port ecosystem and operational workflows using technologies such as AI/ML, IoT, blockchain, digital twins, and predictive intelligence. Indian ports still face traditional institutional and operational challenges, including fragmented legacy approval frameworks, cybersecurity threats, interoperability gaps, inter-departmental silos, high capital requirements, and workforce adaptation to new technologies.

The Government should create a national security framework with a unified protocol for maritime data to consolidate fragmented legacy systems for all IT and Operational Technology (OT) systems. By treating digital maritime infrastructure as critical to National Infrastructure, ports can mitigate risks associated with increased automation and cross-stakeholder connectivity.

Indian ports have witnessed the evolution of Port Community Systems from fragmented PCS 1.0 systems to centralized PCS 2.0 platforms, and now toward Maritime Single Window (MSW 2.0) federated data ecosystems that enable seamless coordination between ports, customs, terminals, shipping lines, SEZs, and logistics stakeholders. The transition to a federated Maritime Single Window (PCS 3.0) using blockchain technology should be accelerated with government support. This enables secure, real-time data exchange between ports, customs, and SEZs while ensuring commercial confidentiality and the legal recognition of digital trade documentation.

India's digital port transformation is directly linked to reducing logistics costs, improving trade efficiency, supporting green corridors, and positioning India as a global maritime and logistics leader and a pioneer in adopting the latest technology.

The framework for this success is the **"Socio-Technical Triad,"** which posits that transformation relies on three interconnected layers: **Technology** (AI, IoT, and blockchain), **Organization** (governance and workforce adaptation), and **Strategy** (national competitiveness and sustainability). To maintain this Socio-Technical Triad success, ports should be mandated to adopt a governance model where every digital infrastructure investment must be accompanied by a documented plan for organizational workflow redesign and updated Standard Operating Procedures (SOPs). Workforce programs focused specifically on hybrid digital-operational expertise—including data analytics, OT systems management, and cyber-resilience—should be incorporated into workforce training to bridge the gap between traditional operations and new technology.

To improve the digitalization of port logistics, a **Real-time National Logistics Performance Dashboard** should be created for all major ports to publicly report dwell time, turnaround time, RFID adoption, and EV deployment. It can be integrated into the **Unified Logistics Interface Platform (ULIP)** for seamless data integration.

On the strategy front, the **Ministry of Ports, Shipping and Waterways** should encourage indigenous maritime technology innovation under **Make-in-India** initiatives by supporting Indian start-ups, research institutions, and technology firms working on AI-driven logistics, blockchain trade systems, predictive analytics, and smart-port infrastructure solutions. The best strategy is to use homegrown products for data sovereignty and to protect our national interests in trade.

AI Stabilization & Operational Expenditure (OPEX) Adjustment Training should be expanded with specialized certification programs that include curriculum paths focused on managing advanced machine learning and AI deployments. Training frameworks must explicitly prepare administrative, financial, and terminal operations teams to navigate the initial one-to-two-month AI stabilization and learning curve—a critical window where predictive scheduling and video analytics train on live port variables. Curricula must teach teams how to systematically refine algorithmic data accuracy while managing the corresponding structural shift from capital expenditure (CAPEX) to increased operational expenditure (OPEX).

Seamless Logistics & Hinterland Connectivity

FROM PORTS TO INDUSTRIAL CORRIDORS

Better connectivity. Faster movement. Stronger growth.

- **Port Gateway**
- **Rail Connectivity**
- **Road & Last-Mile Access**
- **Inland Waterways / Coastal Shipping**
- **Logistics Parks & Warehousing**
- **Industrial Corridors / Manufacturing Clusters**

Key Enablers

- **Policy Support**
- **Infrastructure Investment**
- **Multimodal Planning**
- **Public-Private Collaboration**
- **Digital Systems**

Expected Outcomes

- **Lower Logistics Cost**
- **Reduced Turnaround Time**
- **Stronger Supply Chain**
- **Better Port Competitiveness**
- **Accelerated Industrial Growth**

As **Ashish Dhawan (ESRI)** rightly said, every port generates enormous volumes of data—vessel movements, berth utilization, weather conditions, utility consumption, environmental readings. What they need are tools to make sense of it in real time, across departments, without losing critical information in the gaps between systems. This is where **Geographic Information Systems (GIS)** Platforms step in. India's ports are entering a new phase of digital transformation where isolated operational systems are being replaced by integrated geospatial ecosystems.

The **Port Operational Command & Control Centres (POCC)** act as the operational nerve center of a smart port, integrating berth operations, vessel tracking, weather monitoring, utility mapping, estate management, and environmental surveillance into a single geospatial dashboard. Supported by drone-based surveys, LiDAR mapping, IoT systems, and API-driven integration with enterprise systems such as SAP, CRM platforms, cloud databases, and logistics software, this architecture enables a unified operational picture rather than disconnected departmental silos.

The government should make it mandatory for all major ports to have a POCC that aggregates asset monitoring, vessel tracking, and utility mapping into one geospatial dashboard. It creates an immediate operational nerve center that eliminates departmental silos and enables real-time responses.

No predictive analytics platform, GIS deployment, PCS upgrade, or Just-In-Time (JIT) operation can reach its potential without a clean, standardized, interoperable data foundation. Disconnected software tools create information loss over time. The ports that will achieve operational excellence are not those with the most technology—they are those that have built platform-based, integrated systems where every data source communicates with every other. That, more than any individual tool, is what separates a smart port from a port that has simply purchased smart technologies.

The **DGCOM Centre's** 24x7 maritime monitoring and emergency response facility has been integrated with more data streams under the new framework. The Centre already receives data from the Navy, position-fixing systems, and Port Community Systems. Its potential as an analytical and research resource is significant and largely untapped.

Capt. Harish Khatri argued there is a strong case for partnering with universities, think tanks, and research institutions to convert data into usable knowledge products—for safety planning, trade analytics, and policy development. By formalizing structural links between national maritime data centers and premier academic institutions (IITs/IIMs), raw operational data can be converted into actionable insights for policy research, decarbonization modeling, and smart port logistics.

Through this academia-industry linkage, a **cross-sectoral R&D Grant framework** can be launched with dedicated funding instruments to incentivize innovation in maritime technology. These grants will focus on high-impact innovations in analytics, green shipping technologies, and resilient coastal planning to ensure a continuous pipeline of indigenous maritime solutions.

The **Living Digital Twin** can extend predictive and operational capabilities further by creating a near-real-time virtual replica of the entire port ecosystem—to answer three core questions: What is happening? Where is it happening? What should be done?

The **"Digital First, Physical Next"** approach is based on the principle that digital planning and simulation should precede physical infrastructure development. Before expanding a berth, constructing a new terminal, or procuring capital equipment, proposed investments should first be tested within a virtual environment. Advanced simulation tools enable port planners to model different layout configurations, estimate throughput capacity, identify potential operational bottlenecks, and assess multiple "what-if" scenarios before committing significant financial resources to physical infrastructure.

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This approach supports more informed decision-making, improves resource allocation, and reduces the risks associated with large-scale infrastructure investments.

