

# UNITING OCEANS, ONE MARITIME VISION

## India's Maritime Strides



**RIS**  
Research and Information System  
for Developing Countries  
विकासशील देशों की अनुसंधान एवं सूचना प्रणाली



**CMEC**  
Centre for Maritime Economy  
and Connectivity  
समुद्री अर्थव्यवस्था व संयोजन केंद्र



**AIC**  
ASEAN-India Centre at RIS



## **India Maritime Report 2025-26**

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समुद्री अर्थव्यवस्था व संयोजन केंद्र

Zone IV B, 4th Floor, India Habitat Centre  
Lodhi Road, New Delhi 110 003, India  
Tel.: +91-11-24682177-80  
E-mail: [dgoffice@ris.org.in](mailto:dgoffice@ris.org.in), Website: [www.ris.org.in](http://www.ris.org.in)



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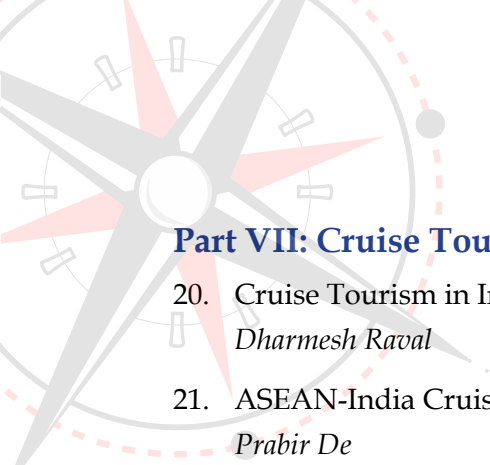
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### MESSAGE

The Ministry of Ports, Shipping and Waterways (MoPS&W) has made remarkable progress in recent years, driving India's maritime sector towards greater efficiency, sustainability, and global competitiveness. Under the visionary leadership of our Honorable Prime Minister, Shri Narendra Modi ji, the Ministry of Ports, Shipping and Waterways has been at the forefront of this transformation. Major ports have doubled their cargo handling capacity to 855 million tonnes in FY 2024-25 with an annual growth of 4.3 per cent. India is aiming for a port capacity of 10,000 MTPA by 2047. This goal is part of broader initiatives like the Sagarmala Programme and the Maritime Amrit Kaal Vision 2047, which also focus on modernizing port infrastructure, improving operational efficiency, promoting green initiatives, and enhancing coastal and blue economy development.

The inland waterways network now spans 4,894 km of operational routes, with record cargo movement of 145.5 million tonnes in FY2025-26, demonstrating the success of initiatives like Jalvahak. In shipbuilding, repair, and recycling, India is strengthening its strategic role along major trade lanes while leading globally in green and safe ship recycling at Alang.

These achievements contribute not only to India's trade growth but also to global maritime connectivity. Our ports, shipping, and logistics ecosystem now offers enhanced efficiency, reliability, and sustainability, making India an increasingly attractive partner for international trade and investment.

The **India Maritime Week 2025**, to be held from 27–31 October in Mumbai, is an important platform to showcase these accomplishments, discuss emerging opportunities, and foster collaboration between national and international stakeholders. The event will bring together governments, investors, industry leaders, innovators, and researchers to deliberate on the future of sustainable maritime trade, technology adoption, and green initiatives.



(2)

I am also pleased to announce the launch of the Report **“Uniting Oceans, One Maritime Vision: India’s Maritime Strides”**, prepared by the Centre for Maritime Economy and Connectivity (CMEC) at RIS, at the India Maritime Week 2025.

The publication provides an in-depth account of the Ministry’s initiatives, key developments in ports, shipping, inland waterways, and coastal tourism, and highlights emerging investment and partnership opportunities. It is designed as a practical resource for industry players, investors, and international collaborators seeking to engage with India’s rapidly evolving maritime sector.

I extend my best wishes to all participants, stakeholders, and contributors who will make India Maritime Week 2025 a grand success. Together, we will continue to strengthen India’s maritime capabilities, promote sustainable development, and ensure that our oceans contribute to India’s growth and global connectivity for decades to come.

21<sup>st</sup> October, 2025  
New Delhi

(Sarbananda Sonowal)

शांतनु ठाकुर  
SHANTANU THAKUR



सत्यमेव जयते

राज्य मंत्री  
पत्तन, पोत परिवहन और जलमार्ग मंत्रालय  
भारत सरकार

Minister of State  
For Ports, Shipping and Waterways  
Government of India

### Message

As we approach the **India Maritime Week**, I am reminded of the profound legacy and the promising future of India's maritime sector. From the bustling ports of Gujarat to the serene waterways of the Northeast, our nation's maritime landscape is as diverse as it is dynamic.

Under the guidance of our Honourable Prime Minister, Shri Narendra Modi ji, the Ministry is focused on enhancing port infrastructure, promoting sustainable practices, and ensuring the welfare of our maritime workforce.

The upcoming **India Maritime Week 2025**, will serve as a platform to showcase these advancements and foster collaboration among stakeholders. It will highlight the strides made in port modernization, the adoption of green technologies, and the development of inland waterways, all aimed at strengthening India's position in the global maritime arena.

Our efforts are also directed towards empowering local communities and creating employment opportunities through skill development initiatives and infrastructure projects. By focusing on regional development and inclusive growth, we aim to ensure that the benefits of maritime progress reach every corner of our nation.

I am happy to announce the release of the Report entitled "**Uniting Oceans, One Maritime Vision: India's Maritime Strides**", prepared by the Centre for Maritime Economy and Connectivity (CMEC) at RIS. I thank all the contributors of the Report for coming out a comprehensive analysis of India's maritime strength and progress. I extend my best wishes to all participants and stakeholders involved in the India Maritime Week, confident that our collective efforts will continue to propel India towards becoming a leading maritime nation.

With warm regards,

(SHANTANU THAKUR)



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





विजय कुमार  
Vijay Kumar



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

### MESSAGE

India's maritime sector has witnessed significant operational and structural progress in recent years. The Ministry of Ports, Shipping & Waterways (MoPS&W) has prioritized efficiency, safety, and sustainability across ports, shipping, and inland waterways. Initiatives such as modernization of port infrastructure, adoption of green and digital technologies, expansion of inland waterways, and improved logistics integration are strengthening India's position in global maritime trade.

A key focus remains the development and welfare of our maritime workforce. Comprehensive training programs, skill enhancement initiatives, and safety protocols are being implemented to ensure that seafarers and maritime professionals are equipped to meet the evolving demands of the sector.

**India Maritime Week 2025**, from 27–31 October 2025 in Mumbai, provides a platform to present these operational achievements, share best practices, and engage with both national and international stakeholders. The week-long event facilitates knowledge exchange, promotes investment, and encourages collaboration across the maritime ecosystem.

I am particularly pleased that the Report “**Uniting Oceans, One Maritime Vision: India's Maritime Strides**”, prepared by the Centre for Maritime Economy and Connectivity (CMEC) at RIS, will be launched at the India Maritime Week. Unlike broader vision statements, this Report offers a **detailed analysis of sectoral performance, infrastructure developments, policy interventions, and investment opportunities**, serving as a **practical reference for policymakers, industry participants, researchers, and international partners**. It provides insights into measurable progress and identifies pathways for sustainable growth and operational efficiency.

I extend my best wishes to all participants and stakeholders contributing to the India Maritime Week 2025, and look forward to the collaborative discussions that will advance India's maritime sector further.

Uj-6  
(Vijay Kumar)



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





# Foreword

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**Ambassador Sanjay Kumar Verma**

Chairman, RIS

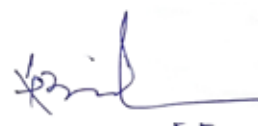
India's maritime sector is at a pivotal juncture. Over the past few years, India has witnessed remarkable developments in trade, investment, technology, and human capital, positioning itself as a dynamic player in the global maritime landscape. These advances are unfolding alongside rapid global shifts in shipping, port infrastructure, sustainability, and digitalization, making India's maritime journey both timely and globally significant.

Guided by the Maritime India Vision 2030 and the Sagarmala programme, India is steadily enhancing its maritime infrastructure, fostering trade linkages, and embracing sustainable practices. Engagement with the Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation (BIMSTEC), the Indian Ocean Rim Association (IORA) nations, and other global partners further strengthens India's role as a hub for investment, innovation, and collaboration in the maritime domain.

I am pleased to note that Centre for Maritime Economy and Connectivity (CMEC) at RIS has come out with a publication titled *"Uniting Oceans, One Maritime Vision: India's Maritime Strides"*. This knowledge product of the CMEC is primarily written in view of the coming India Maritime Week 2025 to be held at the Mumbai on 27-31 October 2025. This Report illustrates how India is steering its maritime sector with foresight, agility, and a commitment to sustainable growth - strengthening its position in the global maritime economy while promoting inclusive development. It also offers actionable insights for policymakers, industry stakeholders, and researchers, highlighting how India can navigate challenges, harness opportunities, and shape a resilient maritime ecosystem.

I take this opportunity to thank the RIS team led by DG, Prof. Sachin Kumar Sharma. In particular, I would like to appreciate the efforts of my colleagues at the CMEC for bringing forth this timely Report.

I am hopeful that the Report will act as a valuable reference point for policy makers, academics and practitioners.



**Sanjay Kumar Verma**





# Preface

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## **Professor Sachin Kumar Sharma**

Director General, RIS

The mission of the Research and Information System for Developing Countries (RIS) is to promote South-South Cooperation and collaborate with developing countries in multilateral negotiations in various forums. The RIS remains a cornerstone for international trade cooperation, and is envisioned as a forum for fostering effective policy dialogue and capacity-building among developing countries on global and regional economic issues. RIS has also been engaged with several inter-governmental processes, regional economic cooperation initiatives and think-tanks led platforms across the world.

The Centre for Maritime Economy and Connectivity (CMEC) has been set up at RIS to give shape to India's maritime ambitions and various associated dimensions. The primary objectives of CMEC are to develop a comprehensive and integrated framework for the systematic growth and diversification of India's maritime sector. By fostering deep collaboration with stakeholders, CMEC seeks to bolster the maritime economy and promote connectivity in the maritime domain. One of the primary objectives of the CMEC is to provide evidence-based high-quality policy inputs to the Ministry of Ports, Shipping and Waterways (MoPSW) on various facets of the maritime sector.

The maritime sector plays a crucial role in driving the country's growth and development. In India, the maritime sector has received significant government attention, including a massive financial package to revitalize the country's shipbuilding and maritime ecosystem. The government has taken several initiatives on modernizing infrastructure, promoting green shipping, and achieving ambitious goals under the *Maritime India Vision 2030* and *Maritime Amrit Kaal Vision 2047* targets. The Government has been actively promoting the country's maritime sector through the PM Gati Shakti Master Plan and *Sagarmala* programme, which are aimed at attracting investments.

Transformative reforms have created an enabling environment for large-scale investments across port infrastructure, inland waterways, shipping, and coastal tourism. India has designed a US\$ 1 trillion maritime investment roadmap under the *Maritime India Vision 2030* and *Maritime*

*Amrit Kaal Vision 2047*, underscoring its commitment to transforming the sector through large-scale investments in ports, shipbuilding, inland waterways, cruise tourism, and green shipping, while positioning itself as a competitive global maritime hub.

The present Report titled “Uniting Oceans, One Maritime Vision: India’s Maritime Strides” presents a rich content of India’s maritime journey, with particular focus on achievements, best practices, challenges, and the way forward. Written by eminent industry experts and research scholars, there are a total 32 chapters divided in 10 parts, covering a wide spectrum of maritime issues, and thus, reflecting India’s strategic vision under the *MIV 2030* and the *MAKV 2047*. The chapters not only discuss India’s maritime heritage, they also analyse the trends in maritime trade, investment and finance. The Report has underscored the need for resilient maritime corridors. A resilient India - Middle East – Europe Economic Corridor (IMEC) is going to build a safe and secure trade route, improving supply chain security, and promoting inclusive and sustainable growth. The Report does a deep-drive on maritime sustainability, and presents the pathways to carbon neutrality. Technological leap in the maritime sector will make our journey not only robust but also sustainable. Technological advancements can integrate the complex supply chain network of multimodal transportation. Digital platforms, blockchain technology, and the Internet of Things (IoT) can enhance transparency, streamline processes, and improve security, making multimodal transportation even more efficient and reliable. Adequate human capital and skills are crucial for maritime growth through increased productivity, innovation, and efficiency. The Report has provided a thrust on the advancement of maritime skilling, while fulfilling the targets of the *MAKV 2047*. Thereafter, three cross-cutting maritime issues have been dealt in the Report such as transforming the blue economy, cruise tourism opportunities, and maritime security and cooperation. The Report highlights India’s maritime role, which is collaborative, demand-driven and outcome-focused – adding capacity where partners want it, reinforcing rules that benefit all, and keeping the ocean open, stable and prosperous. The last part of the Report discusses the policy dynamics for the *Viksit* maritime sector under the overarching *Viksit Bharat 2047* vision. As the Report suggests, three milestones, namely, tonnage tax reforms, flag in international ship registry, and maritime arbitration, are going to strengthen the maritime ecosystem by generating jobs, boosting maritime services exports, and increasing India’s role in shaping global maritime norms. To add further, a robust international ship registry is a strategic enabler for realizing *MAKV 2047* agenda – accelerating maritime growth, enhancing tonnage, and elevating India’s competitiveness on the world stage.

Today, developing world has been facing common challenges in the present global order, including rising trade barriers and supply chain disruptions. In these uncertain times, maritime cooperation has become essential to unite oceans with one vision. Findings of this Report have high policy implications on the maritime sector of the Global South. DAKSHIN, the Centre of Excellence on Global South at RIS, will be working further on the recommendations of this Report, deepening the maritime relations in the Global South.

This Report is also part of our efforts to strengthen the ASEAN-India Comprehensive Strategic Partnership (CSP). The Year 2026 is going to be the *ASEAN-India Maritime Year*. The Report presents rich contents on maritime heritage, cruise tourism and supply chains having implications on India-ASEAN relations. It offers a unique opportunity to the ASEAN-India Centre (AIC) at RIS in promoting the maritime cooperation between India and Southeast Asia.

The Report provides valuable lessons that extend far beyond trade and connectivity. By incorporating perspectives from history, culture, economics, technology, security and environmental science, it offers deep insights into India's evolving maritime relations towards *Viksit Bharat 2047*.

I welcome the publication of this Report, which will serve as a very useful reference for all stakeholders, scholars, practitioners, academicians and policy makers. The diversity and pragmatism of the views by the contributors make it a very worthwhile resource for all trade and maritime practitioners. I thank all the contributors for their valuable inputs.

In particular, I thank Mr. Vijay Kumar, Secretary, MoPSW for his encouragement and cooperation. My compliments to Professor Prabir De for taking the lead in designing and editing this Report. I thank the entire CMEC team, Dr. Shishir Shrotriya, Coordinator, CMEC, and Cmde. Sujeet Samaddar, Visiting Fellow, RIS for their efforts in coming out with this timely and insightful publication.

Thanks are also to the RIS publication team and Mr Sachin Singhal in particular for elegantly bringing out the Report.



**Sachin Kumar Sharma**





# Acknowledgements

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The *India Maritime Report 2025-26* titled “Uniting Oceans, One Maritime Vision: India’s Maritime Strides” was prepared by the Centre for Maritime Economy and Connectivity (CMEC) of Research and Information System for Developing Countries (RIS), led by Dr. Prabir De, Professor, RIS. Other team members include Cmde. (Dr.) Shishir Shrotriya, Coordinator, Centre for Maritime Economy and Connectivity (CMEC) at RIS; and Commodore Sujeet Samaddar, NM (Retd.), Visiting Fellow, RIS.

The manuscript was edited by Dr. Prabir De. The report benefited from inputs and feedback provided by colleagues of the CMEC at RIS. Additional comments, substantive contributions and statistical support were received from other colleagues at RIS, as well as the Ministry of Ports, Shipping and Waterways (MoPSW), Government of India.

Most of the chapters in this Report are written fresh with special focus on the theme of the India Maritime Week (IMW) 2025. CMEC at RIS gratefully acknowledges research inputs and comments of contributors and reviewers for their valuable inputs.

We gratefully acknowledge the support and overall guidance provided by RIS Director General, Professor Sachin Kumar Sharma. We thank him for his valuable direction in organizing the *Anrit Kaal* Sessions at the India Maritime Week (IMW) 2025, Mumbai.

We gratefully acknowledge the support provided by the MoPSW. In particular, we would like to thank Mr. Vijay Kumar, Secretary, Ministry of Ports, Shipping and Waterways (MoPSW), Government of India, for his encouragement and cooperation.

We would like to acknowledge the research assistance provided by Ms. Vanshika Goyal, Research Assistant, RIS; Dr. P Srinivasa Rao, Fellow, RIS; and the entire CMEC team comprising Mr. Mayank Mishra, Consultant; Dr. Jaswant Singh Kain, Consultant; Ms. Anushka Tripathi, Research Assistant; Ms. Shagun Verma, Research Assistant; Ms. Namita Mittal, Research Assistant; and Ms Deeksha Gupta, Research Assistant.

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Views expressed in the Report are those of the contributors and not the views of the Governments of India or RIS, CMEC, AIC, and DAKSHIN. Usual disclaimers apply.





## List of Contributors

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**P. K. Anand:** Dr. P. K. Anand is a Visiting Fellow at the Research and Information System for Developing Countries (RIS). Before joining RIS, Dr. Anand was with the NITI Aayog, where he was the lead for SDGs, Development Monitoring & Evaluation, Plan Appraisal and also handled International Cooperation, G-20, Industry, etc. He is equipped with Ph.D. in Economics; and M.Sc. in Physics, and in Economics, latter from the London School of Economics, and holds the degree of Fellow, Indian Institute of Foreign Trade (IIFT). As a member of the Indian Administrative Service (IAS), he served in ministries of textiles, defence, and rural development of Government of India; and in Government of Rajasthan headed at district and divisional levels, besides handling Co-operative and Public Sector units and serving in education and industry departments.

**Priyadarshi Dash:** Dr. Priyadarshi Dash is Associate Professor at Research and Information System for Developing Countries (RIS), New Delhi with 18 years of experience in policy research on macroeconomic and international finance issues. His current research focuses on blended finance, digital economy and fintech applications. Dr. Dash holds M.Phil (Planning & Development) and Ph.D. in Economics from Indian Institute of Technology (IIT), Bombay.

**Prabir De:** Dr. Prabir De is a Professor at the Research and Information System for Developing Countries (RIS). He works in the field of international economics and has research interests in international trade and development. He has been conducting policy research for the Government of India and several national and international organisations including UN agencies and multilateral development banks.

**Suchandra Ghosh:** Dr. Suchandra Ghosh is Professor and presently Chair in the Department of History, University of Hyderabad. She specializes in early Indian Epigraphy and works on Indo-Iranian borderlands and Indian Ocean Buddhist and Trade Networks.

**Vanshika Goyal:** Ms. Vanshika Goyal is a Research Assistant at Research and Information System for Developing Countries (RIS), where she is currently working on shipbuilding and related policy frameworks including shipbuilding finance in India. She holds a Master's degree in Economics with Specialization in Trade and Finance from Indian Institute of Foreign Trade (IIFT), Delhi.

**Deeksha Gupta:** Ms. Deeksha Gupta is a Research Assistant at the Centre for Maritime Economy and Connectivity (CMEC), Research and Information System for Developing Countries (RIS), New Delhi. She holds a Master's degree in Public Policy, and her research interests lie in the domains of climate change and sustainability, technological innovation, and governance policy.

**Rupal Kalebere:** Ms. Rupal Kalebere is a Senior Research Assistant at the Society for Aerospace, Maritime, and Defence Studies (SAMDeS), where she researches Indo-Pacific security and defence policies. She holds a Master's degree in Public Policy from the International University of Japan.

**Pankaj Kapoor:** Capt. Pankaj Kapoor is a Maritime Lawyer and Managing Partner with QUADRAANT LEGAL. Capt. Kapoor was part of a committee constituted by Prime Minister's Office (PMO) and NITI Aayog for drafting National Maritime Policy. He operates his own law firm with clients from within India and around eight countries.

**Atul Kaushik:** Mr. Atul Kaushik is GDC Fellow at RIS. He retired as Additional Secretary to the Government of India. His areas of work include international trade law, intellectual property rights, and development cooperation. He has been India's negotiator at the WTO and the UNFCCC, and has served at the Permanent Mission of India to the WTO in Geneva. After retirement, he has served as the Vice-Chairman of the Committee for Advanced Trade Research of the Trade Promotion Council of India (TPCI).

**Kartik Kishore:** Mr. Kartik Kishore works at the NITI Aayog as Officer on Special Duty (Policy Reforms). He has a postgraduate degree in Public Policy (Gold Medal) from the O.P. Jindal Global University.

**Arvind Kumar:** Mr. Arvind Kumar retired as Senior Adviser (Transport Research) Ministry of Road Transport and Highways and Member Tariff Authority for Major Ports (TAMP). During his service career he has held various senior assignments in various economic ministries. He holds Masters in Economics from the Delhi School of Economic, MA (Development Economics) University of Sussex, the UK and Advanced Studies Certificate in International Economic Policy Research from Kiel Institute of World Economics, Germany. He has contributed a number of articles and research reports on transport, shipping, connectivity and free trade agreements.

**Mayank Mishra:** Mr. Mayank Mishra is the Legal Consultant at the Centre for Maritime Economy and Connectivity (CMEC) at RIS. He studied law in England and returned to India to work in the social sector. He is passionate about legal research, and, before joining the CMEC at RIS, he has worked at the National Maritime Foundation, New Delhi as a legal researcher, for two years.

**S K Mohanty:** Professor S. K. Mohanty is a Distinguished Fellow at the Research and Information System for Developing Countries (RIS), New Delhi. His research spans international trade, the maritime and Blue Economy, regional trading arrangements, WTO issues, environmental policy, MSMEs, technology-intensive trade, and CGE modelling. He contributed to the National Maritime Policy with the NITI Aayog and to India's Blue Economy Report with the Economic Advisory Council to Prime Minister (EAC-PM). He served as Chair of the IORA Academic Group and Co-chair of the T20 Task Force on Trade and Investment during India's G20 Presidency.

**Kapil Narula:** Dr. Kapil Narula works for the Climate High-Level Champions to catalyse international cooperation for ambitious climate action across regions and sectors. He works on clean energy transition, climate change and maritime sustainability.

**Balaji Ramakrishnan:** Prof. Balaji Ramakrishnan is the Director of National Institute of Ocean Technology (NIOT), Chennai. Dr. Balaji is Professor in the Department of Civil Engineering, IIT Bombay since 2011. He was working as Senior Coastal/Port Engineer at Sogreah Consultants, in Dubai, the UAE. He has obtained his Bachelor degree in Civil Engineering from Madurai Kamarajar University, obtained his Masters and Ph.D degrees in Ocean Engineering field of research from IIT Madras. He has been actively involved in several Government/Ministry sponsored research projects, from Ministry of Shipping, Ministry of Earth Sciences and the DST.

**Sanjeev Ranjan:** Dr. Sanjeev Ranjan is former Secretary, Ministry of Ports, Shipping and Waterways (MoPSW) and Chairman, National Shipping Board. “Maritime India Vision 2030” was adopted and Action Plan “Blue Economy Vision 2047” prepared for revitalizing Indian maritime sector during the period. Dr. Ranjan as Secretary, Ministry of Road Transport and Highways and Chairman, National Highways Authority of India, oversaw formulation and construction of the Expressways in the country. Dr. Ranjan is Member, Adjudicatory Board of Major Ports notified in August 2025. He was a Lee Kuan Yew Fellow at Harvard University and holds Ph.D. from IIT Delhi.

**Dharmesh Raval:** Dr. Dharmesh Raval is Head of Centre for Maritime Economy, Gujarat Maritime University (GMU) and Director at School of Maritime Management, GMU. A Ph.D. in Management, Dr. Raval has research interest in areas like Industry-Academia Collaboration, Maritime Economy, Shipping Finance and Leadership.

**Debojyoti Ray:** Mr. Debojyoti Ray is an ISB and NIT alumnus, CFA, and FRM charter holder. He blends finance, analytics, and policy expertise – uniting strategic insight with creative flair as a published author. He is serving as an Assistant Director at the Ministry of Ports, Shipping and Waterways (MoPSW), Government of India.

**Premesha Saha:** Dr. Premesha Saha is a Senior Policy Fellow at Asia Society Australia, focusing on Indo-Pacific geopolitics and regional security architecture. Her expertise spans minilateral cooperation, great-power competition, India’s Indo-Pacific policy, India–Australia relations, and maritime security across Southeast Asia and the Indian Ocean. She holds a Ph.D. from Jawaharlal Nehru University (JNU), where her research examined Indonesia’s maritime strategy in the Indian Ocean.

**Sujeet Samaddar:** Commodore Sujeet Samaddar, NM (Retd.) is a Visiting Fellow at Research and Information System for Developing Countries (RIS), New Delhi. He is the Founder and Secretary of Society for Aerospace Maritime and Defence Studies, (SAMDeS) a Distinguished Fellow at the Centre for Air Power and Strategic Studies (CAPSS) and Member of the Governing Council of Society for Indian Ocean Studies (SIOS).

**Shishir Shrotriya:** Cmde. (Dr.) Shishir Shrotriya is the Head, Centre for Maritime Economy and Connectivity (CMEC) at RIS. He specializes in Maritime Technology, Strategy and Management, and has steered multiple indigenization initiatives for the Marine and Naval systems. His diplomatic assignment includes, Counsellor (Science & Technology) at the Embassy of India (Moscow).

**Deepankar Sinha:** Prof. Deepankar Sinha is a PhD in Industrial and Systems Engineering (ISE) from the Indian Institute of Technology (IIT), Kharagpur and serving as a Professor in Indian Institute of Foreign Trade (IIFT). He is Head of International Trade Operations and Logistics Division at the IIFT. Besides, he also Heads Research Division and Centre for Trade Facilitation of IIFT's Kolkata Campus.

**Anushka Tripathi:** Ms. Anushka Tripathi is a Research Assistant at the Centre for Maritime Economy and Connectivity (CMEC), Research and Information System for Developing Countries (RIS). She holds a Master's in Public Policy. She has prior experience in addressing policy issues concerning public health, legal aid for the underprivileged, and gender equity.

**Shagun Verma:** Ms. Shagun Verma is currently working as a Research Assistant at the Research and Information System for Developing Countries (RIS), New Delhi. She holds a Master's degree in Applied Economics from Christ University, Bengaluru. Her areas of academic interest include development economics, international and regional trade cooperation, and applied econometrics.



# List of Abbreviations

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|         |                                                                                |
|---------|--------------------------------------------------------------------------------|
| AALCO   | African-Asian Legal Consultative Organisation                                  |
| ADB     | Asian Development Bank                                                         |
| ADCP    | Acoustic Doppler Current Profiler                                              |
| ADR     | Alternative Dispute Resolution                                                 |
| AEO     | Authorized Economic Operator                                                   |
| AEP     | Act East Policy                                                                |
| AI      | Artificial Intelligence                                                        |
| AIF     | ASEAN-India Fund                                                               |
| AIIB    | Asian Infrastructure Investment Bank                                           |
| AJSMC   | ASEAN-India Joint Statement on Maritime Cooperation                            |
| AIKEYME | Africa-India Key Maritime Engagement                                           |
| AIME    | ASEAN-India Maritime Exercise                                                  |
| AIS     | Automated Identification System                                                |
| AITF    | ASEAN-India Tourism Forum                                                      |
| AML     | Anti Money Laundering                                                          |
| AMO     | ASEAN Maritime Outlook                                                         |
| AOIP    | ASEAN Outlook on the Indo-Pacific                                              |
| AOSIS   | Alliance of Small Island States                                                |
| API     | Application Programming Interface                                              |
| ARF     | ASEAN Regional Forum                                                           |
| ASEAN   | Association of South East Asian Nations                                        |
| AU      | African Union                                                                  |
| BALCO   | Bharat Aluminium Company Limited                                               |
| BCD     | Basic Customs Duty                                                             |
| BCE     | Before the Common Era                                                          |
| BIMCO   | Baltic International Maritime Council                                          |
| BIMSTEC | Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation |
| BPCL    | Bharat Petroleum Corporation Limited                                           |
| BRICS   | Brazil, Russia, India, China, and South Africa                                 |

|          |                                                                |
|----------|----------------------------------------------------------------|
| BU       | Beneficial Use                                                 |
| BWM      | Ballast Water Management                                       |
| BWRB     | Ballast Water Record Book                                      |
| CAGR     | Compound Annual Growth Rate                                    |
| CDAC     | Centre for Development of Advanced Computing                   |
| CECA     | Comprehensive Economic Cooperation Agreement                   |
| CEPA     | Comprehensive Economic Partnership Agreement                   |
| CFM      | Climate Fund Managers                                          |
| CII      | Carbon Intensity Index                                         |
| CIT      | Corporate Income Tax                                           |
| CLIA     | Cruise Lines International Association                         |
| CLMV     | Cambodia, Laos, Myanmar, Vietnam                               |
| CMA CGM  | Compagnie Maritime d’Affrètement – Compagnie Générale Maritime |
| COMESA   | Common Market for Eastern and Southern Africa                  |
| COP      | Conferences of Parties                                         |
| CORPAT   | Coordinated Patrols                                            |
| CPR      | Common Public Resource                                         |
| CRZ      | Coastal Regulation Zone                                        |
| CSCAP    | Council for Security Cooperation in the Asia-Pacific           |
| CSP      | Comprehensive Strategic Partnership                            |
| CSRS     | Coastal Surveillance Radar Systems                             |
| CV       | Coefficient of Variation                                       |
| DCoE     | Digital Centre of Excellence                                   |
| DG       | Shipping Directorate General of Shipping                       |
| DISC     | Defence India Startup Challenge                                |
| DLT      | Distributed Ledger Technology                                  |
| DMAF     | Dredged Material Assessment Framework                          |
| DNV      | Det Norske Veritas                                             |
| DP World | Dubai Ports World                                              |
| DPA      | Deendayal Port Authority                                       |
| DPI      | Digital Public Infrastructure                                  |
| DPIIT    | Department of Promotion of Industry and Internal Trade         |
| DRDO     | Defence Research and Development Organisation                  |
| DWT      | Deadweight Tonnage                                             |
| EAS      | East Asia Summit                                               |
| eBDNs    | electronic Bunker Delivery Notes                               |
| EEXI     | Energy Efficiency Existing Ship Index                          |
| EEZ      | Exclusive Economic Zone                                        |

|           |                                                                         |
|-----------|-------------------------------------------------------------------------|
| EGM       | Export General Manifest                                                 |
| EIA       | Environmental Impact Assessment                                         |
| EMC       | Emerging Market Economies                                               |
| EMDEs     | Emerging Market and Developing Economies                                |
| EMP       | Environmental Management Plan                                           |
| EMSWe     | European Maritime Single Window environment                             |
| ESG       | Environment, Social and Governance                                      |
| ETFMT-IP  | Enhanced Trade Facilitation for Maritime Transportation in Indo-Pacific |
| EU SRR    | European Union Ship Recycling Regulation                                |
| EU        | European Union                                                          |
| EXIM      | Export-Import Bank of India                                             |
| FAL       | Facilitation of International Maritime Traffic                          |
| FDI       | Foreign Direct Investment                                               |
| FDMM      | Financial Digital Maturity Matrix                                       |
| FICCI     | Federation of Indian Chambers of Commerce & Industry                    |
| FoCs      | Flages of Convenience                                                   |
| FTA       | Free Trade Agreement                                                    |
| GBP       | Green Bond Principles                                                   |
| GDP       | Gross Domestic Product                                                  |
| GHG       | Green House Gases                                                       |
| GIFT-City | Gujarat International Finance Tec-City                                  |
| GIMAC     | Gujarat Mediation and Arbitration Centre                                |
| GIS       | Geographic Information System                                           |
| GLPs      | Green Loan Principles                                                   |
| GMU       | Gujarat Maritime University                                             |
| GT        | Gross Tonnage                                                           |
| GTPP      | Green Tug Transition Programme                                          |
| GVCs      | Global Value Chains                                                     |
| HADR      | Humanitarian Assistance and Disaster Relief                             |
| HELCOM    | Helsinki Convention                                                     |
| HHLA      | Hamburger Hafen und Logistik AG                                         |
| HKC       | Hong Kong Container                                                     |
| HKMAG     | Hong Kong Maritime Arbitration Group                                    |
| HML       | Harmonized Master List                                                  |
| HPCL      | Hindustan Petroleum Corporation Limited                                 |
| HRD       | Human Resource Development                                              |
| IAPH      | International Association of Ports and Harbours                         |
| IBSAMAR   | India-Brazil South African Maritime Exercise                            |

|         |                                                        |
|---------|--------------------------------------------------------|
| ICAO    | International Civil Aviation Organization              |
| ICC     | International Chamber of Commerce                      |
| ICEGATE | Indian Customs EDI Gateway                             |
| iDEX    | Innovations for Defence Excellence                     |
| IEA     | International Energy Agency                            |
| IFC     | International Finance Corporation                      |
| IFC-IOR | Information Fusion Centre-Indian Ocean Region          |
| IFSC    | International Financial Services Centre                |
| IGST    | Integrated Goods and Services Tax                      |
| IHM     | Inventory of Hazardous Materials                       |
| IIFCL   | India Infrastructure Finance Co. Ltd                   |
| IITTM   | Indian Institute of Tourism and Travel Management      |
| ILO     | International Labour Organization                      |
| ILOs    | International Liaison Officers                         |
| IMCOR   | India Myanmar Coordinated Patrol                       |
| IMDG    | International Maritime Dangerous Goods                 |
| IMEC    | India-Middle East-Europe Economic Corridor             |
| IMO     | International Maritime Organization                    |
| IMU     | India Maritime University                              |
| INSTC   | International North-South Transport Corridor           |
| IOCL    | Indian Oil Corporation Limited                         |
| IONS    | Indian Ocean Naval Symposium                           |
| IORA    | Indian Ocean Rim Association                           |
| IORIS   | Indo-Pacific Regional Information Sharing Platform     |
| IoT     | Internet of Things                                     |
| IPEF    | Indo-Pacific Economic Framework                        |
| IPMDA   | Indo-Pacific Partnership for Maritime Domain Awareness |
| IPOI    | Indo-Pacific Oceans' Initiative                        |
| IREDA   | Indian Renewable Energy Development Agency             |
| IRRC    | Ready for Recycling Certificate                        |
| ISR     | International Ship Registry                            |
| ISWAN   | International Seafarers' Welfare & Assistance Network  |
| ITEC    | Indian Technical and Economic Cooperation              |
| IUU     | Illegal, Unreported and Unregulated                    |
| IWAI    | Inland Waterways Authority of India                    |
| IWAI    | Inland Waterways Authority of India                    |
| IWT     | Inland Water Transport                                 |
| JAFZ    | Jebel Ali Free Zone                                    |

|           |                                                                        |
|-----------|------------------------------------------------------------------------|
| JNPA      | Jawaharlal Nehru Port Authority                                        |
| JTWG      | IMO/ILO Joint Tripartite Working Group                                 |
| KPI       | Key Performance Indicators                                             |
| KYC       | Know Your Customer                                                     |
| Lao PDR   | Lao People's Democratic Republic                                       |
| LC        | London Convention                                                      |
| LDCs      | Least Developed Countries                                              |
| LEP       | Look East Policy                                                       |
| LLDCs     | Landlocked Least Developed Countries                                   |
| LLPs      | Limited Liability Partnerships                                         |
| LMAA      | London Maritime Arbitrators Association                                |
| LNG       | Liquefied Natural Gas                                                  |
| LNOB      | Leave No One Behind                                                    |
| LP        | London Protocol                                                        |
| LPI       | Logistics Performance Index                                            |
| LRIT      | Long-Range Identification and Tracking                                 |
| LSCI      | Linear Shipping Connectivity Index                                     |
| MAD       | Minimum Assured Depth                                                  |
| MAHASAGAR | Mutual and Holistic Advancement for Security and Growth Across Regions |
| MAITRI    | Master Application for International Trade and Regulatory Interface    |
| MAKV      | Maritime Amrit Kaal Vision                                             |
| MARPOL    | International Convention for the Prevention from Ships                 |
| M-ATM     | ASEAN-India Tourism Ministers                                          |
| MBES      | Multibeam Echosounder                                                  |
| MCM       | Million Cubic Meter                                                    |
| MDBs      | Multilateral Development Banks                                         |
| MDF       | Maritime Development Fund                                              |
| MEA       | Ministry of External Affairs                                           |
| MIV       | Maritime India Vision                                                  |
| ML        | Machine Learning                                                       |
| MLD       | Million Litres per Day                                                 |
| MMT       | Million Metric Tons                                                    |
| MNRE      | Ministry of New and Renewable Energy                                   |
| MoPSW     | Ministry of Ports, Shipping and Waterways                              |
| MoU       | Memorandum of Understanding                                            |
| MPA       | Maritime Port Authority                                                |
| MPAC      | Master Plan on ASEAN Connectivity                                      |
| MRAs      | Mutual Recognition Agreements                                          |

|        |                                                   |
|--------|---------------------------------------------------|
| MSA    | Merchant Shipping Act                             |
| MSC    | Mediterranean Shipping Company                    |
| MSME   | Micro, Small, and Medium Enterprises              |
| MSW    | Maritime Single Window                            |
| MT     | Million Tonnes                                    |
| MTPA   | Million Tonnes Per Annum                          |
| MW     | Mega Watt                                         |
| NA     | Not Available                                     |
| NBFC   | Non Banking Financial Company                     |
| NHAI   | National Highway Authority of India               |
| NIA    | National Implementation Authorities               |
| NIP    | National Infrastructure Pipeline                  |
| NIS    | Norwegian International Ship Registry             |
| NISHAR | Network for Information Sharing                   |
| NLP    | National Logistics Policy                         |
| NMDP   | National Maritime Development Programme           |
| NMF    | National Maritime Foundation                      |
| NMP    | National Master Plan                              |
| NOAA   | National Oceanic and Atmospheric Administration   |
| NRI    | Non-Resident Indian                               |
| NT     | Net Tonnage                                       |
| NTO    | National Tourism Organizations                    |
| NW     | National Waterways                                |
| NYK/KK | Nippon Yusen Kaisha/Kaisha-Kaisha                 |
| NZF    | Net -Zero Framework                               |
| ODA    | Official Development Assistance                   |
| OES    | Ocean Energy Systems                              |
| OSPAR  | Oslo-Paris Convention                             |
| OTC    | Over-the-Counter                                  |
| OTEC   | Ocean Thermal Energy Conversion                   |
| P&I    | Protection and Indemnity                          |
| PBD    | Pre-Berthing Detention                            |
| PCS    | Port Community System                             |
| PIO    | Person of Indian Origin                           |
| PMUs   | Project Monitoring Units                          |
| POA    | Plan of Action                                    |
| POEA   | Philippine Overseas Employment Administration     |
| POGO   | Partnerships for the Observation of Global Oceans |

|          |                                                                                              |
|----------|----------------------------------------------------------------------------------------------|
| PPA      | Paradip Port Authority                                                                       |
| PPP      | Public Private Partnership                                                                   |
| PSC      | Port Community System                                                                        |
| PSUs     | Public Sector Undertakings                                                                   |
| R&D      | Research and Development                                                                     |
| RICs     | Regional Implementation Committees                                                           |
| RIMPAC   | Rim of the Pacific                                                                           |
| RIS      | Research and Information Centre for Developing Countries                                     |
| RMI      | Republic of Marshall Islands                                                                 |
| RMT      | Review of Maritime Trade                                                                     |
| RoFR     | Right of First Refusal                                                                       |
| SACU     | Southern African Customs Union                                                               |
| SAGAR    | Security and Growth for All in the Region                                                    |
| SAR      | Search and Rescue                                                                            |
| SARFAESI | Securitisation and Reconstruction of Financial Assets and Enforcement of Securities Interest |
| SbDS     | Shipbuilding Development Scheme                                                              |
| SBFAS    | Shipbuilding Financial Assistance Policy                                                     |
| SCDC     | Shipbuilding Capability Development Centres                                                  |
| SCI      | Shipping Corporation of India                                                                |
| SCMA     | Singapore Chamber of Maritime Arbitration                                                    |
| SCOR     | Scientific Committee on Oceanic Research                                                     |
| SCP      | Sustainable Production and Consumption                                                       |
| SDCL     | Sagarmala Development Company Limited                                                        |
| SDGs     | Sustainable Development Goals                                                                |
| SIDs     | Small Islands Developing States                                                              |
| SLBPs    | Sustainability-Linked Bond Principles                                                        |
| SLLPs    | Sustainability-Linked Loan Principles                                                        |
| SMFCL    | Sagarmala Finance Corporation Limited                                                        |
| SOLAS    | Safety of Life at Sea                                                                        |
| SOP      | Standard Operating Procedure                                                                 |
| SPFO     | Seamen's Provident Fund Organization                                                         |
| SPS      | Sanitary and Phytosanitary                                                                   |
| STCW     | Standards of Training, Certification and Watchkeeping for Seafarers                          |
| TEN-T    | Trans-European Transport Network                                                             |
| TEU      | Twenty-foot Equivalent Unit                                                                  |
| TFP      | Total Factor Productivity                                                                    |
| TFPG     | Total Factor Productivity Growth                                                             |

|          |                                                       |
|----------|-------------------------------------------------------|
| TRL      | Technological Readiness Level                         |
| TRT      | Turnaround Time                                       |
| TTS      | Tonnage Tax System                                    |
| UAE      | United Arab Emirates                                  |
| ULIP     | Unified Logistics Interface Platform                  |
| UN       | United Nations                                        |
| UNCITRAL | United Nations Commission on International Trade Law  |
| UNCLOS   | United Nations Convention on the Law of the Sea       |
| UNCTAD   | United Nations Conference on Trade and Development    |
| UNEP     | United Nations Environment Programme                  |
| UNFCCC   | United Nations Framework Convention on Climate Change |
| UNHRC    | United Nations Human                                  |
| UNODC    | United Nations Office on Drugs and Crime              |
| UNSC     | United Nations Security Council                       |
| USACE    | United States Army Corps of Engineers                 |
| VOCA     | V.O. Chidambaram Port                                 |
| VPA      | Visakhapatnam Port Authority                          |
| VRC      | Vessel Related Charges                                |
| VTC      | Virtual Trade Corridors                               |
| WAG      | Waste Assessment Guidelines                           |
| WB       | World Bank                                            |
| WEF      | World Economic Forum                                  |
| WODA     | World Organisation of Dredging Association            |
| WTO      | World Trade Organization                              |
| ZOPACAS  | Zone of Peace and Cooperation of the South Atlantic   |



# Key Takeaways

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The CMEC-RIS's *India Maritime Report 2025-26* titled "Uniting Oceans, One Maritime Vision: India's Maritime Strides" presents a rich content of India's maritime journey, with particular focus on achievements, best practices, challenges, and the way forward. Some key takeaways of this Report are as follows.

## One ocean, one maritime vision

India's maritime transformation through the *MIV 2030* and *MAKV 2047* demonstrates building domestic capability to promote international cooperation. India has evolved from being a maritime nation to becoming a maritime partner, one that leads by example, offering digital models, sustainability frameworks, and cooperative security initiatives. India upholds the principles of *Mare Liberum* (freedom of the seas) in both spirit and practice by promoting cooperative domain awareness, interoperable digital trade corridors, green corridors and support for developing nations' maritime capacity via training and technology sharing. Together, they make India the fulcrum of a global maritime partnership, bridging the Indian Ocean, Indo-Pacific, and the wider world. Through these frameworks, India is not just uniting its own coasts, it is uniting oceans, building trust, connectivity, and shared prosperity across regions.

## Global North and Global South intrinsically intertwined in sea

The Indian Ocean is a global geo-strategic axis. Not only does this body of water serve as home to 40 per cent of the world's population, it also incorporates more than 50 per cent of the world's oil and 45 per cent of the world's gas reserves and a huge seabed of mineral resources. Equally important is the fact that the region boasts of an active sea lane that plays host to more than half of the world's container shipments, including two-thirds of oil shipments across the world. It is also a critical waterway between Pacific Asia, Africa, and Europe, and the busiest and most significant communication corridor, with 61 per cent of world container traffic and 70 per cent of world petroleum transit. Maritime transport through the Indian Ocean, therefore, is both nationally and globally important where the Global North and the Global South are intrinsically intertwined. With its ambitious MAHASAGAR

initiative, India is poised to take the lead along with other similarly situated countries of the Global South to contribute to this research as well as expand its efforts to build the capacity of other littoral developing countries to enable increased participation in the maintenance of free, open and sustainable global maritime sector.

## India a benign maritime power

India's maritime role is neither hegemonic nor symbolic. It is collaborative, demand-driven and outcome-focused – adding capacity where partners want it, reinforcing rules that benefit all, and keeping the Indo-Pacific open, stable and prosperous. India's maritime engagement – grounded in SAGAR, its evolution under MAHASAGAR, the practical architecture of the Indo-Pacific Oceans Initiative, and the data-sharing backbone of IFC-IOR – already provides workable tools. What matters now is using them in ways that are visible at sea, trusted in the region, and anchored in ASEAN centrality and the UNCLOS. The path forward is pragmatic. Build a common operating picture with partners and then act on it – through routine, coordinated patrols; quiet, professional law-enforcement cooperation; and exercises that rehearse humanitarian assistance and search-and-rescue alongside interdiction of illicit activity. Tie information-fusion to logistics resilience so that alerts translate into quicker responses, safer shipping and faster recovery when shocks occur. Pair this with targeted capacity-building – training, legal processes, and modest but reliable hardware – so coastal agencies in Southeast Asia can own the mission, not just observe it.

## Seizing the maritime moment

India stands at the convergence of historic opportunity and strategic preparedness in the maritime sector. The substantial investment pipeline represents more than an economic opportunity and embodies a fundamental

reimagining of India's role in global maritime architecture. The transformation from a reactive approach to proactively addressing systemic challenges in the maritime sector, which prioritizes maritime sustainability, demonstrates unprecedented government commitment. Growth of maritime infrastructure and dedicated financial institutions signal systematic nation-building through maritime excellence. At the same time, India's maritime transformation window is closing rapidly as global trade patterns shift, environmental regulations tighten, and technological disruption accelerates.

## Toward an inclusive and harmonised trade future

India's Gati Shakti National Master Plan offers an exemplary model of how digital planning, institutional coordination, and real-time monitoring can overcome fragmentation and inefficiencies. If adopted as the regulatory and institutional backbone of India-Middle East – Europe Economic Corridor (IMEC), Gati Shakti can transform the corridor into a 21st-century Golden Road – one that unites economies, empowers regions, and shapes a more inclusive global future. For IMEC to fulfill its promise it must become a digitally integrated, policy-synchronised, and sustainability-aligned economic corridor. The IMEC is not merely a response to logistical bottlenecks; it is a visionary project that redefines how nations collaborate for shared prosperity. However, its success rests not just on laying railway tracks or underwater cables, but on the harmonisation of the rules, systems, and institutions that govern trade, energy, and information flow.

## Accelerating productivity

The acceleration of the productivity after the implementation of the *Sagarmala* programme suggests that investments in infrastructure development have yielded positive results as manifested in the improved productivity levels

of major ports. Deendayal, Jawaharlal Nehru and Paradip are the top three productive ports in the country. These ports have been front runners in port KPIs since 2010. To retain the momentum, the *MIV 2030* and *MAKV 2047* have suggested several new initiatives in these ports including upgrading the Deendayal and Paradip ports to deep-drafts ports, developing them as Green Hydrogen/ Ammonia Hubs under the National Hydrogen Mission.

### **Larger role of private sector reinforcing India's maritime prowess**

Private investment in the maritime sector is crucial for infrastructure development, enhancing operational efficiency, and boosting global competitiveness. By 2030, India's annual port capacity is likely to exceed 3,000 million tonnes. To achieve this target, involvement of the private sector is important, besides government's active guidance and engagement. In a turbulent time when the global uncertainties are looming large, domestic reforms aiming to improve efficiency and productivity of ports, skilling and human resources development, adoption of advanced technologies like automation and Artificial Intelligence (AI), compliance to global security, etc. will help strengthen the maritime sector.

### **More FDI inflows per port**

The total investment in the maritime sector (which includes the sea transport and ports) has increased by close to 2.5 times in the last eight years, from US\$ 3.3 billion in 2017 to US\$ 8.2 billion in 2025. Strengthening FDI inflows into India's maritime sector demands a coherent, multidimensional reform agenda. Legal and institutional harmonization should be prioritized through full implementation of the new maritime legislation, with the Maritime Single Window and One Nation-One Port portal expanded to integrate environmental, land-use, and customs approvals. Streamlined project clearances, transparent concession

frameworks, and standardized dispute-resolution mechanisms can substantially reduce uncertainty and investment risk. State port authorities should introduce investor-friendly policies, including transparent land-acquisition frameworks, fiscal incentives, and industrial cluster linkages with *Sagarmala* corridors. If these measures, implemented cohesively, can transform India from a regional shipping participant into a globally integrated maritime and logistics hub.

### **Motivating strategic investors**

Several leading global maritime players remain untapped in India's port and shipping landscape. Entities such as Abu Dhabi Ports (UAE), Hamburg's HHLA (Germany), CMA CGM (France), MSC (Switzerland), Evergreen Marine (Taiwan), and NYK/KK Line (Japan) have limited or no direct investment presence. Targeting such strategic investors could strengthen India's maritime infrastructure, technology base, and global connectivity, advancing the objectives of the *MAKV 2047*. The ports of the eastern coast especially may take initiative towards attracting these global players.

### **Supply chain security key to the trade and integration**

Disruptions at the maritime chokepoints, whether from geopolitical conflicts, piracy, natural hazards, or accidents, can cause cascading effects on global and regional supply chains. Maritime supply chain disruptions have revealed the fragility of global trade networks and the particular vulnerabilities of import-dependent economies such as India. India, which depends on maritime routes for over 90 per cent of its international trade volume and 70 per cent of its energy imports, maritime chokepoints are not only vital lifelines but also critical vulnerabilities. From pandemic-era port congestion to the Red Sea crisis and climate-induced chokepoint

disruptions, each episode has reinforced the urgency for India to build resilient maritime infrastructure, strengthen trade facilitation, reinforce strategic naval security, and diversify trade corridors beyond traditional choke points. Digitalisation of the supply chain would help to achieve business resilience against supply chain disruption amidst global uncertainties. Effectively implementing the cross-border paperless trade, improving transparency and institutional arrangements would reduce the trade costs, strengthen the global and regional value chains, and better connect the world.

### **Unleashing the opportunities of paperless trade facilitation**

Countries have to enhance trade facilitation for maritime transportation. The overall trend is positive, with the maritime industry steadily moving away from paper-based silos towards an integrated, digital future that benefits global trade efficiency and safety. Digitization of custom processes, paperless trade facilitation, data sharing, and signing of the MRAs for trade facilitation such as the AEO programme, etc. can significantly improve the trade processes. Developing standard operating procedure and necessary skill training for the officials involved in the cross-border logistics can improve the overall process. India's progress has been significant and has been growing leaps and bounds. Promote paperless trade and simplification of trade procedures among the Indo-Pacific would help with regulations at ease, such as single window clearance, IT-enabled mechanisms, simplifications of license, permit procedures, etc.

### **Digitalization and improving operational performance key to sustainability**

The ongoing drive for digitization of customs and port clearance systems is imperative. Adopting AI-driven documentation, inspection tools, and integrated digital logistics platforms

will further reduce turnaround times, cut operational costs, and improve ease of doing business, positioning India as a global maritime logistics hub. The Maritime Single Window is a fundamental digital transformation in the maritime industry. It is a key tool for facilitating trade, enhancing the efficiency of shipping, and improving the competitiveness of ports. By replacing a cumbersome, paper-based process with a streamlined, digital one, it benefits everyone involved – from government regulators to ship operators – making global maritime trade smoother, faster, and safer.

### **Engaging MDBs for unlocking the potential of multilateral corridors**

India has firmly positioned in the world web of corridors. To facilitate the development of corridors, continued investment in road, rail, inland waterways, aviation and maritime transportation is required. Engaging with the MDBs such as the ADB, World Bank, AIIB, etc. and international cooperation agencies such as the JICA will help secure crucial financing, mobilize private capital, offer technical expertise, and promote sustainable development.

### **Sustainable Self-Sustaining Tomorrow's Technology Today (S<sup>3</sup>T<sup>3</sup>)**

Economically feasible perspectives anchored to sustainability and inclusion are essential to fructify the *MIV 2030* and *MAKV 2047*. Green shipping and bio-fuels can help fast-track this journey. Global South coming together can impart impetus for a proactive role, averting an increasing chasm with North. It is proposed to evolve and promote 'Sustainable Self-Sustaining Tomorrow's Technology Today (S<sup>3</sup>T<sup>3</sup>)' models for the maritime sector of India and other littoral states. Bio-fuels can not only help towards greening but also generate and protect livelihoods of farmers growing these as food and non-food crops.

## Sailing for decarbonization of shipping

The annual cost to comply with the IMO regulations could be significant for Indian flagged tonnage. These costs are expected to rise over time as regulations become tougher. Shipping is considered a harder-to-abate sector because ocean-going ships navigate over long distances and have limited options to electrify. Hydrogen-based fuels, such as green ammonia and methanol are the main candidates to decarbonize the industry. Decarbonization of shipping requires a rapid shift from today's predominant use of fossil fuels to low/zero-carbon alternatives. Balancing environmental sustainability, regulatory compliance and economic demands is vital for a sustainable, equitable and resilient maritime transport future. A shift to alternative fuels and carbon neutral landside port infrastructure will need close collaboration amongst shipping lines, shipbuilding, alternate fuel supply chains, state support and building necessary port infrastructure.

## Building digital maritime corridors

India, a leading force in digital innovation, has a golden opportunity to spearhead the development of blockchain solutions specifically tailored to address the complexities of multimodal cargo movement. This focus, coupled with maturing technology and broader adoption, can revolutionize how goods traverse international borders. The number of ports exploring and piloting blockchain solutions is steadily increasing. As technology matures and regulatory frameworks evolve, we can expect to see more widespread adoption of blockchain in ports worldwide, leading to greater efficiency, transparency, and security in the global supply chain. To solidify the country's position as a leader in cross-border trade, India can leverage blockchain technology through collaborative pilot projects with few countries on the IMEC and INSTC corridors. Applications of

blockchain solutions in maritime cargo logistics will also attract foreign investments, both in soft and hard infrastructure. Embracing blockchain technology for cross-border cargo logistics positions India as a frontrunner in transforming global trade technology. This will further unlock a future of efficiency, security, and cost savings, propelling India's global competitiveness.

## Gaining from AMRIT (Accelerating Maritime Research Innovation and Technologies)

The current pace of technology adoption in the maritime sector is required to be increased, creation of innovation platforms and challenges, can accelerate the indigenisation of technologies can drive technological advancement, enhancing competitiveness, and ensuring sustainable growth. The sector, therefore, needs dedicated innovation and technology platforms, which could incubate and empower maritime innovation and research. An integrative maritime innovation and technology platform is also needed to actively engage with the industry players, startups and research institutions to identify and address the critical challenges of this sector. This collaboration can lead to the co-creation of innovative solutions and accelerate their commercialization. The platform will also help in establishing a network of maritime-focused incubators and accelerators providing startups with the necessary support and mentorship to scale and succeed. It is, therefore, proposed to manage and fund this maritime innovation set-up through an enterprise called AMRIT (Accelerating Maritime Research Innovation and Technologies).

## Maritime tokenization reshaping the future of global shipping

India has recognized the concept of tokens. Virtual Digital Assets have found mention at Section 111 of the newly enacted Income Tax Act, 2025. Tokenization is revolutionizing maritime

investment by transforming traditionally illiquid and capital-intensive assets – such as cargo ships, ports, and carbon credits – into accessible, tradeable digital tokens. This innovation is unlocking new capital sources for fleet expansion, enhancing infrastructure development, and driving sustainability efforts through tokenized ESG investments. As adoption accelerates, maritime tokenization is poised to reshape the future of global shipping, democratizing access to one of the world's most essential industries while fostering financial efficiency and environmental responsibility.

### **Robust international ship registry a strategic enabler**

A robust international ship registry is a strategic enabler for realizing MAKV 2047's reform agenda – accelerating maritime growth, enhancing tonnage, and elevating India's competitiveness on the world stage. Adopting global conventions on safety, the environment, and seafarer welfare can make the IISR a Flag of Choice for Indian and international shipping networks. This approach strengthens the maritime ecosystem by generating jobs, boosting service exports, and increasing India's role in shaping global maritime norms. By integrating global best practices within India's legal and institutional framework, the IISR will safeguard national sovereignty and security.

### **Anchoring blue finance for the maritime economy**

India's blue economy policy aligns well with its Net-Zero commitments, and blue energy generation is one of its essential components. Blue finance is a holistic approach towards meeting SDGs and promoting sustainability in marine sectors. As a dedicated vertical of development finance, blue finance possesses immense potential to support the emerging industrial and services sectors of blue economy in the coastal nations across the world. In addition, by promoting a healthy marine

ecosystem and ocean sustainability, blue finance contributes to global public goods. With a pipeline of targeted investments in identified marine sectors, effective integration of blue finance principles and practices into national development finance strategies can bring transformative changes in policy orientation, quantum and quality of funding, and governance structure for the ocean/marine sectors.

### **Upskilling maritime workforce**

India is uniquely positioned to play a leading role in upskilling the maritime workforce of the Global South. A large and growing youth population with a strong proficiency in English, and a cultural affinity with seafaring, India offers a ready pool of motivated talent and expertise. By harnessing these strengths, India can not only contribute to building a skilled regional workforce but also set standards for sustainable, high-quality maritime capacity development across the Global South. Industry-academia tie ups, modular certification courses, professional development programmes and simulation labs, can aid to integrate new skills for the current workforce. Enhancing international recognition of Indian training and certification will ensure continued global employability of seafarers trained in the Indian institutes. By aligning policy interventions, industry demands and academic frameworks, India and the Global South can strengthen their position as global maritime talent hubs, while collectively contributing in shaping the future workforce of the maritime sector. Private shipping companies and port authorities should be encouraged through a PPP model, to invest in the capacity development.

### **Playing a leadership role in global maritime dispute resolution**

Maritime arbitration stands at the intersection of commerce, law, and global governance. Its strength lies in neutrality, expertise, and the

global enforceability of awards. India, endowed with strategic geography, expanding port infrastructure, and progressive legal reform, is poised to emerge as a credible maritime arbitration hub. The establishment of GIMAC at the GIFT City signifies not merely institutional innovation but a declaration of India's aspiration to play a leadership role in global maritime dispute resolution. If sustained through judicial restraint, institutional capacity, and international collaboration, India's maritime arbitration framework can indeed chart a new course—one where global waters converge upon Indian shores for justice, efficiency, and commercial integrity.

### **Rediscovering legacy to revive the maritime glory**

India's maritime heritage is not merely a relic of the past but a living legacy that continues to shape the subcontinent's role in global trade and geopolitics. From the earliest maritime trade routes to the rise of powerful dynasties, India's history is rich with stories of trade,

innovation, and cultural exchange. The sea provided an important conduit of mobility while sacred spaces where people travelling from various places met and interacted offered tangible evidence of our religious heritage both in West Asia and Southeast Asia. It is imperative that we continue to rediscover this legacy and ensure that the contributions of India's maritime past are given the recognition they deserve. The upcoming National Maritime Heritage Complex (NHMC), near Lothal (Gujarat), will serve as a crucial platform for educating future generations about the maritime legacy that lies at the heart of India's ancient civilization. It is essential that future narratives not only focus on the military and naval prowess of India during the reign of the Cholas or the Marathas but also recognize the power of maritime trade and cultural exchanges that India has long fostered. By revisiting the glorious maritime history, we can revive India's leading position in the modern maritime affairs propelling trade, connectivity and prosperity.





# Introduction

Prabir De

Global maritime trade continues to face uncertainties and volatilities. Several downsides continue to affect the maritime trade performance, and some of the notable ones are geopolitical tensions, unpredictability in trade and tariff, supply chain disruptions, rising export control and non-tariff measures, protracting effects of climate change, among others. In this critical juncture, India stands out with more presence in the world. Being the world's fourth-largest economy today, India's maritime trade is powered by expanding infrastructure, visionary reforms, and active global engagement. With 6 per cent plus annual growth, India remains the world's most dynamic big economy, and is going to be the third-biggest by 2028<sup>1</sup>.

The maritime sector forms a critical backbone of India's growth, supporting 95 per cent of India's trade by volume and 70 per cent by value. With a coastline of over 11,000 km, 12 major ports, more than 200 non-major ports, 14,500 km of navigable waterways, 111 National Waterways and strategic positioning in the Indian Ocean, India has become a maritime powerhouse. Over the last decade, transformative reforms under the *Sagarmala*, *Maritime India Vision 2030* (MIV 2030), and *Maritime Amrit Kaal Vision 2047* (MAKV 2047) have created an enabling environment for large-scale investments across port infrastructure, inland waterways, shipping, maritime logistics, and coastal tourism. India's maritime strides have been well-documented, which also offer inspiring lessons for the Global South<sup>2</sup>. In his recent address, Indian Union Minister of Ports, Shipping and Waterways said: "India sets course for sustainable maritime growth, eyes global leadership by 2047."<sup>3</sup> For a future to be imagined, eight distinct developments have contributed to India's maritime integration with the world, posing a test of India's capabilities and resilience.

## (i) Continuing buoyancy

India's ports have witnessed significant growth in trade in recent years. In post-pandemic, buoyancy in port cargo is continued due mainly to the forward looking reforms-induced development. Ports in India have handled

a massive 1.46 billion tonnes of international cargo in 2024-25 with a corresponding trade value of US\$ 1.6 trillion, the highest so far in the history of India. The value-volume ratio of trade clearly shows optimism and opportunities in the maritime sector. For example, India's rising maritime trade is mostly driven by foreign-flagged vessels. At an aggregate level, Indian-flagged vessels carried just 5.33 per cent of the country's trade in 2023-24. Business opportunities for Indian-flagged vessels are likely to grow heavily in view of India's 10,000 million tonnes of maritime trade by 2047, by when Indian economic size is forecasted to be US\$ 30 trillion<sup>4</sup>.

## **(ii) More Indian ports becoming global peers**

Indian ports have witnessed tectonic shifts in the last one and half decade. Today, as many as nine major ports of India have made entry into the global top 100 rankings in the latest edition of Container Port Performance Index (CPPI) for the year 2023. These nine ports are: Visakhapatnam (19), Mundra (27), Pipavav (41), Kamarajar (47), Cochin (63), Hazira (68), Krishnapatnam (71), Chennai (80) and Jawaharlal Nehru (96). There has been a significant improvement via operational efficiency and service delivery in the efficient handling of ships and cargo. Major ports have set several new records by exceeding cargo handling targets in the past. This achievement is an outcome of several initiatives in the past including the *Sagarmala* programme.

## **(iii) Going beyond just connectivity**

In a historic move, Indian Parliament has passed five key maritime acts, namely, Bills of Lading Act 2025, the Carriage of Goods by Sea Act 2025, the Coastal Shipping Act 2025, the Merchant Shipping Act 2025, and the Indian Ports Act 2025, reinforcing the foundation India's maritime sector, which has historical legacy and global identity. In particular, India's key maritime initiatives include expanding port

capacity, improving infrastructure, developing inland waterways, and promoting a sustainable blue economy. Some of the futuristic initiatives include<sup>5</sup> (i) setting up Maritime Development Fund (MDF) with a starting corpus of Rs.25,000 crore (US\$ 3 billion) for long-term financing for the maritime sector; (ii) promoting green shipping with development of green hydrogen hubs and designated zero-emission shipping routes, with targets to reach 60 per cent port energy from renewable by 2030; (iii) revitalizing shipbuilding and maritime ecosystem with a comprehensive package of Rs.69,725 crore (US\$ 8 billion).

## **(iv) Massive maritime investment opportunities**

India has articulated a US\$ 1 trillion maritime investment roadmap under the *MIV 2030* and *MAKV 2047*, underscoring its commitment to transforming the sector through large-scale investments in ports, shipbuilding, inland waterways, cruise tourism, and green shipping, while positioning itself as a competitive global maritime hub.

One of the most dynamic areas of investment is port infrastructure and modernization. India's major port capacity has increased to 1,629.86 million tonnes per annum in 2023-24, nearly doubling within a decade. Operational efficiency has improved considerably, marking a 48.6 per cent reduction, the average turnaround time at major ports reduced to 48.06 hours in 2023-24. These gains have been enabled by mechanized cargo handling, port digitalization, and private participation through Public-Private Partnerships (PPPs). Future investments are targeted at deep-draft berths, container terminals, smart ports, and greenfield port projects, with the *MIV 2030* projecting Rs. 1.25 lakh crore investment opportunities in the sector.

In parallel, inland waterways and coastal shipping are witnessing unprecedented growth. India has 111 notified National Waterways, of

which 29 are operational. Investments totaling Rs. 6,434 crore (US\$ 753.83 million) since 2014 have significantly enhanced infrastructure, increasing the operational length of National Waterways from 2,716 km to 4,894 km in 2024-25. Government schemes like “Jalvahak” (2024) provide 35 per cent cost reimbursement for cargo operators, creating strong incentives for private investment in terminals, jetties, multimodal logistics parks, and green vessels.

### **(v) Big opportunities in ship-building, ship-repairing and ship-recycling**

The ship-building, ship-repairing and ship-recycling sector represents another vital investment frontier. While India currently accounts for less than 1 per cent of the global ship repair market, its strategic location along major trade lanes position the country as a natural advantage to become a global ship repairing hub. The International Ship Repair Facility (ISRF) at Kochi, built at Rs. 970 crore, has already enhanced repair capacity by 25 per cent. On the recycling side, India is the largest global ship recycler, Alang in Gujarat being the greenest and safest ship-breaking hub, dismantling 30-35 per cent of ships recycled in a year, globally. India has extended a US\$ 8 billion package for revitalizing shipbuilding and maritime ecosystem.

### **(vi) Unlocking cruise tourism potential**

Cruise and coastal tourism have also emerged as high-potential segments. Passenger traffic in India’s cruise sector stood at 4.71 lakh in 2023-24 and is projected to cross 1 million by 2029 under the *Cruise Bharat Mission*. By 2030, cruise tourism is expected to generate Rs. 35,500 crore in revenue and create 2.5 lakh jobs. The government has earmarked Rs. 45,000 crore by 2047 for the cruise tourism sector, of which Rs. 35,000 crore for vessels and Rs. 10,000 crore for cruise terminals. Investments in modern cruise

terminals at Mumbai, Kochi, Chennai, Goa, and Visakhapatnam are underway, with potential for private operators to develop luxury vessels and dedicated coastal cruise circuits.

### **(vii) Green bunkering: New beginning**

Bunkering is another area where the FDI is permitted. India is developing its ports, particularly Kandla and VO Chidambaranar (VOC) Port, as bunkering hubs for the Singapore - Rotterdam route, focusing on alternative fuels like methanol and ammonia. Kandla is becoming a renewable methanol bunkering hub with existing infrastructure for trials and plans for a large e-methanol production plant. The VOC Port is developing a pilot facility for green methanol bunkering to support the domestic coastal green shipping corridor and the international route.

### **(viii) Green shipping and digitalization: Next move**

Looking ahead, green shipping and digitalization offer forward-looking investment avenues. The government targets 100 per cent green coastal and inland vessels within the next five years, with pilot hydrogen ferries planned. *Harit Sagar* guidelines aim for ports to source 60 per cent energy from renewable by 2030 and 90 per cent by 2047. This includes decarbonization initiatives, LNG and hydrogen-powered vessels, electrification of ports, and digital waterway management systems. The establishment of a US\$ 3 billion Maritime Development Fund and the creation of a dedicated maritime NBFC under *Sagarmala* provide strong financial frameworks for investment security.

## **Objectives and Structure of the Report**

In view of the above, the CMEC-RIS’s *India Maritime Report 2025-26* titled “Uniting Oceans, One Maritime Vision: India’s Maritime

Strides” aims to present insightful opportunities in the maritime domain. Our goal in this Report is to provide information on the implications of – and options offered by – the Indian and international organizations, specially the maritime organizations that seek to use the maritime sector as a vehicle for development and connectivity. All the more reasons to think ahead and reflect on how inefficient ports and shipping harm the economy and connectivity.

The Report is structured in a total 10 segments: starting with the Maritime Heritage, the Report then discusses Maritime Trade, Investment and Finance; Building Resilient Maritime Corridors; Towards a Green Future; Technological Leap in Shipping; Transforming Blue Economy; Cruise Tourism Opportunities; Human Capital and Skilling; Maritime Security and Cooperation; and finally Policy Dynamics for a *Viksit* Maritime Sector. A total of 32 freshly written articles by eminent industry experts and scholars capture this emerging spectrum of India’s maritime strides in this Report.

India has been aiming for US\$ 2 trillion exports by 2030. The resilience of global maritime trade will depend on coordinated investments in digital logistics systems, port modernization, and geopolitical risk management – areas where India’s maritime policy reforms now play a pivotal role. In a turbulent time when the global uncertainties are looming large, domestic reforms aiming to improve efficiency and productivity of ports, skilling and human

resources development, adoption of advanced technologies like automation and Artificial Intelligence (AI), compliance to global security, etc. will help strengthen the maritime sector. We discuss some of these issues in-depth in this Report while presenting the next move for the Indian maritime sector.

The findings of this Report will help us to better understand the gains of a united world with one maritime vision. India today stands at an extraordinary moment: a substantial but a real chance at a new beginning.

This is the essence of “One Ocean, One Maritime Vision”, a vision where the seas remain open, sustainable, and inclusive, echoing the timeless principle of *Mare Liberum* and the forward-looking philosophy of MAHASAGAR.

## Endnotes

- <sup>1</sup> India’s GDP is projected to reach US\$ 5 trillion by 2027 and US\$ 7.3 trillion by 2030. See, IMF’s forecast in World Economic Outlook, refer, <https://www.imf.org/en/Publications/WEO/Issues/2025/10/14/world-economic-outlook-october-2025>
- <sup>2</sup> Read, Chapter 24 of this Report
- <sup>3</sup> Refer, <https://www.pib.gov.in/PressReleaseDetailm.aspx?PRID=2167305>
- <sup>4</sup> Refer, Viksit Bharat Vision Paper, NITI Aayog, New Delhi
- <sup>5</sup> Refer, <https://www.pib.gov.in/PressReleasePage.aspx?PRID=2170573>



# Uniting Oceans: Maritime India Vision 2030 and Maritime Amrit Kaal Vision 2047

Sanjeev Ranjan

*"History is witness to the fact that whenever Bharat's maritime capability has been strong, the country and the world have benefited greatly from it."*

Hon'ble Prime Minister Narendra Modi at the Maritime Global India Summit 2023

India's maritime heritage exemplifies the principle of open seas (*Mare Liberum*), manifesting in inclusive trade networks. From the Indus Valley Civilization's Lothal dockyard (c. 2400 BCE) to the Chola's expeditions (11th century CE), Indian traditions considered oceans as cultural domains for mutual prosperity. India's open sea traditions counter exclusivist tendencies of colonial

powers. This ethos has been revitalized through visions such as the *Maritime India Vision 2030* and *Maritime Amrit Kaal Vision 2047*.

Archaeological and textual evidence attests to India's early embrace of open seas. The Indus Valley Civilization (c. 3300–1300 BCE) pioneered maritime activities, with Lothal's dockyard (c. 2400 BCE) representing the world's earliest known tidal dock, facilitating trade with Mesopotamia and the Persian Gulf (Rao, 1985). Seals depicting sailing vessels indicate bidirectional commerce, underscoring a non-exclusivist approach. These excavations reveal a sophisticated understanding of monsoon winds for navigation, fostering a shared maritime domain across the Arabian Sea.

The Sangam literature (c. 300 BCE–300 CE) documents thriving ports like Muziris, central to Indo-Roman trade as detailed in the *Periplus Maris Erythraei* (1st century CE). Roman coins and amphorae unearthed at Arikamedu affirm exchanges of spices, textiles, and pearls,

facilitated by open access to sea routes (Cobb, 2015). This shows a cosmopolitan ethos, integrating diverse cultures.

This inclusive approach was in contrast with colonial powers *Mare Clausum* doctrines, commencing with the Portuguese in 1498 (Anand, 1983). Resistance from rulers like the Zamorin of Calicut underscored cultural dissonance, as colonial powers prioritized territorial control over common access to the seas (Pearson, 1987). From ancient inclusive networks to contemporary visions, India's maritime tradition affirms oceans as shared spaces. The *MIV 2030* and *MAKV 2047* carry forward this legacy of open seas, advocating a UNCLOS-centric order that ensures equitable access and sustainability.

India's maritime sector is pivotal to its economic growth, handling over 95 per cent of international trade by volume and contributing significantly to the Indian economy. The *MIV 2030* and *MAKV 2047* represent a continuum of

**Figure 1: Maritime India Vision 2030**



Source: Ministry of Ports, Shipping and Waterways

the open seas tradition, transforming India from a regional player into a global maritime player. Launched by the Ministry of Ports, Shipping and Waterways (MoPSW), the *MIV 2030* provides a decade-long blueprint for immediate reforms, while the *MAKV* extends this horizon to 2047, the centenary of India's independence, aligning with the "Amrit Kaal" era of self-reliance and sustainable development. Together, they outline over 450 initiatives, with investments exceeding INR 80 lakh crore, focusing on infrastructure, logistics, sustainability, and innovation.

## Maritime India Vision 2030: Building Foundations for Global Competitiveness

Unveiled in March 2021, the *MIV 2030* is a comprehensive 10-year plan to elevate India's maritime ecosystem through 150+ targeted initiatives across ports, shipping, and inland

waterways. It addresses inefficiencies in port operations, logistics costs (currently 14 per cent of GDP, higher than global averages), and shipbuilding, aiming to rank India among the top 10 global shipbuilding nations by 2030.

The *MIV 2030* is structured around interconnected pillars, emphasizing port-led industrialization and digital integration (Table 1).

After *MIV 2030* was launched, India's maritime ecosystem has become integrated, modern, digital, green, and globally connected, forming the backbone for Viksit Bharat's trade-led growth and reinforcing the principle of open and cooperative seas (*Mare Liberum*).

The *MIV 2030* has created the structural and operational base for India's maritime transformation, the first essential step in uniting oceans through connectivity, efficiency, and cooperation and aimed to develop deep-draft

**Table 1: MIV 2030 Key Initiatives**

| Pillar                                   | Key Initiatives and Targets                                                                                                                      |
|------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Best-in-Class Port Infrastructure</b> | Modernize 12 major ports; develop greenfield ports like VadHAVAN; increase capacity to 3,000 million tonnes per annum (MTPA) by 2030.            |
| <b>End-to-End Logistics Efficiency</b>   | Reduce turnaround time to 0.5 days; integrate multimodal logistics via Gati Shakti; promote coastal shipping to cut road freight by 20 per cent. |
| <b>Technology-Driven Logistics</b>       | Deploy AI, blockchain, and IoT for real-time tracking; establish National Logistics Portal for seamless data sharing.                            |
| <b>Port-Led Industrialization</b>        | Create multi-modal logistics parks; attract INR5 lakh crore in investments for port-linked clusters.                                             |
| <b>Sustainable and Green Shipping</b>    | Transition to LNG and green fuels; achieve 30 per cent renewable energy in ports; enforce IMO-compliant emission standards.                      |
| <b>Maritime Clusters</b>                 | Develop integrated hubs for ship repair, fisheries, and tourism in coastal states.                                                               |
| <b>Shipbuilding and Repair</b>           | Boost capacity to 5 per cent of global market share; incentivize private yards with tax breaks.                                                  |
| <b>Inland Waterways</b>                  | Operationalize 111 National Waterways; increase cargo volume to 25 per cent of inland traffic.                                                   |
| <b>Skilling and Employment</b>           | Train 1 million maritime professionals; establish Maritime Training Institutes.                                                                  |
| <b>Ease of Doing Business</b>            | Single-window clearances; reduce compliance time by 50 per cent via digital reforms.                                                             |

Source: Author's own

transshipment hubs at Vizhinjam, Galathea Bay and Vadhavan. It has promoted multimodal connectivity approach of Gati Shakti National Master Plan, linking ports by rail, road, and waterways with the hinterland. Integrating customs, shipping and logistics stakeholders digitally and harmonisation of protocols achieved by the MIV create templates for cross-border interoperability, a key component of global maritime unity. Adoption of Harit Sagar Guidelines, shore power pilots, and LNG/e-methanol bunkering showed developing nations that economic growth and environmental sustainability are compatible goals, essential for a shared global maritime future.

The *MIV 2030* has strengthened the vision of SAGAR (Security and Growth for All in the Region), promoting cooperative maritime domain awareness and humanitarian aid across the Indian Ocean. This laid the groundwork for India's "open seas, shared security" principle, the essence of the *Mare Liberum* philosophy. The *MIV 2030* has transformed India from a reactive maritime economy into a regional hub and responsible stakeholder to work toward common maritime goals.

When the *MIV 2030* was launched in 2021, it was designed as a decadal roadmap, to modernize ports, strengthen shipping, and enhance logistics efficiency. However, within two years of launch of the *MIV 2030*, India entered the Amrit Kaal period, the 25-year journey from the 75<sup>th</sup> anniversary of Independence (2022) to the 100<sup>th</sup> (2047), and then the Government of India launched multiple long-horizon frameworks like National Infrastructure Pipeline (NIP), PM Gati Shakti Master Plan, National Logistics Policy (NLP) and *Viksit Bharat 2047* Vision.

## Maritime Amrit Kaal Vision: Scaling to Global Leadership

Building directly on *MIV 2030*, the MAKV, launched in 2023 envisions a "Viksit Bharat" by

2047, with the maritime sector as a cornerstone of the Indian economy, projected to generate US\$ 100 billion in annual revenue. It expands to over 300 actionable points, emphasizing long-term sustainability, innovation, and geopolitical influence, with INR 80 lakh crore investment pipeline with focus on (Figure 2):

**Port Expansion and Modernization:** Develop 6-10 world-class mega-ports and 6 new international cruise terminals to handle 1,000+ vessels annually, boosting tourism and positioning India as a global cruise hub. Targets include 5,500 MTPA capacity and automated, green ports compliant with net-zero goals by 2047.

**Blue Economy and Sustainability:** Promote ocean-based industries like deep-sea mining, aquaculture, and renewable energy (e.g. offshore wind farms).

**Shipping and Logistics Revolution:** Aim for 10 per cent global ship ownership (from <1 per cent today); enhance inland waterways to carry 40 per cent of freight; integrate with global supply chains via corridors like IMEC (India-Middle East-Europe Economic Corridor).

**Innovation and Human Capital:** Invest in R&D for autonomous vessels and navigation; scale skilling to 5 million jobs, with focus on women and coastal communities.

**Global Integration:** Strengthen maritime diplomacy through SAGAR (Security and Growth for All in the Region) doctrine.

The MAKV envisions net-zero ports by 2047, full transition to green fuels, and circular ship recycling (Alang, compliant with the Hong Kong Convention). This environmental leadership model encourages collective responsibility for sustainable seas, central to Uniting Oceans. The MAKV encourages regional collaboration for marine biodiversity and livelihood protection. India shares its expertise with island and coastal nations, ensuring that growth is inclusive and cooperative, not competitive and transforms

India's maritime vision into a global cooperative doctrine, harmonising sustainability, trade, and security across oceans.

Illustrated in Table 2, the MAKV aims to strengthen PM Modi's vision of MAHASAGAR (Mutual and Holistic Advancement for Security and Growth Across Regions). It emphasises global leadership, sustainability and oceanic cooperation. The MAKV ensures that India's maritime sector evolves from being a facilitator of trade to a driver of national prosperity,

regional stability, and global maritime freedom.

*Maritime Amrit Kaal Vision* has extended MIV's framework into the Amrit Kaal era, aligning maritime development with India's *Viksit Bharat 2047* vision. The MAKV globalises India's maritime vision, linking national progress to the collective stewardship of the oceans, integrates India's maritime roadmap with regional and intercontinental corridors like the IMEC (India–Middle East–Europe Corridor), BIMSTEC Maritime Cooperation

**Figure 2: Initiatives for Blue Economy Vision 2047**



Source: Ministry of Ports, Shipping and Waterways

**Table 2: MAKV Initiatives**

| MAHASAGAR Pillar | MAKV Initiative                                                                       |
|------------------|---------------------------------------------------------------------------------------|
| Security         | Strengthening maritime domain awareness, Naval–Civil cooperation, and safe sea lanes. |
| Growth           | Expanding port-led industrialisation, shipbuilding clusters, and Blue economy.        |
| Sustainability   | Implementing HaritSagar Guidelines, green fuels, circular ship recycling.             |
| Cooperation      | Building global maritime partnerships through IMEC, SAGAR, BIMSTEC and IORA.          |

Source: Author's own

**Table 3: MIV and MAKV Interlinkages**

| Dimension                  | MIV 2030                                         | MAKV 2047                                                                                               | Uniting Oceans                                      |
|----------------------------|--------------------------------------------------|---------------------------------------------------------------------------------------------------------|-----------------------------------------------------|
| <b>Connectivity</b>        | Integrated Indian port-rail-road-IWT systems.    | Integration and Harmonisation of protocols to operationalise IMEC and International Economic Corridors. | Seamless maritime connectivity across regions.      |
| <b>Digital Integration</b> | NLP (Marine) and Maritime single-window systems. | Global harmonisation of e-BL, customs and logistics data.                                               | Promotes interoperable, transparent maritime trade. |
| <b>Sustainability</b>      | HaritSagar Guidelines, LNG pilots.               | Net-zero ports, green fuel transition.                                                                  | Common environmental norms for ocean governance.    |
| <b>Security</b>            | SAGAR doctrine, IFC-IOR domain awareness.        | MAHASAGAR cooperative maritime security.                                                                | Shared safety, trust, and stability in open seas.   |
| <b>Blue Economy</b>        | Coastal community projects, ship recycling.      | Regional R&D and marine resource cooperation.                                                           | Shared prosperity through blue growth.              |

Source: Author's own

Agreement, and promotes harmonised logistics standards, digital documentation, and port protocols to ensure seamless trade across the economic corridors.

Oceans carry over 90 per cent of global trade and serve as shared lifelines for the global economy, but face shared challenges like piracy, pollution, overfishing, climate change and regional disputes. Recognising this, India's maritime policy has evolved from a domestic port-development focus (Sagarmala) to a global cooperative framework (MAHASAGAR), anchored in the *MIV 2030* and *MAKV 2047*. The *MIV 2030* and *MAKV 2047* contribute to making Oceans as Connectors and Not Dividers. Both the visions together form India's bridge between internal strength and external cooperation, enabling the idea of "Uniting Oceans, One Maritime Vision."

These visions, rooted in India's SAGAR and MAHASAGAR doctrines, position India as a central player in fostering economic

prosperity, regional security, sustainability, and cooperative governance in the Indo-Pacific. These initiatives align with the region's strategic and economic dynamics, addressing shared challenges and leveraging opportunities in the Indian Ocean region that accounts for 60 per cent of global GDP and 50 per cent of maritime trade. *MIV 2030* and *MAKV 2047* are critical for the Indo-Pacific. By enhancing maritime security, trade connectivity, green practices, and regional cooperation, they position India as a foundation for a free, open, and resilient Indo-Pacific, aligning with UNCLOS and fostering a unified maritime future.

### **MIV 2030 and MAKV Uniting Oceans**

Together, *MIV 2030* and *MAKV 2047* aim to Uniting Oceans on the by promoting global connectivity, digital integration, sustainability, blue economy and security (Table 3).

## MIV 2030 and MAKV 2047: “One Ocean, One Maritime Vision”

The *MIV 2030* and *MAKV 2047* foster a holistic, interconnected approach to maritime governance that aligns with the concept of “One Ocean, One Maritime Vision”. This concept emphasizes the oceans as a unified, shared global commons, where interconnected ecosystems, trade routes, and security dynamics require collaborative management for sustainability, prosperity, and peace. Rooted in India’s *SAGAR* and *MAHASAGAR* doctrines, these visions promote the “One Ocean” concept by integrating economic development, environmental stewardship, security cooperation, and regional connectivity.

*MIV 2030* and *MAKV 2047* promote the “One Ocean and One Maritime Vision” concept by fostering interconnected trade (e.g. IMEC, INSTC), sustainable practices (e.g. green ports), and collaborative security (e.g. IFC-IOR), aligning with *MAHASAGAR*’s vision of mutual growth. By embedding UNCLOS principles and countering exclusivist policies, they ensure the oceans remain a unified, shared resource, and contributing to global prosperity. India’s leadership in these efforts positions it as a steward of the global maritime commons, uniting oceans for a sustainable and inclusive future.

India’s maritime transformation through the *MIV 2030* and *MAKV 2047* demonstrates building domestic capability to promote international cooperation. India has evolved from being a maritime nation to becoming a maritime partner, one that leads by example, offering digital models, sustainability frameworks, and cooperative security initiatives. India upholds the principles of *Mare Liberum* in both spirit and practice by promoting cooperative domain awareness, interoperable digital trade corridors, green corridors and support for developing nations’ maritime capacity via training and technology sharing.

Together, they make India the fulcrum of a global maritime partnership, bridging the Indian Ocean, Indo-Pacific, and the wider world. Through these frameworks, India is not just uniting its own coasts, it is uniting oceans, building trust, connectivity, and shared prosperity across regions.

This is the essence of “One Ocean, One Maritime Vision”, a vision where the seas remain open, sustainable, and inclusive, echoing the timeless principle of *Mare Liberum* and the forward-looking philosophy of *MAHASAGAR*.

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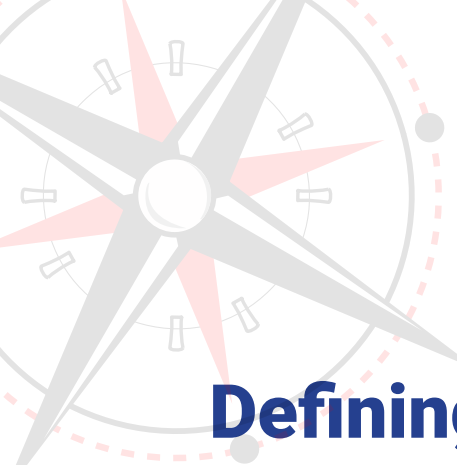
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# **Part I**

# **Maritime Heritage**





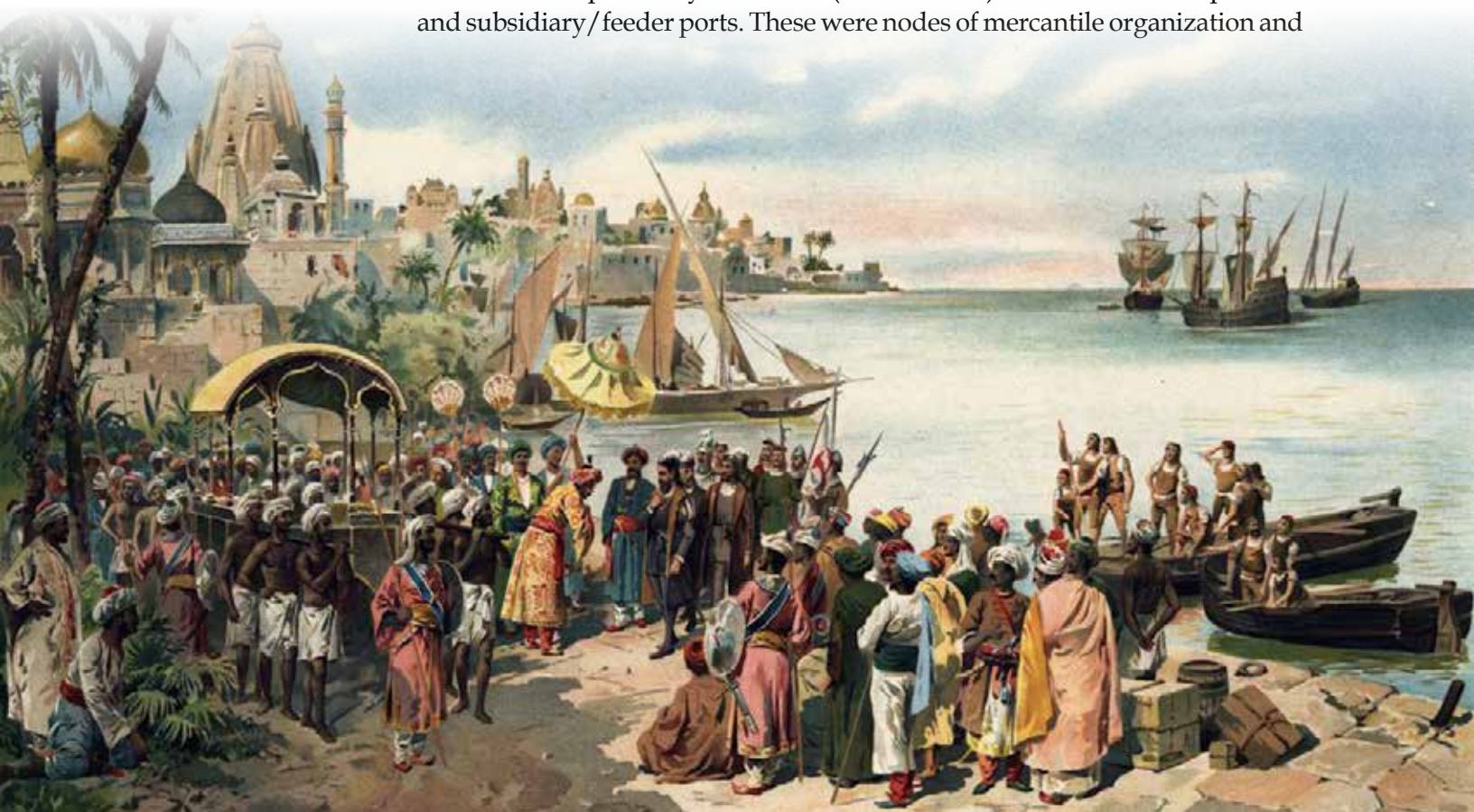


# Defining Maritime Heritage: Identifying Tangible and Intangible Exemplars from Early India (1st Century CE to 13th Century CE)

Suchandra Ghosh

## Prologue

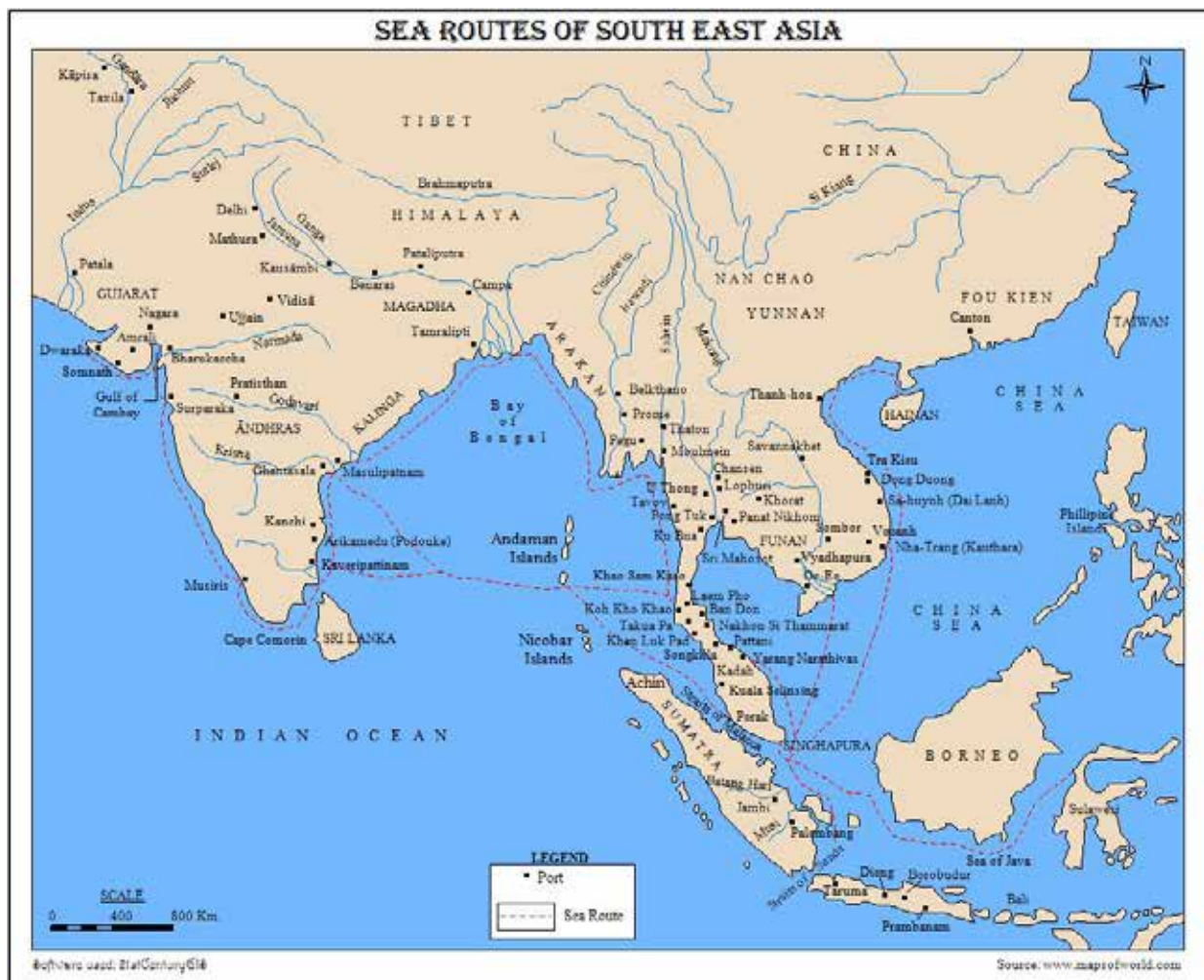
The Indian subcontinent bounded on three sides by seas, along with the island of Sri Lanka stands at the very centre of the Indian Ocean, which encompasses about twenty percent of the total maritime space of this planet. The subcontinent is also endowed with two distinct coastlines, dotted with ports which were like ‘gems in the necklace of the coasts’ according to Michael Pearson (Pearson, 2015: XIII-XX) and ‘brides of the sea’ as Frank Broeze would poetically underline (Broeze, 1989). There were both premier and subsidiary/feeder ports. These were nodes of mercantile organization and



hubs through which connections were fostered. The lineage of seafaring in the Indian Ocean goes back at least to the third millennium BCE during the days of the Harappan civilization (c. 2600-1800 BCE), as evident from the portrayal of the sailing craft on Harappan seals and other related artifacts along with the presence of a port town like Lothal in Gujarat (Map 1). Ancient Indian literary texts were clearly aware of the sea (*samudra*, *sagara*, *jaladhi*, etc., in Sanskrit, and *samudda* in Pali) that washed the three sides of the vast landmass of the subcontinent. But these texts merely speak of the eastern (*purva/prak*) and the western (*paschima/apara*) sea without any further designations (Chakravarti, 2012: 57).

A few of the Jātakas narrate sea voyages and ship wrecks. In the Buddhist sources we have references to Avalokiteśvara and Tārā who are said to be saviours from any impending danger related to sea voyages. The textual sources are complemented by visuals of these two deities in the form of Astamahābhaya Avalokiteśvara and Tārā (Figure 1 and Figure 2) (Ghosh, 2020: 125-133). Thus, a strong maritime heritage of the subcontinent is undeniable and one cannot but agree that Indians were not averse to taking high sea voyages even at the cost of being ostracized by the society following the dictums of the *Dharmaśāstras*.

### Map 1: Ancient Sea Routes of Southeast Asia

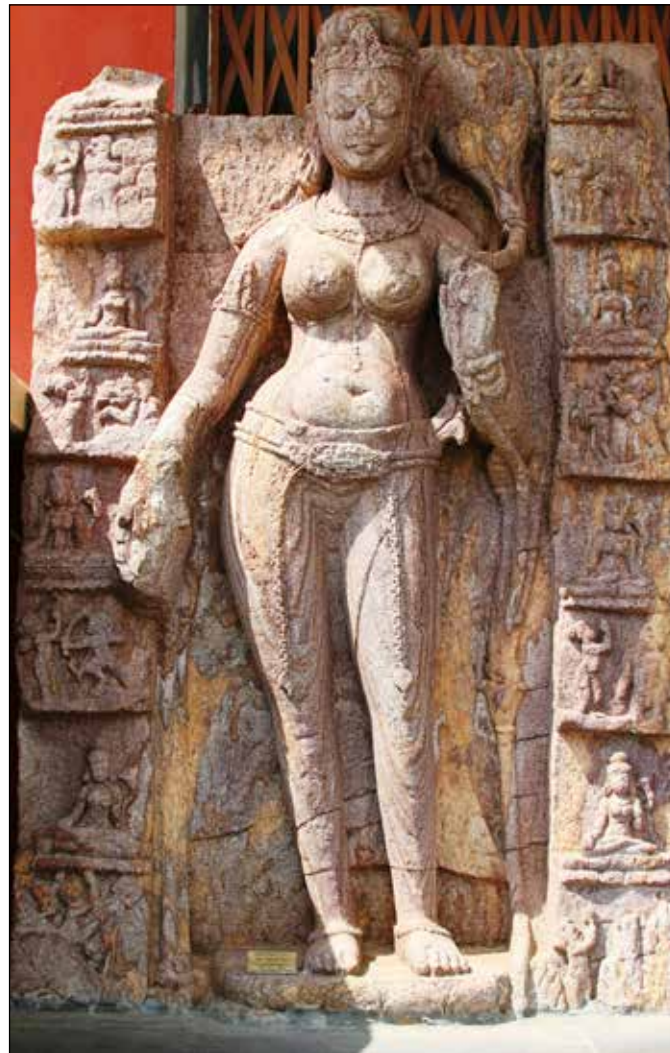


Source: Author's own.

What could be the major constituents of maritime heritage is a question to ponder upon. Traditional maritime skills and knowledge passed down through generations, Hindu-Buddhist monuments and artefacts which made their way across the seas through a complex process of reception and transmission (Dhar, 2023: 3-22), intangible cultural practices along with the art of writing disseminated through the eastern Indian Ocean, the maritime communities and the inimitable ship building tradition indubitably formed the key components of maritime heritage. In this essay, in order

to foreground the maritime heritage of the subcontinent, the temporal frame chosen is from first century CE to thirteenth century CE. To understand 'India's Maritime Strides', the first century could be a perfect entry point as both field archaeological, visual and textual sources offer us a myriad of evidences related to maritime ventures of the people of the subcontinent which continued for the succeeding periods. The sustained seafaring in the Indian Ocean was largely shaped by the monsoon wind system. It is important to highlight the immense possibilities of cultural

**Figure 1: Astamahābhaya Tārā from Ratnagiri, Ratnagiri site Museum**



*Source:* Author's own.

transactions among communities along with exchanges of commercial commodities, which are seen not simply as economic needs, but as socio- cultural and ritual requirements. The present essay wishes to underscore a few aspects of cultural transactions through the lens of tangible and intangible heritage of India both in the context of western and eastern Indian Ocean.