Ports should establish integrated digital coordination systems using Living Twins, where vessel schedules, cargo information, bunkering requirements, truck movements, and hinterland logistics data are shared in advance across stakeholders. This would enable Just-In-Time operations, reduce vessel waiting time, minimize congestion, optimize berth allocation, and improve overall operational efficiency across the maritime logistics chain.

For example, a truck guidance system that displays precise container locations on screens eliminates the need for human direction and optimizes routes by pulling containers from the most advantageous yard positions. This reduces unnecessary yard-to-warehouse movement. For crane group operations managing multiple vessels over extended periods, the system identifies the best next vessel for returned containers—saving time and energy, particularly relevant as battery-powered vehicles become more common across port yards. Automated weighbridges, integrated with parking management systems through cameras and sensors, allow trucks to be weighed without any driver intervention. These are not dramatic innovations in isolation. Together, they remove the small frictions that accumulate into significant delays at scale.

Technical frameworks must be mandated to advance operational algorithms within **Port Operating** Software. Terminal systems must utilize **Prime Routing** (global pooling) to break the inefficient legacy cycle of dedicating trucks to a single vessel, allowing terminal vehicles to dynamically pick up cargo across multiple active berths. Furthermore, ports must implement a **"Generic Pick"** protocol at entry gates, withholding specific container slot coordinates from truck drivers until they interface directly with yard cranes, thereby preventing terminal traffic gridlock.

Automated Guided Vehicles (AGVs) make the case for automation most clearly in numbers. These battery-operated, energy-efficient machines receive operational instructions directly from the Terminal Operating System (TOS) and increase container moves per hour from approximately 10 to 12 moves per hour to up to 20 moves per hour.

Sanjeev Harale (BCBA) explained that UPI has experienced exponential growth with trust in technology. While EXIM transactions are being digitally automated and equipment and customs processes are being modernized, customs transactions—just like UPI—should go 100% digital. Data analytics and AI can be used to identify low- and high-risk shipments for better cutdown decisions. The government can fully revamp IT infrastructure, as fragmentation of systems leads to duplication of data and provides an unreliable experience for users with a lack of seamless interagency communication. It should be fully integrated with "Turant Customs" to reduce delays and backlogs in customs.

As smart ports rely on highly interconnected Internet of Things (IoT) networks and automated Operational Technology (OT), they are vulnerable to operations-stopping ransomware attacks. Maritime safety policy must mandate a strict cybersecurity posture compliant with **ISO 27001 (2022 version), IEC 62443**, and the **NIST framework.** All major ports must establish a **24/7 Security Operations Centre (SOC)** backed by a **Security Information and Event Management (SIEM)** system to continuously monitor infrastructure logs, enforce **Identity and Access Management (IAM)**, and mandate end-to-end data encryption across all terminal devices.

Every digital infrastructure mandate from the government—whether GIS deployment, PCS upgrade, shore power management system, or gate automation—must include a cybersecurity compliance requirement as a non-negotiable design specification. Digital safety should be built upon **zero-trust architecture standards** for all OT and IT systems at major ports and designate maritime digital infrastructure formally as **critical national infrastructure** with the regulatory protections that classification entails. The San Diego cyber-attack that cascaded to Nhava Sheva demonstrates that global ports are highly interconnected, and cybersecurity must be tight and preventive.

The **"9 Ds in the Era of Digital"** framework shows the future of technology at ports: design digital, deliver digital, serve digital, innovate digital, create digital, engage digital, envision digital, accelerate digital, culture digital.

Digitalization and modernization of assets are done with the idea of sustainability in mind as well. But to become a truly green port, it must manage not only the assets and operations on land but also the vessels arriving from and operating at sea.

To eliminate severe project delays, traffic bottlenecks, and structural reworks near logistics parks and jetties, all last-mile road layouts must be engineered virtually before breaking physical ground.

Front-loading layout designs into integrated 3D platforms validates truck turning radii, junction capacities, and spatial clearances before spending capital, and can help deliver a 10% savings in both project execution cost and manual effort.

AI-driven vessel scheduling and planning systems address a different class of inefficiency—berth idle time. Dynamic allocation of stacking locations and better conflict resolution between competing port operations can reduce berth idle time by five to seven percent. That may sound modest, but across a major port handling thousands of vessel calls annually, it represents a material improvement in asset utilization. Predictive maintenance systems add another layer. IoT sensors and AI working together on critical equipment such as crane drives can anticipate failures before they occur, reducing unplanned breakdowns, cutting maintenance costs, and improving operational reliability in a way that reactive maintenance never can.

Most supply chain systems remain largely reactive, responding to issues only after disruptions have already occurred, highlighting the need for a shift toward predictive cargo flow management. Improved schedule tracking and the ability to anticipate delays before they affect operations can strengthen overall supply chain performance. Reliable ETAs are critical, as delays influence not only shipping timelines but also resource planning and operational efficiency across the broader network.

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AI can play a significant role in balancing demand and improving asset utilization by enabling organizations to better plan rail, trucking, and other logistics operations in advance. It can also support stronger integration of operational flows by connecting planning systems, enhancing coordination, and enabling predictive maintenance to reduce disruptions. The effectiveness of AI, however, depends on standardized processes, high-quality and reliable data, stakeholder alignment through appropriate agreements, and robust cybersecurity measures.

A mandate should be passed so that GIS is treated as the core digital foundation of smart ports rather than an optional technology layer. It should integrate systems such as IoT sensors, CCTV feeds, vessel tracking, utilities, and environmental monitoring into a single platform. Procurement policies should also prioritize API-based integration with existing systems and mandate connectivity with ULIP to ensure seamless data sharing and avoid operational silos.

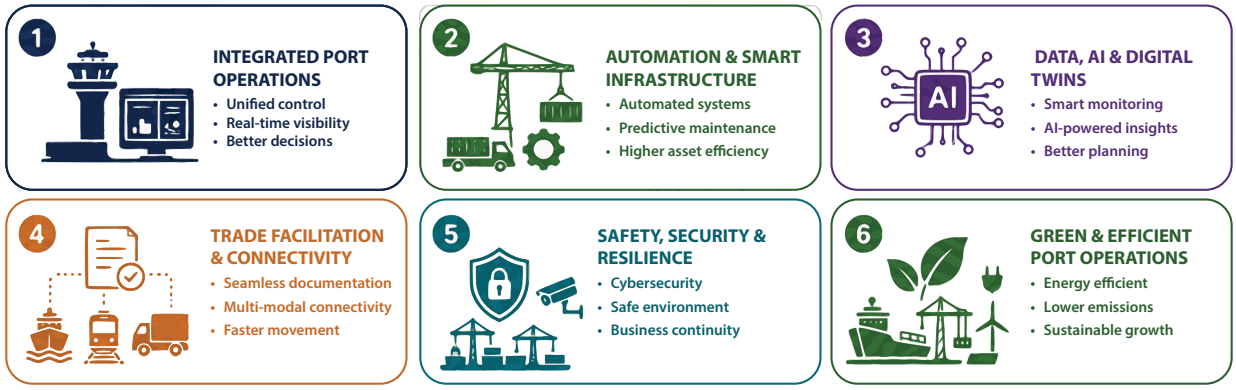
However, Indian ports should not start with technology but instead start by identifying the problem. This distinction matters more than it might appear. Ports across the world have made expensive mistakes by acquiring sophisticated systems and then searching for applications. The result is fragmented software, siloed data, and tools that never deliver their promised value searching for applications. The result is fragmented software, siloed data, and tools that never deliver their promised value.