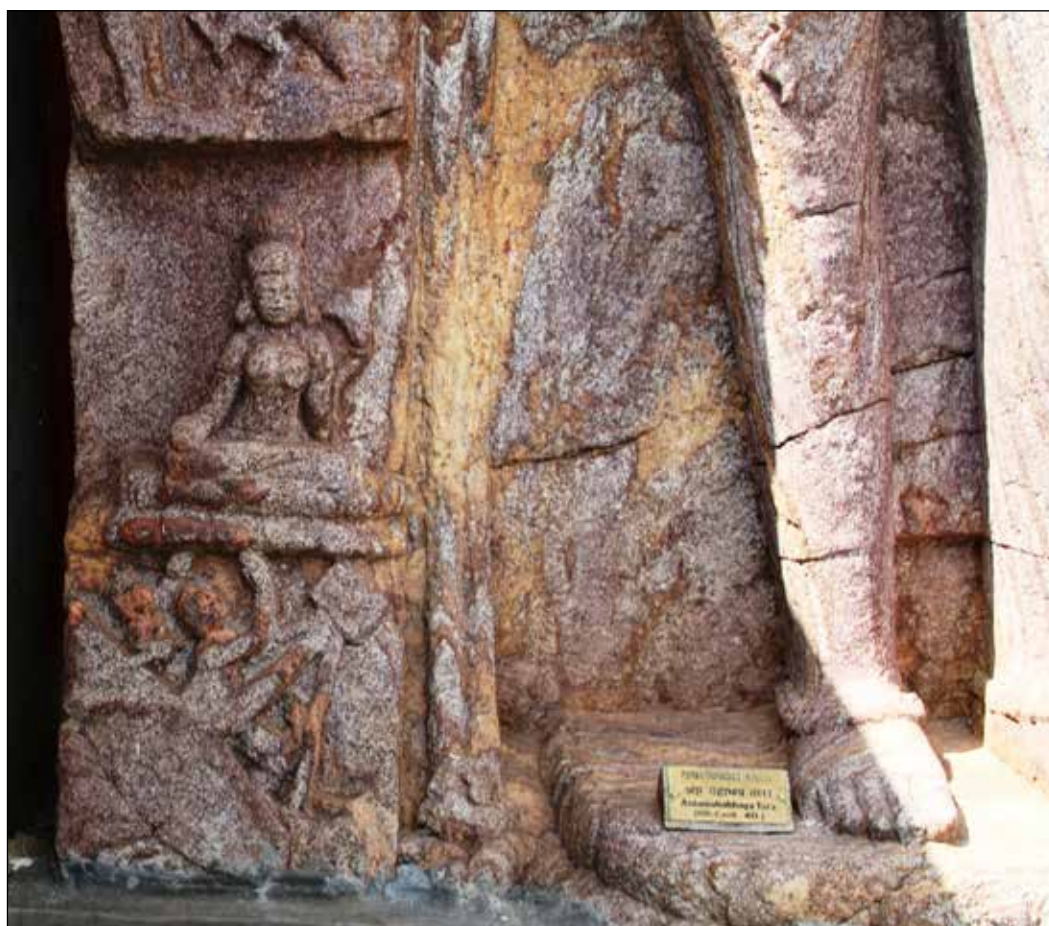
## Bay of Bengal Interaction Sphere<sup>1</sup>

### Sailing to Suvarṇabhūmi : Ship-wrecks and Saviours

I initiate the discussion with the Bay of Bengal Interaction Sphere (Gupta, 2005:21-30) which

includes the eastern sea board of the Indian subcontinent and Sri Lanka on its western side and Myanmar, coastal Thailand, coastal Malayasia and Indonesian island of Sumatra on its eastern side. The region witnessed brisk maritime contacts – commercial and cultural since early centuries CE which is well attested by field archaeological, textual and epigraphic sources. Integral to ports are sailors or mariners and we have reference to sailors and sailings across the Bay of Bengal to the land of Suvarṇabhūmi <sup>2</sup> (mainland Southeast Asia) and Suvarṇadvīpa (Maritime Southeast Asia) in our Jātaka stories (Cowell, 2001). Here one can cite at least three Jātaka stories, the *Surpāraka*, the *Mahājanaka* and the *Sarikha Jātaka* which

**Figure 2: Close View of the Shipwreck Scene of the Tārā Image from Ratnagiri, Ratnagiri Site Museum**



Source: Author's own.

evoke an understanding of Suvarṇabhūmi as a land of riches and hence the chief actors of the narratives were travelling there for amassing wealth. Incidentally the *Surpāraka* and the *Mahājanaka Jātakas* gain huge popularity in Southeast Asia and particular episodes from the stories find their way in sculptures and later mural paintings. The *Suppāraka Jātaka* (no. 463) tells us that the Bodhisattva was born in the family of a master mariner and was named *Suppāraka Kumāra*. He was the captain of a ship bound for Suvarṇabhūmi and returned safely with the merchants and merchandise to the home port of Bharukaccha (modern Broach in Gujarat) (Cowell, 2001:86-87). This journey of *Suppāraka Kumāra* finds a place in a sculpture from Chedi Nakhon Pathom in Thailand.

In the *Mahājanaka Jātaka* (no.539), Mahājanaka, the son of a banished king of Videha, embarked on a ship with some merchants bound for Suvarṇabhūmi. There were seven caravans on board with their beasts and after seven days of plunging through the heavy seas at top speed, the overloaded ship began to sink. Mahājanaka was able to throw himself a far distance from the ship, thus escaping the fate of the other passengers. The goddess Maṇi-mekhalā saw him and recognized that he was not an ordinary mortal. She took him in her arms and flew with him in the kingdom of Mithila, where he was made the king. Though the name of the port is not mentioned, it is possible that it could be Tāmralipta (somewhere near Tamluk) which was the only port in the eastern seaboard which had easy access to Mithila (in Bihar). It is apparent from the Jātakas that the two ports Bharukaccha in the west coast and Tāmralipta in the east coast were the points of departure for ships to Suvannabhumi. The popularity of these Jātaka stories is reflected in Thai mural and manuscript paintings of the particular episode of Prince Mahājanaka being rescued by Manimekhalā. In the Wat Kongkaram, Ratchaburi spectacular paintings of the episode are seen in the decoration of the stupa interior. At the British library (Or 14559), paper folding

books with finest illustration of the ten-birth tales of Buddha, Mahājanaka being the last are found. Another painting, on cloth, of the Mahājanaka Jātaka is at the Walters Art Museum, Baltimore (Figure 3). Again, Khmer traditional mural painting depicts prince Mahājanaka rescued by Manimekhalā in Dharma hall, wat Botum Wattey, Reacheveraram, Phnom Penh, Cambodia. Being far removed from the time and space when the Jātaka stories were written, circulated and represented through different mediums of artistic expression in South Asia, regions of Southeast Asia continued with vigour the translation of Jātaka episodes in various forms of art. In Southeast Asia, the episodes relating to shipwreck and the rescue by Manimekhalā gains primacy. In the world view of regions of Southeast Asia, the role played by Manimekhalā was that part of the narrative which was linked with journey to Suvarṇabhūmi traversing the sea. Circulation of the narrative got translated in the mural and manuscript paintings albeit much later. The examples underscore the cultural dynamics of reception in the Bay of Bengal World. Thus, a Jātaka story when received and reproduced in a sculpture or in a mural painting of a temple in Southeast Asia becomes evidence of dissemination of that story. The intangible heritage is transformed into a tangible heritage.

### Script and Language: Sanskrit and Brāhmi Cosmopolis

In the arena of cultural dialogue, along with art and religion, scripts and languages form a significant area where we have a visible manifestation of interactions (Ghosh, 2024: 6-20). We know that from the fourth century onwards, inscriptions written in Sanskrit began to appear in increasing frequency in the places now known as Myanmar, Thailand, Cambodia, Vietnam, Indonesia and Malayasia. With Sanskrit we have Pāli and a few Prakrit records too. Palaeography is entwined with epigraphy and in case of these records, it is the Brāhmī script and its derivatives that were embraced

**Figure 3: Representation of the Mahajanaka Jātaka, Walters Art Museum**

*Source:* Gift of Mr James E, Bogle, 2010, courtesy :Wikimedia Commons.

over a vast area. Brāhmī evolved into numerous varieties, which eventually became the modern scripts of Bali, Cambodia, Myanmar, and Thailand, among others.

Sanskrit continued to be the most preferred language for inscribed records in most of the regions in Southeast Asia except for central Burma. It is interesting to note how people from diverse ethnic background in Southeast Asia started adopting a new language that became a part of their new political culture. This occurred among Mon speakers in the Chao Phraya Valley, Khmer speakers of the

middle and lower Mekong and the speakers of Cham in central coastal Vietnam. This is a remarkable development keeping in mind that this happened without the enforcement of military power or the pressure of any imperial administrative or legal apparatus. It was perhaps the result of continuous movement of intellectuals between both the regions through the maritime routes. Thus, we find that in case of Khmer or in Java, Sanskrit was used as a mode of political culture and it was exclusively the cosmopolitan language of elite self-presentation (Pollock, 2006). Apart from the Sanskriti, Pāli

and Prakrit inscriptions, some important records written in Tamil language and script have been found in Southeast Asia, mainly in Sumatra and peninsular Thailand. The presence of Tamil inscriptions indicates direct trade relations between Coromondal coast and certain parts of Southeast Asia and the residence of Tamil speaking Indians in those regions. These inscriptions, dating from the mid ninth to late thirteenth centuries, written on stone wholly or partly in Tamil language and using Tamil script, have so far come to light from Myanmar, peninsular Thailand, Sumatra and on the central coast of China (Karashima, 2002).

### Maritime Communities: An Integral Part of Maritime Heritage

The two long coastlines of the Indian subcontinent dotted with numerous ports both in the west and in the east have allowed mariners to forge linkages with regions to the west and the east, traversing the Arabian Sea and the Bay of Bengal. For these voyages, knowledge of the routes is indispensable. Hence along with the mariner, presence of a navigator was crucial in those long-distance voyages. As they needed to know the sea intimately, knowledge about the sea and coast emanated from the activities of these maritime/coastal communities. This knowledge was handed down orally across generations alongside traditional practices. *Nāvikas/Mahānāvikas* as boatmen or master mariners are largely present in the epigraphic records pertaining to the east coast in particular. In case of the navigators, known as *niryāmakas*, the sources are incongruent, stretching across time and place, yet they provide us with some understanding of their role in sea faring. At a time when there were no maps, no nautical charts, navigators oriented themselves by relying on the direction of the winds and on the positions of the sun and stars. This was their knowledge and wisdom, a knowledge gained from lived experiences. How to follow a star or how to master the movement of a wind is a knowledge amassed by long term engagement

with the sea which is only possible for a mariner and a navigator (Ghosh, 2022:103-108). Epigraphic references to *mahānāvikas* (master mariners) in the eastern sea board imply their travel across the eastern Indian Ocean from the first century BCE/CE till at least the tenth century CE (Ghosh and Pramanik, 2019:150-169). A recent golden seal discovered at Bang Kluai Nok in the western coast of Peninsular Thailand has an inscription which reads *brahaspatisarmasanavikasa* meaning ‘of the sailor Brahmaspatisarma’ dated to the early centuries of the common era (Bellina et al., 2014: 84). This would indicate the presence of a Brahmana master mariner in Peninsular Thailand from the subcontinent. Through the agency of these mariners and navigators, traditional knowledge of sailing and ship building could have been shared across the Ocean.

This brings us to the knowledge and ways of ship building. Shipbuilders or the shipbuilding communities were one of the prominent littoral communities across the Indian Ocean regions. The sea going crafts were made of wooden planks which were tied together by coconut coir which gave the impression to have been stitched or sewn without the use of iron nails. Both the raw materials for “traditional” shipbuilding were/are abundantly available in the subcontinent, especially in its coastal tracts. The subcontinent has a special position in the history of shipbuilding technologies in the Indian Ocean prior to the introduction of steam navigation (Chakravarti, 2020:26-27). An eighth century shipwreck in the Gulf of Siam may be recalled here. It was recovered from a place called Phanom Surin near Bangkok (Guy, 2017: 179-196). The major identifier of this ship as an Indian ocean vessel was its construction with wooden planks which were tied together with coconut coir. Actual coconut coir was recovered, which is generally known from written sources. This ship was perhaps plying from the western Indian Ocean to Southeast Asia. As indicated by the Jātaka stories narrated above and the references to Avalokiteśvara and Tārā as

protectors from sea voyages, it is evident that ship wrecks were common in the Indian Ocean world. Hence, we have small rounded clay tablets with images of Avalokiteśvara (Figure 4) and Tārā, being used probably by monks and merchants as amulets to ward off danger in high sea voyages (Ghosh, 2023a: 23-34).

### Shifting Gaze: Case of Barygaza/ Bharukaccha in Gujarat

The western Indian Ocean extends to the east African coast in the west, and embraces the Arabian Sea, the Persian Gulf, and the Red Sea. The ports of Gujarat played a vital role with its long coastline (1600 km long) in all the periods of history. Backed with numerous safe harbours

and accessible ports, as well as a vast and richly endowed hinterland, Gujarat was absolutely central to the history of Indian Ocean maritime exchange involving not only goods, but also people and ideas. For the north Indian plains, Gujarat is the only opening to the sea from the western side. The important ports were Broach (Barygaza/Bharukaccha), Cambay, Diu and Surat among many others in different periods which reflect Gujarat's long engagement with the Sea. Among these ports the port of Broach has the longest history of all the ports in the west coast of India. The most elaborate account of the port comes from the *Periplus Maris Erythraei*, an anonymous seafarer's manual which gives a detailed account of the sea route from the Red

**Figure 4: A Tablet with Four-armed Seated Bejewelled Avalokiteśvara from Tham Khao Kao (Peninsular Thailand), Housed in Nakhon Si Thammarat Museum**



Source: Author's own.

Sea up to the Indian subcontinent. (Casson, 1989). In the Indian context, we can think of the *Suppāraka Jātaka* (no. 463), one of many early Pali parables, recounting previous incarnations of the Buddha, as a ready companion to the *Periplus Maris Erythraei* with respect to Barygaza (Cowell 2001: vol. 4, pp. 86-7). The text also presents a seascape full of commodities, albeit through an epistemic frame distinct from those of Greco-Roman geography. Each of the *saptasamudras*, or “seven seas” of Indian cosmography, brim with precious metals, pearls, and gemstones, the material riches so desired throughout the wider Indian Ocean world. In some ways, the Pali fable more fully demonstrates the complexities of movement throughout the ancient Indian Ocean world.

The premier foreland of Barygaza was the site of Berenike which was developed as a strategic harbour by Ptolemy II in 275 BCE (Sidebotham, 2011). Along with Berenike was the rival entrepot of Myos Hormos (Quseir al-Qadim), which was however 300 KM north of Berenike and closer to the Nile which would be easier for transshipment (Peacock and Blue, 2011). In addition to mercantile connections, reflections of our cultural heritage have been unearthed in recent excavations from Berenike, particularly in the religious sphere. Several items relating to forms of worship have been discovered: a plaque depicting what appear to be Brahmanical deities; a votive head and torso in the guise of the Buddha; and a much larger marble image of the Buddha with links to north Indian, Greco-Roman, and Near Eastern styles (Sidebotham et al. 2021). These were all excavated in the vicinity of the Temple of Isis, which received votives from a variety of ancient traditions.

Journey to Berenike was perhaps made comfortable by halting at Socotra. Close to the opening of the Gulf of Aden and near the Horn of Africa stand the island of Socotra (Suqutra, Republic of Yemen), which scholars have dubbed the site of a “multiethnic trading

diaspora” (Evers 2017: 19). Richest corpus of Indic epigraphy relating to seafaring, together with messages in Greek, Bactrian, Palmyrene Aramaic, and south Arabian languages were found from Hoq cave on the island by Ingo Strauch and his team (Strauch, 2012). We have names that are associated with Buddhism (e.g. Buddhmitra, Buddhanandin, Saṃghadāsa and Śramaṇa), Vaiṣṇavism (Viṣṇupati and Viṣṇusena) and Śaivism (Śivamitra and Śivaghosa) (Chakravarti 2016: 454-60). There are also engravings of sea-going vessels at Socotra which have a close resemblance with the ships represented on the coins of the Sātavahanas (c. 50 BCE-225 CE), the first formidable power in the Deccan.

We can link many of the inscribers to western India from the script they use and the places they mention. Seven distinct individuals in this epigraphic corpus referred to their place of origin as Bharukaccha (Ghosh, 2023b: 369-391). One Śūragaṇja, son of Śūranandin, arrived from Bharukaccha; the names of both father and son are left at multiple sites in the cave (Strauch 2012: no. 11:17, 14:2). Other inhabitants of Bharukaccha include Viṣṇusena and a *niyyāma* named Viṣṇudhara (Strauch 2012: no. 11:11-2). The predominance of individuals, who sailed west from Bharukaccha and other nearby ports, such as Hastakavapra (modern Hathab and Astakapra of *PME* and Ptolemy’s *Geography*), highlights the involvement of western India in a wider maritime network (Ghosh 2023b: 369-91).

## Coastal Shrines: Markers of Maritime Religious Landscapes

An important marker of maritime heritage is the extant structures nearer to the coast, which could be both Buddhist and Brahmanical. These sacred sites, housing diverse faiths, could serve as major markers for seafarers, especially when located on a hilltop visible to passing ships. Here we may mention the well-known *stūpa* sites of Thotlakonda and Salihundam in coastal Andhra. The *stūpa* complex at Salihundam

(Figure 5) is situated on a hill about 8 kms from the ancient port of Kalingapattana. The river Vamshadhara running west-east joins the sea at Kalingapattanam. The name Salihundam is quite significant as it literally means hill of rice (Sali was rice and *hunda* in Odiya meant hill which in Telugu is *Konda*). The hill of the stūpa site at Salihundam has a sizeable height and is clearly visible from the sea. Thus it was possible for the monks and others to locate the monastery from afar. While the Andhra coast was dotted with Buddhist structures, coastal Gujarat was known for temples with varied deities (Ray 2021: 11-12, 56-64). Such religious structures could be seen in Southeast Asia too, peninsular Thailand in particular.

The coastal shrines may well be identified as the tangible feature of the landscape, but the divine images and relics located inside them could move alongside human beings, traveling from one site to another (Ray 2021: 84-97). Moreover, various ritual items so central for religious worship, such as frankincense, populated a number of these spaces, forging bonds between the shrines of south Arabia and

those along the coasts of the Persian Gulf, Red Sea and peninsular India (Kulshreshtha 2021: 186-7). Kulshreshtha rightly pointed out “the three shrines at Khor Rori, located on the coast, would have served as nodal points that were not just connected with the hinterland but also accessed from the sea and visited by various kinds of people as attested by the material remains found there.” (Kulshreshtha 2021: 187).

## Epilogue

The above pages attempted to provide a window to fathom some of the markers of maritime heritage through certain intangible and tangible exemplars. Crafting of storytelling by the Buddhists in the Jātakas, an example of intangible heritage brought about a specific form of oral communication and giving a form and shape to these stories added to the grandeur as the story came alive in the visual representations. Along with rituals Buddhism arrived in Southeast Asia with cultural practices too, visualization of the Jātaka stories, being one of those. Maritime communities are integral to maritime heritage of any country. Though we missed the fisher folk community but they

**Figure 5: Salihundam with Vamshadhara River**



Source: Author's own.

were entwined with the *nāvikas* (boatmen) in our *varṇa-jāti* structure. Manu calls the boatman *dāśa* meaning both a fisherman and a ferryman (Olivelle, 2004: 182). An apt expression ‘artisanal epistemology’ was recently coined by Ranabir Chakravarti in the context of “knowledge created and accumulated through long term experience by practitioners connected with the sea” (Chakravarti, 2020: 58-74). For him these people were in a sense artisan and hence Ahmad ibn Majid was a classic case of ‘artisanal epistemology’ whose knowledge of the sea is epic. Interestingly, in the Suppāraka Jātaka, the occupation of a *niyyāmaka* is regarded as a *sippa* (craft) and hence the expression ‘*niyyāmaka sippa*’. It can thus be said that the lineage of artisanal epistemology could be traced back to the Jātakas. The knowledge of a *niyyāmaka* in studying the stars and mastering the direction of the wind made long distance sea-faring possible. Presence of the community of *mahānāvikas* in the east coast evoke vibrant maritime connections. The sea provided an important conduit of mobility while sacred spaces where people travelling from various places met and interacted offered the tangible evidence of our religious heritage both in West Asia and Southeast Asia.

## Endnotes

- <sup>1</sup> The expression “Bay of Bengal Interaction Sphere” was first coined by Sunil Gupta to indicate the eastern part of the Indian subcontinent (the country of Sri Lanka; the Indian states of Tamil Nadu, Andhra Pradesh, Orissa, West Bengal; and the country of Bangladesh) and the western part of Southeast Asia (Myanmar, coastal Thailand, coastal Malaysia, and the Indonesian island of Sumatra adjoining the Andaman Sea). The Andaman Sea is taken as a contiguous extension of the Bay of Bengal and treated as one with the bay.
- <sup>2</sup> There are of course different contenders for *Suvarṇabhūmi*, the main ones being Thailand and Myanmar. But in the eyes of Buddhist devotees throughout the Theravāda world, “*Suvarṇabhūmi*” is more than just a name, a mere

land of riches and abundance. Nicolas Revire, ‘Fact and Fiction: The Myth of Suvarṇabhūmi through the Thai and Burmese Looking Glass’, *Mahachulalongkorn Journal of Buddhist Studies*, Vol. 4, 2011, pp. 79-114.

- <sup>3</sup> The archaeological and documentary evidence suggest that Myos Hormos, played a major role in facilitating trade along the northern reaches of the Red Sea coast, and with its sister port Berenike to the south, acted as the departure points for exports from the Roman world.

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# Maritime History of India: Rediscovering Legacy to Revive the Maritime Glory

Shishir Shrotriya

**T**he maritime heritage of India, rich in history and cultural significance, stretches back to the ancient Harappan civilization, also known as Sindhu-Saraswati civilization, and even earlier. Recent archaeological discoveries, including seals depicting boats and directional birds, offer a glimpse into the profound maritime culture of India, long before recorded history. The oldest known dock, dating back over 4,000 years, was uncovered at Lothal, in present-day Gujarat (Figure 1).<sup>1</sup>



The Sindhu-Saraswati civilization, which flourished around 5,000 years ago, was heavily reliant on trade and had an expansive network that spanned from the Indus Valley to the Arabian Peninsula, the Roman Empire, and Southeast Asia. Recent works, such as *Ahimsa* by Devdutt Patnaik, reinterpret the success of this ancient civilization, which was built not on military conquest, but on maritime trade. Harappans were active participants in a trade network that included the Arabs, Romans, and other South Asian civilizations.<sup>2</sup>

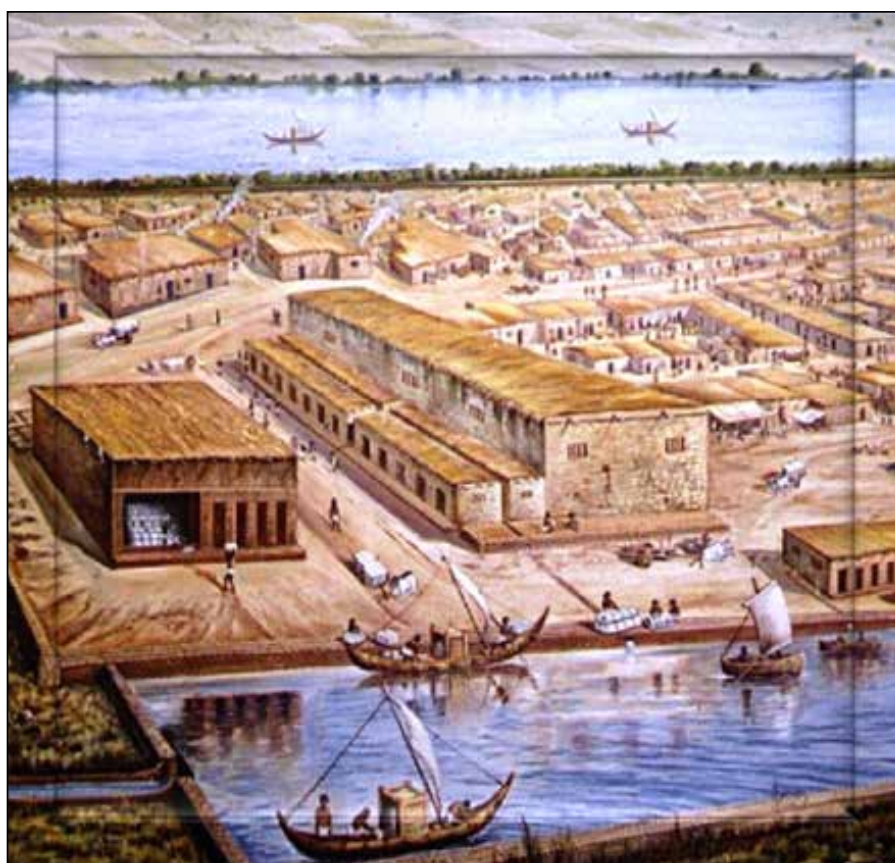
Archaeological findings, such as the Harappan seals and the discovery of shipwrecks off the coast of Sri Lanka, underscore the advanced shipbuilding techniques and vibrant maritime culture of those times.<sup>3</sup> These findings

demonstrate that India was a crucial hub of ancient global trade, a position that persisted through successive centuries.

India's role as a maritime power is evident from the extensive trade routes and ports that dotted both the eastern and western coasts of the subcontinent. Historical accounts from sources like Ravir Chakrabarti's research and the *Periplus of the Erythraean Sea*, provide evidence of these routes, with India at the center of trade that linked the Middle East, Africa, Southeast Asia, and beyond.

During the period between 600 BCE and 1300 CE, India's maritime network facilitated the exchange of goods, ideas, and cultures. India's central position in the global trade

**Figure 1: ASI Lothal: A Harappan Port Town**



Source: Harappa.com.

network meant that any significant maritime movement involved Indian shores, whether it was trade with China, Rome, or the Arab world (Figure 2).<sup>4</sup> In particular, the Chola dynasty, renowned for its naval power, dominated maritime trade routes and established a robust naval force, further consolidating India's position as a maritime hub.<sup>5</sup>

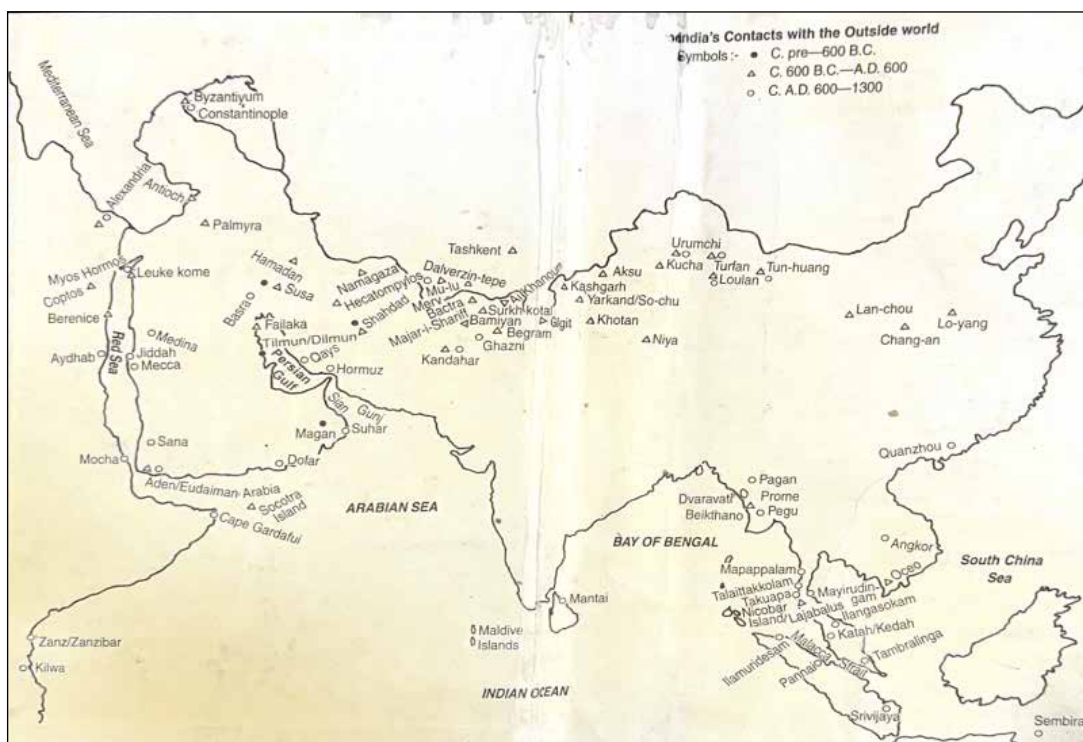
However, the colonial narrative, promoted by the Portuguese, British, and other European powers, has long overshadowed India's vibrant maritime history. This narrative, often embedded in colonial-era textbooks, emphasized the notion that India was a passive civilization that required European intervention to access the world's oceans. Such interpretations ignored India's maritime prowess and the flourishing trade routes that existed long before the arrival of the Europeans.

For instance, the National Maritime Day, which is celebrated on April 5th each year in India, marks the event when an Indian-built vessel first sailed to London in 1919. While this is a noteworthy achievement, it inadvertently distorts the reality that India had a well-established maritime tradition long before the arrival of the British.

Cultural festivals such as the *Boita Bandana* celebrated in Odisha, along with similar festivities in Sri Lanka, Myanmar, and Vietnam, highlight the ancient maritime ties that persist to this day.

India's maritime heritage is not just about ships and trade. It also involves a rich cultural exchange, reflected in ancient texts such as the *Rig Veda*, *Ramayana*, and *Mahabharata*. These texts mention distant lands like *Swarnabhumi* (the land of gold), symbolizing the wealth India accrued through maritime trade.<sup>6</sup>

### Figure 2: Ancient India's Maritime Contacts



*Source:* Chakravarti (2001).

Archaeological evidences further corroborate the existence of ancient maritime trade routes. Excavations in regions like southern Vietnam have uncovered Brahmi inscriptions and Buddhist relics, proving the extensive maritime networks that connected India with Southeast Asia and China from as early as the 3rd century BCE.<sup>7</sup>

These routes, known as the “Golden Road” by historians like William Dalrymple, were the actual precursors to the Silk Road, with maritime trade accounting for 90 per cent of the exchanges between ancient civilizations.<sup>8</sup>

## Evolution of the Maritime Power in India

The origins of India’s maritime legacy can be traced back to the Sindhu Saraswati or the Indus Valley Civilization. This ancient civilization exhibited advanced maritime capabilities, as evidenced by the dockyard at Lothal, one of the earliest known ports in the world. Archaeological discoveries such as seals, weights, and standardized measures

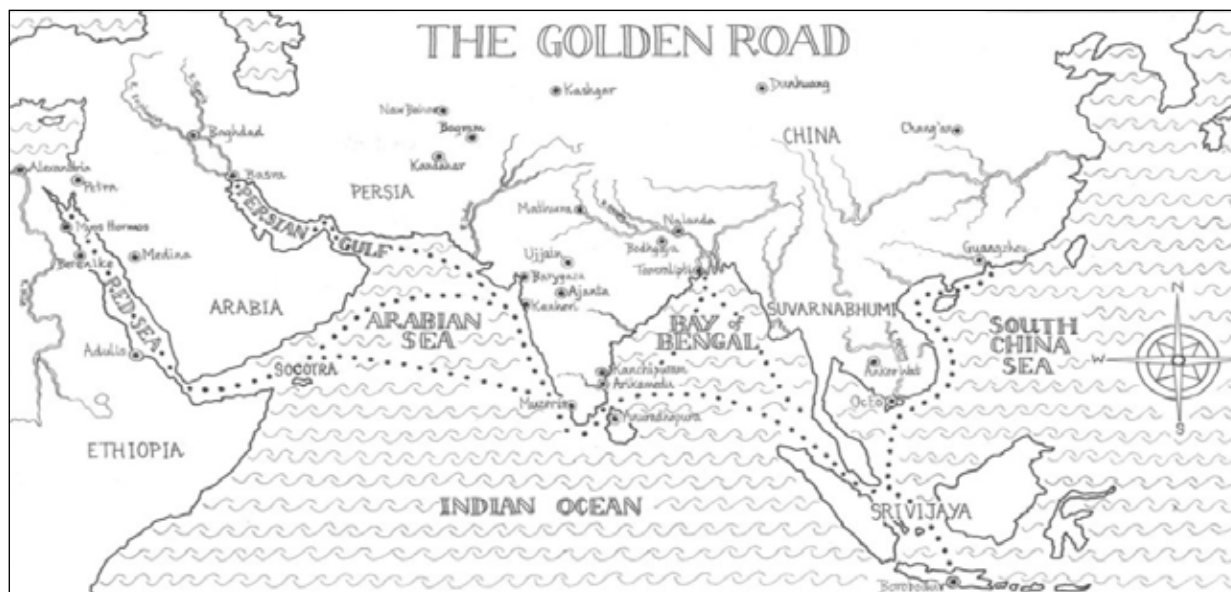
underscore the civilization’s organized trade practices.

Indus seals discovered in Mesopotamia and the Persian Gulf regions provide concrete evidence of long-distance trade. Additionally, Mesopotamian texts reference a region called “Meluhha,” believed to correspond to the Indus Valley, further emphasizing the civilization’s prominent role in international commerce.<sup>9</sup>

During the Vedic and later Vedic periods (c. 1500–500 BCE), India’s maritime knowledge continued to evolve. References in Vedic texts and economic treatises like the Arthashastra highlight the growing importance of trade and navigation. These records reflect an organized approach to maritime activities, supporting both internal and external trade networks.

Under the Mauryan Empire (c. 321–185 BCE), India expanded its maritime activities significantly, extending its cultural and trade influence beyond the subcontinent. Maritime trade routes facilitated the spread of Buddhism to Sri Lanka and Southeast Asia, showcasing

**Figure 3: The Golden Road: How Ancient India Transformed the World**



Source: Dalrymple (2025).

the role of religion and commerce in forging transnational connections.

Prominent ports such as Bharuch and Tamralipti emerged as critical hubs for trade and interaction.<sup>10</sup> Moreover, the Greek navigator Hippalus documented the use of monsoon winds for navigation in the Indian Ocean during the 1st century CE, highlighting India's contribution to global maritime knowledge and navigation techniques.<sup>11</sup>

The Sangam Age (3rd Century BCE–3rd Century CE), witnessed thriving maritime activity under the rule of the Cholas, Cheras, and Pandyas. Sangam literature provides vivid accounts of ports such as Muziris, Kaveripattinam, and Arikamedu, which served as prominent centers for trade with Rome and Southeast Asia.

Indian merchants and artisans played a vital role in shaping the local cultures of Southeast Asia through trade and cultural exchanges. Ports like Muziris became central to Indo-Roman trade, as evidenced by Roman coins and amphorae found during excavations.<sup>12</sup>

The Gupta Empire (320–550 CE), marked a golden age of trade and commerce. Luxury goods such as silk, pearls, and ivory were highly sought after by Mediterranean and East Asian markets. Indo-Greek and Indo-Roman connections facilitated extensive trade with the Mediterranean world, evidenced by Roman coins discovered at Muziris and Mediterranean artifacts unearthed at Arikamedu.

The Bay of Bengal trade routes flourished, connecting India with Southeast Asia and China. Buddhist missionaries, including the Chinese traveler Fa Hien, spread religion and facilitated cultural exchanges along these routes, showcasing the symbiotic relationship between trade and spirituality.

The Chola dynasty (9th–13th Century CE), represents a pinnacle in India's maritime history. Renowned for their naval prowess, the Cholas extended their influence across Southeast Asia,

including present-day Indonesia and Malaysia. Their naval campaigns consolidated Indian Ocean trade networks, linking the Roman Empire, Egypt, and East Africa to Southeast Asia and China.

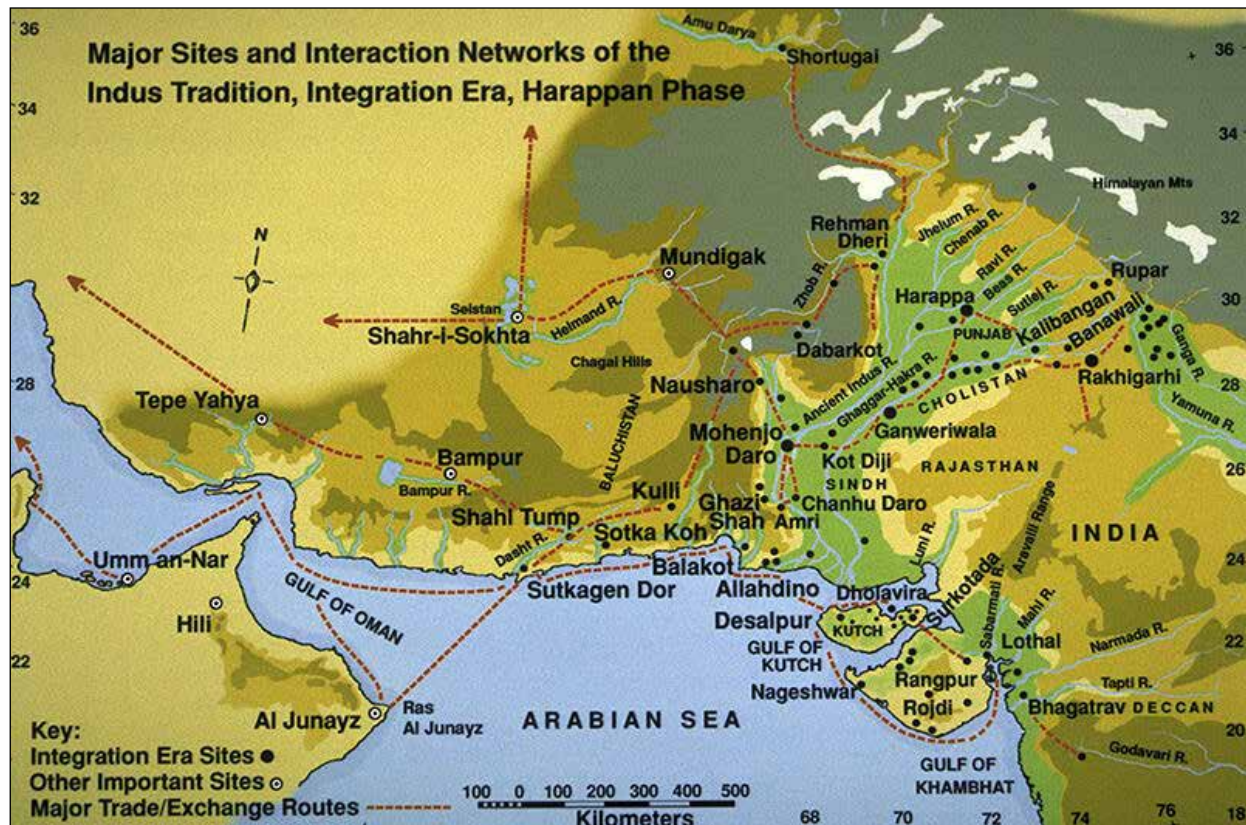
Cultural influence from this era is evident in the spread of Hindu-Buddhist temples, scripts, and traditions across Southeast Asia. Monsoon wind patterns were strategically utilized for faster travel across the Arabian Sea and the Bay of Bengal, solidifying India's dominance in the Indian Ocean trade network.<sup>13</sup>

## Trade in the Early Indian Ocean Network

The early Indian Ocean trade network served as a vibrant web of maritime commerce and cultural exchanges, connecting diverse civilizations across continents. This dynamic network shaped the economic and cultural trajectories of India, Mesopotamia, Greece, Rome, Arabia, Persia, Ancient Egypt, Malaysia, Thailand, Indonesia, Cambodia, Vietnam, China, Sri Lanka, Greece, Rome, and Central Asia.

India's trade relationship with Mesopotamia, referred to as "Meluhha" in ancient texts, highlights the deep connections between the Indus Valley Civilization and Mesopotamian cities. Indian exports such as cotton, beads, pearls, and timber were exchanged for Mesopotamian goods like dates, wool, and silver.<sup>14</sup> Archaeological evidences, including Mesopotamian seals and texts, underscore the significance of this relationship.

The trade between India and the Roman Empire flourished, with Roman merchants traveling to ports like Muziris in Kerala to acquire spices, pearls, textiles, and gems.<sup>15</sup> Roman imports included wine, glassware, and gold. This vibrant exchange is documented in works such as *The Periplus of the Erythraean Sea* and writings by Pliny the Elder. The discovery of Roman coins and artifacts in India further testifies to this trade relationship.<sup>16</sup>

**Figure 4: Indo-Mesopotamia Relations**

Source: Harappa.com.

The Arabian and Persian Gulf ports, such as Sohar (Oman) and Aden (Yemen), also played crucial roles as intermediaries, facilitating the exchange of Indian goods with Africa, the Mediterranean, and beyond. Goods like incense, dates, and horses were traded for Indian spices, textiles, and gems. From the 7th century CE onward, Arab merchants became key players in sustaining the Indian Ocean trade network.<sup>17</sup>

Along the East African coast, cities like Zanzibar, Kilwa, and Mombasa were deeply integrated into the Indian Ocean trade system.<sup>18</sup> East Africa exported ivory, gold, tortoiseshell, and slaves, while Indian textiles and beads were common imports. Indian influence on Swahili culture is evident, particularly in trade practices and the use of Indian beads.

Southeast Asia, with its strategic location, became a gateway for goods traveling between

India and China. The Srivijaya Empire in Sumatra and the Funan Kingdom in Southeast Asia were major participants in the trade network. Indian merchants and scholars brought Hinduism, Buddhism, and Sanskrit, leaving a profound cultural impact on Southeast Asia's art, architecture, and religion. Spices like cloves, nutmeg, and sandalwood from Southeast Asia were exchanged for Indian textiles and pearls.<sup>19</sup>

China's maritime extension of the Silk Road linked it with Indian ports, fostered an exchange of goods and culture. Chinese silk, porcelain, and paper were traded for Indian cotton, spices, and Buddhist texts.<sup>20</sup> Indian monks and scholars traveled to Chinese ports, playing a key role in spreading Buddhism.

Sri Lanka emerged as a vital transit point in the Indian Ocean trade, connecting India,

Southeast Asia, and the West. Sri Lanka exported pearls, elephants, and cinnamon while importing Indian goods.<sup>21</sup> Trade was instrumental in the spread of Buddhism to the island.

Similarly, Persia acted as a bridge between the Mediterranean world and India, enriching trade and cultural exchanges. Persian carpets and silver were exchanged for Indian spices and gems, while Persian traders and scholars facilitated the transmission of Indian ideas, such as the concept of zero, to Europe.

India's trade with Central Asia was facilitated both overland through the Silk Road and via maritime routes. Indian textiles and spices reached Europe through this region, highlighting India's role as a key player in global trade.

Egypt also played a significant role in the Indian Ocean trade network, particularly during the Roman period when Alexandria served as a major hub. Spices like cinnamon and pepper from India were highly sought after in Egypt for embalming and culinary purposes. Archaeological evidence, such as beads and spices from India found in Egyptian sites, testifies to the robust trade relations between the two regions.<sup>22</sup>

One of India's unique advantages in ancient maritime trade was its strategic geography, particularly the monsoon winds. These seasonal winds facilitated easy navigation for Indian vessels, allowing for trade between India, Southeast Asia, and beyond. The Indian subcontinent was equipped with indigenous shipbuilding techniques and materials—such as teak and coconut fibers—making it a center for ship construction for not only Indian sailors but also for traders from other regions.

The Chola dynasty, known for its naval strength, is an example of the advanced maritime power that India wielded during its golden age. The empire's naval expeditions and shipbuilding practices are well documented

and serve as a testament to India's maritime expertise.

## **Maritime Cultural Links: Boita Bandana Festival (Bali Yatra)**

The Boita Bandāna Festival, also known as Bali Yatra, is a traditional maritime celebration held on Kartik Purnima, marked by the floating of ritual boats and the worship of lighted lamps (Figure 5).<sup>23</sup> This festival commemorates the day when the ancient Odia mariner merchants, known as Sadhabas, embarked on their voyages to Southeast Asia and Sri Lanka for trade and cultural exchange.<sup>24</sup> The origins of this ritual can be traced back to the 3rd century BC, during the era of Kalinga. It is believed that these seafaring merchants not only contributed to the trade but also facilitated cultural ties with the broader Southeast Asian region. A remarkable aspect of the festival is its similarity to other regional celebrations, such as the Loi Krathong in Thailand, where people float Krathongs (decorative boats); Boun That Luang in Laos; Tazaunggydaing in Myanmar; Poya in Sri Lanka; and Bon Om Touk in Cambodia. These festivals share the symbolic practice of floating boats or lamps, a reflection of the interconnected maritime cultures of the region.

## **Maritime Connectivity, Ship Building and Trade**

In the 17th century, the Marathas developed prominent shipbuilding yards at Vijaydurg, Swarndurg, and Kolaba, which became notable for their highly maneuverable ships with excellent sailing qualities.<sup>25</sup> Shipbuilding was a well-established craft along various points of the Indian coastline long before the arrival of the Europeans, playing a significant role in Indian maritime activities across the Indian Ocean Region (IOR). Ports such as Masulipatam and Surat were known for building vessels from Indian hardwoods, which were not only cheaper but also more durable than European ships. The Wadia family, skilled shipbuilders,

played a key role in constructing 350 ships for the British East India Company.<sup>26</sup> Between 1736 and 1821, a total of 159 ships over 100 tons were built in Bombay, including 15 ships over 1,000 tons, marking a significant chapter in the history of Indian shipbuilding.<sup>27</sup>

The 17th and 18th centuries saw the enactment of various Acts of Trade and Navigation, particularly by the British, which had a profound influence on global trade. The Navigation Act of 1650, for instance, stipulated that only English ships could bring goods to England and that colonies were required to export commodities and supply raw materials, guaranteeing a market for English goods. Other acts, like the Calico Acts of 1700 and 1701, banned the import of cotton textiles to England, while the Molasses Act of 1733 and the Sugar Act of 1764 placed taxes on certain goods. By the dawn of the 20th century, British

maritime dominance was so entrenched that the seas were often referred to as a “British Lake,” underscoring the extent of British control over global maritime trade.

The arrival of the Portuguese, followed by the British and French, marked the beginning of a systematic decline in India’s maritime dominance. Colonial policies, such as the British Navigation Acts restricted Indian shipping and trade, relegating Indian maritime capabilities to subservience under European control.<sup>28</sup> These policies, coupled with the destruction of indigenous industries such as the handloom textile industry, led to a collapse of India’s once-thriving maritime trade network.

By the 19th century, much of India’s maritime activities were monopolized by colonial powers, and the region’s vast trade routes, once teeming with activity, were reduced to serving the interests of European powers.

**Figure 5: Stone Sculpture of a Boita Belonging to 11th Century A.D. from Odisha**



Source: Worldpress.

## Growing Importance of Indo-Pacific and Indian Ocean Region

In the present context, the growing importance of the Indo-Pacific and the Indian Ocean Region in terms of maritime connectivity, shipbuilding, and trade is becoming increasingly evident. The Indo-Pacific region is home to some of the world's largest economies, including the United States, China, and Japan. Together, these economies contribute significantly to the global economy, with the region accounting for 60 per cent of global GDP.<sup>29</sup>

Additionally, the Indo-Pacific houses nine out of the ten busiest seaports in the world, making it a critical hub for international trade.<sup>30</sup> One of the key maritime trade routes in this region is the Strait of Malacca, a crucial choke point for global shipping, linking the Indian Ocean to the South China Sea and subsequently to the Pacific.

Maritime connectivity directly influences bilateral trade costs, and improved connectivity can yield significant economic benefits. Enhanced shipping infrastructure often results in lower freight rates, stimulating transport demand and ultimately driving increased trade between nations. As such, the Indo-Pacific's strategic maritime routes and its growing importance as a trade corridor are central to global commerce and will continue to shape the economic landscape of the 21st century.

## Rediscovering Legacy to Revive the Maritime Glory

The increasing significance of the Indian Ocean Region has driven nations to reshape their maritime strategies, aiming to strengthen economic ties, enhance security, and promote sustainable growth. Prime Minister Narendra Modi articulated India's vision for the Indo-Pacific region through his speech, which was delivered at the Shangri-La Dialogue in Singapore on 1 June 2018. India advocates for a free, open, and inclusive order in the Indo-Pacific, underpinned by respect for the sovereignty and

territorial integrity of all nations, the peaceful resolution of disputes through dialogue, and adherence to international laws and norms.

India's initiatives, such as *Maritime Amrit Kaal Vision 2047*, *Maritime India Vision 2030*, and *Sagarmala*, reflect its efforts to boost connectivity across the region. These initiatives focus on digital integration, sustainable shipping practices, and green port operations, which are essential for fostering a resilient maritime infrastructure. The India Middle-East Europe Economic Corridor (IMEC) initiative emphasizes the need for multimodal links, data exchanges, and energy connections – often referred to as the “new gold” of global connectivity.

The India-ASEAN economic initiatives, exemplified by the Mekong-Ganga Cooperation, focuses on strengthening data, energy, and transportation corridors that further enhance India's role in the region. These economic corridors are critical to rebuilding the Maritime Golden Road, a historic route that once connected diverse civilizations through maritime trade and cultural exchanges.

Looking to the future, India's *Maritime Amrit Kaal Vision* envisions India as a leading global maritime player, strategically positioned at the center of world trade. This vision involves rebuilding the Maritime Golden Road, leveraging India's rich shipbuilding heritage, which spans multiple historical periods and regional influences. Properly studying and showcasing this heritage can help correct colonial historiographies, inspire grassroots movements, and reinforce India's critical role in the global maritime landscape.

India's maritime heritage is, therefore, not merely a relic of the past but a living legacy that continues to shape the subcontinent's role in global trade and geopolitics. From the earliest maritime trade routes to the rise of powerful dynasties, India's history is rich with stories of trade, innovation, and cultural exchange.

It is imperative that we continue to rediscover this legacy and ensure that the contributions of India's maritime past are given the recognition they deserve. The upcoming National Maritime Heritage Complex (NHMC), near Lothal (Gujarat), will serve as a crucial platform for educating future generations about the maritime legacy that lies at the heart of India's ancient civilization. It is essential that future narratives not only focus on the military and naval prowess of India during the reign of the Cholas or the Marathas but also recognize the power of maritime trade and cultural exchanges that India has long fostered.

By revisiting the glorious maritime history, we can revive India's leading position in the modern maritime affairs propelling trade, connectivity and prosperity.

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**Part II**

**Maritime Trade,  
Investment and Finance**







# Maritime Trade in India: An Overview

Prabir De

Global maritime trade continues to face uncertainties and volatilities. The geopolitical tensions, rising maritime chokepoints, growing tariffs and fluctuating trade policy changes have started shifting global shipping patterns away from the traditional routes.<sup>1</sup> The UNCTAD reported: “While containerized trade is expanding, especially along extraregional corridors, East–West routes remain dominant, anchored by Asia’s central role in global logistics”. Several downsides continue to affect the maritime trade performance in 2025, and some of the notable ones are geopolitical tensions, unpredictability in trade and tariff, supply chain disruptions, rising export control and protection, climate change issues, among others. The path to recovery is still not clear and also unpredictable.



**Table 1: UNCTAD Forecasts for International Maritime Trade****(Annual percentage change)**

|      | Total seaborne trade in tonne | Containerized trade in TEU |
|------|-------------------------------|----------------------------|
| 2025 | 0.50                          | 1.40                       |
| 2026 | 1.00                          | 1.00                       |
| 2027 | 2.20                          | 2.50                       |
| 2028 | 2.30                          | 2.70                       |
| 2029 | 2.20                          | 2.70                       |
| 2030 | 2.30                          | 2.70                       |

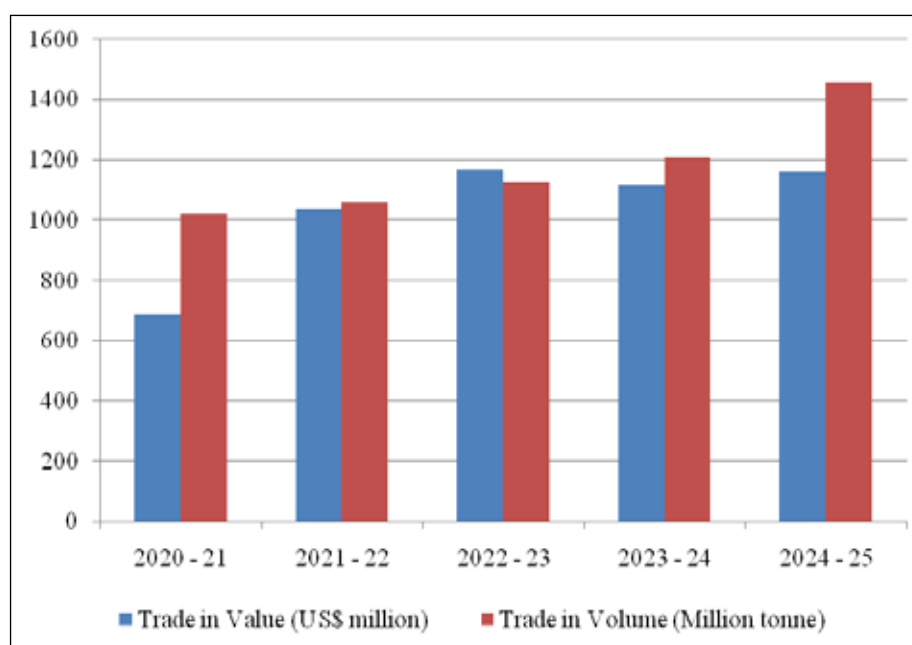
Source: UNCTAD

According to the UNCTAD projections, “World maritime trade volume is expected to expand by 0.5 per cent in 2025, with containerized trade increasing by 1.4 per cent. Over the medium term (2026–2030), total seaborne trade is projected to grow at an average annual rate of 2 per cent, while containerized trade is forecast to rise by 2.3 per cent”. Given the current geo-political situation in the world, the growth in world seaborne trade is defined, but deceleration is likely to continue from 2027 onward.

The maritime sector has been playing a crucial role in driving India’s growth and development. Around 95 per cent of India’s trade by volume and 70 per cent by value are routed through maritime routes with catalytic support of maritime logistics comprising ports and terminals, shipping, coastal and inland water transport, warehouses and digital networks. Maritime nodes are integral part of the multi-modal economic corridors such as the IMEC or the EMC. Being the world’s fourth-largest economy, India’s maritime trade is powered by expanding infrastructure, visionary reforms, and active global engagement.

### Trends in Maritime Trade (Cargo)

India’s maritime trade comprises export and import of bulk and non-bulk goods handled by the ports. Over the last decade, there has been a sharp rise in traffic at Indian ports. Ports are the lifeline of the Indian economy and have been playing a critical role in India’s international trade.<sup>2</sup> Not only does it handle trade, but ports are also planned to serve the country’s strategic needs. At the time of independence, India was

**Figure 1: Trends in India’s Trade**

Source: Author’s own calculation based on various issues of *Basic Port Statistics of India*, MoPSW and *Trade Statistics of India*, DOC.

**Table 2: Volume and Share of India's Trade: 2020-21 to 2023-24**

(Million Tonnes)

| Type of Cargo      | 2020-21        |                           | 2021-22        |                           | 2022-23        |                           | 2023-24        |                           |
|--------------------|----------------|---------------------------|----------------|---------------------------|----------------|---------------------------|----------------|---------------------------|
|                    | Total Trade    | Share of Indian Lines (%) | Total Trade    | Share of Indian Lines (%) | Total Trade    | Share of Indian Lines (%) | Total Trade    | Share of Indian Lines (%) |
| Break Bulk         | 41.13          | 0.15<br>(0.35)            | 48.44          | 0.42<br>(0.85)            | 45.40          | 0.31<br>(0.67)            | 32.25          | 0.33<br>(1.03)            |
| Container          | 218.66         | 8.34<br>(3.81)            | 256.76         | 9.11<br>(3.55)            | 263.61         | 7.49<br>(2.84)            | 296.91         | 7.18<br>(2.42)            |
| Dry Bulk Cargo     | 402.74         | 11.39<br>(2.83)           | 377.60         | 11.8<br>(3.13)            | 425.01         | 13.16<br>(3.10)           | 479.19         | 17.53<br>(3.66)           |
| Liquid Bulk Cargo  | 359.35         | 37.51<br>(10.44)          | 377.33         | 36.17<br>(9.59)           | 391.59         | 35.80<br>(9.14)           | 401.52         | 39.40<br>(9.81)           |
| <b>Total trade</b> | <b>1021.88</b> | <b>57.39<br/>(5.62)</b>   | <b>1060.13</b> | <b>57.5<br/>(5.42)</b>    | <b>1125.61</b> | <b>56.83<br/>(5.04)</b>   | <b>1209.87</b> | <b>64.45<br/>(5.33)</b>   |

\*Overseas cargo handled by India's all major and non-major ports. Figures in parenthesis indicate the percentage share of Indian vessels in respective cargo categories.

Source: Basic Port Statistics of India 2023-24, MoPSW

left with five major ports. Presently, India has 12 major ports and 217 notified non-major ports along its 7517 km coastline, which are the key nodes in global supply chains and crucial to the growth of the Indian economy. Annexure 1 presents the basic maritime profile of India.

In recent years, India's ports have witnessed significant growth in trade. In post-pandemic, buoyancy in port cargo is continued (Figure 1). Ports in India have handled a massive 1.46 billion tonnes of international cargo in 2024-25 with a corresponding trade value of US\$ 1.6 trillion, the highest so far in the history of India. The value-volume ratio clearly shows Indian ports have been handling more volume per value consistently, thereby showing optimism and opportunities in maritime sector in India.

Grown at the 6 per cent CAGR, the total trade handled at Indian ports reached 1209.87 million tonnes (MT) in 2023-24, compared to

1125.61 MT in 2022-23 (Table 2). Dry bulk cargo contributed almost 40 per cent in the total trade in 2023-24, followed by liquid bulk cargo (33 per cent), containerised cargo (25 per cent) and break bulk cargo (3 per cent). Therefore, India's maritime trade has been dominated by dry bulk cargo, namely, dry minerals, grains, fertilizers, etc. Liquid bulk cargo such as crude oil, chemicals, LNG, etc. come next. The share of containerised cargo in India's total maritime trade has grown from 21 per cent in 2020-21 to 25 per cent in 2023-24, thus reflecting India's unparalleled maritime growth.

Noted by the MoPSW, the composition of goods handled at ports over the years had shown some changes. POL and its products continue to be the single largest commodity handled by the ports, constituting 25.26 per cent of the total seaborne traffic in 2023-24, followed by coal (22.43 per cent), iron ore (8.39

per cent), fertilizer raw materials (2.05 per cent), building material (0.64 per cent) and other goods (including Container) (41.23 per cent) in 2023-24<sup>3</sup>.

India's rising maritime trade is mostly driven by foreign-flagged vessels. In 2023-24, the Indian-flagged vessels handled 64.64 MT trade, compared to 56.83 MT in 2022-23. At an aggregate level, Indian-flagged vessels carried just 5.33 per cent of the country's trade in 2023-

24 (Table 2), which also offer high business opportunities to Indian-flagged vessels in the Indian maritime sector. Business opportunities for Indian-flagged vessels are likely to grow heavily in coming years in view of India's future plan of handling 10,000 MT of maritime trade by 2047.

## Impressive Strides

Indian ports have witnessed tectonic shifts in the last one and half decade. Port Performance

**Table 3: Cargo and Container Profile of Major Ports of India**

| Major Ports       | Cargo Handled    |                   |             | Container Traffic |               |             |
|-------------------|------------------|-------------------|-------------|-------------------|---------------|-------------|
|                   | 2010-11          | 2022-23           | CAGR        | 2010-11           | 2022-23       | CAGR        |
|                   | MT               | MT                | (%)         | MT                | MT            | (%)         |
| SMP Kolkata D.S   | 35.00<br>(6.14)  | 17.05<br>(2.17)   | -5.82       | 6.22              | 8.52          | 2.66        |
| SMP Haldia D.C    | 12.54<br>(2.2)   | 48.61<br>(6.2)    | 11.95       | 2.84              | 2.07          | -2.60       |
| Paradip           | 56.04<br>(9.83)  | 135.33<br>(17.26) | 7.62        | 0.07              | 0.19          | 8.68        |
| Visakhapatnam     | 68.04<br>(11.93) | 73.75<br>(9.4)    | 0.67        | 2.57              | 8.46          | 10.44       |
| Kamarajar         | 11.01<br>(1.93)  | 43.51<br>(5.55)   | 12.13       |                   | 10.61         |             |
| Chennai           | 61.46<br>(10.78) | 48.95<br>(6.24)   | -1.88       | 29.42             | 28.37         | -0.30       |
| V.O.Chidambaranar | 25.73<br>(4.51)  | 38.04<br>(4.85)   | 3.31        | 8.17              | 14.68         | 5.00        |
| Cochin            | 17.87<br>(3.13)  | 35.26<br>(4.5)    | 5.83        | 4.42              | 9.99          | 7.03        |
| New Mangalore     | 31.55<br>(5.53)  | 41.42<br>(5.28)   | 2.29        | 0.57              | 2.37          | 12.61       |
| Mormugao          | 50.06<br>(8.78)  | 17.33<br>(2.21)   | -8.46       | 0.22              | 0.03          | -15.30      |
| Mumbai            | 54.59<br>(9.58)  | 63.61<br>(8.11)   | 1.28        | 0.65              | 0.23          | -8.29       |
| J.L.Nehru         | 64.32<br>(11.28) | 83.86<br>(10.69)  | 2.24        | 56.43             | 76.19         | 2.53        |
| Deendayal         | 81.88<br>(14.36) | 137.56<br>(17.54) | 4.42        | 2.59              | 8.57          | 10.49       |
| <b>All Ports</b>  | <b>570.09</b>    | <b>784.27</b>     | <b>2.69</b> | <b>114.16</b>     | <b>170.29</b> | <b>3.39</b> |

**Notes:** Port capacity of Kolkata and Haldia are combined, MT- Million Tonnes.

Figures in parenthesis indicate percentage share in total traffic in respective traffic categories at major ports.

**Source:** Author's compilation from various editions of *Basic Ports Statistics of India*, MoPSW.

is key force in driving competitiveness of a country's trade. Today, as many as nine major ports of India have made entry into the global top 100 rankings in the latest edition of Container Port Performance Index (CPPI) for the year 2023. These nine ports are: Visakhapatnam (19), Mundra (27), Pipavav (41), Kamarajar (47), Cochin (63), Hazira (68), Krishnapatnam (71), Chennai (80) and Jawaharlal Nehru (96).<sup>4</sup> There has been a significant improvement via operational efficiency and service delivery in the efficient handling of ships and cargo. Major ports have set several new records by exceeding cargo handling targets in the past. This achievement is an outcome of several initiatives in the past including those the National Maritime Development Programme (NMDP) and the *Sagarmala* programme. To add a new vision to the maritime sector, India later has introduced the *Maritime India Vision 2030* (MIV 2030) and *Maritime Amrit Kaal Vision 2047* (MAKV 2047).

### Cargo Profile of Major Ports of India

The last decade and half were the watershed phase of the Indian economy, where ports were identified as key growth enablers. While the Indian economic size has doubled from US\$ 1.5 trillion in 2010 to US\$ 3 trillion in 2022, during the same period, India's major ports have witnessed a moderated rise in its cargo throughput in ports between the periods 2010-11 and 2022-23 (Table 3). Notwithstanding the rise of Indian economy, ports remain a slow-starter, and the accentuation of structural constraints has been one of the factors contributing to as low as Compound Annual Growth Rate (CAGR) of 2.7 per cent with total cargo of all major ports increasing from 570.09 MT to 784.27 MT in the same period.

Out of the total cargo handled by major ports, the overseas cargo accounted for 76.4 per cent, which recorded an increase of 9.3 per cent in 2022-23 compared to 2021-22<sup>5</sup>. Port-wise analysis of the traffic growth indicates that

Paradip recorded the highest growth (16.6 per cent), followed by SMP Haldia (13.4 per cent) in 2022-23, compared to 2022-21.<sup>6</sup> Deendayal Port (erstwhile Kandla port) accounted for the highest share of 17.5 per cent in the total cargo traffic at all major ports in 2022-23. Note that Deendayal port has consistently occupied the top rank among the major ports of India since 2010-11, showing a remarkable strength in the Indian port sector. Another interesting development is ports located in bigger urban clusters like Kolkata, Chennai, or Mumbai have witnessed negative or marginal growth in traffic over time, thereby indicating cargo diffusion in the geographic space.

Containerization started in India in 1973 in a limited way with the creation of interim container handling facilities at Mumbai and Cochin ports. Since then, container traffic has steadily increased over the years in tune with the increasing use of containers in international trade (Government of India, 2024). Jawaharlal Nehru port (76.19 MT) continues to function as a major container port in India, followed by Chennai (28.37 MT). The share of Jawaharlal Nehru port in total container traffic in 2022-23 stood at 53.0 per cent (in TEUs) and 44.8 per cent (in tonnage), making it the premier container port of India.

### Performance and Productivity of Major Ports of India

Globally, the empirical evidence suggests that a country's or a region's economic growth in the long run is supported by sustained growth in Total Factor Productivity (TFP) with labour and capital significantly improving the TFP. One of the common constraints that ports remain a slow starter for the Indian economy is low productivity and inefficiency of Indian ports.<sup>7</sup> In other words, efficient and productive port has been identified as a key contributor to overall port competitiveness and international trade costs<sup>8</sup>.

**Table 4: KPIs of Major Ports of India**

| Major Ports       | Port Capacity |                |              | Turn Around Time |              |              |
|-------------------|---------------|----------------|--------------|------------------|--------------|--------------|
|                   | 2010-11       | 2022-23        | Change       | 2010-11          | 2022-23      | Change       |
|                   | MT            | MT             | (%)          | Hours            | Hours        | (%)          |
| SMP Kolkata D.S   | 67.05         | 92.77          | 38.4         | 149.04           | 48.88        | 67.2         |
| SMP Haldia D.C    |               |                |              | 106.8            | 51.52        | 51.76        |
| Paradip           | 76.5          | 289.75         | 278.8        | 185.52           | 46.27        | 75.06        |
| Visakhapatnam     | 64.93         | 134.18         | 106.7        | 140.16           | 73.19        | 47.78        |
| Kamarajar         | 31            | 91             | 193.5        | 66.72            | 45.26        | 32.16        |
| Chennai           | 79.72         | 135            | 69.3         | 104.64           | 48.08        | 54.05        |
| V.O.Chidambaranar | 27.04         | 111.46         | 312.2        | 96               | 46.89        | 51.16        |
| Cochin            | 40.98         | 78.6           | 91.8         | 52.8             | 39.45        | 25.28        |
| New Mangalore     | 45.57         | 108.96         | 139.1        | 64.8             | 44.9         | 30.71        |
| Mormugao          | 41.9          | 63.4           | 51.3         | 250.32           | 54.59        | 78.19        |
| Mumbai            | 44.53         | 84             | 88.6         | 119.04           | 50.4         | 57.66        |
| J.L.Nehru         | 64            | 141.37         | 120.9        | 63.36            | 28.27        | 55.38        |
| Deendayal         | 86.91         | 267.1          | 207.3        | 141.6            | 77.58        | 45.21        |
| <b>All Ports</b>  | <b>670.13</b> | <b>1597.59</b> | <b>138.4</b> | <b>126.96</b>    | <b>51.48</b> | <b>59.45</b> |

Source: Author's compilation from various editions of *Basic Ports Statistics of India*, MoPSW.

Note that a productive and efficient port has often been a prerequisite for successful growth strategies, particularly for export driven growth, under the overarching *MAKV 2047* vision. By sharp contrast, a poorly functioning or inefficient port can hinder growth. India's

growth slowdown in the past was identified as an outcome of the sharp decline of the TFP.<sup>9</sup> Several studies have shown that benefits of early port reforms were partly wiped out by the inefficiency of ports in India<sup>10</sup>.

**Table 5: Indian Ports in Comparative Perspective**

| KPIs                                                        | India | China | USA |
|-------------------------------------------------------------|-------|-------|-----|
| Port capacity stock (per cent of GDP)                       | 1     | 3     | 10  |
| Number of shipyards*                                        | 7     | 70    | 45  |
| Number of Ports in Global top 50                            | 2     | 18    | 4   |
| Container Traffic (million TEUs)                            | 11    | 185   | 44  |
| Average Annual Growth in container Traffic (million TEUs)** | 0.5   | 10    | 0.4 |
| Average Turnaround Time (Days)                              | 4.5   | 1     | 1.2 |

Notes: \*Considers more than 120m long ships; \*\*For the period 2008-2012

Source: Author's calculation from Sagarmala, National Perspective Plan and World Shipping Council.

Port capacity of the major ports has increased significantly from 670.13 million tonnes in 2010-11 to 1597.59 million tonnes in 2022-23 (Table 4). However, a worrying trend is port capacity utilisation has drastically declined from 85 per cent in 2000-01 to 49.01 per cent in 2021-22.

Illustrated in Table 4, the average Turnaround Time (TRT), one of the key indicators to assess port performance i.e., the time spent by a ship entering, unloading, loading, and exiting the port, has significantly improved in the last two decades, reducing TRT by 60 per cent i.e., from around 5 days (126.96 hours) to roughly 2 days (51.48 hours). Jawaharlal Nehru has the lowest TRT of roughly 1 day (28.27 hours), followed by Cochin and New Mangalore having close to 1.5 and 2 days respectively. Drastic improvements of Mormugoa and Paradip ports in TRT are noted as well.

However, compared to countries like the US and China, Indian ports are often small, inefficient and lack the draft to accept larger sized vessels. Only two Indian ports (Jawaharlal

Nehru Port and Mundra) make into the top 50 list of major container ports, according to the World Shipping Council (Table 5). India lags in other few port KPIs such as port capacity stock and Average Turn Around Time, compared to the USA and China. The average size of a container vessel calling at Indian ports is around 5,000 TEUs while for China it is around 12,000 TEUs.<sup>11</sup>

To conclude, there has been a steady increase in handling of cargo at Indian ports over the last two decades. However, to sustain the momentum of exports and improve competitiveness the country would need adequate and efficient ports and maritime services. This also raises the question as to how effectively India's major ports, handling 76 per cent of overseas cargo, can efficiently handle the trade. The TFP results may help us to understand the productivity of each of these major ports, specifically to understand the impact of the *Sagarmala* programme on port productivity.

**Table 6: Predicted Average values: TFP and TFPG**

| Major Ports | 2000-01 to 2013-14 |                 | 2014-15 to 2021-22 |                 | 2000-01 to 2021-22 |                 |
|-------------|--------------------|-----------------|--------------------|-----------------|--------------------|-----------------|
|             | TFP                | TFPG (per cent) | TFP                | TFPG (per cent) | TFP                | TFPG (per cent) |
| ChPA        | 1.26               | -1.01           | 0.84               | -2.08           | 1.21               | -0.45           |
| CoPA        | 0.47               | -2.44           | 0.75               | -2.56           | 0.53               | 0.96            |
| DPA         | 1.77               | -1.84           | 2.16               | 29.63           | 1.94               | 0.30            |
| JNPA        | 1.57               | 2.08            | 1.55               | -1.41           | 1.56               | 2.04            |
| KPL         | 0.89               | 0.36            | 0.80               | 0.20            | 0.94               | 3.73            |
| MbPA        | 0.96               | -3.22           | 1.09               | 7.27            | 1.02               | -0.21           |
| MoPA        | 1.05               | 2.17            | 0.55               | 3.04            | 0.82               | 6.01            |
| NMPA        | 1.02               | -2.12           | 1.05               | 3.49            | 1.03               | -0.76           |
| PPA         | 1.16               | 5.84            | 2.44               | 7.61            | 1.66               | 6.76            |
| SMP (HDC)   | 1.04               | 1.80            | 0.79               | -0.97           | 0.96               | 3.04            |
| SMP(KDS)    | 0.34               | 1.57            | 0.35               | -4.00           | 0.34               | 1.09            |
| VOCA        | 0.63               | 3.24            | 0.93               | 6.02            | 0.72               | 2.81            |
| VPA         | 1.54               | -4.71           | 1.38               | 3.69            | 1.51               | -1.95           |
| CV          | <b>0.4</b>         |                 | <b>0.54</b>        |                 | <b>0.42</b>        |                 |

Source: Author's own calculation.

We predict the TFP and TFP Growth (TFPG) using Pooled OLS estimation based on the Cobb-Douglas production function as carried by (De and Barman, 2025)<sup>12</sup>. Here, we infer that for all the three periods the Decreasing Returns to Scale is observed (Homogeneity < 1).

On an average, the TFP growth has accelerated post-Sagarmala period (2014-15 to 2021-22), compared to pre-Sagarmala period (2000-01 to 2013-14)<sup>13</sup>. In the pre-Sagarmala period, the Port of Deendayal (DPA), Jawaharlal Nehru Port (JNPA) and Vizag Port (VPA) had the highest average TFP among all major ports. In the post-Sagarmala period, Paradip (PPA) Deendayal (DPA) and Jawaharlal Nehru

(JNPA) had the highest average TFP. Overall, DPA, PPA and JNPA have been the top three productive ports (Table 6).

The TFPG rates have shown rise in the post-inauguration of the *Sagarmala* programme. Pre-Sagarmala period, six ports had positive average TFPG with highest growth experienced in Paradip port (PPA) and V.O. Chidambaram Port (VOCA). In the post-Sagarmala period, eight ports had positive average TFPG with highest growth experiences by DPA, followed by PPA. When considering the whole period, nine ports had positive average TFPG with DPA having the highest productivity levels, followed by PPA. One can infer that the Paradip Port

**Table 7: India's Maritime Development Programme**

| Initiative                                                 | Primary objectives                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| National Maritime Development Programme (NMDP) (2005-2012) | <ul style="list-style-type: none"> <li>To modernize port infrastructure through adding new cargo handling facilities, construction/upgradation of berths, deepening of channels, rail/road connectivity projects, equipment upgradation/modernization schemes and other related schemes for creation of backup facilities.</li> <li>To benchmark the performance of ports to international standards.</li> </ul>                                                                                                                              |
| Sagarmala (2015 – 2023)                                    | <ul style="list-style-type: none"> <li>To reduce logistics cost for both domestic and export-import cargo with minimal infrastructure investment.</li> <li>To implement projects for port modernization, port connectivity, port-led industrialization, coastal community development, and coastal shipping and IWT.</li> </ul>                                                                                                                                                                                                               |
| India Maritime Vision 2030 (Introduced in 2021)            | <ul style="list-style-type: none"> <li>To strengthen India's position in the global maritime sector, MIV 2030 identifies over 150 initiatives across various maritime sub-sectors like ports, shipping and waterways.</li> <li>These initiatives particularly focus on operational efficiency improvement, port-driven industrialization and creating safe and sustainable world class ports to address the growing trade volume needs, as well as reducing logistics cost through better evacuation and cost-effective processes.</li> </ul> |
| Maritime Amrit Kaal Vision 2047 (Introduced in 2023)       | <ul style="list-style-type: none"> <li>The Amrit Kaal Vision 2047 builds on the MIV 2030 with an aim to develop world-class ports and promote inland water transport, coastal shipping, and a sustainable maritime sector.</li> <li>It encompasses aspirations in logistics, infrastructure, and shipping, supporting India's 'Blue Economy' for enhancing ports, shipping, and waterways by 2047.</li> </ul>                                                                                                                                 |

Source: Author's own compilation based on several secondary sources

has shown consistent rise in productivity since 2000. Annexure 2 presents the trends in TFP and TFPG for the period 2000-2022.

Note that although some Indian major ports such as Paradip, Jawaharlal Nehru, Deendayal have shown improvement in productivity levels post implementation of *Sagarmala* programme, other ports such SMP Haldia and SMP Kolkata have not shown any improvement in productivity levels post-*Sagarmala*. Therefore, there seems to be an increase in divergence among major ports in terms of productivity level (as measured by Coefficient of Variation (CV)) post-*Sagarmala*.

## India's Maritime Development Programmes

To add further impetus to the maritime sector and scale up the development, India has subsequently introduced the National Maritime Development Programme (NMDP)<sup>14</sup>, *Sagarmala*, *Maritime India Vision 2030* (MIV 2030) and *Maritime Amrit Kaal Vision 2047* (MAKV 2047). Table 7 provides objectives and initiatives of key maritime development programmes of India. From it, we infer that boosting performance and productivity of India's maritime sector has remained one of the prime objectives of these initiatives.

One of the flagship initiatives of the Ministry of Ports, Shipping and Waterways is the *Sagarmala* Programme, which presents a new vision of the Government of India while transforming the country's maritime sector. It includes project implementation through various funding mechanisms such as Equity, Grant in Aid, Internal Resources, Public Private Partnership (PPP) mode, etc. with relevant stakeholders such as Central Ministries, State Maritime Boards, Major Port Authorities, State Governments, etc. The number of projects under the PPP has increased gradually re-defining performance through capacity augmentation, efficiency and productivity enhancement as well as increased competition.<sup>15</sup>

In particular, India's key maritime initiatives include expanding port capacity, improving infrastructure, developing inland waterways, and promoting a sustainable Blue Economy. Regulatory reforms include the Major Port Authorities Act, 2021 and the Indian Ports Bill, 2025, while sustainability is being addressed through the Green Tug Transition Programme (GTTP).<sup>16</sup> While increasing the capacity of major ports, the MoPSW has been striving to improve the operational efficiencies through mechanization, digitization and process simplification. As a result, some of the key efficiency parameters have improved considerably during the last one decade.<sup>17</sup> In a historic move, Indian Parliament has passed five key maritime acts, namely, Bills of Lading Act 2025, the Carriage of Goods by Sea Act 2025, the Coastal Shipping Act 2025, the Merchant Shipping Act 2025, and the Indian Ports Act 2025 in 2025, leading to overhaul the maritime sector in India.

Some of the futuristic initiatives<sup>18</sup> also include (i) setting up Maritime Development Fund (MDF) with a starting corpus of Rs.25,000 crore for long-term financing for the maritime sector; (ii) promoting Green Shipping with development of green hydrogen hubs and designated zero-emission shipping routes, with targets to reach 60 per cent port energy from renewables by 2030; (iii) revitalizing shipbuilding and maritime ecosystem with a comprehensive package of Rs.69,725 crore (US\$ 8 billion). Under this package, the Shipbuilding Financial Assistance Scheme (SBFAS) will be extended until 31 March 2036 with a total corpus of Rs. 24,736 crore.

## Conclusions

The acceleration of the productivity after the implementation of the *Sagarmala* programme suggests that investments in infrastructure development have yielded positive results as manifested in the improved productivity levels of major ports. Deendayal, Jawaharlal Nehru

and Paradip are the top three productive ports in the country. These ports have been front runners in port KPIs since 2010. To retain the momentum, the *MIV 2030* and *MAKV 2047* have suggested several new initiatives in these ports including upgrading the Deendayal and Paradip ports to deep-drafts ports, developing them as Green Hydrogen/ Ammonia Hubs under the National Hydrogen Mission.<sup>19</sup> It is no surprise that Paradip Port has earned Rs 1,570 crore (US\$ 188 million) with a 21 per cent rise in net surplus, while Jawaharlal Nehru Port reported a net surplus of Rs 1,263.94 crore (US\$ 151 million) for the year 2023.<sup>20</sup>

The government has undertaken initiatives for the adoption of advanced technologies like automation and Artificial Intelligence (AI) to further enhance productivity in ports.

By 2030, India's annual port capacity is likely to exceed 3,000 million tonnes. To achieve this target, involvement of the private

sector is important, besides government's active guidance and engagement. Landlord port model only pays when the port and port services are managed by the private operators. Private investment in the maritime sector is crucial for infrastructure development, enhancing operational efficiency, and boosting global competitiveness. In a turbulent time when the global uncertainties are looming large, domestic reforms aiming to improve efficiency and productivity of ports, skilling and human resources development, adoption of advanced technologies like automation and Artificial Intelligence (AI), compliance to global security, etc. will help strengthen the maritime sector.

[Author is grateful to Ms Vanshika Goyal for her research assistance. Author also acknowledges Mr Arpit Barman for his contribution as co-author in previous studies on this subject.]

## Annexure 1

### Basic Maritime Profile of India

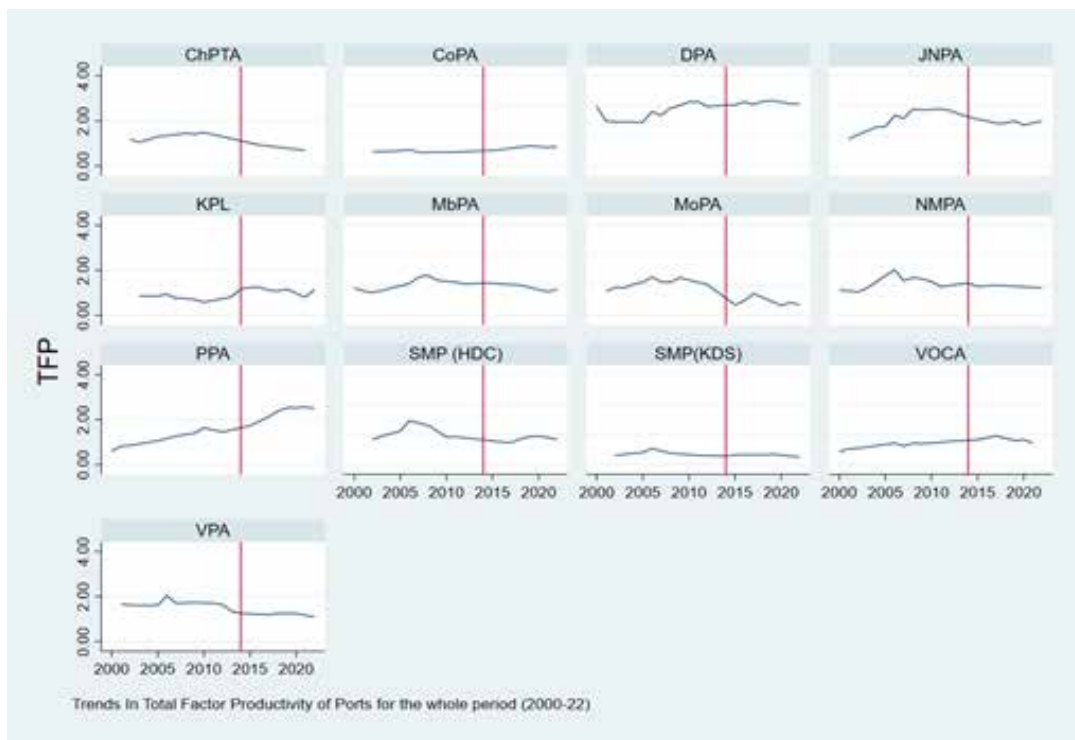
|                                             | 2018-19 | 2019-20 | 2020-21 | 2021-22 | 2022-23 | 2023-24 | CAGR<br>(2018-19 -<br>2023-24) (%) |
|---------------------------------------------|---------|---------|---------|---------|---------|---------|------------------------------------|
| <b>No. of Ports (Number)</b>                |         |         |         |         |         |         |                                    |
| Major Ports                                 | 12      | 12      | 12      | 12      | 12      | 12      |                                    |
| Non-Major Ports                             | 212     | 212     | 212     | 217     | 217     | 217     |                                    |
| Total                                       | 224     | 224     | 224     | 229     | 229     | 229     |                                    |
| <b>Cargo Handled (Million Tonnes)</b>       |         |         |         |         |         |         |                                    |
| Major Ports                                 | 699.17  | 704.93  | 672.68  | 720.05  | 784.31  | 819.29  | 3.2                                |
| Non-Major Ports                             | 582.61  | 615.05  | 577.3   | 603.75  | 651.02  | 723.59  | 4.4                                |
| Total                                       | 1281.78 | 1319.98 | 1249.98 | 1323.8  | 1435.33 | 1542.88 | 3.8                                |
| <b>Containers</b>                           |         |         |         |         |         |         |                                    |
| In number ('000 TEUs)                       | 9877    | 9892    | 9610    | 11225   | 11425   | 12311   | 4.5                                |
| In volume ('000 Tonnes)                     | 145523  | 146861  | 143710  | 167381  | 170284  | 181260  | 4.5                                |
| <b>Passenger Traffic ('000 Nos.)</b>        |         |         |         |         |         |         |                                    |
| Major Ports                                 | 522     | 710     | 44      | 235     | 522     | 624     | 3.6                                |
| Non-Major Ports                             | 24551   | 21005   | 9812    | 14951   | 29551   | 32198   | 5.6                                |
| Total                                       | 25073   | 21715   | 9856    | 15186   | 30073   | 32822   | 5.5                                |
| <b>Performance Indicators : Major Ports</b> |         |         |         |         |         |         |                                    |
| a) Total Cargo Vessels Sailed (Nos.)        | 21872   | 21803   | 20371   | 20977   | 22554   | 23989   |                                    |
| b) Av. Turn Round Time (Hours)              | 65.52   | 50.88   | 52.32   | 53.34   | 51.48   | 52.85   |                                    |
| c) Av. Pre-berthing Detention (Hours)       | 26.4    | 22.8    | 24.96   | 18.82   | 19.29   | 14.14   |                                    |
| On Port Account                             | 8.16    | 6.96    | 5.54    | 6.14    | 8.84    | 6.77    |                                    |
| On Non-Port Account                         | 18.24   | 15.84   | 24.87   | 18.96   | 10.76   | 9.88    |                                    |
| d) Output per Ship berth day (Tonnes)       |         |         |         |         |         |         |                                    |
| Container                                   | 21839   | 21914   | 19171   | 21002   | 22730   | 23570   |                                    |
| Break Bulk                                  | 4699    | 5143    | 4349    | 3938    | 4586    | 4890    |                                    |
| Dry Bulk - Mechanical                       | 29820   | 29594   | 29303   | 30300   | 31439   | 33560   |                                    |
| Conventional                                | 19243   | 18409   | 18738   | 19533   | 20118   | 19579   |                                    |
| Liquid Bulk                                 | 25818   | 26180   | 19838   | 25272   | 26227   | 26643   |                                    |

\*Including both domestic and overseas cargoes handled by Indian ports

Source: Basic Port Statistics of India 2023-24, MoPSW

## Annexure 2

### Trends in TFP and TFPG for the Period 2000-2022



Source: Author's own estimation

## Endnotes

- <sup>1</sup> Refer, for example, UNCTAD (2025) *Review of Maritime Transport 2025*, Geneva, available at <https://unctad.org/publication/review-maritime-transport-2025>
- <sup>2</sup> PIB, Sagarmanthan 2024: India's Maritime Vision <https://pib.gov.in/PressNoteDetails.aspx?NoteId=153432&ModuleId=3&reg=3&lang=1>
- <sup>3</sup> As reported in the Basic Port Statistics of India 2023-24, MoPSW, New Delhi, available at <https://shipmin.gov.in/content/basic-port-statistics-india-2023-24>
- <sup>4</sup> Refer, for example, <https://www.worldbank.org/en/news/press-release/2024/06/01/regional-disruptions-drive-changes-in-global-container-port-performance-ranking>
- <sup>5</sup> Refer, Basic Ports Statistics 2022-23, Government of India (2024) *Basic Port Statistics of India*. Delhi: Ministry of Ports, Shipping & Waterways, Transport Research Wing, New Delhi
- <sup>6</sup> *ibid*
- <sup>7</sup> Refer, De, Prabir (2006) "Total factor productivity growth: Indian ports in the era of globalisation." *Maritime Economics & Logistics* 8: 366-386; Gaur P., Shivani P., and Tarun S. (2011) "Ports face inadequate capacity, efficiency and competitiveness in a developing country: case of India." *Maritime Policy & Management* 38, no. 3 (2011): 293-314; Mandal, Anindita, Soma Roy chowdhury, and Jhumoor Biswas (2016) "Performance analysis of major ports in India: a quantitative approach." *International Journal of Business Performance Management* 17 (3): 345-364.
- <sup>8</sup> Goldar and Paul (2018) argued that improved port efficiency enhances competitiveness of India's manufactured exports enabling Indian manufacturing firms to export more. Goldar, Bishwanath and Mahua Paul (2018) "Impact of Port Infrastructure Development and Operational Efficiency of Ports on Export Performance: A study of manufactured product exports from India", Paper presented at the 14th Annual Conference on Economic Growth and Development, 19-21 December 2018, Indian Statistical Institute, New Delhi.
- <sup>9</sup> Refer to Ahluwalia, I J (1991) *Productivity and Growth in Indian Manufacturing sector*. Delhi: Oxford University Press; Virmani, A. (2004) "Sources of India's economic growth: trends in total factor productivity." ICRIER, New Delhi; Goldar, B (2022) "Did trade liberalization boost total factor productivity growth in manufacturing in India in the 1990s?" *International Productivity Monitor*, 43, 110-139; Goldar, B., Chattopadhyay, S. K., Nath, S., Sengupta, S., and Das, P. C. (2023) "Determinants of Total Factor Productivity Growth in India", *Theoretical Economics Letters*, 13, 683-718
- <sup>10</sup> Refer, for example, De (2009). Also refer, Virmani and Hashim (2011) who argued that the fall in productivity in the post-reform era was the result of technological obsolescence. Virmani, A., and Hashim, M. D. A. (2011) J-curve of productivity and growth: Indian manufacturing post-liberalization. International Monetary Fund (IMF), Washington, D.C
- <sup>11</sup> See, MoPSW, <https://shipmin.gov.in/>
- <sup>12</sup> Refer, De, Prabir and Arpit Barman (2025) "Assessing the Productivity of India Ports" in Maiti, Dibyendu et al. (eds.) *75 Years of Growth, Development and Productivity in India: Issues, Measures, Causes, and Impacts*, Springer Nature, Singapore, [https://link.springer.com/chapter/10.1007/978-981-97-8054-9\\_23](https://link.springer.com/chapter/10.1007/978-981-97-8054-9_23)
- <sup>13</sup> Refer, Annexure 2 for the trend of the TFP and TFGP across major ports.
- <sup>14</sup> See PIB, <https://pib.gov.in/newsite/PrintRelease.aspx?relid=133484>
- <sup>15</sup> Public Private Partnerships (PPP) in Maritime Sector, Maritime Amrit Kaal Vision 2047.
- <sup>16</sup> Refer, <https://www.pib.gov.in/PressReleasePage.aspx?PRID=2155540>
- <sup>17</sup> See, Sagarmala programme site, <https://sagarmala.gov.in/project/port-modernization>
- <sup>18</sup> Refer, <https://www.pib.gov.in/PressReleasePage.aspx?PRID=2170573>
- <sup>19</sup> Maritime Amrita Kaal Vision 2047, PIB: <https://pib.gov.in/PressReleaseIframePage.aspx?PRID=2080010>
- <sup>20</sup> Sagarmanthan 2024, PIB: <https://pib.gov.in/PressNoteDetails.aspx?NoteId=153432&ModuleId=3&reg=3&lang=1>





# FDI as Driver of India's Maritime Vision

Kartik Kishore and Prabir De

India's maritime sector is undergoing a massive transformation, driven by ambitious policy initiatives and substantial infrastructure investments. This transformation is anchored in the *Maritime Amrit Kaal Vision (MAKV) 2047*, which outlines India's comprehensive roadmap to become a global maritime powerhouse through investments worth US\$ 95-100 billion<sup>1</sup> over the next 25 years.

Foreign Direct Investment (FDI) has emerged as a fundamental driver of economic growth for major economies worldwide. According to the World Bank's latest findings, FDI inflows have a positive impact on economic output in emerging market and developing economies (EMDEs), with a 10 per cent increase in FDI inflows estimated to increase GDP by 0.3 per cent after three years. However, this effect becomes much stronger – up to 0.8 per cent – in economies with greater trade openness, stronger institutions,



better human capital development, and lower informality (World Bank, 2025). The MAKV 2047 also recognizes FDI as a critical enabler in achieving India's maritime ambitions.

However, despite these policy initiatives and India's strategic maritime advantages, the country faces significant challenges in attracting sustained FDI flows to its maritime sector. As noted in Shukla (2025), India finds itself "caught in the crosscurrents of global rebalancing" in FDI patterns. This decline occurs within a broader global context where FDI inflows to emerging markets have weakened steadily, dropping to around 2 per cent of GDP in recent years, approximately half the share during the peak year of 2008 (World Bank, 2025).

Against this backdrop, this article aims to examine the trends in FDI inflows to India's maritime sector. The study begins by examining the global landscape of FDI distribution, and through this examination, it seeks to understand the impact of several landmark policy measures over last 5 to 8 years to attract foreign investment in India's maritime sector and propose a way forward.

## Overview of Global FDI

The FDI is a cross-border investment where an individual, company, or government establishes lasting business interests in another country. FDI brings critical benefits such as capital inflows, technology transfer, managerial know-how, and access to global markets, which are important drivers of economic growth and productivity improvements (Borensztein et al., 1998). Given the crucial role of FDI in shaping economic development, understanding its distribution across countries provides insight into global investment patterns and economic dynamics.

To capture this global landscape, we look at the top ten FDI recipient countries ranked by their share in net FDI inflows in 2024 (we take 5-year moving average to balance-out the year-on-year fluctuation).

Table 1 presents the world shares of net FDI inflows for the leading ten recipients. The United States remains the dominant recipient with a 21.9 per cent share in 2024, driven by its large market and investor-friendly policies. China continues to hold the second position with 10.4 per cent. Singapore, a key financial

**Table 1: Net FDI Inflows by World: Share of Top-10 FDI Recipients**

| Country       | 2000 | 2005 | 2010 | 2015 | 2020 | 2024 | Rank (2024) |
|---------------|------|------|------|------|------|------|-------------|
|               | (%)  |      |      |      |      |      |             |
| United States | 22.2 | 16.0 | 12.7 | 13.5 | 16.3 | 21.9 | 1           |
| China         | 2.7  | 6.7  | 7.9  | 11.8 | 13.2 | 10.4 | 2           |
| Singapore     | 1.0  | 1.7  | 1.7  | 2.7  | 5.3  | 8.8  | 3           |
| Germany       | 15.8 | 4.8  | 3.1  | 2.7  | 8.1  | 7.2  | 4           |
| Brazil        | 2.1  | 1.8  | 2.2  | 3.8  | 3.9  | 4.0  | 5           |
| UK            | 10.5 | 9.6  | 6.2  | 2.1  | 5.9  | 3.5  | 6           |
| France        | 2.6  | 5.4  | 2.5  | 1.4  | 2.9  | 3.4  | 7           |
| Spain         | 2.6  | 3.4  | 1.9  | 1.3  | 2.7  | 3.2  | 8           |
| Canada        | 4.4  | 1.8  | 2.5  | 2.5  | 2.2  | 3.1  | 9           |
| India         | 0.2  | 0.6  | 1.5  | 1.5  | 3.0  | 2.9  | 10          |

*Note:* The world shares of Net FDI Inflows are calculated as 5-year moving average to balance-out the high fluctuations. The ranking is based as per the latest share of FDI Inflows in 2024.

*Source:* Authors' calculation based on World Development Indicators (WDI), World Bank.

and logistics centre, ranks third with nearly 9 per cent.

Among the European Union members, Germany (7.2 per cent), France (3.4 per cent), and Spain (3.2 per cent) are major recipients of FDI, with Germany recovering its share after previous declines. The United Kingdom holds a notable position despite its changing political-economic context, with a share of 3.5 per cent. From the developing countries, besides Brazil (4.0 per cent), India stands out as the only other developing economy in the top ten, growing its share from a marginal 0.2 per cent in 2000 to 2.9 per cent in 2024. This near-tripling of India's share highlights its growing stature as an attractive destination for foreign investment.

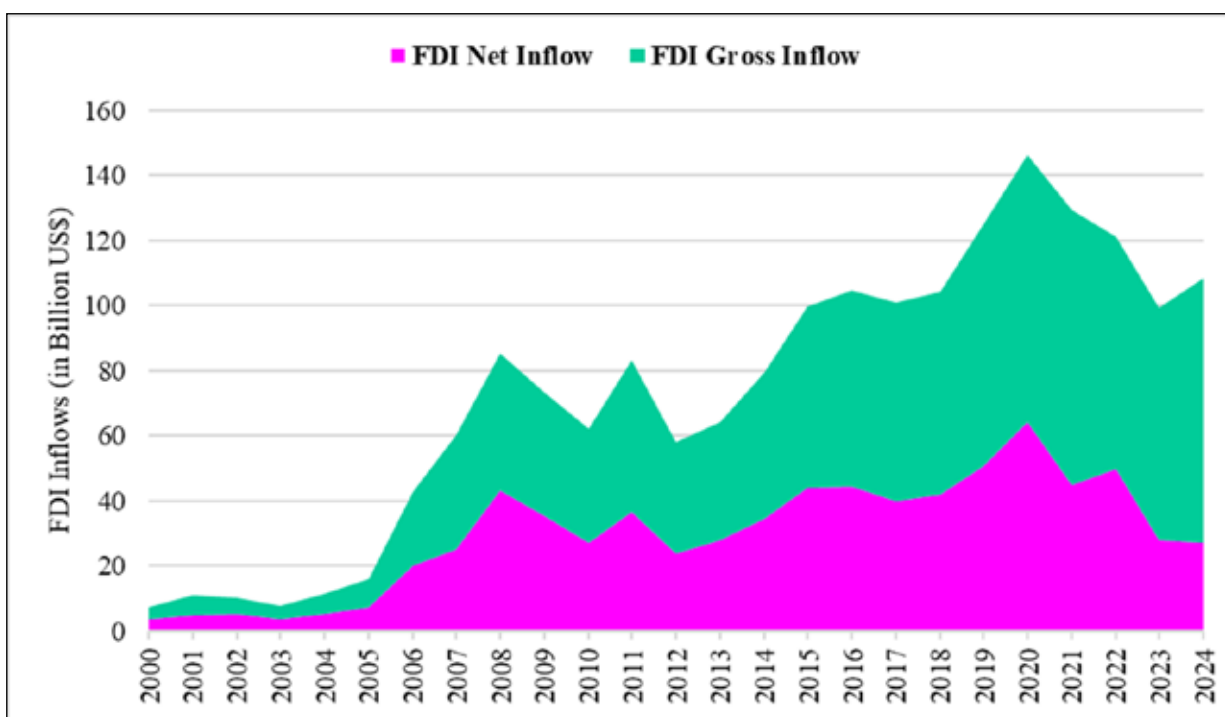
These trends illustrate the enduring dominance of advanced economies in global FDI allocation, while emphasizing the rising influence of key emerging markets like China, Brazil, and India.

## Trends in FDI Inflows in India

The FDI inflows in India over the period 2000 to 2024 can be analysed using two important metrics: Gross FDI inflows and Net FDI inflows. Gross FDI inflows essentially capture all new foreign equity investments made in Indian companies, reflecting the overall scale of foreign investment activity within the economy. In contrast, Net FDI inflows, as defined by the World Bank, calculate the balance of foreign investment after accounting for outward flows.

Examining the observed trends, both gross and net FDI inflows experienced significant growth since 2000, showing India's increasing integration into the global economy. Gross inflows reported by the DPIIT surged from about US\$ 4 to 6 billion annually in the early 2000s to over US\$ 80 billion in recent years (Figure 1). This rise signals strong investor confidence and the effectiveness of government initiatives aimed at improving the investment

**Figure 1: Trends in Gross and Net FDI Inflows in India (2000-2024)**



**Source:** Gross FDI Inflows are from Department for Promotion of Industry and Internal Trade, Govt. of India; Net FDI Inflows are from World Development Indicators (WDI).

climate. The net inflows followed a similar upward trajectory initially, increasing steadily to around US\$ 40 to 50 billion by 2019–2020.

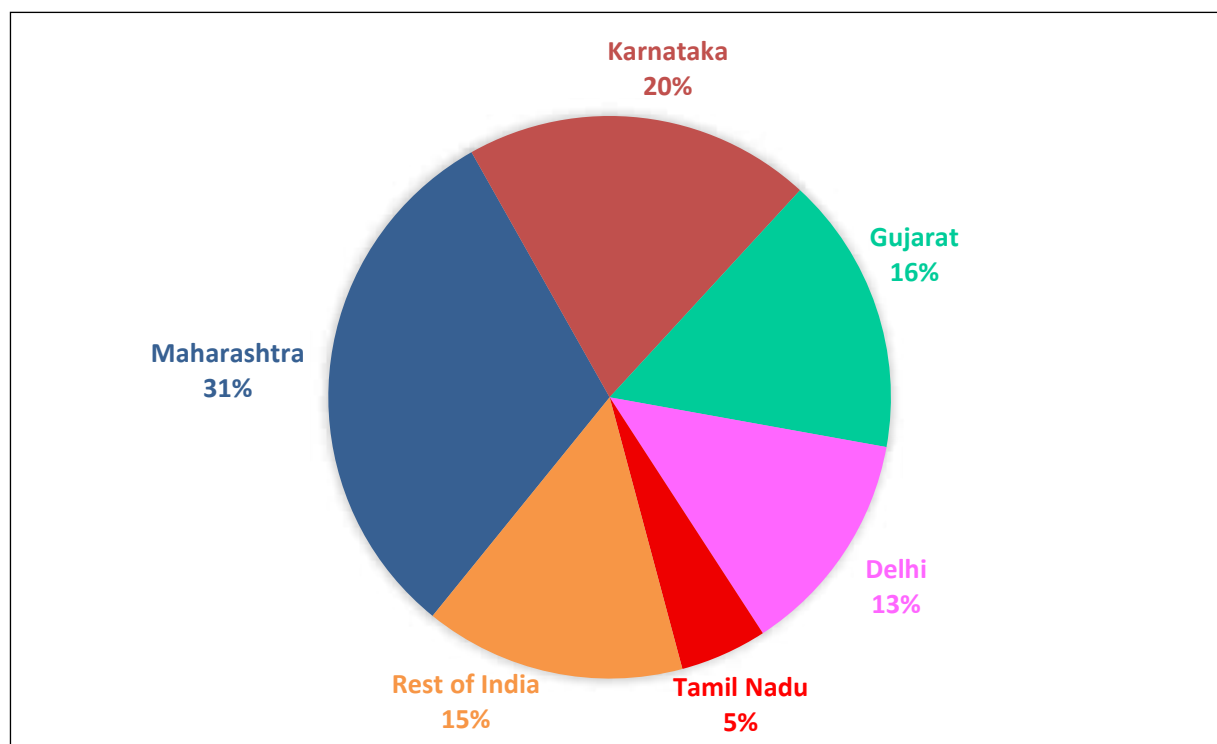
However, substantive divergence emerges post-2020, with gross inflows remaining high, but net inflows declining sharply to approximately US\$ 27 billion in 2024. This widening gap primarily results from increasing outbound investments such as profit repatriation and disinvestment activities by foreign-owned firms.

Following the discussion on trends in Gross and Net FDI inflows in India, it is essential to examine how foreign investment is distributed among Indian states. The data reveal a striking concentration of FDI equity inflows within a limited number of states. Specifically, the top five states – Maharashtra, Karnataka, Gujarat, Delhi, and Tamil Nadu – together account for a

commanding 85 per cent of the total FDI inflows received by India during October 2019 to March 2025 (DPIIT) (Figure 2). This pattern highlights a pronounced disparity in FDI attraction, with a majority of foreign capital flowing into a small group of regions.