Dr. Sanjay Joglekar (Mumbai Port Authority) argued that AI-enabled predictive and prescriptive analytics, supported by IoT-based visibility systems, can improve cargo tracking, optimize port operations, and enhance reverse logistics. He advocated a shift from predictive to prescriptive analytics using AI/ML to optimize port operations.

Smart Ports & Operational Excellence

BEST PRACTICES

Smart practices. Safe operations. Sustainable growth.



Key Requirements

[Standards & KPI | Skilled Workforce | Cybersecurity | Stakeholder Coordination | Digital Infrastructure | Continuous Improvement

Operational Excellence Outcomes

Faster Turnaround | Lower Logistics Cost | Better Asset Utilisation | Safer Operations | Higher Competitiveness

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Future port concession agreements should mandate **GIS-based reporting standards** to ensure that private operators share real-time spatial data with port authorities. The government may also provide fiscal incentives and preferential bidding scores for operators adopting API-enabled interoperable systems.

With the growing focus on sustainability for Indian ports, **ESRI's collaboration with ISRO** adds a dimension that is uniquely relevant. By integrating satellite imagery for shoreline analysis and environmental monitoring, ports can now track coastal changes, infrastructure shifts, and long-term ecological patterns with a level of precision that was previously unavailable.

One specific application—**predictive siltation analysis to optimize dredging cycles**—could meaningfully reduce operational costs for non-major ports, where dredging expenses often represent a disproportionate share of the budget and act as a burden on the operational expenditure (OPEX) of the port.

Key Takeaways:

- **India's port sector is shifting from basic digitization to full digital transformation through Maritime Single Window systems, PCS upgrades, AI, IoT, blockchain, GIS, Digital Twins, and predictive intelligence.**
- **Clean, standardized, and interoperable data systems are essential to connect ports, customs, terminals, shipping lines, SEZs, logistics providers, and regulators in real time.**
- **GIS platforms, POCCs, and Living Digital Twins can serve as the operational nerve center of smart ports by integrating vessel tracking, berth operations, utilities, assets, and environmental monitoring.**
- **AI-led scheduling, predictive maintenance, automated vehicles, smart weighbridges, and digital-first planning can reduce berth idle time, improve asset utilization, and minimize operational delays.**
- **Cybersecurity, workforce readiness, indigenous technology, and digital governance must be treated as core enablers to make India's port digitalization secure, resilient, and globally competitive.**

Acknowledgement:

Session:

Session 3: Unified GIS Solution for Smarter and Resilient Ports

Session 11: Seamless Logistics & Hinterland Connectivity – From Ports to Industrial Corridors

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Theme 3: Sustainability and Green Ports:

Every time a ship berths at a port and keeps its diesel generators running—which is what happens at most ports globally—it continues to burn fuel and emit pollutants into the surrounding environment, often near urban areas. Berthed vessels are a significant and largely unaddressed source of port-area emissions and noise generation.

Shore power, or 'Cold Ironing' as it is known in the industry, offers a direct solution: allow ships to plug into the port's electrical grid while berthed and switch off their engines entirely.

The **IMO's decarbonization targets**, with shore power as an integral part, have tightened over time. Ports that build this infrastructure now will be ahead of the curve. Instead of waiting for international regulations, India should start with well-planned and ambitious annual shore power adoption targets for major ports, beginning with the high number of general cargo and tanker vessels docking at ports. The Ministry should appoint a nodal agency within six months to coordinate implementation, monitor compliance, and publish biannual progress reports. Establishing a dedicated institutional mechanism can improve accountability, enhance inter-agency coordination, and provide greater transparency for stakeholders, which will help strengthen policy credibility and support investor confidence in the Indian maritime sector over time.

Shore power is a complex process to generate, store, and transmit that demands simultaneous planning across three areas: electrical infrastructure, vessel compatibility, and operational safety.

Infrastructure investment—with components like substations, transformers, and energy management systems—all require substantial upfront capital. But the harder problem is that not all ships are currently equipped to connect to shore power systems. The government must provide fiscal incentives, subsidized financing mechanisms, and policy support for this transition. Separate funding streams should also support vessel retrofitting strategies, as not all ships are currently equipped for shore power connectivity.

Ships and ports across different jurisdictions operate at different voltages and frequencies. Without frequency converters and flexible electrical infrastructure, a ship equipped for shore power in one port may still be unable to connect in another. All major ports must be mandated to follow the international technical standard **ISO/IEC/IEEE 80005** for all installations, such as frequency converters and flexible electrical infrastructure, as essential components of future shore power systems, with clear operational protocols documented in concession agreements to prevent technical integration challenges due to voltage differences. Its adoption needs to be treated as a baseline requirement by the government, not an optional specification.

Along with this, operational safety is another layer that needs to be considered seriously. High-voltage cable handling and precise equipment alignment during connection and disconnection carry real risk. Tight coordination between port engineers, vessel operators, and port authorities is essential.

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How Shore Power Reduces Port Emissions

Shore power lets ships plug into clean electricity at berth, cutting emissions, noise and pollution in port cities.

How It Works

Ship at Berth	Diesel Generator Switched Off	Connect to Shore Grid	Lower Emissions & Noise	Cleaner Port City
Vessel is docked and needs power.	Onboard diesel generators are turned off.	Vessel is connected to shore-side electricity.	Significant reduction in emissions and noise at berth.	Cleaner air, quieter ports and healthier communities.

Key Requirements

- ISO/IEC/IEEE 80005 standards
- Vessel retrofitting
- High-voltage safety
- Grid readiness
- Financing support

Key Benefits

- Better air quality
- Lower port-area noise
- Improved crew welfare
- Supports decarbonisation goals

The high costs of starting shore power and retrofitting are one reason why the technology is not being adopted at the scale it should be. To improve commercial viability, ports adopting shore power should receive preferential electricity tariffs, green financing access, and carbon-linked incentives from the government. A **tariff rebate or priority berthing scheme** should be created for shipping lines that reduce SOx/NOx emissions below IMO standards at Indian ports. Link benefits to verifiable emission data. This creates a competitive advantage for compliant vessels and accelerates fleet modernization.

This would help address the current "chicken-and-egg" challenge, which Hemant Gupta from Drewry touched upon, where ports await vessel readiness while ship operators wait for infrastructure availability. The government should establish PPP-based implementation frameworks with clearly defined cost-sharing mechanisms.

With the growing trend of net-zero emissions at ports and in the whole economy at large, **Shantanu Bhadkamkar (ATC Global Logistics)** argued that India's Net Zero transition must be approached pragmatically, with rising energy demand likely to sustain dependence on conventional energy sources even as renewable capacity expands. For a developing country like India with limited resources and a need for high economic growth, it becomes even more important to balance meeting energy demand and sustainable goals.

Ports have evolved from being static EXIM hubs to playing a broader role in global economies, aligning with emerging economic trends centred on sustainability and green fuels. **Amlan Bora (The Port of Rotterdam Authority)** talked about how the port has adopted a four-pillar strategy focused on carbon capture infrastructure, green hydrogen development, feedstock transformation into

a global plastic recycling and biofuel hub, and sustainable shipping through green corridors, demonstrating how legacy ports can contribute to broader decarbonization goals.

India can consider adopting similar strategies across its major ports to accelerate sustainability efforts and support the transition toward greener maritime operations, and a case study can be conducted by the Indian Institute of Technology to develop a plan. Ports should begin preparing infrastructure for carbon capture handling, storage, transportation, and export logistics to support hard-to-abate sectors such as steel, cement, and shipping. Early investment in carbon logistics ecosystems would position Indian ports for future onboard carbon capture operations and emerging international carbon management supply chains ahead of competitors.

Port-side emissions can be addressed through technological interventions across **Type 1, Type 2, and Type 3 emissions. For Type 1 (direct emissions)**, solutions such as electric vehicles, battery swapping systems, AI-driven scheduling, and predictive maintenance can significantly reduce emissions, with potential reductions of up to 75%. For **Type 2 (indirect emissions),** renewable energy sources such as solar and wind power, along with shore power systems, play a critical role in improving air quality in port areas. For **Type 3 (value chain emissions),** measures such as digitization, paperless operations, optimized vessel turnaround times, and gate automation are essential for reducing congestion and lowering overall emissions across the logistics chain. Hydrogen-powered RTG cranes and tugboats (Japan/Vancouver models) can be seen as a model to be replicated. Wastewater management is an essential element of port sustainability to prevent damage to marine life, and major ports should compulsorily have treatment plants to prevent high levels of biodegradation due to high traffic. All major ports should aim to install solar and wind capacity to meet at least 50% of their operational energy needs within five years. A phased implementation plan with clear milestones and capital budgets can be drafted by the port authorities.

Susanta Kumar Purohit (Chairperson, VOC Port), speaking about the port, explained its operating ratio of approximately 30 percent—meaning it spends only thirty paise for every rupee it earns. For context, most comparable ports operate at significantly higher cost ratios.

The port sits on a rocky seabed, which eliminates the heavy dredging costs that burden most Indian ports. Its location near Sri Lanka provides natural protection from cyclones, ensuring year-round operational stability. These geographic advantages have been further backed by other measures such as adoption of renewable energy, shore-to-ship power systems, and a plastic-free operational policy.

This year, VOC Port became carbon negative—meaning it removes more carbon than it emits. It has received Platinum Certification from the Indian Green Building Council, and its operational model is now being studied as a replicable benchmark in academic circles. More importantly, this is not a port that has traded efficiency for sustainability or vice versa. It has achieved both simultaneously, which is what makes it worth examining carefully.

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Looking ahead, VOC Port is working on a **green methanol bunkering facility** with a planned capacity of one million metric tonnes, which is under development, positioning the port as a future hub for clean marine fuels. India's first **Digital Twin Port platform** has been commissioned here, with AI-enabled operational management—internally referred to as **Port GPT.**

The Prime Minister's announcement to develop VOC Port into a major transhipment hub on India's East Coast adds further strategic insight. The proposed Outer Harbour expansion, combined with the Mega Shipbuilding Cluster being developed under an MoU with the Government of Tamil Nadu, shall help strengthen the position of the port.

The broader lesson from VOC Port is simple: geography helps, but it is governance, technology, and sustainability that ultimately separate good ports from great ones. In the maritime sector, sustainability has moved from being a compliance requirement to a competitive differentiator. **The Port of Antwerp-Bruges,** represented at the conference by **Frank Geerkens (Consul General of Belgium)**, shared that the port of Antwerp-Bruges handles nearly 280 million tonnes of cargo annually, hosts over 1,400 companies, and sustains approximately 164,000 regional jobs. It is now actively becoming a leading European hub for hydrogen and renewable energy because it recognizes that ports that control green fuel infrastructure are the way forward. There should be a focus on India to transition ports from traditional transit points into energy-plus hubs powered by integrated solar and wind installations. A **national maritime self-sufficiency energy hub framework** should be created with a phase-wise implementation strategy positioning ports as central nodes in India's renewable energy grid, enhancing energy security and operational autonomy.

India needs to invest in robust multimodal transport infrastructure to integrate ports directly with inland industrial cluster.

By mirroring the Antwerp-Bruges model of seamless hinterland connectivity, this framework reduces systemic logistics costs and enhances the global export competitiveness of landlocked manufacturing zones.

The government should expand and scale the existing **JNPA–Antwerp Port training partnership** into a national maritime capacity-building initiative with specialized curricula on handling hazardous green fuels such as green ammonia and hydrogen, digital twin logistics systems, smart port operations, AI-enabled cargo management, and sustainability and decarbonization practices. Not just the Port of Antwerp-Bruges, but the focus of ports around the world has increasingly shifted toward circular economy models and the development of green fuel bunkering hubs.

As future fuels such as methanol and ammonia require larger onboard storage capacity and more frequent refueling, India should strategically develop multiple green bunkering hubs across key trade routes instead of relying on limited fueling locations. Launching a 'Bharat Green Bunker' Initiative would strengthen India's role in global green shipping corridors and support long-term maritime fuel transition. Green Hydrogen Hubs are a step in the right direction.

The regulatory and commercial challenge right now with scaling green-hydrogen infrastructure in India, according to **Senthil Ganesh (VOC Port)**, is the alignment with European certification standards, which creates immense implementation complexity, while the lack of off-taker agreements, demand aggregation mechanisms, and long-term subsidy support continue to hinder the large-scale commercial viability of green hydrogen projects. To resolve these friction points, the Ministry should harmonize Indian green-fuel certification with European ISO/IEC standards, establishing a single-window clearance mechanism to accelerate alternative fuel projects.

The government should establish dedicated policy and incentive frameworks for methanol, ammonia, hydrogen, and biofuels with production-linked incentives, bunkering infrastructure subsidies, and offtake guarantees. For international corridors, the government should issue a formal policy directive to facilitate collaborative corridors such as **JNPA–Rotterdam** for methanol and hydrogen supply chains. By providing fast-track clearances, customs harmonization, and data-sharing protocols for all such partnerships, the country can use trade diplomacy as a tool for its foreign policy vision.

The new Merchant Shipping Act underpins the legal framework for several reforms discussed across the conference—including vessel design standards, alternative fuel requirements, and coastal shipping regulations. The Ministry can build upon this momentum and bring its reforms into practice in a phased manner.

These large-scale infrastructure developments require significant capital investment and have traditionally been funded primarily by the government. In this context, **Tejas Deoras** highlighted that India's maritime sector remains largely underutilized compared to global competitors, presenting a substantial opportunity for long-term institutional investors. The panelists then discussed the key challenges, investment considerations, and emerging opportunities within the maritime sector.