This high concentration of FDI in a few states holds significance for the maritime sector when we look at the differences between western and eastern parts of India (Table 2). Western states such as Maharashtra, Karnataka, and Gujarat together receive more than two-third of total FDI inflows, while eastern states such as West Bengal (0.67 per cent), Odisha (0.06 per cent), and Andhra Pradesh (0.4 per cent) received much smaller shares. This regional difference is important because the eastern coast of India has important ports including Kolkata, Paradip, Visakhapatnam, and Chennai, which handle large amount of cargo and serve as key entry

**Figure 2: States Attracting Highest FDI Equity Inflow (2025)**



**Note:** The shares are based on the cumulative FDI Inflows from October 2019 to March 2025 (as per available data)

**Source:** Department for Promotion of Industry and Internal Trade, Government of India

**Table 2: FDI Disparity between Western and Eastern Coastal States of India**

| State       | FDI (US\$ billion) | Share (%) |
|-------------|--------------------|-----------|
| Maharashtra | 88.7               | 31.4      |
| Karnataka   | 57.6               | 20.4      |
| Gujarat     | 44.9               | 15.9      |
| Tamil Nadu  | 14.6               | 5.2       |

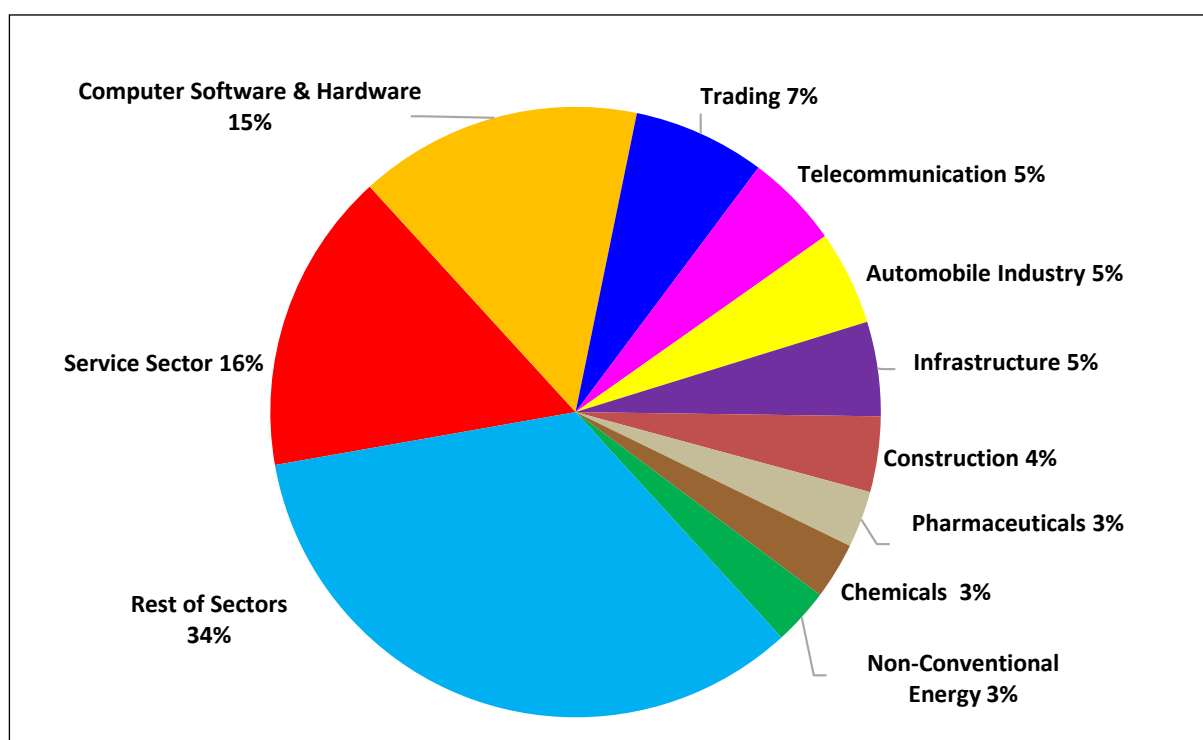
| State          | FDI (US\$ billion) | Share (%) |
|----------------|--------------------|-----------|
| West Bengal    | 1.9                | 0.67      |
| Kerala         | 1.4                | 0.49      |
| Andhra Pradesh | 1.1                | 0.4       |
| Odisha         | 0.2                | 0.06      |

*Note:* Shares are based on the cumulative FDI Inflows from October 2019 to March 2025 (as per available data).

*Source:* Department for Promotion of Industry and Internal Trade, Government of India

points for international and domestic trade. Despite having these port facilities, research shows clear differences in port performance and investment attraction between the western and eastern coasts. According to CRISIL's study on India's port sector, west coast ports together handle about 60 per cent of India's total cargo traffic, whereas east coast ports handle the remaining 40 per cent (CRISIL, 2023).

The sectoral distribution of FDI equity inflows in India shows that top 10 sectors are recipients of two-third of total FDIs in India. Notably, the maritime sector, which includes both sea transport and ports, does not feature among these top-performing sectors, highlighting the relatively limited foreign investment attraction in India's maritime industry despite its strategic importance to the country's trade and economic growth.

**Figure 3: Top 10 Sectors with Highest FDI Equity Inflow in India, 2025**

*Note:* The shares are based on the cumulative FDI Inflows from April 2000 to March 2025 (as per available data).

*Source:* Department for Promotion of Industry and Internal Trade, Government of India

## FDI Inflows in Maritime Sector

We now look more closely at FDI in India's maritime sector. For this analysis, we consider investments in both Sea Transport and Ports sectors as reported by the DPIIT to represent the broader maritime sector. Figure 4 shows how FDI equity inflows to the maritime sector have changed as a share of total FDI equity inflows in India from 2017 to 2025.

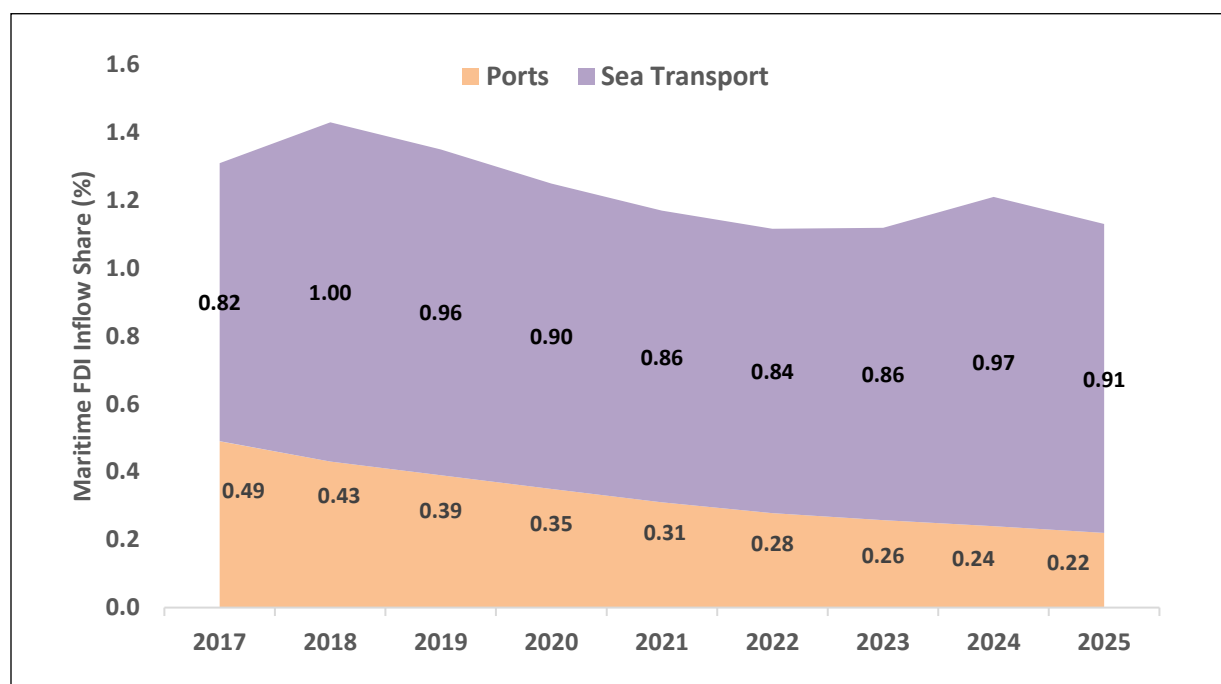
In 2017, ports sector commanded 0.49 per cent of total FDI equity inflows, while sea transport held 0.82 per cent. By 2025, this distribution had reversed, with ports sector declining by more than half to just 0.22 per cent whereas sea transport maintained a relatively stable share at 0.91 per cent. The decline in port sector's FDI share can be attributed to the sector receiving relatively constant absolute FDI inflows since 2017 (from when the data is available on DPIIT). While India's total FDI equity inflows have grown substantially during

this period, the cumulative FDI in the port sector has remained largely stagnant

In contrast, the Sea Transport sector has shown more dynamic patterns, with its share fluctuating between 0.82 per cent and 1 per cent over the last eight-years. The sector experienced its highest share in 2018 (1.00 per cent) and 2024 (0.97 per cent), with notable dips in 2020-2022. These fluctuations likely reflect the cyclical nature of shipping investments and the sector's sensitivity to global trade conditions, regulatory changes, and market opportunities in coastal shipping and inland waterways development.

Academic literature on FDI in India's maritime sector provides several explanations for these trends. Aravindan (2019) note that while India allows 100 per cent FDI in ports and shipping under the automatic route, the capital-intensive nature of port infrastructure and long payback periods create barriers to sustained investment growth. The study emphasizes

**Figure 4: Trends in FDI in Maritime Sector by Share of Total FDI Equity Inflow**



**Note:** Investments under heads of Sea Transport and Ports are considered to be two components of Maritime Sector. The shares are based on the cumulative FDI Inflows from April 2000 to March 2017 and subsequent years (as per available data).

**Source:** Department for Promotion of Industry and Internal Trade, Government of India

that port development requires substantial investments, with estimates suggesting India needs around US\$ 20 billion to increase container capacity to match economic growth projections.

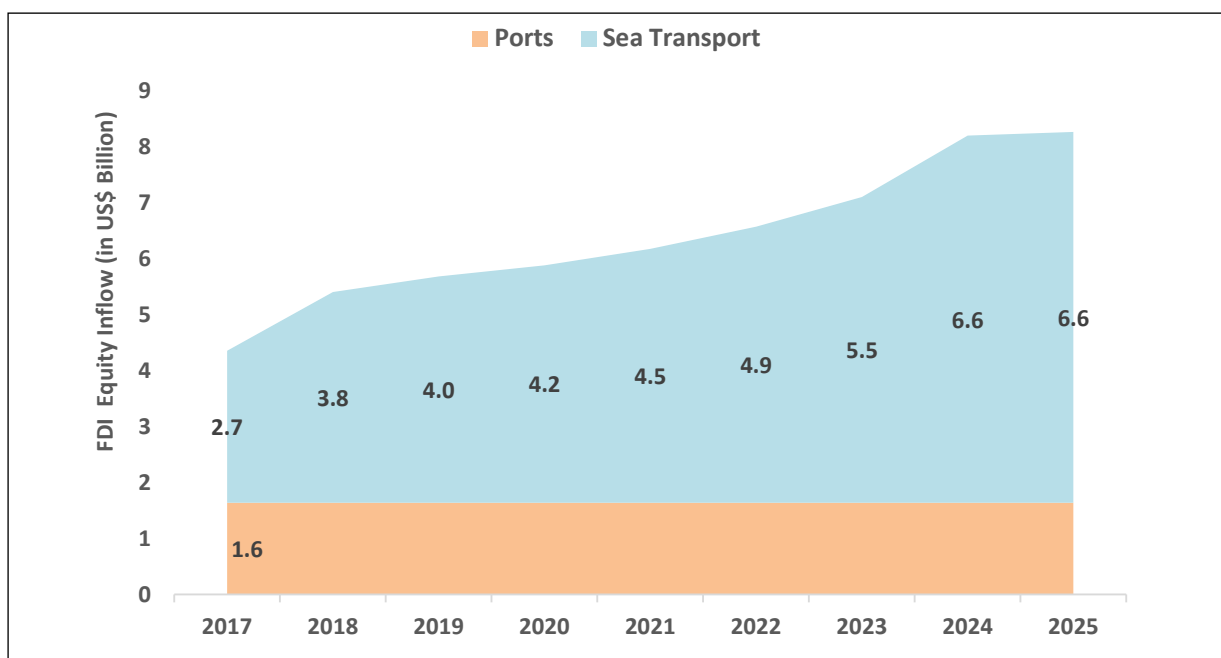
Research by CRISIL (2023) highlights that the ports sector faces unique challenges including regulatory complexities, environmental clearances, and coordination requirements across multiple agencies, which may explain the stagnant FDI patterns. The study notes that while policy frameworks are supportive, execution challenges continue to impact investor confidence in large-scale port infrastructure projects.

The maritime sector literature also suggests that the shift toward sea transport investments reflects India's focus on coastal shipping development and inland waterways under initiatives like the Sagarmala Programme and Maritime India Vision 2030. These policy

frameworks have created new investment opportunities in shipping services, coastal connectivity, and multimodal transport solutions, potentially explaining the relatively better performance of Sea Transport FDI compared to traditional port infrastructure investments (Government of India, 2024).

Building on the previous analysis, cumulative FDI equity inflows in the Sea Transport sector have grown steadily from US\$ 2.7 billion in 2017 to US\$ 6.6 billion by 2025, reflecting continuous investor interest in shipping services and coastal connectivity. In contrast, cumulative FDI inflows under the Ports head have remained effectively unchanged at around US\$ 1.6 billion throughout this period, mirroring the sector's earlier stagnation in annual inflows. The total investment in the maritime sector (which includes the sea transport and ports) have increased by close to 2.5 times in last 8 years, from US\$ 3.3 billion in 2017 to US\$ 8.2 billion in 2025 (Figure 5).

**Figure 5: Cumulative FDI Equity Inflow in Maritime Sector since April 2000**



**Note:** Investments under heads of Sea Transport and Ports are considered to be two components of Maritime Sector. The shares are based on the cumulative FDI Inflows from April 2000 to March 2017 and subsequent years (as per available data).

**Source:** Department for Promotion of Industry and Internal Trade, Government of India (data available from 2017)

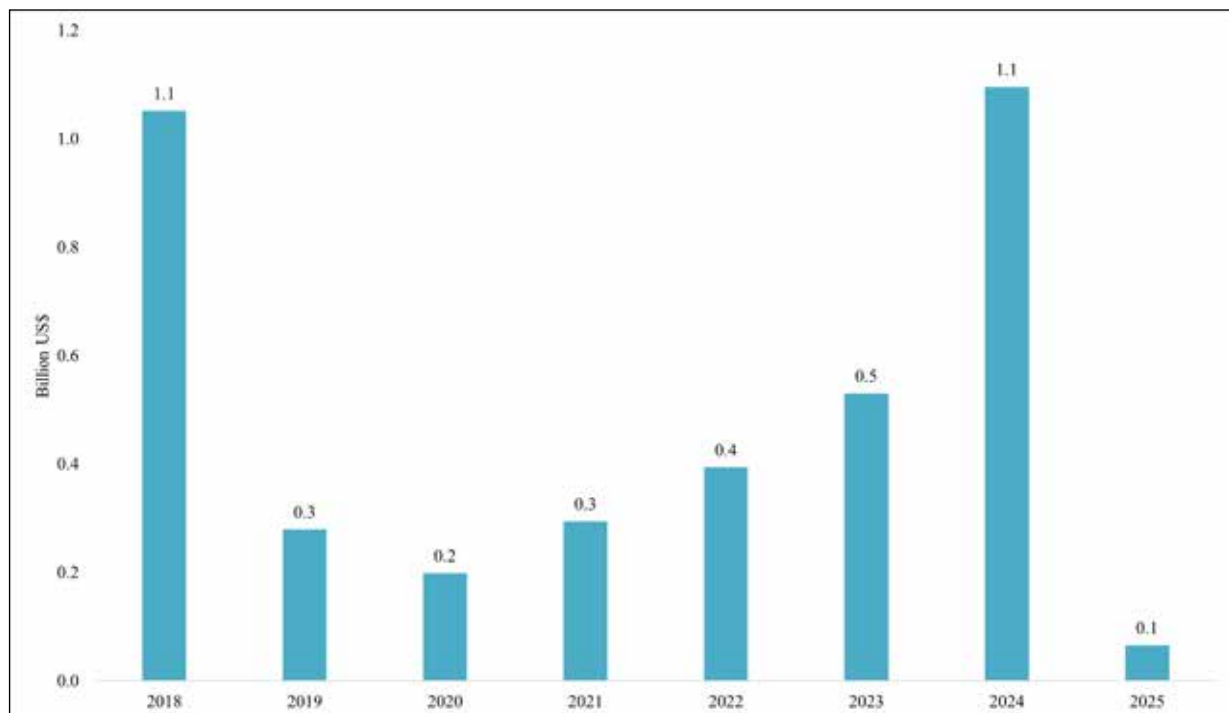
The investment growth in the maritime sector has been led by mainly the transports segment. The change in FDI equity inflows under the Sea Transport head has always been positive since 2018 (earliest data available on DPIIT). This is the reflection of the investment growth of the maritime sector.

However, the inflow of FDI under Ports segment has been constant and thus the change has been zero. Research indicates that, despite 100 per cent FDI allowance under the automatic route, port infrastructure investments face long gestation periods and complex regulatory requirements, which have constrained sustained growth in foreign equity (Aravindan and Prasad, 2019).

## Foreign Investors in India's Maritime Sector

The Government of India has undertaken several policy and institutional initiatives in recent years to attract the FDI into the maritime and port sectors. Under the *Maritime India Vision 2030* and *Maritime Amrit Kaal Vision 2047* framework, the MoPSW has outlined over 150 strategic projects aimed at enhancing port capacity, efficiency, and private participation. The government permits 100 per cent FDI under the automatic route for port development, operation, and maintenance, and provides a 10-year tax holiday for enterprises engaged in such projects (NITI Aayog, 2021). Table 3 provides a look at the core group of foreign investors that continue to maintain significant operations across major ports.

**Figure 6: Change in FDI Equity Inflow of Sea Transport (2018-25)**



Source: Department for Promotion of Industry and Internal Trade, Government of India (data available from 2017)

**Table 3: Established Foreign Investors in India's Port Sector**

| Country          | Company                                      | Key Operations                                                                  | Status                                    |
|------------------|----------------------------------------------|---------------------------------------------------------------------------------|-------------------------------------------|
| Denmark          | AP Moller Maersk                             | APM Terminals; controlling stake in Gujarat Pipavav Port Ltd (1.35 M TEUs)      | Active since 2005                         |
| Singapore        | PSA Singapore                                | 15 container berths at Tuticorin, Chennai, Mumbai, Kolkata                      | Active investor                           |
| UAE <sup>2</sup> | Dubai Ports World                            | Terminals at Vizag, Chennai, Cochin, Nhava Sheva, Mundra; 2 of 5 JNPA terminals | Active operator across major Indian ports |
| South Korea      | Hyundai Engineering and Construction Company | Port development projects                                                       | Active investor                           |

*Source:* Authors' compilation from (Aravindan et al., 2019) and mainstream news reports

Recent institutional reforms have further strengthened the investment climate. The Major Port Authorities Act, 2021 grants greater autonomy to port boards, allowing them to enter into joint ventures and FDI partnerships more flexibly. Moreover, the Government is setting up the Maritime Development Fund and Port Community System 2.0 to streamline digital transactions and facilitate investor engagement. These initiatives have further strengthened the investment environment. Table 4 enlists the major new investors into India's maritime sector.

It is important to note that there are some major global players in maritime sector, which India can target to give a boost to the investments. Some of these companies are Abu Dhabi Ports (UAE), DP World (UAE), Hamburg's HHLA (Germany), CMA CGM (France), MSC (Switzerland), Evergreen Marine (Taiwan), and NYK/KK Line (Japan). The state port authorities, particularly, on the eastern coast may target them to give a much needed push to the stagnant foreign investments in the port and shipping sector.

**Table 4: Major New Foreign Investments in India's Maritime Sector (2024–2025)**

| Country                  | Company                       | Investment Amount                               | Year | Significance                                                | Maritime sub-sector      |
|--------------------------|-------------------------------|-------------------------------------------------|------|-------------------------------------------------------------|--------------------------|
| Germany <sup>3</sup>     | Hapag-Lloyd                   | Not disclosed                                   | 2023 | Strategic terminal investment                               | Shipping (Logistics)     |
| South Korea <sup>4</sup> | HD Hyundai/KSOE               | Not disclosed                                   | 2024 | MoU with Cochin Shipyard Limited on Shipbuilding Technology | Shipbuilding & Repair    |
| Cyprus <sup>5</sup>      | Interorient Navigation Co Ltd | INR 10,000 crore (~US\$1.13 billion) (combined) | 2025 | Largest FDI in Indian maritime sector since 2005            | Shipping (Sea Transport) |
| Denmark <sup>6</sup>     | Danship & Partners Ltd        | INR 10,000 crore (~US\$1.13 billion) (combined) | 2025 | All vessels under Indian flag; strategic European entry     | Shipping (Sea Transport) |

*Source:* Authors' compilation from companies' press release and media news reports

## Challenges

India's maritime sector, encompassing ports, sea transport, coastal shipping, and associated logistics, remains a critical pillar of the nation's trade infrastructure. Although the government allows 100 per cent FDI under the automatic route in most port and shipping projects, actual inflows have been modest. Between 2000 and 2019, cumulative FDI in ports and shipping amounted to only about US\$ 1.6 billion—far below the sector's estimated requirement of nearly US\$ 20 billion to modernize port infrastructure (UNCTAD, 2022; NITI Aayog, 2021). India handles roughly 2 per cent of global maritime trade, compared with far higher shares in countries such as Singapore and China, which have developed globally integrated port ecosystems supported by transparent regulatory frameworks (World Bank, 2020).

### Regulatory and Institutional Barriers

One of the most cited challenges to FDI inflows in India's maritime industry is the persistence of regulatory complexity and fragmented governance. Until recently, maritime legislation was governed by colonial-era statutes that failed to align with international shipping standards (Ministry of Ports, Shipping and Waterways, 2024). Although the government initiated comprehensive reforms—replacing five major acts, including the Merchant Shipping Act and the Indian Ports Act—investors continue to encounter administrative delays, overlapping jurisdictions, and inconsistent interpretation of laws across states (Mukherjee et al., 2023). Multiple clearances for coastal regulation, environmental compliance, and port development lead to procedural delays, which significantly lengthen project gestation periods. The Vizhinjam deep-water transshipment port in Kerala, for instance, experienced nearly six years of delay owing to local protests, land acquisition disputes, and environmental clearances (The Hindu, 2022). Such procedural

uncertainties discourage long-term foreign participation and inflate project costs.

### The Cabotage Uncertainty

India's cabotage policies and coastal shipping restrictions have traditionally constrained foreign participation. Prior to the enactment of the Coastal Shipping Bill (2024), the requirement that only Indian-flag vessels operate in domestic trade restricted competition and efficiency (Raghavan et al., 2024). Although these rules are now being eased, historical protectionism has shaped investor perceptions of risk in the sector. Furthermore, unpredictable trade policy decisions—such as sudden changes in export restrictions and tariff regimes—have created uncertainty regarding throughput and revenue projections for port operators (UNCTAD, 2023). Stable and transparent trade policies are thus essential to improving investor confidence.

### Infrastructure and Financial Constraints

The literature consistently emphasizes that infrastructure gaps remain a critical impediment to FDI inflows. Poor hinterland connectivity, congestion, and high turnaround times reduce port competitiveness and deter private capital (Chaturvedi et al., 2021). Furthermore, the capital-intensive nature of port infrastructure, coupled with financing constraints, limits foreign participation. Public-private partnership (PPP) models in India have often been marred by renegotiations and revenue-sharing disputes, adding another layer of investment risk (ADB, 2020). In contrast, leading maritime economies such as Singapore have created robust institutional environments for maritime investment. Singapore's Maritime and Port Authority (MPA) operates as a unified regulatory and promotional body, providing a single-window clearance mechanism and fiscal incentives, including tax exemptions and ship-financing facilities (Tan, 2021). Its high ease-of-doing-business ranking (2nd globally in 2020) reflects its streamlined governance model (World Bank, 2020). By comparison, India's

maritime policy remains fragmented, with multiple authorities governing ports, shipping, and coastal regulation – an institutional structure that complicates investor engagement.

### Empirical Evidence of FDI Experiences

Case evidence demonstrates both setbacks and emerging successes. The Vizhinjam project, despite its strategic potential as India's first deep-water transshipment hub, illustrates how procedural complexity can derail timelines and investor confidence. In contrast, privately operated ports such as Mundra (Gujarat) and Krishnapatnam (Andhra Pradesh) have achieved global-standard efficiency, handling nearly half of India's containerized traffic (KPMG, 2022). These cases underscore that FDI performance correlates strongly with governance quality, connectivity, and local political support.

### Way Forward

As discussed in the earlier sections, the total investment in the maritime sector (which includes the sea transport and ports) have increased by close to 2.5 times in last 8 years, from US\$ 3.3 billion in 2017 to US\$ 8.2 billion in 2025. Strengthening FDI inflows into India's maritime sector demands a coherent, multidimensional reform agenda. Legal and institutional harmonization should be prioritized through full implementation of the new maritime legislation, with the Maritime Single Window and One Nation-One Port portal expanded to integrate environmental, land-use, and customs approvals (MoPSW, 2024). Streamlined project clearances, transparent concession frameworks, and standardized dispute-resolution mechanisms can substantially reduce uncertainty and investment risk (Mukherjee et al., 2023).

India's eastern seaboard – comprising Odisha, Andhra Pradesh, and West Bengal together with Kerala on the western coast – requires targeted state-level initiatives to bridge regional disparities. Despite its proximity to ASEAN markets and Indo-Pacific routes, the region lags in capacity and foreign participation (Chaturvedi et al., 2021). State port authorities should introduce investor-friendly policies, including transparent land-acquisition frameworks, fiscal incentives, and industrial cluster linkages with Sagarmala corridors, to position eastern ports such as Paradip, Dhamra, and Krishnapatnam as hubs of export-oriented FDI.

Despite substantial FDI inflows, several leading global maritime players remain untapped in India's port and shipping landscape. Entities such as Abu Dhabi Ports (UAE), Hamburg's HHLA (Germany), CMA CGM (France), MSC (Switzerland), Evergreen Marine (Taiwan), and NYK/KK Line (Japan) have limited or no direct investment presence. Targeting such strategic investors could strengthen India's maritime infrastructure, technology base, and global connectivity, advancing the objectives of the Maritime Amrit Kaal Vision 2047. The ports of the eastern coast especially may take initiative towards attracting these global players.

In essence, unlocking FDI potential in India's maritime sector will depend on coordinated legal reforms, infrastructure modernization, and proactive subnational policy engagement – particularly along the eastern coast. These measures, implemented cohesively, can transform India from a regional shipping participant into a globally integrated maritime and logistics hub.

## Endnotes

1. The MAKV 2047 envisages investment of Rs 80 lakh crore over 25 years in maritime sector.
2. Refer, ET Infra (25 May, 2025) - <https://infra.economictimes.indiatimes.com/news/ports-shipping/jawaharlal-nehru-port-achieves-historic-milestone-of-10-million-teu-capacity/121389582>
3. Refer, Hapag-Lloyd Press Release (January 25, 2023)
4. Refer, ET Infra (July 8, 2025)
5. Refer, ET Infra (July 8, 2025)
6. Refer, ET Infra (July 8, 2025)

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# Amrit Kaal: Strengthening Maritime Finance Framework and Enabling Investments

Anushka Triapthi, Shishir Shrotriya and Debojyoti Ray

Maritime finance is a critical pillar for the growth and sustainability of the maritime sector. Globally, maritime finance supports the construction, acquisition, and maintenance of vessels, as well as modernization of ports, terminals, and logistics hubs that facilitate international trade. It enables the adoption of innovative shipping technologies and helps manage sector-specific risks, thereby sustaining maritime services that are fundamental to the global economy. Without maritime finance, global shipping operations that carry over 80 per cent of world trade would face significant disruptions, undermining economic stability and supply chains<sup>1</sup>. In India, the importance of maritime finance is even more pronounced due to the country's 11,098 km. coastline and its strategic ambition to become a major global maritime power. India handles approximately 95 per cent of its trade volume by sea, and encourages investments in port infrastructure, inland waterways, and coastal shipping to maintain and expand capacity<sup>2</sup>.



The indigenous shipbuilding and ship-repairing sectors specifically require long-term, affordable financing to boost domestic capabilities and reduce reliance on foreign fleets. Moreover, the government's initiatives like the *Sagarmala Programme* and *Maritime Amrit Kaal Vision (MAKV) 2047* rely heavily on maritime finance to realise large-scale infrastructure development and technological upgrades. India's maritime finance ecosystem is also critical for supporting MSMEs and emerging startups within the maritime logistics and services sector, facilitating inclusive economic growth. Innovative financial products such as ship leasing, green bonds, and viability gap funding are being introduced to meet the diverse needs of the sector. Strengthening private sector participation and creating an investor-friendly environment are pivotal to mobilizing the huge capital needed for infrastructure and modern services. Additionally, financing is essential to build resilience against climate change impacts and geopolitical risks facing the Indian Ocean region, further securing India's position in global maritime trade. Therefore, maritime finance in India is indispensable to enhancing infrastructure, adopting sustainable practices, fostering innovation, and advancing the country's ambitions to become a global maritime leader with a robust, inclusive, and technologically advanced maritime sector. This comprehensive financial support system enables India to modernize its maritime economy, improve trade competitiveness, and fulfil its long-term strategic maritime visions.

India has set sail on a bold and visionary path with the unveiling of the *MAKV 2047*. The financial development component of the *MAKV 2047* is designed as a sweeping, multi-decade strategy to propel India into the ranks of leading global maritime powers through sustained investment, new funding instruments, tech-driven financial systems, and a solid focus on sustainable growth. India's maritime finance model has evolved through a sequenced, interconnected set of targeted policy

interventions and institutional reforms that now jointly support the development of a dynamic, globally competitive maritime industry. Each major financial initiative relates directly to strategic sectoral needs and builds cohesively on the preceding reforms, ensuring continuity and real impact. The Finance Wing is headed by an Additional Secretary and Financial Adviser who assists in formulating and processing all policies and other proposals having financial implications.<sup>3</sup>

In view of the above, this article discusses the maritime finance policies in India, the models being implemented, and what could be the further plan of action to make the maritime finance more efficient.

## Enabling Structural Foundations : The Strategic Push

India's maritime sector has undergone a profound transformation over the past decade, driven by robust financial reforms, institutional restructuring and long-term visioning under national flagship programmes, as shown in Table 1. The plan aims for India's maritime trade to handle 10,000 MTPA of cargo by 2047 (up from ~1,600 MTPA in 2023). It foresees the creation of about 1.5 crore new jobs, expansive public-private partnerships, and a quantum jump in India's share of maritime value creation and fleet tonnage. Financial empowerment of coastal communities, MSMEs, and start-ups is specifically prioritized, ensuring inclusive growth and broad participation in maritime economic expansion.<sup>4</sup>

## Interconnected Architecture: A Layered Financial Model

Since the launch of the *Sagarmala Programme*, a decade back, for the creation of specialised financial institutions and innovative blended-finance mechanisms, India has consistently sought to bridge structural gaps in funding, regulation, and competitiveness. The government's landmark INR 69,725 crore (US\$

**Table 1: Key Maritime Initiatives by India**

| Sr. No. | Year       | Policy / Scheme                                           | Budget / Corpus                                                                            | Objectives                                                                         | Key Features / Benefits                                                                                                                                                          |
|---------|------------|-----------------------------------------------------------|--------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1       | 2015       | Sagarmala Programme                                       | INR 5,79,000 crore (US\$ 65.18 billion) under Sagarmala to Develop 839 Projects            | Port modernization, coastal economic zones, industrial clusters                    | Establishment of SDCL for project financing, holistic port-led development plan                                                                                                  |
| 2       | 2016–2036  | Shipbuilding Financial Assistance Scheme (SBFAS 2.0)      | INR 24,736 crore (US\$ 2.79 billion) (2025)                                                | Incentivize indigenous shipbuilding, reduce capital costs, promote modernization   | Viability gap funding, subsidized loans, Shipbreaking Credit Note programme, support for ship acquisition and repair                                                             |
| 3       | 2021       | International Financial Services Centre (IFSC), GIFT City | NA                                                                                         | Create global hub for ship acquisition, financing, and leasing                     | Competitive regulatory ecosystem (modeled on Singapore, Hong Kong, Dubai), reduces reliance on foreign leasing hubs                                                              |
| 4       | 2024       | Comprehensive Reform Package                              | INR 69,725 crore (USD7.85 billion)                                                         | Financial restructuring across SBFAS, SbDS, MDF, legal/policy reforms              | Synchronization of financial, policy, legal instruments for sectoral transformation                                                                                              |
| 5       | 2024       | Merchant Shipping Bill 2024                               | NA                                                                                         | Simplify maritime regulation                                                       | Streamlines vessel registration, leasing and ownership documentation                                                                                                             |
| 6       | 2025 (Feb) | Maritime Development Fund (MDF)                           | INR 25,000 crore (US\$ 2.82 billion)                                                       | Provide financial assistance via equity/ debt, ship acquisition, sector investment | 49% govt contribution, blended finance, forecasted Rs1.5 lakh crore investment by 2030; focuses on deep water clusters, PPP shipyards, automation, interest incentivization fund |
| 7       | 2025       | Shipbuilding Development Scheme (SbDS)                    | INR 19,989 crore (US\$ 2.25 billion)                                                       | Expand shipbuilding capacity to 4.5 million GT, promote innovation                 | Support greenfield/ brownfield yards; Ship Technology Centre; risk coverage; insurance                                                                                           |
| 8       | 2025       | Sagarmala Finance Corporation Limited (SMFCL)             | INR 680 crore (US\$ 76.6 million) (Tier-1); INR 3,400 crore (US\$ 383 million) lending cap | Dedicated NBFC for maritime financing                                              | Blended finance (equity, debt, etc.) for ships, ports, MSMEs, cruise, renewable energy, education                                                                                |
| 9       | 2025       | Coastal Shipping Act 2025                                 | NA                                                                                         | Enhance coastal shipping framework                                                 | Legal reforms to improve operational ease, investor confidence                                                                                                                   |

Continued....

Continued....

|    |      |                                                      |                                                      |                                                                                 |                                                                                    |
|----|------|------------------------------------------------------|------------------------------------------------------|---------------------------------------------------------------------------------|------------------------------------------------------------------------------------|
| 10 | 2025 | Bills of Lading Bill 2025                            | NA                                                   | Streamline maritime documentation                                               | Improves efficiency, reduces red tape, increases investor confidence               |
| 11 | 2025 | Maritime Financing Summit & FDMM                     | NA                                                   | Digitalization of port finances, sustainability, credit flows to MSME/start-ups | ESG-linked financing, digital investment-readiness                                 |
| 12 | 2025 | SBFAP 2.0 - Shipbuilding Financial Assistance Policy | Rs 24736 crore (US\$ 2.8 billion) (till 31 Mar 2036) | Financial subsidies for shipyards, boost international orders, competitiveness  | Offsets operational disadvantages, strengthens domestic shipbuilding               |
| 13 | 2025 | New Credit Note Scheme for Ship Breaking             | NA                                                   | Incentivize ship scrapping                                                      | Credit Note for 40% scrap value, reimbursement for "Made in India" ships           |
| 14 | 2025 | Modernization of Indian Ports                        | INR 6,100 crore (US\$ 687.9 million)                 | Upgrade, automate port operations, boost efficiency                             | Infrastructure improvements, upscaling utilization/output                          |
| 15 | 2025 | Basic Customs Duty (BCD) Exemption                   | NA                                                   | On inputs for shipbuilding, ship breaking                                       | Extended 10 years                                                                  |
| 16 | 2025 | 10 Years Rent Holiday on Land                        | NA                                                   | Lower costs for shipyards/ports                                                 | 10-year rent relief or nominal rates                                               |
| 17 | 2025 | Infrastructure Improvement                           | INR 6,100 crore (US\$ 687.9 million)                 | Support for roads, utilities, sewage, etc.                                      | Aims at upgraded and automated shipyard operations and output                      |
| 18 | 2025 | Shipbuilding design & training centers               | INR 1,040 crore (US\$ 117.1 million)                 | Develop shipbuilding-specific trades, HRD                                       | Capital and operational support for welding, cabling, yard services training, etc. |
| 19 | 2025 | R&D in Shipbuilding                                  | INR 610 crore (US\$ 68.7 million)                    | Shipbuilding innovation, technology development                                 | New shipbuilding technology development and improvement                            |
| 20 | 2025 | Shipbuilding Capability Development Centres (SCDC)   | INR 1,200 crore (US\$ 135.1 million)                 | Innovative ship design, engineering solutions                                   | Testing, evaluation for shipping projects                                          |
| 21 | 2025 | Infrastructure Harmonized Master List (HML)          | NA                                                   | Inclusion of large ships for financing/tax incentives                           | Enables private investment, fleet modernization                                    |
| 22 | 2025 | Tonnage Tax Scheme                                   | NA                                                   | Extend to inland vessels, boost waterways cargo                                 | Inland vessels taxed by tonnage, not profits                                       |
| 23 | 2025 | Development of Mega Shipbuilding Clusters            | NA                                                   | Large clusters with 1-1.2 million GT capacity each                              | PPP model, private investment, modernisation, green tech                           |

Source: Authors' own compilation

7.86 billion) reform package in 2024 represents a decisive step in this direction, organized around four interconnected pillars: the Shipbuilding Financial Assistance Scheme (SBFAS), the Maritime Development Fund (MDF), the Shipbuilding Development Scheme (SbDS), and expansive legal, policy, and process reforms<sup>5</sup>. Together, these measures form the foundation of India's financial vision for the maritime sector, aligning with the broader MAKV 2047.

### Sagarmala Foundation

The journey began in 2015 with the launch of the *Sagarmala* Programme, conceived as an integrated national plan for port modernization, coastal economic zones, and maritime connectivity. Unlike piecemeal interventions of the past, *Sagarmala* was envisioned as a holistic blueprint that directly complemented India's larger growth trajectory. Central to its implementation was the establishment of the Sagarmala Development Company Limited (SDCL), created to anchor project financing and ensure structured capital flows into port-led development.

Over time, the SDCL evolved in scope and ambition, and in June 2025 it was remodelled into the Sagarmala Finance Corporation Limited (SMFCL), a decisive milestone in maritime financing. As India's first dedicated Non-Banking Financial Company (NBFC) for the maritime sector, the SMFCL represents a structural innovation in public-sector-led financial infrastructure. Unlike traditional project-based funding models, SMFCL is emerging as a single financial institution capable of offering blended finance instruments, including equity, debt, and subordinated debt. With Tier-1 capital estimated at INR 680 crore and consortium lending capacities extending up to INR 3,400 crore (US\$ 383.52 million), the SMFCL brought unprecedented scale and predictability to the sector. Its mandate was comprehensive, spanning ports, MSMEs, shipyards, coastal logistics, cruise tourism,

renewable energy projects, and maritime education, thereby addressing decades of constraints imposed by high capital costs and fragmented financial support<sup>6</sup>.

### Targeted Financing Schemes: Supporting Shipbuilding and Modernization

Parallel to these institutional reforms, targeted schemes were also launched to build viable financial ecosystems that could ensure long-term sustainability. The Shipbuilding Financial Assistance Scheme (SBFAS), first introduced in 2016, was a pioneering initiative designed to fill the financing gap in the shipbuilding, repair, and modernization sectors, traditionally hampered by prohibitively high costs of capital. By offering viability gap funding and subsidized loans, the scheme enabled vessel owners and shipyards to access working capital at reduced costs. The SBFAS was extended multiple times, aligned with the *MIV 2030* and the *MAKV 2047*, and in its current form, under SBFAS 2.0, it has been extended through 2036. The updated version significantly enhances its budgetary allocation to nearly INR 24,736 crore (US\$ 2.79 billion) to support domestic shipbuilding activities. Also introducing provisions for environmental sustainability through the Rs 4,001 crore (US\$ 0.48 billion) Shipbreaking Credit Note programme<sup>7</sup>. By subsidizing operational and capital expenses, the SBFAS directly tackles the cost disadvantage faced by Indian shipyards, empowering them to improve efficiency and global competitiveness. The scheme has also been reinforced by the establishment of new shipbuilding clusters, supported by investments in critical infrastructure such as breakwaters and dredging, under the supervision of a planned National Shipbuilding Mission.

Complementing SBFAS is the Shipbuilding Development Scheme (SbDS), launched with a budget of INR 19,989 crore (US\$ 2.25 billion) to expand India's shipbuilding capacity to 4.5 million Gross Tonnage annually<sup>8</sup>. This scheme

supports both greenfield and brownfield shipyards, promotes technological innovation through the establishment of the India Ship Technology Centre under the Indian Maritime University, and provides risk coverage and insurance support to reduce uncertainties in shipbuilding projects. Beyond shipyards, its ripple effects are visible in the strengthening of ancillary industries, workforce development, and the growth of local coastal economies, underscoring its broader economic significance.

### **Blended Finance for Long-Term Growth: The Maritime Development Fund (MDF)**

Recognizing that subsidies alone could not address the structural challenge of high capital costs, the government introduced another significant innovation in February 2025 with the launch of the Maritime Development Fund (MDF). With a corpus of INR 25,000 crore (US\$ 2.82 billion), the MDF is designed as a blended finance vehicle pooling government and private sector resources into a single platform.<sup>9</sup> Its structure consists of a Maritime Investment Fund of INR 20,000 crore (US\$ 2.25 billion) and an Interest Incentivization Fund of INR 5,000 crore (US\$ 5.64 million). With the government contributing 49 per cent of equity and the remainder mobilized from private capital, the MDF reduced risks traditionally borne by investors while ensuring accountability in deployment. It was particularly geared toward projects with long horizons of seven to ten years, such as indigenous shipbuilding and the development of blue-water infrastructure. The MDF's ability to deliver a mix of debt, equity, viability gap funding, and buyer's credit provided a comprehensive financial toolkit, capable of scaling up India's maritime sector while enhancing its attractiveness to global investors.

### **Enabling Legal and Regulatory Framework**

Alongside these financing measures, the institutional and regulatory ecosystem was recalibrated to match the pace of innovation. A major breakthrough came in 2021 with the establishment of the International Financial Services Centre (IFSC) at the GIFT City, Gujarat, which created a specialized ecosystem for ship acquisition, financing, and leasing. Modelled on global hubs such as Singapore, Hong Kong, and Dubai, the IFSC offered a regulatory environment that replicated efficiency, transparency, and investor-friendliness, thereby reducing India's reliance on foreign markets for leasing and maritime financial services<sup>10</sup>. Legislative reforms further supported this transition, most notably through the Merchant Shipping Bill of 2024, the Coastal Shipping Act of 2025, and the Bills of Lading Bill of 2025.<sup>11</sup> These laws simplified vessel registration, leasing, and documentation processes, enabling smoother operations, reducing red tape, and enhancing investor confidence. Recognition of large vessels as infrastructure assets further allowed shipowners to access cheaper capital via development banks, pension funds, and external commercial borrowings, while tax incentives such as customs duty exemptions and tonnage tax benefits for inland vessels created a more attractive financing environment.

### **Sustainability and Digitalization: The New Frontier**

As the sector matured, attention shifted to the twin imperatives of digitalization and sustainability. The Maritime Financing Summit of 2025 epitomized this new phase by introducing tools such as the Financial Digital Maturity Matrix (FDMM), which modernized port financial systems and made them more investment-ready for both public and private players.<sup>12</sup> The summit also placed

strong emphasis on green financing and climate-resilient infrastructure, aligning India's maritime strategies with global ESG benchmarks. Dedicated policies promoted credit flows to MSMEs and start-ups, ensuring that smaller enterprises could benefit from the sector's growth. This inclusive and climate-conscious approach signalled that maritime finance was not to be confined to large corporate projects but would extend across the ecosystem.

The cumulative effect of these diverse yet interconnected initiatives has been the creation of a layered maritime finance model that has steadily evolved over the past decade. Beginning with foundational investments under the *Sagarmala* Programme and the institutionalization of financing through SMFCL between 2015 and 2025, the sector advanced into targeted interventions such as the SBFAS and SbDS for shipbuilding and modernization. This was followed by the establishment of the Maritime Development Fund to provide long-term blended finance, and ultimately by the creation of a robust regulatory and digital ecosystem aligned with global best practices. Each stage has built upon the previous one, ensuring continuity while progressively deepening the sector's financial architecture. Today, India's maritime finance model stands as a carefully constructed, multidimensional framework designed not only to overcome legacy challenges but also to accelerate global competitiveness, innovation, and sustainable growth in alignment with the *MAKV 2047*.

### **Strategic MoUs : Driving India's Maritime Finance and Sectoral Transformations**

India has strategically signed several Memoranda of Understanding (MoUs) with various countries, international organizations, and financial institutions to build and enhance the financial model of its maritime sector. These MoUs are crucial for facilitating cooperation in shipbuilding, shipping operations, port

infrastructure, green maritime technologies, and maritime finance mechanisms. These agreements not only bring technical, operational, and investment synergies but also help India access global capital and expertise, which are essential to transforming the maritime ecosystem and achieving the ambitious goals of the *MAKV 2047*. A landmark MoU exchange took place in September 2025 during the "Samudra Se Samriddhi – Transforming India's Maritime Sector" event, where 27 MoUs worth over INR 66,000 crore were signed with public and private stakeholders, state governments, and international partners. These agreements underline India's integrated vision for maritime development, addressing new port infrastructure, shipping operations, shipbuilding clusters, innovative financing, sustainability, and heritage preservation.<sup>13</sup>

Some of the key MoUs enhancing India's maritime financial model include agreements with Denmark and Norway, which deepen cooperation in green shipping technology, joint shipbuilding ventures, and the establishment of green hydrogen hubs at Indian ports like Kandla, Paradip, and Tuticorin. Such ties facilitate technology transfer, regulatory harmonization, and investment collaboration to make India a leader in sustainable maritime operations. During the MoU signing, India also reaffirmed its commitment to routes such as the India-Middle East-Europe Economic Corridor (IMEC), the Eastern Maritime Corridor (EMC) with Russia's Far East, and the International North-South Transport Corridor (INSTC) connecting India to Central Asia and Europe via Iran and the Caucasus.<sup>14</sup> These partnerships facilitate technology transfer, regulatory harmonization, and investment collaboration aimed at positioning India as a global leader in sustainable maritime operations.

Another major initiative was The Shipping Corporation of India (SCI) signing an MoU with Indian Oil Corporation Limited (IOCL), Bharat Petroleum Corporation Limited (BPCL),

and Hindustan Petroleum Corporation Limited (HPCL) to create a Vessel Owning Joint Venture Company<sup>15</sup>. This initiative pools vessel demand from energy Public Sector Undertakings (PSUs), reduces reliance on foreign fleets, and ensures long-term charter contracts for Indian-built ships. This directly supports India's shipbuilding industry by providing steady financing and operational demand, boosting domestic manufacturing and maritime finance stability. Additionally, MoUs have been inked between major Indian ports and state governments (Andhra Pradesh, Odisha, Gujarat, Maharashtra, Tamil Nadu) to set up state-of-the-art shipbuilding clusters. These clusters are designed as green innovation hubs equipped with research and development (R&D) centers, training facilities, and logistics corridors. These frameworks promote sustainable maritime manufacturing and improve India's competitiveness, supported by joint investments and financial incentives fostering both public and private sector participation<sup>16</sup>.

Recognizing the importance of financial innovation, the Sagarmala Finance Corporation Limited (SMFCL) signed MoUs with several financial institutions such as Neo Fund, NaBFID, IIFCL, and Climate Fund Managers. These collaborative frameworks are aimed at mobilizing equity, co-investment, and novel debt instruments for green shipbuilding, fleet modernization, and maritime logistics projects. The involvement of climate-aligned fund managers alongside domestic finance sources expands the capital base, introducing competitive and diversified financing solutions critical for the maritime sector's growth<sup>17</sup>. Furthermore, India has cultivated bilateral maritime cooperation MoUs with maritime nations including the Maldives, Netherlands, and Japan, focusing on technical cooperation, training, port state control mechanisms, environmental regulations, and financial partnerships. Such MoUs bring international experience, best practices, and mutual support,

crucial for building resilience and expanding India's maritime trade connectivity.

The importance of these MoUs lies in their ability to provide a multi-dimensional framework for the financial development of India's maritime sector. They facilitate technology transfer and regulatory alignment, helping India adopt global best practices while tailoring them to domestic needs. These agreements also establish stable financing arrangements for shipbuilding and port modernization, addressing long-standing challenges of capital access and project sustainability. By promoting green technologies aligned with global sustainability goals, the MoUs strengthen India's commitment to environmental stewardship within the maritime domain. Furthermore, they foster robust public-private partnerships across states and sectors, enabling inclusive growth and greater participation in maritime development. A key benefit is their role in linking Indian infrastructure to global capital markets and investors, which enhances the scale and scope of investment in the sector. These collaborative frameworks are vital for mobilizing large-scale investments needed for infrastructure modernization, fleet expansion, and digital transformation. In doing so, they directly support the *Atmanirbhar Bharat* initiative by reducing import dependencies, enhancing indigenous capabilities, and positioning India as a preferred destination for maritime finance and investment.

## **Bottlenecks in the Financial Structure of Maritime Industry**

The financial maritime sector in India faces complex, multi-dimensional challenges that continue to constrain its development despite several recent reforms and ambitious growth agenda. One of the foremost issues is the limited classification of ships as infrastructure, restricting access to long-term bank financing even though shipyards were granted

infrastructure status in 2016. Regulatory hurdles such as limitations imposed by the Securitisation and Reconstruction of Financial Assets and Enforcement of Securities Interest Act (SARFAESI, 2002) prevent effective mortgaging of ships, curbing banks' ability to offer affordable long-term loans essential for capital-intensive projects in the maritime sector<sup>18</sup>. Port infrastructure constraints remain significant; many non-major ports lack modern equipment and sufficient draft to accommodate large vessels, leading to high operational inefficiency and logistics costs. As a result, India tranships over 75 per cent of its cargo via foreign ports, resulting in a loss of substantial revenue annually. Another challenge stems from uncoordinated regulatory frameworks and centralization under recent reforms such as the Indian Ports Act and Merchant Shipping Act, 2025<sup>19</sup>.

Other challenges are expensive adoption of green shipping technologies and sustainability measures, which also presents financial stress, particularly for smaller players. As per DG Shipping, implementing green practices and meeting new environmental norms is expected to increase compliance costs by US\$ 87–100 million annually by 2030, resulting in a 14 per cent increase in fuel expenses and a corresponding 5 per cent rise in freight rates. The ageing merchant fleet is another pressure point: with over 39 per cent of the fleet more than 20 years old, modernizing India's fleet is capital-intensive, and domestic shipbuilding capacity is still underdeveloped, accounting for less than 1 per cent of global output. High average project delays in shipbuilding, relative to leading nations, further discourage large-scale financial investment<sup>20</sup>.

Skills shortages, especially in the digital domain, slow the integration of advanced technologies needed for smart-port management and logistics efficiency. Gender disparities and limited attraction of young, skilled professionals exacerbate workforce constraints. Additional friction comes from the inefficiency

of customs and logistics infrastructure, weak digitalization, and persistent bureaucratic hurdles, all of which increase turnaround times and operational costs<sup>21</sup>. International comparisons reveal that India lags well behind countries like China and South Korea in terms of technological integration, capital mobilization, and export orientation. Altogether, overcoming these financial sector bottlenecks demands synchronised policy reforms, expanded investment in capacity building, pragmatic regulatory amendments, greater public-private partnership, and forward-looking institutional support for digitalization, sustainability, and global competitiveness<sup>22</sup>.

## Gateways for the Partners of the Maritime Growth

India's maritime finance sector stands at a critical point, brimming with opportunities, yet challenged by structural inefficiencies that could hinder its full potential. Recent legislative reforms, including the Indian Ports Act, 2025, and the Merchant Shipping Act, 2025, have laid a strong groundwork for modernization, transparency, and sustainability. The Ministry of Ports Shipping & Waterways (MoPS&W) is driving the sector's true potential through targeted and forward-looking interventions.

Accelerating the expansion and modernization of domestic shipbuilding capacity is essential for the development of the maritime sector. Reducing reliance on foreign shipyards will enhance India's strategic autonomy and competitiveness. This effort is being backed by increased financial incentives for eco-friendly vessel construction, infrastructure investment in shipbuilding clusters, and support for green maritime technologies.

The ongoing drive for digitization of customs and port clearance systems is imperative. Adopting AI-driven documentation, inspection tools, and integrated digital logistics platforms will further reduce turnaround times, cut operational costs, and improve ease of doing

business, positioning India as a global maritime logistics hub.

Deepening regional maritime cooperation through joint ventures, shared infrastructure, and logistics corridors with neighbouring countries can boost cross-border trade and solidify India's strategic role in the Indo-Pacific. Recent regional integration initiatives with ASEAN, BIMSTEC and the Gulf countries is vital for leveraging emerging trade and maritime routes.

Financial inclusion for MSMEs, coastal communities, and maritime start-ups must be prioritized. Expanding access to innovative financial instruments such as blended finance, ESG-linked capital, and climate-aligned investments will ensure inclusive, sustainable growth across the maritime value chain and attract foreign and domestic players.

By addressing the legacy bottlenecks and enabling equitable access to capital, India has evolved into a resilient, globally competitive maritime power driving sustainable economic growth and securing her position at the forefront of the Blue Economy. To achieve the ambitious targets of the coming decades, India and her partnering countries must adopt coordinated and sustained objectives, rooted in innovation, digital transformation, green finance, and regional collaboration.

## **Future Plan of Action: Expanding the Financial Horizon**

To sustain momentum and unlock the next phase of maritime growth, India's financial strategy must evolve toward more sophisticated, diversified, and inclusive instruments that deepen capital markets' participation in the Blue Economy. One promising approach lies in securitization — a tool that can significantly expand the investor base and reduce the cost of capital for maritime infrastructure.

Securitization, by pooling port revenue streams, shipping receivables, or lease

rentals into tradeable financial instruments, can open the maritime sector to a diverse range of investors with varying risk-return appetites — including retail investors, pension funds, and insurance companies. This democratization of infrastructure investment can provide liquidity and predictability to long-gestation maritime projects while reducing dependence on traditional banking channels.

Globally, several successful precedents highlight the potential of such instruments. The Port of Dover securitization in the UK enabled long-term refinancing of port infrastructure through investment-grade bonds. South Korea's shipping receivables-backed securities improved fleet liquidity and ship financing access, while China's port bond securitization through the Shanghai Free Trade Zone diversified funding sources for port modernization and logistics expansion. These global experiences demonstrate how securitization can unlock substantial capital and foster sustainable maritime finance ecosystems.

For India, drawing parallels with its highway and renewable energy sectors — where securitization models have already enabled large-scale retail and institutional participation — can serve as a practical guide. Replicating similar frameworks for shipbuilding, port expansion, and modernization projects would allow the maritime sector to tap new pools of long-term capital, improve liquidity, and attract global investors. Introducing maritime securitization platforms under the aegis of the Sagarmala Finance Corporation Limited (SMFCL) or the Maritime Development Fund (MDF) can facilitate transparent issuance, credit enhancement, and risk management mechanisms. These instruments would align seamlessly with the broader Amrit Kaal vision of democratizing infrastructure investment, enhancing financial inclusion, and positioning India as a global hub for maritime finance innovation.

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# Maritime Single Window: Progress, Challenges and Way Forward

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Deepankar Sinha

**M**aritime trade, the backbone of the world economy, has witnessed a structural shift over time as the average distance moved per tonne of cargo increased from 4,675 miles in 2000 to 5,186 miles in 2024, in spite of recent disruptions. Figure 1 illustrates the annual percentage change in trade volumes and tonne-miles, including miles per tonne.



The increasing trend of miles per tonne of cargo has been possible with increasing facilitation measures undertaken by the World Trade Organisation (WTO), International Chamber of Commerce (ICC), United Nations (UN) and other allied agencies. Maritime transport is a crucial link in any multimodal combination for the cross-border movement of goods. The introduction of multimodal transport documents, namely multimodal bill of lading, TIR Carnet, CIM consignment note and similar multimodal transport documents, led to seamless connectivity across different modes.

The shipping trade volumes, driven by the global economy, reached 12 billion tonnes in 2023, i.e. an increase by 2.4 per cent from 2022.<sup>1</sup>

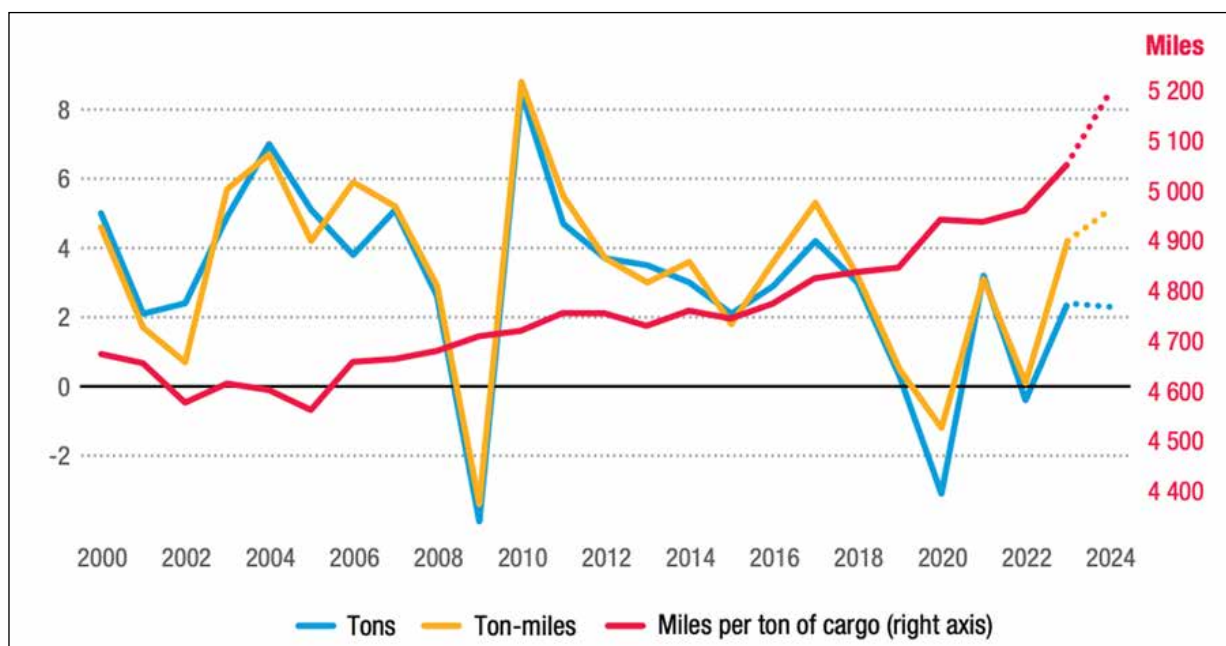
The association between trade volumes and gross domestic product (GDP) (Figure 2) indicates that GDP growth reached 2.7 per cent and is expected to continue, reaching approximately US\$ 180 trillion by 2030.

Besides, the shipping has the lowest environmental footprint. It provides the low cost of transport of goods, making it the most desired choice, especially at times of economic downturns, recessions and inflation. The annual movement of around 12 billion tonnes of cargo translates to around 1.5 tonnes per person based on the global population. All these factors led to a doubling of seaborne trade between 2000 and 2025.

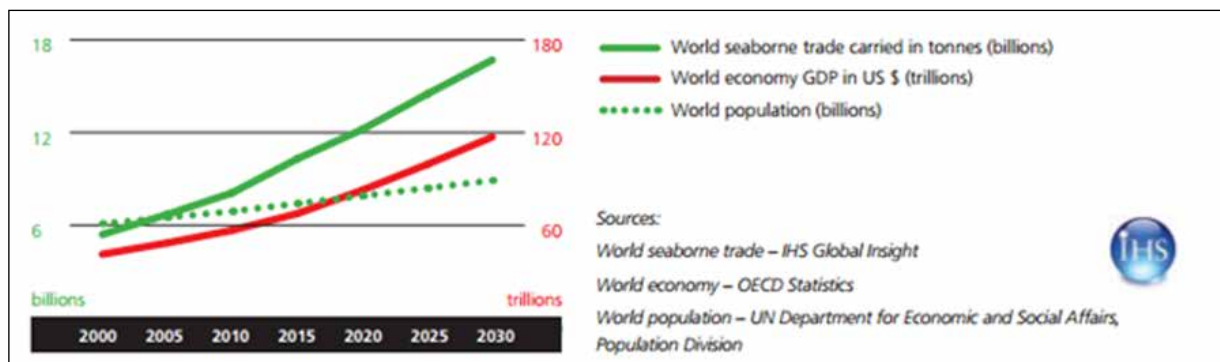
The shipping trend is likely to increase further as barriers to trade and regulatory compliance are reduced, making it easier to move goods across nations. The countries remained divided in terms of the irregularity compliance and mode of clearances, leading to increased cost and time.

The International Maritime Organisation (IMO) initiated the dialogue to minimise the silo driven processes. It aimed to standardise the data and information to facilitate the international transfer of statutory and

**Figure 1: Annual Percentage Change in Trade Volumes and Tonne-miles, including Miles per Tonne of Cargo**



Source: <https://unctad.org/publication/review-maritime-transport-2024>

**Figure 2: Prediction of World Seaborne Trade, GDP and Population**

Source: <https://www.ics-shipping.org/shipping-fact/shipping-and-world-trade-driving-prosperity/#:~:text=Shipping's%20ability%20to%20offer%20economic,refined%20products%20for%20re%2Dexport.>

regulatory documents by the shipping lines. IMO proposed the maritime single window (MSW) for this purpose.

### The International Mandate: FAL Convention

The International Maritime Organisation (IMO) introduced the Convention on “Facilitation of International Maritime Traffic (FAL)”, intending to simplify maritime formalities. Table 1 illustrates the evolution of documentation harmonisation attempts by the IMO.

### Maritime Single Window (MSW)

FAL Convention, since 2019, has made it mandatory for ships and ports to electronically exchange the declarations identified by the Convention. As of January 2024, the single window approach is compulsory in all ports. The IMO celebrated their 60th Anniversary of the FAL Convention, organised on 10 March 2025 during FAL 49, making certain amendments.

The objective of MSW is to reduce administrative burden, eliminating multiple submissions and paper submissions. These aspects, in turn, minimise errors, time and inefficiency, enhancing transparency and security.

Thus, Maritime Single Window, as a single digital platform, serves as a “one-stop shop” for ship reporting formalities. MSW is a system that allows for the electronic submission, once, of all the information required by various government authorities when a vessel arrives at, stays in, or departs from a port. Without the MSW, the shipping lines, through their own offices or agents, are required to submit the same information to multiple agencies (such as customs, immigration, port health, plant & animal quarantine, port authority, etc.).

### Key Features, Process and Benefits

Maritime Single Window is expected to provide a digital platform for the maritime stakeholders comprising government authorities, ports, shipping lines and their agents. The feature of single submission saves time and errors, enabling faster turnaround time and quicker clearances. The system is expected to bring in transparency; however, delays in system response increase uncertainty as the MSW then behaves as a black hole. These challenges prompt shipping bodies to seek manual intervention. Thus, the efficiency of the MSW system becomes a key to the success of its implementation.

**Table 1: Documentation Harmonisation Attempts by the IMO**

| Year      | Documents / Documentation Requirement Introduced or Amended                                                                                             |                                                                                                                                                                                                         |
|-----------|---------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1967      | The Convention on Facilitation of International Maritime Traffic (FAL Convention) comes into force                                                      | Introduced standard FAL documentation (“FAL Forms”) to harmonise formalities, information requirements, and procedures for ship arrival, stay, and departure.                                           |
| 2009      | Adoption of the Hong Kong International Convention for Safe and Environmentally Sound Recycling of Ships (HKC)                                          | Documents/requirements introduced: Inventory of Hazardous Materials (IHM), Ship Recycling Plan, survey & certification for safe ship recycling.                                                         |
| 30-Dec-13 | EU Ship Recycling Regulation (EU SRR) entered into force                                                                                                | Requires non-EU flagged ships $\geq 500$ GT calling at EU ports to carry onboard a valid IHM or Statement of Compliance; aligns with or anticipates HKC requirements.                                   |
| 01-Jan-24 | Amendments to FAL Convention (resolution FAL.14(46)) enter into force                                                                                   | Revised provisions on facilitation procedures/practices; updated FAL documentation and recommended practices.                                                                                           |
| 01-Feb-25 | Amendments to Ballast Water Management (BWM) Convention: revised Ballast Water Record Book (BWRB) format (Appendix II) per MEPC.369(80) come into force | Ships must adopt the new BWRB format, which includes standard codes A-H, detailed items to be recorded, updated guidance for completing record books, and amendments in Ballast Water Management Plans. |
| 26-Jun-25 | Hong Kong Convention (HKC) enters into force                                                                                                            | Mandatory global documentation for ship recycling: valid IHM, Ready for Recycling Certificate (IRRC), ship recycling facility authorisation, surveys and reporting under HKC.                           |

Source: Author’s compilation

## The Process

- **Prior Vessel Arrival:** The ship’s agent or master logs into the national MSW system.
- **Single Submission:** They fill out a standardised electronic form containing all the necessary data for the port call (e.g. General Declaration, Cargo Declaration, Ship’s Stores Declaration, Crew List, Passenger List).
- **Automated Distribution:** The MSW system automatically routes the relevant data segments to the appropriate government agencies (Customs, Border Control, Port Health, Port Authority, etc.).

- **Review and Clearance:** Each agency reviews the data within its own system. They can request additional information or grant clearance electronically.
- **Status Updates:** The ship’s agent can track the status of all clearances through the MSW dashboard.
- **Departure:** A similar process is followed for departure formalities.

## FAL Electronic Declarations

A vessel calling at a port requires approvals for the crew, their health, food items and the cargo it carries. Besides, countries mandate SOLAS, sanitation and waste disposal compliance.

The list of declarations for ship arrival and departure included in the FAL Convention (IMO-Rev2, 2016; IMO, 2025) includes:

- General declaration (FAL 1)
- Cargo declaration (FAL 2)
- Ship's Stores Declaration (FAL 3)
- Crew's Effects Declaration (FAL 4)
- Crew list (FAL 5)
- Passenger list (FAL 6)
- Dangerous Goods Manifest (FAL 7)
- Delivery bill for mail consignment as described in the Acts of the Universal Postal Union, the Universal Postal Convention and its Regulations currently in force
- Maritime Declaration of Health (International Health Regulations)
- Ship Sanitation Control Exemption Certificate, Ship Sanitation Control Certificate or extension (International Health Regulations)
- Security-related information as required under SOLAS regulation XI-2/9.2.2 (MSC.1/Circ.1305)
- Advance electronic cargo information for customs risk assessment purposes, as set out in the WCO Safe Framework of Standards
- Advance Notification document for Waste Delivery to Port Reception Facilities (MEPC.1/Circ.834/Rev.1)".
- Singapore (Maritime Portal - MP): A pioneer in the field, Singapore's system integrates over 20 government agencies. It handles pre-arrival clearance, port movements, and departure formalities seamlessly.
- Norway (Seaweed): A highly advanced system that handles all port call reporting for Norwegian ports. It is highly automated, allowing for a "touchless" port call where most reporting happens without human intervention once the initial data is submitted.
- Denmark (Danish Maritime Authority Single Window): Part of the Danish Digital Ship system. Through the Danish Maritime Authority, it has a well-established system that is now being adapted to fit the new EU-wide model.
- South Korea boasts a sophisticated system integrated with its larger port logistics and customs platforms, thereby facilitating its status as a central global shipping hub.
- European Union: The European Maritime Single Window environment (EMSWe) regulation aims to create a harmonised system across all EU member states, replacing national systems with a common standard to reduce administrative barriers further. Figure 3 illustrates the European Maritime Single Window environment (EMSWe).

## Maritime Single Window (MSW): Current Status

Less than 50 countries appear to have introduced MSW exclusively or as part of their maritime information network (Table 2).

## Examples of Known Maritime Single Windows

Many countries have already implemented sophisticated MSW systems. Here are a few notable examples:

Figure 4 illustrates the EU's Vessel traffic monitoring in EU waters (SafeSeaNet).

## Making Steady Progress (Many Developing and Emerging Economies)

A large number of countries, including major emerging economies, have implemented functional MSW systems but may still be working on full integration or user-friendliness.

- India: The Sagar Setu platform is India's national MSW. Implementation is ongoing across its numerous ports. The focus is on

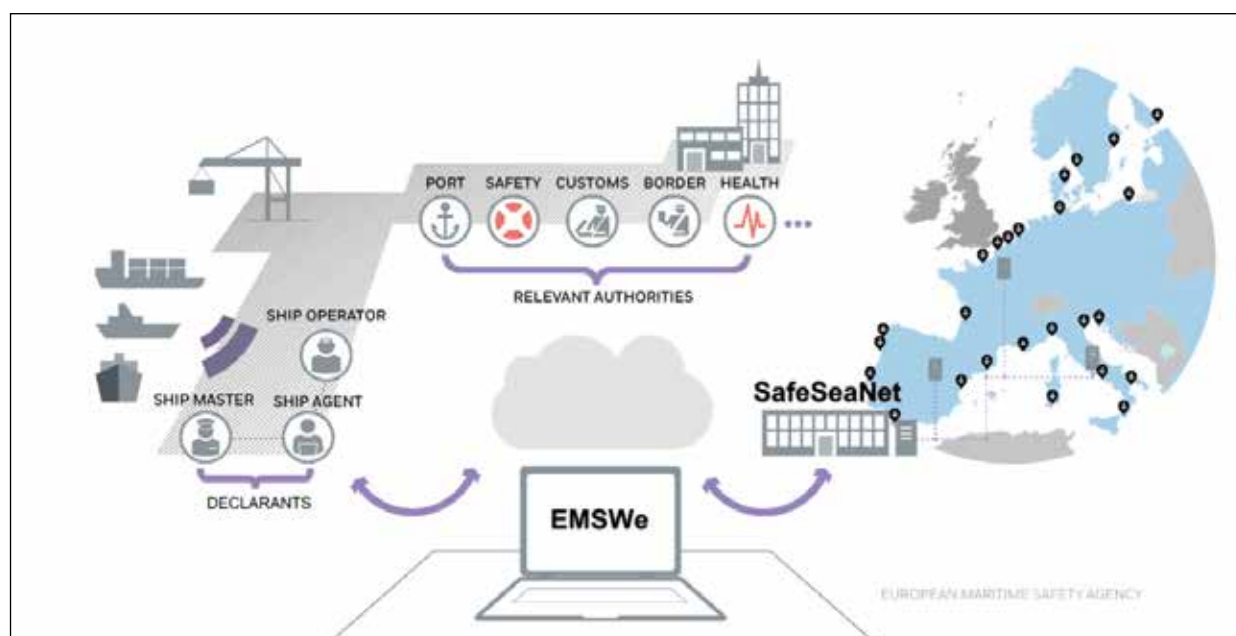
**Table 2: Country-wise Maritime Single Window**

| <b>Country / Territory</b> | <b>Name</b>                                                        | <b>First Year of Operation</b> |
|----------------------------|--------------------------------------------------------------------|--------------------------------|
| Albania                    | Albanian Marine Traffic                                            | 2023                           |
| Azerbaijan                 | Azerbaijan Maritime Single Window                                  | 2024                           |
| Bolivia                    | <b>Foreign Trade Single Window (VUCE)</b>                          | 2024                           |
| Brazil                     | National Single Window - Paperless Harbour (Porto sem Papel - PSP) | 2012                           |
| Cambodia                   | Port Electronic Data Interchange System                            | 2022                           |
| Croatia                    | Croatian Integrated Maritime Information System (CIMIS)            | 2013                           |
| Denmark                    | SafeSeaNet.dk                                                      | 2015                           |
| Egypt                      | Egyptian Maritime Single Window (EGMSW)                            | 2024                           |
| Estonia                    | EMDE – Electronic Maritime Documentation Exchange                  | 2009                           |
| Finland                    | Portnet                                                            | 2000                           |
| Georgia                    | National Maritime Single Window of Georgia (NMSW)                  | 2024                           |
| Greece                     | Hellenic Maritime Single Window                                    | 2019                           |
| Guatemala                  | VentanillaÚnicaMarítima -VUMAR-                                    | 2024                           |
| Honduras                   | Ventanilla Unica del TraficoMaritimo (VUTM)                        | 2017                           |
| India                      | Sagar Setu (National Logistics Portal-Marine)                      | 2024                           |
| Indonesia                  | Inaportnet                                                         | 2021                           |
| Ireland                    | SafeSeasIreland                                                    | 2009                           |
| Israel                     | TASK-Yam Maritime Community Trade Process Platform                 | 2023                           |
| Italy                      | PMIS (Port Management Information System)                          | 2013                           |
| Japan                      | Nippon Automated Cargo and Port Consolidated System (NACCS)        | 1999                           |
| Latvia                     | SKLOIS - Maritime Single Window                                    | 2015                           |
| Lithuania                  | NLESIS - Nacional vessels traffic monitoring system NMSW           | 2013                           |
| Malaysia                   | Malaysia Maritime Single Window (MMSW)                             | 2024                           |
| Malta                      | tmSW - (Transport Malta Maritime Single Window)                    | 2021                           |
| Montenegro                 | National Maritime Single Window (NMSW)                             | 2024                           |
| Morocco                    | PORTNET – Morocco’s National Single Window for Foreign Trade       | 2011                           |
| Netherlands                | Single Window maritime and air                                     | 2016                           |
| Norway                     | SafeSeaNet Norway                                                  | 2005                           |
| Panama                     | VentanillaÚnicaMarítima de Panamá (VUMPA)                          | 2017                           |
| Peru                       | Port Component of Foreign Trade Single Window(VUCE)                | 2006                           |
| Poland                     | National Single Window                                             | 2016                           |
| Romania                    | ROMSW                                                              | 2016                           |
| Saudi Arabia               | Port Community System (PCS) in the FASAH platform                  | 2024                           |
| Singapore                  | digitalPORT@SG                                                     | 2019                           |

|                |                                           |      |
|----------------|-------------------------------------------|------|
| Slovenia       | NacionalnoEnotnoOkno (NEO)                | 2008 |
| Spain          | DUEPORT                                   | 2015 |
| Suriname       | Digital per email                         |      |
| Sweden         | REPORTAL - Maritime Single Window         | 2015 |
| Thailand       | Single Window @ Marine Department         | 2015 |
| United Kingdom | UK National Maritime Single Window (NMSW) | 2016 |
| United States  | Automated Commercial Environment (ACE)    | 2016 |

Source: Author's compilation from different country websites

**Figure 3: European Maritime Single Window Environment (EMSWe)**



Source: <https://www.emsa.europa.eu/emsw.html>

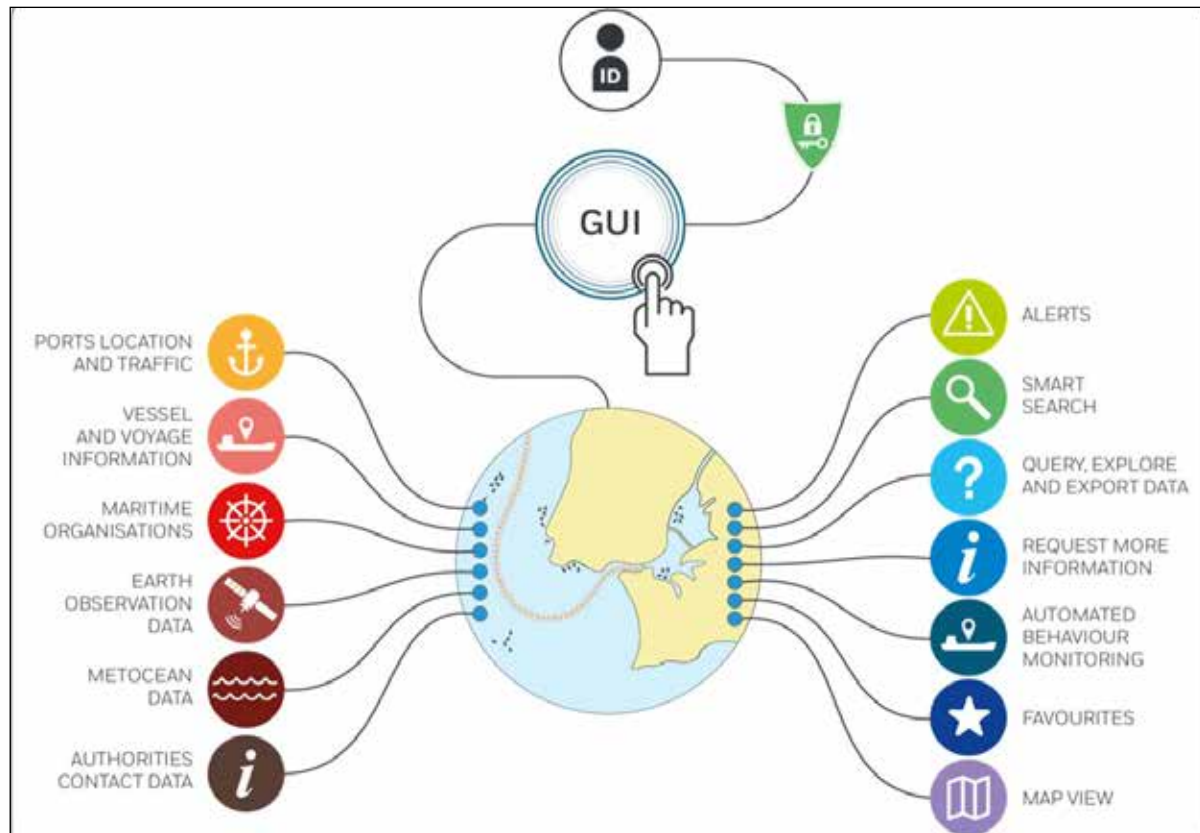
integrating all relevant agencies (Customs, Immigration, and Port Health) into a single digital interface.

- China: Has implemented MSW systems in its major ports (e.g. Shanghai, Shenzhen). The scale of implementation is vast, and the system is central to its trade infrastructure.
- Brazil: Has been working on its MSW (Porto Sem Papel or “Paperless Port”) with progress varying across its different port authorities.
- Kenya and Ghana: Examples of African

nations making significant strides with support from international bodies. Kenya’s Kenya Trade Network Agency (Kentrade) operates the single window for trade, which includes maritime formalities.

### Early Stages - Facing Significant Hurdles

- Progress is slower in regions where funding, digital infrastructure, or political stability are challenges.
- Small Island Developing States (SIDS): For

**Figure 4: EU's Vessel Traffic Monitoring in EU Waters (SafeSeaNet)**

Source: <https://emsa.europa.eu/ssn-main.html>

many SIDS, the cost of developing and maintaining a sophisticated digital platform is prohibitive. They often rely on simpler, sometimes paper-assisted, processes or are seeking international technical assistance.

- **Least Developed Countries (LDCs):** Similar to SIDS, LDCs may lack the necessary infrastructure and institutional capacity. Implementation here is often linked to broader development aid and capacity-building projects sponsored by the IMO, International Association of Ports and Harbours (IAPH), or the World Bank.

## The Global Status at a Glance: Summary

**Leaders (Advanced & Mature):** High-income, trade-dependent nations with long-standing digital governance.

- **Advanced & Implementing (EU Bloc):** European countries transitioning to a supranational EMSWe standard.
- **Developing & Making Progress:** Countries with basic systems, supported by global organisations, are facing integration challenges.
- **Early Stages / Facing Challenges:** SIDS and LDCs face significant challenges in infrastructure and funding.

## Implementation Challenges

**Cost and Technology:** Establishing a secure, reliable digital platform demands substantial investment and specialised technical expertise.

- **Inter-agency Coordination:** Achieving consensus among different government departments on data standards and workflows can be challenging.
- **Legal Frameworks:** Laws may need to be updated to accept electronic submissions as legally equivalent to paper documents.
- **Cybersecurity:** Protecting sensitive commercial and security data is paramount.
- **Global Standardisation:** While the IMO FAL Compendium is the goal, achieving true global interoperability between different national MSWs remains a work in progress.

## Sagar Setu

India launched Sagar Setu as a Maritime Single Window (MSW), enabling the filing of import general manifest (IGM), crew list, immigration declaration, and export general manifest (EGM). The platform, i.e., National Logistics Portal (NLP Marine), integrates Customs' ICEGATE system, ULIP, ports' Port Community System (PCS) and provides an application programming interface with shipping lines to generate an electronic delivery order. ULIP, the Unified Logistics Interface Platform, is India's digital gateway to a single-window, integrated logistics system that connects various government data sources and private players. This application, conceptualised by NITI Aayog and maintained by NLDS, offers access to real-time data through APIs, enhancing transparency, efficiency, and visibility across transportation.

The interface with PCS enables online allocation of a vessel's voyage ID (termed as VCN) and also has provision for ships to forward a "Pilot Memo" for all major ports. Ports using terminal operating systems (TOS) can exchange electronic messages such as COPRAR and COARRI, and other allied

messages. COPRAR and COARRI refer to the container list sent in advance by the shipping lines for loading or discharge, and the message that a container terminal sends back to the shipping line after the vessel has been worked (loaded and discharged).

## Stakeholders' Feedback on Sagar Setu

Shipping lines, especially container liners, have found NLP Marine very useful for container tracking through ULIP; the ease of filing cargo, crew, vessel profile declarations and exchange of VCN, Pilot memo and Delivery Orders.

However, NLP needs integration with Swachha Sagar, Bharat Kosh, Port Health Organisation, and Plant and Animal Quarantine agencies. Regarding the "Advance Notification document for Waste Delivery to Port Reception Facilities," shipping lines must notify on the DG Shipping Website - Swachha Sagar, as there is no provision for NLP Marine. Similarly, for Crew Health and Plant and Animal Quarantine (P&Q) Certificates, the NLP Marine platform should provide an interface with the systems of the Port Health Organisation and P&Q regional offices.

Shipping lines experience inordinate delays at the weekends, slowing down the clearance process, defeating the FAL objectives. NLP registration by statutory bodies and EXIM stakeholders is time-consuming due to the lack of timely responses after documents are submitted. Regarding the sanitation certificate, a nominal fee must be paid at regular intervals through Bharat Kosh, which is not integrated with NLP Marine. Additionally, the payment interface's performance is inconsistent.

Shipping lines wish that vessel-related payments were introduced through the NLP, along with the facility to obtain a No Demand Certificate (NDC) directly. Although MSW has been introduced, hard copies are still required to be submitted to Customs and Immigration. This practice may be discouraged.

Some ports have yet to implement a state-of-the-art port operating system (POS), which handicaps the single window. In addition, different ports have different processes and documentation needs. The government of India's attempt for "One Nation – One Process" is very noble, but its implementation is yet to mature. Stakeholders' discussions reveal that certain ports have specific peculiarities that need to be addressed. For example, Kandla port (Deendayal Port Authority) loads bagged cargo on board a ship with partial aggregation due to a shortage of storage space. Hence, the full vessel load cargo has split Let-Export-Orders (LEO) that is manually managed. Visakhapatnam port has storage outside port premises; therefore, its cargo discharge process varies from other ports. Kolkata Port (Syama Prasad Mukherjee Port), being a riverine port, has a unique pilotage process.

Document exchange between nations is nonexistent due to interoperability, lack of mutual recognition and trust issues. Countries that recognise India's Authorised Economic Operator (AEO) status through Mutual Recognition Agreements (MRAs) include South Korea, Hong Kong, the USA, Taiwan, the UAE, Australia, Singapore and Russia. The super-ordinate goal of the FAL Convention for a single submission per vessel's voyage will be fully met when states recognise and electronically exchange documents.

## Way Forward

The implementation challenge related to interoperability, trust, security, and neutrality across nations can be addressed through the implementation of high-level principles of digitalisation, followed by phased implementation to address cost and technology-related issues. The ten high-level principles of digitalisation adopted by the G20 countries in the G20-2023 under the Indian Presidency (G20, Annexure C, 2023). These principles are:

## High-Level Principles for Digitalisation of Trade Documents

### Principle 1: Neutrality

Digitalisation initiatives for trade documents should remain unbiased towards any specific technology, software or system. The initiatives should ensure the immutability and interoperability of data for seamless communication and exchange across diverse systems.

### Principle 2: Security

To ensure the security of data related to electronic trade document(s), the utilised technologies, including their related digital infrastructure, should adopt robust encryption and other security protocols to protect data and the infrastructure concerned against physical damage and information security threats or data theft.

### Principle 3: Trust

Technologies/frameworks based on transparent domestic rules and procedures should enable confidence, accountability and authentication for the generation and exchange/transfer of the electronic trade documents.

### Principle 4: Interoperability

The utilised technologies, including their related digital infrastructure, should aim to ensure interoperability and seamless exchange of electronic trade document(s) and related data between or among the transacting parties and other stakeholders. The desired interoperability should enable the use of a variety of existing technological systems, standards, document formats and frameworks.

### Principle 5: Data Privacy

The utilised technologies should implement privacy-enhancing technological features/solutions, and share the minimum data necessary for the generation/exchange of

electronic trade document(s) and execution of business transactions between the transacting parties. Also, utilised technologies should comply with applicable data privacy rules/norms.

### **Principle 6: Reliability**

The utilised technologies, including their related digital infrastructure, should ensure the authenticity, immutability and validity of electronic trade documents.

### **Principle 7: Voluntary Sharing of Data**

Sharing of electronic trade documents and related data should be voluntary with the informed consent of economic operators supplying data and only limited to the minimum data exchange necessary for the generation and exchange of documents, and execution of business transactions between the transacting parties in compliance with applicable domestic rules and regulations.

### **Principle 8: Collaboration**

The utilised technologies should provide adequate flexibility to facilitate reliance on the same electronic trade document by governments and competent authorities concerned, financial institutions, transacting parties, technology providers and other stakeholders.

### **Principle 9: Traceability**

The utilised technologies should provide a comprehensive audit trail of the transaction(s), in accordance with domestic regulations of electronic trade documents.

### **Principle 10: Scalability**

To accommodate growth, shifting trade conditions and new technological developments, utilised technologies for the exchange of electronic trade documents must be scalable, and should be able to handle extensive data volumes and transaction numbers.”

India and other implementing countries may actively pursue adherence to high-level principles and extend mutual recognition agreements (MRAs) to each other.

## **Additional Features**

- MSW systems may include features, such as:
- Integration with the terminal operating system (TOS) of ports, including port payments
- Real-time status of document processing when more than one agencies are involved.
- Probable time to restore in case of system disruptions
- Grievance Handling System
- Dispute Settlement System
- Strengthening Inter-agency Cooperation facilitates information sharing beyond standard documents.
- Develop a secure network to prevent data breaches

## **Conclusion**

The world economy has been navigating through disruptions, and global merchandise exports increased by 2.7 per cent in 2024, compared to 2023, amounting to US\$ 24.5 trillion (WTO, 2025). Maritime trade holds a significant share of the world’s trade.

The Maritime Single Window is a fundamental digital transformation in the maritime industry. It is a key tool for facilitating trade, enhancing the efficiency of shipping, and improving the competitiveness of ports. By replacing a cumbersome, paper-based process with a streamlined, digital one, it benefits everyone involved – from government regulators to ship operators – making global maritime trade smoother, faster, and safer.

The “pillars” of a Maritime Single Window (MSW) are the fundamental, foundational components that must be strong for the entire system to function effectively. They provide

a structured way to understand what makes an MSW successful. There are essentially five pillars, namely, the legal & regulatory (creating legal equivalence and ensuring enforceability, i.e., “is it allowed and mandatory?”), institutional and governance (a designated authority for governance, i.e., “who is in charge and how do stakeholders cooperate?”), technical and technological (the core engine of MSW – standardised data model, architecture, user-friendly interface and interoperability, i.e., “how does it work technically?”), operational and process (ensuring the “Submit-Once” principle, harmonised procedures, risk-based management and automated validation, i.e., “what is the new way of working?”) and the human and capacity building (ensuring - “are people ready and able to use it?”) pillars. If any of these pillars is weak, the entire MSW structure becomes unstable.

The crucial factors influencing the pace of implementation include economic dependence on trade, i.e. countries whose economies rely heavily on maritime trade (e.g. Singapore or the Netherlands) had a stronger incentive to implement MSWs early; countries with robust digital infrastructure, international support, and political will of the governments.

Technology plays a significant role in implementation, particularly in ensuring interoperability, which allows different national MSWs to “talk” to each other seamlessly.

Besides, technology should not create a digital divide amongst nations, and platforms should maintain neutrality.

The overall trend is positive, with the maritime industry steadily moving away from paper-based silos towards an integrated, digital future that benefits global trade efficiency and safety. India’s progress has been significant and has been growing leaps and bounds.

## Endnote

- <sup>1</sup> Refer, <https://unctad.org/publication/review-maritime-transport-2024>

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## **Part III**

# **Building Resilient Maritime Corridors**





# Coping with Maritime Supply Chains Disruptions

Prabir De

The Indian economy depends critically on global maritime trade – over 90 per cent of its international trade by volume moves by sea. The COVID19 pandemic (2020–21) and subsequent crises exposed vulnerabilities in maritime logistics. Port closures, workforce restrictions, and shifting demand caused severe port congestions and container shortages. The Indo-Pacific region is the world’s trade hub: about 60 per cent of global GDP and population are in the Indo-Pacific, and roughly 80 per cent of world merchandise trade transits the Indian Ocean region<sup>1</sup> (KIEP, 2024).



A supply chain encompasses all the activities and entities involved in getting a product or service from its origin to the end customer. Some popular disruptions include cyber attacks, natural disasters, pandemic, shortages of raw materials, geo-political and trade issues, etc. (Figure 1). Disruptions add additional costs and time to trade. Developing countries, particularly landlocked and island nations, face disproportionately high costs to trade

The maritime supply chains have witnessed severe disruptions since the COVID-19 pandemic. What began as a health crisis quickly evolved into a complex web of logistical bottlenecks, geopolitical flashpoints, and environmental shocks. The post-pandemic world has been affected by multiple crises such as the 2021 Suez Canal blockage, rising geopolitical tensions, war between Russia and Ukraine, and surging traffic at maritime chokepoints. Illustrated in Figure 2, major chokepoints such as the Suez Canal and Malacca Strait are very much vulnerable to disruptions; any blockage or conflict at these

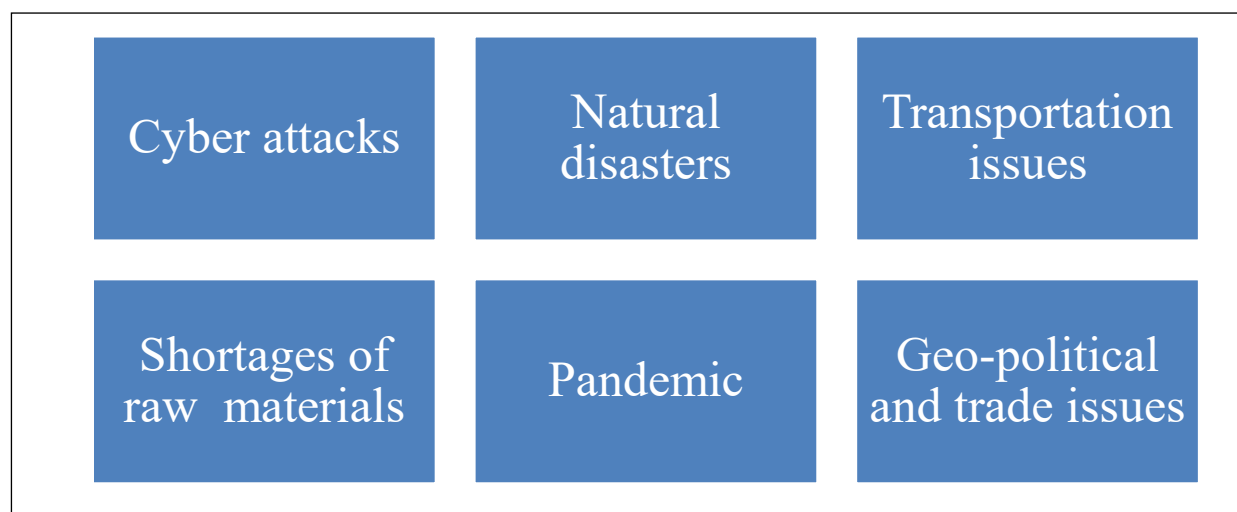
narrow passages can have a high ripple effect in the world.

Table 1 presents maritime supply chain choke points and likely implications for India. The disrupting global supply chains and rising business costs have been dampening global trade and growth. For example, India imports almost 89 per cent of total annual crude oil requirements and 50 per cent of natural gas<sup>2</sup>, thus very much vulnerable to supply chain disruptions.

The trend of month-wise import cost<sup>3</sup> shows that India's import has been facing high costs due to rising cost of transportation, insurance and freight, particularly with the advanced economies (Figure 3). The rising transport costs, freight and insurance emerging from disruptions pose serious threats to India's trade and value chains.

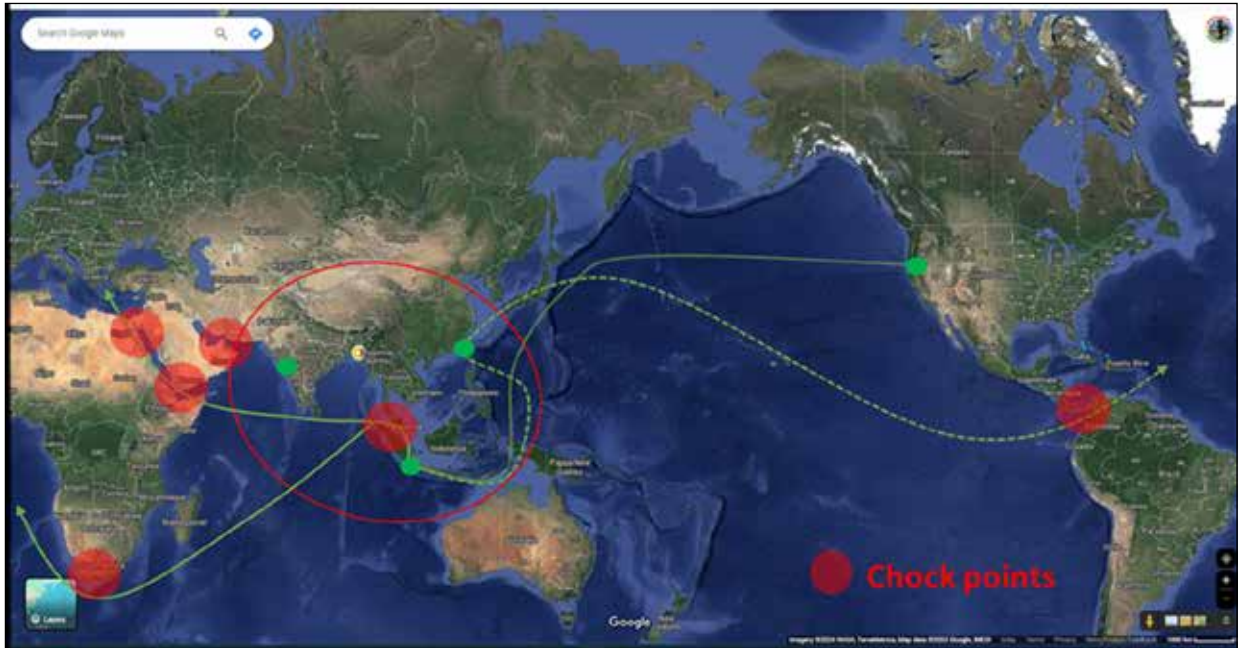
The maritime sector in general and shipping in particular is the first and most visible victim of global supply chain disruptions.<sup>4</sup> Current challenges, therefore, underscore the need for collective efforts for sustainable and long-lasting solutions.

**Figure 1: Some Common Supply Chain Disruptions**



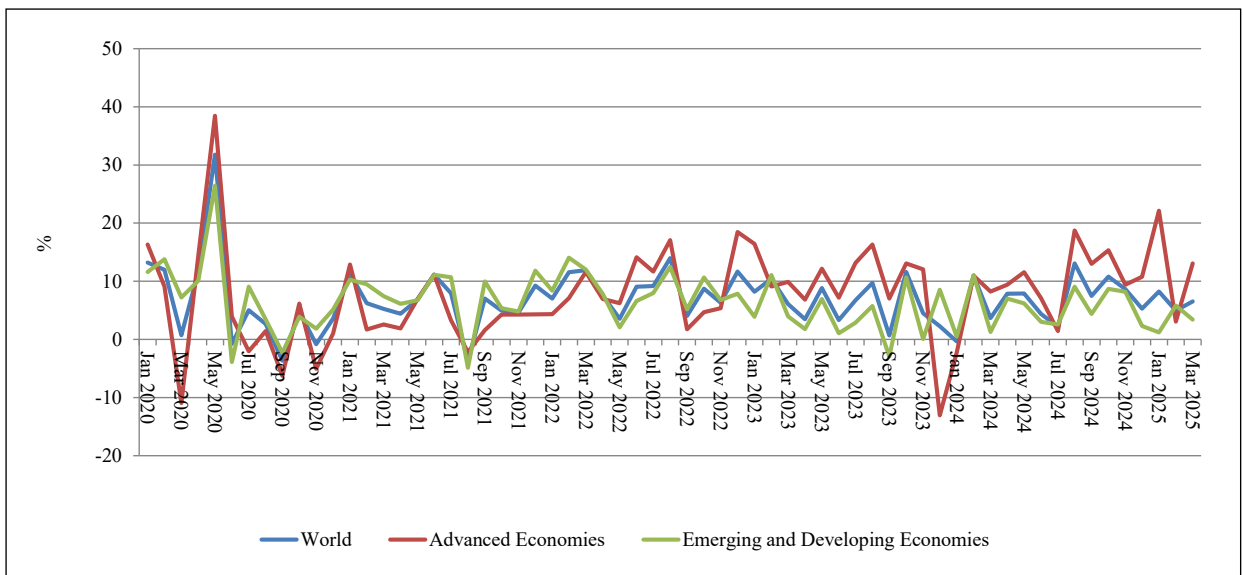
Source: Author's own

**Figure 2: Major Maritime Chock Points**



Source: Author's own

**Figure 3: Trends in India's Import Costs (%)**



Source: Month-wise import (cif) and export (fob) from the DOTS IMF

**Table 1: Maritime Supply Chain Chokepoints**

| Chokepoint                               | Location & Width                                                         | Strategic Importance                                                                                                        | Key Vulnerabilities / Risks                                                      | Relevance to India                                                                                                                        |
|------------------------------------------|--------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|
| Strait of Hormuz                         | Between Oman and Iran; ~21 miles wide at narrowest                       | The world's most critical oil transit chokepoint. ~20 per cent of globally traded oil and ~25 per cent of LNG pass through. | Regional conflict (Iran-US tensions), naval attacks, piracy, drone strikes.      | India imports ~36 per cent of its crude oil via Hormuz. Any closure could severely disrupt India's energy supply.                         |
| Strait of Malacca                        | Between Malaysia, Singapore, and Indonesia; ~1.7 miles wide at narrowest | Connects Indian Ocean and South China Sea – busiest trade route for oil, coal, and consumer goods.                          | Piracy, congestion, collisions, regional geopolitics (China-US-ASEAN).           | India's east coast trade and energy imports from East Asia heavily depend on Malacca.                                                     |
| Suez Canal                               | Egypt; 193 km long                                                       | Connects Red Sea to Mediterranean – fastest sea route from Asia to Europe.                                                  | Groundings (Ever Given 2021), terrorist threats, political instability in Egypt. | Key for Indian exports/imports to Europe and the U.S. East Coast. India suffered ~75 per cent of Suez-related losses in 2021 disruptions. |
| Bab el-Mandeb Strait                     | Between Yemen, Djibouti, Eritrea; ~18 miles wide                         | Links Red Sea with Gulf of Aden – crucial for trade between Asia and Europe.                                                | Houthi attacks, piracy, regional conflict, humanitarian crises.                  | Used by Indian ships to access Suez; instability here forces detours via Cape of Good Hope.                                               |
| Cape of Good Hope Route                  | Southern tip of Africa                                                   | Alternative to Suez Canal, longer by 6,000+ km.                                                                             | Weather hazards, high insurance/fuel costs.                                      | Used by Indian shippers when Suez is blocked. Adds 2-3 weeks transit time.                                                                |
| Panama Canal                             | Central America; 82 km long                                              | Shortcut between Atlantic and Pacific oceans.                                                                               | Droughts (reducing water levels), maintenance issues, congestion.                | Affects India's trade with Latin America and the U.S. West Coast.                                                                         |
| Turkish Straits (Bosporus & Dardanelles) | Connect Black Sea to Mediterranean                                       | Key for Russian, Ukrainian, and Central Asian exports (oil, grain).                                                         | Regional conflict (Ukraine war), political leverage by Turkey.                   | Indirect impact: India imports fertilizers and oil from the Black Sea region.                                                             |
| Strait of Gibraltar                      | Between Spain and Morocco; 14 km wide                                    | Gateway between Mediterranean and Atlantic.                                                                                 | Congestion, illegal migration, naval tensions.                                   | Connects India-Europe shipping via Suez.                                                                                                  |

| Chokepoint               | Location & Width          | Strategic Importance                                                       | Key Vulnerabilities / Risks                                    | Relevance to India                                                                                      |
|--------------------------|---------------------------|----------------------------------------------------------------------------|----------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|
| Lombok and Sunda Straits | Indonesia                 | Alternatives to Malacca; used by larger tankers unable to transit Malacca. | Longer routes, piracy, underdeveloped ports.                   | India may rely on these if Malacca becomes impassable.                                                  |
| Bering Strait            | Between Russia and Alaska | Emerging Arctic trade route due to melting ice.                            | Extreme weather, lack of infrastructure, geopolitical tension. | Long-term relevance: potential alternative route to Europe for Indian exports as Arctic routes develop. |

Source: US Energy Information Administration

## Some Major Disruptions Affected India's Trade

### Post-COVID Logistics Shock (2020–2022)

In the immediate aftermath of the COVID-19 pandemic, global maritime supply chains faced unprecedented disruption. Lockdowns, labour shortages, and port congestion combined with a sharp rebound in consumer demand to create what the World Bank (2021) described as the “largest global shipping logjam in history.” Container freight rates surged by over 400 per cent between 2020 and 2021, and port congestion at key hubs such as Singapore, Shanghai, and Los Angeles caused delays in shipping for several weeks<sup>5</sup>. The ripple effects were especially severe for India. Indian exporters of textiles, pharmaceuticals, and auto components faced shipping delays, while importers experienced shortages in critical intermediates. The IMF (2022) noted that developing economies such as India were particularly exposed due to limited negotiating power in container charter markets and dependency on foreign-flag vessels<sup>6</sup>.