Key Takeaways:

- Shore power can significantly reduce emissions from berthed vessels, but its success requires vessel retrofitting, grid readiness, safety protocols, and clear adoption targets across major ports.
- Green port transition will require fiscal incentives, concessional power tariffs, green financing, and PPP-based cost-sharing to overcome high upfront costs for shore power and alternative fuel infrastructure.
- Indian ports should move toward renewable energy, carbon capture logistics, wastewater treatment, green bunkering hubs, and circular economy models to strengthen long-term sustainability.
- VOC Port offers a strong benchmark by combining operational efficiency with renewable energy, shore-to-ship power, carbon-negative operations, digital twin deployment, and future green methanol bunkering.
- India should develop green hydrogen, methanol, ammonia, and biofuel infrastructure through dedicated policies, certification alignment, offtake support, and international green shipping corridors.

Acknowledgement:

Sessions:

Session 6: Investing in India's Maritime Future
Session 8: Global Investment & Trade
Session 1 Indian Ports Act, 2025 – A Game Changer for India's Maritime Future
Session 5 Building Smart, Green & Climate Resilient Port Pathways
Session 7: Procurement, Supply Chain & Port Operations

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Theme 4: Investing in India's Maritime Future:

Globally, maritime infrastructure is attractive for sovereign wealth funds, pension funds, and private infrastructure investors because port assets are capital-intensive, strategically located, and difficult to replicate. **Such assets provide long-term investment visibility, stable cash flow potential, and strong economic relevance. India should actively make regulatory and policy changes to attract sovereign wealth funds, pension funds, private equity, and infrastructure investors.**

The **Maritime Development Fund** is an excellent financing mechanism to combine government participation with private capital. Private investors are often hesitant to invest fully due to long development periods and high upfront costs. Using the fund with blended finance and a Public-Private Partnership (PPP) structure, the government's support will help long-gestation maritime projects become more attractive for investors.

Anish Bansal (DBS Bank) explained the investor's perspective, where they do not evaluate port projects only based on size or infrastructure scale. They also look at long-term commercial viability, execution capacity, risk management, and scalability. Greenfield projects carry higher risks due to long gestation periods, regulatory uncertainties, land acquisition challenges, and large capital requirements, so government support, blended finance, and risk-sharing mechanisms become important for attracting institutional capital.

The Maritime Development Fund can also be strategically deployed to support shipbuilding, ship-repair, and maritime manufacturing ecosystems through concessional financing, land support, and long-term capital partnerships. Developing domestic maritime manufacturing capabilities would strengthen India's position in the global shipping value chain and should be a high priority for expanding India's sphere of influence.

Domestic banking systems and capital markets in India now offer financing that is competitive enough to reduce the historical dependence on foreign-currency structures for large infrastructure projects. The Maritime Development Fund can be tailored to leverage this domestic capital availability, with clear instruments for institutional investors, pension funds, and domestic infrastructure platforms to participate alongside government capital in long-gestation maritime projects.

Investment decisions are also being shaped by energy-transition realities. Even sectors that are traditionally seen as ESG-sensitive, such as coal, are being reconsidered when supported by better sustainability practices and operational efficiency. Investors are more confident when projects have strong fundamentals, proven execution capability, and a clear commercial logic.

India should scale up green bonds, ESG-linked funding, low-carbon infrastructure incentives, and sustainable financing instruments for ports and maritime infrastructure. Green financing should be directly linked to measurable outcomes such as lower emissions, cleaner energy use, improved efficiency, and adoption of green maritime technologies.

Indian ports should continue transitioning toward **landlord-port and asset-monetization models** that crowd in private capital while allowing port authorities to focus on strategic infrastructure planning and regulation. Structured private participation improves efficiency, accelerates infrastructure delivery, and reduces dependence on public sector capital expenditure.

India's current container handling capacity is much lower than global competitors and needs to build maritime capacity in advance; otherwise, future trade and manufacturing growth may face serious logistics bottlenecks.

A comparison with the aviation sector further highlights this imbalance: while India has placed orders for more than 1,000 aircraft against an existing fleet of around 800, a similar pace of expansion has not yet been reflected in port infrastructure development. India needs to have shovel-ready maritime projects in the pipeline to be started on a phase-wise basis.

However, several large-scale infrastructure expansion projects such as **Vadhvan Port** and expansions at **JNPT, Paradip, Visakhapatnam, and Chennai** have been started to fit into India's broader vision of **Viksit Bharat 2047** and **Maritime Amrit Kaal 2047.**

As infrastructure expands and new investments are made, ports should move beyond functioning as isolated cargo-handling points and evolve into integrated logistics ecosystems.

When the government invests in port infrastructure, it should be developed with multimodal logistics platforms that improve cargo movement from origin to destination. This will reduce logistics costs, improve supply-chain efficiency, and strengthen India's position as a global manufacturing and logistics hub.

The focus should not just be on expansion of infrastructure but to maximize productivity and utilization of existing infrastructure assets, also called "asset sweating".

Along with building new ports and expanding infrastructure, the Indian government can also focus on improving throughput, turnaround time, cargo handling, berth productivity, and overall asset performance.

All major ports should adopt technology-led and data-driven operational frameworks to maximize the value of existing assets. Better utilization of current infrastructure can generate faster returns and improve investor confidence in Indian ports.

Ports should continue transitioning toward landlord-port and asset-monetization models that crowd in private capital while allowing port authorities to focus on strategic infrastructure planning and regulation. Structured private participation improves efficiency, accelerates infrastructure delivery, and reduces dependence on public sector capital expenditure and thus the government budget.

ESG should be treated as a strategic investment parameter rather than only a compliance requirement by financial institutions and should act as a measure for the long-term vision of the project. Shipping, rail, coastal movement, and inland waterways can help reduce emissions by shifting cargo away from road-based logistics.

Green financing, blended finance, and ESG-linked funding models can support sustainable port infrastructure, clean logistics, and supply-chain decarbonization. Indian banks and financiers should link maritime financing with measurable ESG outcomes such as emission reduction, coastal shipping adoption, green logistics, and sustainable port operations.

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Mihir G. Shah mentioned how due to long gestation periods, infrastructure decisions taken today will determine India's logistics competitiveness for the next two decades. Since port projects take many years to develop, India must begin planning now for future trade volumes, transhipment demand, industrial expansion, and sustainable freight movement.

India should position itself as a long-term global maritime manufacturing, logistics, and transhipment hub by aligning port infrastructure development with domestic industrial expansion and international trade growth strategies. Transhipment capture reduces dependence on Colombo, Singapore, and Port Klang.

However, this initiative needs support from **State Maritime Boards**, with them playing a more active role in long-term maritime infrastructure planning, investment promotion, and logistics integration alongside major ports. Broader participation from state-level maritime institutions is essential for achieving nationally coordinated port-led development and attracting wider private sector investment. nvestment has been shaping the changing role of ports as integrated industrial and logistics ecosystems supporting manufacturing, exports, warehousing, and supply-chain optimization, which has led to a focus on **port-led industrial growth**

Key Takeaways:

- India must attract long-term capital from sovereign wealth funds, pension funds, private equity, and infrastructure investors by improving regulatory certainty, risk-sharing, and project bankability.
- The Maritime Development Fund can unlock private investment through blended finance, PPP structures, concessional funding, and government-backed support for long-gestation maritime projects.
- Ports should transition toward landlord-port and asset-monetization models to crowd in private capital while allowing port authorities to focus on planning, regulation, and strategic infrastructure development.
- Future investments must focus not only on new capacity but also on asset sweating through better berth productivity, turnaround time, cargo handling, digital operations, and multimodal logistics integration.
- ESG-linked funding, green bonds, and sustainable financing should be tied to measurable outcomes such as emission reduction, coastal shipping, clean logistics, and green port operations.