### Suez Canal Blockage (March 2021)

The grounding of the Ever Given in the Suez Canal in March 2021 served as a critical wake-up call on maritime chokepoint vulnerability. The blockage, which lasted six days, halted

nearly 12 per cent of global trade and delayed over 400 vessels<sup>7</sup>. It also caused around US\$ 10 billion in goods per day to be stranded and delayed due to severe congestion<sup>8</sup>. India, heavily reliant on the Suez route for exports to Europe and the US East Coast, was one of the worst-affected countries. According to India's Ministry of Commerce, about 75 per cent of its westbound container traffic was temporarily disrupted, leading to delays in key sectors such as garments, petrochemicals, and engineering goods. Insurance premiums and demurrage costs spiked, and Indian shipping lines were forced to reroute via the Cape of Good Hope—adding up to three weeks of transit time and additional costs. This event reinforced India's policy shift toward developing alternate maritime routes, such as the India–Middle East–Europe Economic Corridor (IMEC).

### Ukraine–Russia War (2022–Present)

The outbreak of the Ukraine war in early 2022 introduced long-term geopolitical volatility into maritime supply chains. The closure of Black Sea ports, sanctions on Russian shipping, and the rerouting of energy and grain cargoes disrupted global shipping patterns. According to the World Bank (2023) and UNCTAD (2023), the conflict reduced Black Sea grain exports by nearly 50 per cent, contributing to global food inflation and port congestion in

alternative export regions. India, which imports a significant share of fertilizers from Ukraine and crude oil from Russia and the broader Eurasian region, faced both opportunities and challenges. On one hand, discounted Russian crude has boosted supply security, while, on the other, payment channel disruptions and insurance sanctions have complicated logistics. The conflict has also forced India to deepen energy diversification strategies and explore domestic refining and storage capacity expansions.

### **Red Sea and Bab el-Mandeb Crisis (2023–2025)**

Since late 2023, escalating Houthi rebel's attacks on commercial shipping in the Red Sea and Bab el-Mandeb Strait have emerged as one of the most acute maritime security threats. The World Bank (2024) estimated that global shipping costs rose by 141 per cent year-on-year basis during early 2024 due to rerouting and security expenses. Major carriers, including Maersk and MSC, temporarily suspended transits through the Suez Canal, opting for detours around the Cape of Good Hope, adding additional 6,000–7,000 kilometers per voyage. For India, which conducts roughly 55 per cent of its westbound container trade via the Suez–Red Sea corridor, the impacts have been severe—longer transit times, higher freight costs, and increased energy import risks. Indian exporters in high-value sectors such as pharmaceuticals, textiles, and machinery have faced shipment delays and contract renegotiations. The disruptions have called for maritime resilience, diversification of trade corridors, and the need for enhanced naval presence in the Arabian Sea and Gulf of Aden.

### **Panama Canal Drought and Climate-linked Disruptions (2023–2024)**

Climate change has added a new dimension to maritime vulnerabilities. The Panama Canal—a crucial link between the Atlantic and Pacific Oceans—experienced severe droughts in 2023–

2024, forcing the Panama Canal Authority to impose vessel draft and daily transit restrictions. The IMF (2024) and J.P. Morgan Research (2024) noted that this climate-induced chokepoint disruption affected supply chains between Asia and the Americas, leading to rising insurance and charter rates. While India's direct use of the Panama route is limited, secondary effects—such as increased container shortages and vessel repositioning delays—have affected India's trade indirectly. Nevertheless, the event highlights how environmental shocks can compound existing geopolitical and structural maritime risks.

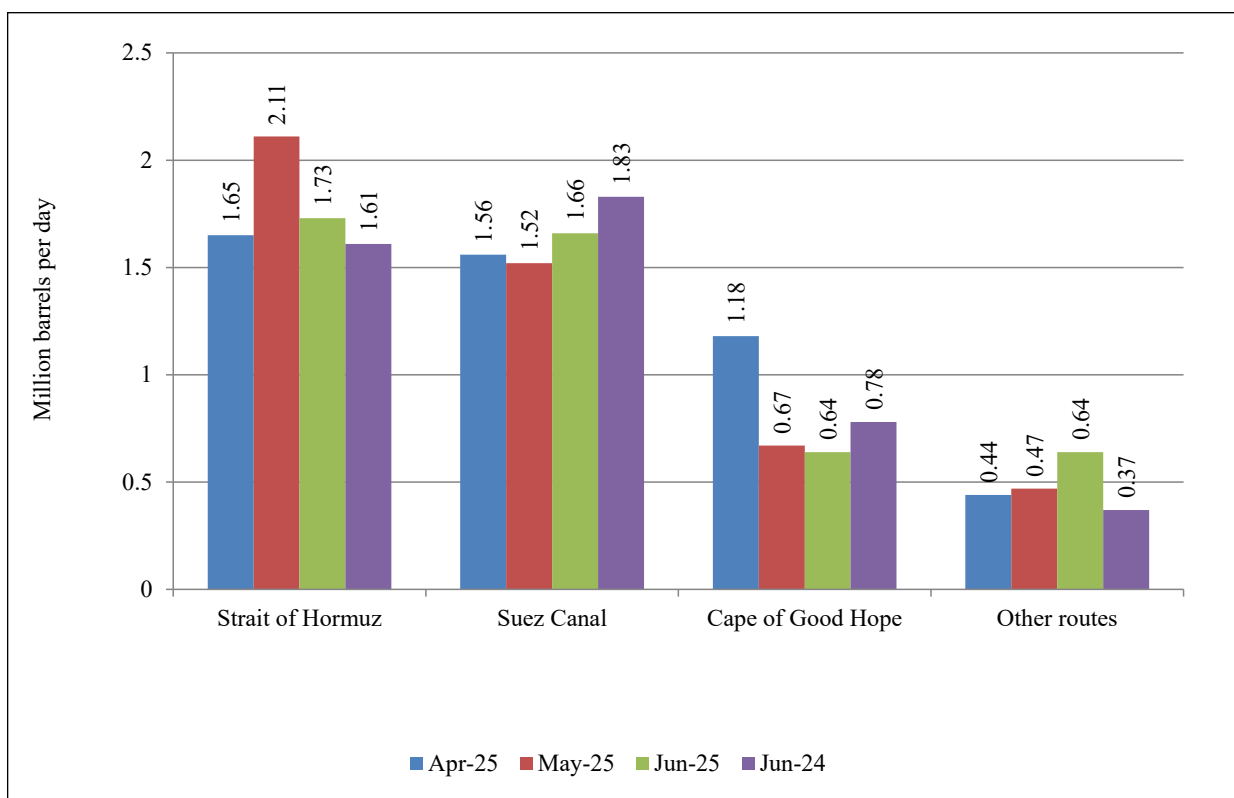
### **Strait of Hormuz (2025)**

The Strait of Hormuz connects the Persian Gulf with the Gulf of Oman and the Arabian Sea. This strait is crucial for global energy security, with a significant portion of the world's petroleum passing through this chokepoint. According to the *IMF PortWatch*, the Strait of Hormuz's share in global seaborne trade in 2023 was 11.1 per cent, and share in global seaborne trade volume per commodity were 39 per cent of crude oil, 31 per cent of propane, 20 per cent of oil products and 19 per cent of natural gas.<sup>9</sup> About 45 per cent of India's crude oil and 54 per cent of LNG imports pass through the Strait of Hormuz. The importance of Strait of Hormuz in India's energy imports is thus very clear from Figure 4.

Recent Israel-Iran conflict, though not majorly affecting the energy flow in the Strait of Hormuz, any disruption at the Strait of Hormuz is a major risk to India's energy security and economic instability.<sup>10</sup>

### **Structural Port Inefficiencies**

Although the world moved beyond the acute pandemic phase, structural inefficiencies still continue to affect the performance of the global ports. The IMF and UNCTAD (2023) highlighted chronic labor shortages, container imbalances, and hinterland connectivity constraints as enduring barriers to maritime

**Figure 4: India's Monthly Imports of Crude Oil by Routes**

Source: Author's own based on Kpler.

fluidity. Indian ports such as Jawaharlal Nehru Port and Chennai Port have also experienced periodic congestion and rise in dwell time. These issues are exacerbated by geopolitical crises since the rerouted vessels lead to uneven global port utilization. India's ongoing *Sagarmala* and PM Gati Shakti programmes seek to address these challenges through port automation, multimodal integration, and the creation of logistics parks, but implementation remains uneven.

### Rising Insurance and Energy Costs

Across all post-COVID disruptions, one common thread is the rise in operational costs. The World Bank (2024) and Clarksons Research (2025) report that shipping insurance premiums through high-risk zones (Red Sea, Hormuz, and Malacca) have more than doubled since 2023. At the same time, volatile bunker fuel

prices, driven by geopolitical conflict and OPEC+ decisions, have added to logistics inflation. For India, which imports over 80 per cent of its crude oil, these costs translate directly into higher domestic inflation and trade deficits. Indian policymakers are therefore increasingly emphasizing energy self-reliance, fleet diversification, and the use of longer-term charter contracts to manage risk exposure.

The marine insurance market size has grown strongly in recent years. According to the *Marine Insurance Global Market Report 2025*, the global marine insurance market is likely to grow from US\$ 32.2 billion in 2024 to US\$ 34.19 billion in 2025 at a compound annual growth rate (CAGR) of 6.2 per cent.<sup>11</sup> The Report indicates "The growth in the historic period can be attributed to global trade expansion, rise in international shipping, piracy and maritime security concerns, stringent regulatory

requirements, natural disasters and climate risks. In 2025, marine insurers face heightened risks because of several ongoing global conflicts and geopolitical tensions that impact maritime trade and shipping routes.” Marine cargo insurance premium in India rises by up to 30 per cent in the first half of 2025, and is likely to go up if disruptions continue.<sup>12</sup> The rise in insurance premium is expected to impact importers of commodities and exporters from India.

## Way Forward

Supply chain disruptions cause havoc to the growth of trade and economic security. Disruptions at the maritime chokepoints, whether from geopolitical conflicts, piracy, natural hazards, or accidents, can cause cascading effects on global and regional supply chains. Supply chain security is the key to the IMEC trade and integration.

Maritime supply chain disruptions have revealed the fragility of global trade networks and the particular vulnerabilities of import-dependent economies such as India. India, which depends on maritime routes for over 90 per cent of its international trade volume and 70 per cent of its energy imports, maritime chokepoints are critical to India’s trade.

From pandemic-era port congestion to the Red Sea crisis and climate-induced chokepoint disruptions, each episode has reinforced the urgency for India to build resilient maritime infrastructure, strengthen trade facilitation, reinforce strategic naval security, and diversify trade corridors beyond traditional choke points. For example, India’s unilateral initiatives in cross-border trade facilitation are known to the world. India has made significant stride in trade facilitation.<sup>13</sup>

India has been aiming for US\$ 2 trillion exports by 2030. As underscored by the World Bank and IMF, the resilience of global maritime trade will depend on coordinated investments in digital logistics systems, port modernization,

and geopolitical risk management – areas where India’s maritime policy reforms now play a pivotal role.

Governments have an important role while dealing with the disruptions. Domestic reforms along with enhanced international cooperation are critical for strengthening supply chain resilience.<sup>14</sup> There are some options for India, and some recommendations are as follows.

- Streamline trade procedures supporting the agile and responsive supply chain;
- Strengthen services and logistics to enable supply chain connectivity;
- Support digitalisation and cross-border trade flows for better risk management;
- Promote international/regional cooperation;
- Set up early warning system, monitoring the markets, etc.;
- Find out alternate sources, new shipping corridors, etc.;
- Extend financial support to MSMEs;
- Encourage regional and South-South trade to provide a buffer against global disruptions; and
- Sharing India’s experiences in dealing with supply chain disruptions with the neighbours in South and Southeast Asia, Africa, etc.

[Author is grateful to Kartik Kishore for his research assistance.]

## Endnotes

<sup>1</sup> Refer, <https://hcss.nl/wp-content/uploads/2024/12/Maritime-Security-for-resilient-global-supply-chains-HCSS-2024.pdf#:~:text=Area%20of%20Interest%20Ocean%3B%20it%20is%20an%20area>

<sup>2</sup> Refer, De, Prabir (2025) Talk on ‘Maritime Supply chains’ which was delivered at the RIS on 30 June 2025 at Delhi.

<sup>3</sup> Import cost is calculated based on:  $IC_i^t = \left[ \frac{cif_i^t - fob_i^t}{cif_i^t} \right] \times 100$

<sup>4</sup> Refer, for example, <https://www.lmitac.com/articles/global-supply-chain-disruptions>

- <sup>5</sup> Refer, UNCTAD (2024) Vulnerability of supply chains exposed as global maritime chokepoints come under pressure, available at <https://unctad.org/news/vulnerability-supply-chains-exposed-global-maritime-chokepoints-come-under-pressure#:~:text=Key%20recommendations,more%20resilient%20and%20sustainable%20future>.
- <sup>6</sup> Refer, <https://www.elibrary.imf.org/view/journals/002/2022/386/article-A001-en.xml#:~:text=2.,Contribution%20to%20Real%20GDP%20Growth>
- <sup>7</sup> Refer, Wan et al. (2023) *Transportation Research Part E*
- <sup>8</sup> Refer, Goodman (2024) <https://www.nytimes.com/2024/03/27/business/economy/container-ship-global-trade.html#:~:text=A%20factory%20near%20Philadelphia%20may,the%20Fragility%20of%20Global%20Trade>
- <sup>9</sup> Refer, <https://portwatch.imf.org>
- <sup>10</sup> Refer, <https://indianexpress.com/article/business/israel-iran-strait-of-hormuz-critical-india-energy-imports-10071992/>
- <sup>11</sup> Refer, <https://www.thebusinessresearchcompany.com/report/marine-insurance-global-market-report>
- <sup>12</sup> Refer, Indian Express, 17 June 2025. <https://indianexpress.com/article/business/war-risks-marine-cargo-insurance-premium-rises-by-up-to-30-pc-10072584/#:~:text=%E2%80%9CMarine%20cargo%20insurance%20premiums%20have,official%20of%20an%20insurance%20company>.
- <sup>13</sup> For example, National Single Window was introduced in 2016, and India has set up the NCTF and introduced the NTFAP 3.0 (2024-2027).
- <sup>14</sup> Refer, <https://www.oecd.org/en/topics/resilient-supply-chains.html#:~:text=The%20OECD%20Supply%20Chain%20Resilience,respond%20to%20complex%20global%20challenges>





# Maritime Corridors: Building for Trade

Prabir De

Developing large transport corridors is increasingly seen as a way to stimulate integration and economic growth. A physical corridor that connects more than two countries is known as an international corridor or cross-border corridor such as multi-modal transport corridor, energy corridor, etc. International corridors offer high spillovers to participating economies, both economic and strategic. There are five major benefits that cross-border maritime corridors offer to the participating countries or regions<sup>1</sup>:

- to sustain growth of the economy;
- to give big push to trade and industrial value chains;
- to strengthen the connectivity;
- to build strategic partnership by leveraging maritime strength; and
- to foster multilateral and regional cooperation.



The concept of soft connectivity is also popular across the world. Some soft connectivity initiatives that connect participating countries or regions anchor on digital, tourism, education, health, etc.

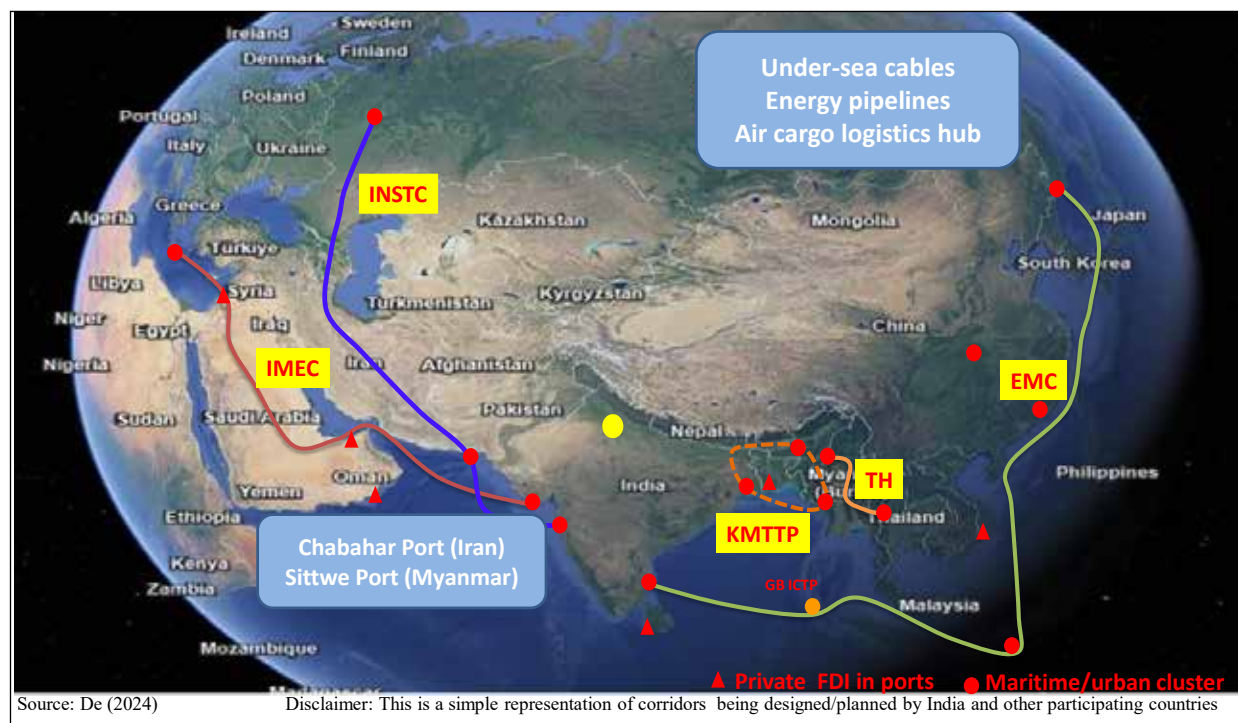
The multi-country corridors, which became popular in the 1990s, are known as the GMS corridors, mostly implemented by the Asian Development Bank (ADB). Today, the world has been witnessing a web of corridors. Some corridors are being driven by China as part of the Belt and Road Initiative (BRI) and some are by the EU. India, on the other, has taken initiatives to build multi-country corridors such as the TH, INSTC, EMC, IMEC, etc. and also a range of soft corridors through digital connectivity. Figure 1 presents a set of multi-modal corridors being developed by India.

This article presents the emerging contours of the international maritime corridors, particularly where India is involved.

## Transport Corridor or an Economic Corridor?

Economic corridors provide connection between gateways, economic nodes or hubs. The economic corridor approach emphasizes integration of infrastructure improvement with economic opportunities such as trade and investment, and it includes efforts to address the social and other outcomes of increased connectivity (De and Iyengar, 2014). Economic corridor becomes successful when corridors connecting gateways (cities) coupled with supporting institutions (logistics) improve the competitiveness of a geographic space (country). The economic corridor approach has gained momentum in Asia with the Asian Development Bank's (ADB) support to the Greater Mekong Subregion (GMS) and later Central Asia Regional Economic Cooperation Programme (CAREC). A major achievement of the GMS Programme is improved transport connectivity in the subregion, particularly in

**Figure 1: Multi-modal Transport Corridors by India**



the less-developed areas, as exemplified in the main GMS economic corridors: the East–West, the North–South, and the Southern. There are large opportunities for trade, investment, and economic growth due to multimodal economic corridors. At the same time, challenges are plenty such as acquisition of land or rising taxes on citizens in high subsidy economies for development of infrastructure, townships and industrial or economic zones.

In general, an economic corridor is infrastructure that helps facilitate economic activities. Figure 2 shows the stages in the development of an economic corridor. A corridor can be national (e.g. Leipzig - Frankfurt corridor, Tokyo - Osaka corridor), regional (e.g. GMS or CAREC corridors), or even international (e.g. submarine telecommunication cables or energy pipelines). Trade facilitation and logistics services are the main catalysts in the development of the economic corridor. Economic corridor helps strengthen industrial

(or, services) agglomeration over time through establishment of industrial zones (or, SEZ) and facilitates cluster-type development of enterprises.

Economic corridors play a key role in integrating economies across regions. Some of their environmental effects notwithstanding, well-functioning and efficient economic corridors are essential for the development of a region. For example, reducing the costs of transportation, both within and across regions, improves international market access, increases income, and reduces poverty. The salutary effect of improving cross-border transport infrastructure in the GMS has been well documented, and better connectivity has helped the subregion reduce poverty.<sup>2</sup> In one hand, economic corridors are meant to fill regional infrastructure gaps, and, on the other, promote pro-poor socio-economic development. They help increase trade flows, create employment, and reduce poverty.

**Figure 2: Stages of Development of Economic Corridor**



Source: Author's illustration based on Srivastava (2012)

**Table 1: What Makes an Economic Corridor**

| Stage | Corridor           | Policy               | Measure                                                                                                                                          | Role                                                                                 |
|-------|--------------------|----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| 1     | Transport corridor | Trade facilitation   | <ul style="list-style-type: none"> <li>Integrated trade facilitation</li> <li>Customs cooperation</li> </ul>                                     | <ul style="list-style-type: none"> <li>Government</li> <li>Private sector</li> </ul> |
| 2     | Trade corridor     | Trade liberalization | <ul style="list-style-type: none"> <li>Border policies</li> <li>Behind-the-border policies</li> </ul>                                            | <ul style="list-style-type: none"> <li>Government</li> </ul>                         |
| 3     | Economic corridor  | Economic development | <ul style="list-style-type: none"> <li>Corridor value chains</li> <li>Corridor township development</li> <li>Cross-border investments</li> </ul> | <ul style="list-style-type: none"> <li>Government</li> <li>Private sector</li> </ul> |

Source: Author's own based on several secondary sources of the ADB

Why do we need to focus on economic corridors? How do they differ from transport corridors? The literature suggests economic corridors have three specific advantages over transport corridors. First, sustained economic growth increases the demand for infrastructure services – software or otherwise. Improved economic corridors help ease the demand for infrastructure services, generating more output. Second, efficient economic corridor networks are important to regional integration, in both absolute and relative terms, as tariff-based barriers have declined. Economic corridors help facilitate trade and investment, fostering regional integration. Third, better infrastructure (supply links) encourages fragmentation of production, and enhances regional and global trade, expediting regional integration. Table 1 illustrates the structural differences between transport corridor, trade corridor and economic corridor.

There is another argument for building an economic corridor. With growing uncertainties, there is a need to reduce export dependence and increase reliance on regional markets (e.g. fruits and vegetables, textile and clothing, automobile parts, etc.). Building regional economic corridors will then increase regional trade, thereby facilitating regional integration process.

## Emerging Contour of Cross-border Multi-modal Corridors

The cross-border multi-modal transport corridors have been gaining high momentum in international relations. For example, the Indian Prime Minister while addressing the 20<sup>th</sup> ASEAN-India Summit in 2023, called for establishing a multi-modal connectivity and economic corridor that links South-East Asia-India-West Asia-Europe and an enhanced cooperation on maritime safety, security and domain awareness.<sup>3</sup> In the same year, a Memorandum of Understanding (MoU) was signed for development of the India-Middle

East-Europe Economic Corridor (IMEC) by leaders from India, the US, Saudi Arabia, the UAE, France, Germany, Italy, and the EU at the sideline of the G20 Summit in New Delhi.<sup>4</sup>

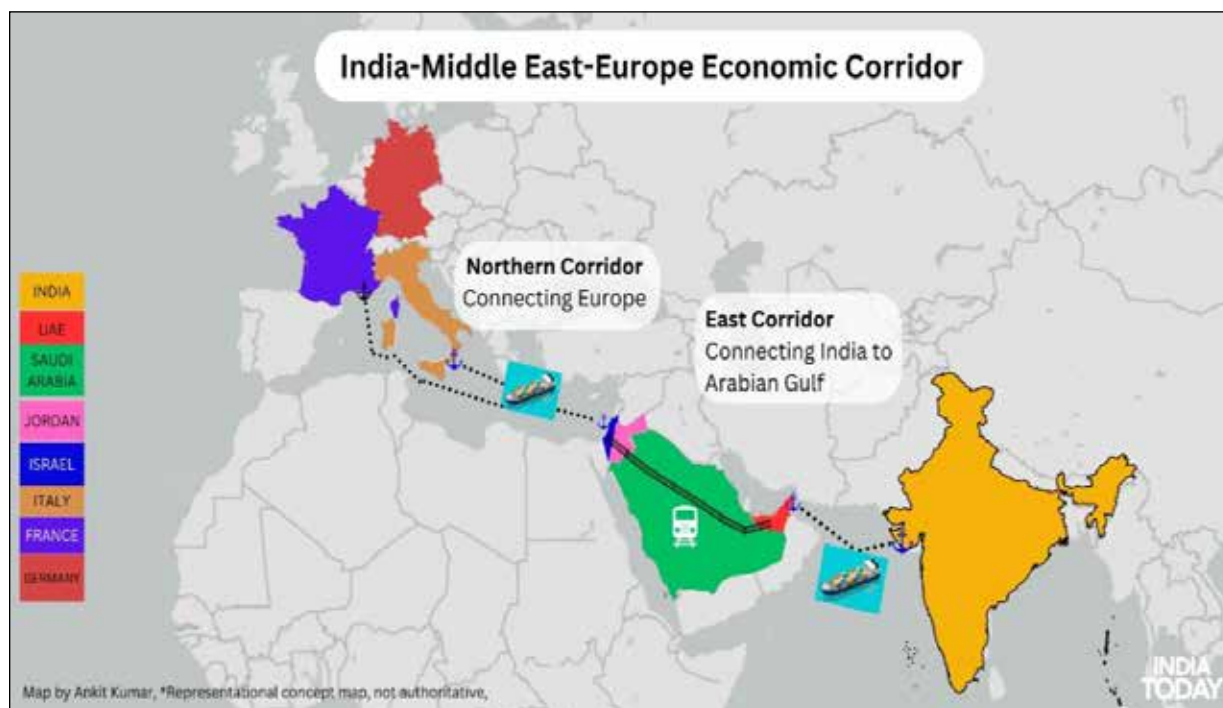
Many of these multi-modal transport corridors are aimed to enhance connectivity, trade, and energy and digital integration between the participating countries / regions. India, for example, has anchored several of these corridors in South Asia and beyond (see Figure 1).

Corridors lead to augment trade and strengthen economic prosperity<sup>5</sup>. It also adds heft to the strategic objectives. However, there are caveats to the corridor-led growth model. For example, if the corridors do not generate the expected surpluses, they can become wasteful white elephants.<sup>6</sup> Even when corridors generate aggregate surpluses, a relevant question is whether the net benefits are fairly distributed across the participating countries. If they are not, corridors then are becoming inequitable investments<sup>7</sup>. At the same time there are environmental trade-offs.

### (i) IMEC – an Economic Corridor in Making

The India-Middle East-Europe Economic Corridor (IMEC) is a multi-modal corridor being promoted by a group of countries, namely, the US, India, Saudi Arabia, the UAE, France, Germany, Italy and the EU. It aims to cover maritime, rail, road, hydrogen pipeline, and high speed data cable. To avoid risks and threats in the Red Sea, the IMEC is designed as an alternative route to connect India with Europe and vice versa. Divided in two segments (East corridor and Northern corridor), the IMEC appears to be a best alternative to strengthen economic linkages between South Asia, Middle East and Europe (Figure 3).

India's trade volume with some of the IMEC partners shows a positive trend between 2018 and 2022 (Table 2). The calculated containerized trade volume between India and the UAE was 543,538 TEUs in 2022, increased from 388,618

**Figure 3: IMEC Routes**

Source: India Today Media Group

**Table 2: India's Containerized Trade with IMEC Partners**

| IMEC Partner | 2018   |        |        | 2022   |        |        |
|--------------|--------|--------|--------|--------|--------|--------|
|              | Export | Import | Total  | Export | Import | Total  |
| Greece       | 8294   | 4188   | 12482  | 13763  | 8878   | 22641  |
| Italy        | 107800 | 38067  | 145866 | 143234 | 58381  | 201615 |
| Saudi Arabia | 131882 | 64530  | 196412 | 186491 | 91716  | 278207 |
| UAE          | 192393 | 196225 | 388618 | 314888 | 228650 | 543538 |

Notes: 1. Containerized trade is calculated based on the methodology as discussed in the RIS DP # 284, available at <https://www.ris.org.in/index.php/en/node/3752>. 2. Unit: TEUs (twenty equivalent unit)

Source: Calculated by author based on 6-digit HS available at the WITS

TEUs in 2018; growth rate was highest among the four IMEC partner countries. The rise in merchandise trade between India and the UAE is driven by India-UAE Comprehensive Economic Partnership Agreement (CEPA), which was signed in 2022, and the efficient maritime connectivity between them. Besides, the IMEC has made remarkable achievements in the implementation of the WTO Trade

Facilitation Agreement (TFA) and cross-border paperless trade facilitation.<sup>8</sup>

### India-UAE MAITRI

India and the UAE have implemented a virtual trade corridor, which is known as the Master Application for International Trade and Regulatory Interface (MAITRI), a digital

platform created to streamline trade between the two countries as part of the IMEC. The MAITRI interface integrates various Indian and UAE trade portals to enable real-time, paperless data exchange for customs and logistics, with the goal of reducing costs and increasing efficiency. Some of the key features of the MAITRI are as follows<sup>9</sup>:

- **Digital integration:** The platform acts as a unified interface that connects existing digital systems, such as India's National Logistics Portal and the Unified Logistics Interface Platform, with similar UAE systems.
- **Streamlined and simplified trade processes:** By facilitating the seamless and paperless exchange of information like customs data, shipping manifests, and container tracking details, MAITRI aims to reduce administrative processes and time.
- **Enhanced efficiency:** The initiative is designed to lower logistics and transport costs, improve transparency, and enhance the overall ease of doing business for both the countries.
- **Technological progress:** It is expected to leverage technologies like Artificial Intelligence (AI) and Blockchain for greater efficiency and security.

### Scaling up IMEC

In IMEC, two cross-border paperless trade measures are basic building blocks towards enabling the exchange of trade-related data and documents across borders: (i) laws and regulations for electronic transactions, and (ii) recognized certification authority issuing digital certificates. The other four cross-border paperless trade measures facilitate the actual exchange of trade-related data and documents across borders are (i) e-system for customs declaration; (ii) e-system for certificate origin; (iii) e-SPS certification; and (iv) e-letter of credit, among others. All of them have implemented the AEO frameworks, and Customs Single

Window. Online submission of Bill of Lading (e-BL) is work in progress. There has been a growing interest in full supply chain security along the IMEC or between India and the UAE. All of them are members of the IMO and have been following the IMO guidelines on maritime security. Besides, they have implemented the ISPS code and compliance protocols. IMEC partners are also members of the TIR carnet, offer market-driven marine insurance and follow the WTO rules on trade practices.

Here, we propose a few policy recommendations for scaling up the maritime connectivity in IMEC.

One, since IMEC partners have already implemented the national single window, a regional single window is a doable project, which will help facilitate trade and connectivity within the IMEC;

Two, signing of MRAs will help harmonise the standards in gradual manner;

Three, online submission of (i) COO, (ii) SPS, (iii) BL, etc. will pave the way for deeper trade integration;

Four, along with the e-submission of the trade documents, recognition of certification authorities is a must in IMEC; and

Five, IMEC partners shall agree on interoperability of their respective maritime single window facilities.

### (ii) Strategic Importance of INSTC

International North-South Transport Corridor (INSTC) is one of the oldest cross-border multi-modal transport corridors that connects a total 7200 km from the Indian Ocean and Persian Gulf to northern Europe via Iran and Russia. Initiated in 2000 by India, Russia, and Iran, the INSTC aims to improve trade and transport connectivity between participating countries (Figure 4). The corridor is seen as a crucial alternative for trade, especially given disruptions in other major routes like the Suez

Canal. A total of 13 countries are partners in the INSTC such as Azerbaijan, Belarus, Bulgaria, Armenia, India, Iran, Kazakhstan, Kyrgyzstan, Oman, Russia, Tajikistan, Turkey, and Ukraine.

Movement of goods are envisaged to move from Mumbai (India) to Shahid Beheshti Port Chabahar (Iran) by sea, then from Chabahar to Bandar-e-Anzali (an Iranian port on the Caspian Sea) by road, and then from Bandar-e-Anzali to Astrakhan and after that from Astrakhan to other regions of Russia and further into Europe by Russian Railways (Figure 4). In June 2024, an India-bound coal from Russia via the INSTC was reported, specifically mentioning that Russian Railways had sent two trains carrying Kuzbass coal to India via the port of Bandar Abbas<sup>10</sup>. The journey began in Siberia before heading through Kazakhstan and Turkmenistan to the Iranian port of Bandar Abbas. From Bandar Abbas, the coal consignment was transported via sea and finally delivered to Mumbai port,

underscoring the need for a multi-modal cross-border transport corridor.

India's containerized trade flow with some of the INSTC partner countries show positive growth except Iran (Table 3). The calculated trend of India's containerized trade also indicates that India's trade with Turkey has witnessed 19 per cent growth between 2018 and 2022, the highest among the four reported countries in Table 3. The containerized trade potential in INSTC also tells us high trade potential in the INSTC partner countries provided the countries resolve the differences on the corridors and push for its completion. There are some low-hanging fruits for cooperation. INSTC partner countries have witnessed remarkable performance in implementation of the WTO TFA, but they are trailing in cross-border paperless trade facilitation. Except Armenia, remaining INSTC participating countries have fully implemented the WTO TFA, thus showing

**Figure 4: INSTC Routes**



Source: Author's own

**Table 3: India's Containerized Trade with INSTC Partners**

| INSTC Partners | 2018          |               |               | 2022          |               |               | Growth Rate (CAGR) (%) |           |           |
|----------------|---------------|---------------|---------------|---------------|---------------|---------------|------------------------|-----------|-----------|
|                | Export        | Import        | Total         | Export        | Import        | Total         | Export                 | Import    | Total     |
| Azerbaijan     | 2231          | 106           | 2336          | 2921          | 36            | 2958          | 7                      | -23       | 6         |
| Iran           | 246911        | 27169         | 274080        | 229679        | 28560         | 258239        | -2                     | 1         | -1        |
| Russia         | 58718         | 115668        | 174385        | 84695         | 181429        | 266125        | 10                     | 12        | 11        |
| Turkey         | 176141        | 42501         | 218642        | 355024        | 81480         | 436504        | 19                     | 18        | 19        |
| <b>Total</b>   | <b>484000</b> | <b>185443</b> | <b>669443</b> | <b>672320</b> | <b>291506</b> | <b>963825</b> | <b>9</b>               | <b>12</b> | <b>10</b> |

**Notes:** 1. Containerized trade is calculated based on the methodology as discussed in the RIS DP# 284, available at <https://www.ris.org.in/index.php/en/node/3752>. 2. Unit: TEUs means twenty equivalent unit. 3. The CAGR is for the period 2018 and 2022.

**Source:** Calculated based on 6-digit HS available at the WITS

**Figure 5: Chennai-Vladivostok Eastern Maritime Corridor (EMC)**

\*The map is simply for illustration purposes and political boundaries are not real.

**Source:** The Gateway House, Mumbai

**Table 4: India's Containerized Trade with EMC Partner Country**

|        | 2018   |        |        | 2022   |        |        | Growth Rate (CAGR) (%) |        |       |
|--------|--------|--------|--------|--------|--------|--------|------------------------|--------|-------|
|        | Export | Import | Total  | Export | Import | Total  | Export                 | Import | Total |
| Russia | 58718  | 115668 | 174385 | 84695  | 181429 | 266125 | 10                     | 12     | 11    |

**Notes:** 1. Containerized trade is calculated based on the methodology as discussed in the RIS DP # 284, available at <https://www.ris.org.in/index.php/en/node/3752>. 2. Unit: TEUs means twenty equivalent unit. 3. The CAGR is for the period 2018 and 2022.

**Source:** Calculated based on 6-digit HS available at the WITS

trade policy convergence in moving the trade across the corridor.

In view of ongoing geopolitical tensions, the INSTC may continue to face uncertainties. Nevertheless, it has strong strategic importance as an alternative trade route.

### (iii) Chennai-Vladivostok Eastern Maritime Corridor (EMC)

Russia and India introduced the 10,300 km long Chennai-Vladivostok Eastern Maritime Corridor (known as the EMC) connecting Russia's Far East with India's east coast (Figure 5). The EMC project was initiated in 2019, and cargo traffic has started flowing through it since 2024. The EMC is a transformative project, strengthening India-Russia trade ties and reinforcing India's maritime and strategic ambitions in the Indo-Pacific<sup>11</sup>. The EMC is an end-to-end maritime corridor.

Grown at 12 per cent CAGR, India's containerised trade with Russia increased from 174385 TEUs in 2018 to 266125 TEUs in 2022

(Table 4). India's imports from Russia using the EMC are mostly coal, oil, liquefied natural gas, fertilizers, containers, textiles, and other types of cargo, etc. These key trade items highlight the growing importance of the EMC.<sup>12</sup> In 2024-25, the EMC witnessed a significant increase in cargo volumes, with coal shipments rising by 87 per cent and crude oil transport growing by 48 per cent.<sup>13</sup> The EMC is likely to witness more volumes in the future if a bilateral FTA between India and Russia comes into effect. The AEO programme is aimed to enhance both the security and facilitation of customs trade between the participating nations. India and Russia signed an Authorized Economic Operator (AEO) Mutual Recognition Agreement (MRA) to simplify and expedite customs clearance for trusted exporters. Although India and Russia have fully completed the WTO TFA mandates, they are still lagging in cross-border paperless trade facilitation. Both India and Russia should continue to strengthen the linkages between Russia's Far East and India through the EMC.

Figure 6: Kaladan Corridor



Source: ASEAN-India Centre (AIC) at RIS

#### (iv) Kaladan Multi-modal Transit Transport Project

The Kaladan project has two major components: waterways component and road component. As on date, the waterways component, which includes construction of port and IWT terminal and back-up facilities at Sittwe and Paletwa; dredging at Sittwe port; dredging of river on Sittwe-Paletwa stretch (158 km); and delivery of 6 IWT vessels; has been completed. On the other hand, the road component, which includes construction of a 109 km double lane highway between Paletwa and Zorinpuri, is still work in progress. The road between Paletwa and Zorinpuri needs heavy construction in hill and forest areas in Chin province of Myanmar, sharing a border with Mizoram. Until and unless this highway is completed, Northeast India's access to Bay of Bengal through Sittwe will remain incomplete.

Operationalization of Sittwe port's new terminal in 2023 was a major milestone that India and Myanmar have achieved. It is an important component of the Kaladan Multi-modal Transit Transport Project (KMTTP) for which a framework agreement was signed between India and Myanmar as the contracting parties on 2 April 2008.<sup>14</sup> Although it took over two decades from the year of planning to operationalisation of the port, the revamped Sittwe port has started handling maritime cargo.<sup>15</sup>

#### (v) Development of Chabahar Port in West and Sittwe Port in East

Chabahar (ZBR) is the deepest Port in Southeast of Iran. It is an all weather deep draft port with a draft of 16 m. at the container terminal and 14 m. at the multipurpose terminal. It is a gateway to connect India with Central Asia, aiming to strengthen India's ties with the energy-rich

**Figure 7: Two Vital Ports in India's Neighbourhood**



Source: Author's own

region. The current infrastructure includes two multipurpose cargo-handling Berths and two container cargo-handling berths (Figure 7). In 2023-24, Chabahar Port handled container traffic of more than 60,000 TEUs and bulk and general cargo of over 1.9 million tonnes<sup>16</sup>. An SEZ is also coming up at the Chabahar port area. The Chabahar Port was handed over to the IPGL to operate and run the terminals. The opening of Chabahar port has added momentum to the India-Iran-Turkmenistan-Uzbekistan connectivity (India-Central Asia connectivity).

India and Myanmar signed an MoU for the operationalisation of the Sittwe Port and Paletwa and Sittwe Inland Water Transport (IWT) terminals on 22 October 22, 2018, which then allowed the Indian agency (India Ports Global Limited) to own and operate the newly built terminal. Terminals at Sittwe are already operational from 2023. On 20 July 2024, Sittwe handled 100<sup>th</sup> cargo vessel mainly for domestic transportation. However, the Sittwe Port is yet to handle international cargo on a regular basis.

## (vi) Development of Sabang Island, Indonesia

Occupying strategically a vital position at the tip of Malacca Strait, the development of Sabang Island has gained an official endorsement during the visit of Indian Prime Minister to Indonesia in 2018. The two leaders agreed to cooperate on connectivity and established a Joint Task Force to oversee the development of Sabang Island as part of the Andaman – Aceh corridor. Sabang is located at the entrance of the Strait of Malacca (Figure 8), a critical maritime chokepoint that sees heavy international shipping traffic. Enhanced connectivity between Sabang and Andaman will benefit both India and Indonesia, and also bring new momentum to the Indo-Pacific.<sup>17</sup>

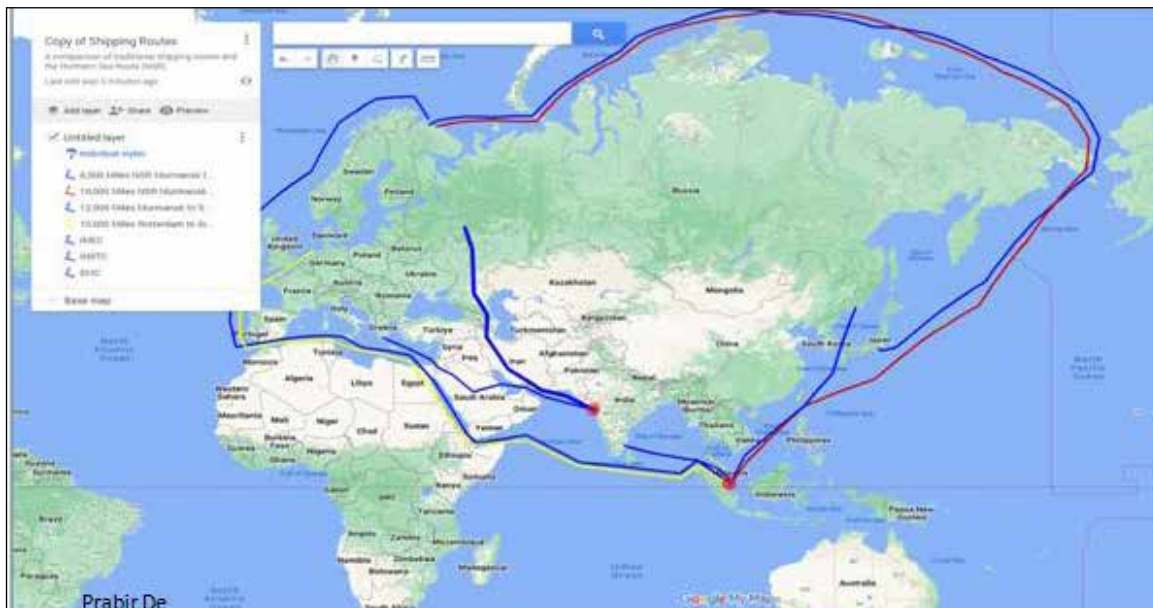
## Going Forward

The foregoing analysis clearly tells that India has firmly positioned itself in the world web of corridors. India-centric corridors are emerging under four verticals:

**Figure 8: Location of Sabang Island**



Source: Author's own

**Figure 9: Emerging Contour of International Corridors**

Source: Author's own

One, corridors connecting the India's neighbourhood such as the TH, Kaladan, etc.;

Two, corridors connecting Southeast Asia, East Asia and Far East such as the TH, EMC, etc.;

Three, corridors connecting Gulf, Central Asia and Europe such as the INSTC, IMEC; etc., and

Four, a strong wind of soft corridors such as the trade facilitation initiatives.

The emerging network of international corridors also opens an opportunity of transportation over the Arctic (see Figure 9). India has deep interest in using the Arctic's Northern Sea Route (NSR) for trade transportation purpose. The NSR offers a more cost-effective and shorter path between Europe and Asia compared to traditional routes like the Suez Canal<sup>18</sup>.

To facilitate the development of corridors, the candidate pillars of cooperation are recommended:

(i) Hard Infrastructure: Continued investment in road, rail, inland waterways,

aviation and maritime transportation is required. Engaging the MDBs such as the ADB, World Bank, AIIB, etc. and international cooperation agencies such as the JICA will help secure crucial financing, mobilize private capital, offer technical expertise, and promote sustainable development.

(ii) Soft Infrastructure: Digitization of custom processes, paperless trade facilitation, data sharing, and signing of the MRAs for trade facilitation such as the AEO programme, UN CPTA, etc. can significantly improve the trade processes.

(iii) Capacity Development: Developing standard operating procedure and necessary skill training for the officials involved in the cross-border logistics can improve the overall process.

Geography is fast changing and so are development paradigms. The Indian economy is likely to reach US\$ 30 trillion in 2047, which offers huge opportunities for economic integration and corridor development. New lines of corridors will help India in driving the

growth and development. At the same time, corridors could help India, an energy deficient economy, in securing precious energy and natural resources. What follows is that rules are important to drive the corridor projects and inclusive participation of countries in owning/buying the initiatives. New studies and strategic plans are keys to making informed decisions.

[Disclaimer: The containerized trade flow reported in this chapter has been calculated by the author based on the methodology as discussed in the RIS DP # 284, available at <https://www.ris.org.in/index.php/en/node/3752>. These are calculated data and not the actual realized trade flow between trade partners. Author is grateful to Mr Amal K Saji and Dr Tuhin Giri who worked with the author in carrying out the analytical exercise.]

## Endnotes

- <sup>1</sup> Refer, ADB *et al.* (2018)
- <sup>2</sup> The remarkable progress in the Mekong in recent years is reflected in an increase in average per capita income from about US\$ 630 in 1992 to about US\$ 1,100 in 2006 (World Bank 2007). Edmonds and Fujimura (2008) found a positive effect of cross-border infrastructure on trade in major goods in the Mekong region. Also refer, ADB *et al.* (2018)
- <sup>3</sup> Refer, [https://www.mea.gov.in/press-releases.htm?dtl/37070/Prime\\_Ministers\\_participation\\_in\\_the\\_20th\\_ASEANIndia\\_Summit\\_and\\_the\\_18th\\_East\\_Asia\\_Summit](https://www.mea.gov.in/press-releases.htm?dtl/37070/Prime_Ministers_participation_in_the_20th_ASEANIndia_Summit_and_the_18th_East_Asia_Summit)
- <sup>4</sup> Refer, [https://www.mea.gov.in/press-releases.htm?dtl/37091/Partnership\\_for\\_Global\\_Infrastructure\\_and\\_Investment\\_PGII\\_IndiaMiddle\\_EastEurope\\_Economic\\_Corridor\\_IMEC](https://www.mea.gov.in/press-releases.htm?dtl/37091/Partnership_for_Global_Infrastructure_and_Investment_PGII_IndiaMiddle_EastEurope_Economic_Corridor_IMEC)
- <sup>5</sup> Refer, for example, De and Iyengear (2014), available at [https://www.ris.org.in/sites/default/files/Publication/Developing%20Economic%20Corridors%20\(webversion\)%20%2028.4.15\\_0.pdf](https://www.ris.org.in/sites/default/files/Publication/Developing%20Economic%20Corridors%20(webversion)%20%2028.4.15_0.pdf)
- <sup>6</sup> Refer, ADB *et al.* (2018)
- <sup>7</sup> *ibid*

- <sup>8</sup> Refer, De (2024).
- <sup>9</sup> Based on author's own communication with the MoPSW and the inputs received.
- <sup>10</sup> Refer, <https://sputniknews.in/20240624/russia-inaugurates-india-bound-coal-delivery-via-north-south-transport-corridor-7689342.html>
- <sup>11</sup> Refer, 'Maritime Briefing No. 8: India-Russia Maritime Cooperation', RIS. Available at: <https://www.ris.org.in/sites/default/files/2023-09/Maritime-Briefing-8.pdf>
- <sup>12</sup> Refer, for example, <https://www.thehindubusinessline.com/economy/logistics/sea-link-to-far-east-russia-turns-vital/article69537819.ece>
- <sup>13</sup> *ibid*
- <sup>14</sup> Refer, <http://www.mea.gov.in/Portal/LegalTreatiesDoc/MM08B0360.pdf>
- <sup>15</sup> Indian Minister of Ports, Shipping & Waterways and Ayush inaugurated the new terminal of the Sittwe port by receiving the cargo vessel at the terminal on 9 May 2023, which was sailed from Kolkata port on 4 May 2023. The vessel MV-ITT LION (V-273) carrying 20,000 bags holding 1,000 metric tonnes of cement left the Syama Prasad Mookerjee Port in Kolkata on 4 May 2023 for Sittwe. The total sailing time was 5 days to cover 540 km from Kolkata to Sittwe.
- <sup>16</sup> Author's own based on the IPGL
- <sup>17</sup> Refer, for example, <https://maritimeindia.org/the-sabang-and-aceh-andamans-initiatives-beyond-base-access-and-balancing/>
- <sup>18</sup> Refer, "Introducing the Arctic as a Strategic Geopolitical Pillar for India", available at [https://www.orfonline.org/research/introducing-the-arctic-as-a-strategic-geopolitical-pillar-for-india#\\_ednref14](https://www.orfonline.org/research/introducing-the-arctic-as-a-strategic-geopolitical-pillar-for-india#_ednref14)

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# India-Middle East-Europe Economic Corridor (IMEC): Current Status and Prospects

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Sanjeev Ranjan

The India-Middle East-Europe Economic Corridor (IMEC) was launched at the sideline of G20 Leaders' Summit in New Delhi in September 2023. It brings together India, the United Arab Emirates (UAE), Saudi Arabia, Jordan, Israel, and European nations including Italy, France, and Germany under a unified framework for connectivity, logistics, and digital infrastructure. The corridor is designed as a multimodal network



with a maritime leg connecting India to the UAE, and then through the Middle East into Europe. India-Middle East-Europe Economic Corridor (IMEC) is the grand vision rooted in history for inclusive development. European Union (EU) and India bilateral trade of more than US\$ 140 billion, makes IMEC strategically important as an alternative trade corridor to enhance route redundancy and trade security

More than a physical trade route, IMEC aspires to become a sustainable economic corridor—integrating energy grids, undersea data cables, clean hydrogen pipelines, and digital trade platforms. Yet, the true challenge lies in orchestrating seamless coordination among diverse political and regulatory environments. The potential of IMEC to become a catalyst for regional development, technological exchange, and sustainable growth will depend on harmonising regulations across borders. The India-Middle East-Europe Economic Corridor (IMEC) emerges as a transformative initiative aimed at reshaping global trade routes, fostering regional integration, and propelling inclusive development.

## Grand Vision for Transformative Integration

Eastern leg of the IMEC would take containers from India to the UAE on the well-established shipping routes from India's west coast, joining the corridor's land route in Saudi Arabia through UAE. The goods would move by rail to the Mediterranean coast.

The IMEC MoU (2023) mentions that, "Along the railway route, Participants intend to enable the laying of cable for electricity and digital connectivity, as well as pipe for clean hydrogen export. This corridor will secure regional supply chains, increase trade accessibility, improve trade facilitation, and support an increased emphasis on environmental social, and government impacts. Participants intend that the corridor will increase efficiencies, reduce costs, enhance economic unity, generate

jobs, and lower greenhouse gas emissions - resulting in a transformative integration of Asia, Europe and the Middle East."<sup>1</sup>

The western leg of the corridor would put the containers back on ships and take them to European ports across the European Union, France, Italy, and Germany for onward transmission by European rail networks to their final destinations. This route reduces Suez Canal dependence and offers faster transportation with high-speed freight trains.

The IMEC leverages existing shipping routes and major ports on India's Western coast, such as Mumbai, Jawaharlal Nehru Port, Kandla, Mangalore, Mormugao, Vizhinjam and Kochi, which are key transit points. This collaboration with Gulf states, especially the UAE, utilizes an established economic route without requiring immediate large-scale infrastructure development. Promoting Fujairah port on the UAE's eastern seaboard will also provide geopolitical benefits by bypassing the Strait of Hormuz.

A crucial component of IMEC's digital connectivity plans, the undersea data cable will enhance high-speed data transmission between participating countries. It aims to bolster digital infrastructure, supporting seamless communication for economic activities and regional integration. This network will ensure reliable communication channels, essential for businesses and governments to coordinate effectively and enhance trade in goods and services. As part of IMEC's digital initiatives, creating integrated digital payment ecosystems will streamline financial transactions. This infrastructure aims to foster secure and efficient digital payments across the region, promoting economic growth and financial inclusion. Integrating clean hydrogen pipelines within IMEC's energy corridors is pivotal for promoting sustainable energy solutions. These pipelines will support the transition towards cleaner fuels, reducing carbon emissions. It's a transformative project.

## Rooted in History

India has a rich heritage of trade corridors that facilitated not just commerce, but also cultural and technological exchange. The archeological findings have established that during the period of Indus Valley Civilization the routes similar to IMEC were in vogue 5,000 years back. Lothal is a heritage site of significant international importance, dating to 2600 BCE to 2000 BCE. Archaeological Survey of India excavations have discovered the oldest man-made dockyard at Lothal - world's first tidal dock. Ships from Lothal, traded up to Babylon and Mediterranean areas.

IMEC is a civilizational reconnect. The Roman Empire was linked with Asia through the "Maritime Silk Road" and the "Golden Road" which followed a similar alignment. It's a grand vision rooted in history, but a result of the present-day geopolitical realities and therefore, it's an idea whose time has come. *Periplus of the Erythraean Sea*, a mariners guide book of first century A.D. by a Greco-Egyptian author, names many ports on the west coast of India.<sup>2</sup>

It is the civilizational connect that IMEC will strengthen and reestablish. The kind of goods that used to move, cloth in big quantities, spices, animals, fragrances would however be different with containers, energy and data becoming more important for IMEC. But the linkages and the connect has been there for a long time. Maritime Route was the dominant route of trade in history when it came to movement of large quantities of goods and was the "The Golden Road" and IMEC will revive the Golden Road.

## Some Major Objectives

**Infrastructure Development:** The IMEC initiative aims to drive infrastructure development along the corridor, including the construction of transportation networks, logistics hubs, and industrial zones.

**Cultural Exchanges:** The IMEC aims to facilitate cultural exchanges between India, the Middle East, and Europe, fostering greater

understanding and cooperation among the diverse societies along the corridor.

**Movement of Goods and Services:** One of the key objectives of the IMEC is to streamline and simplify the movement of goods and services between India, the Middle East, and Europe. By reducing trade barriers, enhancing logistics efficiency, and harmonizing regulations, the corridor will create a conducive environment for businesses to expand their operations, enhance market access, and increase the flow of goods and services across the region.

**Green Energy:** A central feature of the IMEC is the proposed development of hydrogen pipelines to transport green hydrogen from the Middle East (particularly countries like Saudi Arabia and the UAE) to Europe and potentially India. Green hydrogen, produced using renewable energy sources, is expected to play a major role in the energy transition away from fossil fuels. Middle East is well-positioned to become a global hub for hydrogen production.

**Energy Grid Connectivity:** The corridor would facilitate cross-border electricity trade, especially from renewable energy sources like solar and wind. The IMEC will likely improve the efficiency of energy trade via maritime routes, particularly for crude oil and Liquefied Natural Gas (LNG) from Gulf states to India and Europe.

**High-Speed Data Transmission:** One of the cornerstone projects of IMEC will be the deployment or enhancement of subsea fiber optic cables between India, the Middle East, and Europe. These undersea cables will provide high-capacity, low-latency internet and communication links.

**Data Centers and Cloud Services:** These cables along the IMEC will interconnect major data hubs in India, the UAE, Saudi Arabia, and Europe, enabling faster data exchange and improving cloud services in these regions. The IMEC could build upon existing submarine cable systems such or create new routes.

**Digital Supply Chain Management- Smart Ports and Logistics:** The IMEC will integrate advanced digital supply chain platforms to streamline trade and logistics. Ports and logistics hubs along the corridor will likely adopt digital technologies to manage and optimize shipping routes, inventory tracking, and cargo management.

**Real-Time Data Sharing:** Enhanced fiber optic and satellite links will facilitate real-time data sharing across the corridor, allowing for smoother customs clearance, better tracking of goods, and predictive maintenance of logistics infrastructure.

## Beyond a Trade Corridor, an Economic Corridor

IMEC's scope is far greater than traditional logistics corridors. It seeks to integrate various dimensions of connectivity – physical, digital, energy, financial, and regulatory. IMEC intends to provide an alternative route to the Suez Canal, significantly reducing transit times for goods moving between Asia and Europe. The western leg of the corridor will use high-speed freight trains from the UAE through Saudi Arabia and Jordan to Israel, from where shipments will travel to Europe. This new trade artery aims to improve resilience in global supply chains and reduce dependence on routes vulnerable to geopolitical disruptions.

IMEC being developed as an economic corridor would promote industrial and economic growth creating industrial hubs, attract investments, and boost local economies by establishing new manufacturing and industrial hubs and generating employment and making economic growth more inclusive, ensuring balanced development.

## Multimodal Connectivity, Digital and Sustainable Infrastructure for Inclusive growth

With the containers increasingly being the way things move; multimodality has become the

new order. In order for multimodality to be cost effective, it is necessary that the containers can switch from one mode to another at the ports and the transport hubs, seamlessly like messages are switched in a computer network from one node to another. The more seamless the switching is, the more efficient is the logistics chain. This will, however, require development of the proper infrastructure, interoperability of system and harmonization of trade, security and customs protocols.

In addition to seamless movement of the traditional cargo, IMEC should also have systems that allow seamless movement of energy in the grid, green hydrogen in the pipelines and data in the cables for the benefits of IMEC to be fully integrated. Kandla Port, which is one of the nodes on the Indian side, has already made a head start by setting up a pilot plant for green hydrogen production and a Center of Excellence for Green Hydrogen to develop the required SoPs and protocols for green hydrogen handling, storage, shipping and transport. Development of the SOPs to get green hydrogen moving is a new emerging challenge which requires close coordination and cooperation amongst all the stakeholders.

From undersea data cables and hydrogen pipelines to AI-based logistics systems and smart ports, IMEC's infrastructure is rooted in innovation. However, this diversity also introduces technological and regulatory complexity, necessitating harmonisation in standards, processes, and legal frameworks across borders.

## Challenges and Risk Factors

IMEC would have to be developed in parts, where some may have their own challenges. The challenge is how we speed up the process of financing, policy coordination and technology integration and make things work together. Let's discuss some of them.

**Finance:** Securing finance for rail-route construction poses a significant challenge.

Coordinated efforts between governmental and private investors are crucial to fund extensive power lines and green energy pipelines, essential for sustainable transport infrastructure.

**Policy Coordination:** Ensuring consistent cooperation and coordination among participant countries is essential. Harmonizing standards and regulations across diverse regions will be necessary to mitigate inefficiencies in transport connectivity and customs procedures, promoting seamless trade and transport facilitation.

**Technological Integration:** Overcoming challenges related to technology adaptation and integration across various verticals, namely, railway links, clean hydrogen pipelines, and digital and electricity grids, requires robust solutions. This includes addressing technical interoperability and compatibility issues to ensure the corridor's operational efficiency.

**Environmental and Social Sustainability:** Integrating sustainable procurement and production mechanisms into the IMEC framework is critical. Balancing economic development with climate change considerations, particularly in renewable energy and green hydrogen initiatives, will be key to ensuring long-term environmental and social benefits.

## Financing Strategy

In order to mobilize the private sector funding and the public private participation (PPP) projects under IMEC, having a policy framework that gives PPP a nudge would do wonders and make IMEC an economic reality.

It is already happening for some of the parts of IMEC. The PPP framework for development of ports in India has addressed the private sector concerns. With the recent amendments to the legal framework by enactment of the Major Ports Authority Act, 2021 and the new PPP Concession Agreement adopted in 2021 all the

port terminal projects are being lapped up by the private sector.

IMEC would facilitate storage and movement of data, the new gold, reviving the “Golden Road”. IMEC by providing the right framework and platform for the emerging IT and energy technologies would kick start the transformation with the private sector providing the finance and the expertise.

World Bank and Asian Development Bank have structured and supported development of a number of economic corridors. An institutional framework supported by WB and ADB expertise to develop the self of IMEC PPP projects that are viable and bankable is the immediate short term requirement for the IMEC to take off.

## Way Forward

Europe has several economic corridors that enhance regional trade, connectivity, and industrial integration. These corridors are designed to support multimodal transport (rail, road, waterways, and ports) and boost the EU's single market, trade with Asia, and energy security.

Experience of Economic Corridors and Transport Networks in the EU countries having the trans-European Economic Transport Network would be useful in deciding on the institutional and organization arrangements that need to put in place for IMEC to be developed and made operational.

In the EU, the TEN-T and Rhine-Danube show how multimodal transport integration boosts trade, Baltic-Adriatic and Mediterranean corridors highlight the role of ports and industrial hubs and Eastern Partnership Corridor shows how EU's connectivity with neighbors strengthens economic growth. These are the key takeaways for IMEC.

Many corridor projects however face challenges on account of geopolitical tensions (e.g. security issues), infrastructure funding gaps (private sector investment remains low),

regulatory barriers (customs inefficiencies, trade restrictions) and environmental concerns (some projects risk biodiversity loss).

In order for IMEC to be truly effective, it would require:

- Strong policy coordination among participating countries;
- More private sector investment in industrial zones and logistics; and
- Sustainable infrastructure that balances economic and environmental goals.

## Policy Coordination and Harmonisation

India-Middle East-Europe Economic Corridor (IMEC) to succeed would require policy and regulatory harmonization across the participating countries. The corridor spans diverse legal, economic, and political systems, so aligning following regulations is key to seamless connectivity:

- **Customs Procedures and Border Management**
  - Unified digital customs systems to ensure faster clearance;
  - Mutual recognition of standards and certifications, including Authorized Economic Operator (AEO) programmes;
  - Adoption of single-window clearance mechanisms to reduce paperwork.
- **Transport and Logistics Regulation**
  - Harmonize multimodal transport laws across maritime, rail, and road networks;
  - Standardized freight documentation (e.g. electronic bills of lading);
  - Interoperability of logistics platforms and mutual recognition of insurance and liability regimes.
- **Trade Facilitation and Standards**
  - Align technical standards, SPS (Sanitary and Phytosanitary) regulations, and quality norms;

- Create joint trade facilitation bodies for dispute resolution and feedback;
- Harmonized rules of origin to prevent trade barriers.

- **Investment and Infrastructure Policies**

- Common framework for PPP (Public-Private Partnership) models and dispute resolution mechanisms;
- Coordinated financing and procurement guidelines, especially where multilateral development banks (MDBs) are involved; and
- Open and transparent investment promotion frameworks across countries.

- **Digital Infrastructure and Data Governance**

- Agreement on cross-border data flows, cloud hosting, and cybersecurity standards;
- Interoperability of digital trade platforms (e.g., MAITRI, Port Community Systems); and
- Data localization rules should be aligned or made flexible for corridor-related operations.

- **Energy Regulations (Hydrogen, Electricity, Renewables)**

- Harmonization of energy transmission and storage standards, including safety norms;
- Joint frameworks for hydrogen certification, carbon accounting, and pricing mechanisms; and
- Compatible infrastructure for pipelines and electricity interconnectivity.

- **Labour, Visa, and Skill Mobility**

- Easier issuance of work and transit visas for logistics and infrastructure personnel; and
- Bilateral agreements on recognition of professional skills and certifications.

## Digital Interoperability

### • National Logistics Portal (Marine)

Launched by the Ministry of Ports, Shipping & Waterways, NLP-Marine is a single-window digital platform that connects all stakeholders in the maritime trade ecosystem. It helps harmonization in following ways:

- Standardizes port and shipping procedures across India's major ports;
- Integrates customs, shipping lines, freight forwarders, and terminal operators into one interface;
- Supports electronic documentation, reducing manual intervention and improving transparency; and
- Can serve as a template for integration with IMEC port systems (e.g. Jebel Ali, Haifa, Piraeus), enabling cross-border data exchange and process synchronization.

### • Unified Logistics Interface Platform (ULIP)

An initiative under the Gati Shakti framework, ULIP connects over 30 logistics data sources from various ministries, departments, and private players. It helps harmonization in following ways:

- Breaks data silos by integrating transport, freight movement, vehicle tracking, and customs data;
- Offers real-time visibility and tracking for logistics operations;
- Enables development of APIs for private and international players, which can be extended to IMEC countries to align data formats and standards; and
- Facilitates interoperability between Indian and foreign digital trade systems, aiding cross-border logistics harmonization.

They are important for IMEC because of followings:

- Serve as interoperable digital infrastructure that can be extended or mirrored by IMEC countries;
- Support creation of “digital corridors” similar to MAITRI; and
- Enable regulatory convergence via data transparency, standard APIs, and shared KPIs (e.g. dwell time, turnaround time).

## IMEC: Adopting the Gati Shakti Model

Beyond physical infrastructure, the corridor's long-term success hinges on regulatory harmonisation among its participating nations. India's Gati Shakti National Master Plan (NMP) offers a replicable model for synchronised planning, digital integration, and regulatory coherence that can guide IMEC into becoming a true “Golden Road” of the 21st century.

India's NMP, launched in 2021, offers a proven and innovative solution to the challenge of regulatory harmonisation. By bringing together multiple ministries, using a real-time GIS-based infrastructure database, and focusing on multimodal transport integration, Gati Shakti has become a cornerstone of India's modern infrastructure planning.

Key features of PM Gati Shakti framework relevant to IMEC include:

- Synchronized infrastructure planning through a unified digital portal;
- GIS-based route optimisation to identify chokepoints;
- Interoperability across transport modes (rail, road, ports, and inland waterways); and
- Regulatory integration, involving customs, logistics, energy, and IT.

Aligning the IMEC with PM Gati Shakti model, several regulatory advantages can be achieved through:

- **Standardisation of Trade and Customs Procedures**

- Use of digital customs gateways like ICEGATE and Unified Logistics Interface Platforms (ULIP) can be extended to Gulf and European partners, easing customs clearances and reducing red tape; and
- Establishment of Virtual Trade Corridors (VTC) being developed between India and UAE may be extended across the corridor to facilitate data-sharing and digital pre-clearance systems.

- **Harmonised Digital Infrastructure**

- Smart ports and AI-based logistics tracking can streamline cargo movement, while MAITRI (Master Application for International Trade and Regulatory Interface) ensures intergovernmental coordination.

- **Energy and Sustainability Regulations**

- Joint regulatory frameworks for green hydrogen pipelines, carbon accounting, and clean energy standards can foster a climate-aligned corridor; and
- Cross-border energy grid connectivity between Europe, the Gulf, and India requires uniform transmission codes and renewable energy certifications.

- **Institutional Coordination Framework**

- A proposed IMEC Apex Council and National Implementation Authorities (NIAs) can mirror the institutional setup of PM Gati Shakti; and
- Project Monitoring Units (PMUs) supported by GIS and AI-based dashboards ensure transparency, accountability, and speed.

- National Implementation Authorities (NIAs) for transport, digital, and energy sectors;
- Project Monitoring Units (PMUs) for real-time tracking and local execution; and
- Regional Implementation Committees (RICs) for customs, logistics, and trade facilitation.

By integrating public-private partnerships (PPP) and multilateral financing mechanisms – involving the World Bank, ADB, and AIIB – IMEC can mobilise long-term, risk-mitigated capital investments.

## Extending the India-UAE Model across IMEC Partner Countries

India and the UAE have already taken following concrete steps toward policy and regulatory harmonization in support of IMEC. These actions are paving the way for broader integration across the corridor. Line-up of projects already underway:

- **Comprehensive Economic Partnership Agreement (CEPA), 2022**

- Tariff reductions and customs cooperation: Over 80 per cent of tariff lines were liberalized immediately, improving trade flows.
- Digital trade facilitation: Includes commitments on paperless trading, e-invoicing, and mutual recognition of standards; and
- Services sector liberalization: Covers finance, logistics, and professional services – critical for IMEC's success.

## Institutional Governance and Private Sector Involvement

The Gati Shakti model suggests a four-tiered governance approach that IMEC can replicate:

- Apex Governing Body (e.g., IMEC Council) for strategic decisions;

- **MAITRI Platform – Launched in September 2024**

- A digital trade corridor that integrates Indian and UAE logistics, customs, and compliance platforms;
- Reduces processing times, harmonizes

procedures, and improves end-to-end visibility across borders; and

- Supports the broader IMEC goals of trade digitization and operational efficiency.
- **Joint Working Groups and Task Forces**
  - India and UAE have set up joint working groups and task forces to work on logistics harmonization, port connectivity, investment frameworks, and multimodal transport. These forums are directly aligned with IMEC's development.
- **Strategic Energy and Infrastructure Cooperation**
  - Agreements on green hydrogen production and certification, logistics infrastructure, and supply chain security; and
  - Both countries are working on standardizing energy infrastructure norms for future hydrogen and electricity trade.

Until the time a unified framework comes in place, IMEC will be developed with projects on a country-to-country basis, and on a project-to-project basis. There are multiple business possibilities for each of these sectors and it is for private sector to pick up these ideas and take them forward. For example, for the India and UAE link, DP World, which is one of the biggest shipping conglomerates, both on the shipping and the port side, has bid for the Tuna Tekra container terminal. Alongside the container terminal, there is a huge area, which is also available to them, and will be developed as a growth center. On the UAE side, DP World operates Jebel Ali Free Zone (JAFZ), which is an integral part of the DP World integrated business hub. Seamless movement of container cargo from Indian side to Dubai with growth centers linked to it is a model that can be replicated for other sections of the IMEC. MAITRI project, which is being implemented, should make the existing databases and the

systems that we have on the Indian side and the UAE side seamlessly talk to each other and the containers from Kandla, Mundra, Tuna Tekra, JNPA should be able to move seamlessly to the ports in the UAE, and then further move on along the IMEC route towards Europe.

## Policy Recommendations: Making IMEC the Golden Road

To ensure IMEC evolves into a world-class economic corridor anchored in harmonised regulation, the following policy steps are recommended:

- Institutionalise Gati Shakti Principles: Mandate digital infrastructure planning and multimodal coordination using a real-time platform modelled on Gati Shakti.
- Create an IMEC Digital Twin: Develop a digital simulation platform for the entire corridor, mapping infrastructure, customs nodes, and energy grids in real-time.
- Establish Common Regulatory Protocols: Develop a multilateral IMEC Regulatory Charter for trade, energy, data, and transport standards.
- Deploy Cross-Border Data Governance: Create shared protocols for data protection, cybersecurity, and interoperability in the VTC and smart logistics platforms.
- Leverage India's Digital Public Infrastructure: Platforms like MAITRI, ULIP, and ICEGATE should be shared with IMEC partners to facilitate smoother trade and logistics flows.

## Conclusion: Toward an Inclusive and Harmonised Trade Future

For IMEC to fulfill its promise it must become a digitally integrated, policy-synchronised, and sustainability-aligned economic corridor. The IMEC is not merely a response to logistical bottlenecks, it is a visionary project that redefines how nations collaborate for shared

prosperity. But its success rests not just on laying railway tracks or underwater cables, but on the harmonisation of the rules, systems, and institutions that govern trade, energy, and information flow.

India's Gati Shakti National Master Plan offers an exemplary model of how digital planning, institutional coordination, and real-time monitoring can overcome fragmentation and inefficiencies. If adopted as the regulatory and institutional backbone of IMEC, Gati Shakti can transform the corridor into a 21st-century Golden Road—one that unites economies, empowers regions, and shapes a more inclusive global future.

## Endnotes

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# **Part IV**

## **Towards a Green Future**







# Maritime Sustainability and Investment Opportunities in Indian Maritime Sector

Kapil Narula

India's maritime sector stands at the threshold of an unprecedented transformation. With a coastline of approximately 11,100 kilometers, and a unique geographical position in the Indian Ocean, India commands a strategic advantage which provides India with unparalleled access to some of the busiest international maritime trade corridors connecting Asia, Europe, and Africa (Government of India, 2025). The sector's critical importance to India's economy is underscored by the fact that almost 95 per cent of the country's merchandise trade by volume is transported through the sea route with the 12 major ports and over 200 non-major ports poised to play a larger role in the world economy. Over 14,500 kilometers of navigable inland waterways also provide inland connectivity for hinterland India.<sup>1</sup>



## India's Maritime Economic Transformation

India's maritime transformative journey has gained momentum through visionary policy frameworks that have reshaped its maritime economic landscape. The Sagarmala programme, which is the cornerstone of India's maritime infrastructure development, is driving large-scale investments across multiple sectors (Ministry of Shipping, 2016). With 840 projects worth INR 5.8 lakh crore under implementation by 2035, India's maritime economic transformation is already in motion (The Economic Times, 2025). The Maritime India Vision 2030, which envisages an overall investment of INR 3,00,000 to 3,50,000 crore across ports, shipping, and inland waterways, is a testimony to the government's commitment to the maritime sector (Ministry of Ports, Shipping and Waterways, 2021a). The Maritime Amrit Kaal Vision 2047, which targets INR 80 lakh crore investments in the maritime sector, establishes a clear map for India's approach to becoming a global maritime hub (Ministry of Ports, Shipping and Waterways, 2021b).

The strategic geographical location, bold vision and policy support provided by the government presents a historic opportunity to establish India as a dominant force in global maritime trade. It also opens up US\$ 1 trillion maritime investment opportunities across ports, shipbuilding, inland waterways, cruise tourism, green shipping, cargo terminal operations, ship recycling, ship repairs and green hydrogen hubs which can lead to a larger role in a growing global maritime economy (FII News, 2025).

## India's Alignment with Global Advances in Maritime Sustainability

The global maritime industry is undergoing a fundamental transformation driven by ambitious environmental commitments, which are backed by regulatory frameworks. The '2023 IMO Strategy on reduction of GHG emissions from ships' establishes net-zero GHG emissions

from international shipping by or around 2050 as the shipping industry's long-term target (International Maritime Organization, 2023a). This ambitious framework which in 2018, aimed for only 50 per cent reduction GHG emissions from the sector by 2050, demonstrates the shipping industry's commitment to play its fair share in mitigating global GHG emissions. IMO's strategy establishes crucial interim benchmarks, including a commitment to ensure uptake of alternative zero and near-zero GHG emission fuels by 2030, with indicative checkpoints for 2030 and 2040 (International Maritime Organization, 2023b). Mandatory measures will also require all ships to implement lower emission marine fuel standards and phased reduction of GHG intensity of marine fuels, creating opportunities for low emission fuel and clean maritime technology suppliers.

India has proactively aligned its plans with global maritime sustainability developments through comprehensive policy frameworks that can position India as a leader in green shipping. India's formal collaboration with Singapore on Green and Digital Shipping Corridor presents strategic opportunities for international partnerships and technology transfer (Maritime and Port Authority of Singapore, 2025). India's participation in Asia-Europe green shipping initiatives particularly through its collaboration with the Port of Rotterdam to develop a green hydrogen supply chain leverages its position along critical trade routes, while investments in LNG bunkering infrastructure and hydrogen production facilities establish India as a crucial link in the global clean shipping ecosystem (The Maritime Standard, 2025). This approach ensures that India not only meets international regulatory requirements but can establish itself as a preferred partner for global shipping companies seeking compliance with increasingly stringent global maritime environmental standards.

The Harit Sagar Green Port Guidelines establish ambitious renewable energy targets

for port operations, mandating that ports source 60 per cent of their energy from renewable energy sources by 2030 and 90 per cent by 2047 (Ministry of Ports, Shipping and Waterways, 2023). This ambition goes beyond international requirements, demonstrating India's plans to usher an era of maritime sustainability.

The Harit Sagar guidelines extend beyond fuel transition to encompass comprehensive environmental management, aiming to minimize waste through Reduce, Reuse, Repurpose, and Recycle principles to achieve zero waste discharge from port operations. This holistic approach, monitored through environmental performance indicators, creates investment opportunities across waste management technologies, circular economy solutions, and implementing environmental monitoring systems.

The guidelines also emphasize the use of cleaner fuels such as green hydrogen, green ammonia, green methanol/ethanol, and the development of port capabilities for storage, handling, and bunkering of these fuels, positioning Indian ports as 'green nodes' in the global maritime fuel supply chain. This creates synergies with the National Green Hydrogen Mission and India's aspirations to become a leading exporter of low emission hydrogen. The Maritime Amrit Kaal Vision 2047 mandates all states to use green fuels for 50 per cent of inland waterways-based passenger fleets by 2033, and 100 per cent by 2045, creating substantial market opportunities for clean technology providers (Ministry of Ports, Shipping and Waterways, 2021b).

## Investment Opportunities in Indian Maritime Sector

The global blue economy is projected to reach US\$ 6 trillion by 2030, which presents an extraordinary window of opportunity for India to establish leadership in sustainable maritime practices and capture a larger share of the growing global market. India's maritime sector

offers attractive investment returns validated by recent projected growth estimates. With US\$ 82 billion in planned infrastructure projects, the sector offers substantial market opportunities across multiple subsectors.<sup>2</sup>

## Port Modernization

India's port infrastructure has undergone a remarkable transformation over the past decade, achieving productivity improvements that demonstrate the sector's readiness for matching global performances. The country's major ports have registered significant operational efficiency improvements with average turnaround time (TRT) reducing from 96 hours in FY 2014-15 to 49.5 hours in FY 2024-25. This has been complemented by a 36 per cent improvement in Pre-Berthing Detention (PBD) time (on port account) in FY 2024-25 compared to the previous year, directly translating into reduced logistics costs (Press Information Bureau, 2025e).

The financial performance of India's port sector validates the success of infrastructure investments and operational reforms. Total income from major ports more than doubled to INR 24,203 crore in FY 2024-25, registering a 7.5 per cent compound annual growth rate (CAGR) over 10 years, which demonstrates the sector's potential for revenue generation. Cargo handling capacity at major ports has increased by 87 per cent from 2014-15 to 2023-24, while idle time has dropped by approximately 29 per cent over the same period, indicating comprehensive operational optimization across multiple performance parameters (Press Information Bureau, 2024a).

India's port modernization initiatives have been powered by Public-Private Partnership (PPP) models that combine public strategic oversight with private operational efficiency and capital investment. This has attracted significant private investment in container and liquid cargo terminals that demonstrate the effectiveness of the PPP model in delivering operational improvements. Investments in

PPP projects at major ports has increasing threefold, from INR 1,329 crore in FY 2022-23 to INR 3,986 crore in FY 2024-25, highlighting strong investor confidence (Press Information Bureau, 2025b). Private participation has also introduced international best practices in port operations through advanced cargo handling equipment, warehouse management systems, and integrated logistics services resulting in enhanced port productivity.

### Green Maritime Infrastructure and Fuels

The Maritime India Vision 2030 establishes a comprehensive roadmap for port infrastructure development with specific investment targets and strategic priorities. The vision identifies development of green maritime infrastructure including building world-class port infrastructure and development of sustainable maritime sector, which can create targeted opportunities for investors. This include investments of Rs. 1,00,000–1,25,000 crore for capacity augmentation and development of world-class infrastructure at Indian ports including deep-draft berths, container terminals, and specialized cargo handling facilities (Press Information Bureau, 2023). Development of container transshipment capabilities represents a particularly attractive investment opportunity, given that Indian ports can capture growing intra-Asia trade and serve as feeder ports for major global routes. Developing dedicated container terminals with advanced automation, rail connectivity, and multimodal integration creates substantial value propositions for private investors seeking long-term return from building and operating green maritime infrastructure assets.

Maritime transport and ports have significant potential for decarbonization through green hydrogen or derivatives such as green ammonia and green methanol as fuel, creating substantial opportunities for refueling hub development and vessel retrofit services. Implementation has already begun through pioneering projects that demonstrate technological feasibility and

economic viability with India's first indigenous hydrogen fuel cell ferry, a 24-meter catamaran vessel capable of ferrying 50 passengers (ETN News, 2024). The government has launched pilot projects for decarbonizing the shipping sector using green hydrogen under the National Green Hydrogen Mission (Mercom India, 2024) through initiating the construction of green hydrogen-powered ships (Ship Technology, 2025).

Port electrification enhances operational efficiency, while reducing environmental impact. Shore power systems enable vessels to connect to land-based electricity grids during berthing, eliminating diesel generator emissions and noise pollution. The integration of renewable energy into port operations, including solar panels, wind turbines, and energy storage systems, support both green vessel operations and clean port infrastructure. The development of green hydrogen production facilities at major ports establishes strategic advantages for both domestic and international shipping companies seeking clean fuel options. These investments include specialized storage systems and bunkering infrastructure that can position Indian ports as preferred refueling destinations along international shipping routes.

### Ship Repair and Recycling

India's ship repair sector represents significant untapped opportunities in the maritime industry, poised for exponential growth through infrastructure investments and policy support. Despite India's strategic positioning along major global shipping routes, the country currently holds less than 1 per cent of the global ship repair market, with nearly 60 per cent of vessel repairs occurring abroad due to the absence of a domestic financing ecosystem (Centre for Strategic and Defence Research Online, 2024). This gap represents a substantial market opportunity, particularly given that India's ship repairing market reached US\$ 1.3 billion in 2024 and is projected to reach US\$

2.8 billion by 2033 with an estimated CAGR of about 8 per cent during 2025-2033.<sup>3</sup>

The transformation is already underway with flagship projects which indicate India's intent to becoming a global repair hub. Cochin Shipyard's International Ship Repair Facility (ISRF), built at INR 970 crore, commenced commercial operations in 2024, demonstrating the viability of developing world class ship repair infrastructure (Logistics Outlook, 2024). The global ship repairing market is expected to reach US\$ 54 billion by 2029 growing at about 9 per cent CAGR, which presents substantial opportunities for India to capture the regional market share through competitive pricing, use of sustainable practices, and world-class infrastructure (The Business Research Company, 2025).

The global ship recycling market size, valued at approximately US\$ 4 billion in 2024, is projected to reach US\$ 8.2 billion by 2033 at an estimated CAGR of 8.2 per cent (Business Research Insights, 2025). The sector is experiencing robust growth, with projections indicating recycling of 3.8-4.2 million GT (gross tonnage) in 2025 (Entrepreneur, 2024). India has established itself as the global leader in ship recycling, with Alang-Sosiya complex in Gujarat being the world's largest ship recycling facility. It handles 47 per cent of all ships recycled globally and employs 60,000 people, while recycling more than 350 ships annually (Down to Earth, 2021). India's dominance in the sector is further demonstrated by its 33 per cent share of the world's total ship recycling tonnage as of 2023. Riding on the back of global growth, India's ship recycling industry is positioned for 10 per cent annual growth by 2028, indicating substantial opportunities for capacity expansion, technology upgrades, and environmental compliance improvements (Shipping Inbox, 2024).

Sustainable practices present emerging investment opportunities, particularly as international regulations strengthen around

ship recycling standards. The advantage of established infrastructure, SME strength, growing market demand, and supportive policy environment positions the ship repair and recycling sector as a cornerstone of India's maritime economic transformation, promising investors attractive returns while contributing to global maritime sustainability.

## Financial Architecture and Investment Support

India has established a comprehensive financial architecture designed to mobilize substantial capital for maritime sector transformation through dedicated institutions and investment support mechanisms.

In September 2025, the Indian government approved a comprehensive plan to revitalize India's shipbuilding and maritime ecosystem. The announced package includes a four-pillar approach to strengthen domestic shipbuilding capacity, improve long-term financing, promote shipyard development, enhance technical capabilities and skilling, and implement legal, taxation, and policy reforms for creating a robust maritime infrastructure. It was announced that the Shipbuilding Financial Assistance Scheme (SBFAS) with a total corpus of INR 24,736 crore will be extended until 31 March 2036. A Shipbuilding Development Scheme (SbDS) of approximately INR 20,000 crore was also announced with an aim to expand domestic shipbuilding capacity, support mega shipbuilding clusters, infrastructure expansion, establish the India Ship Technology Centre and provide insurance support for shipbuilding projects (Press Information Bureau, 2025d). The overall package is expected to unlock 4.5 million Gross Tonnage of shipbuilding capacity, generate nearly 30 lakh jobs, and is expected to attract investments of approximately INR 4.5 lakh crore into India's maritime sector.

This is in addition to the Maritime Development Fund (MDF), announced during Union Budget 2025-26, with an initial outlay of

INR 25,000 crore (approximately US\$ 3 billion) to provide long-term, affordable financing for domestic shipbuilding and maritime infrastructure projects (Press Information Bureau, 2025a). The fund is strategically structured with 49 per cent equity contribution from the central government and 51 per cent from major ports, financial institutions, sovereign funds, and private investors, ensuring government strategic oversight. Between the MDF and SMFCL, the government aims to mobilize nearly INR 1.5 trillion for maritime financing by 2030, representing one of the largest financial commitments in India (Business Standard, 2025). The MDF will support financing needs across the entire maritime industry including ports, shipping, shipbuilding, and inland water transport through long-term, low-cost financing.

The institutional architecture has been strengthened through the establishment of Sagarmala Finance Corporation Limited (SMFCL), India's first maritime sector-specific Non-Banking Financial Company (NBFC) (Press Information Bureau, 2025c). The management of the MDF will likely be vested with multiple entities, including SMFCL, National Bank for Financing Infrastructure and Development (NaBFID), India Infrastructure Finance Co Ltd (IIFCL) and Climate Fund Managers (CFM) - a climate-focused blended finance investment manager which is a joint venture between Dutch development bank FMO and Sanlam InfraWorks of the Sanlam Group of South Africa (Shipping Tribune, 2025).

The government's strategic approach involves creating multiple entry points for different investor categories, with the fund accessible via equity participation, debt instruments, and hybrid securities to accommodate diverse risk appetites and return expectations (Maritime Executive, 2025). This flexible structure enables pension funds, sovereign wealth funds, development finance institutions, and private equity firms to participate according to their

investment mandates, risk appetite and time horizons and acts as a confidence builder for India's maritime development strategy while creating opportunities for foreign investors to participate in the growth trajectory.

## Seizing the Maritime Moment

India stands at the convergence of historic opportunity and strategic preparedness in the maritime sector. The substantial investment pipeline represents more than an economic opportunity and embodies a fundamental reimagining of India's role in global maritime architecture. The transformation from a reactive approach to proactively addressing systemic challenges in the maritime sector which prioritizes maritime sustainability, demonstrates unprecedented government commitment. Growth of maritime infrastructure and dedicated financial institutions signal systematic nation-building through maritime excellence.

At the same time, India's maritime transformation window is closing rapidly as global trade patterns shift, environmental regulations tighten, and technological disruption accelerates. The convergence of policy vision, financial commitment, and technological capability creates an ecosystem primed for sustainable growth and larger global influence. Investors who enter now will shape India's trillion-dollar maritime ecosystem while capturing first-mover advantages across ports, green shipping, and maritime infrastructure. Strategic partnerships between government, private capital, and international expertise are no longer optional but essential for developing world class maritime infrastructure. India's commitment to sustainable growth through green vessels, renewable energy in ports, and circular economy principles creates alignment with global sustainability trends while generating robust returns. The choice for India is stark - lead the maritime sustainability revolution or watch competitors capture

the growing growth opportunity. Maritime leadership requires decisive action today and the momentum build over the last few years signals that India is moving in the right direction to recapture its status as a civilization-state, reasserting historical command of ocean trade routes.

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# Sustainable and Economically Feasible Perspectives towards Attaining MIV 2030 and MAKV 2047

P K Anand

Economically feasible perspectives with sustainability at its core are essential to fructify the Maritime India Vision (MIV 2030) and Maritime Amrit Kaal Vision (MAKV 2047) to attain the larger vision of Viksit Bharat 2047. The 2030 vision is not a short-term version, but the very bedrock of the 2047 vision, being envisaged to progress together in sync. The financing mechanisms that can look beyond the short term are thus stepping stones in this endeavour. Green shipping and bio-fuels can help fast-track this journey. Global South coming together can impart impetus for a proactive



role averting an increasing chasm with North. The monitoring mechanisms captured in the periodic Sustainable Development Reports and UN Emission Gap Reports would be some of the crucibles to test progress in, while the efforts and measurements are nudged to be developing countries-centric.

This article presents perspectives on sustainable and economically feasible India's maritime future while attaining the MIV 2030 and MAKV 2047.

## Vision to Regain the Glorious Maritime Past and More

India has over one-sixth of the world population, but falls much short of its due share on many of the maritime parameters. The greatest hope comes from the fact that technically speaking though India falls in the category of developing countries, but in reality it is a redeveloping country, as evidenced by its past of having almost one-fourth of global share of GDP and of industrial share, as estimated by Maddison, Angus for the year 1750<sup>1</sup>. And a substantial portion of trade was through the sea lanes with Indian dominance in items like textiles, spices, precious stones, teak-wood, perfumes, pharma products. India's maritime prowess moved the goods for the world, thus reflecting India's glorious maritime past.

In the strides made to catch up with the past glory, Maritime India Vision, 2030 underscores that India has already progressed from 44<sup>th</sup> rank in 2018 to 22<sup>nd</sup> in 2023<sup>2</sup> in logistics performance as per the World Bank's Logistics Performance Index (LPI). However, the country has to make much progress by 2030 in the SDG era and beyond, in order to fructify the Maritime Amrit Kaal Vision (MAKV) 2047.

## Sustainability in Sync with the Long-term Economic Perspectives

In contrast to the short-term battle between sustainability and narrow financial blinkers,

the good news is that the long-term economic perspectives reveal that only sustainable pathways can be economically vibrant, and thus, there is nothing such as a lasting war.

The UN SDR 2025<sup>3</sup> reveals that none of the 17 SDGs would be achieved by 2030. It adds that globally certain SDGs, including SDG 14 (Life Below Water), are particularly off track, facing challenges and showing little progress (being stagnant).

A split drilled to the indicator levels brings out the following at the World level:

- Mean area protected in marine sites important to biodiversity at 28.1 per cent (2023), having major challenges and being stagnant;
- Ocean Health Index: Clean Waters score (worst 0–100 best) being 48.0 (2024), having major challenges and being stagnant;
- Fish caught from over exploited or collapsed stocks of total catch 21.3 per cent (2018), on track and remaining stagnant;
- Fish caught by trawling or dredging at 22.4 per cent (2019), with challenges remaining and being stagnant;
- Fish caught that are then discarded as 6.7 per cent (2019), with challenges remaining and being stagnant; and
- Marine biodiversity threats embodied in imports (per million population) at 0.1 (2018), on track and remaining stagnant.

The above updates reveal the dire need for a big push on the first two, a push on four and five and to maintain momentum in three and six, among these indicators.

## Challenges to Marine Sustainability

One of the most prominent set of challenges is the trio of ocean-acidification, unabated rising sea temperatures and deoxygenation. Pimental *et al.* analysing the simultaneous adverse effects of the 'trio' argue it to be markedly detrimental to fish early developmental stages, eventually

leading to adverse carry-over effects<sup>4</sup>. Among other challenges, an 'Economist' Report cites World Economic Forum 2019 indicates sea level rise of 0.5 meter by 2050<sup>5</sup>. An important milestone that faced setback is the early (2020) set of SDG Aichi targets, now replaced by the Kunming-Montreal Global Biodiversity Framework laid for end of the SDG era 2030 targets. Notably, oceans absorb about one-fourth of the CO<sub>2</sub> emissions<sup>6</sup>, acting as a big buffer to climate change, which are under

increasing stress. Table 1 covers some major maritime challenges on the sustainability-cum-economic perspectives front.

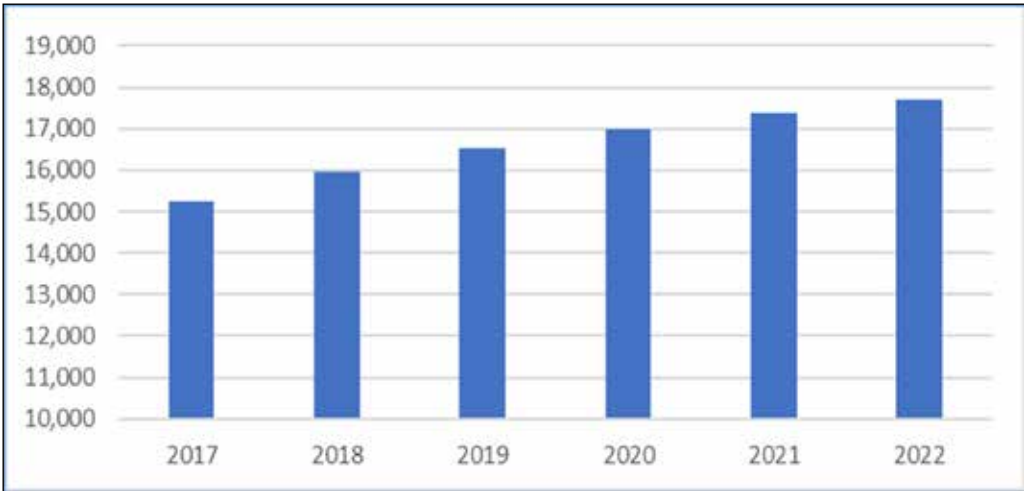
As an example, Figure 1 shows the status on beach litter manifested for the World over 2017 to 2022, indicating a rising trend from an already whopping over 15.2 million tonnes to over 17.7 million tonnes. Its Region/ Group specific portion (in per cent) reaching the Oceans is manifested next in Figure 2.

**Table 1: Some Major Maritime Sustainability-cum-Economic perspectives Challenges**

| Sl. No. | Aspect                                 | Situation                                                                                                                   | Comment                                                                                                                                                         |
|---------|----------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.      | Ocean Acidification                    | ph has already fallen from 8.2 to 8.1                                                                                       | it is further falling and harming marine life                                                                                                                   |
| 2.      | Ocean warming                          | Disrupts marine ecosystems                                                                                                  | an estimated 800 million people, are vulnerable to a sea-level rise of half metre by 2050 across the globe                                                      |
| 3.      | Deoxygenation                          | Warmer water holds less dissolved oxygen, and leads to reduced oxygen levels stressing marine life                          | in mid-2021 Marine Protected Areas, were only about 8.4 per cent of the ocean, much below the 30 per cent target for 2030                                       |
| 4.      | Loss of Bio-Diversity                  | As an indicator, the sustainability of global fishery resources continues to decline, notably as a relief at a reduced rate | the Aichi Biodiversity Targets for 2020 deadline were not met, leading to adoption of a more achievable Kunming-Montreal Global Biodiversity Framework for 2030 |
| 5.      | Plastic Pollution                      | Increasing unabated, necessitating actions including better awareness                                                       | harms food chains, micro-plastics stubbornly persist in vital organs                                                                                            |
| 6.      | Slow pace of adopting circular economy | ship breaking required in sync with ship building                                                                           | IT strength in development of the latest related software on designs and simulation can fast-track it                                                           |
| 7.      | Overfishing                            | diminishes fish stocks below regenerative capacity for many species                                                         | affects livelihoods, especially of small fishers                                                                                                                |
| 8.      | Sea piracy                             | renders sea lanes choked                                                                                                    | collaborations needed under SDG 17                                                                                                                              |
| 9.      | Sea accidents                          | lead to pollution, or choking of critical points like Suez Canal                                                            | Alternatives like IMEC need to be in place                                                                                                                      |

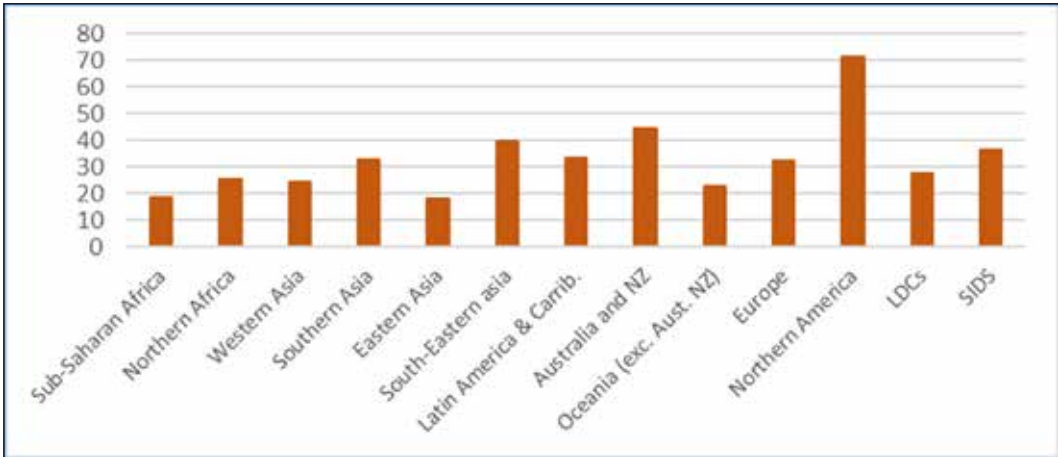
Source: Author's own

**Figure 1: Exported Beach Litter Originating from National Land-based Sources**  
(in '000 tonnes)



*Source:* Author’s depiction based on data from the UN Economic and Social Council. Progress towards the Sustainable Development Goals. Report of the Secretary General. E/2024/54, Statistical Annex. pp 177.

**Figure 2: Beach Litter Originating from National Land-based Sources Ending in the Ocean, 2022**



*Source:* Ibid (as for the Figure 1).

## Unique Features of the Ocean Ecosystem

It may be apt here to reflect on how the ocean ecosystem differs from other ecosystems, to evolve appropriate policy pathways. First, the oceans are vastly spread as a Common Public Resource (CPR), to the extent of over 70 per cent of earth's surface area<sup>7</sup>, of which size-ably beyond EEZ and thus even a higher proportion of volume, which is quite substantial. Second, oceans largely act as beneficial pure public goods in many respects, thanks to the non-excludable and non-rivalrous inherent nature, especially the large high seas, which are almost free to sail through. Third, for centuries, especially since 1750, the pollution drained into oceans remains unabated and worsening global challenge. Fourth, countering sea-piracy necessitates collaborations for security of the vessels and seafarers. For sure, these characteristics make oceans as a candidate for strong international collaborations, be it South-South or Triangular, however, it also raises intense concerns of constrained technology diffusion to the Global South. In this gigantic endeavour, the strong SDG interconnects are essential to harness toward attaining the MIV 2030 and MAKV 2047.

## Sustainability for Survival

The planet is already severely stressed by excessive breaching of safe limits for survival, acidification of oceans is one such striking example.

Notably, the share of global CO<sub>2</sub> emissions by shipping is about 3 per cent<sup>8</sup>. Obviously, aggregate reduction, based on reduction in each sector is now essential for the very survival of the human-race.

The UN Emission Gap Report 2024 aims to increase the share of zero-emissions fuels in maritime shipping fuel supply from zero per cent (2018 benchmark) to 5 per cent by 2030,<sup>9</sup> Notably, the share of sustainable aviation fuels in global aviation fuel supply is envisaged to

increase from 0.1 per cent (2022 benchmark) to 13 per cent by 2030. This throws open the challenge for the maritime sector to make policies more innovative and modern, and at the same time have better database (including to meet the choice of a latest benchmark).

The UN Emission Gap Report 2024 further pins hopes on the shipping sector for emission reduction, projecting it to contribute up to 0.2 GtCO<sub>2</sub> equivalent per year of emission reduction potential in 2030 and up to 0.4 GtCO<sub>2</sub> equivalent reduction by 2035, specifically from energy efficiency, operational optimization and a shift to zero- and low- emission fuels like bio-fuels, hydrogen, methanol and ammonia.

## Indian Visions: MIV 2030 and MAKV 2047

In this stride India envisions Viksit Bharat 2047 to become a developed country by its centenary year of independence. Notably, this resolve is inclusive and sustainable, and thus not driven by any narrow financial sub-optimal equilibrium.

As a part of the larger vision, its maritime component is enshrined as Maritime Amrit Kaal Vision 2047, which is not limited to mere financial targets, but goes much beyond to envision wave-fronts of progress toward becoming a flourishing society. Sustainability, which the world has learnt in a hard way, is no longer a box item to be ticked and forgotten, but goes much deeper into the SDG encompassed 5 Ps i.e. the people, the planet, in a peaceful manner with the partnerships leading to prosperity. And, such a prosperity is not meant for the current generation, but internalises Gen-Next so as to make that flourish and hand over the baton generation after generation. Therefore, it does not assign a low and diminishing discount rate on the utility and welfare of the coming generations, but treats the present as a gift from the future, to be saved, nurtured and smoothly passed over, as a trustee. The SDG mantra of 'Leave No One

Behind (LNOB)' woven around the well-being extends to those who would inherit, and thus for sure entails an onerous responsibility on the current generation.