Acknowledgement:

Sessions:

Session 6: Fireside Chat: Investing in India's Maritime Future

Session 7: Procurement, Supply Chain & Port Operations

Session 9: Global Trade Corridors Transshipment Strategy and Investment Outlook in a Shifting Political Landscape

Session 10: Ports of the Future – Scaling Capacity, Technology and Sustainability

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Theme 5: The future of India's Industrialisation – Port-led Industrial growth:

Port-led industrial growth can play a critical role in strengthening India's exports, manufacturing competitiveness, employment generation, and regional development. For the government, it supports broader economic growth and trade expansion; for port authorities, it improves cargo volumes and land utilization; and for manufacturers, it reduces logistics, inventory, and EXIM-related costs. However, this model can succeed only when ports are developed as integrated logistics and industrial ecosystems rather than isolated cargo-handling points.

A major shift in manufacturing decisions is the increasing focus on **total landed cost** rather than only low-cost labour. Logistics cost, inventory holding, customs delays, cargo visibility, and supply-chain reliability are now central to investment decisions. To strengthen India's position as a global manufacturing and export hub, major ports must be linked with industrial corridors, multimodal logistics parks, Free Trade and Warehousing Zones (FTWZs), inland terminals, and digital logistics platforms.

FTWZs should evolve from basic transit points into value-addition and export-oriented ecosystems. Clearer regulations, simplified customs procedures, stronger monitoring mechanisms, and predictable governance frameworks are required to improve investor confidence and unlock the full potential of FTWZs. Digital legal infrastructure, including electronic documentation systems and secure data vaults, should also be embedded in future greenfield port projects to support compliance, dispute resolution, and legal protection.

Ports are also becoming strategic national assets, influencing trade security, geopolitical positioning, and supply-chain resilience. Global disruptions in the Red Sea, Strait of Hormuz, and other maritime chokepoints have shown the need for diversified trade corridors, stronger geopolitical monitoring, and proactive risk management. India should strengthen its role across East Africa, Southeast Asia, Indo-Pacific, Global South, and SAARC trade routes while also operationalizing alternative corridors such as the **International North-South Transport Corridor (INSTC).**

India should adopt a focused transhipment strategy by prioritizing one or two strategically located ports based on draft, cargo flows, connectivity, and long-term trade potential. Vizhinjam demonstrates the potential of modern, technology-enabled transhipment infrastructure. However, transhipment should not be treated as the final goal. The larger objective should be to build India as an export-led manufacturing and logistics hub, supported by strong domestic cargo volumes, industrial corridors, and reliable hinterland connectivity.

Hinterland connectivity remains one of the biggest structural constraints in India's port-led growth model. While port infrastructure has received significant policy attention, road, rail, inland waterway, and last-mile connectivity beyond ports remain uneven. Efficient cargo movement from ports to factories and from factories back to ports must be treated as a core requirement. Every future port and industrial corridor investment should be aligned with India's long-term cargo capacity targets and supported by integrated multimodal planning.

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India's logistics system needs to move from fragmented, asset-centric operations to integrated, technology-enabled networks. Rail freight share must be improved through better rake allocation, dedicated rail windows at ports, cargo aggregation centres, multimodal logistics parks, and stronger Dedicated Freight Corridor integration. Inland waterways should also be developed as a serious freight alternative through single-window approvals, viability-gap funding, better jetty connectivity, and basic supporting infrastructure such as roads, signage, and truck parking.

Port-Led Industrial Growth

Integrating Ports with Manufacturing Clusters & FTWZs

Connect. Integrate. Grow.

Growth Flow

Port Infrastructure → FTWZs / Logistics Parks → Manufacturing Clusters → Export Processing / Value Addition → Domestic & Global Markets

Key Growth Pillars

Port Infrastructure & Capacity
- Modern terminals
- Sustainable & efficient systems

FTWZs & Logistics Ecosystems
- Warehousing & distribution
- Faster movement

Manufacturing Cluster Linkages
- Connect with industrial clusters
- Support export-oriented manufacturing

Multimodal Connectivity
- Integrated rail, road, coastal & IWT
- Lower cost, faster logistics

Investment & Policy Support
- Pro-investment policies
- Land & approvals made easy

Regional Development & Exports
- Jobs & industrialisation
- Higher exports & regional growth

Strategic Enablers

Policy Support | Infrastructure Investment | Multimodal Planning | Public-Private Collaboration | Digital Systems

Expected Outcomes

Lower Logistics Cost | Faster Cargo Movement | Stronger Exports

Higher Private Investment | Regional Industrial Growth

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Warehousing also needs modernisation. The sector is growing rapidly but is still often treated as basic storage infrastructure. Smart warehousing, digital inventory systems, cold-chain facilities, and integrated logistics platforms can reduce turnaround time, improve cargo visibility, and strengthen supply-chain efficiency. Digital platforms linked with ULIP can support route optimisation, multimodal planning, fleet utilisation, warehouse management, reverse logistics, and real-time visibility across fragmented supply chains.

India also needs stronger sovereign shipping capacity. Heavy dependence on foreign carriers exposes Indian trade to external shocks and limits bargaining power during geopolitical disruptions.

A national container shipping line can improve cost leverage, resilience, and control over strategic trade routes. Increasing India's containerization rate will also be critical to improving export competitiveness and reducing logistics inefficiencies.

ESG readiness is becoming a trade competitiveness issue. As Europe and the United States move toward stricter sustainability screening, Indian ports and logistics players may face buyer rejection, higher insurance premiums, or reduced access to trade finance if they do not comply. India should accelerate domestic ESG standards for maritime clusters, support international certification, and integrate financial, environmental, social, and governance parameters into port performance frameworks.

The future of port-led industrial growth will also depend on workforce capability and inclusion. India's seafarers, port workers, truck drivers, logistics personnel, and terminal operators are central to the maritime value chain. Training should be expanded across digital port operations, AI-enabled systems, terminal operations, safety, multimodal logistics, and green technologies. Better working conditions, healthcare access, accommodation, social security, and grievance redressal mechanisms should be treated as productivity and retention priorities.

Inclusion must also become part of maritime competitiveness. Modern port operations increasingly include roles such as control-room monitoring, remote crane operations, AI-based dashboards, and digital supervision, which can enable greater participation of women and people with disabilities. Ports should invest in accessible infrastructure, simulator-based training, gender-sensitive facilities, flexible policies, and structured skilling partnerships. Human capability, inclusion, and workforce readiness should therefore be treated as core indicators of port performance alongside cargo capacity, berth productivity, and infrastructure investment.