India's *MIV 2030* and *MAKV 2047* lay a strong pathway starting port modernization and maritime infrastructure expansion for capacity, including deep draft ports and reduction of turn-around time as elements of efficiency, amidst modernization and digitalization of port operations; and along with national waterways underpinning augmentation of multi-modal port connectivity to harness economies of scale. The *MIV 2030* thus provides a comprehensive framework for the holistic development of the Indian maritime sector, encompassing all the elements i.e. ports, shipping, and waterways. The *MIV 2030* outlines as many as 150 initiatives with the aim to propel India to attain global maritime leadership.

All these initiatives and the resolve to catapult more ports, from presently 2 under top 50 global ports, shipbuilding thrust, ship-breaking green transition and a slew of initiatives for Technological Advancements and Digital Transformation, entail huge investments.

A key feature of sustainability is its '*Harit Sagar*' Green Port Guidelines aimed at reduction of carbon intensity, while developing an environment friendly ecosystem at the major ports. Development of three major ports as Green Hydrogen/Ammonia Hubs under National Hydrogen Mission would impart India traction to emerge as a green maritime leading country, covering along with inland waterways under *Harit Nauka* guidelines to clinch green transitions.

The *MIV 2030* also envisions to harness on India's global strength of ship building and ship repairing enhancement for which a comprehensive revamped shipbuilding and ship repairing policy is being evolved, to further improve domestic capacity. To harness

economies of scale under it, four shipbuilding and ship repairing clusters are envisaged, to foster an integrated approach spurring on modernization of shipyards in order to attract investment, and thus generate employment.

## Economy-Wide Picture of Revenue Streams and pathways

Freight and fare are the major conventional revenue channels of the maritime sector to generate funds for operations and investments. A vibrant maritime sector, if one takes a cue from Greece, can set low taxation rates in this sector, attract economy wide large activity, and generate revenues which far exceed the revenues foregone in the maritime sector. This places sectoral Laffer cover under another larger curve, the one anchored to the general equilibrium sense to the entire economy. Therefore, in contrast to the sector specific Laffer curve that indicates zero revenue in case of zero tax rate; the larger curve invigorating the entire economy can push up the economy bringing in larger revenues.

In the underlying macroeconomic parlance, low taxes in one sector may become such a competitive point that these can crowd in a plethora of activities raising aggregate demand from Consumption (C), Investment (I), government sector (G), and clinching sizeable net exports (X-M), the channels of GDP, emanating from both goods and services across the economy.

On the human capital front, there is emphasis on the skill development and collaboration, and here the word 'collaboration' is specifically included in the official vision, underscoring its criticality which is certainly not limited to physical capital. It would have focus on skilling initiatives and support the MSMEs in shipbuilding sector. It is also envisaged to attract seafarers for academic positions in India's maritime universities and training institutes.

Bitros argued<sup>10</sup> that to revamp Greek economy, the model of open and competitive markets, to be followed by the Greek ship-owners thriving for centuries, still held the best potential; adding that shipping and tourism could put it back on the growth path of better progress.

India, however, cannot blindly adopt the financial practices of some of the maritime leaders, as it needs to first disentangle the instruments of fiscal prudence that impart traction, from the ones that thwart it. For instance, the tonnage tax regime of Greece, with its tax base as gross tonnage, is argued by Panagiotou and Thanopoulou to be practical for cash flow projections; however, it may encourage over-investment, terming it as an 'endemic tendency'<sup>11</sup>. This situation strikingly differs from the Indian economic system of resource constraints and inadequate investments, though to break off from which India's Union Budget 2025-26 has proposed a Rs. 250,000 million Maritime Development Fund.

Kasimati and Veraros analysed the maritime sector using variables like flow of freight earned and sales and purchase market for vessel stock, with related variables like the additional stock of new ship-building, and by subtracting the stock of ships demolished. They bring forth dynamics of the sector, covering influence of global trade, to analyse efficiency; to help make better evidenced investment decisions.<sup>12</sup> They also analysed price elasticity of supply when initially low freight rates rise to offer higher tonnage, right upto when the supply curve becomes inelastic, when in the short-term the only way to increase supplied tonnage remains to raise the service speed of the ships. Of course, additional tonnage comes into the economy by the pull of buoyancy of prices, restoring some elasticity to the supply curve.

Mavrogiannis assessed the impact of structural reforms on the gross capital inflows, by application of local projection method, addressing reform endogeneity, and found

a positive medium-term effect of structural reforms on inflows of capital - both direct as well as portfolio<sup>13</sup>. He further touched upon the issue of public debt ratio, so critical for the developing countries of Global South; adding that a low debt ratio reflects stronger fundamentals. It is, therefore, recommended for the Global South to undertake some evidence based research, by splitting the debt utilisation, towards capital and revenue expenditures in order to fine tune appropriate policies for the developing countries.

On the enormity of funds required a study indicating industry view estimates the total investment needs for port adaptation and mitigation in developing countries at roughly US\$ 55 to 83 billion<sup>14</sup>.

A DNV Report on Energy Transition Outlook 2025 brings out ways to improve understanding of the IMO's Net-Zero Framework (NZF) to provide fresh insights into the maritime fuel transition both onboard and onshore<sup>15</sup>.

The DNV Report is also a pointer to a long-term pathway, as it visualises that onboard capture of carbon on the largest ships could cut enough global fleet emissions to meet the aim of the IMO's 2030 Goal.<sup>16</sup> It is therefore recommended that the countries of Global South may undertake brainstorming sessions to reach the maritime high table in 2050 to avert, rather than first let rise and then reduce, their fleet emissions. Otherwise, they would have to pay heavily for the 2050 tightened norms, and would need to divert resources on corrective rather than *ab initio* robust preventive frameworks.

Current research on the bio-fuels includes FAME (fatty acid methyl ester) bio-diesel, based on bio-fuels produced from vegetable oils or animal fats, through a process called transesterification, where in this renewable path fats react with methanol (an alcohol) in the presence of a catalyst. Similarly, HVO (Hydrotreated Vegetable Oil) bio-diesel is yet another

renewable fuel option. These are surely *en route* to the ensemble of Bio-fuel feed-stock sources, which are now right upto the fourth generation defined by the feed-stock used<sup>17</sup>.

Such initiatives need to be propelled with what this article evolves as intense collaborations on 'Augmentation of Renewable and Inclusive Actions (ARIA)', for instance ship breaking and recycling in a safe manner can be sustainable as well as inclusive by generating livelihoods. Similarly, protection of rights of small fishers, and collectives (like co-operatives) can help harness economies of scale across the operations, and help ensuring sustainability for Gen-Next. The overarching concept also evolved in this article is to evolve and promote 'Sustainable Self-Sustaining Tomorrow's Technology Today (S<sup>3</sup>T<sup>3</sup>)' models, to harness India's technological strengths and vision. For instance, green shipping or any of its component like green bunkering, needs to be adopted fast by the global South, rather than wait and keep on buying over the years the technologies of 'yesterday' remaining behind the ever expanding technological frontiers,

## Conclusions and Way Forward

To conclude, economically feasible perspectives anchored to sustainability and inclusion are essential to fructify the Maritime India Vision (MIV 2030) and Maritime Amrit Kaal Vision (MAKV 2047). The green financing mechanisms are the stepping stones toward fulfilling these in time. Green shipping and bio-fuels can help fast-track this journey. Global South coming together can impart impetus for a proactive role, averting an increasing chasm with North. The way forward of this journey envisages:

One, it is proposed in this paper to evolve and promote 'Sustainable Self-Sustaining Tomorrow's Technology Today (S<sup>3</sup>T<sup>3</sup>)' models for the maritime sector of India and other littoral states

Two, bio-fuels can not only help towards

greening but also generate and protect livelihoods of farmers growing these as food and non-food crops.

Three, on the financing front for capital infrastructure, the Indian Union Budget 2025-26 has envisaged Rs. 250,000 million Maritime Development Fund (MDF), has inbuilt mechanism to take private sector along by keeping government share to 49 per cent. It is also with an enhanced ship-building financial assistance scheme of Rs 247,360 million, and further a ship-building development scheme of Rs. 199,890 million. This gives an opportunity to crowd in sizeable finance, and human capital.

Four, the role of MSMEs envisaged in ship-building would have a higher investment elasticity of employment generation and skilling, so essential for overall progress. Such an integration can do a lot to take the sector on higher and inclusive growth trajectories.

Five, it is also proposed to intensely collaborate on 'Augmentation of Renewable and Inclusive Actions (ARIA)', under South-South collaborations in a holistic manner.

Six, India, with its IT and education positions, which is reasonably high in the global scenario, can harness it to move closer to the human capital and development frontier for the maritime sector.

Seven, Global South needs to constantly strengthen evidence-based research and share it.

## Endnotes

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- <sup>16</sup> Refer, DNV Report on Energy Transition Outlook 2025. Maritime Forecast to 2050: A deep dive into shipping’s decarbonization journey. pp 57.
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# Green Shipping and Ports: Opportunities and Challenges

Arvind Kumar

Shipping connects world economies and underpins global supply chains. The shipping industry accounts for over 80 per cent of the world's trade volume and nearly 3 per cent of global greenhouse gas emissions (UNCTAD, 2023). About 40 per cent of seaborne trade by volume is made up of energy-related commodities, including coal, oil and gas. Emissions per cargo unit and per distance travelled (ton-mile) have declined in recent years, partly due to economies of scale, yet the total global emissions of the sector have increased by 20 per cent in the past.<sup>1</sup> Annually, international shipping combusts about 300 million tonnes of mainly heavy and distillate fuel oils, which would need to be gradually replaced (IMO, 2020).



## Transition to Net-Zero

The shipping industry requires a portfolio of measures to align with global emissions reduction targets, including intervention measures affecting operations (e.g. route optimization, vessel speed, maintenance), fleet design, propulsion, engines, fuels and infrastructure for alternative fuel bunkering supplies. The use of fossil fuels in shipping needs to be replaced with alternatives that do not emit greenhouse gas (GHG) emissions across their entire life cycle. However, at present, there is no readily available, one-size-fits-all fuel solution, and the transition to the use of low-carbon or zero-carbon alternative fuels remains in the early stages, with global shipping fleet still using fossil fuels. Liquefied natural gas dual fuel remains the most popular choice, but is viewed as a “transition fuel”, while more long-term, sustainable alternatives are sought.<sup>2</sup>

Hydrogen, ammonia and methanol are being explored as potential alternative fuels. Each has its merits but also its drawbacks, such as the cost of production and the high pressures required to store hydrogen and the potential toxicity of ammonia. Risks and drawbacks need to be better understood and mitigated, to ensure the safe handling of such new fuels. The use of biofuels has also been gaining traction, as it offers the advantage of not requiring major engine modifications. However, biofuels used by ships are generally blended with a high proportion of traditional fuels. There are also concerns about the sustainable production of biofuels, since they may be sourced from agricultural crops used for food and for animal feed. The availability of fuels and bunkering facilities remains a key issue with regard to all alternative fuel options. Low-carbon and zero-carbon fuels are less energy intensive than fossil fuels and ships are therefore expected to bunker more frequently. At the same time, port authorities may be hesitant to invest in storage and supply facilities until there is greater certainty about which fuels will be required,

with the likelihood that ports will be expected to provide more than one fuel type.<sup>3</sup>

## Transition Costs to Decarbonization in Shipping

Investment is required to adjust ship operations, designs and engines, generate alternative fuels at scale and implement green on-board technologies. However, the transition comes with substantial costs. As per UNCTAD's RMT 2023, an additional US\$ 8 billion to US\$ 28 billion will be required annually to decarbonize ships by 2050, and even more substantial investments, ranging from US\$ 28 billion to US\$ 90 billion annually, will be needed to develop infrastructure for 100 per cent carbon-neutral fuels by 2050. Decarbonization measures in shipping are expected to drive up maritime logistics costs and negatively impact trade flows and economic output, particularly in developing nations.

## Challenge of Aging Global Shipping Fleet

Ageing fleet presents a multitude of concerns, from operational efficiency to environmental sustainability. Ship owners face the challenge of renewing the fleet without clarity regarding alternative fuels, green technology and regulatory regimes to guide ship owners and ports, while port terminals face similar challenges in vital investment decisions (UNCTAD, 2023). The global fleet is getting older. Weighted by gross tonnage, the global fleet was, on average, 12.6 years old in 2024. By vessel count, the fleet was 22.2 years old. Developing countries' share of dead weight ton capacity that is older than 20 years (21.1 per cent) was more than twice that of developed economies (9.3 per cent) (UNCTAD, 2025). Progress towards greening the fleet is underway but incremental, mainly reflecting ongoing uncertainty over the fuels of the future, carbon pricing, evolving regulations, and rapid technological advancements. This uncertainty

has led many to delay investment in new ships, choosing instead to keep older vessels in service.

On average, ocean-going ships have a service life of 20 to 30 years. Thus, ships built today will still be in operation by 2050, the year that most net-zero emissions targets are due. To meet these targets, existing ships that are not compliant with the new requirements will likely be recycled, retrofitted, converted or replaced by vessels running on alternative fuels (RMT, UNCTAD, 2025).

### Age Profile of Indian Shipping Fleet

India has a fleet strength of 1545 vessels with 13.50 million gross tonnages (GT) in 2024. Out of the 1545 vessels registered as on 31 December 2024, 68 per cent vessels were engaged in coastal trade and the remaining 32 per cent vessels were engaged for overseas trade. In terms of load carrying, the overseas trade was 88 per cent of Indian GT in contrast to only 12 per cent of Indian GT in coastal trade (Indian Shipping Statistics (ISS, 2024). India accounts for 1.5 per cent of world fleet by dead weight tonnage.<sup>4</sup>

Older vessels constitute a significant proportion of India's shipping fleet. The age profile of Indian merchant shipping vessels shows that 46.1 per cent of the fleet was above 20 years old, 17.9 per cent was between 16-20 years, 19.1 per cent was between 11-15 years, 9.1 per cent was between 6-10 years while 7.8 per cent was in the age group of 0-5 years. As on end December, 2024, 489 Indian registered vessels with 11.83 million GT were deployed on overseas trade. Among the 489 vessels for overseas trade, the maximum number of vessels (190) was of the age group "over 20 years" with GT of 4.24 million (ISS, 2024). Purchasing a new vessel involves hefty expenses and extensive lead times. In an industry as dynamic as maritime, older vessels face the challenge of meeting modern efficiency standards. While replacing an entire fleet with new ships may

not always be feasible, integrating technological upgrades can enhance the performance and lifespan of these vessels.

The Directorate General of Shipping (DGS) has introduced age-based cut-off norms for registration into Indian flag such as 25 years for gas carriers, chemical tankers etc., 20 years for oil tankers, bulk carriers etc. The policy does not mandate scrapping but discourages prolonged operation of aging less efficient vessels through registration restrictions with implementation proposed in a phased manner. The Order further allowed continued operation of registered Indian flagged vessels based on compliance with specified qualitative parameters. In an industry as dynamic as maritime, older vessels face the challenge of meeting modern efficiency standards.

This regulatory measure aims to gradually phase out older, less efficient, and environmentally substandard vessels in alignment with India's commitment to fleet modernization, maritime safety, and global decarbonization goals. The aim of the policy is to improve the efficiency and competitiveness of the Indian fleet to become sustainable with respect to the global safety and environmental policies, and cannot be treated as threat to maritime ecosystem.<sup>5</sup>

### Need for a Just and Equitable Transition to Decarbonize Shipping

Among developing countries, a multilateral solution adopted under the aegis of IMO need to keep in view the needs of developing countries expected to be most affected by transition costs.

There is general agreement that shipping must undergo a rapid energy transition. This implies a shift from fossil bunker fuels, such as the predominant heavy fuel oil (HFO), to a new generation of alternative bunker fuels. These alternative fuels are known to produce very low, and ultimately zero, GHG emissions during their production, distribution, and

use. They are called zero-carbon bunker fuels and encompass fuels which are “effectively zero” (that is, where the fuel is produced from zero-carbon electricity, for instance, hydrogen produced from solar or wind power), or “net-zero” [that is, where the production of the fuel removes a quantity of carbon dioxide from the atmosphere equivalent to that emitted during combustion, such as with biofuels.]<sup>6</sup>

## Decarbonization Pathways

The IMO serves as the primary regulatory body for environmental standards in the maritime sector, setting global policies for emissions reduction and sustainable operations. In 2018, IMO adopted a sector reduction pathway consistent with the 2015 Paris Agreement. As part of its **decarbonization strategy**, IMO has set a target to reach net-zero emissions in maritime transport by **2050**. The intermediate goals include reducing carbon intensity by **at least 40 per cent by 2030** and cutting total emissions by **at least 70 per cent by 2040**. These objectives are to be achieved through a combination of short-, mid- and long-term measures, with quantitative targets until 2050. Table 1 summarizes some proposed measures.

At present, the regulatory outlook is uncertain. The IMO has yet to agree on a number of issues, such as the market-based mechanism. Moreover, the IMO regulations coexist with those from other bodies such as the EU. As of 2024, the European Union’s Emissions Trading System (EU-ETS) started to cover GHG emissions from voyages to and from European Union (EU) ports. As of 1 January 2025, vessels above 5,000 gross tonnes are also required to comply with the Fuel EU maritime regulations for voyages within the EU Economic Area as well as to and from the area<sup>7</sup>.

Lower shipping emissions will come from new technologies, improved operations and alternative fuels. Improving the energy efficiency of ships through technological measures can yield part of the needed emission

reductions. Ready and available options include hull design improvements, air lubrication and bulbous bows (a large, bulb-shaped structure located at the front of a ship) to reduce friction, or waste heat recovery as a source of energy. Operational measures such as reduced speeds, smoother ship port interfaces and bigger ships that carry more freight in relation to energy used could achieve further emission reductions. Finally, switching from oil to alternative fuels and renewable energy can cut shipping’s carbon emissions. Alternative fuels and renewable energy can deliver much of the required reductions.

Decarbonizing shipping is necessary, yet presents challenges, including high transition costs and uncertainty about the choice of the alternative fuels of the future and whether these will be readily available. Also, emissions depend on ship type, size and engine, as well as on sea routes and navigation conditions. In addition, uncertainty about the regulatory framework also presents challenges for ship-owners, who need to decide whether to renew fleets now or wait until there is greater clarity and certainty about alternative fuels, green technology options and regulatory regimes.

## Green Shipping Corridors

The Clydebank Declaration, signed at the Conference of the Parties (COP26) Climate Summit at Glasgow in November, 2021 proposed establishing Green Shipping Corridors – zero-emission maritime routes between two or more ports – to accelerate the decarbonization of the shipping sector and achieve net-zero emissions by 2050. The declaration’s goal was to establish at least six such corridors by 2025, with an aspiration for many more by 2030, and to foster public-private partnerships to overcome barriers and support the transition to clean fuels and zero-emission vessels. Since then, around 30 green corridor initiatives have been announced by governments and industry stakeholders around the globe.

**Table 1: Some Proposed IMO Measures to Reduce Greenhouse Emissions**

| Category                                                     | Subcategories                                                                                                                                                                                                                      | Examples of measures                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|--------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Short-term measures, to be agreed upon between 2018 and 2023 | <ul style="list-style-type: none"> <li>• Technical and operational energy-efficiency measures;</li> <li>• Use of alternative low-carbon or zero-carbon fuels for marine propulsion and other technologies</li> </ul>               | <ul style="list-style-type: none"> <li>• New operational energy-efficiency standards for new and existing ships (EEXI);</li> <li>• Consider and analyse the use of speed optimization and reduction;</li> <li>• Developments of port infrastructure to support alternative fuels;</li> <li>• Progressive tightening of standards on minimum energy efficiency levels and emissions, based on ship design and engine performance data (CII);</li> <li>• R&amp;D efforts on marine propulsion with alternative fuels;</li> <li>• Encourage the development of national action plans to develop policies and strategies to address greenhouse gas emissions from international shipping</li> </ul> |
| Mid-term measures, to be agreed upon between 2023 and 2030   | <ul style="list-style-type: none"> <li>• Market-based measures – carbon pricing mechanisms to give firms economic incentives to emit less;</li> <li>• Operational energy efficiency measures for new and existing ships</li> </ul> | <ul style="list-style-type: none"> <li>• Market-based measures could include an offsetting scheme, a maritime emissions trading scheme, or a carbon levy;</li> <li>• Specify in the national action plan measures to increase the uptake of low- and zero-carbon fuels</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                               |
| Long-term measures (to be agreed beyond 2030)                | <ul style="list-style-type: none"> <li>• Measures to ensure zero-carbon and fossil-free fuels</li> </ul>                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |

*Note:* Some measures mentioned in this table have been agreed at the IMO (short-term measures including EEXI and CII) whereas others have not.

*Source:* Table 2.10, Review of Maritime Transport 2021, [https://unctad.org/system/files/official-document/rmt2021\\_en\\_0.pdf](https://unctad.org/system/files/official-document/rmt2021_en_0.pdf)

## Carbon Pricing in Shipping

Carbon pricing corrects that market failure by pricing the social costs of carbon, which are the negative externalities related to the use of fossil fuels, including the damages that result from emitting additional carbon dioxide into the atmosphere. Conceptually, there are two principal ways to design carbon pricing: a carbon tax (or levy) or emissions cap-and-trade schemes (or emissions trading systems). Carbon pricing in shipping refers to the imposition of fees on GHG emissions to incentivize the use of cleaner fuels and more efficient practices, thereby reducing the industry's significant

climate impact. The IMO has established a global carbon pricing mechanism, beginning in 2028, which requires ships to pay a fee for their emissions or switch to lower-emission alternatives. Putting a price on the shipping's GHG emissions would go a long way toward advancing carbon neutrality in the shipping industry. Requiring shipping companies to pay for every tonne of emissions from their vessels would raise the cost of using fossil fuels, thereby accelerating the shift toward clean-energy sources. The revenue generated from this fee need to be reinvested into developing sustainable technologies, improving port

infrastructure, and supporting vulnerable nations in their transition to a low-carbon future.

## Status and Scope of Green Ports and Waterways in India

India has a sizeable maritime sector with 12 operational major ports and about 220 notified non-major ports along 11098.81 km coastline and sea islands and a vast network of navigable waterways. The country's maritime sector plays a crucial role in its overall trade and growth, with 95 per cent of the country's trade volume and 65 per cent of the trade value being undertaken through maritime transport.<sup>8</sup> As part of Maritime India Vision (MIV) 2030, a target of 30 per cent reduction in CO<sub>2</sub> emission per tonne of cargo is envisaged by 2030 and an ambitious 70 per cent by 2047.<sup>9</sup>

## Green Ports

Ports are the nodes of the maritime industry, serving as critical hubs that keep global trade running. However, despite their strategic importance, port activities can have significant negative impacts on the environment and ecosystems. As trade volumes and vessel traffic continue to grow, carbon emissions are rising, while rising sea levels and extreme weather events pose direct threats to port infrastructure. Therefore, transforming ports into sustainable hubs is not just an environmental responsibility but a vital step for long-term operational resilience.

## What is a Green Port?

A green port is an approach that aims to minimize and eventually eliminate the environmental damage caused by port operations, including emissions from ships and other logistics activities. Green port initiatives focus on reducing carbon emissions, improving energy efficiency, and optimizing waste management practices. Green ports symbolize a paradigm shift in the maritime industry, demonstrating

that economic development and environmental responsibility can coexist.

The "Harit Sagar" Green Port Guidelines (Box 1), issued by the Ministry of Ports, Shipping and Waterways outline specific measures to promote environmental sustainability across major ports. These include increasing green cover, electrification of port equipment and vehicles, adoption of renewable energy, provision of shore-to-ship power supply, promotion of coastal shipping, improved waste and effluent management, marine ecosystem protection, and use of energy-efficient infrastructure. The guidelines also call for green hydrogen infrastructure, rainwater harvesting, and incentives for green shipping practices.

The guidelines emphasize active collaboration with stakeholders, including terminal operators, shipping lines, logistics providers, government agencies, and private entities. Incentives such as priority berthing and fee rebates are encouraged for vessels and operators using cleaner fuels or electric equipment. Besides, there are financial incentives in the form of vessel related charges (VRC) /rebates for promoting Coastal Shipping, VRC rebates for vessels using cleaner fuels, shipbuilding financial assistance for the shipyards for construction of hybrid and green vessels etc, in order to ensure seamless transition from the conventional to green and sustainable mode of operation.

The other major initiatives launched by the government to promote green maritime development include: (i) to develop three major ports, namely, Deendayal Port Authority, Paradip Port Authority, and V.O. Chidambaranar Port Authority as Green Hydrogen/ Ammonia Hubs under National Hydrogen Mission; (ii) Green Tug Transition Programme (GTTP) for transition from conventional fuel-based harbour tugs to greener, more sustainable alternatives and; (iii) Harit Nauka Guidelines for Green transition of Inland Waterways based transportation ecosystem.

## Potential of India's Inland Water Transport (IWT)

India is endowed with various Inland Water Transport (IWT) options that comprise rivers, canals, backwaters, creeks, and tidal inlets. India's total and navigable length of waterways reported across states is around 15,494 km.<sup>10</sup> These not only form a competitive alternative mode of transportation with lower operating cost (30 per cent lower than the railways and 60 per cent lower than road) but also an environmentally friendly and sustainable mode in freight logistics and passenger transport. However, modal share of IWT in freight movement is 2 per cent leaving significant room

for growth. Key impediments in development of this sector include - limited infrastructure availability, shortage of inland vessels and non-availability of return cargo.<sup>11</sup>

India has prioritized development of 23 national waterways (NWs) in the next 10 years, which are expected to increase the goods traffic more than two-fold from 73 million tonnes per annum (MTPA) as of now to more than 200 MTPA. Coastal cargo handled at all ports in India was 339 million tonnes and accounted for a share of 21 per cent in total cargo handled (1603 million tonnes) in 2024-25.<sup>12</sup> The modal share of IWT in freight movement is expected to increase from 2 per cent to 5 per cent by

### Box 1: Harit Sagar Guidelines: Key Focus Areas

- 20 per cent green cover in port areas by 2030 and 33 per cent by 2047;
- Over 50 per cent electrification of ports (including vehicles) by 2030 and 90 per cent by 2047;
- Retrofit port crafts for propulsion via cleaner and greener fuels, namely, green ammonia and green hydrogen;
- Creation of infrastructure for storage, bunkering and refuelling of green hydrogen under National Green Hydrogen Mission;
- Green ammonia bunkers and refuelling facilities to be established at all major ports by 2035;
- Share of renewable energy at ports to exceed 60 per cent by 2030 and 90 per cent by 2047;
- At least one LNG bunkering station and an adequate number of electric charging stations in port campuses by 2030;
- All Ports shall develop the infrastructure to provide "Shore to Ship" power to port crafts, coast guard/navy small coastal vessels and Exim vessels in a phased manner;
- Ports shall use energy efficient equipment's / material viz. LED smart lighting system, highest energy rating equipment's such as AC, Fans, Electronic devices etc. to reduce the energy consumption demand
- 20 per cent reduction in freshwater consumption per tonne of cargo and 100 per cent recycle and reuse the wastewater by 2030;
- All Ports shall strive to earn Carbon Credits by reducing Green House Gas (GHG) emissions.
- Use digital infrastructure, that is, "Sagar Setu"-National Logistics Portal Marine, EBS, Radio Frequency Identification, etc, reduce carbon footprint;
- Effluent discharge from ships calling at ports to be monitored closely as per IMO;
- Emergency Oil Pollution Response Management to combat oil pollution.

*Source:* Based on "Harit Sagar" Guidelines, Ministry of Ports, Shipping & Waterways

2030.<sup>13</sup> However, to achieve this significant development in infrastructure is required.

## Way Forward

The maritime industry stands at a critical crossroads, where the need for sustainable practices has never been more pressing. Business as usual is not an option in shipping, as it could lead to “stranded assets” – vessels that are inefficient to operate or are denied access to green shipping corridors and green ports. By leveraging technology and fostering collaboration, we can transform the challenge of carbon regulation into an opportunity to reduce costs and strengthen its global competitiveness.

Decarbonization of shipping requires a rapid shift from today’s predominant use of fossil fuels to low/zero-carbon alternatives. Balancing environmental sustainability, regulatory compliance and economic demands is vital for a sustainable, equitable and resilient maritime transport future.

The Indian shipping industry faces a significant challenge. The annual cost to comply with IMO regulations could be significant for Indian flagged tonnage. These costs are expected to rise over time as regulations become tougher. The GHG emissions vary with shipping activity levels, trade flows, ship type, size, age, and operational practices. Shipping is considered a harder-to-abate sector because ocean-going ships navigate over long distances and have limited options to electrify. Hydrogen-based fuels, such as green ammonia and methanol, are the main candidates to decarbonize the industry.

Port authorities and operators face a number of challenges with respect to the role and impact of ports in sustainable development of coastal areas. Indian ports and maritime bodies need to focus on areas as emphasised in Maritime India Vision 2030, such as: (a) increasing

renewable energy usage at ports; (b) improving air quality at ports, (c) optimizing water usage and increasing green cover, (d) improving solid waste management, (e) dredging material recycling, (f) zero accidents, injuries or health hazards at ports, and (g) centralized monitoring of key performance indicators (KPIs) and compliance to global standards<sup>14</sup>.

Achieving carbon neutrality in the maritime industry comprising shipping, ports and waterways is a challenge and is expected to come from energy efficiency initiatives and switch over to alternative fuels like hydrogen, ammonia and biofuels. A shift to alternative fuels and carbon neutral landside port infrastructure will need close collaboration amongst shipping lines, shipbuilding, alternate fuel supply chains, state support and building necessary port infrastructure.

## Endnotes

<sup>1</sup> Refer, Policy Brief No.112, UNCTAD, November 2023

<sup>2</sup> ibid

<sup>3</sup> ibid

<sup>4</sup> Refer, Table 11.3, Review of Maritime Transport, UNCTAD, 2025

<sup>5</sup> Refer, Ministry of Ports, Shipping & Waterways, Lok Sabha Unstarred Question (LSUSQ) No. 2233 replied on 01.08.2025 on age-based restrictions on Indian flagged vessels.

<sup>6</sup> Refer, Vol. 1: The potential of zero-carbon bunker fuels in developing countries World Bank, 2021.

<sup>7</sup> Refer, page 64, RMT 2025, UNCTAD

<sup>8</sup> Refer, MIV, 2030

<sup>9</sup> Refer, MIV 2030, page 244

<sup>10</sup> Refer, SIWS 2022-23 page 5.

<sup>11</sup> Refer, MIV 2030, page 168

<sup>12</sup> Refer, Port Update, March, 2025

<sup>13</sup> Refer, MIV 2030, page 187

<sup>14</sup> Refer, MIV 2030, page 224

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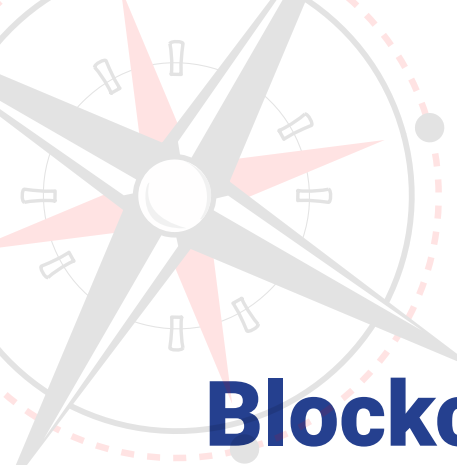


**Part V**

# **Technological Leap in Shipping**







# Blockchain and the Cross-border Multi-modal Cargo Logistics

Shishir Shrotriya

In the intricate tapestry of modern global trade, cross-border multimodal cargo transportation stands as a crucial thread, weaving together economies and cultures through the efficient movement of goods. Its significance is not merely logistical; it is a catalyst for economic growth, expanded market access, cost optimization, and environmental sustainability. With the growth of multiple international transport corridors spreading across regions and infrastructure development continuing apace, the role of multimodal transportation is poised to become more pivotal today.



## Importance of Cross-border Multimodal Cargo Logistics

At its core, cross-border multimodal cargo transportation involves the seamless integration of various modes of transport, such as ships, trucks, trains, and airplanes, to move goods across international borders. This approach is far from a novel concept; it has been a fundamental pillar of trade for centuries. However, its relevance has been amplified in recent times due to the rapid globalization of markets, increasing complexity of supply chains and the ambition for making it seamless.

One of the primary reasons for the indispensability of multimodal transportation lies in its ability to unlock new markets for businesses. By leveraging different modes of transport, companies can reach consumers and businesses in remote or landlocked regions that would otherwise be inaccessible through a single mode. This not only opens up avenues for increased sales but also fosters economic development in remote hinterland areas.

Furthermore, cost optimization is another compelling factor driving the adoption of multimodal transportation. Different modes of transport have varying cost structures and operational efficiencies. By strategically combining modes, businesses can minimize expenses, streamline their supply chains, and bolster their overall competitiveness. For instance, using sea freight for long-haul international transport and rail or road for inland distribution can result in significant cost savings.

Moreover, multimodal transportation plays a crucial role in reducing transit times, which is paramount in today's fast-paced business environment. By utilizing faster modes for certain legs of the journey and avoiding bottlenecks at ports or border crossings, goods can reach their destinations quicker. This translates to improved customer

satisfaction, reduced inventory holding costs, and ultimately, a more competitive advantage for businesses. These very principles underpin the development of international cross-border corridors by the international community.

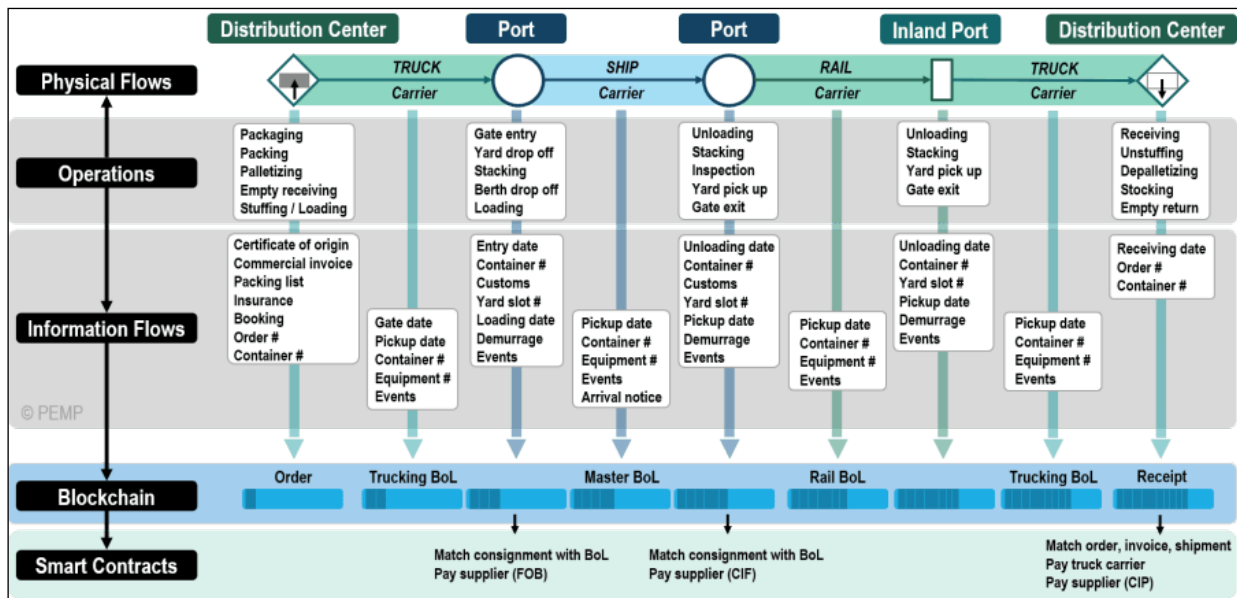
Further, the environmental impact of transportation cannot be ignored in the modern era. Cross-border multimodal cargo transportation can contribute to sustainability efforts by incorporating eco-friendly modes of transport, such as rail or inland waterways. These modes can often have lower carbon emissions compared to road or air transport, making them a more sustainable choice for long-haul shipments.

## Technology Integration for Complex Logistics Chains

Technological advancements and platforms can further integrate the complex supply chain network of multimodal transportation. Digital platforms, blockchain technology, and the Internet of Things (IoT) can simplify the way cargo is tracked, managed, and secured across borders (Figure 1). These technologies enhance transparency, streamline processes, and improve security, making multimodal transportation even more efficient and reliable. For example; application of Blockchain helps improve process simplifications in port supply chain (Figure 2).

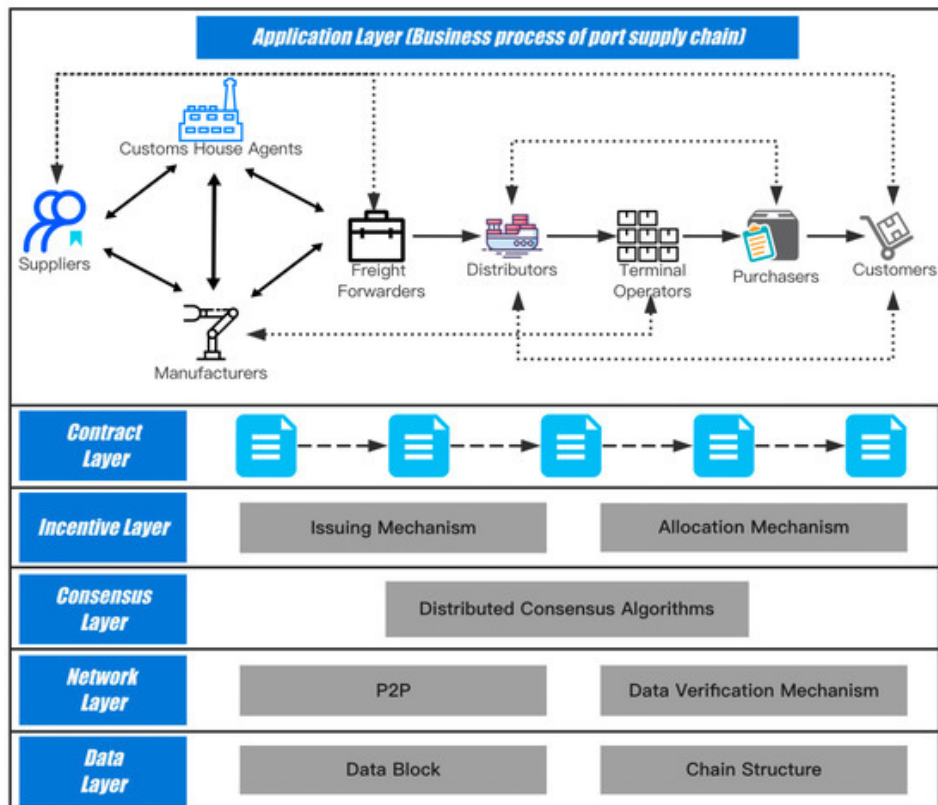
As the complex logistics world continues to evolve, the importance of cross-border multimodal cargo transportation will only intensify. Continued investment in infrastructure development, such as the construction of intermodal terminals and the expansion of rail networks, will further facilitate the seamless movement of goods. Furthermore, advancements in artificial intelligence and automation are expected to optimize routing and scheduling, reducing costs and transit times even further.

Figure 1: Blockchain Integration of Stakeholders



Source: Port Economics, Management, and Policy (PEMP), open access

Figure 2: Hierarchy of Blockchain for Port Supply Chain



Source: Article in Business Model, The Perspectives of Systems Thinking and Innovation, Open access

## Complexities of Cross-border Multimodal Cargo Logistics

While multi-modal cargo offers several advantages like flexibility and cost-effectiveness, it also presents numerous challenges. Each country has its own set of regulations and documentation requirements for cross-border trade. Navigating these varying rules can be time-consuming and prone to errors. Customs clearance procedures can be lengthy and complex, leading to delays and additional costs.

Ensuring compliance with different regulations and standards (e.g. safety, environmental, security) across multiple jurisdictions can be a challenge.

Similarly, efficient movement of goods across different modes of transportation and multiple stakeholders (e.g. shippers, carriers, freight forwarders, customs agents) hinges on efficient communication and coordination. Differences in infrastructure quality and standards between countries can lead to bottlenecks and delays. For example, incompatible rail gauges or inadequate road networks can hinder seamless cargo movement. Additionally, tracking movement of cargo across diverse modes and borders can be a challenge, leading to a lack of visibility and potential for delays or loss.

Navigating payments and insurance across borders presents a significant hurdle in multimodal transportation. The complexities of dealing with different currencies and regulations can lead to additional costs and administrative burdens. Furthermore, exchange rate fluctuations add another layer of uncertainty, potentially impacting transportation costs and exposing shippers and logistics providers to financial risks. Cargo theft, damage, and other security risks are higher in cross-border transportation, particularly in regions with weak governance or high levels of crime.

While multimodal transportation offers efficiency benefits, it can contribute to greenhouse gas emissions if not designed and

regulated effectively. Different countries have varying environmental standards, making it challenging to ensure compliance throughout the transportation process. This highlights the need for stricter regulations and the adoption of cleaner technologies.

Integrating data from different systems and stakeholders across the supply chain can be a significant obstacle, leading to fragmented information and potential errors. Furthermore, the biggest vulnerability lies in the computer and digital systems used for tracking, documentation, and communication. Their susceptibility to cyberattacks poses a major risk to data integrity and security.

Widespread adoption of blockchain technology across the shipping industry is crucial for its success. Developing common standards and protocols for data exchange and interoperability is essential. Governments need to establish clear legal frameworks to address issues like data privacy and security.

Therefore, many of these challenges need to be addressed holistically through holistic framework agreements agreed across cross-border nations, in at least the following explicit areas of harmonizing regulations and standards across countries can simplify procedures and reduce complexity. Adopting eco-friendly practices and technologies can minimize the environmental impact of cross-border multimodal cargo logistics. It is also significant to map and record the emissions during multimodal transits, in order to meet the collective responsibility and sustainability targets.

By addressing these challenges and adopting innovative solutions, the cross-border multimodal cargo logistics sector can become more efficient, reliable, and sustainable, contributing to the growth of global trade.

## Blockchain as a Solution to Complex Logistics

Blockchain creates an immutable ledger of all

transactions, including the movement of goods, customs clearance, and payment details.<sup>1</sup> This ensures transparency and prevents tampering or fraud. Smart contracts can be used to trigger updates on the blockchain whenever cargo changes hands or crosses a border, providing real-time visibility into the shipment's location and status to stakeholders. The technology also has drivers of improved accountability, where all parties involved in the supply chain can access the same information, fostering accountability and reducing disputes over missing or damaged goods.

Blockchain can also replace paper-based documents like bills of lading, invoices, and customs declarations with tamper-proof digital versions.<sup>2</sup> This reduces the risk of errors, forgeries, and delays. Automated execution of smart contracts upon fulfilment of predefined conditions (e.g. arrival of goods, payment verification) can expedite customs clearance and reduce manual intervention. Blockchain can facilitate seamless exchange of information between different stakeholders (e.g. shippers, carriers, customs authorities) across borders, reducing bureaucratic hurdles. Blockchain's consensus mechanism also verifies the authenticity of transactions, reducing the risk of fraudulent activities. Streamlined customs procedures and automated verification can expedite the release of goods, reducing delays and associated costs.

## International Initiatives

International use-cases have shown that blockchain can facilitate secure and transparent transfer of electronic Bill of Ladings (B/Ls) between different parties involved in the shipment, reducing the risk of fraud and delays. Blockchain-based can also ensure Proof-of-Delivery (POD), proving irrefutable evidence of delivery, reducing disputes and ensuring timely payments. Blockchain can streamline trade finance processes, such as letters of credit, by automating verification and reducing the

need for intermediaries. Although, the full-scale adoption of blockchain systems is in its early stages, the number of ports exploring and piloting blockchain solutions is steadily increasing and few notable initiatives are covered below.

### (i) Shanghai Yangshan Port

The Shanghai Yangshan Port's implementation of blockchain for customs clearance, using Hyperledger Fabric, has reportedly improved efficiency, reduced paperwork, and enhanced transparency in the customs clearance process.<sup>3</sup> This includes reconstructing the clearance process with smart contracts. The Shanghai International Port Group (SIPG) has been involved in the research and development of blockchain technology for port operations since 2018. Shanghai Port further augmented the "Yangtze River Port and Shipping Blockchain Integrated Service Platform" in 2020, allowing better visual tracking and management of cargo logistics and documentation integrating the inland waterways. The Shanghai Municipal Commission of Commerce and other authorities unveiled a series of measures to streamline cross-border trade operations, which included enhancing customs clearance efficiency and upgrading smart port technologies.<sup>4</sup>

### (ii) Port of Rotterdam

Likewise, the Port of Rotterdam has been actively involved in blockchain initiatives, exploring its use for container tracking, supply chain finance, and data sharing. The port, in collaboration with the ABN AMRO and Samsung SDS, developed and piloted the Naviporta blockchain platform.<sup>5</sup> The DELIVER pilot was a notable success, demonstrating a paperless, instantly financed, and fully tracked container journey from Korea to a warehouse in the Netherlands. The platform allowed for the secure and seamless transfer of digital documents, ownership, and financial transactions across multiple modes of transportation (ocean, truck, and inland barge). The goal was to create an open, independent,

and global cargo shipping platform.<sup>6</sup> The Port of Rotterdam has also applied blockchain technology beyond logistics. In a pilot project with S&P Global Platts and its subsidiary BlockLab, the port used a blockchain-powered microgrid electricity trading platform called Distro. This platform leveraged the AI and blockchain to coordinate the supply and demand of renewable energy, leading to lower electricity costs for users and improved revenues for local producers. The blockchain's smart contracts were used for transaction validation and enforcing market rules in this decentralized energy market.

### **(iii) Singapore Port**

Singapore is the world's leading bunkering port. The Maritime and Port Authority of Singapore (MPA) has taken a proactive approach to digitalize this sector. The MPA has launched several blockchain-based projects, including a digital platform for bunkering delivery verification and a system for electronic bills of lading.<sup>7</sup> A key component of this is the mandatory use of electronic bunker delivery notes (eBDNs). The MPA has whitelisted various digital bunkering solutions that conform to specific standards for security and regulatory reporting.

### **(iv) Port of Antwerp-Bruges**

This European leading port has experimented with blockchain for secure data sharing among supply chain partners. Through the use of blockchain technology, documents like certificates of origin and phytosanitary certificates are transferred, while the process itself is automated using 'Smart Contracts'. This cuts cost and speed things up. A consortium effort by Belfruco, Enzafruit, PortApp, 1-Stop, and T&G Global, has tailored a solution specifically for phytosanitary certificates, ensuring the safety of fruits and vegetables.<sup>8</sup>

### **(v) Blockchain Consortiums**

Among other global technology providers,

a blockchain platform, built on Microsoft Azure global cloud technology has been developed to provide significant value to the insurance industry.<sup>9</sup> The first of its kind in the insurance industry, the platform goes beyond insurance, aiming to utilize the benefits of blockchain for end-to-end applications across the marine industry. To address traceability and transparency in the marine fuel supply chain, blockchain technology and governance experts Blockchain Labs for Open Collaboration (BLOC) – through their subsidiary Maritime Blockchain Labs (MBL) – have established a consortium. This consortium includes significant industry players like Lloyd's Register, Precious Shipping, Bostomar, BIMCO, the International Bunker Industry Association (IBIA), and Good Fuels.

## **Towards Digital Maritime Corridors**

While the full-scale adoption of blockchain systems like the one at Shanghai Yangshan Port are not too many, the number of ports exploring and piloting blockchain solutions is steadily increasing. As technology matures and regulatory frameworks evolve, we can expect to see more widespread adoption of blockchain in ports worldwide, leading to greater efficiency, transparency, and security in the global supply chain.

India, a leading force in digital innovation, has a golden opportunity to spearhead the development of blockchain solutions specifically tailored to address the complexities of multimodal cargo movement. This focus, coupled with maturing technology and broader adoption, can revolutionize how goods traverse international border.

To solidify the country's position as a leader in cross-border trade, India can leverage blockchain technology through collaborative pilot projects with few countries on the IMEC and INSTC corridors. Partnering with key trading partners and domestic stakeholders on these projects will involve implementing blockchain-based platforms for specific trade

corridors. This collaborative approach allows India to test, refine, and showcase the benefits of blockchain in a controlled setting. By demonstrating the efficiency, security, and cost-effectiveness of this technology, India can pave the way for a more streamlined and competitive trade environment. Applications of blockchain solutions in maritime cargo logistics will also attract foreign investments, both in soft and hard infrastructure.

Strong foundational infrastructure is critical for India to thrive in the world of blockchain. This requires investment in building a robust digital ecosystem. High-speed internet connectivity is crucial for smooth operation, where blockchain solutions will be integrated efficiently. Training stakeholders through digital literacy programs is equally important for widespread acceptance. Additionally, collaboration and forming consortiums with international organizations on the usage of blockchain technology in the marine industry is essential. By ensuring compatibility across blockchain platforms, India can foster seamless information exchange and unlock the technology's full potential for network effects.

Embracing blockchain technology for cross-border cargo logistics positions India as a frontrunner in transforming global trade technology. This will further unlock a future of efficiency, security, and cost savings, propelling India's global competitiveness.

## Endnotes

- <sup>1</sup> Refer, <https://www.ibm.com/topics/blockchain#:~:text=Blockchain%20is%20a%20shared%2C%20immutable,patents%2C%20copyrights%2C%20branding>
- <sup>2</sup> Refer, <https://scholarship.law.umn.edu/cgi/viewcontent.cgi?article=1496&context=mjlst#:~:text=Blockchain%20could%20be%20the%20technology,potential%20in%20the%20shipping%20industry.>
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- <sup>5</sup> Refer, <https://www.marineinsight.com/know-more/7-major-blockchain-technology-developments-in-maritime-industry-in-2018/>
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- <sup>7</sup> Refer, <https://www.offshore-energy.biz/mpa-worlds-first-digital-bunkering-initiative-launched/>
- <sup>8</sup> Refer, <https://ris.org.in/sites/default/files/Publication/PB-3%20Dr%20Shishir%20Shrotriya.pdf>
- <sup>9</sup> Refer, [7 Major Blockchain Technology Developments In Maritime Industry](#)





# Accelerating Maritime Research Innovation and Technologies

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Mayank Mishra and Shishir Shrotriya

India's maritime domain encompasses a vast coastline, an intricate network of inland waterways, with 12 major and more than 200 non-major ports. The National waterways Act has declared, 111 National Waterways (NWs) in the country to promote shipping and navigation, with a total length of 20,275 km. spread across 29 states and 8 Union Territories.

*Maritime Amrit Kaal Vision 2047* emphasises the critical role of technology in achieving maritime 'Amrit Kaal' in India. Realizing these goals hinges on transformative innovation and technology adoption, and this awareness is also reflected in India's policy documents. Technology in the maritime



sector is evolving and will continue to evolve with new technologies being invented even at a faster pace. Technology adoption has resulted in several benefits, including seamless transactions, efficiency enhancement, cost optimisation and ease of doing business.

*Maritime India Vision 2030* also emphasizes the role of technology in enhancing ease of doing business and improving operational efficiency, through four vectors of effort – digitization to facilitate international (or EXIM) trade, digital-led port operations enhancement, improving the efficiency of ports' functional processes, and digitization in other maritime areas like vessel registration, port reception, cargo tracking, and inland water operations (Ministry of Ports, Shipping and Waterways, n.d.).

## Recent Digital Initiatives in Maritime Sector

The need for maritime related innovations stems from the imperative to modernize and optimize India's ports, bolster the shipping industry's competitiveness, and unlock the vast potential of inland waterways, etc. Digital solutions today can mitigate challenges of congestion, inefficient cargo handling and facilitate global trade. In addition digitalisation and innovation can also help in adopting sustainable shipping practices, reduce emissions, and enhance vessel efficiencies in the sea-borne trade.

The various stakeholders under the Ministry of Ports Shipping & Waterways (MoPS&W), have begun to accelerate initiatives towards digitalisation in ports, inland waterways, cruise tourism, shipping, cargo and logistics, shipbuilding and ship recycling sectors, to improve the efficiency of operations, productivity, safety, transparency, ease of doing business, cost optimization and sustainable practices.

Recently, the MoPS&W launched several major digital and sustainability initiatives

aimed at transforming India's maritime sector. Key announcements included the launch of the SAGAR SETU platform to streamline EXIM operations, enhance ease of doing business, and connect over 80 ports and 40 stakeholders through a unified, paperless digital system.

A landmark MoU between MoPS&W and Centre for Development of Advanced Computing (CDAC) was also signed to establish a Digital Centre of Excellence (DCoE), driving innovation through AI, IoT, and blockchain while supporting the *Maritime India Vision 2030* and *Maritime Amrit Kaal Vision 2047*.

The DRISHTI framework was also introduced to monitor maritime progress using KPIs and performance tracking, while a standardized Scale of Rates (SOR) was released to harmonize port tariffs, increase transparency, and facilitate digital integration.

Green initiatives included the "Gateway to Green" report to transform Indian ports like Paradip, the JNPA, and the DPA as global hubs for green hydrogen production and export, supporting India's 2030 target of producing 5 million tonnes of green hydrogen. These initiatives reflect a comprehensive push toward digitalization, sustainability, and global competitiveness, aligning with the Indian Prime Minister's vision of a *Viksit Bharat* and *Atmanirbhar* maritime economy.

The flagship Sagarmala Programme, launched in 2015, also underpins much of this transformation by promoting port modernization, digitization, improved port connectivity, and new technological adoption, especially blockchain, IoT, and automation. These efforts are gradually inducing better coordination, lower operational costs, and increased transparency across the supply chains. Non-major ports, especially, could leverage on the digital tools for real-time tracking and data management, benefiting from private-sector experimentation.

## Driving the Innovation Ecosystem in India

India's innovation ecosystem is thriving, and has witnessed significant growth and evolution in recent years, driven by government initiatives, private sector investments, and a burgeoning start-up culture, this vibrant ecosystem has fostered innovation across various sectors, namely, Defence, Space, Information Technology, and many others.

The Innovations for Defence Excellence (iDEX) scheme, launched by the Indian Prime Minister in 2018, aims to foster innovation and technology development in defence and aerospace by engaging innovators and entrepreneurs to deliver technologically advanced solutions for modernizing Indian Military. The iDEX provides a collaborative platform for stakeholders to co-create and develop innovative defence technologies. It also runs challenges for Indian startups, MSMEs, and individual innovators including the Defence India Startup Challenge (DISC), Open Challenge, Thematic Open Challenge and Advancing Defence Innovation Acing Development of Innovative Technologies with iDEX (ADITI) Challenge (iDEX, n.d.).

Several other organisations in India have also launched important innovation challenge platforms to foster innovation and technology development in their respective sectors. In addition to iDEX, other prominent existing models, which have operational to accelerate innovation, are enumerated in the succeeding paragraphs.

Technology Development Fund scheme of the Ministry of Defence, is executed by DRDO. The implementing partner for this scheme is Global Innovation and Technology Alliance or GITA, a Section-8 company, promoted jointly by the Technology Development Board (TDB), Department of Science and Technology (DST),

Government of India and the Confederation of Indian Industry (CII) (India Science, Technology and Innovation Portal, n.d.).

MeitY Startup Hub (MSH) by the Ministry of Electronics and Information Technology (MeitY), which promotes startups in the IT and electronics sectors. The MSH act as the implementing agency for the 'Startup Accelerators of MeitY for Product Innovation, Development and Growth (SAMRIDH)' Scheme (MeitY Startup Hub, n.d.). MSH is an independent business division under the Digital India Corporation, a not-for-profit company set up by MeitY under section 8 of Companies Act, 2013 (Ministry of Electronics and Information Technology, n.d.).

Atal Innovation Mission (AIM), which is a flagship initiative of NITI Aayog to promote a culture of innovation and entrepreneurship across school children and youth in India. As part of AIM, Atal Community Innovation Centres (ACICs) are set up under section 8 of the Companies Act, 2013 (Atal Innovation Mission, 2020).

The Startup Grand Challenge, by the Ministry of New and Renewable Energy (MNRE), promotes the development of innovative renewable energy technologies and solutions (Ministry of New and Renewable Energy, n.d.).

In the maritime domain too, the S2I2 Sagarmala Startup and Innovation Initiative (S2I2) has been started to create an ecosystem of innovation and entrepreneurship for the ports and maritime sector in India. It seeks to bring in new ideas, energy and involve youth to address the challenges of the sector. The scheme can bring in the much needed collaboration amongst stakeholders, academic and training institutions, research institutes and centres of excellence, other government departments and the private sector. It could also provide the much desired financial, institutional, mentorship and the market access to Startups.

However, the maritime sector is so wide that multiple accelerators, innovation hubs are required to address the demand of the industry with indigenous technologies, boosted by the efforts of the startups and the MSME industry. All this would also require technological collaboration with global players, private sector investment, and capacity-building in the maritime sector.

## Opportunities for Maritime Innovation

Multiple sectors of the maritime ecosystem need to pursue innovation and introduce new technologies, in order to accelerate efficiency, optimise cost and time and enhance safety and security. A brief outlook of the explicit and implicit technology and innovation requirements of a few important maritime sub-sectors, are discussed in the succeeding paragraphs.

### Smart Ports

Ports are fundamental to the maritime industry, and their technological transformation is a critical component of modernizing global trade. As the world economy becomes more complex, port ecosystems are under increasing pressure to adopt smarter infrastructure to handle growing trade demands. The shift towards the “Smart Ports” model is driven by several factors which primarily include efficiency and productivity. By adopting technologies, ports can handle increasing cargo volumes, reduce delays, and improve efficiency.

Automation and Robotics fields have abundant opportunities for implementation of automated cargo handling systems, robotic cranes, and automated guided vehicles (AGVs) to improve efficiency, reduce human error, and enhance safety (Chu et al., 2018; Gavalas et al., 2024; Mi and Liu, 2022; Johansson et al., 2023). Automation also leads to a safer work environment through intelligent threat detection and real-time monitoring.

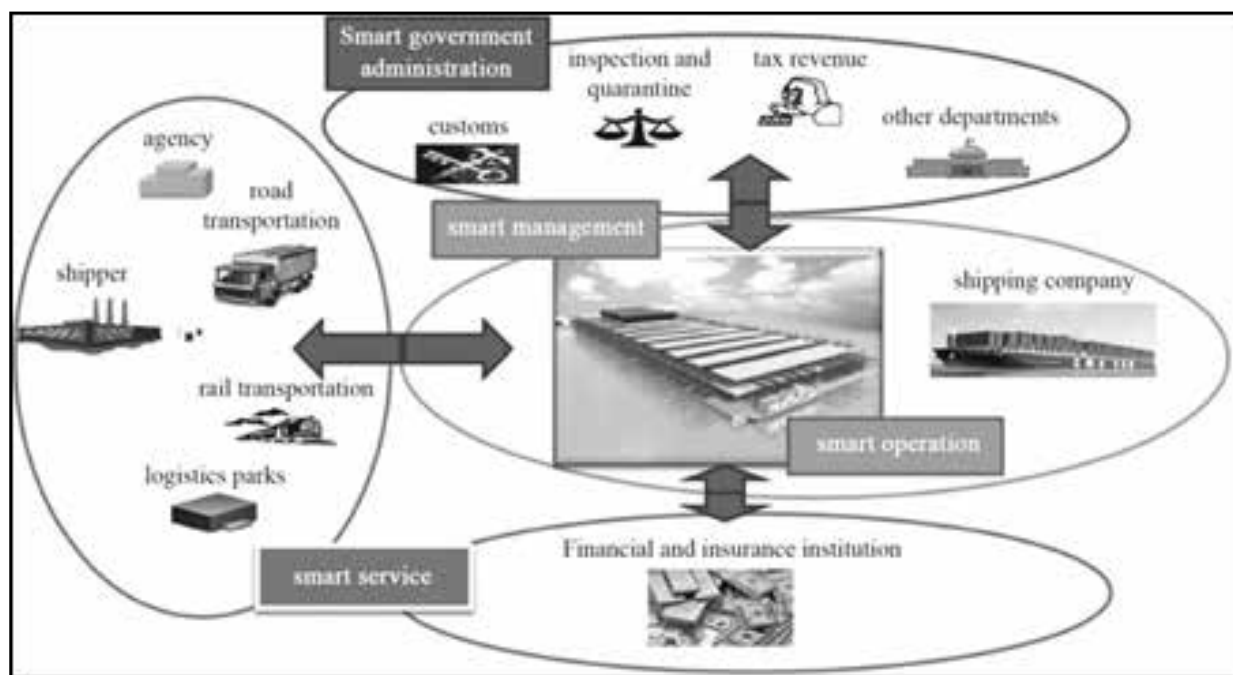
Similarly, data analytics and Artificial Intelligence (AI) can help towards predictive vessel maintenance, optimized vessel traffic management, and intelligent decision support system in port operations (Putra, 2024). The trend toward technological transformation is seen as a necessity for ports to remain competitive and resilient. By embracing advanced technologies and ensuring collaboration among all stakeholders—from ports and carriers to governments and customs officials—the maritime industry can enhance efficiency, security, and sustainability, securing its vital role in global trade.

Ports are adopting green technologies to reduce their environmental impact. This includes using electric-powered equipment, shore-to-ship power systems, and renewable energy sources. Digitalization can also reduce emissions by minimizing inefficiencies and fuel consumption. Concurrently, renewable energy sources like solar and wind power, shore power connection for ships, and electric vehicles for cargo handling will reduce emissions and environmental impacts (Gruchmann, 2019; Wu et al., 2020; Tommasetti et al., 2014; Bjerkan and Seter, 2019; Doudounakis and Kanellos, 2015).

Despite the significant benefits, the widespread adoption of port automation faces challenges, including high initial investment costs, the need for infrastructure upgrades, and potential workforce resistance. However, the transition to automation should be leading to smarter and more efficient workforce.

A systems approach to Smart Ports development involves integration of various systems and technologies for real-time monitoring, data sharing, and collaborative decision-making, leading to a more efficient and responsive port ecosystem.

Figure 1 depicts the functional composition and management of Smart Ports with the use of technologies.

**Figure 1: Functional composition of a Smart Port**

Sources: Mi and Liu, 2022; Johansson et al., 2023

## Integrated Inland Waterways

India's Inland Waterways network, encompassing major rivers like the Ganga, Brahmaputra, Yamuna, Krishna and Godavari and their tributaries, possesses immense potential as a cost-effective, energy-efficient, and environmentally friendly mode of transport (Ministry of Shipping, 2024). Despite this promise, the sector currently handles a negligible fraction of India's freight traffic, primarily due to inconsistent river conditions, inadequate infrastructure, and a significant technological deficit (IWAI, 2023). To elevate the Inland Water Transport (IWT) sector to a level of operational efficiency comparable to road and rail, a comprehensive and strategic technological overhaul is imperative.

The inconsistent depth and width of India's rivers, particularly during the dry season, pose the single largest impediment to reliable navigation (Dutta and Das, 2022). Addressing

this requires a shift from manual, reactive maintenance to technology-driven, proactive channel management.

Maintaining the Minimum Assured Depth (MAD) necessary for commercial cargo movement is a constant challenge due to heavy siltation (IWAI Annual Report, 2023). Thus, smart dredging is essential with technologically advanced dredgers integrated with real-time positioning and data feedback systems (Global Waterways Report, 2024). This allows dredging operations to be optimized based on immediate hydrographic data, minimizing operational time and cost while maximizing the maintenance of navigable fairways.

The critical technological requirements across three fundamental pillars of enhanced navigation safety, modernized transport fleets, and integrated advanced digital management systems, can therefore leverage the riverine economies and use of national waterways for

cargo and passenger services, besides the allied economic growth benefits.

## System Integration and Riverine Ecosystem Management

Amongst the digitalisation imperatives, the implementation of an integrated River Information System (RIS) network is non-negotiable for safe and efficient IWT operations (UNESCAP, 2021). RIS uses telematics and data exchange platforms to provide comprehensive information to vessel operators and waterway managers.

RIS includes mandatory adoption of the Automatic Identification System (AIS) transponders on all vessels, linked to central monitoring stations, enabling accurate tracking, traffic management, and collision avoidance in real-time (Maritime Safety Authority, 2022).

Waterway data dissemination can be achieved by integrating mobile platforms and radio communication to broadcast critical information, including water level forecasts, navigational warnings, fairway advisories, and lock schedules, directly to the operators (World Bank Transport Paper, 2023).

The limited Indian IWT fleet currently is, however, characterized by older vessels with suboptimal designs, leading to high fuel consumption and limited cargo capacity (FICCI Logistics Report, 2024). Modernizing the fleet requires incorporating advanced propulsion and design technology.

Promoting vessel designs tailored specifically for shallow draft and high-efficiency operation in India's riverine environment (Naval Architects India, 2024) is essential for boosting National Waterways.

Modernising cargo handling is also essential through integrating containerization and modern roll-on/roll-off (Ro-Ro) facilities at terminals. This requires specialized cranes and mechanized handling equipment that are

designed for river barges, ensuring faster vessel turnaround times – a key metric for logistics cost reduction.

To function as a coherent and competitive component of the national logistics chain, the IWT requires deep digital integration with ports, rail, and road networks.

Integrating Port Community Systems (PCS) can establish interoperability between the IWT platform, managed by the Inland Waterways Authority of India (IWAI) and the major seaports' PCS (Logistics Ministry Circular, 2023). This will enable seamless exchange of Electronic Data Interchange (EDI) for documents like the Bill of Lading, facilitating faster customs clearance and integrated multimodal scheduling.

Adopting Artificial Intelligence (AI) and Machine Learning (ML) solutions for demand forecasting, vessel routing, and multimodal resource allocation are key to shipping (NITI Aayog, 2024). Such software can analyze real-time data from RIS, weather forecasts, and port congestion reports to provide optimized scheduling, ensuring cargo moves efficiently and predictably.

The transformation of India's Inland Waterways is a national priority that demands significant and sustained investment in technology. The path forward is multifaceted, requiring simultaneous deployment of advanced hydrographic tools and smart dredging for channel maintenance, the rollout of a comprehensive digital RIS for navigation safety, and a policy-driven shift towards green and efficient fleet designs.

By prioritizing the complete integration of IWT into the digital national logistics framework, India can unlock the full economic and environmental benefits of its vast river network, turning a historically under-utilized asset into a cornerstone of the third largest economy ambition.

## Smart Shipping

Integration of smart shipping solutions by integration of sensors, communication systems, and data analytics for real-time monitoring of vessel performance, predictive maintenance, and optimized routing is the need of the hour (SmartPort, 2019; Liang, 2016).

Table 1 summarises the benefits of emerging technologies in shipping.

Similarly, implementation of innovative hull designs, propulsion systems, and energy management solutions to reduce fuel consumption and emissions is the way-forward (Romero et al., 2024; Raviv, 2024; Nautilus Shipping, 2024).

Utilizing blockchain technology for transparent and secure tracking of cargo, ensuring traceability and reducing fraud in the supply chain is another imperative for the sector (LinkedIn, 2024; Dong et al., 2022).

## Cruise Tourism

Eco-Tourism Initiatives and development of

eco-tourism destinations and activities that minimize environmental impact and promote conservation of marine biodiversity are crucial for the growth of the maritime sector (Ministry of Tourism, 2022a).

Designing and building energy-efficient and low-emission cruise ships, adopting sustainable practices onboard, and promoting responsible tourism in coastal communities is also a key requirement of the sector (Ministry of Tourism, 2022b; European Commission, 2022; Balestracci et al., 2024).

Development of advanced submersibles, underwater drones, and virtual reality experiences to explore and showcase the underwater world without harming marine ecosystems, lead to sustainable cruise tourism (Bruno et al., 2020; Novian et al., 2023; UTM Consultants, n.d.). Similarly, creation of AR/VR platforms and mobile applications for promoting India-bound cruise tourism are important digital initiatives (Virtusa, n.d.; Visit Greenland, n.d.; Pasca et al., 2021).

Figure 2 depicts the virtual reconstruction

**Table 1. Emerging Technology in Shipping**

| No | Technology                   | Single Description                                     | Main Benefit                                               |
|----|------------------------------|--------------------------------------------------------|------------------------------------------------------------|
| 1  | Autonomous Navigation System | Using sensors, radar, and GPS for automated navigation | Improving human safety, increasing navigation efficiency   |
| 2  | Predictive Maintenance AI    | Analyzing data to predict equipment failures           | Preventing breakdowns, reducing maintenance costs          |
| 3  | Automated Mooring System     | Using AI and sensors to detect and guide mooring       | Enhancing maritime safety, reducing human errors           |
| 4  | Port Automation              | AI and robotics for logistics and cargo handling       | Improving operational efficiency, reducing turnaround time |
| 5  | Operational Data Analytics   | AI-based analysis of operational data                  | Optimizing vessel performance, enhancing fuel efficiency   |

Sources: Riyadh, 2024; Molodtsova, 2023

of an underwater archaeological site with 3D points of interest, and a virtual diving system.

## Ship Building

Modularisation in shipbuilding, brings a higher product variety and customization using product platforms, improved production efficiency through standardization on parts, reduced lead time both by isolating functional enhancements as well as supporting parallel development and production, reduced risk, and cost and efficiency improvements through outsourcing and globalization of supply chains.

Adoption of modular construction methods to reduce construction time, improve efficiency, and enable customization of ships is the way-forward for the ship building industry (NAVAIS Project, n.d.; European Commission, n.d.; McKinsey and Company, 2024).

Modular concepts aimed at providing operational flexibility, may contribute to

a cost-efficient modernization of obsolete equipment, upgrades, and adaptation to changed external conditions like the new markets, trades, regulatory regimes, etc. This may also contribute to increasing the operational efficiency of the vessel, as well as extending the vessel's operational life. Modularity could also contribute to a more efficient recycling of the vessel along the interfaces defined by the modular architecture, and possibly applied to the reuse of those components for which the economic life time is longer than for the ship itself (Erikstad, n.d.).

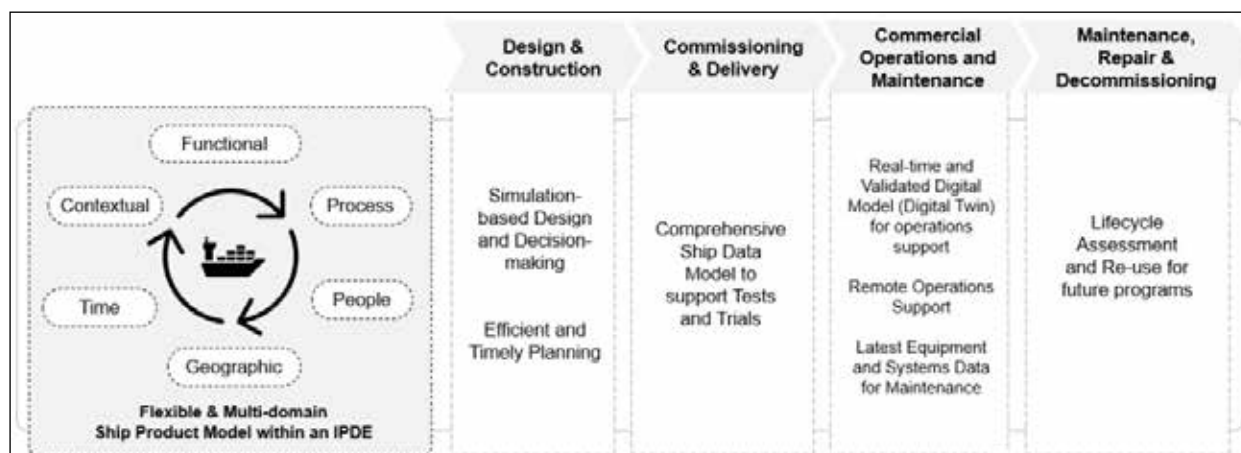
## Advanced Materials and Manufacturing

Use of lightweight and high-strength materials, such as composites, and advanced manufacturing techniques, like 3D printing, improves ship performance, allows greater speeds and payloads, and reduces fuel

**Figure 2: Virtual Reconstruction of an Underwater Archaeological Site**



Source: The ISPRS Foundation

**Figure 3: Ship Product Data Modelling to Support Various Lifecycle Phases**

Source: Fujikubo et al., 2024

consumption, emissions, and costs (Rong, 2024; Dole et al., 2023; Roland et al., 2004).

Incorporation of energy-efficient propulsion systems, waste heat recovery, and air lubrication systems will lead to reducing fuel consumption and emissions (Tadros et al., 2023; Rutkowski, 2016).

Utilization of digital design and simulation tools to optimize ship design, test performance virtually, and reduces errors during construction (Bronson et al., 2024; Smallman et al., 2011; Perez-Martinez and Perez Fernandez, 2023).

Further, developing digital twin(s) of running machinery to evaluate the need of preventive maintenance, rather than undertaking breakdown maintenance (Liu et al., 2024; Fujikubo et al., 2024; Wang et al., 2024). Figure 4 presents the functioning of a digital twin system in this context. Figure 4 depicts production workshops architecture mapping with digital twins for enchainning efficiency.

## Ship Recycling

Adoption of international standards and new technologies for waste management in ship recycling, ensuring proper disposal of hazardous materials and minimizing environmental impact is a key aspect of

sustainability (Romuno, 2024; Department of Science and Technology, n.d.; Sukitno et al., n.d.; Stannard, 2021).

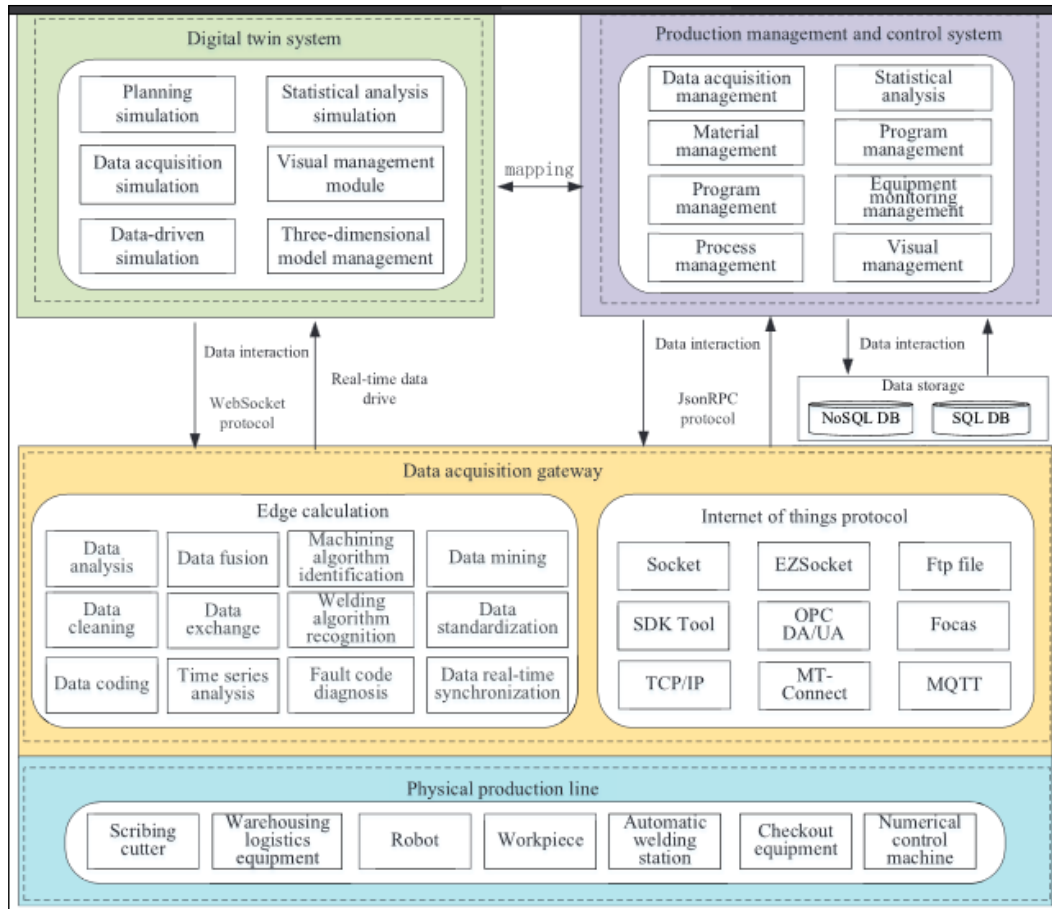
Similarly, development and implementation of innovative technologies for dismantling ships, recovering materials, and minimizing waste generation is the only way-forward (ElMenshawry et al., 2024).

Implementation of safety measures and technologies (like remote monitoring systems) to protect workers engaged in shipbuilding and ship-recycling, including safety from exposure to toxins, cannot be neglected. Table 2 summarises some key safety technologies (Yap et al., 2024; Akano et al., 2024).

In the concurrent approaches, promoting circular economy and exploring technologies and opportunities to reuse and recycle materials from scrapped ships requires a continuous effort by the stakeholders (Okumus et al., 2024; Mannan et al., 2024; Hoffmann and Pruyn, 2024).

## Coastal Community Development

Promoting alternative livelihoods for coastal communities, such as ecotourism, seaweed farming, and sustainable fishing practices, to reduce dependence on traditional fishing and

**Figure 4: Data Mapping and Fusion System Architecture of Production Workshop**

Source: Liu et al., 2024

mitigate environmental impacts is a growth driver for the blue economy and empowerment of coastal communities (Dept. of Fisheries, n.d.; National Fisheries Development Board, n.d.; Briggs et al., 2003; Lux-Mag, n.d.).

This needs structured training and skill development programs for coastal communities in areas like marine conservation, tourism management, and sustainable aquaculture to enhance their livelihoods (Sagarmala, n.d.; Sagarmala, n.d.; Paul, 2014).

Innovative infrastructure for coastal communities, such as fishing harbours, cold

storage facilities, and transportation networks, to improve their economic and social well-being is also a must (Aggregate Industries, n.d.; OECD, 2018; Elrick-Barr et al., 2024).

For disaster response, implementing measures to enhance the resilience of coastal communities towards natural disasters like cyclones and floods, including early warning systems, disaster-resistant infrastructure, and community-based disaster management plans, cannot be forgotten devoid of integrated technological solutions (National Institute of Disaster Management, 2021; Almutairi et al., 2020).

**Table 2 : Summary of Safety Technologies in Ship Recycling**

| No. | Safety technology                                      | References                                          |
|-----|--------------------------------------------------------|-----------------------------------------------------|
| 1   | Building information modelling (BIM)                   | (Getuli et al. 2020; Park et al. 2017)              |
| 2   | Wearable sensing devices (WSD)                         | (Awolusi et al. 2018; Ye et al. 2019)               |
| 3   | Mobile devices on site                                 | (Kim et al. 2013; Lee et al. 2009)                  |
| 4   | Radio frequency identification (RFID)                  | (Landt 2005; Lu et al. 2011)                        |
| 5   | Light detection and ranging (LiDAR) and laser scanning | (Gamba and Houshmand 2000; Marshall and Stutz 2018) |
| 6   | Quick response codes (QR codes)                        | (Liu et al. 2008; Lorenzo et al. 2014)              |
| 7   | Digital signage                                        | (Morris et al. 2001; Nnaji et al. 2020b)            |
| 8   | Camera network systems                                 | (Abeid et al. 2003; Leung et al. 2008)              |
| 9   | Photogrammetry                                         | (Tatum and Liu 2017; Zhang et al. 2017a)            |
| 10  | Exoskeleton/exo-suit                                   | (Yin et al. 2020; Zhu et al. 2021)                  |
| 11  | Artificial intelligence (AI)                           | (Ayhan and Tokdemir 2019; Pan and Zhang 2021)       |
| 12  | Unmanned aerial vehicles (UAV)                         | (Liu et al. 2014; Seo et al. 2018)                  |
| 13  | Virtual and augmented reality (VR/AR)                  | (Li et al. 2018b; Park and Kim 2013)                |
| 14  | Automation and robot                                   | (Cai et al. 2019; Gharbia et al. 2020)              |
| 15  | Internet of things (IoT)                               | (Li et al. 2018a; Zhou and Ding 2017)               |

Source: Akano et al., 2024

## Way Forward: Accelerating Maritime Research and Innovation

The foregoing discussion outlines the significance of technology and innovation. Since, the current pace of technology adoption in the maritime sector is required to be increased, creation of innovation platforms and challenges, can accelerate the indigenisation of technologies can drive technological advancement, enhancing competitiveness, and ensuring sustainable growth. The sector, therefore, needs dedicated innovation and technology platforms, which could incubate and empower maritime innovation and research.

These Maritime innovation platforms can serve as a catalyst for this transformation, not only to achieve our goals and objectives listed in the *MIV 2030* and *MAKV 2047*, bringing self-reliance in the crucial maritime sector and accruing savings to the exchequer.

An integrative maritime innovation and technology platform is also needed to actively

engage with the industry players, startups and research institutions to identify and address the critical challenges of this sector. This collaboration can lead to the co-creation of innovative solutions and accelerate their commercialization. The platform will also help in establishing a network of maritime-focused incubators and accelerators providing startups with the necessary support and mentorship to scale and succeed.

Furthermore, it could also facilitate engagements with the investors to attract funding for maritime innovation projects. Creating open innovation platforms can encourage participation from a wider range of stakeholders, including individual innovators, students, and researchers, leading to a more diverse and inclusive innovation ecosystem.

It is, therefore, proposed to manage and fund this maritime innovation set-up through an enterprise called AMRIT (Accelerating Maritime Research Innovation and Technologies). AMRIT's mandate will be

to create and expand maritime innovation hubs, communicate to relevant agencies/partners the innovation-related needs of the MoPSW, and organise challenges and technology events for the maritime sector. AMRIT should also facilitate prototype testing and integration, evaluation of technologies, and development of interfaces with various governmental, non-governmental and other stakeholders at the national and international level. In addition to the strong linkages with the MoPS&W and other organisations under the ministry, the success of AMRIT will also depend on its autonomy, which is a pre-requisite for high quality and desired implementation speeds.

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[Due to space constraints, authors are forced to ignore presenting the full list of references, which is available on request from the authors.]



# Fractional Ship Owning: Leveraging Fintech

Sujeet Samaddar and Vanshika Goyal

The global sea-borne trade remains the oldest, most cost-effective, and important economic activity in the history of civilization, facilitating people-to-people exchanges, spreading culture, and knowledge sharing. Ships carry 80 per cent of global trade by value and 90 per cent by volume. This accounts for a colossal market valued at US\$ 380 billion in freight rates, thereby contributing about 5 per cent of total world trade.<sup>1</sup> This trade is carried by bulk carriers, container ships, oil, gas, and chemical tankers, ferries, and passenger ships, which are all, built in shipyards. In 2024, global shipbuilding market value reached US\$ 162.14 billion and is projected to grow to US\$ 228.82 billion by 2032, growing at a CAGR of 4.4 per cent.<sup>2</sup>

But, owing to its unique features, shipbuilding is unlike any other industry. It is a demand-driven industry, where global economic trends have a decisive influence on the sector's performance. It is a highly capital-

intensive industry that requires substantial funding, raw materials, diverse equipment, and highly skilled management and labor. It entails long gestation periods, during which capital remains invested with no returns. Revenues accrue only after vessels are completed and charters are concluded. For financiers, insurers, charterers, shipyards, and shipping companies, shipbuilding is a highly speculative business. Consequently, financing of ships becomes a highly specialized business, different from other more predictable asset-based industries such as real estate and aircraft.

Ship finance is a broader term encompassing financing shipping companies (to acquire ships, refinance existing debt, and working capital requirements), and shipyards (maintaining working capital before delivering orders and receiving full payments).<sup>3</sup> Typically, funds for shipbuilding or even ship owning are raised through two ways, Equity (Owner Equity, Private Equity, Limited Partnerships, and Public Offerings) and Debt (Loans, Bonds, and Leasing). The governments also frequently provide funds by offering low-cost financing, grants, and subsidies to revive and sustain the industry.

However, the current ship financing models have become less appealing to both investors and lenders, with total ship financing on a declining trend since 2010, as highlighted in UNCTAD's *Review of Maritime Transport 2024*<sup>4</sup>. Recognizing this, article aims to discuss alternative finance for shipbuilding, and bring the Fintech revolution by introducing the tokenization of real-world shipping assets.

## Alternative Finance

Tokenization of real-world assets refers to the process where a programmable ledger (such as distributed ledger technology (DLT) using blockchain) digitally represents ownership of an asset by creation of a unique digital token in a transformable format. Each token

represents a fraction of the asset and holds something of value (e.g. a claim on or digitized version of a tangible asset) that can be legally issued, stored, or operationally exchanged on the programmable ledger.<sup>5</sup> Virtually any real-world asset can be tokenized, including art, real estate, commodities, and precious stones. Ships are 'floating real estate' and, therefore, can be tokenized.

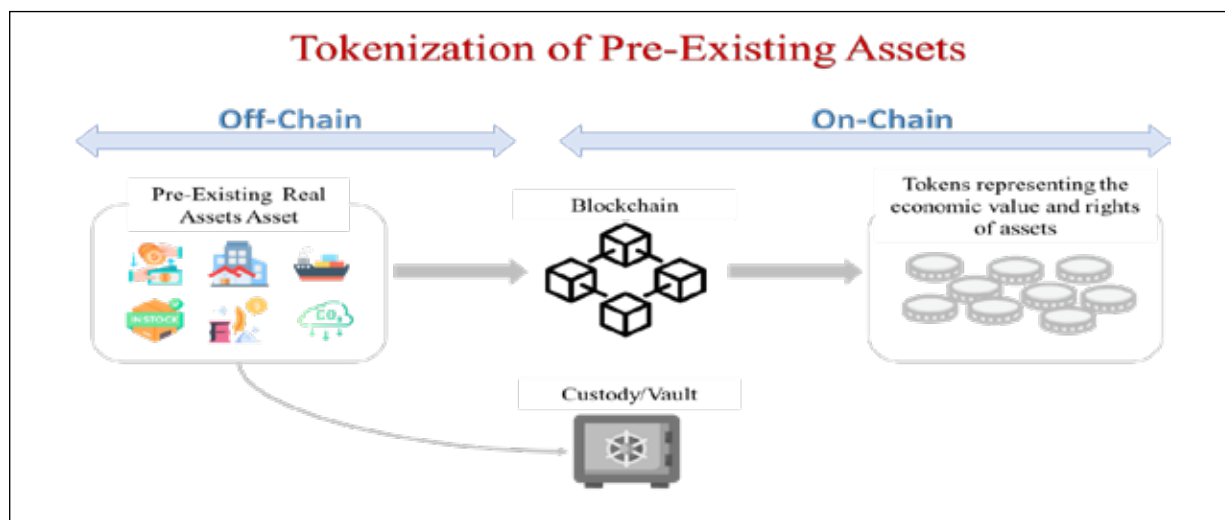
Tokenization procedure can be totally 'on-chain' or hybrid - 'on-chain' & 'off-chain'.<sup>6</sup> When the physical assets are digitally represented on DLT, the procedure follows a hybrid regime, and the tokens function as a digital twin 'on-chain,' while the underlying real assets continue to exist in the 'off-chain' world. Asset's economic value and rights gets linked or embedded into the DLT-based tokens, which serve as a store of value as shown in Figure 1.

The DLT platform can be operationalized under three models<sup>7</sup>:

- **Public Permissionless.** These are open, decentralized networks that allow anyone to participate, transact, and validate transactions without requiring prior authorization, limiting the default privacy.
- **Public Permissioned.** These are networks restricted to selected, vetted participants, typically regulated entities that combine decentralization with controlled governance, ensuring transparency, high performance, and regulatory compliance.
- **Private Permissioned.** These are fully centralized networks with access limited to pre-approved participants, designed for high performance, confidentiality, regulatory compliance, and internal institutional applications.

For example, ERC3643 (Token Standard for RWA Tokenization) is a permissioned token standard for real-world asset tokenization, ensuring only eligible investors can hold and transfer tokens.

Figure 1: Digital Representation of Physical Assets on DLT



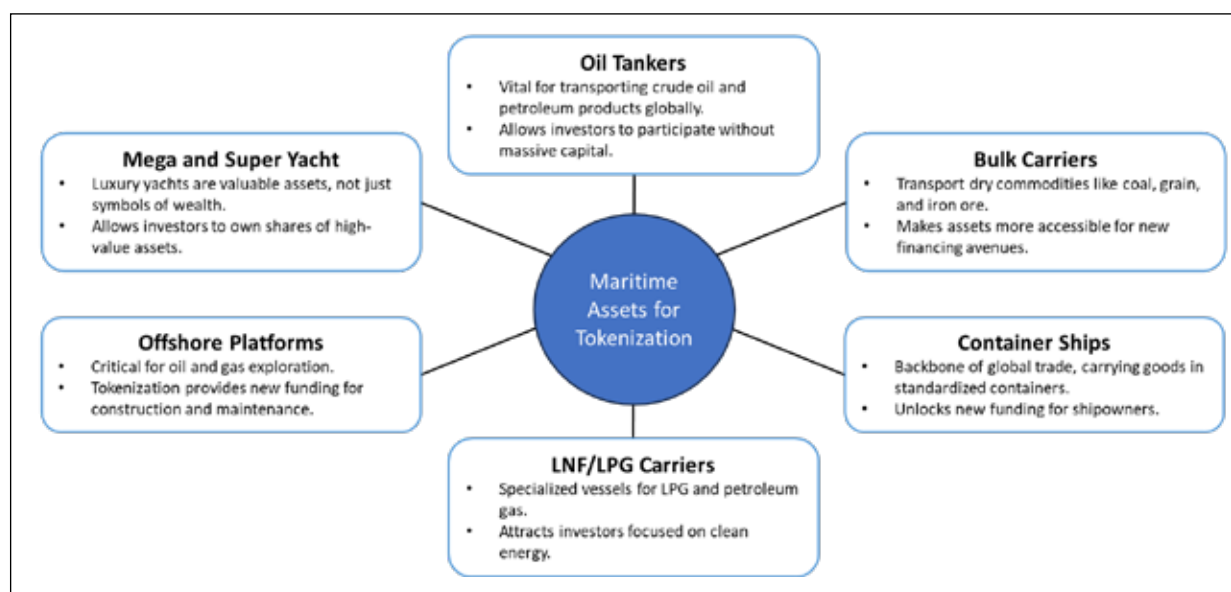
Source: Authors' own<sup>8</sup>

## Ship Tokenization

Applying the concept to the maritime assets, “ship tokenization refers to the process of converting ownership and operational rights of a vessel into digital tokens on a blockchain.”<sup>9</sup> It allows investors to participate in maritime investments without owning the entire vessel,

as each token exhibit a fractional value of it. Usually, the registered GRT of the vessel is converted into equivalent tokens. For example, a ship with a capacity of 12,000 GRT in the ‘off-chain’ realm will have an equivalent digital representation of 12,000 tokens residing on the ‘on-chain’ ledger.

Figure 2: Categories of Maritime Assets for Tokenization



Source: Antier Solution<sup>10</sup>

**Figure 3: WEF - Tokenization-ready Traits for an Asset**

Source: World Economic Forum<sup>11</sup>

Various types of ships can be tokenized as shown in Figure 2. The underlying principle of fractional ownership remains the same. However, the revenue recognition model may differ according to the vessel type.

## Tokenization Traits and Shipbuilding/Ship owning

The World Economic Forum (WEF)<sup>12</sup> describes eight key traits that determine whether an asset is suitable for tokenization (Figure 3). These attributes have been examined briefly in the context of ships to assess their suitability for tokenization.

- **Physical Form Factor.** Ships are tangible assets that can be tokenized on DLTs, benefiting from secure immobilization, tradability, and liquidity.
- **Operationally Intensive.** With multiple entities involved in ship operations and their regulations, it is a complex business where programmability can help maintain a single record system through smart contracts.
- **Asset Reusability.** Ships can be used as collateral or liquid staking<sup>13</sup>, benefiting from the interoperability of tokens.
- **Institutional Demand.** Ships are the backbone of international seaborne trade, thus have high institutional demand, but high capital requirement often becomes an entry barrier for institutions with low capital and less risk-taking capacity; tokenization enables fractional ownership, thus increasing investor base for finance.
- **Infrastructure Maturity.** Ship tokenization is an emerging finance, which is yet to see widespread adoption; hence, infrastructure maturity is low.
- **Unstructured OTC Markets.** Ship sales today often take place through private negotiations, brokers, and over-the-counter (OTC) deals, which are fragmented, opaque, and highly relationship-driven making it difficult for smaller players to participate. Tokenization would enable trading on new structured digital marketplaces.
- **Limited Divisibility.** At present, investors

can only redeem their capital by selling an entire vessel, which makes ships a highly illiquid asset class. Through fractional ownership, investors could instead liquidate portions of their holdings via secondary marketplaces, enabling quicker and more flexible redemption.

- **Regulatory Readiness.** Shipping finance is currently working on well-established traditional frameworks and regulations. Therefore, ships present a case point for asset tokenization.

### Architecture for Ship Tokenization

Figure 4 describes how asset tokenization works with ships as the underlying asset. This is briefly explained below:-

- **Physical Asset Layer (Off-chain):**
  - » **Physical Asset.** The initial step is to select a vessel for tokenization. This vessel is then 'issued' on a ledger supporting blockchain.
  - » **Regulatory Adherence.** Due diligence must be conducted to create a legal

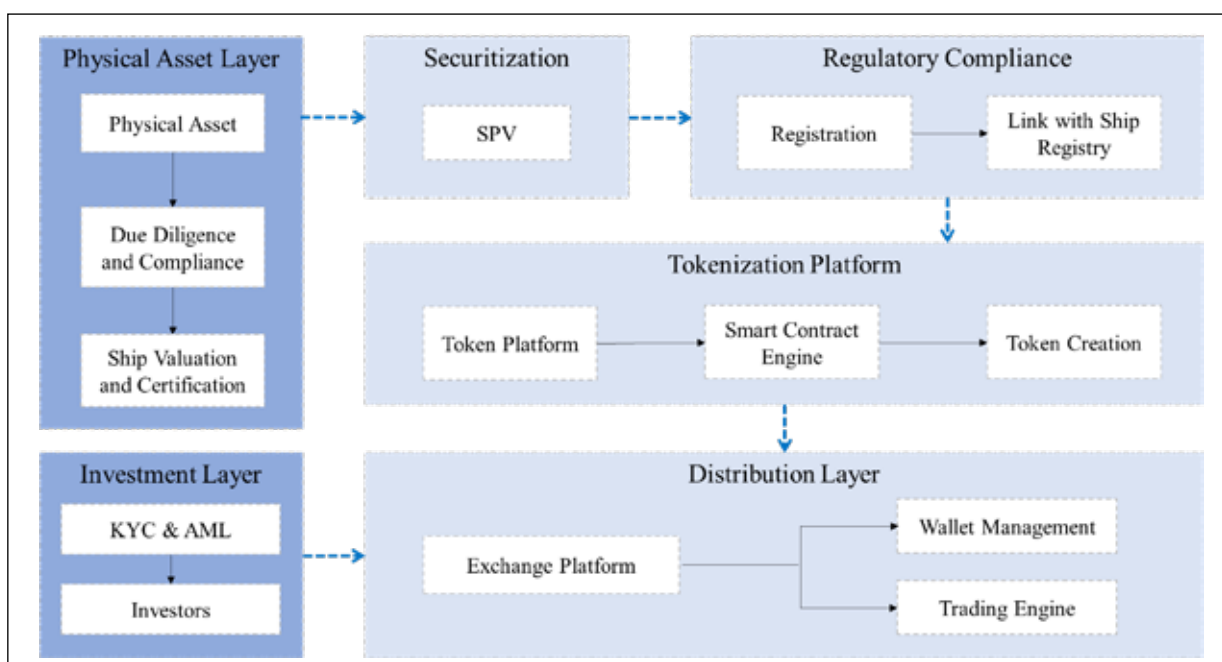
entity with clearly defined ownership details, rights, and obligations for all parties, ensuring legal compliance. This involves a comprehensive document developed in collaboration with legal experts to structure the investment entity. The document should be legally enforceable in the respective jurisdiction.

- » **Asset Value.** It is crucial to define how the underlying vessel is valued. This means determining the method or process used to assess its market value. Shipbrokers, class societies, and insurers help determine the ship's value, condition, and operating profile.

- **Securitization (Off-Chain):**

After identifying the vessel that is to be tokenized, the shipping company incorporates a Special Purpose Vehicle, which holds 100 per cent ownership and operational rights of that vessel. The SPV is the issuer of the tokens.<sup>14</sup>

**Figure 4: Ship's RWA Tokenization Architecture**



Source: Authors' compilation

- Regulatory Compliance (Off-Chain and On-Chain):
  - » Registration. The SPV must register with the recognized regulator/ authority overseeing the tokenization procedure as per the law in the respective jurisdiction.
  - » Link with the Ship Registry. The SPV must register with the ship registry to establish a legal connection between the physical asset (vessel) and its digital representation. Ship registries should be integrated with the blockchain DLT to mirror the details of tokenized ships, ensuring each tokenized vessel has a verifiable digital footprint linked to its official registry entry.
- Tokenization Platform (On-Chain):
  - » Token Platform. Establishment of a token platform, which is the core system responsible for managing the entire process of tokenizing assets. It provides the infrastructure for converting vessels into digital tokens on the blockchain, supported by DLT.
  - » Smart Contracts (Programmability). They are self-executing agreements whose terms are directly embedded in code. They record the day-to-day operations of the tokenized vessel and transactions impacting their value, automatically enforce and carry out the contract when predefined conditions are met (known as atomic settlement), removing the need for intermediaries. These contracts ensure that the asset behaves transparently, exactly as defined by the issuer and regulator, without human interference.
  - » Token Creation. It involves token configuration, done to set parameters, rights, and compliance rules; and token minting refers to the process when the token is created to represent asset ownership.
- Investment Layer(Off-Chain):
 

Selection of eligible investors, such as retail or institutional investors is carried out. The selection criteria must be clearly defined, and a thorough KYC and AML process is necessary to be conducted following the legal requirements set by the regulatory authorities.
- Distribution Layer (On-Chain):
  - » After token creation on the selected vessel and the implementation of smart contracts, investors undergo KYC and AML verification. Once on board, the token is listed on a blockchain-based trading platform, enabling seamless token trading.
  - » Exchange Platform. An exchange platform (or specialized investment platform) is created to list the tokens, acting as a gateway between issuers (those creating tokens) and investors/ traders (those transacting tokens).
  - » Wallet Management. Tokens are stored in regulated digital wallets that require cryptographic keys for access, to ensure that only the rightful owner can access and transfer tokens. Wallets can be custodial (managed by the platform) or non-custodial (controlled by the user).
  - » Trading Engine. The trading engine is the core system that matches buy and sell orders in real-time based on supply and demand dynamics.
- Post-trade Revenue Distribution (On-Chain):
 

The distribution of charter income or profits flows automatically to token holders through smart contracts. Any sale, mortgage, or title change in the real world is reflected digitally 'on-chain.' Ships' income stream could be derived in two ways:

  - » Intrinsic Value. A Ship, being a tangible asset, possesses an inherent value subject to depreciation over time.

However, its value can also appreciate if demand for that specific ship type rises, as ship supply is inelastic in the short term

- » Operational Income. Ships earn revenue through charterers and leasing, which depends upon the cargo capacity (ship size, bunkers, and stores), productivity (operational planning, backhauls, speed, DWT utilization, port time), and freight rates (market balance, quality of service).<sup>15</sup>
- Certain additional measures to ensure that tokenization is implemented successfully need attention<sup>16</sup>.
  - » Maintaining Custody of tokenized assets. Ensuring secure custody of tokenized vessels through government bodies or licensed entities, always to guarantee the presence of underlying assets;
  - » Taxation. Ensure all taxes as per the judicial jurisdiction are duly levied and recovered, including direct taxes, stamp duties, securities transaction tax, capital gains tax, or any other indirect taxes;
  - » Adoption in Financial System. Asset transfer enablement requires a clearing house and settlement, involving both the central bank and commercial bank money.
  - » Banking Framework. For seamless asset trading, a strong banking foundation is essential, with domestic digital or tokenized currency as the ideal baseline.

Therefore, representing ownership rights of physical maritime assets (Ships) on DLT through blockchain allows fractional ownership of a vessel by multiple token holders, liquidates a traditionally illiquid asset through easier and faster trading of tokens in the secondary market, and allows participation of retail investors with lower investment capacity

to own part of this highly capital-intensive asset, democratizing finance in a true sense. Automation of transactions through smart contracts eliminates counter party risk due to clear traceability and auditability. Further, investors are exposed only to the risks related to the specific ship whose tokens they own, rather than the entire shipping company. Their investment is affected by company-related risks only if those risks directly impact the tokenized ship. This structure not only hedges investors from idiosyncratic risks but also minimizes the impact of systematic risk by isolating it from unrelated factors affecting the broader shipping industry.

However, like any other financial model, tokenization can present various risks, like a lack of proper regulatory mechanisms can expose investors to cyber security risks and aggravate regulatory arbitrage due to non-compliance with anti-money laundering. When investors redeem their investments, the settlement asset in the form of central bank money must be available; interoperability among the traditional and digital platforms is a must for successful tokenization.

## Conclusion

Though tokenization is at a nascent stage, it has found use cases in sectors such as real estate, commodities, precious metals and even renewable energy assets across the world. Several jurisdictions like Luxembourg (Blockchain Law), Liechtenstein (Token and Trusted Technology Service Provider Act), the European Union (Markets in Crypto-Assets Regulation), and the UAE (Dubai's VARA<sup>17</sup> Act) have enacted laws to regulate blockchain technology in the Financial Sector.<sup>18</sup> India too, has recognized the concept of tokens. Virtual Digital Assets have found mention at Section 111 of the newly enacted Income Tax Act, 2025. In 2025, IFSCA rolled out Consultation Paper, "Regulatory Approach Towards Tokenization of Real-World Assets," seeking industry and

expert inputs on the pathway for introducing tokenization as a financial security and to recommend measures for the development of a digital asset ecosystem in GIFT IFSC<sup>19</sup>.

Tokenization is revolutionizing maritime investment by transforming traditionally illiquid and capital-intensive assets – such as cargo ships, ports, and carbon credits – into accessible, tradeable digital tokens. This innovation is unlocking new capital sources for fleet expansion, enhancing infrastructure development, and driving sustainability efforts through tokenized ESG investments. As adoption accelerates, maritime tokenization is poised to reshape the future of global shipping, democratizing access to one of the world's most essential industries while fostering financial efficiency and environmental responsibility.

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# **Part VI**

## **Transforming Blue Economy**



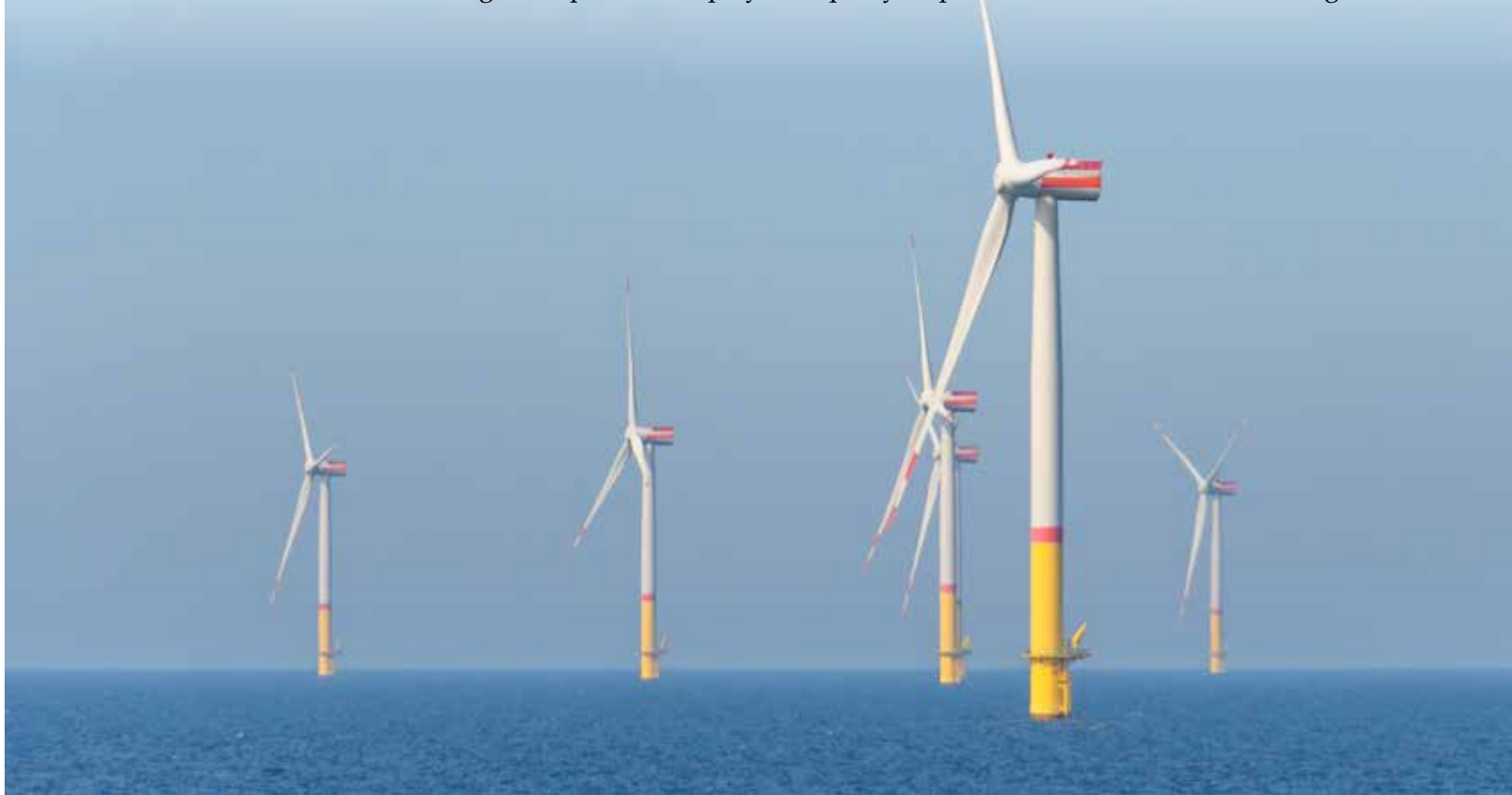




# Significance of Marine Renewable Energy in Blue Economy for India

Balaji Ramakrishnan

**R**enewable energy is considered a crucial driver for low-carbon growth and India's sustainable solution to issues related to electrification in off-grid locations. Taking advantages of vicinity, marine renewables can be explored for the coastal communities along East and West coast of India. In addition, Andaman and Lakshadweep islands that are dependent on fossil fuels for the electricity generation, can alternatively utilize the hybrid power from renewable sources. The total installed capacity of renewable energy in India is mainly dominated by solar and wind energy installations. Therefore, augmenting renewable energy sources with as many forms as possible is essential. Installations for off-grid requirements play an equally important role. With the increasing



power demand in the country, it is important to develop more renewable energy technologies, including marine/ocean energy.

Sustainable marine energy plays a vital role in economic development and climate adaptation. The relevance of blue energy initiatives lies in their ability to harness the vast and untapped energy resources of the world's oceans. This aligns with global efforts to transition towards more sustainable and environmentally friendly energy sources. Offshore regions have tremendous potential to provide renewable energy, such as offshore wind, waves, ocean currents, including tidal currents, salinity gradients, and ocean thermal energy, thereby contributing significantly to blue energy initiatives by the Government of India. India has a long coastline of more than 11,000 km with many estuaries and gulfs, and ocean/marine energy can be extracted for both grid and off-grid applications.

## Opportunities related to Harvesting Marine Energy in India

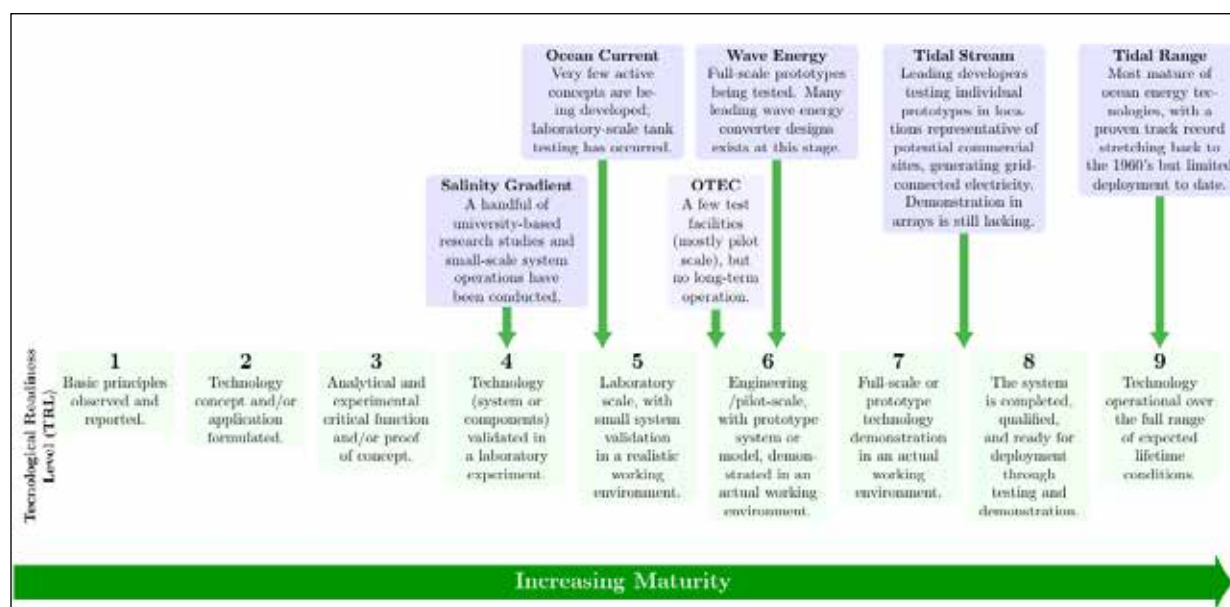
With the increasing global interest in clean

energies and the fast pace of technological developments in this sector, marine energy is expected to occupy a significant component in the global energy mix. Figure 1 shows the Technological Readiness Level (TRL) of different forms of marine energy as of 2014.

## Wave Energy

Waves are the sea surface undulations created by the transfer of energy from wind blowing over the seas. The energy from sea waves can be harnessed using various technologies. Worldwide, especially in Europe, several wave energy devices are operational, but commercialization is yet to take place. India's climate comprises a wide range of weather conditions across a vast geographic scale, resulting in large seasonal variations along its coast. Consequently, wave power is highly variable seasonally and spatially. Generally, wave potential is greatest during the southwest monsoon. The estimated potential of wave energy along India's coastline is 41,000 MW.<sup>1</sup> Small power wave energy converters (WECs) are associated with low power generation, such

**Figure 1: Technological Readiness Level (TRL) of Various Forms of Marine Energy**



Source: Ocean Energy (2014).

as the backward bent ducted buoy (BBDB), which requires efficiency improvements. These devices can power subsea sensors, data collection equipment, and subsea robotics. Large power WECs, on the other hand, should be integrated with breakwaters supporting ports and harbors for a cost-effective solution. These WECs can be connected to grid-scale systems, power desalination plants, share conventional electricity in ports and harbors, and support coastal communities.

## Hydrokinetic Energy in Ocean Currents

Ocean currents are driven by wind and solar heating of waters near the equator, although some currents result from variations in water density and salinity. While ocean currents are much slower compared to wind speeds, water is many-fold denser than wind. This means that the energy density in a smaller water flow can be equivalent to that in wind with extremely high velocity. Energy can be extracted from ocean currents using submerged turbines that capture energy from hydrodynamic lift and drag forces. Although India generally has low ocean current speeds along its coast, tidal streams offer significant potential for hydrokinetic energy conversion in Indian waters. The estimated potential in tidal streams along the Indian coastline is 12,455 MW.<sup>2</sup> Potential locations include the Gulf of Khambhat, Gulf of Kutch,<sup>3</sup> Palk-Bay-Mannar Channel, Sundarbans, and Andamans<sup>4</sup>. Energy extraction through current/tidal energy converters is particularly suitable for off-grid applications.

## Ocean Thermal Gradient

As a tropical country located near the equator, India experiences warm sea surface temperatures ranging from 28°C to 32°C. At presently exploitable depths around India, temperatures are found to be in the order of 4°C to 6°C, providing a temperature difference of greater than 20°C. This ocean thermal

gradient can be leveraged for energy generation through Ocean Thermal Energy Conversion (OTEC). Sea water temperatures are stable and prevail continuously throughout the year. The estimated potential for OTEC in India is 180,000 MW.<sup>5</sup> Additionally, Ocean Thermal Gradient can be utilized for desalinating seawater through Low-Temperature Thermal Desalination (LTTD), as implemented by the NIOT in the Lakshadweep Islands.

## Salinity Gradient

Salinity gradient energy is generated from the difference in salt concentration between two fluids, typically fresh and saltwater, such as when a river flows into the sea. Two technologies are being demonstrated, both using membranes. The compartments between the membranes are alternately filled with seawater and freshwater, and the salinity gradient difference drives the transport of ions, resulting in an electric potential that is then converted to electricity through a process called Reverse Electro dialysis (RED). Only a few plants are known to be operational. A laboratory-scale technology project using novel Pressure Retarded Osmosis (PRO) technology has been taken up by IIT Bombay.

A systematic approach to estimating potential of marine renewable energy in India was undertaken recently. India has been actively working on harnessing its marine renewable energy potential through various initiatives. Some of the key developments include

### (i) Study on Tidal and Wave Energy

As part of Memorandum of Understanding (MoU) between IREDA and MNRE, Government of India, CRISIL Risk & Infrastructure Solutions Limited in association with Indian Institute of Technology, Madras carried out a project titled "Study/ Survey & Preparation of Road Map on Tidal Energy Projects in India". This study aims to assess the potential and create a roadmap for tidal energy projects in India.<sup>6</sup>

## (ii) Integrated Ocean Energy Atlas

The Indian National Centre for Ocean Information Services (INCOIS) under MoES published an atlas showcasing India's vast ocean energy resources in the Indian Exclusive Economic Zone (EEZ) in 2024. The atlas, although mapped using theoretical estimates, identifies areas with high potential for energy generation and serves as a reference for policymakers, industry, and researchers.<sup>7</sup>

Ocean energy technologies are still under research and, in their present state, require further studies to achieve commercial viability, especially in the tropical regions. Ocean energy devices must be designed to withstand extreme weather and at the same time need to be designed to operate across a wide range of wave conditions, which means the structure, must be able to withstand a broad range of wave loads. Therefore, an optimal balance must be achieved among performance, survivability, and investment criteria. Guidelines for achieving this optimal design need to be established.

Ocean energy harvesting is particularly relevant to remote, off-grid coastal areas with limited or no electricity supply due to infrastructure constraints, as well as to islands that rely on diesel generators for electricity. Harnessing ocean energy could significantly contribute to the country's total installed power generation capacity. This sector has growth potential, which could fuel economic development, reduce carbon footprint, and create jobs both along the coast and inland along supply chains.

The current need is to develop technologies in India and acquire proven technologies to supplement existing renewable energy initiatives.

## Status of Marine Energy

The Ministry of Earth Sciences (MoES) under the Government of India has been funding

endeavors in marine energy. However, a formal countrywide policy is yet to be created. A roadmap with adequate funding is necessary to take activities to larger scales, from the research and development stages to demonstration stages.

The National Institute of Ocean Technology (NIOT) under the MoES, with a mandate to develop these technologies, has successfully crossed the laboratory stage, improving the understanding of complexities involved along the way. India's wave energy initiative led to the commissioning of a wave energy plant based on the principle of oscillating water column at Vizhinjam in 1991, developed by IIT Madras under funding from the Department of Ocean Development. This pilot plant, operated by NIOT, led to the first-ever wave-powered desalination plant in 2003. The wave energy plant was subsequently decommissioned after conducting numerous experiments.

NIOT has been working on a floating wave-powered device called the Backward Bent Ducted Buoy (BBDB). The BBDB was fitted with a unidirectional turbine and successfully generated power in the open sea off Ennore. The first phase of sea trials was conducted off Ennore port in 2011. The second and third phases of sea trials, with improved instrumentation and a resized new turbine, were conducted in 2014 and 2015, respectively, and led to successful power generation with significantly improved performance. Currently, work towards scaling up the turbine is in progress.

NIOT developed a wave-powered navigational buoy as a product for use in ports and harbors, conducting various laboratories, numerical and actual sea demonstrations. The buoy serves as a navigational aid and an observation buoy for ports/harbors or coastal regions.<sup>8</sup> This technology has been transferred to several industries. The buoy, developed by NIOT and funded by Kamarajar Port Ltd. (KPL), Chennai, is currently operational as a fairway

**Figure 2: Wave Energy Plant at Vizhinjam**



Source: NIOT archives

buoy off KPL, providing useful in-situ data on an hourly basis through GSM/GPRS-based communication and a specially designed mobile application to KPL authorities. The product has enhanced IoT-enabled real-time assessment of oceanographic parameters, in addition to serving as a fairway buoy. Various ports in India have shown keen interests in implementing NIOT's wave-powered navigational buoy at their premises. NIOT has also been working on harnessing electrical energy from ocean currents. The team has developed a small

**Figure 3: Wave-powered Navigational Buoy**



ocean current turbine for harnessing kinetic energy from seawater bidirectional currents, such as those found in tidal streams. Extensive numerical studies, laboratory tests, and open-channel tests were carried out on this turbine, and subsequently, a small turbine was successfully tested in Macpherson Strait in Andaman in 2016. All the sub-components were indigenously designed and fabricated locally. These low-speed turbines require low-speed alternators, which were developed in-house. The open-sea testing has paved the way for

**Figure 4: Current Turbine Testing in Andaman**



Source: NIOT archives

**Figure 5: OTEC-Desalination Lab at NIOT**



scaling up for off-grid units for remote coastal locations<sup>9</sup> The forest outposts in Andaman have a requirement for small off-grid power modules of less than 5 kW capacities, and a turbine of this size is currently under development for deployment at Andaman.

NIOT attempted to establish a barge-mounted 1 MW OTEC plant in 1000 m water depth, approximately 40 km off Tuticorin, in the year 2000. As part of the commissioning activities, various subsystem qualification tests were carried out onshore and in shallow waters. Finally, the 1000 m long pipe with a 1 m diameter was towed 40 km to the desired site. However, the final commissioning could not be completed due to the operational challenges.

Later, the same barge was used for mounting 1 MLD desalination equipment, and fresh water was first generated in shallow waters using a long 1 m diameter HDPE pipe. NIOT has been extensively working on desalination using ocean thermal gradients. The surface water from the sea, with a temperature of 28-31°C, is allowed to pass through a low-pressure flash chamber, where it is flash-evaporated, and the generated vapor is condensed by cold seawater, producing drinking-quality water. This process is called Low Temperature Thermal Desalination (LTTD).

A plant based on the LTTD technique, with a capacity of 100 m<sup>3</sup>/day, was successfully demonstrated on Kavaratti Island in the Lakshadweep union territory in 2005. The plant has become the main source of drinking water for Kavaratti and has reportedly reduced the incidence of waterborne diseases, improving the standard of living and health of the islanders. The success of the desalination plant at Kavaratti led to the commissioning of several LTTD plants in subsequent years, based on requests from the union territory of Lakshadweep.

Furthermore, the LTTD technology was utilized for generating fresh water from waste

heat from coastal thermal power plants, and a pilot project was successfully demonstrated at the North Chennai Thermal Power Station using their condenser reject water.<sup>10</sup>

Further towards scaling up the technology for mainland requirements, NIOT also commissioned and demonstrated an experimental floating barge-mounted LTTD plant off the Chennai coast with a capacity of 1 MLD. The long 1 m diameter HDPE pipe successfully pumped cold water for several weeks during the performance trials. The success of the 1 MLD floating barge off the Chennai coast encouraged the idea of scaling up to a 10 MLD capacity offshore desalination plant for mainland water requirements. This project was undertaken with an industrial partner, and a complete design for a 10 MLD offshore thermal desalination plant has been successfully completed.

Currently, majority of Andaman and Lakshadweep islands are powered by diesel generator sets, and the diesel required to run these sets is shipped from the mainland, leading to a high cost of generation and may potentially affect the fragile eco-system. Using the OTEC cycle for powering the desalination plant is the most suitable and reliable alternative that utilizes an environmentally friendly energy resource, thus reducing the carbon footprint and diesel usage for islands. It also improves the commercial viability of thermal desalination.

Although desalination is actually an offshoot of the OTEC cycle, the current focus is on powering the desalination plant using OTEC, since large OTEC power with grid connectivity is not feasible at this juncture. The design of a 100 m<sup>3</sup>/day capacity OTEC-powered LTTD plant was completed for a challenging project at Kavaratti Island in the union territory of Lakshadweep, where the plant will generate enough power to meet the requirements of the desalination plant. Work towards the installation of this plant is currently in progress.

NIOT has continued R&D on various components, such as turbines and heat exchangers, of closed and open-cycle OTEC systems. These efforts have resulted in the establishment of an OTEC-Desalination Test Facility, where further research can be carried out on different system configurations and component designs.

## Recent Strategies by Government of India

India has become a member of the Ocean Energy Systems Technology Collaboration Programme (OES-TCP), an intergovernmental collaboration between countries. OES operates under the framework established by the International Energy Agency (IEA). This involvement can facilitate collaborative efforts between Indian researchers and researchers from other member countries.

Recently, a national committee on Marine Energy Conversion Systems (ETD-54) of the Bureau of Indian Standards (BIS) was constituted to formulate standards for the development of ocean energy in India. As part Deep Ocean Mission funded by the MoES, a detailed project report for a 10 MW closed-cycle OTEC and a 5 MLD capacity open-cycle OTEC-powered desalination plant has been commenced. A new demonstration project towards generating energy and freshwater on a floating platform in the deep sea utilizing thermal gradient will also be carried out by NIOT.

## Conclusions

With ever depleting fossil fuels and commitment towards investing in renewables, ocean energy offers a promising solution, especially for island communities. The development and demonstration activities related to marine energy technology by NIOT are focused on

exploring the potential of renewable energy resources that can be harnessed from the vast oceans.

There are several possibilities for generating electricity from OTEC as a renewable energy resource in India, which has a tropical climate and sufficient availability of ocean thermal gradients. Wave, current, and salinity gradient resources offer a unique opportunity for sustainable energy generation along the Indian coast. These are best suited for off-grid applications in remote locations and islands.

While there are still challenges and opportunities related to ocean energy development in India, NIOT's efforts in this area are promising. The Government of India's efforts in recognizing and supporting marine energy development are encouraging, as seen from the recent strategies formulated by MoES, MNRE, BIS, etc. Furthermore, marine energy finds significant mention in the Blue Economy policy laid by the Government of India.

India's blue economy policy aligns well with its Net-Zero commitments, and blue energy generation is one of its essential components.

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- <sup>7</sup> Refer, INCOIS (2024)
- <sup>8</sup> Refer, Pattanaik et al. (2020)
- <sup>9</sup> Refer, Dudhgaonkar et al. (2017)
- <sup>10</sup> Refer, Venkatesan et al. (2014), Phanikumar et al. (2009)

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# Blue Finance: Prospects and Opportunities

Priyadarshi Dash

Financing, undoubtedly a critical pillar of development strategy, continues to remain a task unfinished. From the heydays of public sector-led development models adopted in most parts of the world during the 1950s through the 1970s to an era of market economy beginning with the mid-1990s, the complexity of mobilizing finance and finding suitable, innovative and scalable sources and tools of funding have received the maximum attention of the policy makers. In this perspective, the shortfall in development finance especially in the developing countries and least developed countries has become more of a routine task to be addressed by the countries. In fact, the financing gap is growing over time worldwide across different sectors including infrastructure, energy transition, climate action, among others. Besides overall emphasis on role, scope and efficiency of development finance in general, specific verticals within development finance such as green finance, sustainable finance, energy finance, infrastructure finance and others have assumed focus with an aim to attract targeted investments



into specific activities under those verticals, ensure optimum end-use, efficiency in resource mobilization, and for timely monitoring of progress and inputs for appraisal and possible reforms in the subsequent stages. Blue finance is an organic evolution of the financing framework in line with the principles of green finance and sustainable finance.

## Scope of Blue Finance

Blue finance is essentially a conscious drive towards meeting the Sustainable Development Goals (SDGs) particularly SDG 14 (Life below Water) and SDG 6 (Clean Water and Sanitation). In terms of coverage, the blue finance domain broadly includes ocean sustainability, marine conservation, coastal resilience, all water bodies like rivers, lakes, etc. The rationale for 'blue finance' as a dedicated window of financing lies in the very treatment that the ocean/marine sectors received in the race to attain high economic growth. Most economies of the world have pursued an extractive model of economic development since the 1990s, followed by globalization which led to greater thrust on expanding trade, investment and integration with global value chains (GVCs). Marine sectors contributed enormously to socio-economic development in this phase of economic expansion and diversification beyond national boundaries.

While higher production and trade inspired governments worldwide to divert investments to productive sectors including marine sectors, sustainability assumed a back seat. Although awareness about climate change and the roadmap for climate action was recognized early in the 2000s, the severity of ocean sustainability issues like marine pollution, marine plastics, erosion of coastal reefs, overfishing, etc. that cause serious harm to marine ecosystem and ecological balance perhaps received relatively less attention. As a consequence, ocean sectors were considered as part of the overall sustainability and climate

action like other sectors, which reflected in approaches towards financing as well. Since oceans constitute two-third of earth and provide food and employment to billions of people across the world, timely recognition of 'blue finance' initiatives is a novel policy step towards sustainability and SDGs.

In technical terms, the sources and instruments of blue finance are not very different from conventional financing. Labeling it blue finance puts onus on the sectors and activities targeted by blue investments, directing funds for the desired end-use, enhancing availability of data and metrics for proper monitoring and appraisal, and addressing the core issue of optimizing existing sources of financing. Table 1 presents the varieties of instruments that are typically employed in blue finance. Essentially, it covers a basket of market-based financial assets, models of public-private partnership (PPPs), risk management tools and packaging of incentives. IFC (2025) highlights the sectors that are eligible for blue finance; hence setting measurable goals and targets for tangible outcomes. Those sectors include (i) sustainable water and wastewater management, (ii) ocean-friendly products, marine biotechnology and chemicals (including circular economy adapted products), (iii) transport and shipping, (iv) fisheries and aquaculture, (v) habitat restoration and protection of coastal, marine and watershed environments, and (vi) tourism and recreation. The larger universe of blue economy, its measurement and policy dimensions are comprehensively captured in Mohanty, Dash, Gupta and Gaur (2015). In its paper on 'Guidelines for Blue Finance Version 2.0', IFC has identified impact indicators for the above-mentioned sectors for appraisal of blue finance projects.

In terms of sources, blue finance ideally covers traditional as well as innovative sources of funding. Traditional sources comprising public investments, funding by Multilateral Development Banks (MDBs), dedicated national

climate finance/blue finance funds, etc. would continue to be major sources of blue finance. In fact, public investments would be critical for crowding-in private investment, which is desirable for the countries with less-matured or underdeveloped financial sectors. Capital market-based instruments like bonds, securities, etc. can help tap fixed-income markets and attract institutional investors like pension funds, insurance companies, and so on. On the other hand, innovative financing involves several features, which are not necessarily defined from the rigid prisms of public and private investments rather a combination of parameters and features of both that work effectively for the purpose it is meant for. The innovative financing instruments target efficient blending of risks and returns added with guarantee, credit enhancement, risk mitigation, first-loss guarantee, and other novel features.

Blue finance puts heavy emphasis on sustainability and resilience. Since ocean resources and marine ecosystems have public good characteristics, investments in those segments correspond to the societal and ecological benefits at large. Blue finance in practice refers to the Green Bond Principles

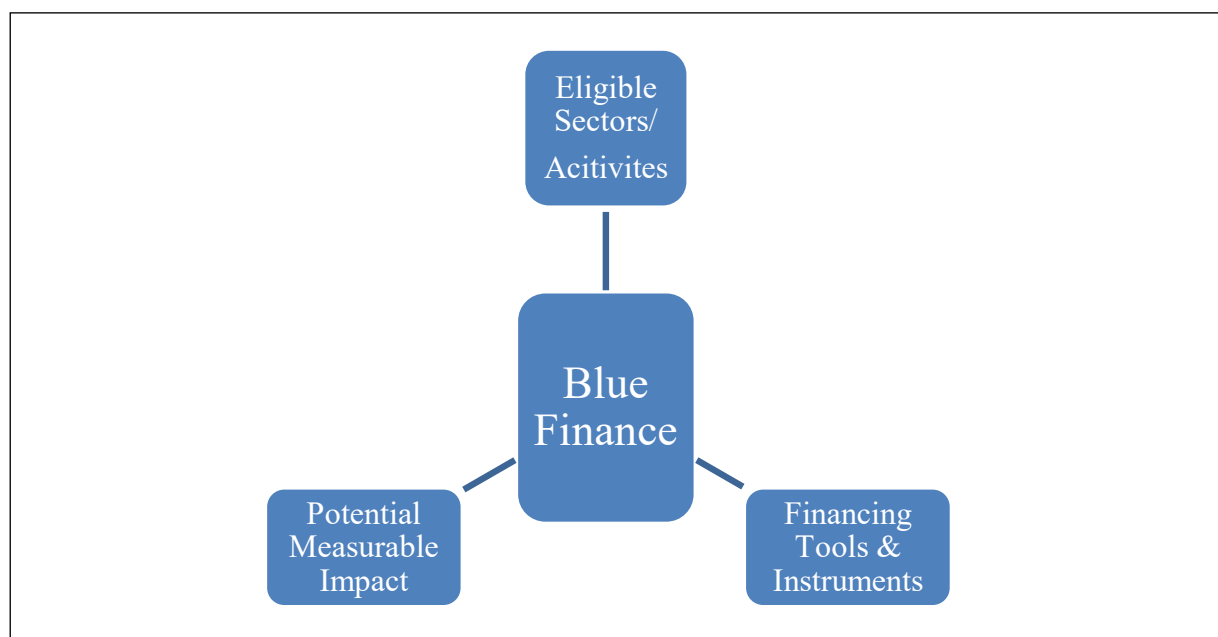
(GBPs) and the Green Loan Principles (GLPs) (IFC, 2025). Figure 1 captures the core conceptual and design characteristics of blue finance implemented by the World Bank and other agencies.

Viewing blue finance as a subset of climate finance and sustainable finance suggests huge financing requirements in the coming years. More activity in oceans and waters amplify investment requirements in the sector; most of which are either unrealized or unknown. Various estimates of financing gaps exist for sustainable finance which provide a basis for conception, design and execution of blue finance projects. As per the estimate by UNDP-UNEP-ADB (2022) for the Asia-Pacific region, blue finance gaps (measured in terms of investment required to meet SDGs by 2030) are to the tune of US\$ 2.3 trillion for South Asia, US\$ 2.1 trillion for Southeast Asia and US\$ 1.1 trillion for the Pacific. As far as various sectors and sub-sectors are concerned, the magnitude of financing gaps is relatively large for resilient ports, marine offshore wind renewable energy, non-point source pollution management, solid waste management, wastewater management, resource efficiency and circular economy,

**Table 1: Blue Finance Instruments**

| Categories of Instruments                                                                                                                                              |                                                                                                                                                                                         |                                                                                                     |                                                                                                               |                                                                                                                      |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|
| Thematic Bonds                                                                                                                                                         | Outcome-Based Finance                                                                                                                                                                   | Risk Mitigation Tools                                                                               | Dedicated Funds & Facilities                                                                                  | Fiscal & Economic Incentives                                                                                         |
| <ul style="list-style-type: none"> <li>• Green bond</li> <li>• Social bond</li> <li>• Blue bonds (sovereigns, Development Finance Institutions, corporates)</li> </ul> | <ul style="list-style-type: none"> <li>• Blue carbon credits</li> <li>• Sustainability-linked loans/bonds</li> <li>• Outcome bonds</li> <li>• Payment for ecosystem services</li> </ul> | <ul style="list-style-type: none"> <li>• Guarantee</li> <li>• Insurance catastrophe bond</li> </ul> | <ul style="list-style-type: none"> <li>• Blended finance</li> <li>• PPPs</li> <li>• Revolving fund</li> </ul> | <ul style="list-style-type: none"> <li>• Taxes</li> <li>• Fees</li> <li>• Subsidies</li> <li>• Debt swaps</li> </ul> |

Source: Adapted from PROBLUE ad The World Bank (2025).

**Figure 1: Guideposts for Blue Finance**

Source: Drawn by the author.

among others (Table 2). These estimates for Asia indicate the extent of financing gaps that other regions of the world might be grappling with.

### Leveraging on Innovative Financing

It is now common knowledge that the nature and scope of climate finance and blue finance needs to change from a pure public investment-dependent model to public investment-driven and/or private investment-led financing models. This paradigm shift entails greater use of the whole range of innovative financing sources, instruments and mechanisms by the sovereigns, MDBs and financial markets across various blue economy sectors. While Table 1 presents all different categories of blue finance instruments, it is imperative to harness the potential of some of those instruments keeping in mind the inter-linkages shown in Figure 1.

### Blue Bonds

Like green bonds, sustainable bonds and similar categories of financial assets, blue bonds could be promising asset categories for mobilizing blue finance. Issuance of blue bonds

by individual countries, MDBs, banks and other entities generally follow the prescribed guidelines and adhere to standards developed by relevant international regulatory bodies. Compliance and certification norms like the ADB Green and Blue Bond Framework, Climate Bonds Initiative, UNEP Sustainable Blue Economy Finance Principles, IFC Guidelines for Blue Finance, the Green Bond Principles, Green Loan Principles, Sustainability-Linked Bond Principles (SLBPs), and/or Sustainability-Linked Loan Principles (SLLPs) are widely referred. In line with sustainable finance, blue economy taxonomies need to be developed along with adequate market-making and issuance safeguards. Forward-looking regulatory reforms may be voluntarily undertaken by the emerging markets and developing countries in order to promote blue bonds as a viable investment class.

### Debt-for-Nature/Development Swaps

The challenge of financing often gets exacerbated for countries facing high debt service burden, low fiscal space and shallow revenue base. Such

**Table 2: Estimates of Blue Finance Gaps in Asia and the Pacific  
(Investments Needed by 20230 to Meet SDGs)**

(US\$ million)

| Themes                                     | Segments                                        | Pacific          | Southeast Asia   | South Asia       |
|--------------------------------------------|-------------------------------------------------|------------------|------------------|------------------|
| Ecosystem and Natural Resource Management  | Marine and river ecosystems                     | 121              | 44               | 51               |
|                                            | Fishing                                         | 22               | 200              | 2,001            |
|                                            | Fisheries                                       | 14               | -27              | 28               |
|                                            | Seafood processing and distributions            | 930              | 4,775            | 3,429            |
|                                            | Aquaculture & algaculture                       | 1,001            | 9,782            | 9,843            |
| Pollution Control                          | Solid waste management                          | 80,500           | 145,000          | 47,400           |
|                                            | Resource efficiency and circular economy        | 9,000            | 58,600           | 69,900           |
|                                            | Non-point source pollution management           | 26,300           | 87,100           | 463,800          |
|                                            | Wastewater management                           | 13,900           | 97,000           | 150,400          |
| Sustainable Coastal and Marine Development | Coastal and marine tourism                      | 1,776            | 1,396            | 773              |
|                                            | Coastal resilience                              | 1,700            | 3,600            | 6,340            |
|                                            | Resilient ports                                 | 881,000          | 1,510,000        | 1,280,000        |
|                                            | Green ports                                     | 8,858            | 63,641           | 22,086           |
|                                            | Green shipping                                  | 2,171            | 5,649            | 5,532            |
|                                            | Marine offshore wind renewable energy           | 25,200           | 151,800          | 235,900          |
|                                            | Marine tidal, wave, geothermal renewable energy | 100              | 500              | 800              |
| <b>Total</b>                               |                                                 | <b>1,052,593</b> | <b>2,139,060</b> | <b>2,298,283</b> |

Source: Adapted from UNDP-UNEP-ADB (2022).

circumstances coupled with low sovereign credit ratings (which is very often the case) restrict access to international finance; hence leaving the financing gaps unaddressed. Many developing countries and small economies are currently locked in similar situations mostly after the COVID-19 pandemic and volatile geopolitical environment following the Russia-Ukraine conflict and the war in the Middle East. 'Debt-for-nature' swaps are viewed as a solution to this resource logjam

in the debt-affected economies. These swaps typically involve no repayment of debt but a proportionate commitment by affected countries towards climate action at home. Countries like Seychelles, Belize and others have tried with debt-for-nature swaps. By preventing leakage of domestic financial resources in the form of principal and interest repayments, this type of swaps incentivizes countries to pursue climate action seriously (Nair *et al.*, 2024).

Although the debt-for-nature swaps appear to be meant for debt-affected economies, debate is ongoing on scaling up the novelty of this instrument to wider development finance spectrums. Building on the existing work, Nair *et al.* (2025) provide a strong rationale for adoption of 'debt-for-development' swaps as an instrument to support inclusive and sustainable development in the developing world at large. Besides its immediate utility and efficacy for the debt-affected countries, this variety of swaps can be viewed as an all-weather financing instrument for blue finance in many coastal economies. From the perspective of coastal resilience, Dash *et al.* (2022) argue for embedding 'resilience' up front in the urban infrastructure planning process itself. Discussing the vulnerabilities of coastal cities in the form of marine plastics, coastal erosion, destruction of coral reefs, contamination of sea water due to industrial effluents, etc; the planning for new cities should take cognizance of environmental sustainability, ecological balance and disaster resilience within the urban planning horizon which at present heavily obsessed with engineering and physical design parameters. These perspectives fit well within the comprehensive frameworks for blue finance which are already in practice in different parts of the world.

### Blended Finance

Unlike standard Public-Private Partnership (PPP) models that are observed to have mixed outcomes, blended finance models are widely advocated by different stakeholders across the world. Barring OECD, the World Bank and other MDBs, the merits and effectiveness of blended finance has been underlined at multilateral forums like G20 and BRICS. Blended finance refers to a type of PPP model in which public investment catalyzes private investments. It helps unleash private commercial capital for wider development projects. In times of falling Official Development Assistance (ODA), the need for attracting private capital is key.

Since private investors show reluctance to conventional development projects, blended finance with added features like provision of concessional loans, first-loss guarantee, risk mitigation, credit enhancement, etc. can help de-risk large marine projects and ensure meeting the targets of blue finance.

### Incentivizing Industry Participation

Ocean-based and marine industries are crucial players for development of sustainable blue economy. The contribution of the blue economy to national and global GDP has been immense in recent years suggesting the need for proactive measures to promote research, innovation and investments in critical industrial sectors of the blue economy. The major blue industries such as fish processing, marine engineering, marine instrumentation, marine biotechnology, ocean energy, marine ICT, shipping, coastal tourism, etc need scaling up of commercial investments. Along with commercial investments blue finance could help adopt climate-friendly production technologies, encourage sustainable production and consumption (SCP) practices by firms and households, and promote to Environmental, Social and Governance (ESG) and sustainability standards in vogue. Blue finance practitioners should adequately factor ideas and experiences of blue firms in design and implementation of blue finance.

### Conclusion

Blue finance is a holistic approach towards meeting SDGs and promoting sustainability in marine sectors. As a dedicated vertical of development finance, blue finance possesses immense potential to support the emerging industrial and services sectors of blue economy in the coastal nations across the world. In addition, by promoting a healthy marine ecosystem and ocean sustainability, blue finance contributes to global public goods. With a pipeline of targeted investments in identified marine sectors, effective integration of blue finance principles and practices into

national development finance strategies can bring transformative changes in policy orientation, quantum and quality of funding, and governance structure for the ocean/marine sectors. Regional and multilateral forums like BIMSTEC, IORA, ASEAN, COMESA, SACU and others that view blue economy as priority sectors of cooperation can undertake necessary measures to spread awareness, help scaling up and encourage replication of best practices in blue finance, which, in turn, will help achieve SDG 6 and SDG 14 targets.

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# **Part VII**

## **Cruise Tourism Opportunities**







# Cruise Tourism in Indian Blue Economy

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Dharmesh Raval

Cruise tourism is an important constituent of the global blue economy and a unique pillar of global tourism industry. Cruise tourism is gaining popularity and acceptance with industry players and/or service providers and locations being added in different parts of the world. Although originated in mid-20<sup>th</sup> century, notable academic research highlighted from early 1990s along with the sector gaining gradual economic recognition (Meng, 2023). In 2024, more than 34 million ocean going cruise passengers sailed globally, which is a 9 per cent annual increase as compared to the year 2023. According to



the 2024 Global Market Report, published by the Cruise Lines International Association, cruise tourism occupies a meagre 3 per cent share of the global market of tourism, reflecting the limited reach of the industry. Cruise tourism industry is concentrated in North America with more than 50 per cent of global passengers. With regard to cruise locations, Caribbean region is the most visited destinations, followed by other destinations like Europe, Alaska, Eastern Canada, etc. Cruise tourism got severely impacted due to the COVID-19, but, the growth in last two years - 55 per cent in 2023 and 9 per cent in 2024 - is indicating optimism and positive outlook of this industry (CLIA, 2024). Post-pandemic, leisure travel has shown steady growth, especially among higher and middle income groups. This has been made possible by increased disposable income of middle class, increase in retiree wealth and opening of some unique waterways like polar route (Mordor Intelligence, 2025).

## Cruise Tourism and Economic Impact

Globally, cruise tourism has witnessed higher economic gains as compared to other forms of tourism industry. However, on the contrary, it has received lesser recognition and boost. Any country will like to have flourishing cruise tourism since it can create double impact on the economy. Even though it has several non-economic advantages, the economic advantages are large enough to get identified as a priority area of focus. Cruise tourism aids businesses related to ship building, shipping services, shipping related services, port and port related services, crew related services, thereby making the cruise tourism special. Cruise tourism contributes to regional economic development and generates income for supporting industries. It promotes tourism places, where the tourists

visit, by way of hospitality, purchase of consumables and services from local suppliers and related services (Sun *et al.*, 2019). So, on one hand, cruise tourism provides a boost to shipping related businesses, whereas, on the other hand, it promotes other services (Chua, 2015; Brida and Zapata, 2010).

Cruise tourism has gradually become an affordable service for general public, which otherwise was a luxury. This shift, caused by competition and innovation, has helped cruise got introduced as adventure tourism, cultural tourism and family tourism (Wondirad, 2019). North America is remained as a mature market in early 2000 with ever increasing count of passengers (Siriwardena, 2017). The global market size for cruise industry is valued approximately between US\$ 5 to 9 billion in 2025, with a projection to grow with a CAGR of 5.67 per cent to 11 per cent by 2030 (Precedence Research, 2025).

India has shown keen interest in this sector in recent past. As per an estimate, more than 450,000 cruise passengers travelled during the year 2023-24. The vision to reach one million cruise passengers by 2029 and five million by 2047 is certainly ambitious, but not unrealistic. With approximately 500 cruise calls per year, India has taken a big leap of five times in last 10 years. If the current domestic market size is close to US\$ 150 million, it can certainly double in coming five years with a CAGR of 15 per cent (Maritime Gateway, 2025).

Cruise tourism possesses high potential in terms of economic impact with a positive spillover effect on hospitality, transportation and other related sector. As of now cruise tourism is highly concentrated in few countries in terms of cruise tourism destination and passenger volume.

**Table 1: Volume of Passengers to Destinations for the Year 2024 (in '000)**

| Destination                   | Passengers (K) |
|-------------------------------|----------------|
| Caribbean-Bahamas-Bermuda     | 14,973         |
| Central Western Mediterranean | 3,900          |
| Asia and China                | 2,599          |
| Northern Europe               | 2,176          |
| Eastern Mediterranean         | 1,855          |
| Alaska                        | 1,713          |
| Australia-NZ-Pacific          | 1,326          |
| NA West Coast/Mexico          | 1,334          |
| Panama Canal/South America    | 1049           |
| Canary Islands                | 627            |
| Africa Middle East            | 516            |
| Transatlantic & World Cruise  | 421            |
| Exploration Destination       | 386            |
| Canada                        | 316            |
| Hawaii                        | 241            |
| Baltics                       | 237            |

Source: CLIA, 2024

**Table 2: Passenger Volume Source Country (Leading Countries) (in '000)**

| Country/Region | Passengers (K) |
|----------------|----------------|
| United States  | 19,122         |
| Germany        | 2,574          |
| UK/Ireland     | 2,400          |
| Australia      | 1,324          |
| Canada         | 1,183          |
| Italy          | 1,148          |
| Mainland China | 931            |
| Brazil         | 776            |
| Spain          | 610            |
| Singapore      | 576            |
| France         | 573            |
| India          | 308            |

Source: CLIA, 2024

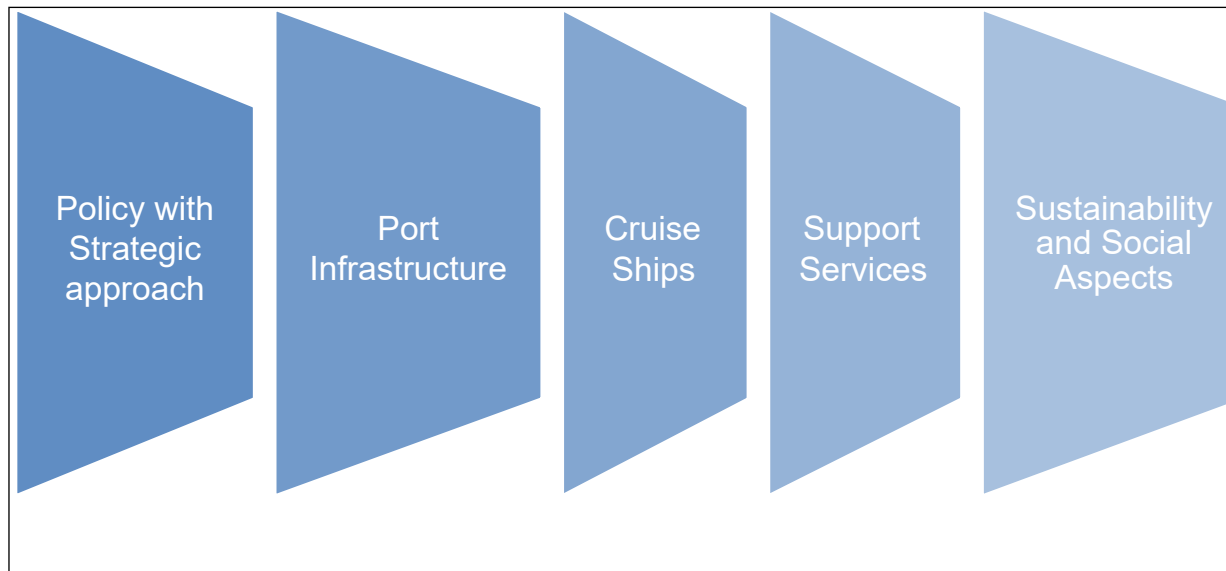
It is evident through above statistics, that cruise tourism is driven by popular/unique/appealing destinations and this type of tourism is not popular equally in the world, owing to several reasons. Hence the growth of cruise tourism will be driven by how countries focus on the developing and marketing destinations along with the enabling tourists from larger part of world to participate as tourists.

## India and Cruise Tourism Enablers

As one of the fastest growing economies, India story is unique in more than one way. Maritime sector opens a plethora of opportunities to the country under the umbrella of Blue Economy. Cruise tourism is relatively new entrant, but with the focus of policy and industry on river tourism, there are enough reasons to bet big on this sector. What are the key areas to focus on and what are the challenges?

## Policy with Strategic Approach

Every sector requires strategic approach, which is capable to achieve long term goals. With regard to cruise tourism a well-structured approach including target destinations, route selection and appropriate theme makes all the difference in the efforts (Figure 1). In India, Inland Waterways Authority of India (IWAI) is the nodal agency for developing and regulating National Waterways in India. The Authority is planning to develop 51 new river cruise circuits on 47 national waterways by 2027 across 14 states and 3 union territories. The Prime Minister of India has given a vivid vision to promote river cruise tourism and developing sustainable water transports system in India. Based on the vision of the Prime Minister, Ministry of Ports, Shipping and Waterways (MoPSW) launched the *Cruise Bharat Mission* in September 2024, aiming to project India into the league of top cruise tourism nations, with a tenfold increase in sea cruise traffic by 2029. The mission aims to increase the river cruise passengers from 0.5 million to 1.5 million. This mission will be achieved through development

**Figure 1: Policy with Strategic Approach**

*Source:* Author's own

of cruise terminals, related port infrastructure, promoting eco-friendly tourism practices, use of green vessels and creating employment opportunities. The success of the *MV Ganga Vilas* – the world's longest river cruise – has established the potential of long-distance inland cruising in India. With the success of this route the strategy of promoting cruise tourism in the lines of spiritual, cultural and scenic appeal is validated and it will be made deeper and stronger by offering more cruise destination on these themes.

### Port Infrastructure

Governments across the world have realized their role as provider of maritime infrastructure and the importance of such infrastructure in development of shipping and other port related activities. Port infrastructure for cruise tourism is a specific infrastructure requirement distinct from cargo handling facilities. Appropriate and adequate port infrastructure for cruise ships is a precondition for cruise tourism to flourish as it can facilitate and provide convenience to cruise tourists along with facilitating and encouraging private players to venture in this sector.

Port infrastructure for cargo movement is relatively robust in India and is being developed gradually in lines with the increasing cargo traffic. Handling passenger traffic requires special type of infrastructure, which is different from cargo handling facilities. Special facilities for receiving and waiting facility areas for domestic and international passengers, round the clock navigation facilities for better utilization of ports, and seamless connectivity with applicable hinterland for tourism purpose requires special planning and development of infrastructure. Dedicated cruise terminals are already being developed on the Ganga and Brahmaputra rivers with cruise terminals planned in Varanasi, Guwahati, Kolkata and Patna. In the North East Region of India, cruise terminals are proposed at Silghat, Biwanath Ghat, Neamati and Guijan (Indiaseatrade, 2025).

### Cruise Ships Availability and Building

To promote cruise tourism in India, it is important to be self-reliant with regard to the cruise ships. Over a long period of time, ship building (cruise) for tourism if built in India, will lead to a new opportunity under the Make

in India, which will open new opportunities for employment and other ancillary facilities. As a country, India has developed some self-sustenance in naval and defence shipbuilding. But, commercial ships and especially cruise shipbuilding is still in nascent stage in India. The policy initiatives such as 'Shipbuilding Financial Assistance Scheme', 'Shipbuilding Development Scheme' and the 'Maritime Development Fund' are relatively recent initiatives, and, hence, it will take some time before such initiatives start giving results. Hooghly Cochin Shipyard at Kolkata is building ships for cruise tourism in India. One of the ships is named Viking Brahmaputra (Indiasseatrade, 2025), and, several others as Indian cruise tourism operators, such as Heritage River Journey Private Limited, operating as Antara River Cruises (Business Standard, 2025).

## Support Services

Growth of cruise tourism in India will depend upon key support services including passenger facilities on port and helping them connect with key tourist locations. Foreign passengers will require customs and other immigration services along with banking and other important services, making their stay comfortable inside Indian destinations. Tourism in India is a developed sector, but customized services for cruise tourists needs to be identified and developed.

## Environmental and Social Considerations

On account of several reasons that the global cruise travel is increasing, no business today can afford to underestimate the environmental and sustainability aspect. Cruise Lines International Association (CLIA) is a community of cruise services providers, including ocean, river and specialty cruises. This association released the Global Cruise Industry Environmental Technologies and Practices Report in the year

2023, highlighting the sustainability initiatives. According to this Report, there were 44 new cruise ships on order books, out of which 25 ships were LNG-powered ships, and 7 ships will be either methanol-ready or methanol-capable, and all of these are sustainable form of marine fuels. It is important to address the societal aspects. For example, tourism in Arctic region may impact the livelihood of original habitat of the Arctic. Social obligation is an equally important for sustainability consideration.

As observed in case of cargo ships, the size of cruise ships is also rising, thereby expanding the capacity to accommodate more passengers/ tourists in every voyage. This not only provides higher economies of scale for the operator but also helps in reducing the costs for the passengers, thereby making cruise voyages more affordable, and, hence, more popular.

Among all cruise voyages, ocean voyages are more than 70 per cent, and the fastest growing segment is polar route, growing at 10 per cent CAGR (Mordor Intelligence, 2025). Unique and rare voyages have given a big thrust to the cruise tourism. Tourist voyages in the European part of the Arctic have been conducted since the middle of the 19th century. The phenomenon of "last chance tourism" premised on disappearing Arctic nature has become a popular trend in several Arctic destinations (Lemelin et al., 2010)

## Cruise Tourism Hospitality Training: Prospects of Job Creation

Cruise industry provides several employment avenues including ship building, cruise operations, cruise port operations, marketing and managing cruise passengers. Also needed are accommodation of passengers on tourist spots, arranging shopping and other tourist-friendly activities for the passengers. Cruise operation tasks such as accommodation, dining, entertainment, restaurant, shore excursions, photography, etc. require several types of jobs, and special training and exposures.

The workforce for a cruise is different from the crew in cargo ship. For an international cruise, approximately 1500 to 2000 crew members are required for different functions. Similar to cargo vessels, cruise vessels also sail under different flags, crew members can be from several countries, and the type of contracts, etc. bring varying challenges for training and qualifications for the crew. These crew members need to be better prepared than employees of multinational corporations, for the simple reason that these crew will be working with people of several nationalities and will stay away from their respective family members for several months, and above all staying afloat on water poses its own physical and psychological challenges (Vega A., *et al.*, 2020). This poses serious requirements of training, which includes:

- Hospitality skills;
- Occupational health and safety issues;
- Psychological and sociological aspect of behavior;
- Interpersonal relationship among crew as well as with passengers;
- Attitudes and motivation; and
- Legal issues, rights and duties as a crew member.

## Opportunities for India, Domestic and Foreign Investors, and the Way Forward

India has adopted river cruise as its cruise tourism strategy. Cruise circuits are developed with the heritage value, spiritual value and other related themes in centre. India attracts lakhs of foreign tourists due to its unique and rich cultural and spiritual appeal. As river cruise tourism develops, Indian domestic tourists are also eager to exploit river cruises and the destinations, which are connected through river transportation.

For cruise tourism to flourish, appropriate ports, river cruise vessels/ships, tour

operators, ship management companies, skilled manpower, cruise booking services and all other hospitality and related services will be required to be augmented by a massive scale. New businesses will be required to be set up to provide such services, and majority of them will require substantial capital investments.

For port infrastructure development, the PPP model has already proved as a successful model in India. However, ship owning, ship leasing and managing of ships are still yet to find takers in India. There are enough international operators who may be willing to invest in India in river cruise sector. With the recent focus of national government on Make in India and its pro-investor policies, significant investments can be expected in the coming years. Indian tourist today is eager to visit to most exotic global cruise tourism destinations at par with other global tourist. It will be important if we as a country consciously choose either a foreign tourist or an aspiration Indian tourist as our target market.

There are very few players today in cruise tourism industry. It is obvious to expect more investments and players entering in less time to exploit this burgeoning sector.

## Conclusion

Tourism is a choice and leisure industry, which is expected to grow in medium to long term. Shipbuilding, shipping, port infrastructure, hinterland connectivity, support services, maritime sector skilling, etc. are the key areas driving cargo and passenger transportation including cruise tourism. Cruise tourism will gain further momentum with the growth of cargo transportation infrastructure in the country. With increasing number of ports and better technology and connectivity, cruise tourism requires to focus only on the cruise passengers and their facilities. A tourist is a consumer who is looking for best, safe and most exciting holiday experience. If Indian cruise market players are providing it, this can be

major contributor to the blue economy of India. With *Cruise Bharat Mission* in place, there are all possibilities for significant investments in this sector from domestic and foreign investors, making it one of the most lucrative business proposals going forward.

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# ASEAN-India Cruise Tourism: Current Engagements and Way Forward

Prabir De

India and Association of South East Asian Nations (ASEAN) are bound together by their shared history and culture. There has been steady progress in India's relations with ASEAN since the Look East Policy (LEP) was initiated in 1992, which later upgraded into the Act East Policy (AEP) in 2014. India's engagement in the region is primarily structured through the ASEAN, which is a rules-based open regional process.

The ASEAN remains a major driving force for speeding up cooperation between Southeast Asia and India in the backdrop of unfolding Indo-Pacific. In 2022, ASEAN and India completed their three decades of dialogue partnership, and the relation between them was upgraded

into the Comprehensive Strategic Partnership (CSP). The CSP is expected to boost ASEAN-India maritime linkages, particularly maritime tourism. ASEAN announced a declaration on mainstreaming four priority areas of the ASEAN Outlook on the Indo-Pacific (AOIP) within the ASEAN-led mechanisms. The strengthening of ties may result in improved coordination between India's Indo-Pacific Oceans Initiative (IPOI) and ASEAN's AOIP. This synergistic approach may allow India and ASEAN to collaborate even more closely in maritime domain, particularly in the areas of tourism and people to people connectivity. The year 2025 is marked as ASEAN-India Tourism Year.

### Tourists Flow and ASEAN-India Year of Tourism

ASEAN and India are maritime neighbours. The ocean connects both, but tourism unites. While the land-based tourism has flourished

between ASEAN and India, the potential of cruise tourism between them is not yet fully utilized.

Cruise tourism in ASEAN is expanding rapidly, mostly driven by rising incomes, a growing middle class, investments in port infrastructure, and promotion of cruise tourism destinations<sup>1</sup>. Southeast and East Asia is also emerging as a significant source market for cruise passengers and a popular destination for cruises originating from other regions.

ASEAN cruise tourism destinations include major hubs like Singapore and Hong Kong, along with popular ports in countries like Thailand (Phuket, Bangkok), Vietnam (Halong Bay, Ho Chi Minh City), Malaysia (Penang, Langkawi), and the Philippines (Manila). This is illustrated in Figure 1. New destinations such as Brunei, Indonesia (Bali), and South Korea (Busan) are also being promoted.

**Figure 1: Popular Cruise Tourism Destinations in ASEAN**



\*As on October 2025

Source: Author's own based on *My Cruises*

### Box 1: Key Aspects of the ASEAN-India Year of Tourism 2025

**Promoting Cultural Exchange:** The initiative aims to foster greater appreciation for the shared cultural heritage and promote thematic circuits, such as Buddhist circuits, connecting India with ASEAN countries.

**Economic Collaboration:** The year serves as an opportunity to develop new tourism products and promote sustainable travel practices, further strengthening the economic partnership between India and ASEAN.

**Youth and Connectivity:** The 5th ASEAN-India Youth Summit in Goa was held to mark the occasion, bringing together young leaders from various fields to enhance connectivity and cooperation.

**Tourism Products and Promotion:** India has committed US\$ 5 million to the ASEAN-India Tourism Work Plan for the period 2023-2027, which will support promotional campaigns, capacity building programs, and sustainable tourism projects, with a particular focus on the tourism potential of Northeast India.<sup>2</sup>

**Strengthening People-to-People Ties:** By encouraging mutual learning and promoting travel through various media, the initiative seeks to strengthen the people-to-people connections between India and the ASEAN nations.

*Source:* Author's own based on the Ministry of External Affairs (MEA).

The year 2025 is marked as ASEAN-India Year of Tourism, which is a significant initiative to boost cross-cultural understanding and economic collaboration in tourism between India and the ASEAN member states. Box 1 presents the key aspects of the ASEAN-

India Year of Tourism. The year 2025 features events like the Youth Summit in Goa and the organization of the ASEAN-India Pavilion at international travel expos, symbolizing enhanced people-to-people ties and a new era of tourism cooperation<sup>3</sup>.

**Table 1: Tourists Flow between ASEAN and India**

#### (a) Tourists Inflow to India from ASEAN

|                    | 2019          | 2020  | 2021 | 2022   | 2023          | 2024          | CAGR (2019-2024) (%) |
|--------------------|---------------|-------|------|--------|---------------|---------------|----------------------|
| Brunei             | 578           |       |      |        | 443           | 863           | 8.35                 |
| Cambodia           | 6271          |       |      |        | 8167          | 11326         | 12.55                |
| Indonesia          | 50177         |       |      |        | 32677         | 39227         | -4.80                |
| Lao PDR            | 1818          |       |      |        | 1860          | 2997          | 10.51                |
| Malaysia           | 334579        | 69897 | 6628 | 126192 | 262458        | 307526        | -1.67                |
| Myanmar            | 86842         |       |      |        | 51235         | 47588         | -11.33               |
| Philippines        | 56393         |       |      |        | 50064         | 57542         | 0.40                 |
| Singapore          | 190089        |       |      |        | 183772        | 205383        | 1.56                 |
| Thailand           | 169956        | 52626 | 4668 | 54367  | 116060        | 140489        | -3.74                |
| Vietnam            | 33636         |       |      |        | 57284         | 54091         | 9.97                 |
| <b>ASEAN total</b> | <b>930339</b> |       |      |        | <b>764020</b> | <b>867032</b> | <b>-1.40</b>         |

**(b) Tourists Outflow to ASEAN from India**

|                    | 2019           | 2020          | 2021         | 2022           | 2023           | 2024           | CAGR (2019-2024) (%) |
|--------------------|----------------|---------------|--------------|----------------|----------------|----------------|----------------------|
| Brunei             | 8925           | 1750          | 119          | 1263           | 3555           | 5922           | -0.08                |
| Cambodia           | 75286          | 12919         | 846          | 34016          | 68836          | 77632          | 0.01                 |
| Indonesia          | 657300         | 111724        | 6670         | 281814         | 606439         | 710207         | 0.02                 |
| Lao PDR            | 8152           | 1743          |              | 3568           | 12093          | 27032          | 0.27                 |
| Malaysia           | 735309         | 155883        | 3916         | 324548         | 671846         | 1133331        | 0.09                 |
| Myanmar            | 117317         | 24831         | 1454         | 8069           | 14392          | 15334          | -0.33                |
| The Philippines    | 134963         | 29014         | 7202         | 51542          | 70286          | 79366          | -0.10                |
| Singapore          | 1417931        | 175522        | 54380        | 686469         | 1070178        | 1197099        | -0.03                |
| Thailand           | 1995363        | 261778        | 6544         | 997913         | 1628542        | 2129149        | 0.01                 |
| Vietnam            | 168998         |               |              |                | 145340         | 501427         | 0.24                 |
| <b>ASEAN total</b> | <b>5319544</b> | <b>775164</b> | <b>81131</b> | <b>2389202</b> | <b>4291507</b> | <b>5876499</b> | <b>0.02</b>          |

*Source:* India Tourism Data Compendium 2025, Ministry of Tourism, Government of India, New Delhi

Tourism has started gaining new momentum after a complete shutdown of tourism during the last pandemic. In 2021, only 81,131 Indian tourists visited ASEAN, the lowest so far. Four years later, India received 8,67,032 tourists from ASEAN in 2024, and ASEAN, on the other, received 58,76,499 tourists from India, thereby reflecting a renewed interest in cross-cultural exchanges and economic collaboration (Table 1).

In aggregate terms, the total volume of tourists from ASEAN to India increased in 2024, compared to 2023. At the bilateral level, tourists from ASEAN member states to India increased except Myanmar and Vietnam (Table 1(a)). During 2019 and 2024, aggregate tourists flow from ASEAN to India declined, thereby witnessing a negative growth (Table 1(a)). In particular, tourists from Myanmar, Indonesia, Malaysia and Thailand to India declined in 2024, compared to 2019. However, tourists from Cambodia, Vietnam, Lao PDR and Brunei to India increased sharply during 2019 and 2024. Singapore is the second largest source of tourists from ASEAN to India in terms of volume and the growth in tourists flow from Singapore to India came out positive.

Volume of tourists flow from India to ASEAN increased during 2019 and 2024, but growth in tourists flow came out negative in 2024, compared to 2019. In 2019, just before the pandemic, 53,19,544 tourists went to ASEAN from India, which grew only to 58,76,499 in 2024. The positive side is that the tourists flow from India to ASEAN has been rising consistently since 2022 (Table 1(b)). Malaysia, Thailand, Singapore and Vietnam are the major recipients of Indian tourists. What follows is that, compared to tourists outflow from India to ASEAN, India receives less number of tourists from ASEAN.

Today, ASEAN member states and India are connected by more direct flights except Lao PDR and Brunei. The direct flight between India and the Philippines is likely to start in October 2025. With establishment of direct flight, tourists flow is expected to grow further provided the regions do not suffer from any health or economic threats or disruptions. At the same time, tourists flow between ASEAN and India will rise further if cruises are encouraged to serve the tourist destinations, which are having the needed maritime facilities (e.g. cruise terminal),

safety (e.g. hygienic and health protocols) and incentives (e.g. favorable tax regime).

## ASEAN-India Engagements in Cruise Tourism

The cruise tourism in India has started gaining momentum even though it is in its nascent stage of development. Post-pandemic cruises have gone up in India as the country has opened several cruise terminals and extended tax incentives in the form of exemption of GST to foreign going cruise vessels for their coastal operation<sup>4</sup>.

The *Maritime Amritkaal Vision 2047* aims to increase annual cruise passengers to 1.8 million in 2030 and approximately 5 million in 2047. To support the growth of cruise tourism, India has been developing several cruise terminals across the country and the UTs. New cruise terminals have been already inaugurated at Mumbai and Visakhapatnam, and some are in the process of redevelopment. Redevelopment works have been going on at Mormugao (Goa) Cochin (Kerala), New Mangalore (Karnataka), and Chennai (Tamil Nadu). The Mumbai International Cruise Terminal was inaugurated in September 2025, whereas Chennai and Mormugao already have dedicated facilities. The Vizag International

Cruise Terminal (VICT) was inaugurated in September 2023.

Several international and domestic cruise liners operate in India for both sea and river cruising. Most of the popular sea cruises depart from ports such as Mumbai and Chennai, with itineraries to destinations such as Goa, Lakshadweep, Southeast Asia, Maldives, and Sri Lanka (Figure 2). Today, there is buoyancy in cruise tourism industry in India with rising numbers of cruise operators.<sup>5</sup>

To facilitate cruise tourism, India has launched the *Cruise Bharat Mission* in 2024. Under the PM Gati Shakti, the *Cruise Bharat Mission* provides a framework for inter-ministerial coordination on policy, regulatory, and other aspects of the cruise sector. This mission aims to double cruise passenger traffic within five years. The *Maritime Amritkaal Vision 2047* aims for 25 operational cruise terminals by 2047 with approximately 5 million annual passengers<sup>6</sup>. Some of the recent developments of cruise tourism include (i) priority berthing of cruise vessels, (ii) E-visa and on-arrival visa facilities, (iii) no cabotage for foreign cruise vessels in case of transporting passengers between Indian ports, (iv) IGST exemption for foreign flag vessels serving domestic passengers as coastal voyage<sup>7</sup>.

**Figure 2: Cruise Tourism Itineraries between India and ASEAN**



\*As on October 2025

Source: Author's own based on *Cordelia Cruises*

## ASEAN-India Tourism Ministers Meeting and ASEAN-India Cruise Dialogue<sup>8</sup>

ASEAN is a growing source of inbound tourists for India and so also India to ASEAN. In 2024, over 6 million Indian tourists visited ASEAN (Table 1). To facilitate the tourism sector, ASEAN and India have an annual Track I interaction process. The 12<sup>th</sup> Meeting of ASEAN-India Tourism Ministers (M-ATM Plus India) was held on 20 January 2025, back to back with the 28<sup>th</sup> Meeting of ASEAN Tourism Ministers (M-ATM) in Johor, Malaysia.<sup>9</sup> The aforesaid meeting also expressed appreciation to India for its support of US\$ 5 million from ASEAN-India Fund towards joint activities under the ASEAN-India Tourism Work Plan (2023-2027), as announced during the 21<sup>st</sup> ASEAN-India Summit.<sup>10</sup> Noted by ASEAN Secretariat: “The Meeting reviewed the progress of ASEAN-India Tourism Cooperation based on the ASEAN-India Tourism Work Plan 2023-2027 and noted updates in the following key areas:

(i) sharing best practices for the development of responsible and sustainable tourism; (ii) sharing resources and facilities to provide mutual assistance in tourism education and training for quality tourism development; (iii) establishing and updating ASEAN-India Crisis Communication Contact Points and a list of focal points for investment and economic data; and (iv) exchanging information related to statistics, development strategies, investment opportunities, and economic data.”

The 12<sup>th</sup> Meeting of ASEAN-India Tourism Ministers (M-ATM Plus India) reiterated the importance of enhancing connectivity between ASEAN and India, with a focus on air, maritime, and land transport. Strengthening regional connectivity was deemed critical for seamless cross-border travel, facilitating visitor mobility, and supporting tourism growth.

Recognising the potential of cruise tourism, the 12<sup>th</sup> Meeting of ASEAN-India Tourism Ministers (M-ATM Plus India) highlighted it as a priority in the ASEAN-India collaboration

**Figure 3: ASEAN-India Cruise Dialogue in 2025**



Source: MoPSW, New Delhi

agenda. In 2024, Indonesia hosted the ASEAN-India Cruise Dialogue, held on 29-30 October 2024 in Aceh, Indonesia. This event served as a platform for relevant stakeholders to discuss opportunities of connecting ASEAN and India through potential cruise routes. The Meeting further encouraged ASEAN National Tourism Organisations (NTOs) and India to sustain the progress in cruise tourism development by fostering mutual cooperation with the private sector and mobilising funding support from the ASEAN-India Fund (AIF) to facilitate future initiatives related to cruise tourism.

India in collaboration with the ASEAN Secretariat organized the second ASEAN-India Cruise Dialogue, which was held in Mahabalipuram, Chennai on 30 June – 1 July 2025. The dialogue was aimed to strengthen maritime cooperation, enhance cruise connectivity, and promote sustainable tourism across the Indo-Pacific region. While inaugurating the Dialogue, Indian Ports, Shipping and Waterways Minister Sarbananda Sonowal said “India will work with ASEAN to develop cruise tourism circuits in the Bay of Bengal and the Indian Ocean”.

This dialogue series marks a significant step in promoting ASEAN-India cruise and advancing the blue economy. Some of India’s major ports have also come forward to support

the ASEAN-India Cruise Dialogue (refer Box 2). The key outcomes of the ASEAN-India Cruise Dialogue 2025 are as follows: (i) opening of 5,000 km of navigable waterways to enhance cruise connectivity with ASEAN member states; (ii) regulatory alignment between ASEAN and India; (iii) identification of cruise routes connecting cultural and commercial centres across the Bay of Bengal and beyond.<sup>11</sup>

## Way Forward

There are several opportunities that ASEAN and India offer for enhanced cruise tourism. One, ASEAN and India have diverse coastal tourism attractions. The current cruise terminals at Mumbai, Mormugao, Chennai and Vizag are connected with coastal towns, cultural heritage sites. Similarly, Thailand, Malaysia, and Singapore have several coastal attractions and favourable cruising conditions. With growing middle class and rising income per capita in ASEAN and India, the demand for cruise tourism and leisure travel is expected to grow.

To unlock the growing cruise tourism potential, more modern cruise terminals, faster visa and seamless travel between cruise and tourist destinations, state-of-the-art vessels, etc. are needed. The gains are enormous. Growing tourism means more jobs.

### Box 2: KPL Joins ASEAN-India Cruise Dialogue 2025: Advancing Maritime Partnership in the Indo-Pacific

Kamarajar Port Limited (KPL) took part in the ASEAN-India Cruise Dialogue 2025, which came out as a landmark initiative under the ASEAN-India Year of Tourism. This first-of-its-kind multilateral platform aims to:

- Enhance cruise connectivity across the Indo-Pacific;
- Promote sustainable and responsible tourism;
- Strengthen maritime cooperation between India and ASEAN; and
- Unlock the potential of India as a strategic cruise tourism hub

Source: Kamarajar Port Limited



ASEAN has already designed a detailed ASEAN Cruise Tourism Roadmap<sup>12</sup>. India may like to promote the ASEAN-India Cruise Tourism Corridors. Effective promotions of cruise industry to each other's market are necessary to strengthen the cruise tourism between ASEAN and India. Sustainable and responsible cruise tourism should be strictly followed and there must be an agreed SOP between ASEAN and India. Some of the recommendations to strengthen the ASEAN-India cruise tourism are as follows:

- First, India and ASEAN must continue the cruise tourism dialogue, followed by trade fairs and promotional activities. Developing and jointly promoting integrated cruise tourism circuits are equally important.
- Second, ASEAN and India shall jointly develop a strategy in order to unlock the cruise tourism potential. A joint statement by ASEAN and India, if issued, will provide the needed strategic direction, further adding to the growth momentum.
- Third, reactivating the ASEAN-India services trade agreement and ASEAN-India investment agreement will help promote cruise tourism.
- Fourth, special financial incentive packages including slashing IGST rate will help attract cruise liners.
- Fifth, an ASEAN chair on tourism may be constituted at the Indian Institute of Tourism and Travel Management (IITTM), and, similarly, an Indian chair in ASEAN member states.
- Sixth, ASEAN and India Tourism Forum (AITF) may be set up to help connect NTOs, tour operators, hoteliers, retailers, etc.

## Endnotes

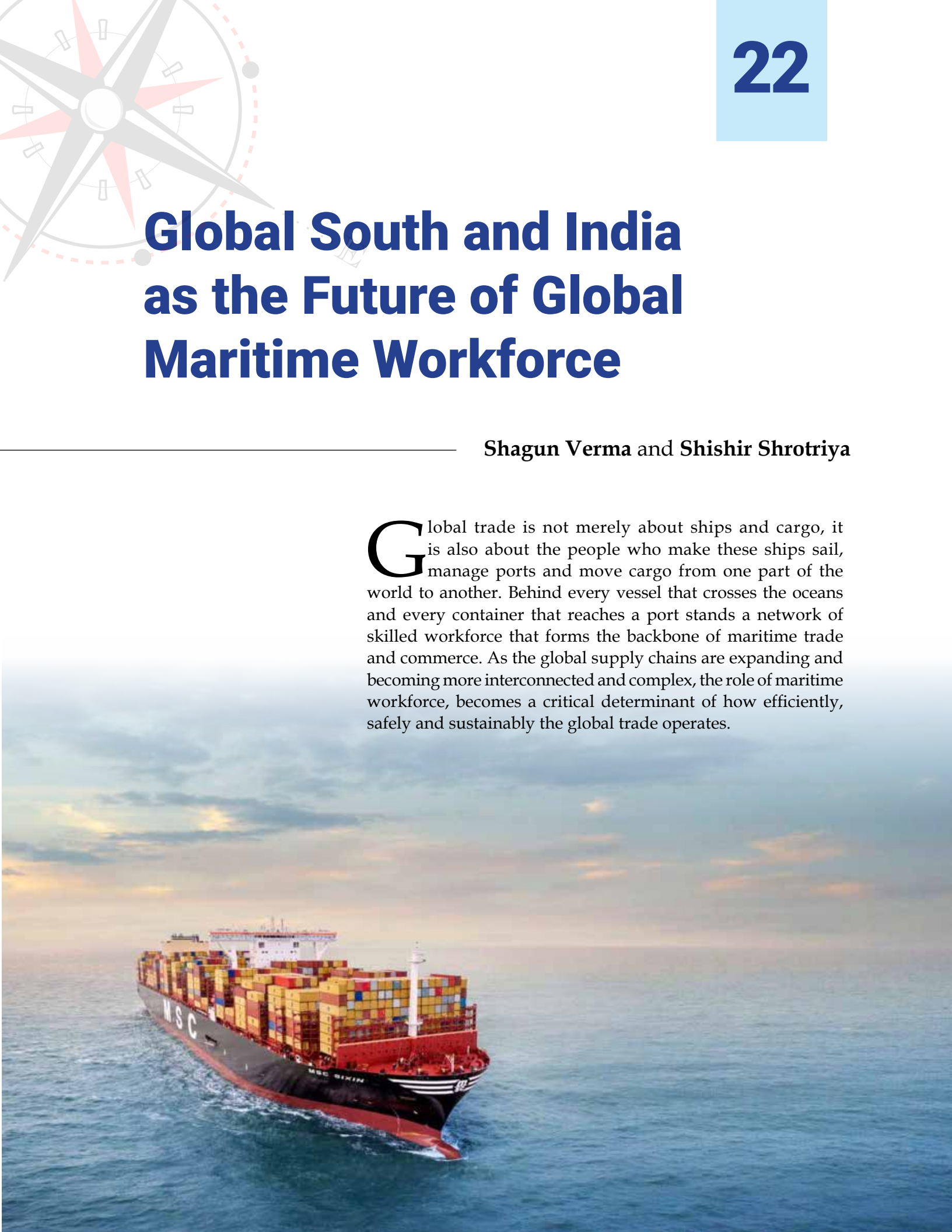
- <sup>1</sup> Refer, for example, *Asia Pacific Cruise Market Outlook to 2030*, available at <https://www.kenresearch.com/industry-reports/asia-pacific-cruise-market>
- <sup>2</sup> Refer, <https://timesofindia.indiatimes.com/city/guwahati/india-committed-to-boosting-tourism-ties-with-asean-min/articleshow/120439384.cms>
- <sup>3</sup> Refer, [https://www.mea.gov.in/press-releases.htm?dtl/40053/5th\\_ASEANIndia\\_Youth\\_Summit\\_Goa\\_August\\_2831\\_2025](https://www.mea.gov.in/press-releases.htm?dtl/40053/5th_ASEANIndia_Youth_Summit_Goa_August_2831_2025)
- <sup>4</sup> Refer, for example, <https://www.thestatesman.com/business/foreign-going-cruise-vessels-exempted-gst-for-coastal-run-1503229307.html>
- <sup>5</sup> For example, some of the popular cruises, which operate in India, are Cordelia Cruises, Costa Cruises, to mention a few.
- <sup>6</sup> Refer, <https://static.pib.gov.in/WriteReadData/specificdocs/documents/2025/apr/doc2025421543001.pdf>
- <sup>7</sup> Refer, <https://static.pib.gov.in/WriteReadData/specificdocs/documents/2025/apr/doc2025421543001.pdf>
- <sup>8</sup> Based on the ASEAN Secretariat's report available in public domain. Refer, <https://asean.org/wp-content/uploads/2025/01/Adopted-JMS-12th-M-ATMIndia.pdf>
- <sup>9</sup> Refer, <https://asean.org/wp-content/uploads/2025/01/Adopted-JMS-12th-M-ATMIndia.pdf>
- <sup>10</sup> *ibid*
- <sup>11</sup> Refer, <https://www.pib.gov.in/PressReleaseIframePage.aspx?PRID=2140940>
- <sup>12</sup> Refer, <https://www.asean.org/wp-content/uploads/images/archive/16734.pdf>

# **Part VIII**

## **Human Capital and Skilling**





A large container ship, with 'MSC' visible on its side, is sailing on a blue ocean under a sunset sky. The ship is loaded with many colorful containers. In the top left corner, there is a faint graphic of a compass rose.

# Global South and India as the Future of Global Maritime Workforce

Shagun Verma and Shishir Shrotriya

**G**lobal trade is not merely about ships and cargo, it is also about the people who make these ships sail, manage ports and move cargo from one part of the world to another. Behind every vessel that crosses the oceans and every container that reaches a port stands a network of skilled workforce that forms the backbone of maritime trade and commerce. As the global supply chains are expanding and becoming more interconnected and complex, the role of maritime workforce, becomes a critical determinant of how efficiently, safely and sustainably the global trade operates.

Highlighted in UNCTAD's *Review of Maritime Transport*<sup>1</sup>, 2024, global seaborne trade is expected to grow on an average by 2 per cent in the period 2025-2029<sup>1</sup>, driven by expansion in population, industrial diversification and reorientation of supply chains across the world. This significantly increases the demand for trained seafarers, not only in absolute numbers but also in competencies required.

Today, over 1.9 million seafarers are serving the international merchant fleet<sup>2</sup>, and nearly half of the workforce comes from the Global South, predominantly from the Philippines, India, Russia and Indonesia. India alone constitutes to around 10 per cent of the global seafaring workforce<sup>3</sup>. This shows how the dynamic and developing economies of the Global South are becoming the sources of maritime workforce of the world.

As the maritime sector is undergoing a transition towards decarbonisation and technologically advancing shipping systems, the need to act decisively has never been greater for the Global South. This places new demands on the maritime workforce, making it imperative for the Global South to prioritise the reskilling and upskilling of its maritime workforce through technological competencies

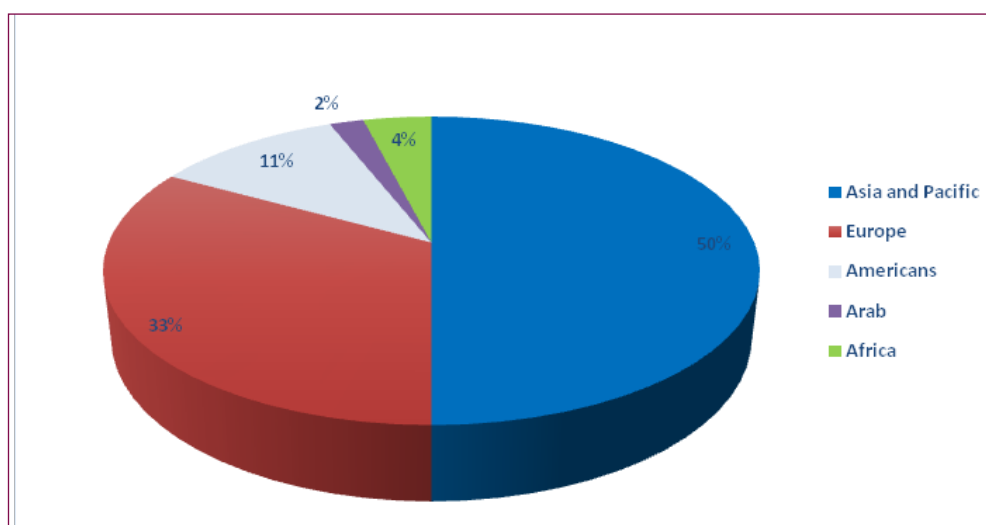
and targeted training, while also safeguarding the rights and well-being of their seafarers amidst this structural transformation.

## Global South Workforce Today

Approximately, 80 per cent of the world trade by volume moves by sea. From navigating complex maritime routes to handling vessels and coordinating with port authorities to comply with International regulations, seafarers play a critical role in ensuring the continuity and efficiency of global trade. Studies conducted by the Baltic International Maritime Council (BIMCO) and International Chamber of Shipping (ICS) 2021, underscore the indispensable role of seafarers for sustaining the global supply chains and how any disruption in their performance can potentially cause significant economic and operational consequences across international trade networks.

According to the *Seafarer Workforce Report 2021*, published by the BIMCO and ICS, roughly 1.89 million seafarers were actively employed in more than 74,000 vessels within the global merchant fleet in 2021, out of which 857,540 were officers and 1,035,180 were ratings<sup>4</sup>. The majority of this workforce originates from Asia and the Pacific, contributing around 50 per cent

**Figure 1: Distribution of Seafarers across Regions**



Source: WMU Transport Report 2024.

of the total global maritime workforce, followed by Europe and Africa, accounting for 33 and 4 per cent, respectively<sup>5</sup>.

Figure 1 illustrates the distribution of seafarers supply across regions for the year 2021. It not only highlights the prevailing geographical imbalances in supplying seafarers worldwide but also underscores the centrality of the Asia-Pacific region in supplying seafarers to the international maritime sector.

Number of seafarers has steadily risen over the past decades, with the Global South serving as the major source of the world's seafaring workforce. Initially concentrated in the roles of ratings (entry- and mid- levels), seafarers from countries like the Philippines and India are now progressively advancing into officer positions (command and technical leadership). The Philippines alone accounts for approximately 25 per cent of the global seafaring workforce<sup>6</sup>.

Table 1 presents the five largest seafarer-supplying countries in 2021, along with the leading five countries providing officers and ratings. These countries together represent 44 per cent of the global workforce<sup>7</sup>.

According to the Annual Maritime Statistics of MARINA<sup>8</sup>, the five largest seafarer supplying countries are the Philippines, followed by Russia, Indonesia, China, and India. Of these, the Philippines has held the leading position since 1987, supplying nearly a quarter of

the global seafaring workforce. Notably, the Philippines also stand out as the foremost supplier of officers, followed by Russia, China, India and Indonesia. Meanwhile, countries like Vietnam, Myanmar, and Bangladesh are also emerging as significant contributors to the maritime workforce, thereby reshaping the dynamics of the global maritime labour market.

The sustained flow of the seafarers from these countries is grounded in their structural, educational and socio-cultural advantages. A large and youthful population provides a steady pool of individuals seeking careers in seafaring. These nations have also invested in a robust maritime education ecosystem consisting of well-established maritime institutions and rigorous training programs, ensuring that their workforce align closely with international standards of competency, safety and operational efficiency. Moreover, high levels of proficiency in English language further enhance their scope of employability in a multinational marine environment. Beyond these factors, a deep-rooted cultural affinity for seafaring, embedded in their community traditions continues to motivate further generations to pursue careers at sea.

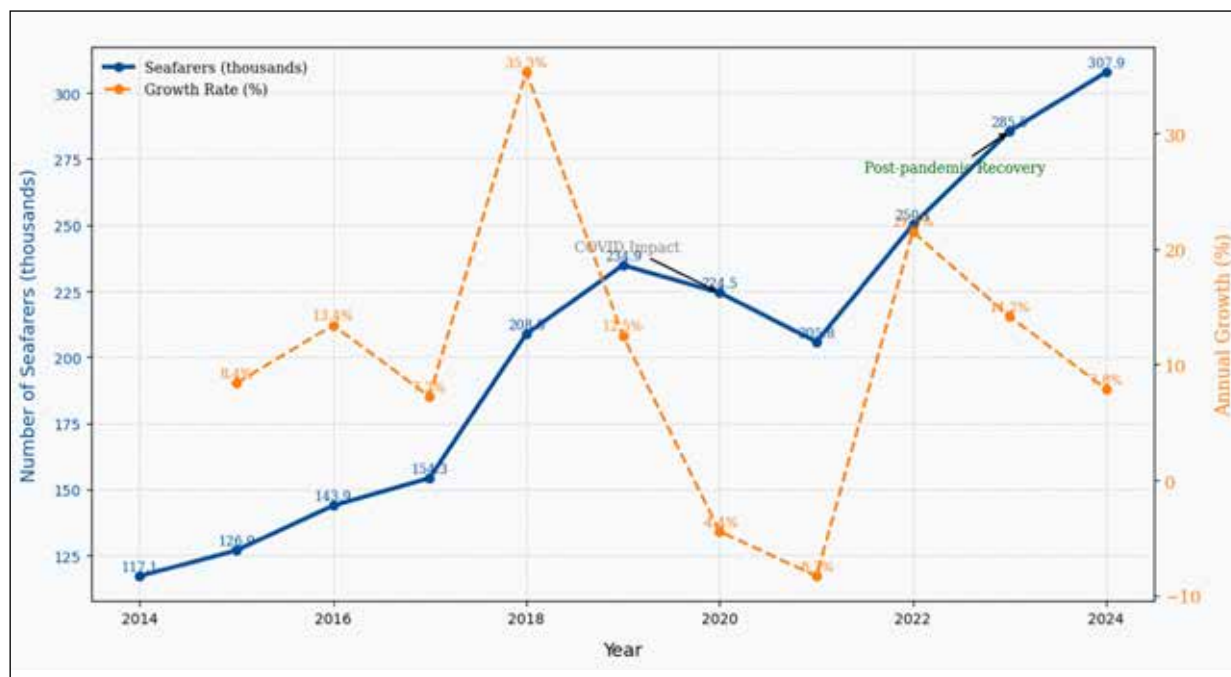
## India's Seafarer Growth Trends

Over the past decade, India has steadily strengthened its position as a leading provider of seafarers. Figure 2 illustrates India's seafaring

**Table 1: Five Largest Seafarer-Supplying Countries, 2021**

| All seafarers            | Officers                | Ratings                  |
|--------------------------|-------------------------|--------------------------|
| The Philippines (13.33%) | The Philippines (9.46%) | The Philippines (16.55%) |
| Russian (10.47%)         | Russian (8.36%)         | Russia (12.22%)          |
| Indonesia (7.59%)        | China (8.09%)           | Indonesia (8.39%)        |
| China (7.10%)            | India (6.84%)           | China (6.27%)            |
| India (6.00%)            | Indonesia (5.97%)       | India (5.3%)             |

Source: Annual Maritime Statistics, MARINA.

**Figure 2: Indian Seafarers: Trends and Growth (2014-2023)**

Source: DG Shipping.

**Table 2: Structural and Gender Composition of Indian Seafaring Workforce**

| Dimension                | Category/Segment           | Share (%) |
|--------------------------|----------------------------|-----------|
| Departmental Composition | Nautical Engineering       | 67.3      |
|                          |                            | 32.7      |
| Rank Distribution        | Ratings Officers           | 64        |
|                          |                            | 36        |
| Gender representation    | Women in Nautical roles    | 95        |
|                          | Women in Engineering roles | 5         |

Source: Crew Annual Report 2024-2025.

workforce trends from 2014 to 2024. Over the decade, the total number of seafarers increased from 117,100 to 307,900. This represents an increase of more than 160 per cent in 10 years.

A closer analysis of **year-on-year trends** highlights the dynamic growth of Indian seafarers over the past decade. During 2014-2018, the sector experienced a period of robust growth, with the workforce expanding steadily and the growth rate peaking at 35.3 per cent in 2018. However, this momentum

was significantly disrupted during 2019-2021 due to the COVID-19. Port closures and recruitment delays caused a visible slowdown in employment growth. Following this challenging period, the workforce rebounded strongly post-2021 with growth nearing 25 per cent.

Table 2 presents an overview of the structural and gender composition of the Indian maritime workforce. The numbers reveals pronounced concentration of seafarers in the nautical department, which accounts for two-third

of the total, reflecting the country's strength in deck operations and navigation. Ratings similarly comprise a substantial share of the total, while officers, who provide leadership and specialized technical proficiency, constitute a comparatively smaller segment.

Gender representation within the workforce remains notably imbalanced. Women are overwhelmingly concentrated in nautical roles, with only a marginal presence in engineering positions. These trends underscore the persistence of occupational segregation and highlight the need for targeted interventions.

Addressing these structural and gender imbalances through targeted training, career pathways, and diversity initiatives will be crucial for preparing India's maritime workforce for a technologically advanced and globally competitive shipping industry.

## Challenges Facing the Maritime Workforce in the Global South

Although seafarers execute some of the most vital jobs, their numbers are not adequate as per the current industry demands. Their work at sea is demanding and involves challenging conditions marked by long working hours, physical strain and extended periods away from family and friends.

They often spend weeks or even months away from land working under extreme harsh conditions with little rest. The modern employment structure usually in the form of short-term contracts has also made the profession less attractive, as the current system deprives them of long-term career security. The lack of incentives, safety and predictable career growth has diminished the interests in seafaring, especially amongst women.

Although, Global South continues to supply a significant share of worlds' seafarers, but despite this dominance, several structural and institutional challenges constrain the sustainable development of this workforce.

One of the trends is deteriorating working conditions and reduction in the cost of industry for the workforce over the past few decades. This creates huge challenges in terms of attractiveness of the sector for seafarers and causes labour shortages which can be detrimental to the Industry overall. A central challenge confronting the maritime workforce is the persistent imbalance between the demand and supply of seafarers, especially at the officer level. The BIMCO/ICS Manpower Report (2015) estimated an officer shortage of 16,500, a gap expected to rise to 147,500 by 2025<sup>9</sup>. It is predicted that there will be a need for an additional 89,510 officers by 2026 to operate the world merchant fleet.<sup>10</sup>

Even for those who secure employment, working conditions are often precarious. Seafarers from developing countries receive significantly lower wages and are often regulated to lower-ranking positions compared to their counterparts from developed countries. Earnings disparities are most pronounced in the lower ranks. For example, an Asian deck cadet on an oil product tanker may earn approximately US\$ 400 per month, whereas a US deck cadet performing the same role can receive around US\$ 950 per month<sup>11</sup>.

A 2025 analysis of SeaEmploy on the Seafarer wage trend shows that the purchasing power of the seafarers' salaries between 2015 and 2025 has declined by roughly 6.6 per cent, despite normal pay increases. This decline has been most pronounced for seafarers from high inflation countries, especially from Eastern Europe and developing countries. The Philippines, as the world's largest seafarer supplier, experienced cumulative inflation of approximately 38 per cent, substantially diminishing the real value of remitted wages. India faced even more pronounced inflationary pressure, with consumer prices rising by an estimated 65 per cent over the decade, outpacing nominal wage growth within the maritime sector. This trend has intensified recruitment and retention

challenges, particularly among young officers, who are drawn to opt for land-based careers that offer similar compensation without the lifestyle drawbacks associated with the maritime work<sup>12</sup>.

Despite producing a substantial number of maritime graduates annually, countries of Global South face persistent challenges in translating this human capital into a competent and globally competitive workforce. A critical constraint is the shortage of onboard training berths, which hinders cadets from gaining the requisite practical experience. For instance, in South Africa, the absence of a robust domestic shipping industry compels cadets to compete for a limited number of global placements, thereby exacerbating the paradox of surplus graduates and persistent officer shortages<sup>13</sup>.

Furthermore, the proliferation of private maritime training institutes without standardized curricula leads to uneven quality of education and training. This lack of standardization complicates the recognition of certifications internationally, limiting employment opportunities for graduates and perpetuating disparities in the maritime labour market.

The ongoing transformation of the maritime sector towards digitalization, decarbonisation and exploring the use of alternative fuels, further amplifies the challenge to develop new skills and competencies of the maritime workforce. The DNV and the Singapore Maritime Foundation (SMF) have reported that around 75 per cent of the seafarers must now be trained in either partial or full training to effectively operate and handle the technologies expected to be deployed on future vessels, while more than 87 per cent will need training on new emerging marine fuels.<sup>14</sup> Therefore, without targeted training in these domains, seafarers from the Global South risk being marginalized in the evolving maritime labour market.

Another distressing challenge faced by seafarers worldwide is the alarming increase in

abandonment cases, which is a serious breach of human and labor rights. Data given in the International Transport Workers' Federation (ITF, 2025), reveals that there is an 87 per cent surge in abandonment cases in 2024. Around 3100 seafarers were left stranded by ship-owners compared to 1,676 in 2023<sup>15</sup>. These abandoned seafarers endure months with limited food and water and fall into severe isolation. India accounted for 899 abandoned seafarers in 2024, followed by Syria, Ukraine, the Philippines and Indonesia<sup>16</sup>.

Certification challenges further worsen these challenges. While the STCW Convention establishes minimum global standards, disparities in the implementation of these standards across countries can undermine their effectiveness. In Bangladesh, for instance, marine engineering education has been found insufficient to meet the STCW competence requirements, particularly in preparing seafarers for advanced ship technologies.<sup>17</sup> Graduates may hold certificates, but discrepancies in the practical skill required for modern, environmentally compliant vessels limit their employability in the global maritime industry.

Institutional weaknesses also play a pivotal role in perpetuating these challenges. Weak regulatory frameworks and inconsistent enforcement leave seafarers exposed to exploitation. In India, the Directorate General of Shipping (DGS) continues to receive complaints regarding abandonment, detention, and illegal arrest of seafarers, often involving vessels operating without mandatory documentation or valid Protection and Indemnity (P&I) insurance<sup>18</sup>.

Building on challenges in training and workforce development, another critical issue is the underrepresentation of women in seafaring. However, there has been a marginal increase in women being employed in the profession. As of 2021, there were estimated 24000 women seafarers, which has been a 46 per cent increase since 2015<sup>19</sup>. Still, they account for only 1.2 per

cent of the total maritime workforce, with only 0.85 per cent serving as officers. A majority of these women are engaged in the cruise and ferry sectors. Despite this growth, issues like limited support from families, gender-based discrimination and harassment continues to restrict women from applying for such jobs.

## Mitigation Strategies: International Practices

As the global shipping sector is evolving through digitalisation, decarbonisation and automation, the issue of well-being and protection of seafarers becomes more pressing than ever. From exploitative contracts to abandonment, the vulnerabilities of seafarers demand strong institutional responses. This becomes more important for the Global South, as they supply a large number of seafarers to the world.

One of the most persistent problems has been the fraudulent contracts and exploitative recruitment practices, which are more present in developing maritime nations. Many seafarers from countries like India, Bangladesh and Myanmar are recruited through intermediaries who often misrepresent contract terms. To address this, the Philippines has long had a regulatory framework of Philippine Overseas Employment Administration (POEA), which carefully monitors and regulates such practices, by advising, “do not apply at recruitment agencies not licensed by POEA” and “do not pay any placement fee unless you have a valid employment contract” as norm to prevent such fraudulent practices.<sup>20</sup> Similarly in India, the Directorate General of Shipping (DGS) has introduced and implemented Grievance Redressal Mechanism for Seafarers, which involves various measures such as real-time tracking of recruitment platforms and a 24/7 grievance helpline along with programmes targeted towards educating seafarers about their fundamental rights<sup>21</sup>.

The problem of seafarer retention has also been central. In Sri Lanka, the National Seafarer Development Programme offers returning seafarers with a comprehensive package, which includes support in healthcare, insurance and family assistance.<sup>22</sup> There are also mental health awareness programmes that are focused on enhancing the well being and job satisfaction of the seafarers.

Safety at sea is another area which requires immediate attention. Indonesia now mandates regulations for even small vessels to undergo safety and emergency response training aligned with STCW standards. Vietnam, on the other hand, has strengthened its port state control measures to enhance and upgrade the rescue infrastructure under its National Maritime Safety Strategy, showing its commitment in reducing maritime fatalities and occupational risk this job demands.

The issue of ship abandonment is still a grave concern which continues to affect thousands of seafarers. However, in recent years many countries have established targeted regulatory frameworks to tackle this challenge. In India, the government has established a National Welfare Board to help stranded seafarers by providing them immediate financial and legal assistance. Meanwhile, the Philippines maintain a repatriation fund, which ensures prompt return and recovery of unpaid wages to the abandoned seafarers. Both the nations have strengthened their collaboration with IMO-ILO joint initiatives to address enforcement gaps and awareness programmes and training aim to sensitize the seafarers about their rights and responsibilities.

However, the issue of protection of seafarers extends beyond national borders, and requires regional as well as international cooperation. International frameworks, introduced by International Maritime Organisation (IMO) and International Labour Organisation (ILO), have established frameworks comprehensively to

safeguard the interest of seafarers. The IMO/ILO Joint Tripartite Working Group (JTWG) focuses on addressing challenges related to human rights and working conditions of seafarers.<sup>23</sup>

Beyond these regulatory frameworks, the evolving nature of the maritime industry demands a future ready workforce. IMO's updated greenhouse (GHG) strategy, aims to reduce 40 per cent of emissions in shipping by 2030 and net zero emissions by 2050.<sup>24</sup> This will require seafarers to develop competencies in operating vessels powered by alternative fuels such as ammonia or hydrogen alongside mastering energy efficient operational techniques. Studies suggest that by 2030, nearly 450,000 seafarers will need advanced training, rising to 800,000 by the mid-2030s, highlighting the scale of the workforce transformation required<sup>25</sup>.

In addition to these ongoing national and international initiatives, the Government of India through the Ministry of Ports, Shipping and Waterways (MoPSW) and the Directorate General of Shipping (DGS) has implemented multiple welfare schemes aimed at improving the safety, well-being, gender inclusivity and social security of the maritime workforce.<sup>26</sup>

Table 3 summarizes some of the major national-level programmes and policy measures introduced recently to strengthen the welfare framework for Indian seafarers.

These initiatives reflect India's committed and multifaceted approach to enhance the safety, skills, and social security of its seafarers. Through sharing expertise, providing specialized training, and deploying modern maritime technologies, these efforts help develop a skilled and resilient seafaring workforce capable of meeting the complex challenges of 21st-century shipping industry, while promoting sustainable and inclusive growth within the maritime sector.

## Future Alignments: India and the Global South

For the Global South, the strategy lies in transforming their numerical strength in seafarers into leadership in sustainability, adaptability, superior competence and innovation. Establishing Centres of Excellence across leading seafarer nations will ensure their readiness and preparedness for the emerging requirements of the Industry. This necessitates a greater role for private sector players in establishing appropriate institutions that can complement government-led initiatives and can help seafarers adapt more efficiently to the dynamic requirements of the industry.

In parallel, Foreign Direct Investment (FDI) will play a catalytic role by providing capital for critical infrastructure such as state-of-the-art simulators, modern training vessels and research centers dedicated to address emerging challenges of decarbonisation, automation and digitalisation.

Global as well as regional partnerships with maritime technology leaders will facilitate knowledge transfers and enhance the competitiveness of the maritime workforce both in terms of quantity and quality.

India is uniquely positioned to play a leading role in upskilling the maritime workforce of the Global South. A large and growing youth population with a strong proficiency in English, and a cultural affinity with seafaring, India offers a ready pool of motivated talent and expertise. By harnessing these strengths, India can not only contribute to building a skilled regional workforce but also set standards for sustainable, high-quality maritime capacity development across the Global South.

Coupled with the government's expanding efforts to enhance maritime training, infrastructure, and international collaborations, India provides a model that other Global South countries can learn from, in developing their

maritime workforce. For India, the trajectory is already charted through *Maritime India Vision 2030* and *Maritime Amrit Kaal Vision 2047*, both of which emphasise skill development, international collaboration, and innovation-led growth. Translating these frameworks into measurable outcomes requires the following:-

- Developing **Maritime Centres of Excellence** that bridge academic research with shipboard applications and emerging technologies;
- Expanding **PPPs and FDI inflows** to build world-class simulation centres, training ecosystems, and maritime R&D clusters;
- Enhancing **international recognition of Indian training and certification**, ensuring continued global employability of seafarers trained in the Indian institutes; and
- Creating structured **mentorship pipelines** to nurture cadets and junior officers, combining technical proficiency with leadership development.

**Table 3: Recent Indian Initiatives for Seafarers' Well-being**

| Initiative / Programme                       | Year                                                                                                     | Key Features                                                                                                                                                                                                                                                                              |
|----------------------------------------------|----------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Merchant Shipping Act, 2025</b>           | 2025, Ministry of Ports, Shipping and Waterways                                                          | Replaces the 1958 Act to modernize India's maritime legal framework in line with global conventions. Introduces provisions for digital ship registration, improved safety, environmental standards, and strengthened welfare and social security measures for seafarers.                  |
| <b>Sagar Mein Samman (SMS)</b>               | 2025, MoPSW / DG Shipping                                                                                | Policy framework to enhance participation of women in maritime sector: inclusivity, leadership, safety, skill development and a broader version of UN-SDG 5.<br><br>Target ~ 12 per cent female representation in technical maritime roles by 2030, and a broader vision of the UN SDG-5. |
| <b>Sagar Mein Yog (SMY)</b>                  | 2025, DG Shipping in collaboration with NUSI                                                             | A holistic wellness initiative promoting yoga, mindfulness, and mental health among seafarers across pre-sea, at-sea, and post-sea stages. The programme also proposes inclusion of a standardized wellness module in all Maritime Training Institutes.                                   |
| <b>MoU with ISWAN</b>                        | 2025, DG Shipping & ISWAN (International Seafarers' Welfare & Assistance Network)                        | Collaboration between DGS and ISWAN to enhance welfare outreach, training, family support, and grievance redressal through ISWAN's 24/7 helpline, with added emphasis on gender safety and mental well-being.                                                                             |
| <b>Seamen's Provident Fund Scheme (SPFO)</b> | Under the Seamen's Provident Fund Act, 1966; administered by Seamen's Provident Fund Organization (SPFO) | Provident fund for seamen: retirement / old-age savings, with contributions from employer / seafarer; coverage for death benefits etc.                                                                                                                                                    |

Source: DG Shipping.