"The port sector's transition toward digitalization, automation, and green technologies requires a parallel evolution in workforce development. By forging strategic partnerships with maritime academies and universities, sea ports can successfully close the skills gap. These collaborations would enable the co-design of future-proof curricula, the facilitation of applied research, and the creation of seamless talent pipelines through targeted internships and study programs. Ultimately, this industry-academia synergy would empower the next generation of maritime professionals with the critical competencies necessary to drive sector resilience, sustainability, and global competitiveness. Major hubs, such as the Port of Rotterdam, anchor their international maritime education and research through dense networks of local universities and applied sciences centers.

Key Takeaways:

- Port-led industrial growth can strengthen exports, employment, regional development, and Make in India by integrating ports with manufacturing clusters, FTWZs, logistics parks, and industrial corridors.
- Strong last-mile and hinterland connectivity is critical, as inefficient road, rail, inland waterway, and multimodal links directly increase logistics costs and weaken port competitiveness.
- India should prioritize integrated logistics ecosystems over isolated port expansion, with better warehousing, Multimodal Logistics Parks (MMLPs), DFC connectivity, inland terminals, and digital platforms linked through ULIP.
- Global trade disruptions highlight the need for resilient supply chains, strategic transhipment hubs, diversified trade corridors, stronger Indian shipping capacity, and improved containerization.
- Maritime competitiveness must also include ESG readiness, legal clarity, workforce upskilling, seafarer welfare, gender inclusion, accessibility, and better working conditions across ports and logistics.

Acknowledgement:

Sessions:

Session 14: Legal Compass – Navigating Maritime Law, Ports and Logistics
Session 15: Workforce Development and Talent
Session 10: Ports of the Future – Scaling Capacity, Technology and Sustainability
Session 12: Smart Ports and Operational Excellence – Best Practices
Session 8: Global Investment & Trade
Session 1: Indian Ports Act, 2025 – A Game Changer for India's Maritime Future.

Recommendations from the Conference:

India's maritime sector is at a critical stage of transition, where policy reform, infrastructure expansion, private investment, digital transformation, sustainability, and logistics integration must move together. The sector has strong growth potential, but its progress continues to be constrained by distributed governance, fragmented approvals, underutilised assets, limited digital interoperability, and gaps in multimodal connectivity. To achieve the objectives of Maritime India Vision 2030 and Maritime Amrit Kaal Vision 2047, a more coordinated, technology-enabled, investment-oriented, and sustainability-focused approach is required.

A key priority is to strengthen maritime governance and simplify project approvals. The sector currently operates across overlapping jurisdictions involving central ministries, state governments, port authorities, regulators, and environmental agencies. Instead of creating another coordination body, the existing Maritime State Development Council should be empowered as the principal platform for resolving inter-agency issues and accelerating project execution. Alongside this, a functional Maritime Single Window system should be integrated with the Parivesh Portal to process land, environmental, CRZ, port, and regulatory approvals through one digital interface. Time-bound clearances, single-point accountability, automated escalation mechanisms, and deemed approvals in clearly defined cases should be introduced to reduce delays and improve investor confidence.

Market transparency and tariff oversight also need to be strengthened as private participation increases across ports and terminals. A dedicated Maritime Competition and Tariff Oversight Wing may be established within the competition regulatory framework to monitor port tariffs, terminal charges, market concentration, and access arrangements. Periodic tariff assessments, transparent benchmarking, and sector-specific competition guidance would help prevent unfair pricing, discriminatory charges, and misuse of market dominance while ensuring a balanced operating environment for investors, port users, and logistics stakeholders.

India already has several digital platforms such as Sagar Setu, ULIP, PCS, and port-community systems. The immediate requirement is not to create another platform, but to establish a public-facing performance and accountability layer. A Port Performance Scorecard should be introduced for all major ports and gradually extended to non-major ports. This scorecard should report key indicators such as vessel turnaround time, cargo dwell time, berth productivity, gate automation, RFID adoption, EV deployment, and asset utilisation. Integration with ULIP and Sagar Setu would enable real-time benchmarking, improve transparency, and support data-driven planning across the maritime logistics ecosystem.

The next phase of port modernisation should focus on smart port transformation. GIS mapping, Digital Twins, AI/ML systems, RFID-enabled logistics, and Port Command-and-Control Centres should be made core components of port planning and day-to-day operations. Every major port should establish an integrated command centre covering vessel traffic, cargo handling, gate operations, utilities, safety systems, and environmental monitoring.

A dedicated portion of the Maritime Development Fund should support AI-enabled digital twin deployment at key ports such as JNPA, Deendayal Port, V.O. Chidambaranar Port, and Paradip Port. These systems should focus on reducing berth idle time, improving cargo visibility, automating gates, enabling predictive maintenance, and increasing asset utilisation. As port operations become more digital and interconnected, cybersecurity must be treated as a matter of trade and national security. A zero-trust cybersecurity framework should be mandated across all major ports and maritime digital infrastructure. This framework should include identity-based access controls, continuous network monitoring, OT and IT system protection, encryption standards, incident response protocols, and periodic security audits. Cybersecurity requirements should be built into every digital infrastructure project, including GIS systems, digital twins, PCS upgrades, gate automation, shore power systems, and customs platforms.

Customs modernisation should also be accelerated. Turant Customs should evolve from a clearance mechanism into a comprehensive digital governance and risk-management platform for maritime trade. AI-enabled risk detection can be used to identify high-risk vessels, suspicious cargo movements, documentation anomalies, and supply-chain disruptions in real time. Greater interoperability between customs, ports, logistics platforms, shipping lines, and security agencies will reduce documentation delays, improve compliance, and strengthen India's overall trade facilitation framework.

Sustainability should be positioned as a strategic competitiveness opportunity rather than only a compliance requirement. The Ministry should establish a high-level implementation and monitoring committee to coordinate India's green port transition through one national roadmap. Shore power, green tugs, alternative fuels, digital twins, gate automation, Just-In-Time vessel operations, circular economy initiatives, and low-emission logistics should be brought under a common framework with clear milestones. Annual sustainability and efficiency scorecards should be published for major ports to improve accountability and implementation discipline. Investments in green energy hubs, shore power, circular economy infrastructure, and low-emission logistics at ports such as VOC, Kandla, Paradip, and other priority ports should be fast-tracked.

All major ports should be mandated to meet at least 50 per cent of their operational energy requirement through solar and wind power within five years. Port authorities should prepare phase-wise implementation plans with clear milestones and capital budgets. The Government should also publish a Green Fuel and Bunkering Policy within the next two to three years covering methanol, ammonia, hydrogen, and biofuels. The policy should include production-linked incentives, viability-gap funding, bunkering infrastructure subsidies, tax incentives, and long-term offtake support. A "Bharat Green Bunker" initiative should be launched to position India as a strategic green bunkering hub across key maritime trade routes. International green corridors, including partnerships such as JNPA–Rotterdam for methanol and hydrogen supply chains, should be prioritised through fast-track clearances, customs harmonisation, and interoperable digital documentation.

The Maritime Development Fund should be structured as first-loss or anchor capital to attract sovereign wealth funds, pension funds, multilateral institutions, domestic infrastructure platforms, and private investors. The Fund should prioritise ESG-aligned maritime infrastructure, smart port systems, green fuel infrastructure, shipbuilding, ship repair, container manufacturing, and long-gestation port-led industrial projects. A blended finance approach would reduce project risk, improve investor confidence, and accelerate the development of globally competitive maritime infrastructure.