By aligning policy interventions, industry demands and academic frameworks, India and the Global South can strengthen their position as global maritime talent hubs, while collectively contributing in shaping the future workforce of the maritime sector.

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# Global Transitions and the Workforce Imperatives for the Maritime Sector

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Deeksha Gupta and Shishir Shrotriya

**M**aritime sector is under transformation due to forces of decarbonisation, digitalisation and geopolitics situations. These shifts are altering trade relations, governance frameworks, and most critically the dynamics of maritime workforce. As per International Labour Organisation (ILO), all persons of working age who are either employed or looking for work comprise of labour force.<sup>1</sup> This definition is inclusive of both active contribution and potential engagement in productive activities. For maritime industry, it covers broad range of occupations such as professionals, seafarers, dockworkers, shipbuilders, logistic operators and regulatory staff.



Alignment with International Maritime Organisation's (IMO) action plan of net-zero emissions by 2050 gives dual challenge of adopting to sustainable practices while ensuring human capital is adequately equipped for these transitions. Acknowledging this issue, the IMO, ILO and International Transport Workers Federation (ITF) have formulated a 'Maritime Just Transition Force' for smooth, inclusive, equitable transition that strike a balance between sustainability and human resources.

In this context, this article explores the global transitions of environment, technology, geopolitics and regulation, and examines the impact of these transitions on employment patterns, skill requirements and institutional developments with a particular focus on India.

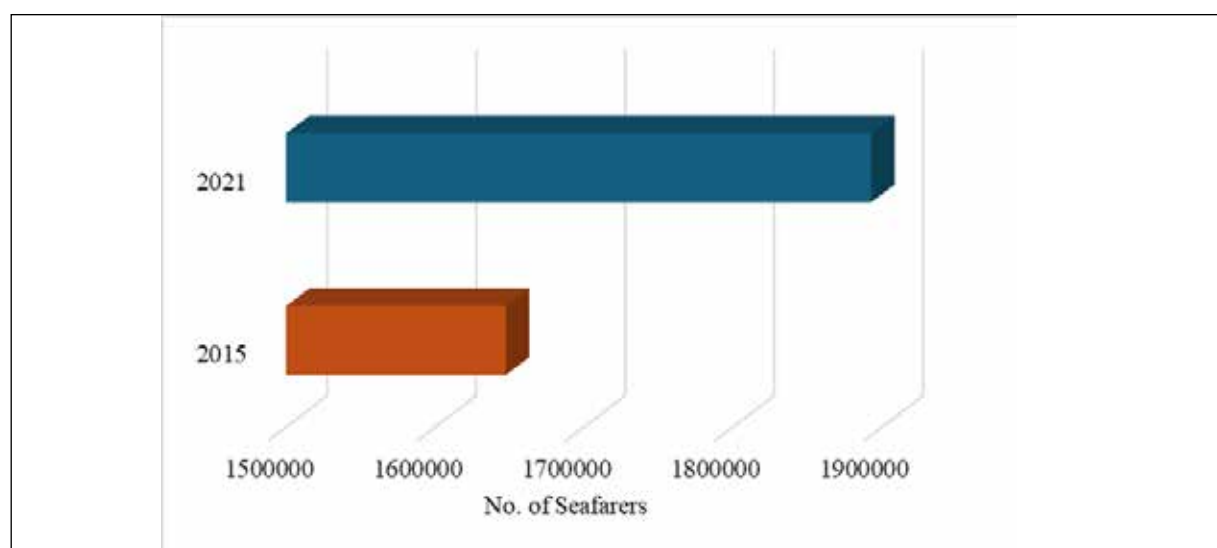
## Trends in Global Maritime Workforce and Major Seafarer-Supplying Countries

Figure 1 presents the growth in global seafaring workforce from 2015 to 2021, showcasing the consistent growth in demand for seafarers.

According to the BIMCO/ICS Seafarer Workforce Report (2021), the number of seafarers increased to around 1.9 million in 2021 from approximately 1.6 million in 2015, which reflects an increase of 18 per cent between 2015 and 2021. This accelerated trend shows rising need for qualified maritime workforce.

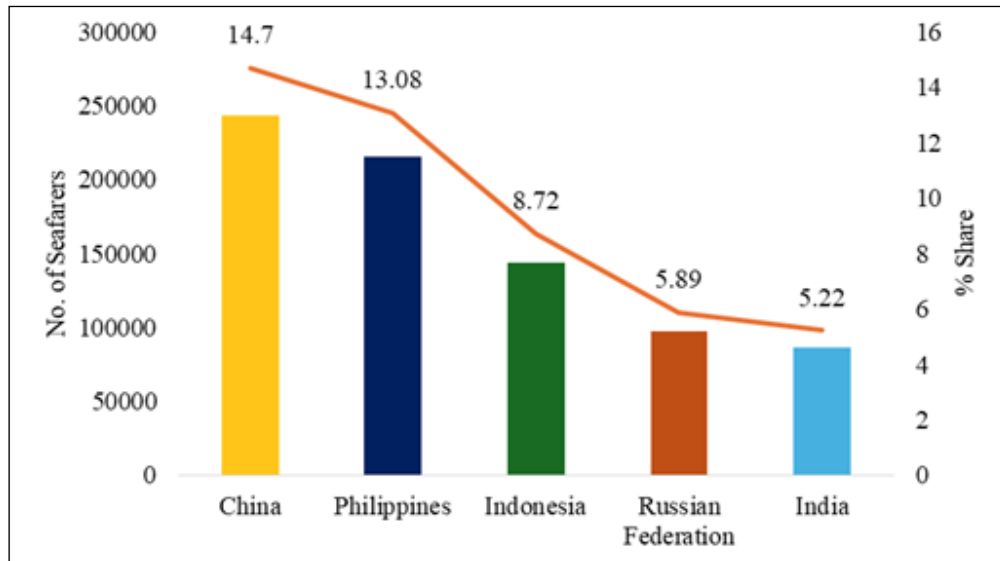
Figure 2 and Figure 3 present the top five seafarer-supplying countries in the global maritime workforce for 2015 and 2021. Both illustrations reveal changes in country ranks and proportional shares. China was the top supplier of seafarers with headcount over 2,40,000 with 14.7 per cent share of the global maritime workforce, followed by the Philippines, Indonesia, Russian Federation and India in 2015. By 2021, the Philippines overtook China (which drastically dropped to fourth place with 7.09 per cent share) and became the leader with 13.33 per cent of global share and headcount of approx. 2,50,000. Russia moved from fourth place in 2015 to second place in 2021 with its share rising from 5.89 per cent to 10.46 per cent respectively, registered a growth of

**Figure 1: Global Maritime Workforce 2015 and 2021**



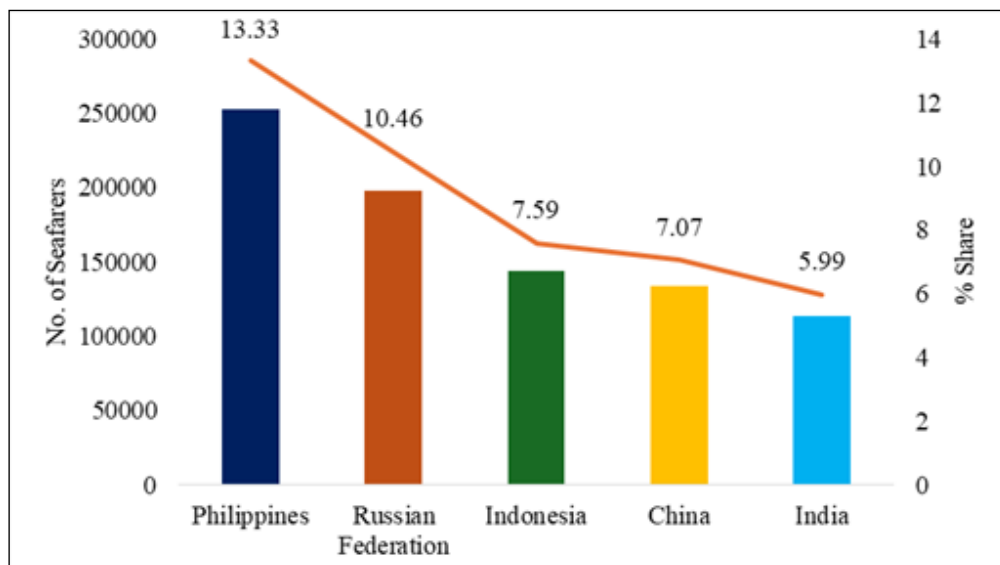
*Source:* Authors' own based on BIMCO/ICS Seafarer Workforce Report (2021); UNCTAD Review of Maritime Transport 2021

**Figure 2: Top Seafarer-Supplying Countries in the Global Maritime Workforce, 2015**



*Source:* Authors' own based on: BIMCO/ICS Seafarer Workforce Report 2021; UNCTAD Review of Maritime Transport 2021

**Figure 3: Top Seafarer-Supplying Countries in the Global Maritime Workforce, 2021**



*Source:* Authors' own based on BIMCO/ICS Seafarer Workforce Report (2021); UNCTAD Review of Maritime Transport 2021

almost 78 per cent. Indonesia retained its third place but saw a decrease in share from 8.72 per cent to 7.59 per cent. In 2021, India witnessed a modest increase in share to 5.99 per cent in 2021 from 5.22 per cent in 2015 and maintained a spot in top five.

## Transitions and Workforce Dynamics

According to the ILO, a 'Just transition' means "greening the economy in a way that is as fair and inclusive as possible, to everyone concerned, creating decent work opportunities and leaving no one behind".<sup>2</sup>

Climate change commitments, globalization, technological growth, revised trade networks and routes are broadly the reasons for the transition in maritime sector. Together, these factors call for shift towards sustainable practices, technology integration and restructuring of workforce in line with this change.

The global shipping industry is responsible for about 3 per cent of global greenhouse gas emissions and is under pressure to decrease its carbon footprint.<sup>3</sup> In 2023, the IMO targeted GHG emissions from international shipping to reach net zero by or around 2050 taking into consideration different national circumstances.<sup>4</sup>

Taking a step further in 2025, IMO's net zero framework has established a mandatory emissions limit to decrease the GHG emissions across entire industry.<sup>5</sup> Hence, the sector has been undergoing a major energy and technological shift from conventional fuels (heavy fuel oil and marine gas oil) to low carbon and zero carbon alternative fuel (Hydrogen, Ammonia, Methanol). Hence, it is essential that workforce transitioning away from declining fossil fuel industries is also included in this structural shift.

## Energy and Environmental Transitions

Decarbonization in maritime shipping means

reducing GHG emissions through improved energy efficiency and innovative energy-efficient technologies.<sup>6</sup> Maritime decarbonization is crucial to achieving the global temperature limit of 1.5 degrees. Shift to alternative fuels such as biofuels, hydrogen and ammonia, liquified natural gas (LNG), electrification of ships mainly for shorter distances (e.g. Norway's ferry fleet), upgrading ship design and optimizing operations like enhanced propeller designs, can reduce emissions from conventional fuels<sup>7</sup>. Figure 4 presents some samples of solar-powered boats. Global Maritime Forum 2023 forecasts that demand for e-fuels could rapidly scale to over 500 million tonnes by 2040 and 600 million tonnes by 2050<sup>8</sup>. Green port infrastructure like renewable energy integration decreases emissions, while improving air quality and reducing operational costs. Such measures will make ports as key hubs in the global shift towards sustainability.

In this context, there is immense economic potential in decarbonization of shipping. Analysis by global maritime forum estimates that transition to e-fuels in maritime sector could generate 4 million new green jobs by 2050, which is double the number of seafarers serving globally today.<sup>9</sup> The International Energy Agency (IEA) predicts that between now and 2050 the expansion of wind and solar capacity to grow four-five times faster than other sources of energy.<sup>10</sup>

IMO's 'Maritime Just Transition Task Force' has recognized that almost 8,00,000 seafarers may require additional training by mid-2030s to handle alternative fuels safely, on the same lines.<sup>11</sup> The *Maritime India Vision 2030* acknowledges the need for workforce capacity building, while adopting the alternative fuels and renewable energy systems. This highlights the need for structured maritime education with continuous learning modules and certification programs for the new as well as current seafarers.

## Digital and Technology Transitions

In the maritime context, study of automation is essential for understanding its impact on the workforce, sector management and operations. Automation in simple words means technology driven implementation of tasks earlier conducted by humans<sup>12</sup> It involves broad spectrum from automated navigation systems to fully autonomous ships Technologies, namely, Internet of Things (IoT), artificial intelligence (AI), machine learning (ML), blockchain technology and big data analytics are the driving force of this technological transition. Its applications involve route optimization, cargo operations management, predictive maintenance, real-time monitoring, integration of logistics network and decision-making support. The Port of Singapore is a leading example of world-class port infrastructure, handled 40 million TEUs in 2024<sup>13</sup>, supported by advanced automation and the upcoming Tuas Port, set to be the world's largest fully-automated port terminal.<sup>14</sup>

Adoption of AI has been increasing across sectors and set to become a prominent technology in the coming future. A Microsoft and PWC report of 2021 highlights that AI used in sustainability-related contexts could add up to US\$ 5.2 trillion to the global economy in 2030.<sup>15</sup> Likewise, maritime sector too stands to benefit. The ML, AI, satellite technology will be deployed in commercial ships to improve shipping safety and productivity. The SeaGPT, an AI-driven chatbot, is anticipated to become an executive assistant to the crew to retrieve and process data for communications that do not require direct human interaction.<sup>16</sup>

The IoT is a network of previously isolated objects that are embedded with sensors and software to connect and exchange data online. According to the *Global Maritime Trends 2050* Report, the maritime IoT market is projected to grow at a compound annual growth rate of 6.2 per cent between 2020 and 2027.<sup>17</sup> The same report mentions that there will be an expected 30.9 billion IoT units in 2025, up from 13.8

**Figure 4: Solar-powered Boats**



Source: University of Plymouth, UK

billion in 2021.<sup>18</sup> It helps the vessel operators to monitor and control remote maritime assets, protect offshore assets from damage, theft and unauthorised fluctuations.

Blockchain functions as a decentralised database, with data stored across various computers, making it resistant to tampering.<sup>19</sup> It could bring efficiencies in the current bureaucratic processes. Keeping real time track of cargo, speed up business operations, visibility improvement in the global supply chain, reduction in customs clearance time, costs and risks are some of the applications of blockchain technology. Norwegian Seafood Association is a prominent example which uses blockchain technology to share supply-chain data across the industry.<sup>20</sup>

The arrival of this transition has been a double-edged sword; on one side it improves efficiency and safety, while, on the other side, casts a shadow on traditional workforce dynamics. Maritime professionals and seafarers would require upskilling and reskilling on data analytics, digital literacy, remote monitoring capabilities, cybersecurity awareness, AI-driven navigation, automated cargo handling and energy efficient propulsion systems. It necessitates continuous professional development to mitigate risk of workforce displacement and certain/ensure adaptability in changing maritime landscape.<sup>21</sup>

The twin transition includes both environmental and digital transformation.<sup>22</sup> Carbon footprint of the maritime sector can remarkably diminished through digital solutions. Therefore, both ecological and digital transitions complement each other. As maritime sector navigates through these transitions, the need for a well-equipped workforce that possesses both digital and green competencies is necessary.

## Geopolitical Transitions

By 2050, de-globalisation and regional fragmentation will increasingly reshape the global economic and trade dynamics. Economies are shifting near regional integration with emerging regional blocs focused on safeguarding their important industry and sectors. Earlier, oil and gas sector influenced global supply chains. However, with advancing transition towards green energy the dependency on oil and gas industry has been decelerating. This change in adoption may give rise to strong regional alliances and new trade routes going towards self-reliance.

The future with demographic changes, technology advancements and new resource demand would drive the emergence of Asian economies. By 2050, China with nominal GDP of above US\$ 80 trillion is expected to overtake the USA as world's largest economy according to Economist Intelligence Unit.<sup>23</sup> Not far behind India, Indonesia, South Korea and Japan are also expected to contain half of world's top 10 economies by middle of the century. This transformation will also be impacted by de-dollarization trend. The year 2021 already witnessed 64 per cent of maritime imports and 43 per cent of exports of Asian economies<sup>24</sup>, which reflect their high potential to finance their trade, and their growing dominance in global seafarers' supply.

Maritime workforce will be impacted by this rearrangement of trade bloc, regionalism, sanctions and shifting chokepoints. Port workers and seafarers may face problems like uncertainties, risk exposures, longer voyages, etc. According to the *ICS Maritime Barometer 2024-25*, geopolitical tensions give rise to complicated crew logistics, insurance, operational continuity.<sup>25</sup> Disruptions in chokepoints such as Suez Canal and Red Sea routes add strain to the

existing traffic and supply chains, highlighting the demand for workforce resilience and flexibility.<sup>26</sup> Geopolitical awareness, multiple routes knowledge, risk assessment should be prioritised as core competencies in the education strategy. Strategic deployment of flexible workforce can act as a cushion against disruptions.

## Regulatory and Governance Transitions

The IMO's targets are net-zero emissions from international shipping by 2050 through combination of market-based pricing systems and technical fuel standards. Regulatory transitions are the key component to governing decarbonisation, digitalization and safety. In April 2025, IMO gave its approval of net zero framework that mandates emission limits and GHG pricing for large ocean vessels over 5000 gross tonnages, which releases 85 per cent of the total CO<sub>2</sub> emissions from international shipping.<sup>27</sup> According to *Lloyd's Register's 2025 Barometer*, there is heavy reliance on fossil fuels, only 24 per cent to 30 per cent of the industry transition is in alignment with IMO's targets<sup>28</sup>. In the Indian context, DGS estimates compliance costs at US\$ 87 – 100 million annually by 2030 with rise of 14 per cent in fuel costs and 5 per cent in freight rates but would also create strategic benefits as it targets production of 5 million tonnes of green hydrogen by 2030.<sup>29</sup> Only 14 per cent of India's registered fleet qualifies for IMO's rules, which reflects need for retrofitting and upgradation of ships and their crews.<sup>30</sup> To contain this transition, Indian maritime curriculum needs to be overhauled to include fuel intensity strategies, lifecycle emissions accounting, new propulsion systems and more. Shipyards, ports, and academic institutions need to work in synergy to train the workforce in dual-engine operations and maintenance, digital compliance technology, green fuel bunkering, etc.

Established under the International Convention for the Safety of Life at Sea (SOLAS), International Maritime Dangerous Goods (IMDG) code set out the international standard regulating the maritime transport of hazardous materials in packaged form. Since 2004, it is a mandatory framework, which provides guidelines on packaging, labelling, segregation and classification of dangerous substances to prevent pollution and accidents. IMDG code is also in sync with International Convention for the Prevention of Pollution from Ships (MARPOL- Annex III), amplifying both ecological sustainability and operational efficiency.<sup>31</sup>

The International Code of Safety for Ship using Gases or other Low-flashpoint Fuels (IGF code) provides compulsory international parameters for the arrangement and installation of equipment, and fuel systems, also for the design, operation, construction of ships using gas or low-flashpoint fuels other than vessels included in IGC code (International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk) to minimise the risks to crew, ships and environment. Its principles are based on engineering expertise, contemporary naval architecture, operational experience with periodic review system. The code acknowledges all the areas needed for the usage of gas or low-flashpoint fuels supporting sectors' transition towards safer fuels.<sup>32</sup>

Adopted by the IMO, the International Code for Ships operating in Polar Waters (the Polar code) provides mandatory regulations (design and equipment) for ships operating in Arctic and Antarctic waters. It observes that polar waters require additional demands on ships beyond those normally encountered. Polar code is executed through amendments to MARPOL, SOLAS and STCW, with part 1 consists of safety measures for SOLAS ships and part 2 talks about environmental provisions applicable under MARPOL. It considers operational

challenges of polar environment and mandates the requirements of crew training ensuring high level of safety in polar navigation.<sup>33</sup>

## Challenges to Maritime Workforce Transformation

The effective adaption in implementing the transformation of the maritime workforce is encountered with multiple challenges. A few of these challenges are discussed below.

- **Skills Gaps and Workforce Preparedness:** The wave of transition that is deemed and been advocated, is mainly the integration of green and digital technologies. However, there is a significant disparity between the current workforce skills and the new skills required to acquire for the maintenance of digital and green integration. The present-day institutional framework in the maritime sector, is largely inadequate in providing essential skill training to the workforce for the smooth transition to new methods of working and optimal efficiency.
- **Educational and Qualification Misalignment:** Most of the onshore workforce comes from the lower economic strata of the society, hence lacks basic minimum educational degrees. In addition to this, there is a disconnect between the existing education curriculum or training programs and the emerging demands for competencies. This could pose a serious challenge in transformation of the maritime sector.
- **Unmatched Technological Evolution:** The unprecedented technological evolution such as digital monitoring system or automation has further complicated the matter as it could outstrip the learning and adaptation capabilities of the workforce (both offshore and onshore). The sector also gets impacted by the high investment requirements and technical shortages to integrate renewable energy and advanced environmental monitoring.
- **Regulatory Compliance:** Rigorous and stricter environmental regulations, such as the IMO and EU targets for rapid reduction of GHG and adaptation of renewable energy, necessitate specialized training for better coordination, intervention and implementation of the measures, current workforce training is symbolic and meagre in these areas.
- **Regional Disparities:** Different countries and regions have a different training infrastructure at place, with varying levels of capacity to train and upskill the maritime sector. Therefore, a homogeneous approach at the global level to standardize the sector through benchmarked and certified training facilities gets seriously challenged, highlighting a major policy gap.
- **Risk Mitigation and Cybersecurity:** The digital transition while bringing innovation, transparency, efficiency and smartness in the management, handling and overall working of the maritime sector, also brings the potential vulnerabilities and threats of cyber-attacks and consequent system failures. Therefore, the transition not only brings the ease of doing business but also demands robust processes and tools to duly deal with the potential threats at the global level.
- **Geopolitics:** Sea routes go through countries and continents, and given the dynamics played by the digital transition, a multinational stakeholders coordination and management is a prerequisite to unhindered trade flows. Geopolitical tensions could reverse the gleaned objectives as they may complicate cooperation and stability, leading to risks to infrastructure, navigation and sovereignty affecting the nations and markets.
- **Social and Psychological Challenges:** Scheming out effective training modules that support workforce's mental and cognitive health for the challenging tasks

becomes an essential challenge, as the shift from the traditional methodologies at work, to the technology blended roles, may induce psychological stress, fatigue, and loss of situational awareness.

- **Resistance and Constraints:** There is also possibility that low wages, insecurity of jobs and resistance to the transition amongst the workforce may put a constraint on the effective learning and workforce retention to meet the emerging industry standards and demands.

To summarize, digital and green standardization and transition require coordination and concentrated consultation and efforts across the verticals of policy, education and industry for better alignment of the upskills and the needs of the sectors. Additionally, the transition also requires putting in its reach the management and handling of the geopolitical, financial, legal and human challenges with solution centric approach and strategic planning through continuous stakeholders' consultations and cooperation to ensure a sustainable, resilient, digitalized and greener maritime workforce and future ensuing it is flexible, and adaptive to the evolution of time and age.

## Proactive Approach to Global Workforce Transition

A proactive approach to maritime workforce is essential to tackle the global transitions. Maritime curriculum must be upgraded continuously. For e.g. training on Polar code (for safe navigation in polar waters), IGF code (for tackling alternative fuels and low flashpoint fuels), and the recent SOLAS guidelines (safety of life at sea), will prepare officers and seafarers are competent for the evolving transitions. On the technical front, continuous re-skilling and upskilling in energy efficiency, emissions monitoring, green propulsion systems, data-analytics, cybersecurity, AI and ML driven autonomous / expert systems, should also be incorporated at suitable levels.

Industry-academia tie ups, modular certification courses, professional development programmes and simulation labs, can aid to integrate new skills for the current workforce. An evolving framework for the maritime workforce can be formulated in consultation with all stakeholders, to minimise risk of displacement and fair access to everyone. Private shipping companies and port authorities should be encouraged through a PPP model, to invest in the capacity development.

At the international level, IMO through its technical cooperation programs such as Green Voyage 2050<sup>34</sup> (assisting developing countries to implement the energy efficiency measures and IGF code), and its 'Maritime Just Transition Force' program, attempts to bridge the environmental goals with labour protection requirements and nurture capacity building on a global scale.

India's *Maritime Amrit Kaal Vision 2047* and *Maritime India Vision 2030* include targets of green shipping and human capital development. Collective measures with Industry, Academia and Regulators, will steer a proactive transition in a just, inclusive, resilient and sustainable fashion.

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**Part IX**

**Maritime Security and  
Cooperation**







# Maritime Cooperation in Global South: An Indian Perspective

Atul Kaushik

The size of the global ocean economy has more than doubled in the past 25 years but the benefits from the ocean and exposure to its harms are not distributed evenly within and between countries. Dependency on the ocean is particularly pronounced for the over 3 billion people living in the Global South<sup>1</sup>, particularly small island developing states (SIDS) who live near the ocean.<sup>2</sup>

Around four-fifths of international trade takes place over water due to the fuel efficiency of seaborne freight as compared with land- and air- based transportation and worldwide dependency on water as a means of transportation. The Global



South accounts for a significant share of sea-borne trade, with developing countries loading approximately 60 per cent and unloading about 70 per cent of the global total in 2020, according to UNCTAD data.<sup>3</sup> The Global South accounts for a significant share of sea-borne trade, with developing countries loading approximately 60 per cent and unloading about 70 per cent of the global total in 2020, according to UNCTAD data.<sup>4</sup>

Access to oceans impacts maritime trade and is, thus, important for determining a country's economic success. However, maritime infrastructure is highly capital intensive, and the increasing use of high-end technology makes it unaffordable and inaccessible to the Global South. Further, maritime governance has traditionally been in the hands of institutions led by the Global North. These features of the marine economy add to challenges of the countries in the Global South.

Global South is increasingly driving the fast growth of marine economy. Their exports of ocean-related goods surged 34 per cent between 2020 and 2023, outpacing the global average of 26 per cent<sup>5</sup>. This is increasing the stake of the Global South in maritime economy. Global South countries are expanding their participation in a range of different maritime businesses. While, on the one hand, they are increasing their involvement in their traditional marine activities like ship scrapping, registration, and supplying seafarers, they are, on the other hand, also gradually becoming significant players in capital-intensive areas such as ship construction, ship owning, and even ship financing and insurance services. The role of maritime logistics in enabling them to seize opportunities in this rapidly evolving landscape by identifying key infrastructure, regulatory and coordination challenges cannot be overemphasised.

The unilateral tariff measures taken by the United States in 2025 have resulted in additional headwinds to global trade flows,

particularly affecting small and vulnerable economies<sup>6</sup>, threatening marginal gains made by least developed countries (LDCs), SIDS and landlocked developing countries (LLDCs). LDCs like Lao PDR and Myanmar face some of the highest new tariffs resulting in a loss of competitiveness, especially in labour intensive sectors like textiles and agriculture, posing substantial risks to their development. The US tariffs on some of the larger developing countries like Brazil, China and India are also among the highest.

Apart from the tariff related uncertainties, Global South needs to adapt to the systemic changes in the maritime sector. Digitalization and information technology infrastructure are game-changers in increasing predictability and transparency in maritime trade. Ports and border agencies are upgrading their systems, and in doing so, improving efficiency. Countries of the Global South often lack the necessary financial, technological, and human capacities to do so, even as some of their ports have become major shipping hubs. Thus, Global South needs to invest in digital infrastructure, capacity-building and strengthened governance to harness the potential of these technologies for sustainable development.

## **Maritime Relations and Cooperation within Global South**

Amongst the global commons the oceans are a transnational resource, rendering global coordination and coherence paramount. The broadest remit on ocean governance comes from the United Nations Convention on the Law of the Sea (UNCLOS - 1982), treated as the constitution for the oceans. It sets out the international legal framework governing the principles for the use of marine resources and protection of the marine environment by law. There have been several international agreements impacting ocean governance, some of them even preceding UNCLOS, for example the Convention on the Prevention of Marine

Pollution by Dumping of Wastes and Other Matter (1972) and the International Convention for the Prevention of Pollution from Ships (MARPOL – 1973). There are several others, mostly relating to regulation of fishing, but also other areas like the International Convention for the Control and Management of Ships' Ballast Water and Sediments (2004). The most recent is the Agreement on under the United Nations Convention on the Law of the Sea on the conservation and sustainable use of marine biological diversity of areas beyond national jurisdiction – the BBNJ Agreement (2023), which is yet to come into force.

Several other international agreements regulating other domains of international relations impact ocean governance, such as the World Trade Organization (WTO), the United Nations Framework Convention on Climate Change (UNFCCC) and its Paris Agreement, the Convention on International Trade in Endangered Species of Wild Fauna and Flora, the Convention of Biological Diversity, and the Sustainable Development Goals<sup>7</sup> agreed under Agenda 2030. The global treaty impacting marine economy that has most recently come into force is the Agreement on Fisheries Subsidies<sup>8</sup> that aims to prohibit fisheries subsidies that contribute to illegal, unreported and unregulated (IUU) fishing, fish stocks declared as overfished, and fishing in unregulated high seas.

Organizations like the Partnerships for the Observation of Global Oceans (POGO)<sup>9</sup>; Scientific Committee on Oceanic Research (SCOR)<sup>10</sup>; Intergovernmental Oceanographic Commission (UNESCO/IOC)<sup>11</sup> have been supporting Global South with transfer of marine technology related capacity building programs.

There are gaps in existing arrangements to govern and finance the ocean as a global public good and common pool resource. At the same time, countries of the Global South have historically not been well integrated into global ocean processes, and participating in and influencing regional

and international ocean-related agreements remains a challenge for them. The Group of 77 (G-77) usually coordinates the position of developing countries in discussions in various forums of the United Nations. Major emerging economies of Brazil, South Africa, India, and China (BASIC Group) advocate for the interests of developing countries in UNFCCC, emphasizing their need for development space while also addressing the global challenge of climate change. India along with Bangladesh, Morocco, Senegal and Tunisia has been supported by around 50 developing and LDCs in the fisheries negotiations at the WTO to introduce meaningful special and differential treatment by calculating fisheries subsidies on a per capita rather than aggregate level of subsidisation and a 25-year transition period to safeguard small and artisanal fish farmers.

The most impactful of the Global South grouping has been the Alliance of Small Island States (AOSIS) that has played a useful role in international climate and ocean talks to advocate in favour of SDG 14 (Life below water) and to draw attention to their special vulnerabilities, though after drawing on international partnerships.<sup>12</sup> The ocean economy remains critically underfunded. SDG 14 requires US\$ 175 billion annually, but only US\$ 30 billion has been disbursed since 2010, making it one of the least-funded global goals. Development cooperation has been a handy tool in this regard.

Traditionally, development cooperation has had an important role to play in supporting developing countries to tap into the ocean's opportunities and mitigate risks associated with climate change, ocean degradation, and rapid growth in ocean-based economic activities. However, ocean-related official development assistance (ODA) from developed countries has been limited, with 2022 commitments equivalent to about US\$ 2.4 billion constituting roughly 1 per cent of global ODA.<sup>13</sup> Further, it is concentrated in specific areas and regions and not entirely sustainable.

Of particular importance for developing countries, especially LDCs and SIDS, is the envisaged disbursement of revenues from the Net-Zero Fund to promote a just and equitable transition and facilitate “environmental and climate protection, adaptation and resilience building within the boundaries of the energy transition in shipping, paying particular attention to the needs of developing countries”<sup>14</sup>. Other aspects of the Net-Zero Framework that are of particular interest for developing countries include draft regulation 42, on the promotion of technical cooperation and transfer of technology related to continuous improvement in the greenhouse gas fuel intensity of ships, and draft regulation 43, which requires the Marine Environment Protection Committee to “address [...] the disproportionately negative impacts of this chapter on food security, paying particular attention to countries exposed to food insecurity”, and “keep the potential impacts of this chapter on food security under continuous review”<sup>15</sup>.

These policies and plans indicate an interest of the international community to secure interests of developing countries in the marine economy, yet there is a huge gap in meeting technology and funding requirements to realise them. Developing countries, through South-South Cooperation, are supplementing such global efforts.

## India's Engagement with the Global South

India, one of the world's 17 megadiverse countries, hosts approximately 5.3 per cent of global marine diversity with about 15,000 coastal and marine species.<sup>16</sup> India, the 16<sup>th</sup> largest maritime state, has a blue economy anchored on more than 11,000-kilometre coastline and sustainable ocean resource utilisation, contributes around 4 per cent to national GDP and facilitates 95 per cent of trade by volume through maritime routes.<sup>17</sup> High growth sectors such as fisheries, shipping,

renewable energy and tourism offer significant potential for economic diversification and job creation.

Keeping these national and regional factors in consideration, India has taken several steps to garner the marine economy for its national endeavours while at the same time taking steps to engage in development partnerships for the Global South.

While disparate efforts on the blue economy and oceans strategy have been made by India for a long time, these were primarily focused on national priorities. Gradually, a regional and Global South focused policy paradigm has emerged in India. In an effort to bring littoral states of the Indian Ocean together, India promoted the Indian Ocean Naval Symposium (IONS) bringing together 35 navies of the region in 2008. A comprehensive maritime doctrine or strategic document was released by the Indian Navy called “Ensuring Secure Seas: Indian Maritime Security Strategy” in 2014<sup>18</sup>. In 2019, Indian Prime Minister launched the Indo-Pacific Oceans' Initiative (IPOI) at the 14<sup>th</sup> East Asia Summit (EAS), held in Bangkok as an open, non-treaty based global initiative that seeks to manage, conserve, sustain, and secure the maritime domain.<sup>19</sup>

A comprehensive look at the blue economy emerged in 2015, when the Indian Prime Minister announced Vision SAGAR<sup>20</sup> (Security and Growth for All in the Region), a focused Indian Ocean doctrine aimed at combating terrorism, piracy, and trafficking. Defence Minister of Madagascar, Richard Rakotonirina, stated that the Indian Ocean Island states view India as a significant actor playing the role of a ‘security umbrella which maintains peace and prosperity in the area’ and these states benefit from India's capacity building assistance in tackling various maritime threats<sup>21</sup>. SAGAR has since evolved into Vision MAHASAGAR<sup>22</sup> (Mutual and Holistic Advancement for Security and Growth Across Regions), launched in March 2025, which extends that ambition to the Global

South, embracing Africa, Latin America, and the Pacific Islands.

The objective of Vision SAGAR is to safeguard India's interests in the Indian Ocean Region (IOR) and strengthen the defence and maritime capabilities of friendly countries in IOR. Vision MAHASAGAR builds on Vision SAGAR and expands its scope from the Indian Ocean to the wider Global South. It focuses on trade, development cooperation, capacity building, sustainable growth and mutual security for the broader Global South, looking further afield to build a community of shared values and aspirations among developing countries. MAHASAGAR encompasses the ideas of trade for development, capacity building for sustainable growth, and mutual security for a shared future, under which India will extend cooperation through technology sharing, concessional loan and grants. The Prime Minister stated at its launch: "The objective was also to bring the voice of the Global South to the global high table. In advancing Vision MAHASAGAR, we are demonstrating and signalling once again our commitment to the Global South."<sup>23</sup>

India, of course, has miles to go to be more impactful in global maritime trade. It has targeted to go from the current 16<sup>th</sup> position in world shipping to 5<sup>th</sup> position and increase the representation of Indian seafarers from the current 12 per cent to 25 per cent by 2047.<sup>24</sup> As per reports, every year an estimated USD 75

Billion<sup>25</sup> is paid to foreign shipping companies, impacting India's foreign exchange reserves. This translates to approximately 93 per cent of Indian-origin or international destination cargo shipments and 39 per cent of Indian cargo is shipped on foreign vessels. It has to further improve its port logistics, cost efficiency and technological knowhow apart from taking initiatives towards green shipping and alternative fuels and LNG bunkering to make a greater impact on global maritime sector. It has to evolve from a ship breaking nation to a ship building one to save the freight charges it pays annually today.

To accelerate the pace of maritime reforms, the Indian Parliament has recently passed five key maritime bills – The Merchant Shipping Bill 2025, The Indian Ports Bill 2025, Coastal Shipping Bill 2025, The Carriage of Goods by Sea Bill 2025, and The Bills of Lading Bill 2025. They cover a whole host of maritime aspects related to ports, shipping, etc., replacing old and outdated legislations on these issues. The Indian Parliamentary Committee on External Affairs<sup>26</sup> has recently urged the Indian government to undertake a comprehensive review and emphasised the need to sequence ambitions and consolidate the near seas before extending to the far oceans.

Further, the Maritime India Vision 2030 captures the essence of India's development cooperation in the statement: Uniting Oceans, One Maritime Vision is more than a tagline –

### Box 1: Sagarmala Programme of India

Areas identified for development assistance:

- Technological Assistance: develop software and technology platforms for Maritime community; Naval architecture and shipbuilding/ship repair; Ocean engineering and hydrography; Long-range identification and tracking.
- Infra assistance: Port management, port design, and institutes in collaboration with business houses; shipbuilding/ship repair and recycling; dredging
- Capability development: Maritime Law; seafarers

Source: <https://sagarmala.gov.in/sites/default/files/MIV%202030%20Report.pdf>

it is our commitment to bringing the world's maritime stakeholders together in the current geopolitical environment.<sup>27</sup> The development cooperation focus of the Vision is writ large in it: two of its foci are (i) enhancing maritime cooperation across BIMSTEC nations - Enabling India to play major role in development of Maritime trade between BIMSTEC countries (e.g. capability development, mutual agreements, etc.), and (ii) collaboration with other maritime nations - Expanding cruise / ferry connectivity and driving tie-ups/MoUs across topics with various countries to enhance maritime co-operation. This dovetails well into the development cooperation vision embedded in India's Sagarmala programme in 2015 (Box 1).

India has elaborate plans to collaborate with the Global South in its Vision of a Viksit Bharat (developed country status) by the centenary year of its independence in 2047, called Amrit Kaal. As a broader, more comprehensive roadmap for maritime transformation in the next 25 years, Maritime Amrit Kaal Vision 2047 elaborate extensive steps to establish India as a global maritime leader, promoting economic growth and creating job opportunities. In this vision, India will continue to collaborate with BIMSTEC and IORA member countries in the field of maritime security, disaster management, and value-added courses.<sup>28</sup>

To realise the vision, the Indian Ports Association (IPA) and Research and Information System for Developing Countries (RIS) have launched the Centre for Maritime Economy and Connectivity (CMEC) to give shape to India's maritime vision and various associated dimensions.<sup>29</sup> RIS also hosts DAKSHIN, the Global South Centre of Excellence established during India's G-20 presidency in 2023, a platform of development solutions which connects think-tanks and academia of the Global South. Under Indian Technical and Economic Cooperation (ITEC) programme, India is offering training and capacity building on issues relevant for blue economy to countries of the

Global South in premium institutions like the Gati Shakti Vishwavidyalaya, Indian Institute of Remote Sensing, and Land Ports Authority of India (LPAI).<sup>30</sup> India has also started special Sagar Amrut Scholarships for the 14 Pacific Island countries and QUAD Infrastructure Fellowships for the 17 Indo-Pacific countries.

The trilateral security arrangement between India, Maldives, and Sri Lanka, signed in 2013 as a maritime security framework was an early Maritime Domain Awareness (MDA) framework in the region with a focus on anti-piracy operations, naval Search and Rescue (SAR) operations, and surveillance of Exclusive Economic Zones (EEZs). Much more can be done. In the Indian Ocean region, for example, there is a need to identify existing facilities of select institutes and offer courses and obtain feedback, and develop capabilities across Indo-Pacific and BIMSTEC nations. Many IORA and BIMSTEC member countries do not have their own Long-Range Identification and Tracking (LRIT) data centre for tracking ships; India's LRIT National Data Centre can step in for assistance. India can also offer its core expertise to developing countries for collaboration across the other domains of technology, infrastructure, and capability development.

India's capacity building initiatives have historically been largely focused on its maritime neighbourhood, but are gradually expanding beyond the region. Sri Lanka, Maldives, Bangladesh, Myanmar, Seychelles, and Mauritius have been the largest beneficiaries of India's capacity development initiatives. Personnel of law enforcement agencies of Maldives, Sri Lanka, Singapore, Seychelles, and Madagascar have received training from India to strengthen their maritime capabilities and human resources.

Beyond its neighbourhood, India's capacity development projects on IUU fishing, maritime pollution, and piracy extend to the ASEAN countries.<sup>31</sup> In terms of institutionalised collaboration, the ASEAN-India Maritime

### Box 2: Summary of Development Cooperation by India

**Capacity development:** Naval hardware transfer

**Capability enhancement:** Bilateral and multilateral maritime exercises; Coordinated patrols; Cast Guard exercises; EEZ patrols; Hydrographic assistance, training assistance

**Maritime cooperation enabling environment:** IONS, IORA, Navy to Navy talks, Coast Guard talks, White shipping, IFC-IOR, Goa Security Conclave, Colombo Security Conclave

*Source:* Adapted from Kiran G S K and Saikia P (2025) *India's maritime cooperation in the Indo Pacific: understanding India's capacity building mechanisms*, Australian Journal of Maritime & Ocean Affairs, DOI: 10.1080/18366503.2025.2550074 (accessed 4 October 2025)

Exercise and the QUAD Malabar Exercise focusing on maritime security related issues, and the India-Brazil South African Maritime Exercise (IBSAMAR) that also focuses on humanitarian disasters and counter-piracy are worth mentioning. The inaugural Africa-India Key Maritime Engagement (AIKEYME) exercise held in April 2025 to enhance maritime cooperation and interoperability between India and several African nations is a recent example of India going beyond the immediate neighbourhood.

Maritime cooperation by India supplements several global initiatives through North-South, South-South and triangular cooperation. Just to mention some recent initiatives, the Nice Oceans Action Plan in the UN Oceans Conference Declaration of June 2025 supports enhancing cooperation, including South-South and triangular cooperation, to strengthen mechanisms for collaboration, peer learning, knowledge - sharing and exchange of best practices within marine scientific research, and to support developing countries in addressing their constraints in access to technology, and analysing and using reliable data and statistics.<sup>32</sup> Launched as a partnership between the UN Global Compact and UNEP Finance Initiative, the Ocean Investment Protocol 2025 is similarly a framework for financial institutions, policy makers and industry leaders to lead the growth of the sustainable ocean economy to achieve Sustainable Development Goal 14 (Life Below Water) and other related SDGs.<sup>33</sup> Such collaborative initiatives help the Global

South manage the various challenges faced in harnessing the blue economy sustainably.

### Addressing Challenges

The maritime world has always been full of challenges, but they are increasing rapidly. Major concerns apart from the evident geopolitical and geoeconomics security related challenges include the implications of climate change including sea level rise, threat to marine life and biodiversity including IUU fishing, ocean acidification and pollution. Steps being taken to address these challenges pose iniquitous costs on the Global South with its limited capital and technology prowess in the marine economy. The Indian Ocean is most impacted by marine environmental degradation and is also more prone to natural disasters. The Indian Ocean warms up faster, it creates deoxygenation, and the impact of sea-level rise is increasingly being seen, for instance in wave driven floods, climate driven migration among others.<sup>34</sup>

The maritime industry is highly regulated. There are numerous national, regional, and international regulations governing everything from ship safety and environmental protection to labour standards and trade compliance. Navigating this regulatory landscape is more challenging for the Global South with its limited resources. On top of it, new regulations are being introduced frequently. Meeting sustainability related regulations, such as the IMO's existing regulations intended to bring down greenhouse gas emissions by 40 per

cent by 2030<sup>35</sup> and limiting sulphur content in marine fuel to 0.5 percent<sup>36</sup>, are already adding to the cost of operation of vessels owned by developing countries. IMO's Net-Zero Framework, approved in April 2025, establishing regulation targeting net-zero emissions by 2050 further adds to the problem. The maritime industry is rapidly adopting new technologies (smart ship applications relying heavily on machine data and sensors) and embracing digitalisation (use of artificial intelligence), areas in which the Global South needs to do a lot of catch up.

With increased global value chains integration and resultant increase in movement of goods across oceans, port upgradation has become an imperative that overawes the Global South due to its capital intensity and technology absorption challenges. The complexity and cost for regular maintenance and repair of ships to ensure their safety, efficiency, and longevity is particularly challenging for the resource and technology constrained Global South.

Collaborative efforts among the stakeholders from the Global South in the maritime sector are of paramount importance to leverage scarce resources that they can individually contribute to increase their footprints in the global maritime sector. In this regard, it is notable that the African Union (AU) celebrated the decade of 2015-2025 as the decade of African Seas and Oceans, and called for Continental and global collaborations. Despite the challenges emanating from the Red Sea shipping crisis, Africa has made significant improvement in port and vessel performance, trade facilitation and transition to clean energy. India's SAGAR in collaboration with other initiatives like IORA, the African-Asian Legal Consultative Organisation (AALCO) and the Zone of Peace and Cooperation of the South Atlantic (ZOPACAS) could serve as instrumental tools for enabling the implementation of ideas of trans-continental maritime governance institutions within the South-South cooperation.<sup>37</sup>In

Asia, the Indonesian government has made the maritime sector one of the priority development agendas and intensified its efforts to reduce transportation costs, among others by establishing a 'maritime highway'.<sup>38</sup> Similar efforts are underway in the rest of Asia and in Latin America.

The Global South needs collaborations not only within, but with the more technologically advanced Global North to address its challenges. Some efforts in this regard, beyond the multilateral sphere such as through IMO, are welcome. India's IPOI, with its seven pillars<sup>39</sup>, gained resonance and support from some key players, including Australia, Japan, France, Vietnam, and the Philippines. There is a great degree of convergence between the EU's Indo-Pacific strategy and India's IPOI, including the Indo-Pacific Regional Information Sharing Platform (IORIS)<sup>40</sup> under the CRIMARIO project of the European Union (EU). In a similar effort, the Information Fusion Centre-Indian Ocean Region (IFC-IOR) was established in 2018 by India to host International Liaison Officers (ILOs) from 14 countries and connected with 50 organisations from 25 countries. MITRA, an Indian communication platform that utilises the NISHAR (Network for Information Sharing) tool to enhance interoperability in maritime functions supports key functions of the IFC-IOR.

To overcome the challenges faced by the Global South, they need to advance beyond their traditional maritime activities of ship scrapping, registration, and supplying seafarers while further honing and expanding the skill-set needed for traditional activities.

With their labour cost-efficiency, they could consider evolving from ship scrapping to ship repair, ship retrofitting, and shipbuilding. The Global North needs to assist the Global South in meeting the requirements under the Hong Kong Convention (formally the Hong Kong International Convention for the Safe and Environmentally Sound Recycling of Ships) that

has recently entered into force. Financial support for the development of maritime, coastal and port-related infrastructure and equipment will be particularly critical for the Global South. For greater participation in maritime trade, they need financial, technological and technical assistance from private operators and development partners, particularly in using artificial intelligence.

Many developing countries have abundant solar and wind resources and existing renewable energy infrastructure as well as legacy infrastructure that could be repurposed for low-carbon hydrogen production and transport.<sup>41</sup> Investment in new facilities to accommodate new cargo types and bunkering in developing countries would also be the key to a just and equitable transition.

These are anecdotal examples of both the challenges and the means to address them based on the Indian experience. More research, and more importantly, more involvement of international intergovernmental organisations and funding agencies is required to map out the challenges as well as contribute to their solutions.

## Conclusion

The Indian Ocean is a global geo-strategic axis. Not only does this body of water serve as home to 40 per cent of the world's population, it also incorporates more than 50 per cent of the world's oil and 45 per cent of the world's gas reserves and a huge seabed of mineral resources. Equally important is the fact that the region boasts of an active sea lane that plays host to more than half of the world's container shipments, including two-thirds of oil shipments across the world.<sup>42</sup> It is also a critical waterway between Pacific Asia, Africa, and Europe, and the busiest and most significant

communication corridor, with 61 per cent of world container traffic and 70 per cent of world petroleum transit.<sup>43</sup> Maritime transport through the Indian Ocean, therefore, is both nationally and globally important where the Global North and the Global South are intrinsically intertwined. However, studies often focus on the Global North while neglecting the Global South.<sup>44</sup> India is at the heart of this ocean named after it, and now with Vision MAHASAGAR has ambitions to expand its footprints beyond this ocean.

More research is required to address the needs of the countries of the Global South in Africa, Asia and Latin America. And all these regions are growing faster than the Global North, making this exercise not only pertinent but urgent. At a global level, any policy roadmap to strengthen Global South cooperation in the maritime economy must focus on enhancing sustainable infrastructure, promoting inclusive industrialization, and improving trade and connectivity through digital technologies and regional initiatives. Key actions include upgrading port resilience, increasing access to finance for small enterprises, and facilitating trade through harmonized procedures and digital platforms. The strategy must also emphasize capacity building, knowledge sharing, and strong governance mechanisms to ensure long-term economic growth and environmental protection.

With its ambitious Vision MAHASAGAR initiative, India is poised to take the lead along with other similarly situated countries of the Global South to contribute to this research as well as expand its efforts to build the capacity of other littoral developing countries to enable increased participation in the maintenance of free, open and sustainable global maritime sector.

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# Tides of Cooperation: India's Pathway to Maritime Security in Southeast Asia

Premesha Saha

Maritime security today extends well beyond traditional naval conflict to encompass piracy, smuggling, illegal fishing, maritime terrorism, and environmental risks. The Indo-Pacific's sea lanes are a lifeline for global commerce, with a large share of the world's seaborne trade crossing these waters; their security is therefore both an international concern and a regional priority. Southeast Asian states — many in the Global South — face complex, transboundary risks that no single country can manage alone, which is why regional



actors increasingly emphasise cooperative approaches to safeguard the maritime commons. This article defines maritime security in contemporary terms, surveys core challenges in Southeast Asia, outlines India's eastward maritime initiatives, and examines capacity-building and coordination efforts. It also sets out a concise, actionable set of policy recommendations—highlighting India's role in the maritime security of Southeast Asia. As India heads into *India Maritime Week 2025* in late October 2025—a forum focused on safety, security, and collaboration—the arguments advanced here align with *Maritime India Vision 2030* and *Maritime Amrit Kaal Vision 2047*<sup>1</sup>, underscoring New Delhi's commitment to a secure, prosperous maritime future and the growing importance of cooperative security.

## Defining Maritime Security and the Need for Cooperation

Maritime security can be defined as the condition of freedom from threats arising “in, from or through the sea,” encompassing both traditional naval threats and a wide spectrum of non-traditional dangers.<sup>2</sup> In practice, this means protecting the maritime domain – ports, coastal waters, and high seas – against risks such as piracy and armed robbery, illicit trafficking of people, weapons or narcotics, terrorism at sea, illegal fishing, and even natural hazards or environmental degradation. Unlike traditional security concerns which center on inter-state military conflict, these non-traditional maritime threats are typically transnational, fluid, and intertwined with economic and human security. For example, illegal, unreported and unregulated (IUU) fishing not only undermines marine ecosystems and coastal economies, it is often linked to organized crime networks and labor abuses at sea.<sup>3</sup> Maritime terrorism and hijackings – such as the 2004 SuperFerry 14 bombing in the Philippines or the wave of kidnappings by the Abu Sayyaf Group around 2016 – illustrate how non-state actors can exploit

maritime routes.<sup>4</sup> Environmental threats like oil spills, marine pollution, and climate change-induced disasters (cyclones, extreme flooding, sea-level rise) also directly impact maritime safety and require a security response in terms of disaster relief and resilience building. In short, maritime security today is multidimensional, blending elements of national defense with law enforcement, environmental protection, and human security.

Given the transnational nature of these challenges, international and regional cooperation is indispensable. Piracy, smuggling and IUU fishing routinely cross maritime borders and legal jurisdictions, exploiting seams in law and capacity. No country can monitor and police the vast ocean spaces alone. Regional centres and initiatives are built around exactly this problem. In Southeast Asia, this reality has pushed ASEAN to prioritise cooperative security through its ASEAN Outlook on the Indo-Pacific (AOIP), which calls for substantive, practical and tangible cooperation under ASEAN-led mechanisms, and through ADMM-Plus, which commits defence ministers to deepen capacity-building in areas such as humanitarian assistance, search and rescue, and early-warning systems.

Effective maritime security thus demands pooling of resources and intelligence, harmonizing legal approaches, and conducting coordinated operations among littoral states. Collective action amplifies each nation's capacity – whether through combined patrols that share the burden of maritime policing, or rapid humanitarian assistance from neighbors after disasters. In essence, cooperation is not just desirable but critical for maritime security.

## Key Maritime Security Challenges in Southeast Asia

Southeast Asia's maritime domain faces an array of security threats, both traditional and non-traditional. Traditional challenges involve inter-state tensions over sovereignty and rights,

exemplified by disputes in the South China Sea, while non-traditional threats stem from transnational criminal activities and other illicit or unsafe practices at sea.

## Piracy and Sea Robbery

Maritime piracy and armed robbery remain persistent concerns in Southeast Asian waters. The region has consistently accounted for a large share of global piracy incidents, concentrated in strategic chokepoints and archipelagic waters. In 2023, a total of 100 incidents of piracy and armed robbery were reported in Asian seas (virtually all were armed robbery in territorial waters rather than high-seas piracy), marking a 19 per cent increase from the previous year.<sup>5</sup> Notably, the Straits of Malacca and Singapore – one of the world’s busiest shipping lanes – saw 63 reported incidents in 2023, up from 55 in 2022.<sup>6</sup> Incidents were also on the rise in the waters of Indonesia, the Philippines, Thailand and Vietnam.<sup>7</sup> In response, regional bodies and agreements like the ReCAAP Information Sharing Centre facilitate cooperation to combat piracy. Enhanced patrols and information-sharing have shown some success: for instance, early 2024 saw a downturn in cases in the Singapore Strait following joint efforts by littoral states.<sup>8</sup> Nonetheless, the continuing volume of incidents underscores the need for sustained vigilance and collaborative security measures to keep vital sea lanes safe.

## Illegal, Unreported and Unregulated (IUU) Fishing

The IUU fishing has emerged as a serious non-traditional security threat across Southeast Asian waters. The region’s rich fisheries are of critical importance – six ASEAN member states rank among the world’s top fish producers – yet these resources are imperiled by rampant illicit fishing.<sup>9</sup> The IUU fishing ranges from poaching by foreign vessels in exclusive economic zones to local boats using destructive practices and under-reporting catches. It exacts huge

economic and ecological costs: one estimate put annual financial losses from IUU in the ASEAN region at roughly US\$ 6 billion, alongside undermining of tax revenues, food security and conservation efforts.<sup>10</sup> By accelerating overfishing and habitat destruction, IUU fishing threatens already over-exploited fish stocks and marine biodiversity, deepening the hardship of coastal communities who rely on the sea for their livelihoods. The problem often involves well-organized networks – for example, fleets of foreign fishing boats (sometimes linked to state-backed maritime militia) have been caught encroaching in Indonesian or Malaysian waters. Southeast Asian governments have started to push back. Indonesia, long seen as a regional leader in anti-IUU enforcement, continues to crack down on poachers – in one 2023 operation, its authorities intercepted 14 illegal foreign fishing vessels (from Vietnam, Malaysia, and the Philippines) caught trespassing in Indonesian waters.<sup>11</sup> At the regional level, ASEAN has adopted a Roadmap for Combating IUU Fishing and strengthened coordination mechanisms for vessel monitoring and law enforcement cooperation.<sup>12</sup>

## Smuggling and Transnational Maritime Crime

Maritime routes in Southeast Asia are routinely exploited by transnational criminal networks to smuggle illicit goods and even people. The region’s extensive coastline, busy ports, and porous maritime boundaries make it a convenient corridor for trafficking in narcotics, weapons, contraband goods, and human beings. In particular, the drug trade has increasingly taken to the sea. The UN Office on Drugs and Crime (UNODC) reports that organized syndicates have adapted their routes to evade crackdowns on land – notably, traffickers from the Golden Triangle (the narcotics-producing area spanning Myanmar, Lao PDR, and Thailand) have shifted large methamphetamine shipments southward to maritime routes. This trend has continued to grow. Tellingly, in

mid-2025 Indonesian authorities scored the country's largest-ever drug seizure when a joint naval and police operation intercepted a vessel carrying two tons of crystal meth bound for Indonesia from the Golden Triangle region.<sup>13</sup> The haul – worth an estimated US\$ 200–400 million – underscores both the scale of maritime drug smuggling and the success that better inter-agency coordination can achieve in combating it.<sup>14</sup>

Human smuggling and unsafe migration by sea are likewise pressing concerns. Southeast Asia has witnessed recurrent maritime people-smuggling crises, most visibly involving Rohingya refugees and Bangladeshi migrants risking deadly voyages across the Bay of Bengal and Andaman Sea. The past two years saw a sharp uptick in such journeys. In 2024 alone, over 7,800 Rohingya refugees attempted to flee by sea – an 80 per cent increase from the year before – and more than 650 of them died or went missing during the passage.<sup>15</sup> Tragic incidents of overloaded boats capsizing or being stranded at sea have drawn international alarm, prompting calls by the UNHCR for a more humane and coordinated regional response.<sup>16</sup> Beyond migrants, other forms of contraband smuggling (from small arms to wildlife trafficking) also plague the region's waters. Tackling these illicit flows requires strengthening maritime law enforcement cooperation – such as information-sharing networks, joint patrols, and capacity-building in surveillance and interdiction – so that coastal states can monitor their vast sea lanes more effectively. Progress is being made (for example, through UNODC-supported maritime security training and new patrolling initiatives), but the clandestine nature of smuggling means it will remain a formidable challenge.

## Maritime Terrorism and Safety Risks

Maritime terrorism – the threat of violent extremist groups using the sea to conduct

attacks or raise funds – is a security challenge that, while muted lately, cannot be overlooked. In the mid-2010s, parts of Southeast Asia saw a spate of kidnappings and attacks at sea linked to terrorist-insurgent groups (most infamously the Abu Sayyaf Group in the southern Philippines). Since 2017, a concerted crackdown by the Philippines, Malaysia, and Indonesia – including coordinated naval patrols in the Sulu and Celebes Seas – has largely suppressed this menace.<sup>17</sup> No ship crew abductions have been reported in those waters since January 2020, allowing authorities in 2023 to even downgrade the assessed threat level for piracy/terrorism in the area from “moderate” to “moderate-low”.<sup>18</sup> Nonetheless, the risk has not vanished entirely. Resilient splinter cells or other extremist actors could still seek maritime targets of opportunity, whether for kidnapping, sabotage, or even potential attacks on ports and ferries. Regional security forces thus remain alert, conducting trainings and sharing intelligence to preempt any resurgence of seaborne terrorism.

Maritime safety is an important aspect of security in Southeast Asia's crowded seas. The region's waters see some of the heaviest maritime traffic on the planet – including dense clusters of commercial shipping, fishing boats, and passenger ferries – and this congestion heightens the risk of accidents. The Strait of Malacca and Singapore, for example, handles around 90,000 vessel transits a year, and its narrow channels leave little margin for error.<sup>19</sup> Collisions or groundings in such chokepoints can have cascading impacts: they not only endanger lives and disrupt commerce, but also carry environmental risks like oil spills. In July 2024, a Singapore-bound tanker collided with another tanker in busy waters off Johor, Malaysia, igniting a shipboard fire and prompting fears of a major oil spill in the vital sea lane.<sup>20</sup> Governments are working to upgrade vessel traffic management systems, enforce safety standards on ships, and cooperate on search-and-rescue capabilities.

## Sovereignty Disputes and Grey-Zone Coercion

Heightened sovereignty disputes in Southeast Asian seas – above all in the South China Sea – form the backdrop of many security issues and remain a flashpoint in their own right. Tensions have occasionally erupted into standoffs and confrontations, raising concerns about conflict among regional states. While outright naval battles have been avoided, grey-zone coercion by China has become a regular occurrence. This refers to aggressive maneuvers short of open warfare – typically involving China’s coast guard and a government-backed maritime militia of ostensibly civilian fishing vessels – to intimidate other claimants and assert de facto control over disputed waters.<sup>21</sup> Over the past few years, Southeast Asian governments have repeatedly protested incidents of Chinese ships harassing their oil exploration activities, shadowing their coast guard patrols, or chasing away local fishermen within these states’ own maritime zones. In 2023, such tactics intensified against the Philippines for instance, which has become a focal point of China’s efforts to enforce its claims. In one notable episode, the Philippine Coast Guard reported that more than 135 Chinese vessels were detected “swarming” around Whitsun Reef (Julian Felipe Reef) inside the Philippines’ EEZ – a mass deployment Manila called an “alarming development” amid already heightened tensions.<sup>22</sup> That same year saw a flash of confrontation at Second Thomas Shoal (Ayungin Shoal), where a Philippine navy vessel is stationed: China Coast Guard ships used water cannons and dangerous maneuvers to block a Philippine resupply mission to the shoal, drawing sharp condemnation from the Philippines and international partners.<sup>23</sup>

These grey-zone activities present a dual challenge. In the immediate term, they erode the ability of Southeast Asian states to exercise their sovereign rights – undermining fishing, resource exploration and law enforcement in their own waters – while letting China press its

claims without triggering a military response. Over the longer term, they risk normalizing a more militarized and unstable maritime environment. There is growing worry that a miscalculation or collision during one of these confrontations could spiral into a larger crisis. To manage these disputes, ASEAN and China have been negotiating a Code of Conduct for the South China Sea, and regional navies increasingly communicate to prevent incidents at sea. However, progress is slow, and the balance-of-power asymmetry in these contested waters means Southeast Asian nations must constantly navigate between defending their maritime entitlements and avoiding provocation. The sovereignty disputes thus continue to be a dominant maritime security concern, one that demands careful diplomacy alongside enhanced deterrence and partnership with extra-regional powers to uphold a rules-based order.

## India’s Maritime Security Initiatives Focused Eastward

India, as a major Indian Ocean power with an expanding strategic outlook, has in recent years undertaken a series of maritime security initiatives “eastward” – engaging the Bay of Bengal, Southeast Asia, and beyond into the wider Indo-Pacific.

## SAGAR and MAHASAGAR Initiatives

**SAGAR (2015):** Announced in 2015, SAGAR articulates India’s commitment to cooperative maritime security in the Indian Ocean and adjoining seas. It emphasizes respect for international law (including UNCLOS), dialogue with partners, capacity building, and collective action against non-traditional threats. Under SAGAR, India has pursued closer naval and coast guard ties with littoral states from East Africa to Southeast Asia. For example, India has institutionalized Coordinated Patrols (CORPAT) with several Southeast Asian

neighbors – like with Indonesia, where the Indian and Indonesian navies have conducted coordinated patrols along their maritime boundary twice a year since 2002<sup>24</sup> to keep sea lanes safe for shipping. In practice, SAGAR is implemented via a whole-of-government approach: the Indian Navy, Coast Guard, Ministry of External Affairs and other agencies work together to support neighboring countries with maritime domain awareness (MDA) services, training, and humanitarian assistance.<sup>25</sup>

**MAHASAGAR (2025):** In 2025, India expanded the scope of SAGAR with the launch of MAHASAGAR – “Mutual and Holistic Advancement for Security and Growth Across Regions.” Announced by Indian Prime Minister during a visit to Mauritius in March 2025, MAHASAGAR is described as an evolution of SAGAR’s vision as it enters its second decade. Whereas SAGAR was regionally focused on the IOR, the new MAHASAGAR initiative signals a broader Indo-Pacific outlook with an emphasis on the Global South.<sup>26</sup> It aims to link India’s immediate Indian Ocean security efforts with those further east in Southeast Asia and beyond, under a holistic framework of inter-regional maritime cooperation.

**Indo-Pacific Oceans Initiative (IPOI):** At the East Asia Summit in Bangkok in November 2019, India unveiled the Indo-Pacific Oceans Initiative. The IPOI is a comprehensive framework for regional collaboration on maritime affairs, structured around seven interrelated pillars: (1) Maritime Security; (2) Maritime Ecology; (3) Marine Resources; (4) Capacity Building and Resource Sharing; (5) Disaster Risk Reduction; (6) Science, Technology & Academic Cooperation; and (7) Trade Connectivity & Maritime Transport.<sup>27</sup> This initiative aligns closely with ASEAN’s Outlook on the Indo-Pacific and seeks to reinforce a “free, open, inclusive, and rules-based maritime order”. Each pillar has lead partners – for example, Australia leads on Maritime

Ecology, Japan on Connectivity, and France on Marine Resources, while India naturally champions some security and capacity aspects. IPOI’s Capacity Building pillar dovetails with India’s SAGAR efforts – focusing on training, technical assistance, and resource-sharing to uplift smaller states’ maritime capabilities. Notably, IPOI explicitly encourages linking up with ASEAN-led mechanisms and the Pacific Islands Forum, ensuring that India’s approach complements existing regional architectures.

## Maritime Domain Awareness and Information Fusion Centre

A cornerstone of India’s cooperative security outreach is improving maritime domain awareness (MDA) across the region, especially for the benefit of smaller littoral states. The flagship effort is the Information Fusion Centre – Indian Ocean Region (IFC-IOR), established by the Indian Navy at Gurugram in late 2018. The IFC-IOR is a 24/7 regional maritime surveillance and information-sharing hub; it hosts International Liaison Officers (ILOs) from about 12 partner countries and maintains real-time linkages with dozens of other maritime centers worldwide.<sup>28</sup> As of 2024, India hosts liaison officers from 12 nations at IFC-IOR and has around 67 international information-sharing linkages connecting the center with other MDA hubs across the globe (including similar fusion centers in Singapore for Southeast Asia and the Pacific Fusion Centre for the island states)<sup>29</sup>. The IFC-IOR’s mission is to fuse data from coastal radars, AIS transponders, satellites and open sources to generate a common operational picture of the waters, focused primarily on “white shipping” (commercial vessels).

Another aspect of building MDA capacity is developing coastal surveillance infrastructure for partner states. India has helped install Coastal Surveillance Radar Systems (CSRS) in several Indian Ocean littoral countries, creating a radar chain whose feeds are often integrated into India’s own information

centers.<sup>30</sup> Plans have been discussed to extend similar radar support to certain Southeast Asian rim countries to cover key chokepoints in the Bay of Bengal. Additionally, India has provided patrol vessels and aircraft to bolster neighbors' maritime security.<sup>31</sup> The Indian Navy has also periodically stationed maritime patrol aircraft (such as Dornier surveillance planes) in friendly countries upon request to conduct joint EEZ surveillance – as done with Mauritius and Seychelles – to help monitor fishing zones and deter illicit activities.<sup>32</sup>

## India-ASEAN Maritime Engagement

India's maritime security ties with Southeast Asia have deepened considerably, recognizing ASEAN's central role in the region's security architecture. In recent years, this partnership has translated into more concrete cooperation at sea. A milestone was the inaugural ASEAN-India Maritime Exercise (AIME) held in May 2023, co-hosted by India and Singapore. The exercise brought together naval ships and aircraft from India and all 10 ASEAN member states for maneuvers in the South China Sea. In the sea phase, roughly 1,400 personnel and nine warships participated, including India's INS Delhi and Satpura alongside vessels from Singapore, Indonesia, Malaysia, Brunei, Thailand, Vietnam, the Philippines and others. The drills featured tactical maneuvers, cross-deck helicopter landings, maritime interdiction exercises and search-and-rescue simulations.<sup>33</sup> Such combined exercises build familiarity and trust, complementing other multilateral engagements that India participates in (for example, the Rim of the Pacific (RIMPAC) exercise, Western Pacific Naval Symposium activities, and India's own MILAN multinational exercise series which regularly includes ASEAN navies).

Beyond exercises, India-ASEAN maritime cooperation involves strategic dialogue and capacity-building initiatives. The ASEAN-India Strategic Partnership Plan of Action (2021-2025)

highlights collaboration on maritime safety and security, including joint efforts against piracy, adherence to UNCLOS, and sustainable use of marine resources.<sup>34</sup> India and ASEAN are also discussing an ASEAN-India Maritime Transport Agreement to improve regional connectivity. On the capacity-building front, India offers training slots in its naval academies, hydrography and maritime law enforcement courses for ASEAN member state personnel. Indian Navy ships regularly make port visits to Southeast Asian countries and conduct table-top exercises with their counterparts on humanitarian assistance, disaster relief, and oil-spill response. Institutionally, India is an active member of bodies like the Indian Ocean Naval Symposium (IONS) – which includes several ASEAN navies – and has engaged in ARF inter-sessional meetings on maritime security, even co-chairing workshops on law enforcement at sea. Furthermore, India's involvement in minilateral groupings like the Quad (with the US, Japan, Australia) indirectly benefits Southeast Asia; for example, the Quad's IPMDA initiative launched in 2022 will provide ASEAN and Pacific Island states with better access to satellite tracking data to monitor illicit maritime activities.<sup>35</sup> In sum, India's outreach to ASEAN on maritime security is multi-pronged – combining diplomacy, training, technological support and combined operations.

## Challenges in Implementing India's Eastward-Focused Maritime Initiatives

### Operational Constraints

India's eastward maritime ambitions face significant operational hurdles. Resource constraints are a major factor – India's maritime programs often outstrip the available budget and assets, slowing implementation. Even flagship efforts like SAGAR have been hampered by “budgetary shortfalls and lack of resources”, which limit India's ability to deliver on promised capacity-building and

patrol missions.<sup>36</sup> These constraints also cap the naval reach and logistics of the Indian Navy. India must cover vast distances to sustain a presence in Southeast Asian waters, yet it has a relatively modest fleet and only limited forward logistical access.<sup>37</sup> This makes it challenging for New Delhi to maintain persistent deployments or quickly project power into Southeast Asia, given the strain on vessels, crew and supply lines. In short, operational shortfalls – from funding and hardware to bases and support – restrict India’s eastward maritime engagement and demand careful prioritization of missions.

### Diplomatic Sensitivities

Diplomatically, India must navigate a delicate environment in Southeast Asia. ASEAN states generally prize their strategic autonomy and hedge between major powers, rather than taking clear sides. This means India’s outreach must be calibrated to avoid alarming regional partners or forcing strategic choices. For example, many Southeast Asian countries welcome India’s presence as a balance, but they remain cautious about any initiative that might be seen as overtly antagonistic to China. India therefore faces the task of managing relations with China even as it increases engagement with ASEAN. New Delhi has taken a firmer line in practice – deepening defence ties with Manila, supplying BrahMos coastal batteries under the 2022 contract (with deliveries in 2024–25)<sup>38</sup>, and conducting the first India–Philippines bilateral joint sail inside the Philippines’ EEZ this August<sup>39</sup>. At the same time, India has calibrated its posture in these contested waters, repeatedly affirming UNCLOS, freedom of navigation and a ‘clear and consistent’ South China Sea position to avoid inflaming tensions. Any steps India takes to deepen security ties or naval presence in Southeast Asia require careful diplomacy to reassure ASEAN members of benign intent and to avoid provoking a counter-reaction from China.

### Strategic Coherence and Overlap

Another challenge lies in maintaining strategic coherence across India’s multiple maritime initiatives. Over the past decade, India has introduced several overlapping frameworks – from the SAGAR vision (2015) to the Indo-Pacific Oceans Initiative (2019) and most recently the expansive MAHASAGAR concept (2025) – each aimed at strengthening India’s role in the wider Indian Ocean and Indo-Pacific. While these initiatives share broad objectives, without clear coordination they risk redundancy or diluted focus. Analysts note that India needs to better integrate and streamline its various initiatives to present a unified strategy. For instance, experts have urged greater synergy between India’s IPOI and ASEAN’s own Indo-Pacific Outlook, ensuring India’s plans complement regional frameworks rather than run in parallel.<sup>40</sup> Similarly, there have been calls for more consistency and follow-through: policies or proposals announced with much fanfare must be sustained and aligned across different forums. At times, a lack of coordination between government agencies and the overlapping mandates of SAGAR/MAHASAGAR have led to slow implementation. In summary, achieving strategic coherence – by unifying India’s maritime vision and avoiding compartmentalized or duplicative efforts – remains an important challenge for India’s eastward maritime push.

### Policy Recommendations

- **Develop a Unified Indo-Pacific Maritime Strategy (from SAGAR to MAHASAGAR):** Conduct a comprehensive review to integrate India’s existing maritime frameworks – SAGAR and the new MAHASAGAR doctrine – into a single cohesive strategy. This unified Indo-Pacific maritime strategy should align India’s Indian Ocean initiatives with its broader Pacific engagement, reflecting MAHASAGAR’s expanded focus on the Global South. An inter-ministerial

task force can drive this integration, ensuring that diplomatic, defense, and economic agencies work in concert. This will solidify India's leadership role by providing clear strategic guidance across government and signaling to partners that India's maritime engagement is holistic and well-coordinated.

- **Institutionalize and Expand Joint Maritime Exercises with ASEAN:** Scale up joint naval activities with Southeast Asian nations to boost interoperability and regional presence. Building on the successful inaugural ASEAN-India Maritime Exercise (AIME) in 2023, India should make such engagements a regular fixture (e.g. annual or biennial). Co-hosting future exercises with ASEAN partners – potentially on a rotating basis – will deepen interoperability and trust. India can also invite more ASEAN navies to its multilateral exercises like MILAN. Additionally, strengthening existing bilateral and trilateral drills (such as those with Singapore, Thailand, Indonesia, etc.) will complement these efforts.
- **Boost Regional Capacity Building and Security Assistance:** India should expand its capacity-building initiatives to empower Southeast Asian and other Indo-Pacific littoral states. This can include increasing training slots for ASEAN naval and coast guard officers in Indian institutions, mobile training teams for specialized skills, and sharing best practices in maritime law enforcement. For instance, under the Quad's new MAITRI initiative, India can host workshops for Southeast Asian coast guards/navies on legal prosecution of maritime crimes and technical skills to “monitor and secure their waters” and enforce maritime laws. New Delhi can also step up security assistance by providing critical hardware – for example, offering lines of credit or grants for patrol vessels, coastal radar systems, and maritime patrol aircraft to interested partners. India's

readiness to supply indigenously-built equipment (or donate surplus platforms) will address capability gaps among its neighbors. Simultaneously, expand logistics cooperation by pursuing new mutual support agreements with key ASEAN states – similar to the 2018 India-Singapore naval pact that grants Indian vessels refueling and basing access at Changi Naval Base.<sup>41</sup> By tailoring assistance to each country's needs (as envisioned under SAGAR) and prioritizing requests from Global South partners, India reinforces its image as a trusted security provider that builds regional capacity rather than imposing solutions.

- **Strengthen Maritime Domain Awareness and Information Sharing:** Enhancing shared maritime domain awareness (MDA) with Southeast Asian partners should be a priority to tackle piracy, smuggling, illegal fishing, and other transnational threats. India can integrate advanced technologies – such as satellite surveillance, unmanned systems, and AI analytics – to monitor the maritime environment in real time. It should expand the IFC-IOR by linking it with Southeast Asian information centers and recruiting more liaison officers from ASEAN navies. Through the IPOI, India should link IFC-IOR data with ASEAN and Quad information-sharing systems, enabling real-time exchange on piracy, illegal fishing, and maritime incidents across Southeast Asian waters. Accelerating agreements for white-shipment information exchange beyond the 22 countries already partnered will further improve the common operating picture. These practical steps will significantly improve collective surveillance and early-warning, enabling India and its partners to respond swiftly and collaboratively to maritime incidents.
- **Champion a Sustainable Blue Economy and Disaster Resilience (“Green MAHASAGAR”):** India should launch

a Green MAHASAGAR initiative to coordinate regional efforts on marine environmental protection and climate resilience. This entails working with ASEAN and Indian Ocean states on sustainable fishing practices, marine biodiversity conservation, and reduction of marine pollution – aligning with global environmental priorities and the principles of UNCLOS. New Delhi can host a regular Indo-Pacific Blue Economy Conference under the IPOI, sharing expertise in areas like coastal ecosystem restoration, renewable ocean energy, and climate-resilient infrastructure. Equally important is strengthening cooperation on HADR. India could establish joint HADR protocols and pre-position relief material (e.g. food, medical supplies) at strategic locations, building on its reputation as the region’s “first responder” in crises. By leading on environmental security and disaster response, India not only helps safeguard livelihoods across the Indo-Pacific but also underscores its commitment to inclusive growth and security for all, in line with SAGAR’s ethos.

## Conclusion

Southeast Asia’s crowded sea lanes and contested spaces will define the Indo-Pacific’s stability as much as any headline summit. The evidence in this article is clear: the most durable answers to piracy, illegal fishing, trafficking, disaster risks and grey-zone coercion are cooperative ones that link shared maritime awareness to predictable presence and local capacity. India’s eastward engagement – grounded in SAGAR, its evolution under MAHASAGAR, the practical architecture of the Indo-Pacific Oceans Initiative, and the data-sharing backbone of IFC-IOR – already

provides workable tools. What matters now is using them in ways that are visible at sea, trusted in the region, and anchored in ASEAN centrality and UNCLOS.

The path forward is pragmatic. Build a common operating picture with partners and then act on it – through routine, coordinated patrols; quiet, professional law-enforcement cooperation; and exercises that rehearse humanitarian assistance and search-and-rescue alongside interdiction of illicit activity. Tie information-fusion to logistics resilience so that alerts translate into quicker responses, safer shipping and faster recovery when shocks occur. Pair this with targeted capacity-building – training, legal processes, and modest but reliable hardware – so coastal agencies in Southeast Asia can own the mission, not just observe it.

India will also have to manage real constraints: finite resources, diplomatic sensitivities, and the need for strategic coherence across multiple initiatives. That argues for a unified Indo-Pacific maritime strategy (integrating SAGAR and MAHASAGAR), a small set of measurable near-term deliverables (from new white-shipping agreements to added ASEAN liaison officers at IFC-IOR), and transparent reporting that demonstrates delivery rather than rhetoric. In parallel, minilateral formats – especially with Australia and Indonesia – can prototype solutions quickly and then fold them back into ASEAN-led mechanisms for legitimacy and scale.

Done this way, India’s maritime role is neither hegemonic nor symbolic. It is collaborative, demand-driven and outcome-focused – adding capacity where partners want it, reinforcing rules that benefit all, and keeping the Indo-Pacific open, stable and prosperous.

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# Maritime Connectivity and Security: An Agenda for Safe Navigation

Sujeet Samaddar and Rupal Kalebere

**T**he seas have always been more than mere bodies of water. They are the stage upon which empires rose, economies flourished, and political rivalries played out. From the spice routes of the Indian Ocean to the Atlantic crossings that underpinned colonial expansion, control of the oceans has long determined who holds power and who falls behind. In the twenty-first century, this remains true in new and profound ways.



The seas regulate the planet's climate, store carbon, generate oxygen, enable commerce and also connect economies. The blue economy which has an asset base of over US\$ 24 trillion and generates at least US\$ 2.2 trillion each year from the combination of fishing and aquaculture, shipping, tourism, and other marine-based activities.<sup>1</sup> The clothes worn in European cities, the oil that fuels Asia's industries, the grain that feeds Africa, and the manufactured goods that stock American shelves all rely on uninterrupted maritime flows. Beyond trade, oceans provide vital food resources, energy supplies, and ecological functions, including climate regulation and oxygen production. Fiber-optic cables laid on the seabed carry nearly all international internet traffic, making the maritime domain not only the foundation of globalization but also the nervous system of the digital age.

### **Fragile Arteries of Globalisation**

Yet, these arteries of commerce and communication are fragile. They are exposed to natural hazards, political disruptions, criminal activities, and armed conflicts. In an era of geopolitical rivalry, environmental stress, and technological transformation, maritime spaces are increasingly contested and vulnerable. Two interrelated concepts capture this dual reality: connectivity and security. Connectivity refers to the capacity of moving goods, services, people, energy, and information efficiently across borders and oceans. Security refers to the condition in which those flows can occur free from threats and disruptions. Together, connectivity and security define the maritime order upon which modern prosperity rests.

But, they also reveal a paradox. Connectivity brings integration, growth, and opportunity. It also creates vulnerabilities, dependencies, and risks. Every advance in maritime connectivity exposes new targets for exploitation. Every chokepoint that enables global trade — the Suez

Canal, the Strait of Malacca, the Panama Canal, the Red Sea — can become a bottleneck or a battlefield. Every subsea cable that accelerates the digital economy can be tapped, sabotaged, or severed. Every subsea pipeline is vulnerable. Every ship that sails the oceans from time immemorial is exposed to maritime crime and piracy. The challenge of our time is to ensure that connectivity strengthens resilience rather than magnifying fragility, and that security is maintained without suffocating the openness upon which globalization depends.

### **Connectivity and Its Discontents**

Maritime connectivity is not just about ships moving across seas. It is about the systems that allow goods, people, energy, and ideas to move smoothly and predictably across regions. Ports connect to railways and roads, oil and gas pipelines extend from offshore platforms to urban centers, and fiber-optic cables stitch continents together. Trade agreements, customs procedures, and digital platforms all act as institutional enablers of this connectivity.

When these systems function well, the results are transformative. Goods move faster and cheaper. Supply chains become more predictable. Investors gain confidence, and economies grow. Maritime connectivity thus becomes a form of power, enabling states to project influence and shape regional orders. China's Belt and Road Initiative (BRI) is emblematic of this approach, investing in ports and shipping routes not merely to facilitate trade, but to expand strategic reach.

Yet, connectivity is never neutral. It always creates winners and losers, advantages and vulnerabilities. Landlocked countries depend on transit corridors to reach global markets, making them hostage to the policies of their neighbors. Coastal countries with poorly managed ports lose out to more efficient hubs. Chokepoints such as the Red Sea and the

Strait of Hormuz carry outsized significance, with even minor disruptions causing global economic shockwaves. The 2021 blockage of the Suez Canal by the *Ever Given* container ship offered a dramatic reminder: a single accident in a single corridor can hold up billions of dollars in trade and unsettle supply chains worldwide.

Digital connectivity mirrors these dynamics. Illustrated in Figure 1, the subsea cables, particularly those traversing the Red Sea carry as much as 17 per cent of global internet traffic<sup>2</sup>. They are essential to finance, communication, and commerce. Yet, they are also concentrated in narrow geographic zones, making them highly vulnerable. A deliberate attack or even an accident can disconnect entire regions, with cascading effects on economies and societies. As geopolitical competition extends into the digital domain, the security of undersea cables has become a pressing concern for both governments and corporations.

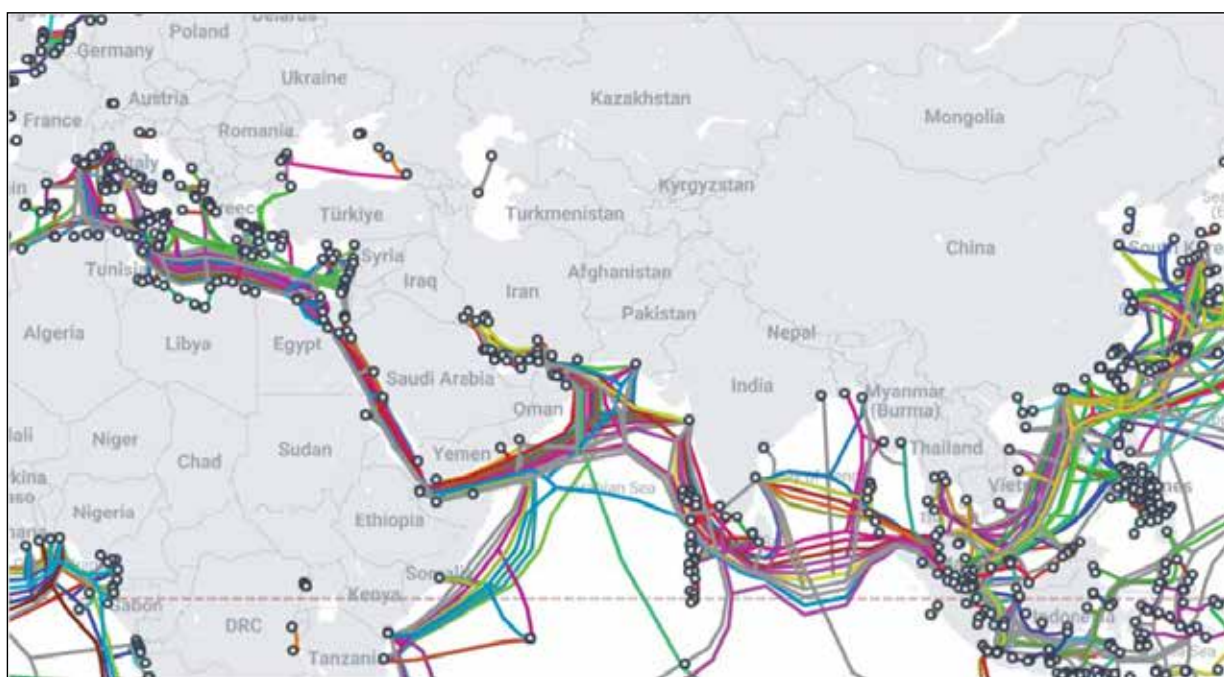
Connectivity, in short, is both the bloodstream and the Achilles' heel of globalization. Its expansion brings prosperity, but its fragility exposes the world to crises that ripple far beyond maritime spaces and hence whilst connectivity promotes commerce but commerce requires security.

## The Expanding Maritime Security Agenda

For much of history, maritime security was synonymous with naval power. States built fleets to protect trade routes, deter rivals, and project force. Today, while navies remain crucial, the scope of maritime security has broadened dramatically. It encompasses not only traditional military threats but also a wide spectrum of non-traditional risks.

Piracy illustrates this evolution. Once regarded primarily as a criminal nuisance,

**Figure 1: Subsea Internet Cables in the North Indian Ocean<sup>3</sup>**



Source: [www.submarinecablemap.com](http://www.submarinecablemap.com)

piracy in the Gulf of Aden between 2008 and 2012 forced the international community to recognize its global economic implications. Insurance premiums rose, shipping costs climbed, and vessels had to be rerouted around the Cape of Good Hope, adding weeks to journeys. The response—multinational naval patrols, private security measures, and capacity-building for coastal states—became a template for addressing transnational maritime threats.

Terrorism at sea adds another layer. The 2008 Mumbai attacks, launched by militants, who arrived by boat, demonstrated the vulnerability of coastal cities. Oil tankers, ports, and offshore platforms present high-value targets. Maritime terrorism has not reached the scale of piracy, but remains a persistent concern, particularly in regions with weak governance and volatile politics.

Illegal, unreported, and unregulated (IUU) fishing has emerged as perhaps the most significant non-traditional maritime security challenge. It undermines food security, depletes fish stocks, and threatens the livelihoods of coastal communities. It is often linked to other illicit activities, including smuggling and human trafficking. In some regions, competition over fisheries has triggered interstate disputes, making resource security inseparable from national security.

Environmental degradation further blurs the line between security and sustainability. Oil spills, plastic pollution, and industrial discharges degrade marine ecosystems, with long-term consequences for human well-being. Climate change compounds these risks. Rising sea levels threaten the very existence of small island states, while melting Arctic ice is opening new navigational routes and intensifying competition over resources. The oceans are no longer just spaces of commerce and conflict; they are also frontlines of the planetary environmental crisis.

Finally, cyber threats represent the newest addition to the maritime security agenda. Ports increasingly rely on digital management systems. Ships depend on electronic navigation and satellite communications. A successful cyberattack can paralyze operations, disrupt supply chains, and cause financial losses in the billions. The 2017 NotPetya malware attack on Maersk<sup>4</sup> offered a sobering glimpse of this vulnerability, as one of the world's largest shipping companies was forced to reinstall thousands of servers and computers, with global ripple effects.

What emerges is a picture of maritime security as a multi-layered, multi-actor enterprise. It is no longer confined to navies and warships but extends to coast guards, customs agencies, environmental organizations, private companies, and international institutions. Each has a role to play, but coordination remains a persistent challenge.

## The Human and Environmental Dimension

Often lost in discussions of ships and strategy are the people whose lives and livelihoods are bound to the sea. Millions of seafarers work on merchant vessels, facing grueling conditions and extended periods away from home. The COVID-19 pandemic revealed their vulnerability, as thousands were stranded at sea due to travel restrictions, with limited access to healthcare and shore leave. Their plight underscored the human dimension of maritime security: safeguarding not just cargo and infrastructure but also the dignity and welfare of those who keep the system running.

Ports are another critical human space. They are not merely logistical hubs but also urban ecosystems where labor, commerce, and governance intersect. Efficient and transparent port management is essential not only for trade facilitation but also for curbing corruption, preventing smuggling, and ensuring safety.

Ports also bear the brunt of natural disasters, cyberattacks, and geopolitical disruptions, making their resilience a core component of national security.

Coastal communities represent a further human dimension. For many small island developing states and coastal nations, fisheries and tourism are lifelines of the economy. Rising sea levels, cyclones, and shifting fish stocks threaten not only livelihoods but also cultural identities and sovereignty itself. For them, maritime security is inseparable from human security.

Environmental concerns amplify these vulnerabilities. Marine ecosystems are under unprecedented pressure. Unsustainable practices risk collapsing fish stocks. Pollution threatens biodiversity. Climate change accelerates acidification and coral bleaching. These are not abstract environmental issues, but tangible security challenges, as food systems, economies, and societies depend on healthy oceans. The emerging discourse on the “blue economy” captures this intersection, emphasizing the need to use ocean resources sustainably to support economic growth, while ensuring environmental health and social inclusion.

## Navigating the Future

Looking ahead, the maritime domain faces an array of future challenges that will test the adaptability of states and institutions.

The rise of shadow fleets—vessels that operate outside established regulatory frameworks—undermines transparency and stability in global trade. These fleets are often used to evade sanctions, transfer oil illicitly, or conduct activities outside the reach of enforcement. They represent a parallel system that erodes legitimate commerce and complicates governance.

Hybrid tactics at sea are another growing concern. States and non-state actors increasingly employ methods short of war to assert control,

from the deployment of maritime militias to the use of drones and sea mines. These tactics exploit the ambiguity of the maritime domain, challenging traditional concepts of deterrence and response.

Technological dependencies add further risks. As shipping, ports, and offshore industries become more digitalized and automated, their exposure to cyber and electronic warfare grows. Dependence on outer space for navigation and communication means that vulnerabilities in satellites directly translate into risks at sea. The militarization of space thus has immediate implications for maritime security.

Climate change will reshape the maritime order in profound ways. Melting ice is opening Arctic routes, shortening shipping times but also heightening sovereignty disputes. Rising seas threaten to redraw coastlines and even erase entire states, raising unprecedented questions about sovereignty, jurisdiction, and rights under international law. As per a NOAA study, “scientists expect environmental changes such as warming oceans, rising sea levels, frequency and intensity of floods and droughts, and ocean acidification to increase with continued shifts in the planet’s climate system”<sup>5</sup>. Environmental change is not a distant prospect; it is already altering fisheries, intensifying storms, and destabilizing coastal societies.

These challenges demand coherent maritime strategies. States must integrate security, economic, environmental, and human concerns into comprehensive policies. International cooperation is essential, as no state can manage these threats alone. At the same time, strategies must be adaptable, capable of responding to rapidly shifting technological and geopolitical landscapes.

## Conclusion: Securing the Global Commons

The seas are the global commons par excellence. They are shared spaces upon which all nations depend, yet they are also arenas of rivalry,

contestation, and fragility. Connectivity makes them the lifelines of globalization, while security ensures their stability. Neither can exist without the other. Connectivity without security is brittle; security without connectivity is hollow.

The future of maritime order will depend on how well states, businesses, and societies navigate this paradox. It will require investments in resilience, innovations in governance, and commitments to sustainability. It will require respect for international law, particularly the United Nations Convention on the Law of the Sea (UNCLOS), as the anchor of legitimacy. And, it will require recognition that maritime security is not merely the responsibility of navies or great powers but a collective endeavor involving a wide array of actors, from seafarers and port workers to international organizations and coastal communities.

The oceans are vast, but their vulnerabilities are immediate and shared. A blockage in the Suez Canal, a cyberattack on a port, a collapse of a fishery, or the severing of a cable can affect billions of people worldwide.

As António Guterres, Secretary-General of the United Nations told the Security Council that ‘the “basic condition” for preserving maritime security is that all States respect international law. Without maritime security, there can be no global security,’ The oceans are increasingly under strain from traditional and emerging threats that are challenging connectivity, He stressed urging action in “three key areas” – respecting international law, addressing the root causes of maritime insecurity and creating “partnerships at all levels”<sup>6</sup>.

Maritime connectivity and security, once niche concerns, now sit at the heart of global stability. Ensuring their resilience is not an option, it is an imperative for the twenty-first century world.

## Endnotes

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# Connecting the Nations: Indo-Pacific Oceans Initiative (IPOI)

Prabir De

The Indo-Pacific is a multipolar region with geographical coverage in the Indian and the Pacific oceans (Map 1). Indo-Pacific participating countries, all of which border the Indian Ocean or the Pacific Ocean, seek to deepen their strategic bonding by enhancing maritime connectivity through quality infrastructure, free and fair trade, preserving marine resources, tackling climate change, and enabling digital connectivity, marine safety and maritime security. However, there are differences in each country's approach towards the



Indo-Pacific construct; and there is, therefore, a need to maximise convergence in multiple areas of cooperation, to achieve peace and security in the Indo-Pacific as a whole. In particular, India reiterated a common effort to achieve the framework in the maritime domain and identified five principles in this direction<sup>1</sup>.

There is a growing consensus in understanding the geographical scope and economic and strategic approaches towards Indo-Pacific. The perspective of Indo-Pacific is to ensure safe and secure maritime space through an inclusive and multilateral approach among participating countries while ascertaining the ASEAN centrality and to support the rules-based international order and regional stability.<sup>2</sup>

India's vision for the Indo-Pacific includes securing end-to-end supply chains in the region, no disproportionate dependence on

a single country, and ensuring prosperity for all stakeholder nations. Being the centre of gravity of economic growth, Indo-Pacific could drive the world into the path of sustainable and resilient recovery from the current global uncertainties and supply chain disruptions<sup>3</sup>.

## Comparative Strength of Indo-Pacific

The Indo-Pacific contributes more than half of the world's GDP and population and has huge natural resources and potential for new economic opportunities. About 70 per cent of world trade is from Indo-Pacific participating countries. For instance, Indo-Pacific participating countries' global exports and imports were about US\$ 12.11 trillion (69.51 per cent) and US\$ 12.78 trillion (69.77 per cent), respectively, in 2024 (see Table 1). The intra-

### Map 1: Indo-Pacific Countries Bordering with the Indian Ocean or the Pacific Ocean



Source: Author's own (designed by Sachin Singhal, RIS)

**Table 1: Major Indicators of Indo-Pacific, 2024**

| Indicators                           | Indo-Pacific | Share in World (%) |
|--------------------------------------|--------------|--------------------|
| Land area ( million sq. km)          | 74.83        | 57.59              |
| Population (billion)                 | 5.80         | 71.24              |
| GDP (current US\$ in trillion)       | 67.94        | 79.45              |
| Export in Goods (US\$ trillion)      | 12.11        | 69.51              |
| Import in Goods (US\$ trillion)      | 12.78        | 69.77              |
| Total Trade in Goods (US\$ trillion) | 24.89        | 70.34              |
| Intra-Regional Trade (US\$ trillion) | 9.67         | 71.32              |

*Note:* ASEAN: Brunei Darussalam, Cambodia, Lao PDR, Myanmar, Malaysia, Indonesia, Singapore, Thailand, Vietnam, Philippines; South Asia: India, Sri Lanka, Pakistan, Bangladesh, Maldives; Latin America: Colombia, Chile, Ecuador, Peru; North America: Canada, Mexico, United States; North-East Asia: China, Japan, South Korea, Russian Federation; Pacific: Australia, New Zealand, Papua New Guinea, Fiji; West Asia: Iran, Islamic Rep., United Arab Emirates, Yemen, Rep., Oman; Africa: Kenya, Somalia, Tanzania, Madagascar, Mozambique, South Africa, Mauritius, Comoros, Seychelles; European Union: France, Germany, Netherlands, United Kingdom.

*Source:* Calculated by author based on World Development Indicators, World Bank Database.

regional trade among Indo-Pacific countries stands at 71 per cent (US\$ 10 trillion) in 2024.

The intra-regional trade share suggests strong interdependency in trade and has a potential strength of economic integration in the Indo-Pacific. Studies have shown the scope for potential strength of economic integration across the Indo-Pacific region. They found that reduction in tariff and improved trade facilitation by the Indo-Pacific group may generate over US\$ 1.12 trillion welfare gain. The studies have also shown that the Indo-Pacific could become a powerful bloc if the South and Southeast Asia could be linked through stronger connectivity, particularly developing maritime linkages and improved trade facilitation and other networks that would reduce trade costs, which are a necessary step to realise the trade potential of the Indo-Pacific.<sup>4</sup>

The most-traded merchandise products within the Indo-Pacific region include machinery and transport equipment, automobiles, garments, digital and office equipment, mineral fuels, lubricants, chemical and related products.

Services are an increasingly important part of the Indo-Pacific region, wherein the trade in services plays an important role in integrating Indo-Pacific in the areas of Industry 4.0, tourism, education, transportation, financial services, among others. Within the Indo-Pacific, India is known for its IT prowess and is a leading exporter of technology-enabled modern services. India is one of the major commercial services providers in the world, having comparative advantages in the export of computer and information services and other business services (that include a wide range of information-intensive services).

In terms of FDI inflows, emerging countries in the Indo-Pacific region have become the attractive destination of FDI in the world. On the other hand, the major FDI outward flows are also from the developed countries of the Indo-Pacific. Therefore, Indo-Pacific has huge potential to generate intra-trade and investment opportunities, thereby benefiting the region. Most of the FDI outflows are from developed countries like the USA, Japan, China, South Korea, Canada and Singapore and Thailand.

In what follows Indo-Pacific participating countries have strong interdependence in trade, which is the key potential strength of economic growth in the region. To enhance the trade and value chains, the Indo-Pacific participating countries shall aim for a regional investment framework. A regional investment framework would not only facilitate regional coordination but also exploit economies of scale. Such a regional framework will motivate countries in harmonising the investment regime and also streamlining and simplifying the procedures for investment applications and approvals.

## The IPOI and Its Structure

India occupies a prominent position in the Indian Ocean in terms of geographical and cultural and civilisational linkages. The Indo-Pacific obtained renewed vibrancy when ASEAN, in June 2019, and India, in November 2019, came out with their respective Indo-Pacific visions, namely, the ASEAN Outlook on the Indo-Pacific (AOIP), and, the Indo-Pacific Oceans Initiative (IPOI), respectively. The IPOI focuses on seven pillars: (i) Maritime Security; (ii) Maritime Ecology; (iii) Maritime Resources; (iv) Capacity Building and Resource Sharing; (v) Disaster Risk Reduction and Management; (vi) Science, Technology and Academic Cooperation; and (viii) Trade, Connectivity and Maritime Transport. As of

today, about a dozen countries have joined the IPOI as lead/co-lead partners (Table 2). Over half a dozen countries including Korea and Denmark have shown interest to join the IPOI.

To spearhead the IPOI, the ASEAN-India Joint Statement on Cooperation on the ASEAN Outlook on the Indo-Pacific for Peace, Stability, and Prosperity in the Region was issued at the 18<sup>th</sup> ASEAN-India Summit on 28 October 2021. The statement emphasised the relevance and the commonalities between ASEAN Outlook on the Indo-Pacific (AOIP) and India's IPOI to promote peace and cooperation in the region. Initially, both identified four areas of cooperation as outlined in the AOIP, namely, maritime cooperation, connectivity, the Sustainable Development Goals (SDGs), and economic and other possible areas of cooperation. Later, the areas of cooperation expanded to cover supply chain disruptions and maritime cooperation.

The IPOI participating countries offer a variety of complementary resources. It would be a great opportunity for India to engage these countries for development of the Indo-Pacific. A project-based action plan may help align diverse objectives of participating countries to unlock the Indo-Pacific potentials, while defining roles for everyone.

**Table 2: IPOI Pillars and Lead Countries**

| Pillars No. | Particulars                                       | Lead Country        |
|-------------|---------------------------------------------------|---------------------|
| 1           | Maritime Security                                 | The UK, India       |
| 2           | Maritime Ecology                                  | Australia, Thailand |
| 3           | Maritime Resources                                | France, Indonesia   |
| 4           | Capacity Building and Resource Sharing            | Germany             |
| 5           | Disaster Risk Reduction and Management            | India, Bangladesh   |
| 6           | Science and Technology and Academic Collaboration | Singapore, Italy    |
| 7           | Trade, Connectivity and Maritime Transport        | Japan, USA          |

As on October 2025

Source: Author's own based on the MEA

## Action Plan to Strengthen the 7<sup>th</sup> Pillar of IPOI

To strengthen the 7<sup>th</sup> pillar of IPOI (Trade, Connectivity and Maritime Transport) in the Indo-Pacific region, an action plan is suggested here.

### (i) Foster Economic Framework to Strengthen the Regional Architecture

The seventh pillar of the IPOI deals with the trade component, which indicates the importance of economic engagement of Indo-Pacific countries to reinsure its position in the global framework. Indo-Pacific countries contribute about 70 per cent of world total trade, indicating intense economic relations among these countries. The USA has outlined its Indo-Pacific Economic Framework (IPEF) to drive the region's growth through economic engagement. The ASEAN-India joint statement on AOIP and IPOI has reiterated to strengthen their economic relationship with suitable measures. These indicate that economic ties are an important instrument to accelerate the prosperity of the region. The countries of the region could consider an economic framework that will be a win-win condition for all since the countries are diverse in nature.