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Alongside new capacity creation, India must improve the productivity of existing assets. "Asset sweating" should be prioritised through dedicated optimisation teams within all Major Port Authorities. These teams should identify bottlenecks in berth allocation, cargo handling, gate operations, storage, equipment deployment, and multimodal connectivity. Data-driven interventions should focus on improving throughput, reducing idle time, increasing turnaround efficiency, and enhancing overall asset utilisation. These measures can generate faster and more cost-effective gains than large-scale capital expansion alone.

India's logistics competitiveness will also depend on stronger rail, inland waterway, and multimodal integration. The Inland Waterways Transport Wing should be empowered with adequate funding and implementation authority to develop underutilised waterways through viability-gap funding and multimodal integration incentives. To reduce logistics costs, rail freight share must be increased through faster rake allocation, dedicated rail freight windows at ports, improved freight turnaround, integrated cargo tracking, and predictive logistics planning. Rail-linked logistics parks, cargo aggregation centres, inland terminals, and multimodal freight hubs should be strengthened to shift cargo from road to rail and waterways wherever feasible.

India's dependence on foreign shipping lines reduces its bargaining power and exposes trade to external disruptions. The Bharat Container Shipping Line should be operationalised through a dedicated task force involving SCI, CONCOR, ports, and logistics stakeholders. The task force should prepare route prioritisation plans, service frequency benchmarks, intermodal integration with Dedicated Freight Corridors and inland container depots, and clear vessel deployment timelines. Annual performance reviews should track India's share of containerised EXIM cargo handled by Indian carriers.

Free Trade and Warehousing Zones should be repositioned as integrated trade, warehousing, manufacturing, and value-addition ecosystems rather than basic transit points. Updated regulations should simplify customs procedures, reduce compliance complexity, improve multimodal connectivity, and provide predictable governance for private investors. Dedicated support for warehousing, cold-chain infrastructure, digital logistics systems, and export facilitation services should be integrated with FTWZ policy to improve India's export competitiveness.

India should also undertake structured benchmarking of global maritime hubs such as the Port of Rotterdam and the Port of Antwerp-Bruges. Focus areas should include hinterland connectivity, port-led industrialisation, inland waterway integration, port-community coordination, digital systems, green fuel infrastructure, sustainability transition, and asset utilisation. Relevant global practices should be adapted to Indian conditions to accelerate India's transition into an integrated, efficient, sustainable, and globally competitive maritime and logistics power.

Finally, India's maritime ambitions must be supported by a skilled and resilient workforce. Training should be expanded across digital port systems, AI-enabled operations, green technologies, logistics management, multimodal transport, maritime safety, and terminal operations. In partnership with the Ministry of Labour and Employment, working conditions for drivers, dock workers, logistics personnel, and seafarers should be improved through better welfare facilities, healthcare access, accommodation, safety standards, social security, and structured training. Workforce welfare should be treated as a productivity, retention, and operational reliability issue, not only as a social responsibility measure.

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We extend our sincere gratitude to the below distinguished speakers at the India Ports and Logistics Conference 2026 whose expertise, insights, and thought leadership shaped the discussions and outcomes documented in this report.

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Eminent Speakers

Shri Susanta Kumar Purohit	Chairperson, V O Chidambaranar Port Authority
Shri Sushil Khopde	Addl Director General of Shipping, Directorate General of Shipping, Ministry of Ports, Shipping and Waterways, Government of India
Mr. Frank Geerkens	Consul General of Belgium, Mumbai
Mrs. H K Joshi	Former Chairperson, Shipping Corporation of India & Member, INMEX SMM India Advisory Board
Mr. Davinder Sandhu	Co-Founder & Chairman, Primus Partners
Dr. R. D. Tripathi	CEO, Centre of Excellence on ESG & Circularity, Mumbai Port Sustainability Foundation
Mr. Aditya Krishnamurthy	Partner, Bose & Mitra & Co, Advocates
Capt. Harish Khatri	Chief Executive Officer, Board of Examinations for Seafarers Trust
Mr. Ravish Kumar Singh	Deputy Chairperson, Jawaharlal Nehru Port Authority
Mr. Ashish Dhawan	Senior Consultant – Infra, ESRI
Mr. Rajeev Kumar	Director, Integri Marine and Offshore Service Pvt. Ltd.
Mr. Tarun Kumar	Director, Integri Marine and Offshore Service Pvt. Ltd
Mr. Hemant Gupta	Deputy Director, Drewry
Mr. Amlan Bora	Chief Representative South Asia (India, Sri Lanka, Bangladesh), Port of Rotterdam Authority
Mr. V B S Venkateshwara Rao	Chief Mechanical Engineer, Mormugao Port Authority
Dr. Sanjay Joglekar	Chief Technology Officer, Mumbai Port Authority
Mr. Tejas Deoras	Principal, Master Fund, National Investment and Infrastructure Fund Limited (NIIFL)
Mr. Mihir G. Shah	Partner / Principal and Leader – Transport | GPS – Strategy and Transactions, Ernst & Young LLP
Mr. Rajiv Agarwal	Former CMD, Essar Ports Ltd
Mr. Hitesh Arya	VP Adani Ports & SEZ
Mr. Shantanu Bhadkamkar	MD, ATC Global Logistics Pvt Ltd
Mr. Girish Babu Shetty	Business Implementation Manager-IBS Maersk
Mr. Senthil Ganesh	Executive Engineer - Electrical Department, VOC Port Authority
Mr. Rajiv Jalota	Former Chairperson, Mumbai Port Authority & Former Director General of Shipping
Mr. Anish Bansal	India Country Head, DBS Bank India Limited
Mr. Anshumali Dwivedi	CFO & Head of Strategy, Essar Ports Ltd
Mr. Nidhin Raj	Senior Manager, Adani Ports and SEZ Ltd
Mr. Amitava Majumdar	Managing Partner, Bose Mitra & Co.

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Dr. Shishir Shrotriya	Coordinator, Centre for Maritime Economy & Connectivity (CMEC) at RIS (Research & Information System for Developing Countries)
Mr. Jerome Clement	Traffic Manager, Mormugao Port Authority
Mr. Rajnish Khandelwal	CEO, J M Baxi Marine Services Private Ltd
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Mr. Rajan Bagade	Technology Consultant for Ports and Logistics Business
Mr. Rajan Gurav	Technical Consultant, Jawaharlal Nehru Port Authority
Dr. Abhay Sinha	Director General, Services Export Promotion Council
Capt Virendra N Mishra	CEO, The Shipping Tribune
Mr. Sanjeev Harale	President, Brihanmumbai Customs Brokers Association & Founder CEO, Interport Clearing Services
Mr. Giriraj Rathod	Former Head of GAD and HR Department VOC Port and Mumbai Port Authority
Mr. Savraj Mehta	Chief Commercial Officer, North Standard P&I
Ms. Radhika Sharma	Marine Claims Handler (Lawyer), Insurance and Vessel Claims, A.P. Moller -Maersk
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