- Activate Indo-Pacific Business Council to enhance trade and ensure developing countries interest; and
- Regional Investment Framework to facilitate regional integration in terms of economic scaling.

India is a member of the IPEF, a partnership of 14 countries aimed at strengthening economic ties. India has joined three of the four pillars, namely, Supply Chain Resilience (Pillar II), Clean Economy (Pillar III), and Fair Economy (Pillar IV), whereas India is an observer in the Trade pillar (Pillar I).<sup>5</sup> The IPEF aims to strengthen economic and strategic linkages, improve supply chain resilience, promote clean

energy, and enhance anti-corruption and tax administration efforts in the region.<sup>6</sup>

### (ii) Create Resilient Indo-Pacific

The global supply chains have been witnessing disruptions, initially caused by the COVID-19 pandemic and later by several unfavourable trade conditions and collapse of maritime routes. The restriction on goods and services affected the global value chain process. To address this challenge, Australia, India and Japan have initiated the Supply Chain Resilience Initiative in April 2021. The initiative aims to mitigate supply chain disruptions and strengthen the supply chain process. On the other side, the USA and the EU have also published their plans for the future course in building a resilient supply chain. For instance, ASEAN and India emphasised more on value chain linkages between them to make resilient supply chains for the region to cope with the future shocks. Along with the economic engagement, Indo-Pacific countries need to create resilient value chain lines, which will protect the economic interest of the region as well as prepare for future shocks.

- Platform to share knowledge to build resilient value chain lines for developing nations;
- Initiate capacity building programme to incorporate more digital technology including India's DPI;
- Japan's lead in building resilient value chain lines in the Indo-Pacific;
- Harmonised or consolidation in trade agreements of the countries of the region; and
- Mutual recognition of standards and building more testing facilities.

### (iii) Strengthening Maritime Connectivity

Data reveals that about 90 per cent of global trade in volume and over 80 per cent of global

trade in value are transported through sea routes, which signify the dominance of maritime trade connectivity in global trade architecture. Wider connectivity between ports of the region will increase trade of the region and reduce the time and cost of transport.

- Promote direct maritime connectivity across the Indo-Pacific region;
- Strengthen inter-port cooperation in maritime single window, data sharing and green shipping;
- Explore areas such as short-sea shipping, cruise shipping, inland waterways, etc.; and
- Strengthen backend connectivity with the hinterland.

#### **(iv) Sustainable Maritime Transportation**

Maritime Transportation is facing various environmental challenges which cause climate change. To mitigate the climate change issues, the International Maritime Organization (IMO) has laid out the strategy to reduce annual greenhouse gas (GHG) generated from shipping activities to support UN Sustainable Development Goal 13. The IMO has been mandated to reduce GHG emission by 50 per cent by 2050 from 2008 levels. Along with 170 countries, India has signed for sustainable initiatives to reduce GHG. The ASEAN Climate Change Report (2021) stated 'viable goals and pathways to develop an ASEAN vision for climate action toward 2050'. In line with that, Indian government has set a target of net-zero GHG emissions by 2070 and by 2030 it has planned to reduce GHG by 45 per cent. The USA has also strategized its way towards net-zero GHG emission by 2050. Therefore, Indo-Pacific countries may reach a consensus to reduce the GHG, which is a challenging task for the developing nations. The developed nations of the region can assist the developing nations by providing technical assistance and capacity building programmes to implement sustainable goals.

- Organize regular high-level policy dialogue to take forward the agenda of climate change adaptation in the maritime transportation domain in the Indo-Pacific; and
- More workshops and knowledge sharing platforms are required to be undertaken to reduce GHG.

#### **(v) Infrastructure Development for Green Marine Transportation**

Green ports are not only environment friendly, but it also includes technologies 'to enhance competitiveness and sustainability'.<sup>7</sup> India has initiated the 'Green Ports' project in 2016 to take measures about environmental challenges at ports and to make India cleaner. The Indian green port initiative aims to make the country's ports more environmentally sustainable, with a key framework of the "Harit Sagar" Green Port Guidelines 2023. This initiative focuses on reducing carbon emissions and waste, promoting renewable energy, and developing green fuel infrastructure to achieve zero carbon emission goals. Key actions include developing storage for green fuels, using solar and wind power, and implementing robust waste management systems. The AOIP and IPOI possess a great interest in building smart and green infrastructure to facilitate maritime transportation. The developing countries of the region require large investments to build smart and green infrastructure. Sharing technology, data and financing on port infrastructure and allied sectors will facilitate the improvement of the quality of maritime transport services.

- Need to develop infrastructure bank to finance infrastructure projects in developing Indo-Pacific countries;
- Organise global conclave on investment opportunities to digitize ports of the region;
- Facilitate port e-service, Logistics e-services and cargo handling in developing countries of the Indo-Pacific;

- Undertake Enhanced Trade Facilitation for Maritime Transportation in Indo-Pacific (ETFMT-IP); and
- Joint initiative for making the Indo-Pacific ports green and sustainable under a new initiative of Indo-Pacific Green Ports and Logistics.

### **(vi) Enhanced Trade Facilitation for Maritime Transportation**

Need to ensure the harmonization of data standards beyond the aforementioned convention to facilitate the sharing of port and berth-related master data for the just-in-time operation of ships and optimum resource deployment by vessel services and suppliers, logistics providers, cargo handling and clearance, Port e-service, Logistics e-services, and cargo related services, thereby saving energy, improving safety and cutting costs and emissions. Indo-Pacific participating countries may enhance trade facilitation for maritime transportation (ETFMT-IP). A network of national trade facilitation committees of Indo-Pacific participating countries could be a good start. Performance monitoring of Indo-Pacific ports will add immense value in designing an appropriate regional policy for the development of ports and shipping. Indo-Pacific participating countries can facilitate ETFMT-IP by promoting national collaborative platforms such as the single windows, port community systems or national trade facilitation committees. The ETFMT-IP would help to integrate port community systems with their respective integrated customs management systems within and between countries.

- Simplification and harmonization of maritime trade procedures;
- Designing and implementing common trading standards;
- Application of digital technology to the marine logistics chain;
- Promoting the use of new technologies to facilitate transport and logistics in the

region by sharing experience, developing knowledge products, including transport facilitation tools, and undertaking pilot demonstrations; and

- Training and capacity building programmes in maritime transportation and logistics.

### **(vii) Digitalisation of Maritime Logistics Chain**

Advancing on the developments of maritime autonomous surface ships, drones and navigation systems along with the global navigation satellite systems, used for the safe navigation of ships, and automatic identification system signals via satellites, tracking ships, are considered critical to improving the safety of ship navigation and the reliability of data for vessel tracking and analytics, including for insurance purposes. Strengthen global navigation satellite systems and automatic identification system communications, both use satellites. Promote paperless bill of lading for cargo shipping, particularly in containerized transport for smooth trade between the ports and avoid irregular shipping patterns.

- Organize workshops to enhance knowledge on newer technology; and
- Facilitate automated custom systems to promote digitalisation.

### **(viii) Need of a Regional Comprehensive Maritime Transport Policy**

In order to scaling up the maritime activities, Indo-Pacific participating countries shall aim for a regional policy framework in maritime transport, which will facilitate simplification of maritime trade procedures and reforms, sourcing and sharing best practices, and regional coordination, leading to promote maritime transportation across the region. It may also provide a mechanism for knowledge-sharing and policy dialogue around good practices. Standardized and harmonized data reporting, dissemination and statistical framework is required for regional cooperation

in maritime transportation including short sea shipping and/or coastal shipping. In this context, BIMSTEC offers important lessons for regional maritime cooperation. The BIMSTEC member states have signed the maritime cooperation agreement at the 6<sup>th</sup> BIMSTEC Summit in Bangkok in April 2025 and all participating countries have agreed to liberalise the Cabotage in the region.

- Design a comprehensive maritime transport policy for Indo-Pacific; and
- Build forum to facilitate maritime transport that shares best practices.

## Conclusions

The perspective of Indo-Pacific is to ensure safe and secure maritime space through an inclusive and multilateral approach among participating countries while ascertaining the ASEAN centrality and to support the rules-based international order and regional stability. Indo-Pacific region has high potential to generate intra-regional trade and investment opportunities. The seventh pillar of India's IPOI deals with the trade component, thus indicating the importance of economic engagement of Indo-Pacific participating countries to reinsure

its position in the global framework. Indo-Pacific region contributes about 70 per cent of world total trade, thereby telling us the intense economic relations among the Indo-Pacific participating countries.

As this chapter shows, the Indo-Pacific participating countries have to enhance trade facilitation for maritime transportation. Promoting paperless trade and simplification of trade procedures in the Indo-Pacific would help with regulations at ease, such as single window clearance, IT-enabled mechanisms, simplifications of license, permit procedures, etc. Information Technology enabled services will make the trade procedures simple and will help firms to avoid delay in export time and reduce trade costs associated with cumbersome administrative procedures. Digitalisation of the supply chain will help to achieve business resilience against supply chain disruption amidst global uncertainties. Effectively implementing the cross-border paperless trade, improving transparency and institutional arrangements will reduce the trade costs, strengthen the global and regional value chains, and better connect the Indo-Pacific nations.

## Annexure 1

### Excerpt of Indian Prime Minister's Remarks at the UNSC, 9 August 2021

In his speech, Prime Minister Narendra Modi reiterated the importance of international cooperation in maritime security at the UNSC. Oceans and their sea routes are the lifeline for international trade and possess prospects for all. He emphasised the maritime heritage and gave thrust to make a framework of mutual understanding and cooperation for the preservation of maritime heritage. He also reiterated for common effort to achieve the framework in the maritime domain and identified five principles in this direction. Firstly, create an inclusive structure of maritime security for the region to facilitate free maritime trade with full respect to the rights of each other's sailors. Secondly, the settlement of maritime disputes is an integral part of mutual trust and confidence in the region. Thirdly, collaborative approach for the challenges like natural disasters and maritime threats created by Non-state. Fourthly, preserve the maritime environment and maritime resources to mitigate the climate change challenges. Finally, it is necessary to create responsible maritime connectivity through building infrastructure to enhance maritime trade.

Source: Ministry of External Affairs, Government of India

### Endnotes

- <sup>1</sup> Refer, for example, Indian Prime Minister's speech at the UNSC on 9 August 2021. See, Annexure 1 for an excerpt of his speech.
- <sup>2</sup> Refer, the Address by Indian External Affairs Minister at the Chulalongkorn University on "India's Vision of the Indo-Pacific", delivered on August 18, 2022, available at <https://www.mea.gov.in/Speeches-Statements.htm?dtl/35641/>
- <sup>3</sup> Refer, for example, Arfina Ara Hussain and Obja Borah Hazarika (2025) "India's Indo-Pacific Outlook: Strategies and Challenges" in Chintamani Mahapatra (ed.) *Indo-Pacific Strategic Churn: Challenges & State Responses*, Springer Nature, Singapore, [https://link.springer.com/chapter/10.1007/978-981-96-5245-7\\_3](https://link.springer.com/chapter/10.1007/978-981-96-5245-7_3)
- <sup>4</sup> Refer, for example, Rahman *et al.* (2020) investigate the potential economic effect of Indo-Pacific regional economic cooperation and compares it with the extended CPTPP. Using the Computable General Equilibrium (CGE) modelling, authors have shown that the quadrilateral alliance between the US, Japan, Australia, and India along with South and Southeast Asia would lead to substantial economic gain. Rahman, M.M., Kim, C. and De, P. (2020). Indo-Pacific cooperation: what do trade simulations indicate?, *Journal of Economic Structures* 9, 45.
- <sup>5</sup> India has decisively opted out of the 4<sup>th</sup> pillar of the IPEF. Study of Sen and Mathur (2025) show that gains would be the highest for all members if all four pillars, including the trade pillar, are incorporated. India would incur welfare losses if it opts out of IPEF. Refer, Rahul Sen and Somesh Mathur (2025) "India Opting Out of the Trade Pillar: A Quantitative Assessment of the Indo-Pacific Economic Framework", *Economic and Political Weekly*, Vol. 60, Issue No. 40, <https://www.epw.in/journal/2025/40/special-articles/india-opting-out-trade-pillar.html>
- <sup>6</sup> Refer, Archana Srivastava, Somesh K. Mathur, and Prabir De (2026) "An Ex-Ante Evaluation of Indo-Pacific Economic Framework: A General Equilibrium Analysis", in Somesh K. Mathur, Prabir De, Archana Srivastava (eds.) *The Changing Profile of India's Trade Relations: A Partial and General Equilibrium Analysis*, Routledge, New Delhi
- <sup>7</sup> Refer, for example, UNCTAD (2021), which has emphasised greener industrial port activities to 'transforming ports into carbon-neutral ecosystem'. Refer, UNCTAD. (2021). *Review of Maritime Transport 2021*. United Nations Conference on Trade and Development (UNCTAD), New York.





# Maritime Cooperation between India and ASEAN: An Overview of Issues and Way Forward

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Prabir De

India and Southeast and East Asian countries have a rich history of maritime trade and civilizational linkages. India is the closest maritime neighbour of Association of Southeast Asian Nations (ASEAN) bloc; the maritime distance between India and Indonesia is about 80 nautical miles. Ports are critical components of global supply chains, and most of the merchandise trade between ASEAN and India is carried through sea.

Economic ties between India and ASEAN are always in the forefront and have been deepening day by day. The total trade between ASEAN and India increased to US\$ 123.12 billion in 2025-26, of which US\$ 38.96 billion and US\$ 84.16 billion were India's exports to and imports from ASEAN, respectively.<sup>1</sup> The ASEAN-India Free Trade Agreement (FTA) in goods, implemented in 2010, and the services trade and investment agreement between ASEAN and India thereafter represent an important effort to enhance economic integration. India has also signed and implemented bilateral CEPAs/CECAs



with ASEAN member states such as Singapore and Malaysia.

Maritime cooperation has long been a shared priority for India and ASEAN. A stronger maritime relation between ASEAN and India may help unlock the trade potential between them.

Maritime cooperation has taken the centre stage of ASEAN-India relation. ASEAN-India maritime cooperation focuses on a set of agreed line of activities including maritime safety and security, blue economy and cruise tourism. India and ASEAN have jointly conducted the ASEAN-India Maritime Exercise (AIME). Cooperation between them is framed within India's Indo-Pacific Oceans Initiative (IPOI) and aligns with ASEAN's Outlook on the Indo-Pacific (AOIP). In past, ASEAN and India have issued a joint statement of maritime cooperation at the 20<sup>th</sup> ASEAN-India Summit, which was held on 7 September 2023 at Jakarta. Against this background, and drawing on the related work of the RIS, some key issues are presented in this article, to facilitate deliberations on a way forward.

## Maritime Economic Profile

ASEAN and India are littoral states and dotted with many seaports. While ASEAN is the fulcrum of the Pacific and Indian oceans, India is one of the fastest growing economies in Indo-Pacific aiming for US\$ 30 trillion economic size by 2047 under the *Viksit Bharat* programme.<sup>2</sup> Table 1 presents some of their maritime economy attributes for the year 2023. Maritime profile of ASEAN countries in terms of ocean cargo, both in tonnage and numbers (TEUs), is impressive - truly indicating the outward orientation of the member economies. Today, some of the world's best seaports are in the ASEAN region. In 2022, Singapore alone handled 1/3<sup>rd</sup> of ASEAN's total container traffic, followed by Malaysia and Vietnam; all of them have made impressive strides in the maritime

sector. These are the countries, which also have strong presence in global shipping if we consider their global ranks in the UNCTAD's liner shipping connectivity index (LSCI).

While the LSCI indicates a country's integration level into global liner shipping networks, the LPI (Logistics Performance Index) presents countries' performance on trade logistics. Singapore comes first in LPI and several ASEAN members such as Malaysia and Thailand have done well in the logistics performance, particularly in dwell time at ports<sup>3</sup>. However, the gap between developing and least developed ASEAN in the maritime sector is quite noticeable. For example, Brunei, Cambodia, the Philippines and Myanmar fall behind other ASEAN members in terms of their global presence in international passenger and cargo volumes, shipping and logistics. India, on the other, is fast emerging as a global maritime power house. Although India's container traffic volume has been much lower than that of ASEAN, India is ahead of many ASEAN countries in the liner shipping and logistics performance. Although, as on date, only two ports from India and six ports from ASEAN feature in the top 40 global container ports, Indian container ports are in turning moment with the rise of Indian merchandise trade from less than half a trillion dollar in mid. of the last decade to over a trillion dollar trade today. Performance of ports has also improved as captured by the LPI. For example, average dwell time of Indian ports is now comparable with that of Singapore and Malaysia.<sup>4</sup> The low dwell time at Indian sea ports is an outcome of reforms undertaken by the government in the shipping sector to enhance port productivity and improve visibility of the supply chain through digitalization. Therefore, with rise in efficiency, cargo volume may likely to go up in Indian and ASEAN ports. What follows is that India stands out as a promising maritime economy not only for the ASEAN region but also for the entire world.

Table 1: Maritime Profile of ASEAN and India in 2023

| Country     | Economic size <sup>1</sup> | Merchandise trade volume <sup>2</sup> | No. of international major sea ports <sup>3</sup> | International sea passenger traffic <sup>4</sup> | International sea cargo traffic <sup>5</sup> | International sea container traffic <sup>6</sup> | LSCI Rank <sup>7</sup> | LPI Rank <sup>8</sup> |
|-------------|----------------------------|---------------------------------------|---------------------------------------------------|--------------------------------------------------|----------------------------------------------|--------------------------------------------------|------------------------|-----------------------|
|             | (US\$ billion)             |                                       |                                                   | (million)                                        | (million tonnes)                             | (million TEUs)                                   |                        |                       |
| Brunei      | 16.68                      | 23.34                                 | 1                                                 | 0.280                                            | 1.766                                        | 0.150                                            | 134                    | *                     |
| Cambodia    | 29.61                      | 50.75                                 | 2                                                 | 0.027                                            | 6.382                                        | 1.765                                            | 111                    | 115                   |
| Indonesia   | 1317.26                    | 529.43                                | 18                                                | 2.739                                            | 843.289                                      | 2.134                                            | 27                     | 61                    |
| Lao PDR     | 15.05                      | 17.18                                 |                                                   | Not applicable                                   |                                              |                                                  |                        | 115                   |
| Malaysia    | 407.09                     | 655.83                                | 12                                                | 0.100                                            | 591.489                                      | 28.419                                           | 4                      | 26                    |
| Myanmar     | 62.99                      | 34.35                                 | 1                                                 | 0.001                                            | 16.329                                       | 1.182                                            | 106                    | *                     |
| Philippines | 404.28                     | 224.03                                | 15                                                | 0.041                                            | 180.203                                      | 4.940                                            | 62                     | 43                    |
| Singapore   | 466.60                     | 990.12                                | 1                                                 | 0.766                                            | 599.643                                      | 37.468                                           | 3                      | 1                     |
| Thailand    | 495.30                     | 592.29                                | 5                                                 | 0.165                                            | 243.518                                      | 9.904                                            | 18                     | 34                    |
| Viet Nam    | 408.80                     | 729.70                                | 8                                                 | 0.032                                            | 598.376                                      | 16.264                                           | 14                     | 43                    |
| ASEAN       | 3623.67                    | 3847.01                               | 63                                                | 4.151                                            | 3080.995                                     | 102.226                                          | 53                     | 55                    |
| India       | 3390.00                    | 1176.08                               | 34                                                | 15.190                                           | 1323.000                                     | 11.230                                           | 23                     | 38                    |

**Notes:** \* Data not available. 1: GDP at current price taken from IMF. 2: Taken from the WDI, World Bank. 3: Seaports as approved to handle international cargo, taken from the maritime atlas, PIANC. 4, 5, 6: Sourced from the ASEAN Stat. ASEAN Secretariat for ASEAN countries and Basic Ports Statistics, Ministry of Ports, Shipping and Waterways, India. 7: Global rank in liner shipping connectivity index (LSCI) for the 4<sup>th</sup> quarter 2022, taken from the UNCTAD. 8: Global rank in logistics performance index (LPI) for the year 2022, taken from the World Bank.

**Source:** Author's own compilation from several secondary sources.

To drive the economic growth, India and ASEAN member states have undertaken several national initiatives in the maritime sector in the past, which can be grouped in four categories: (i) capacity enhancement, (ii) efficiency and competitiveness, (iii) climate and sustainability; and (iv) international cooperation.<sup>5</sup> For example, India's *Sagarmala* programme has helped the country to enhance capacity and digitalisation activities, whereas Singapore, Malaysia and Thailand in ASEAN have also extended high priorities on performance and efficiency of ports. Countries have found digital technology as an acceptable parameter to enhance maritime domain awareness. However, ports in ASEAN and India are slow-starters in fulfilling climate agenda and sustainable development goals. It appears that significant challenges remain with regard to mobilizing adequate climate change adaptation and finance in the maritime sector.

Ports are primarily strategic outfits. To scale up the Indo-Pacific activities, ASEAN has introduced the ASEAN Outlook on the Indo-Pacific (AOIP) and India has come out with the Indo-Pacific Oceans Initiative (IPOI), both share relevant fundamental principles in promoting peace, stability and prosperity in the region.<sup>6</sup> Maritime cooperation has been the foundation of both AOIP and IPOI. There is ample scope of learning from mutual experiences. There are several primary (Strait of Malacca) and secondary choke points between India and Southeast Asia, thereby raising high risks alert. Although there are areas of convergence between ASEAN and India in maritime cooperation, the scope of cooperation can be further restructured in order to deal with current needs and challenges.

## ASEAN's Approach to Maritime Cooperation

Maritime cooperation requires a cross-pillar approach and involvement of multi-stakeholders. ASEAN has introduced the ASEAN Maritime Outlook (AMO) in 2023 as

a guide for ASEAN maritime cooperation in the region. ASEAN's maritime cooperation includes but are not limited to: (i) proliferation of marine debris and pollution, (ii) environmental impact of marine transport, (iii) piracy and armed robbery against ships, (iv) cyber attacks against ships and port facilities, (v) irregular movement of persons, (vi) illegal, unregulated and unreported (IUU) fishing activities, (vii) blue economy, (viii) offshore mining, and (ix) offshore renewable energy.<sup>7</sup>

The implementation of the AOIP remains one of the most important frameworks of ASEAN's engagement with external partners on maritime cooperation. Cooperation with external partners could be undertaken in consultation with the relevant sectoral bodies in the following areas, among others, maritime security and safety; sustainable management of marine resources; maritime connectivity; conservation of marine biodiversity; and technical cooperation in marine science. The ASEAN Senior Officials' Meeting (ASEAN SOM) as the Lead Sectoral Body for Maritime Cooperation is at the forefront of coordinating and facilitating cooperation among the ASEAN mechanisms and stakeholders involved. Noted in the *AMO 2023*, "this Outlook will make a meaningful contribution towards the work of ASEAN Community-building as well as further strengthening ASEAN's engagement with external partners. It is also meant to help create synergies among ASEAN's programmes and work plans across the relevant ASEAN Sectoral Bodies, mechanisms and processes."<sup>8</sup>

## Current Contour of ASEAN-India Maritime Cooperation

ASEAN and India have been working closely in securing the trade routes, freedom of navigation in international waters, over flights, threat or use of force to intimidate, reducing piracy along the Malacca Straits, cooperating in addressing traditional and non-traditional security challenges, including in areas of de-

radicalization, prevention of violent extremism, cyber crime and natural disaster management, and the peaceful settlement of maritime-territorial disputes in accordance with the established principles of international law, including the 1982 United Nations Convention on the Law of the Sea (UNCLOS).

East Asia Summit (EAS) has been giving focus on maritime security and cooperation. It has been discussed also in other ASEAN-centric regional fora such as ASEAN Defence Ministers Meeting Plus (ADMM-Plus), ASEAN Regional Forum (ARF) and Expanded ASEAN Maritime Forum (EAMF). India is a member of the Expanded ASEAN Maritime Forum (EAMF). India is also an active participant in non-ASEAN centric regional fora such as the Indian Ocean Rim Association (IORA); Indian Ocean Naval Symposium (IONS); and the Council for Security Cooperation in the Asia-Pacific (CSCAP).

Notwithstanding the past activities, the ASEAN and India have undertaken collective efforts to address three aspects of maritime cooperation: connectivity, security and cooperation. The priorities of maritime cooperation are to build a safe, sustainable and efficient maritime transport system in the region as well as maintain the security in the ocean.

### **ASAEAN-India POA (2021-25) and ASEAN-India POA (2026-2030)**

Maritime cooperation has been guided by the Plan of Action (POA) to implement the ASEAN-India Partnership for Peace, Progress and Shared Prosperity (2021-2025). The POA outlines the shared agenda of maritime cooperation:

First, to promote maritime security and safety, freedom of navigation and overflight, unimpeded commerce, mutual trust and confidence, exercise of self-restraint, the non-use of force or of the threat to use force, and the resolution of disputes by peaceful means, in accordance with universally recognised

principles of international law, including the 1982 United Nations Convention on the Law of the Sea (UNCLOS), the relevant Standards and Recommended Practices of the International Civil Aviation Organization (ICAO), and the relevant instruments and conventions of the International Maritime Organization (IMO).

Second, to explore cooperation, where appropriate, to promote common principles, objectives and elements between the AOIP adopted at the 34th ASEAN Summit in Bangkok and the IPOI announced by India at the 14th East Asia Summit in Bangkok.

Third, to promote maritime cooperation, including maritime security, counter piracy, maritime safety and search and rescue (SAR) cooperation, and information sharing, through appropriate mechanisms under the ASEAN-India framework and other appropriate ASEAN-led mechanisms, including EAS, ADMM-Plus, ARF, Expanded ASEAN Maritime Forum and where appropriate, promote technical cooperation, capacity building and development, exchange of experience and sharing of knowledge and expertise.

Fourth, to forge closer cooperation in order to enhance transportation infrastructure, networks and operations, including air, maritime, road and rail to improve ASEAN-India trade and tourism-related transport connectivity, including through supporting the implementation of the Kuala Lumpur Transport Strategic Plan (ASEAN Transport Strategic Plan) 2016-2025.

Fifth, to promote maritime transport cooperation and encourage potential private sector participation in the development of seaports, maritime logistics network and maritime services in order to create greater efficient linkages.

Sixth, to support the implementation of the Bangkok Declaration on Combating Marine Debris in ASEAN Region, the ASEAN Framework of Action on Marine Debris, and

the 2018 EAS Leaders' Statement on Combating Marine Plastic Debris.

India and ASEAN have recently adopted a new ASEAN-India POA for the period 2026–2030 at the sidelines of the 58<sup>th</sup> ASEAN Foreign Ministers' Meeting to deepen the ASEAN-India Comprehensive Strategic Partnership, with a focus on digital, defence, maritime, and economic cooperation.

### **ASEAN-India Joint Statement on Maritime Cooperation (AIJSMC)**

To add further momentum to maritime cooperation, ASEAN and India issued a Joint Statement on Maritime Cooperation at the 20th ASEAN-India Summit on 7 September 2023.<sup>9</sup> Besides, the ASEAN-India Joint Statement on Cooperation on the ASEAN Outlook on the Indo-Pacific for Peace, Stability, and Prosperity in the Region (2021), and the Joint Statement on ASEAN-India Comprehensive Strategic Partnership (2022) also come in play in driving the maritime cooperation activities between the two partners. At the 20th ASEAN-India Summit, leaders of ASEAN and India reaffirmed the importance of strengthening ASEAN-India maritime cooperation to ensure regional security, stability and growth through ASEAN-led regional architecture and in cooperation with relevant regional bodies. Followings are the major takeaways of the AIJSMC.

One, to further strengthen ASEAN-India cooperation on maritime safety and security through confidence-building measures, coordinating and sharing best practices on emergency response, Humanitarian Assistance and Disaster Relief (HADR), Search and Rescue (SAR) operations, early warning systems as well as in the areas of countering piracy, armed robbery against ships, trafficking in persons and smuggling of arms and drugs, and combating IUU fishing.

Two, to enhance information sharing and capacity building in maritime domain and

strengthen cooperation through specialised bodies in the region.

Three, to promote cooperation and coordination between maritime authorities and law enforcement agencies through dialogue, exchange of expertise and capacity building and explore cooperation on sustainable use of the oceans, seas, and marine resources.

Four, to enhance connectivity between ASEAN and India in line with the "Connecting the Connectivities" approach, including in the maritime domain by exploring synergies between the Master Plan on ASEAN Connectivity (MPAC) 2025 and India's connectivity initiatives in the region to ensure seamless connectivity in the Indo-Pacific by collaborating for quality, sustainable and resilient infrastructure.

Five, to promote cooperation in Blue Economy in the areas of sustainable development of marine resources, marine biodiversity and ecosystem conservation, combating climate change and marine pollution, promoting green and efficient maritime transport and developing new and renewable energy including marine-based renewable energy, among others.

Six, to strengthen collaborative actions between ASEAN and India in order to prevent and reduce marine debris, including through the implementation of joint actions and partnerships for addressing this challenge, which will contribute to the implementation of the ASEAN Regional Action Plan for Combating Marine Debris in the ASEAN Member States.

Seven, to enhance cooperation for conservation and preservation of underwater natural and cultural heritage of ASEAN and India including marine parks of India and those listed as ASEAN Heritage Parks as well as through the ASEAN Cultural Heritage List.

What follows is that the joint statement is an excellent way to provide a direction of cooperation. However, ASEAN and India have to design a set of action plans and tasks

to implement the mandates as outlined under the ASEAN-India framework to strengthen maritime cooperation.

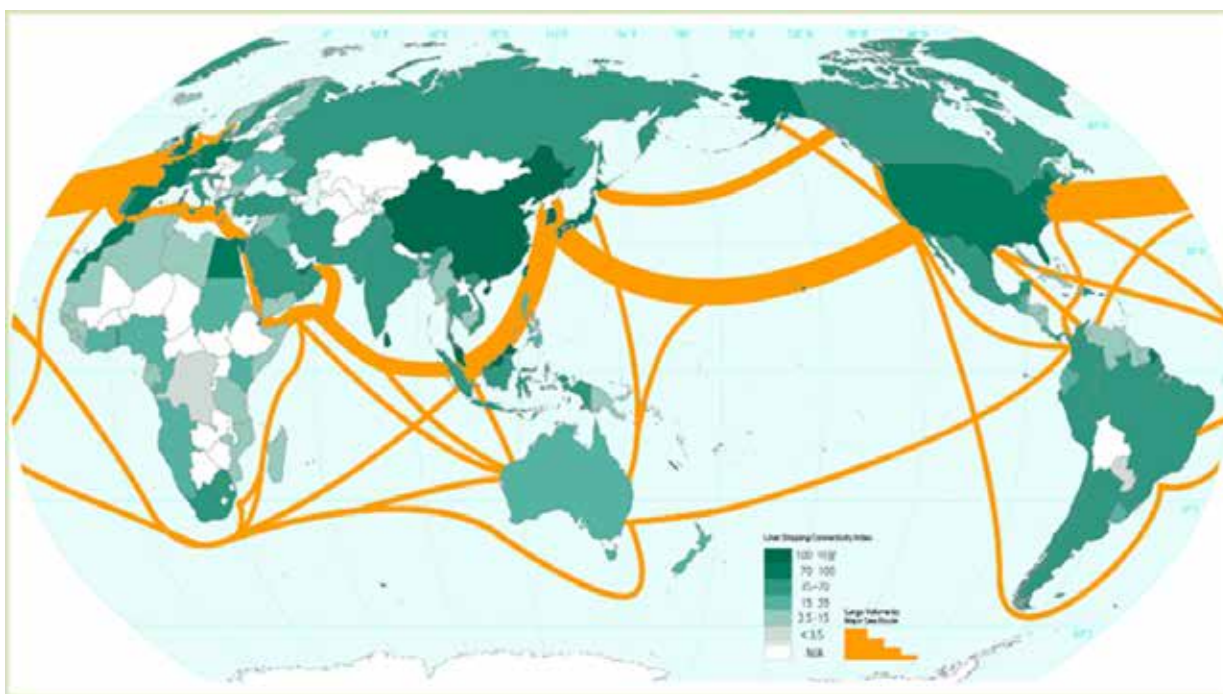
## Way Forward

At the ASEAN-India Commemorative Summit, held on 25 January 2018 at New Delhi, India, leaders of ASEAN and India outlined the vision on the future of ASEAN-India Strategic Partnership, wherein they designated ASEAN-India Cooperation in the Maritime Domain as one of the key areas of this partnership. India endorsed the 'Blue Economy' as a new and central pillar of the country's economic activity. It encompasses both the coastal areas and the linked hinterland. India has emphasised the 'SAGAR' (Security and Growth for All in the Region) concept, which reaffirmed India's key role in strengthening the Blue Economy in the India-ASEAN region. Relationship between them is now upgraded to the level of ASEAN-India Comprehensive Strategic Partnership.

ASEAN countries and India have to identify all such challenges and plan collaborative responses, in terms of cooperation among naval forces, coast guards and other law enforcement agencies, capacity-building, deconfliction of naval encounters, and confidence-building at sea. Let's discuss some of the programmes, which may further strengthen the maritime partnership.

- The inaugural ASEAN India Maritime Exercise (AIME-2023) successfully culminated in the South China Sea on 8 May 2023. Approximately 1400 personnel manning nine ships participated in the Sea Phase of the multilateral naval exercise. India's indigenously designed and built ships-destroyer INS Delhi and stealth frigate INS Satpura, maritime patrol aircraft P8I and integral helicopters exercised with ASEAN naval ships from Brunei, Indonesia, Malaysia, Philippines, Singapore, Thailand

**Figure 1: Network of Major Sea Routes of the World**



\*Representative map based on the actual flow of trade in 2019

Source: Cello Square

- and Vietnam.<sup>10</sup> This exercise should be continued in regular frequency.
- At the bilateral level, India conducted joint naval exercises and patrols with ASEAN member states, including Singapore and Indonesia, to enhance maritime domain awareness and demonstrate a commitment to a rules-based regional order. India and Myanmar have signed the standard operating procedure (SOP) for India Myanmar Coordinated Patrol (IMCOR). The signing of the pact formalises a key part of ongoing maritime cooperation between India and Myanmar in the Bay of Bengal. India has already signed a bilateral agreement with Indonesia and Thailand for maritime coordinated patrols. Myanmar is another country with which India has signed an agreement on maritime coordinated patrols. Thus, two of the ASEAN member states, namely, Myanmar and Thailand, have signed an agreement with India for maritime coordinated patrols. Cambodia and Vietnam may consider signing a similar agreement with India. Recently, coast guards of Vietnam and India took part in a search and rescue drill operation to strengthen the maritime security ties.
  - Maritime Domain Awareness (MDA) must be promoted in its all forms. The enhancing regional Maritime Domain Awareness (MDA) could be undertaken through focused measures such as setting up Coastal Radar Surveillance System (CSRS) including radars, electro-optic and Automatic Identification System (AIS) sensors; regional agreement on White Shipping information (unclassified merchant ship information) culminating in a cooperative information Fusion Center (IFC) with linkages with other similar global centres; and use of a collective data centre for Long Range Identification and Tracking (LRIT) of ships on lines of the EU (European Union) LRIT Data Center.<sup>11</sup>
  - Enhancing regional connectivity and trade through direct short-sea shipping and shipping facilitation agreements would strengthen maritime connectivity between ASEAN and India. India is located at a critical strategic location in Indian Ocean. Resilience of supply chain depends how well we look after the shipping lanes (Figure 1). At present, ASEAN and India have been negotiating the ASEAN-India Maritime Transport Cooperation Agreement (AIMTCA). This Agreement may provide greater access to maritime services; facilitate the flow of trade through sea; and encourage private investments in the areas of maritime transportation, port development, etc. ASEAN and India shall take up issues such as coastal shipping network (short sea shipping), development of maritime cargo routes, etc., which hold immense potential.
  - Strengthening maritime connectivity would lead to strengthen economic integration through higher trade and investment, promotion of tourism, and building seaports and shipping networks, signing of Mutual Recognition Agreement (MRA) in shipping and logistics services, cooperation for improving efficiency of ports joining ASEAN Ro-Ro and Cruise Network, etc., ASEAN and India may also decide the possibility of developing RoRo terminals, ports and building connectivity between islands under the Sagarmala project.
  - India has taken steps to augment capacity at major ports across the country. New cargo terminals are under construction at ports in Kamarajar, Ennore, Visakhapatnam, V.O. Chidambaranar, Tuticorin, Paradip and Kolkata. Partnership with ports located in Myanmar, Thailand, Indonesia, Singapore and Malaysia can make Indian ports important gateways to ASEAN member states and vice versa. The Kaladan Multi-Modal Transit Transport project is likely to improve connectivity between Indian ports

- on the eastern seaboard and Sittwe Port in Myanmar, which would not only promote trade links with Myanmar but also facilitate transit of goods to and from the North East India.
- ASEAN-India maritime connectivity agenda may consider strengthening connectivity between the islands. Islands can be turned into centres of excellence if we implement a stronger inter-island connectivity programme. ASEAN-India islands connectivity has gained momentum in recent years with ASEAN's investments in infrastructure in its islands, and India's investments in infrastructure, tourism, agriculture (organic and fisheries) and renewable energy development in the Andaman and Nicobar Islands region. There is scope to unlock the vast potentials of cooperation with ASEAN, with respect to tourism, maritime security, disaster management, etc. Several ASEAN ports and shipping companies are running terminals and carry international trade.
  - ASEAN and India may conduct more cooperation and capacity building in aquaculture and deep-sea fishing. Besides, greater hydrographic cooperation through training, capacity building and joint surveys would help both to refine the knowledge and understanding on maritime cooperation. These are the areas where India can extend effective support to CLMV countries.
  - ASEAN countries and India may consider examining national approaches to the responsible development of marine resources including the utilisation of marine-based renewable energy. Emerging technologies are opening up new frontiers of marine resource development leading to mining of seabed mineral resources. Low carbon shipping, regional fisheries agreements, ocean surveillance, information sharing, marine biotechnology, cyber security and IT services are some of the areas for cooperation.
  - ASEAN and India may consider a strategic alliance between their respective Port Community Systems. A Port Community System (PCS) is a single window digital platform that connects multiple stakeholders electronically. Streamlining and digitising port logistics and operations between ports in ASEAN and India may help reduce trade costs and improve the efficiency. India is setting up an international transshipment terminal at Galathea Bay in Andaman and Nicobar Islands. Indian private sector port operator, Adani Group, has shown interest to develop ports at Sabang Island in Aceh Province in Indonesia and at Lien Chieu in Vietnam.
  - Training and capacity building at the India Maritime University (IMU), Chennai or the National Maritime Foundation (NMF) for ASEAN officials may be undertaken in the areas of maritime supply chain resilience with support of the MEA's ITEC programme. Besides, forming a network of maritime think-tanks between ASEAN and India may help facilitate analytical studies on cross-cutting areas in maritime cooperation. RIS may conduct training programme for ASEAN scholars and young leaders on maritime cooperation.
  - To further strengthen the maritime partnership, ASEAN and India have jointly declared that the 2026 is the Year of ASEAN-India Maritime Cooperation.

## Endnotes

- <sup>1</sup> Based on Export-Import Databank, Department of Commerce (DOC), New Delhi
- <sup>2</sup> Refer, NITI Aayog's recent forecast on India's GDP. Reported in <https://timesofindia.indiatimes.com/business/30-trillion-economy-document-to-outline-reforms-pitch/articleshow/104806581.cms?from=mdr>
- <sup>3</sup> Read, for example, <https://lpi.worldbank.org/export-delays>

- <sup>4</sup> Refer, <https://pib.gov.in/PressReleaseIframePage.aspx?PRID=1920541>
- <sup>5</sup> Refer, for example, Mitra, S *et al.* (2021) “Reforming Port Processes in India for Logistics Efficiency”, ADB Briefs # 187, Manila, available at <https://www.adb.org/publications/reforming-port-processes-india>
- <sup>6</sup> Read, for example, Singh, Gurjit (2022) “The India ASEAN AOIP-IPOI Cooperation”, ORF, New Delhi, <https://www.orfonline.org/expert-speak/the-india-asean-aoip-ipoi-cooperation> and also refer, ASEAN-India Centre (AIC) at RIS, *ASEAN –India Development Cooperation Report 2021*, New Delhi, and De, Prabir (2024) (ed.) *Thirty Years of ASEAN-India Relations: Towards Indo-Pacific*, Routledge, New Delhi, available at <https://www.routledge.com/Thirty-Years-of-ASEAN-India-Relations-Towards-Indo-Pacific/De/p/book/9781032617473>
- <sup>7</sup> Refer, ASEAN Secretariat (2023) *ASEAN Maritime Outlook*, Jakarta, available at <https://asean.org/wp-content/uploads/2023/08/AMO-1.pdf>
- <sup>8</sup> Ibid
- <sup>9</sup> Refer, <https://asean.org/asean-india-joint-statement-on-maritime-cooperation>
- <sup>10</sup> Refer, <https://pib.gov.in/PressReleaseIframePage.aspx?PRID=1922815>
- <sup>11</sup> Author’s own interaction with the NMF, New Delhi

## **Part X**

# **Policy Dynamics for Viksit Maritime Sector**







# Dredging for Competitiveness to Steer India's Port-led Industrialisation

S. K. Mohanty

**T**he global expansion in economic activities is largely attributed to the resurgence of maritime trade, where port-led industrialisation became the key development strategy for many countries (Valentine *et al.*, 2013). For the success of port-led development, dredging plays a pivotal role in steering maritime infrastructure activities. With the rise of global interdependence, a substantial volume of global trade moved across the world, and the growing technology supports its focus on expanding the sizes of ships and persistent demand for maintaining a high draft at the port as well as riverine system through capital and maintenance dredging in order to make the sector competitive with rising economies of scale (Tchang, 2020).



Dredging is a lifeline for ports and river terminals which face frequent sedimentation and navigational chokepoints. Today, the world dredging sector is based on a globally sustainable maritime system. It is supporting numerous activities, including port development, development of inland waterways, beach nourishment, habitat creation, land reclamation for port and urban expansion, etc., among others (Solanki *et al.*, 2023). In global best practices, several projects were undertaken in the broader framework of putting a limit on the extent of environmental damage.

## Global Best Practices

There are several best practices seen in the dredging sector in the world, ranging from port expansion to intensifying the draft of canals, sustainable riverine, etc. Several such instances can be drawn from developed and developing countries. For example, the Netherlands adopted a suitable policy for dredging where waves and currents have evenly distributed sediments naturally, and reducing the need for repeated dredging to maintain a at desirable level (Stive and Vrijling, 2017). In another case, persistent reclamation activities in Singapore have been useful in expanding the national land area through the application of advanced technology and governance. To tie over choke points, Egypt initiated the 'New Suez Canal' project in 2015 and used ultra-fast deepening projects to facilitate the entry of large ships into the channel (Chorev, 2023). A similar initiative was undertaken by Panama in 2016 to launch 'New Panamax' to accommodate and facilitate movements of multiple large container vessels through the canal (Carse, and Lewis, 2020). In an attempt to maintain the waterways, the US maintains a long stretch of 12,000 km of inland waterways through the USACE system, which is managing navigation by connecting more than 1000 harbours (Emery, 2024). Besides, there are several global best practices can be seen in the dredging sector around the world on port and inland water transport (IWT) dredging

with the use of advanced technology, thereby making them more sustainable.

## Evolving Regulatory Framework in India

India has been pursuing the global trend in adopting dredging as a key sector to drive the port-led industrialisation in the country. It has promoted capital dredging and maintenance dredging simultaneously to boost primarily port and IWT expansion, along with other activities such as coast restoration, habitat creation, etc. India has already adopted 111 national waterways under the National Waterways Act, 2016 to use the country's riverine system for efficient cargo transportation (Aggarwal *et al.*, 2020). India has 12 major ports and over 200 non-major ports, which are handling cargo, ferrying passengers, and conducting fishing activities. Major ports in India handle about 65-70 per cent of India's cargo, whereas non-major ports are in the process of getting modernised with additional cargo handling capacity. The *Maritime India Vision 2030* has set a target to raise the share of IWT in the overall cargo movement of the country from the present level of 2 per cent to 5 per cent by 2030 (Pasha and Rastogi, 2022). As such, the movement of cargo through inland waterways expanded from 18.1 million tonnes in 2013-14 to 145.5 million tonnes in 2024-25, registering a CAGR of 20.69 per cent for the same period. As of 2024, the dredging market in India is about 157 million cubic meters (mcm), where maintenance dredging is at 110 mcm and capital dredging is at 47 mcm (NITI, 2025). India has already evolved a set of dredging guidelines for major ports in 2016, and the revised version in 2021, and shared a SOP (Standard Operating Procedure) for the standardised contract and performance management.

## Flagship Programmes of India

To provide a major thrust to the maritime sector, the Ministry of Ports, Shipping, and Waterways (MoPSW) launched a flagship programme called *Sagarmala* in 2015 to reduce logistic costs and

bring in competitiveness in the sector through the modernisation of ports, connectivity, coastal shipping, and the development of inland water transport (*Maritime India Vision 2030*, 2021). The Jal Marg Vilas project was launched by the Inland Waterways Authority of India (IWAI) with the World Bank to develop a river navigation system for cargo movement along 1390 km, and the multimodal river waterways system has been in operation since 2018 (World Bank, 2023). In the dredging sector, both public and private sectors are operating simultaneously, and the disinvestment pursued by the government encouraged the private sector to become important in driving the sector (Patel and Bhattacharya, 2010). There is a large potential for dredging activities due to the expansion of major and non-major ports, as well as growing IWT. The National Waterways Act, 2016 outlined the national waterways framework. The development of these waterways generates huge demand for dredging activities in India. To what follows the government initiatives like the Sagarmala project and inland waterway projects further enhanced the demand for dredging.

## Global and Domestic Trends in Sustainable Dredging

### Adverse Impact of Dredging

Environmental sustainability in the dredging sector has been accorded priority in both global and domestic policy frameworks. The adverse impact of dredging on the environment has been intense on the marine biodiversity. Dredging creates a thin layer of sediments, which generates a cloudy cover in different layers of the water column that reduces the beaming of light (Dankers, 2002). This prevents the photosynthesis of organisms like corals, seagrass, etc., and many times, it destroys organisms like reefs, leading to the destruction of habitats. Removal of sediments from the seafloor and reshaping of the seabed causes severe losses of organisms such as worms,

vibrates, crustaceans, etc., affecting food chains of fisheries and other organisms. Dredging activities also affect fishing stock in terms of threatening their existence by planting a layer of sediments on the gills of fish, thereby increasing the possibility of morbidity of fish around the dredging area (Wenger *et al.*, 2017). For example, in Marmagao Port in Goa, there were incidences of loss of biodiversity to the extent of 60-70 per cent at the site of dredging. Considering the possible environmental impact on the area around the dredging site, global- and country- level regulations should be stringent.

### International Regulatory Regime

The International Maritime Organisation (IMO) regulations focus on the prevention of pollution in the sea from ships, and, therefore, pollution from dredged materials into the sea also comes under the purview of the IMO (Wasim, and Nine, 2017). The London Convention (LC) in 1972 and London Protocol (LP) in 1996 deal with pollution prevention in the sea from the dumping of materials by using a science-based permitted system, and both of them are administered by the IMO. Under the provisions of the LC and LP, dumping materials in the sea is banned except for items stipulated in Annexure 1, which includes dredged material, permitted after complying with the procedures outlined in Annexure 2. The IMO also extends the Waste Assessment Guidelines (WAG) under the LC and LP to present specific stipulations on dredged materials, disposal sites, and steps to monitor the operation. Under the IMO Dredged Material Assessment Framework (DMAF), the need for dredging may be justified by adhering to waste prevention audit. The International Convention for the Prevention from Ships (MARPOL) was held in 1973 and adopted in 1978. Though the Convention is not directly linked to the governance of dredging, its' garbage disposal, release of oily water, sewage, emission in the air, etc. fall under the purview of the convention. The World Organisation of Dredging Association (WODA) adopted seven

points in 2013 for sustainable dredging to keep a balance between social, economic and environmental objectives at different stages of a project (Thomsen *et al.*, 2016). It focuses on taking care of the local ecosystem and the carbon footprint of a project, the involvement of stakeholders from the conceptual stage, disposal of dredged materials for certain purposes, such as nourishment of land, habitat creation, etc. and data analysis before, during, and after completion of a project, etc. which are cited as different provisions in the WODA.

### Regional Regulatory Regime

Besides these international conventions, several regional conventions deal with the dredging sector. The Oslo-Paris Convention (OSPAR) in 1992 of the north-east Atlantic region provided guidelines for the use of materials from dredging for the contracting parties (Van Der Burgt, 1994). The Helsinki Convention (HELCOM), held in 1974 and entered into force in 1980, deliberated on dredged materials into the sea, used by its participating members in the Baltic Sea region. There are several other regional conventions existing in different parts of the world, including the Barcelona Convention, which was held in 1976 and entered into force in 1995 for the Mediterranean region, and the Bucharest Convention (1992) for the Black Sea region.

### Regulatory Regime in India

In line with international conventions, India also enacted several guidelines to direct both capital and maintenance dredging to follow global best practices in the marine sector. Following the disciplines set by the London Convention and the London Protocol, India enacted Dredging Guidelines for Major Ports (2021) for capital and maintenance dredging in major ports. Addendum to 2021 guidelines (2023) also issued to utilise Beneficial Use (BU) of dredged materials for specific purposes such as sea beach nourishment, habitat

restoration, land reclamation, construction fill, environmental announcement, etc., rather than just disposal. This is very much in consistent with the principles of the IMO, London Convention and London Protocol and regional conventions like the OSPAR and the HELCOM. The Coastal Regulation Zone (CRZ) in 2019 emphasises on location-specific safeguards for sensitive areas, while operating, and takes notes of regional sea practices. The EIA notification (2006) guidelines for ports and harbour make it mandatory to undertake environmental clearances for activities such as board expansion and capital works, which involve dredging. This notification is consistent with the provisions of the Waste Assessment Guidelines (WAG) of the LC and LP. The Major Ports Authority Act (2021) provides guidelines for the dredging operation, which requires compliance with the Environmental Impact Assessment (EIA) and an Environmental Management Plan (EMP). These comprehensive policies have brought in orderly changes in the governance structure of the dredging sector, and are consistent with the global dredging principles and practices.

### Potential Challenges for the Sector

Multiple agencies are operating for a range of activities, posing challenges in approval, and variations in regulations across different states, causing slow decision-making processes. There has been considerable need for single-window clearance, a time-bound approval process, publication of SOPs for maintenance and capital dredging, etc. The sector has been witnessing disputes related to methods used for pre- and post- hydrographic surveys. This has culminated in disputes related to the volume of dredged materials and payments to be made. There are several policy options available globally to resolve such disputes, including third-party certification, the International Hydrographic Organisation's S-44 standard, etc.

Demand for maintenance dredging is large in India, but, it is seasonal in nature. The indigenous availability of hopper/cutter capacity is much lower than the overall demand of the country, and, thus, largely depends on foreign crew and equipment. This inflates the cost of hiring of such services. There is a need for considering certain issues, such as a Fleet Augmentation Plan with a multi-year contract, shipyard incentives under the 'Make in India' programme, intensive training courses in certain education and capacity-building programmes, etc. The environmental compliance in the dredging sector has been complex and is often subject to legal complications. The IMO and LC, and LP consider dredged material as a resource, which should be replies for constructive purposes such as shoreline nourishment, wetland/mudflat creation, engineered fills, etc., but a substantial part of the silt goes to sea or is disposed in nearshore. Most of the rivers, like the Ganga and Brahmaputra, have the tendency to split and rejoin, banks move sideways, and silt piles up systematically, and this is more so during the monsoon periods. In order to make it sustainable for a navigational route, flexible plans need to be designed. In many waterways and small ports, last-mile connectivity has been poor for multiple reasons, and, therefore, investment planning is needed for developing infrastructure to connect them. The Indian peninsula is often affected by changing weather conditions, climate variability, and coastal change. To prevent recurrence of damage by natural calamities, investment plans may be developed to build infrastructure based on the BU. The dredging sector in India faces several impediments, and resolutions to those challenges are highly capital-intensive and require persistent efforts for the smooth functioning of the sector.

### **Navigation in the Ganga and Brahmaputra Basins**

The Ganga and Brahmaputra are two big river systems, which are intensively used for

navigation in the country apart from other purposes. During the monsoon, these rivers also transport large volumes of mud, sand and silt, reducing the draft of the river bed, and, therefore, causing navigation unfit for transportation. It is often seen that rivers have a tendency to shift sideways after a flood. Silt not only goes to sea with the flow of the river, but also returns upstream because of the tide, and this reverse action refills the navigational channels with silt. This situation requires dredging for safe navigational operations. The dredged materials treated as resources, according to the IMO and LC/LP, are often unfit to reuse on beaches because they are too thin silt. These developments become the cause of dispute in the sector. This requires quick survey data because the river bed shifts, causing dispute when contractors are paid per cubic meter.

For ensuring an uninterrupted navigational system, the availability of depth across the navigational route should be maintained, for which INR/km-month formulae may be considered. Furthermore, other parameters may be considered, including weekly MBES/ADCP surveys with independent certification, bandalling/bar-skimming, and the use of silt as a resource for wetlands/mudflats where feasible. Initiating a single digital window for approvals is also a pressing issue that needs immediate attention.

Though cargo in inland waterways has been expanding in double digits over the past decade, higher cargo transportation is constrained due to unpredictable depths, high first/last-mile costs, and few scheduled services. Regional countries are already operating through Indian waterways, and a variety of products, including cement, clinker, stone, grain, fertiliser, coal/biomass, etc. are transported through the navigation route. Through regional coordination, operation through the river waterway system and coastal shipping can be improved.

## Regional Integration in Maritime Trade: Dredging and Trade

Global experience shows that there is a positive linkage between waterways and coastal shipping and regional trade when countries form regional corridors. Policy coordination becomes easier for a group of countries when they form regional groupings and pursue regional corridors. The experiences from Europe, where the Motorways of the Sea programme is to develop hinterland connectivity for cargo movement among multiple countries, and it is a part of the TEN-T network (Aperte and Baird, 2013). Similarly, the Rhine–Alpine corridor and the Danube River also have provided an enduring navigation system to Europe to support their regional trade. India can pick up a few river corridors for promoting regional trade, which can enhance regional integration.

The BIMSTEC region has high potential for improving intra-regional trade through greater regional integration (De, 2023). The region has several waterways and long coastlines. By developing inland waterways and coastal shipping, regional integration can be achieved through lowering logistics costs and access to new markets within the region. This requires reliable shipping corridors and predictable transport services, for which a large investment in dredging is required regularly. A regional convention on dredging may be organised by the BIMSTEC member states.

At present, the Bay of Bengal region faces enormous challenges with the existing navigation systems, with unreliable depth across various inland waterways and coastal shipping. Frequent occurrence of natural calamities, including monsoons, cyclones, and floods, adversely affect regional navigation systems. In the absence of a formal agreement between the countries, dredging activities are undertaken independently by individual countries, but not corridor-by-corridor. There is no uniformity in rules adopted by regional

economies in various maritime sectors, such as pilotage, customs, fees, etc., causing a surge of logistics costs. Environmental rules are not uniform across the region, and mechanisms for the sharing of maritime-related information are not in place on a real-time basis. Regional ports and terminals are devoid of good last-mile links to rail and roads, and other forms of transportation. The list is too long to mention the deficiencies in the maritime sector concerning dredging activities. If the region is to integrate through regional cooperation, establishment of strong navigational system has to put in place to strengthen transregional inland waterways and coastal shipping.

## Conclusion

The dredging sector plays a very important role in keeping ports, canals and rivers navigable, lowering logistics costs and making maritime trade more competitive. India followed global practices to develop its' maritime sector by initiating several programmes and a regulatory policy framework to streamline the sector. The *Sagarmala* programme is mandated to modernise ports, connectivity and also the dredging. India is consistently adopting international norms, including the IMO's London Convention/Protocol, in evolving its national guidelines for capital and maintenance dredging, CRZ safeguards, mandatory EIA/EMP, etc., in the dredging sector.

Policy challenges also exist in the sector. Demand for dredging has been expanding exceptionally in double digits during the past decade, and large potential exists in India, but the tasks before the country have been enormous. This article has identified some measures to address such challenges.

Regional cooperation in the waterways and coastal shipping can unlock large opportunities that exist in BIMSTEC. Long coasts and extensive waterways could bring down the cost of navigation if the navigation system is made reliable. Urgent actions are needed in

certain areas for redressal, such as non-uniform rules including pilotage, customs, fees, weak last-mile links, disaster risks, and the absence of corridor-level dredging agreements raise costs. A regional task force may be constituted to look into various aspects of challenges that the region has been facing in the dredging sector. A regional convention on dredging is suggested for consideration of the BIMSTEC member states.

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# Tonnage Tax Reforms in India: A Proposal

Sujeet Samaddar and Vanshika Goyal

India being one of the fastest growing economies and home to 1.4 billion people plays an important role in the global trade – both as an exporter and importer of goods, mostly carried through ships. In 2024, the country's merchandise imports reached US\$ 701.6 billion<sup>1</sup>, with seaborne volume of 830 million metric tons (MMT), or 7 per cent of the global trade<sup>2</sup>. In comparison, India's merchandise export value amounted to US\$ 442.6 billion<sup>3</sup> with volumes growing at a moderate pace, stood at 225 MMT in 2024, yet representing a strong 2 per cent share in global exports<sup>4</sup>.

During 2000-2025, the seaborne trade for India saw a tremendous growth marked by a threefold increase in imports and a twofold rise in exports (Figure 1). Despite this surge in trade, the global share of Indian-flagged tonnage in terms of deadweight tonnage (DWT)<sup>5</sup> declined over the similar period from 1.4 per cent in 2000 to merely 0.7 per cent in 2025, registering a y-o-y decline of 2.2 per cent in 2025<sup>6</sup>. Consequently, over 93 per cent of international cargo with Indian origin or destination and around 39 per cent of total Indian cargo, including coastal and offshore shipments, is carried on foreign-flagged vessel, resulting in an estimated annual freight outflow of US\$ 75 billion<sup>7</sup>. This reliance on foreign-flagged vessels may only grow unless judicious policy reforms are implemented.

Recognizing the importance of the maritime sector, the Ministry of Ports, Shipping and Waterways (MoPSW) has prepared the Maritime Amrit Kaal Vision Document 2047 (MAKV 2047). The MAKV 2047, among its 11 themes, identifies the requirement to 'Enhance

Net Tonnage' of the Indian-flagged fleet and sets an ambitious target for India to rank among the top 5 countries globally by 2047.

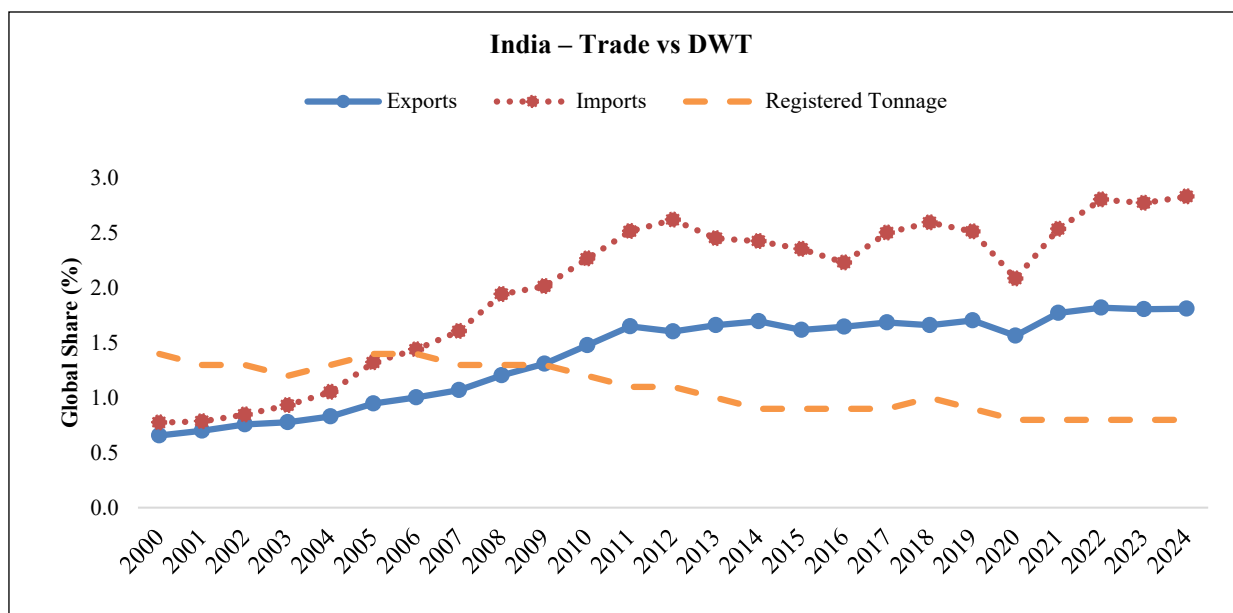
An action point to achieve this objective lies in reviewing the tonnage tax scheme, which the MAKV 2047 highlights as "Indian-flagged vessels face a comparatively higher tax burden or a tonnage tax scheme including mandatory training obligations, with the annual cost of training a cadet estimated at INR 30 lakh, which is to be borne by the Indian registered shipping companies", thereby favouring the foreign-flagged vessels<sup>8</sup>, which do not have to carry this 'liability' and giving them a competitive edge.

A Policy Brief #121<sup>9</sup> proposing reforms in Tonnage Tax was published by the RIS, New Delhi. This paper summarises proposed reforms in the current tonnage tax regime to enhance national registered tonnage.

## Shipping Companies Taxation in India

India offers three types of taxation to shipping companies under the Income Tax Act, 1961:

**Figure 1: India's EXIM Trade and Registered Tonnage (DWT)**



Source: Authors' own based on UNCTAD Stat

1. Section 44B: For non-resident companies, levied on presumptive income (7.5 per cent of gross receipts) at prevailing Corporate Income Tax Rate (CIT);
2. Section 171: For non-resident ships on Indian voyages, levied on 7.5 per cent of gross receipts (voyage-wise summary assessment) at prevailing CIT; and
3. Tonnage Tax Scheme (TTS): Under section 115V, for Indian resident companies operating qualifying ships, levied on tonnage tax income at prevailing CIT.

## Tonnage Tax

The core principle of tonnage taxation is that the tax payable by 'qualifying' shipping companies<sup>10</sup> is calculated based on the Net Tonnage (NT) of 'qualified' ships,<sup>11</sup> instead of the 'actual' accounting profits from the operations of the vessel. Therefore, the NT of the vessel, multiplied by a fixed amount of deemed profit per ton per sailing day, determines the presumptive revenue, which is then subject to prevailing CIT rate applicable in a country to arrive at the tax liability for that ship. Further, the computation of the tax liability is derived from two primary approaches:

- Model A: Under Model A, tonnage income is first calculated on a per-day per ton basis, grossed over the total operational days. Thereafter, the tax liability is determined by applying the prevailing CIT rate to the annual deemed tonnage income. Some countries that follow Model A include Denmark, India, Germany, Singapore (since 2025), and the United Kingdom.
- Model B: Annual Tonnage Tax liability is directly levied on the registered NT of the ship, irrespective of income, operational days, etc. Model B is adopted by Cyprus, Hong Kong, Liberia, Malta, the Marshall Islands (RMI), Norway, and Singapore.

## Tonnage Tax and DWT

Tax policies have significant impact on business decisions for a shipping company including fleet registration location, capital investment in fleet expansion, compliance costs, etc. Therefore, a country's tonnage tax policy can have a significant impact on the tonnage registered under its flag.

The merchant fleet data by flags of registration for countries including India, Germany, Denmark and the United Kingdom for Model A and Cyprus, Hong Kong (China), Liberia, Malta, Norway, Marshall Islands (RMI) and Singapore for Model B was examined from 1980-2025. Each country's registered tonnage was observed under the pre and post tonnage tax scenarios, it became apparent that every country witnessed an increment in their registered fleet in terms of DWT post taxation, particularly, those adopting Model B demonstrated significantly stronger growth in registered DWT. The analysis does not quantify the causality between the two, but rather observes the trend in DWT growth following the introduction of tonnage taxation.

## Tonnage Tax in India: Computation and Benchmarking

India adopted the tonnage taxation under Model A and introduced the Tonnage Tax Scheme under Chapter-XII G (Special Provisions Relating to Income of Shipping Companies) of the Income Tax Act, 1961, in 2004<sup>12</sup>. Section 115 VG describes the methodology to compute the tonnage income, with sub-section (3) presenting the daily tonnage income rates for qualifying ships (Table 1).

The summary profile of India's registered merchant Fleet<sup>13</sup> is shown in Table 2. The summary is aligned with the tonnage tax rate slabs as mentioned in Table 1.

Based on the methodology outlined in Chapter XII-G of the IT Act and subject to certain assumptions<sup>15</sup> the annual tonnage income for 1,519 qualified vessels<sup>16</sup> came out to be INR 138.05 crore, taxed at prevailing CIT of 25.168 per cent<sup>17</sup>, and provided estimated tax revenue of INR 34.75 crore. For example, the average NT for slab >25,000 NT (Table 1) for 113 vessels identified is 37,000 NT (Table 2), the estimated daily tonnage income is INR 17.23 lakh, annual tonnage income is INR 62.90 lakh, which is taxed at 25.168 per cent, providing INR 15.83 lakh of tonnage tax to the exchequer.

The tonnage tax schemes of the sample countries were then compared with India's tonnage tax scheme, under both taxation models to highlight differences in tax liabilities for the same NT. The estimated tonnage tax has been computed using each country's tonnage tax formula for the same NT (the average NT of that category for India) in each of the slabs mentioned in Table 1. The estimated tonnage tax

liability payable for a vessel with corresponding NT (300 NT, 2500 NT, 17,500 NT, and 37,000 NT) for each of the selected countries is mentioned in Table 3.

The analysis indicates that after Denmark, India imposes a higher tax on each corresponding NT. In contrast, countries like Liberia, RMI, Hong Kong, and Singapore, among the top 5 flag registries, collectively account for 45 per cent of global DWT while maintaining lower tonnage tax rates<sup>18</sup>. These Model B regimes collectively incentivize ship registration through competitive taxation.

## Recommendations

Since the core objective is to enhance the national registered shipping tonnage, one pathway is reforming and rationalizing the existing tonnage tax regime to make registering ships in India more attractive. The following recommendations are proposed:

**Table 1: Daily Income Rates for the Qualifying Ships in India**

| Qualifying Ship having NT                 | Annual of Daily Tonnage Income                                |
|-------------------------------------------|---------------------------------------------------------------|
| Up to 1,000                               | INR 70 for each 100 tons                                      |
| Exceeding 1,000 but not more than 10,000  | INR 700 <i>plus</i> INR 53 for each 100 tons >1,000 tons      |
| Exceeding 10,000 but not more than 25,000 | INR 5,470 <i>plus</i> INR 42 for each 100 tons > 10,000 tons  |
| Exceeding 25,000                          | INR 11,770 <i>plus</i> INR 29 for each 100 tons > 25,000 tons |

Source: Income Tax Act, 1961, Chapter XII-G

**Table 2: Slab-wise Profile of Vessels Registered in India**

| Slab (tons)                  | <1,000 | 1,001 to 10,000 | 10,001 to 25,000 | >25,000 |
|------------------------------|--------|-----------------|------------------|---------|
| No. of Ships                 | 915    | 332             | 159              | 113     |
| Average GT                   | 506    | 4210            | 29150            | 61638   |
| Average NT (60% of GT)       | 304    | 2526            | 17490            | 36983   |
| Rounded-Off NT <sup>14</sup> | 300    | 2500            | 17500            | 37000   |

Source: Authors' calculation based on Indian Shipping Statistics, 2024

**Table 3: Country-wise Annual Tonnage Tax Payable for indicated NT**

| Model | Countries      | CIT Rate (%) | Slab-wise Tonnage Tax (INR) |          |           |           |
|-------|----------------|--------------|-----------------------------|----------|-----------|-----------|
|       |                |              | 300 NT                      | 2,500 NT | 17,500 NT | 37,000 NT |
| A     | India          | 25.168       | 19,291                      | 1,37,335 | 7,91,861  | 14,00,914 |
|       | Singapore      | 17           | 11,057                      | 73,715   | 3,50,148  | 5,89,723  |
|       | Germany        | 15.83        | 15,783                      | 1,11,794 | 2,01,402  | 5,56,512  |
|       | Denmark        | 22           | 28,091                      | 1,94,479 | 10,00,108 | 16,18,463 |
|       | United Kingdom | 20           | 15,374                      | 1,08,898 | 5,89,329  | 9,35,240  |
| B     | Singapore      | N/A          | 6,600                       | 33,000   | 2,31,000  | 4,88,400  |
|       | Hong Kong      |              | 15,000                      | 67,500   | 5,80,000  | 7,75,000  |
|       | RMI            |              | 42,500                      | 42,500   | 2,52,875  | 4,71,750  |
|       | Liberia        |              | 78,985                      | 89,756   | 5,10,096  | 6,97,928  |
|       | Cyprus         |              | 10,841                      | 82,215   | 4,61,706  | 7,62,627  |
|       | Norway         |              | 7,884                       | 1,05,120 | 7,62,120  | 12,35,160 |
|       | Malta          |              | 2,47,500                    | 2,47,500 | 4,53,420  | 6,20,730  |

Source: Authors' calculation

- Transiting to Model B system abolishing the tonnage-income computation and charging a fixed annual fee per NT along with the one-time registration fee;
- No need to maintain records of days of operation, tonnage reserve account, minimum training requirement, complex compliance conditions, and special accounting rules;
- Exemption for vessels with a capacity of up to 100 tonnes;
- The MAKV 2047 document identifies the 'Green Maritime Sector' as a key theme, and also recommends the introduction of green initiatives, including tonnage tax rebates for compliant vessels.
- After careful consideration and analysis of multiple models, the following tonnage tax rates in INR/NT are proposed in Table 4.

**Table 4: Proposed Tonnage Tax Rates (INR/NT)**

| Slabs (Net Tonnage)            | Regular Tax Rate | Green Tax Rate |
|--------------------------------|------------------|----------------|
| Up to 1,000 tons <sup>19</sup> | 35               | 23.5           |
| Next 1,001 to 10,000 tons      | 30               | 20.1           |
| Next 10,001 to 25,000 tons     | 24               | 16.1           |
| Next 25,001 to 40,000 tons     | 17               | 11.4           |
| Next > 40,000 onwards          | 9                | 6.0            |

Source: Authors' calculations

The proposed rates are expected to reduce tax liability for a 37,000 NT vessel from INR 14 lakh (Table 3) to just INR 8.69 lakh<sup>20</sup>, a reduction of approximately 38 per cent.

Tweaking Tonnage Tax will make the extant tax regime more modern, competitive and attractive. This reform combined together

with the prospects of the clear requirement for enhancing national registered tonnage will have a water fall affect on the sector. These include reshoring Indian owned ships but registered under foreign registry to reflag to India. It could also spur investment in the shipping sector by way of larger requirements of services such as brokers, financiers, charterers and insurers who are part of this ecosystem leading to multiple specialized jobs. Potentially these services would attract foreign companies to operate in India thus bringing in foreign exchange to the national coffer.

## Conclusions

The journey towards Viksit Bharat and fulfillment of the MAKV 2047 aspirations will require invoking two principles: first, Ease of Doing Business through *deregulation* – bringing a simple annual tonnage tax regime and reducing the complicated regulatory compliance by removing additional requirements; and second, Cost of Doing Business - making the tonnage tax regime more competitive by *lowering* the tax rates to drive expansion of the national shipping fleet, especially for larger vessels, to reduce dependence on foreign hulls for crude, product, LNG, coking coal, and fertilizers, amongst other goods, that are vital to maintaining economic growth and development. This will be crucial for India's journey to becoming the 3rd largest economy by 2047, achieve the MAKV 2047 target of climbing to the 5th largest registry in the Amrit Kaal, as well as meaningfully contribute to greener, cleaner, and *Atmanirbhar* shipping.

## Endnotes

- <sup>1</sup> See, UNCTAD Stat Data centre, International Trade Data, Merchandise Total Trade and Share; Source: <https://unctadstat.unctad.org/datacentre/dataviewer/US.TradeMerchTotal>
- <sup>2</sup> Refer, Clarksons, "India's Growing Maritime Role"; Stephen Gordon; Retrieved from: <https://www.clarksons.com/home/news-and-insights/2025/india-s-growing-maritime-role/>
- <sup>3</sup> See, UNCTAD Stat Data centre, International Trade Data, Merchandise Total Trade and Share; Source: <https://unctadstat.unctad.org/datacentre/dataviewer/US.TradeMerchTotal>
- <sup>4</sup> Refer, Clarksons, "India's Growing Maritime Role"; Stephen Gordon; Retrieved from: <https://www.clarksons.com/home/news-and-insights/2025/india-s-growing-maritime-role/>
- <sup>5</sup> The vessel capacity is measured by: (i) Deadweight Tonnage (DWT) which represents the total weight a ship can safely carry, including cargo, fuel, water, crew, and other supplies; (ii) Gross Tonnage (GT) measures ship's overall internal volume, used for regulatory and port fee purposes. It applies to the vessel and not cargo; and (iii) Net Tonnage (NT) measures the usable cargo-carrying capacity of a ship, derived from gross tonnage after deducting spaces not used for cargo or passengers. It represents the available space for accommodation of passengers and stowage of cargo.
- <sup>6</sup> See, UNCTAD Stat Data Center, Maritime Transport, Merchant fleet by flag of registration; Source: <https://unctadstat.unctad.org/datacentre/dataviewer/US.MerchantFleet>
- <sup>7</sup> Refer, Maritime Amrit Kaal Vision 2047, Chapter 13 "Enhance India's Tonnage", pp 348; Source: [https://shipmin.gov.in/sites/default/files/Maritime%20Amrit%20Kaal%20Vision%202047%20%28MAKV%202047%29\\_compressed.pdf](https://shipmin.gov.in/sites/default/files/Maritime%20Amrit%20Kaal%20Vision%202047%20%28MAKV%202047%29_compressed.pdf)
- <sup>8</sup> Refer, Maritime Amrit Kaal Vision 2047, Chapter 13 "Enhance India's Tonnage", pp 348; Source: <https://shipmin.gov.in/sites/default/files/Maritime%20Amrit%20>

Kaal%20Vision%202047%20%28MAKV%202047%29\_compressed.pdf

- <sup>9</sup> Refer, "Enhancing National Registered Tonnage: Tweaking Tonnage Tax", Sujeet Samaddar, Vanshika Goyal Policy Brief No 121, September 2025. Retrieved from : <https://www.ris.org.in/en/node/4254>
- <sup>10</sup> "Qualifying" shipping company means a company referred to in section 115VC of Income Tax Act, 1961.
- <sup>11</sup> "Qualifying" ship means a ship referred to in section 115VD of Income Tax Act, 1961.
- <sup>12</sup> Government of India, Income Tax Act, 1961, Section XII-G "Special Provisions Relating to Income of Shipping Companies", pp 511 to 523; Source: <https://www.indiacode.nic.in/bitstream/123456789/2435/1/a1961-43.pdf>
- <sup>13</sup> "Indian Shipping Statistics 2024", Ministry of Ports, Shipping, and Waterways, Table 1.11 "List of Vessels Registered for Indian Trade (As on 31st December, 2024)", pp 76 - 135; Source: <https://shipmin.gov.in/sites/default/files/ISS%20Final%202024.pdf>
- <sup>14</sup> Sub-section (5) under Section 115VG of Chapter XII-G provides rules for rounding off the tonnage.
- <sup>15</sup> Assumptions:
  - i. All shipping companies are qualified companies opting for the scheme
  - ii. As per the 'qualifying ships' definition, only ships with a capacity of NT $\geq$  15 have been factored in
- iii. NT data is not available so NT has been estimated as 60 per cent of the GT of a ship
- iv. A total of 1,519 'qualifying ships' have been identified
- v. For analytical consistency, 365 operating days have been considered for all slabs and companies as Model B does not factor operating days
- vi. The daily tonnage income was calculated based on the average NT of each slab given in Table 1.
- <sup>16</sup> Total vessels registered in India are 1,545. After calculating NT as 60 per cent of GT, only 1,519 vessels have NT  $\geq$  15 tons
- <sup>17</sup> Refer, Section 115BAA, I-T Act 1961 describes the effective CIT as 22 per cent plus applicable surcharges and Cess of 3.68 per cent.
- <sup>18</sup> Refer, UNCTAD Stat Data centre, Maritime Transport, Merchant Fleet, "Merchant fleet by flag of registration and by type of ship, annual"; Source: <https://unctadstat.unctad.org/datacentre/dataviewer/US.MerchantFleet>
- <sup>19</sup> Vessels of less than 100 NT are exempted.
- <sup>20</sup> Under the proposed tonnage tax regime, the tax liability for a vessel of 37,000 NT would be computed as follows (INR): (i) First, 1,000 tons = 35,000 (35\*1000); (ii) Next, 9,000 tons = 2,70,000 (30\*9000); (iii) Next, 15,000 tons = 3,60,000 (24\*15000); (iv) Next, 12,000 tons (37,000-25,000 tons) = 2,04,000 (17\*12000); (vi) Total (1+2+3+4) = 8,69,000





# Flag in India: Case for an International Ship Registry

Sujeet Samaddar and Anushka Tripathi

India, with a vast coastline of 11,039 km., dotted with 13 major and 200 non-major ports with multiple sea lines of communications connecting the Pacific with the Indian Ocean to the Red sea supports a growing maritime trade. These features have great potential for India to become a leading global maritime hub. Yet, India's share in global ship registration, ranking 20<sup>th</sup> with a share of 0.7 per cent of Global DWT<sup>1</sup>, is disproportionately low. Industry experts suggest that this is largely due to outdated regulations, high compliance costs, complex licensing, and a lack of incentives, which have



pushed Indian shipowners to register vessels under foreign flags offering more favourable conditions.

Recognising these barriers, the *Maritime Amrit Kaal Vision 2047* (MAKV 2047) aims to position India among the world's top maritime nations. It advocates for the development of a modern Indian merchant fleet and the creation of globally competitive shipbuilding and repair facilities. The MAKV 2047 notes, "India needs to make certain policy changes and take steps to make the process of registration of vessel and sailing of Indian flagged vessel convenient for all the stakeholders and improve India's ranking and share in world's tonnage"<sup>2</sup>.

Under the MAKV 2047 platforms like 'PCS 1x'<sup>3</sup> and the National Logistics Portal<sup>4</sup> are driving standardized electronic data exchange to cut costs, shorten delays, and enhance transparency for all stakeholders. Through this integrated approach, India intends to secure its place among the world's leading maritime nations by 2047. Modernising, simplifying and decomplicating convoluted procedures for Registration of Ships is a key instrument to enhance national tonnage – a core theme of the MAKV 2047<sup>5</sup>.

A key step in this direction is the Merchant Shipping Act 2025 (MSA), which replaces the 1958 Act and introduces sweeping reforms, especially in the domain of ship registration. Part III of the MSA mandates universal, streamlined, and digital vessel registration, extending coverage to modern vessel types like offshore drilling units and submersibles. Importantly, it widens ownership eligibility to include NRIs, OCIs, LLPs, and Indian companies, thereby encouraging foreign and diaspora investment. The Act also introduces progressive measures such as bareboat charter-cum-demise registration and temporary registration for vessels destined for recycling.

These reforms align with international best practices under the framework of the United Nations Convention on the Law of the

Sea (UNCLOS). The UNCLOS establish the principle states that ships have the nationality of the state whose flag they fly. The Article 91 requires a "genuine link" between a ship and its flag state, which sets the conditions for nationality and registration. The Article 92 defines the status of ships as subject to the exclusive jurisdiction of their flag state, and the Article 94 outlines the flag state's duties, such as ensuring the safety of its ships. These together establish the importance of ship registration as a legal declaration of a vessel's nationality and impose mutual obligations on the flag state and the ship for oversight and regulation on one hand and protection on the other. Therefore, ship registration gives ships a juristic personality and is not merely an administrative mechanism that simply confers legal identity, but it allows lawful navigation, and ensures access to flag state protection. It also enables states to exercise fiscal control, enforce safety and environmental standards, and regulate trade. In this context, India's reform agenda complemented by digital platforms like the PCS 1x and the National Logistics Portal is timely and strategic.

Though there is no binding international standard for the registration process itself, the 1986 UN Convention on Conditions for Registration of Ships provides guiding principles, including the need for a genuine link between ship and flag state. This convention has not been ratified.

To rapidly elevate its maritime stature, India must now focus on drafting progressive rules under the Act, simplifying procedures, reducing compliance burdens, and building confidence among global and domestic shipowners to 'Flag in India'.

## Genuine Link and Global Registry Models

As mentioned earlier, the Article 91 requires that a "genuine link" must exist between a ship and the flag state under which it is

registered. This principle emphasizes that ship registration must not be a mere formality, but must reflect a real and substantial connection that allows the flag state to exercise effective jurisdiction and regulatory oversight over the vessel. This includes ensuring compliance with international safety, environmental, and labour standards, as well as maintaining control over the management, ownership, and crewing of vessels.

The concept of the genuine link, though not precisely defined in UNCLOS, draws heavily from early international jurisprudence, particularly the 1955 *Nottebohm Case*. This case is foundational to the concept of the “genuine link” in international law, especially regarding nationality. In this case, the International Court of Justice (ICJ) described nationality as a “legal bond having as its basis a social fact of attachment, a genuine connection of existence, interests and sentiments, together with the existence of reciprocal rights and duties.”<sup>6</sup> Though the case dealt with individual nationality, its principle has been extended to maritime law, implying that flag states must maintain substantive oversight and control over their registered vessels. This idea strongly influenced the 1958 Geneva Convention on the High Seas and was later reinforced in UNCLOS, although both instruments stop short of specifying how this link should be implemented or enforced in practice.

Ship registration models worldwide are broadly categorized into two main systems: closed registries and open registries. Closed registries, also referred to as national registries, restrict vessel registration to ships that are owned and operated by nationals or companies incorporated within the country. These registries uphold the genuine link requirement through stringent conditions such as domestic ownership, national crewing mandates, and domestic management and control. Such systems serve strategic national interests, enabling countries to protect their maritime

sectors, generate employment, ensure higher safety standards, and retain control over their merchant fleets. Countries like India, China, and Japan follow this traditional model. However, closed registries often face challenges in the globalized shipping market due to their higher operational and regulatory costs, making them less attractive to international shipowners seeking flexibility and reduced expenses.

In contrast, open registries often referred to as Flags of Convenience (FOCs) allow foreign shipowners to register their vessels under the flag of a country with which they have little or no substantive connection. These registries emerged in the early 20th century and grew rapidly in the post-war global maritime economy. States like Panama, Liberia, and the Marshall Islands lead this model by offering low taxes, minimal regulation, easy online registration, and freedom from nationality-based ownership or crew requirements. Such registries have become highly attractive due to their operational flexibility and cost-efficiency. Today, over 70 per cent of the world’s shipping capacity is registered under open registries<sup>7</sup>, even though the flag states often own a negligible portion of these fleets. While these registries provide economic advantages to flag states and shipowners alike, they have been criticized for their weak enforcement of international norms, minimal oversight, and disconnection from the genuine link principle. This has led to concerns over maritime safety, labour exploitation, environmental damage, and even illicit activities such as drug trafficking and sanctions evasion.

In response to the decline of national fleets and to regain competitiveness, several traditional maritime nations have introduced hybrid systems known as second registries. Countries such as Norway, the United Kingdom, France, and Denmark developed second registries to combine the economic advantages of open registries with a degree of state control. These second registries function

alongside the national registry but offer greater flexibility in ownership, taxation, and crew nationality. While they may not strictly uphold the genuine link, they aim to retain vessels within the national maritime framework by offering reduced regulatory burdens and allowing foreign ownership. These systems provide domestic shipowners with options to operate competitively while maintaining the ability of the state to influence maritime policy and ensure some level of compliance with international standards.

## International Ship Registry (ISR) Model

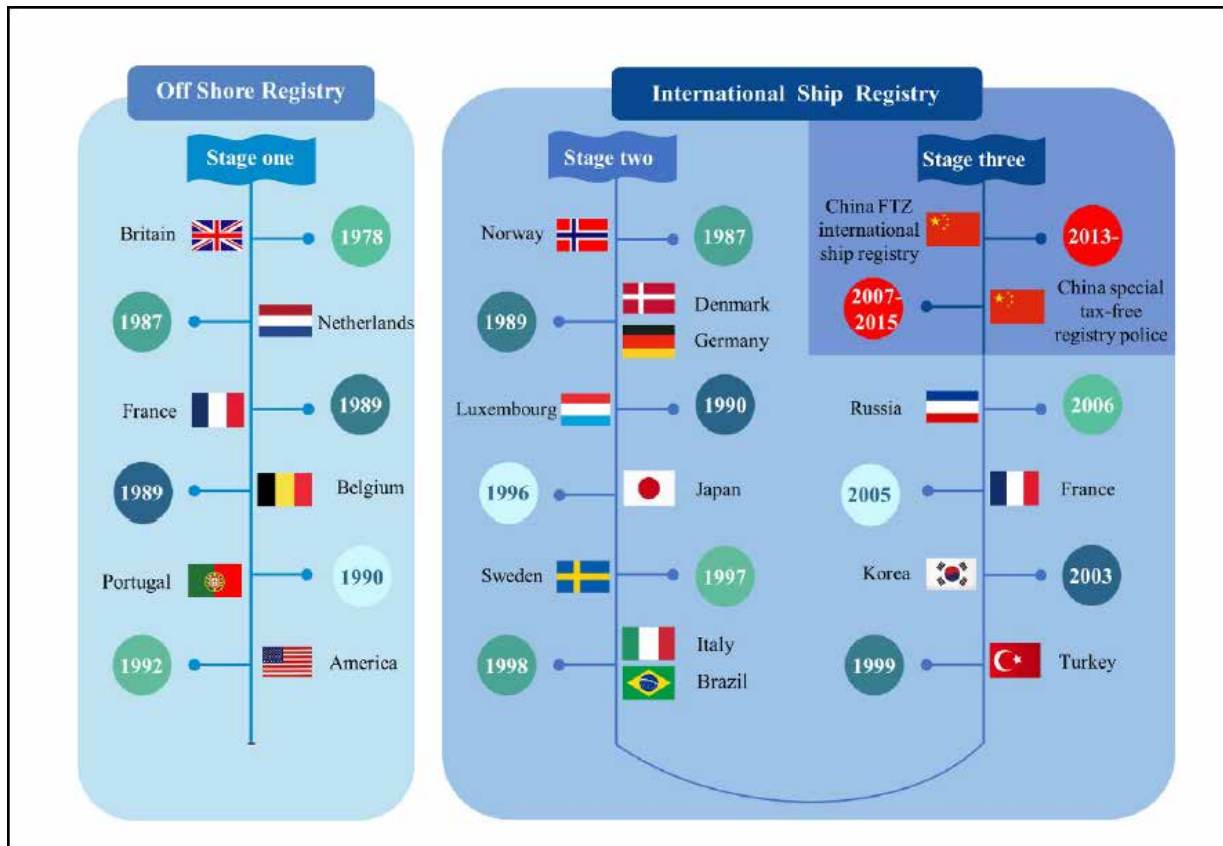
Many countries around the world, aware of the growing dominance of Flags of Convenience (FoC) in maritime commerce, have been grappling with the challenge of flagging-out of their national fleet since the 1970s, when a significant decline in national registered tonnage became apparent. In an attempt to stem this outflow, many countries initially introduced second registries - hybrid models meant to combine the advantages of open registries with some level of national control. However, these registries often failed to deliver the desired results. Their remote locations, limited infrastructure, and weaker administrative capacities rendered them less responsive to the demands of modern shipping, making them unattractive to large-scale commercial operations. Acknowledging these limitations, countries in Northern Europe pioneered a more sophisticated solution - the International Ship Registry (ISR) model. This approach represents a more functional and globally competitive system, designed to preserve national influence over maritime assets, while catering to the commercial realities of global shipping.

Unlike traditional national registries, the ISR model allows ships to be owned by foreign nationals and crewed by seafarers of any nationality, while still offering the benefits of national flag protection and regulatory

oversight. Norway was the first country to create the ISR, called the Norwegian International Ship Registry (NIS) in 1987 and is considered as the country that has the best effect of ISR implementation as it stemmed the Flagging out of their fleet. As of 1 January 2017, Norwegian owners only flagged about 22 per cent of tonnage under Norwegian registry, which grew to 32.4 per cent by 2025. Denmark followed and the Danish Owners flagged 44 per cent in 2017 rising to 50 per cent in 2025 under the Danish Registry<sup>8</sup>. These examples demonstrate that well-designed ISRs can play a pivotal role in enhancing national control over merchant fleets without compromising global competitiveness.

The ISR model's strength lies in its well-defined legal, administrative, and operational frameworks. At its core, ISR systems establish a legal link between the ship and the flag state, ensuring the vessel is entitled to international protection and that the state maintains regulatory control in line with Article 91 of UNCLOS. ISRs also subject ships to the genuine link requirement, uphold rigorous supervision and inspection mechanisms, ensuring ships remain compliant with both domestic and international laws, including IMO conventions like SOLAS and MARPOL.

Another defining characteristic of ISRs is their flexibility regarding crew nationality and labour regulations. Unlike closed registries that require national crews, ISRs allow employment of multinational crews, enabling shipowners to manage costs while maintaining operational efficiency. These registries also offer various fiscal incentives—such as reduced corporate income tax, personal income tax exemptions for seafarers, and lowered vessel registration and maintenance fees—making them commercially attractive. Moreover, ISRs typically restrict registration to vessels engaged in international trade, excluding domestic coastal traffic to preserve national interests in cabotage. Ultimately, the ISR model bridges the gap between open and closed registries. It supports

**Figure 1: Evolution Process of Global ISR Systems**

Source: Authors' own based on Chen et al. (2024)<sup>9</sup>

competitive global shipping, while upholding a state's regulatory authority and aligning with international maritime law. Figure 1 illustrates the evolution of the ISR process across various jurisdictions.

### Ship Registration in India

Section 21/22 of the erstwhile Merchant Shipping Act 1958<sup>10</sup>, required any Indian person owning a ship - as defined therein - to register the said ship with the Indian registrar of shipping. Consequently, owing to the international nature of the industry quite a few 'Indian' owners of ships have 'offshored' ownership to entities in third countries to minimize tax liabilities, reduce regulatory compliance 'overheads' and ease of doing business by registering under more business friendly flag states. The lack of ability of Indian owned ships to register with

the flag of choice or as required by lenders has led to Indian companies forming overseas subsidiaries to acquire tonnage. As per available data 47 ships with a total Gross Tonnage of about 2.5 million flagged in Open Registry states<sup>11</sup>. This has resulted in a loss of economic value to the Indian economy as all associated activities like banking, insurance, and other commercial activities that are undertaken in leading financial hub jurisdictions outside India. The objective should, therefore, be to create the appropriate facilitative framework to encourage these companies to 'reshore' in India

The comparatively complex and costly registration procedures, coupled often with less aggressive marketing and promotion of Indian registry services, limited its appeal to both domestic and international shipowners. This has been noted in the MAKV 2047 and the state

is seized of this matter to evolve more market friendly registration rules and processes.

## Indian Registered Tonnage

India's registered tonnage (as DWT) has shown fluctuating growth over the past decade, with periods of decline attributable to regulatory challenges, high costs, and limited flexibility in the ship registration process.

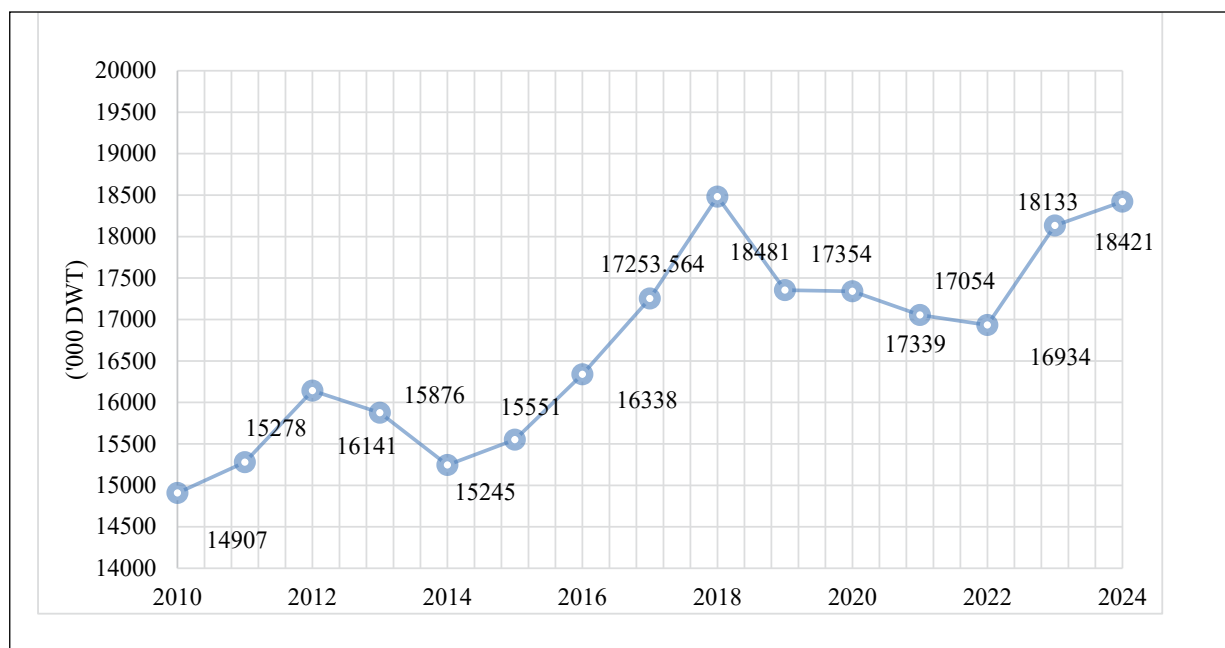
Figure 2 presents the growth of India's Dead Weight Tonnage (DWT) from 2010 to 2024 and illustrates notable fluctuations, with periods of both growth and decline in the country's maritime carrying capacity. Initial steady growth in DWT up to 2012 was followed by a decline that persisted till about 2014, then a recovery phase leading to a peak in 2018. However, from 2018 to 2022, India's registered shipping tonnage faced volatility and a downward dip, reaching a low point, before rebounding strongly in 2023 and 2024. These fluctuations highlight underlying systemic challenges such as restrictive regulations,

ownership limitations, and less competitive registration processes that have constrained the expansion of India's flagged fleet over the years.

## Indian-owned but Foreign Flagged Vessels

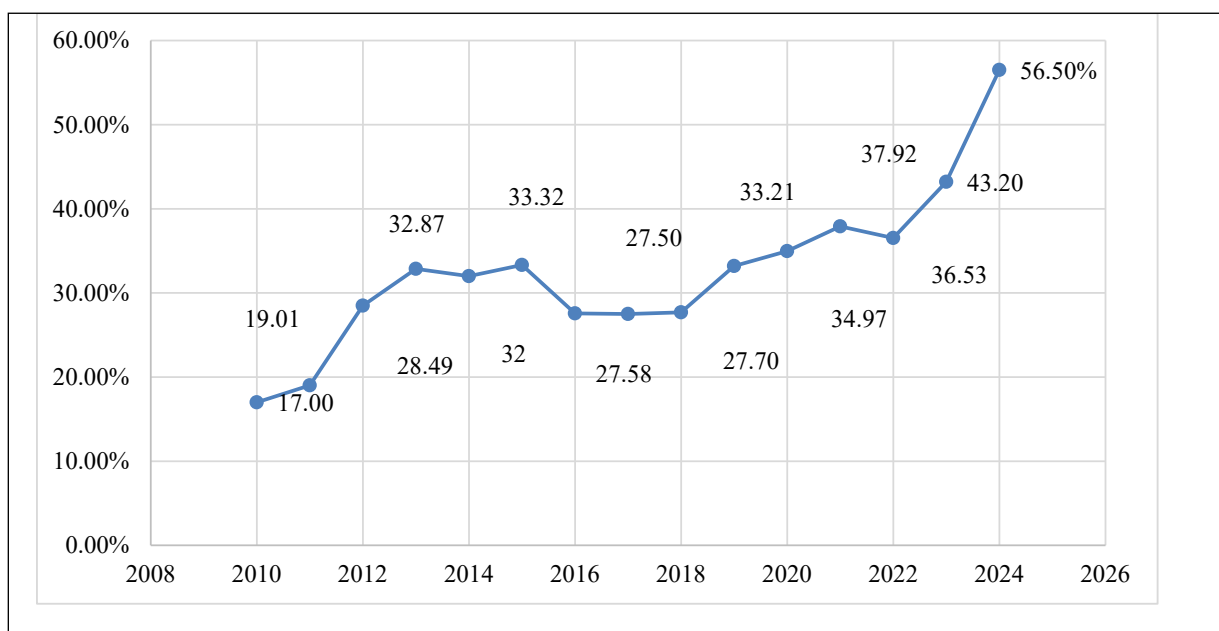
Figure 3 illustrates the trend of India's Foreign Flagged Fleet as a percentage of the total Indian-owned fleet from 2010 to 2024. The "Foreign Flag" percentage represents the proportion of Indian-owned vessels registered under foreign flags rather than the Indian flag. From 2010 to 2011, the foreign-flagged share was relatively low, around 17 per cent, but it climbed steadily to about 32.87 per cent in 2013. Between 2013 and 2016, the share remained relatively stable, fluctuating around 27 per cent to 33 per cent. After a slight dip in 2016 and 2017, the foreign flag share again began to increase, rising from roughly 27.7 per cent in 2018 to 56.5 per cent in 2024. This indicates a growing preference among Indian vessel owners for registering their ships under foreign flags, likely driven

**Figure 2: Trends in India's Registered Ships by Dead Weight Tonnage, 2010-2024**



Source: Authors' compilation based on UNCTAD Stat

**Figure 3: India's Foreign Flagged Ships as Percentage Share of Total Tonnage 2010-2024**



*Source:* Authors' compilation based on various editions of the Review of Maritime Transport, UNCTAD

by more favourable regulatory, tax, and operational environments abroad. The trend highlights ongoing challenges for the Indian shipping registry in retaining tonnage under the national flag and underscores the need for reforms to make Indian registration more attractive and competitive.

The decline is further exacerbated by a cumbersome and costly regulatory environment marked by complex procedures and non-standardized data systems that hamper ease of doing business a complex tonnage tax scheme and limited incentives for fleet modernization, high compliance costs for essential maritime safety and classification. Legal and policy barriers, such as strict cabotage laws and restrictive Right of First Refusal (RoFR) policies, further limit operational flexibility, especially in specialized sectors like cruise shipping.

Other issues that impact ship registration are approximately 44.2 per cent of Indian vessels are over 20 years old,<sup>12</sup> leading to

high maintenance costs, inefficiencies, and diminished attractiveness due to outdated safety and environmental standards. These multifaceted challenges underscore the urgent need to reform India's ship registration system to boost its competitive standing and expand its maritime capacity. India's low pace to match these competitive advantages has resulted in a relatively low share of ship registrations. What follows is that without reforms to reduce barriers and enhance incentives, India risks losing potential tonnage to these more accommodating jurisdictions.

### **India International Ship Registry in GIFT City, Gujarat**

India has a strategic opportunity to establish an International Ship Registry (ISR) within the GIFT City, Gujarat, positioning it as a competitive global maritime hub. To realize this, a robust policy framework must be developed, leveraging GIFT City's regulatory autonomy, fiscal benefits, and integrated

financial ecosystem. Key regulatory reforms should include enabling foreign-flagged vessel registration under an Indian registry specific to the IFSC and empowering DG Shipping to grant flexible licensing within this jurisdiction. Simplified registration procedures will attract global shipowners and lessors. Fiscal incentives such as exemptions from IGST, reduced customs duties on ship imports, and competitive tax rates will make GIFT City financially attractive, aligning it with leading maritime centres. Investment in maritime infrastructure, including legal frameworks like the Gujarat International Maritime Arbitration Centre, and synergies with the Gujarat Maritime Cluster and academic institutions will create a comprehensive maritime ecosystem. Strategic international outreach and promotion campaigns targeting ship owners and maritime financiers will help build global trust.

A specialized governance body should oversee the registry's operations, ensuring continuous policy evolution based on international best practices. Coordinated efforts between central and state authorities, industry stakeholders, and regulatory agencies will be essential to successfully establish and sustain the ISR in GIFT City. The proposed Indian International Ship Registry (IISR), based in GIFT City, is envisioned as a digitally advanced, globally competitive, and nationally aligned platform for international ship registration. Operating under a dual-tier structure, it will accommodate both Indian-controlled and foreign-owned vessels while maintaining robust regulatory oversight.

## Conclusion

Adopting global conventions on safety, the environment, and seafarer welfare can make the IISR a Flag of Choice for Indian and international shipping networks. This approach strengthens the maritime ecosystem by generating jobs, boosting service exports, and increasing India's role in shaping global

maritime norms. By integrating global best practices within India's legal and institutional framework, the IISR will safeguard national sovereignty and security.

In sum, a robust international ship registry is a strategic enabler for realizing MAKV 2047's reform agenda – accelerating maritime growth, enhancing tonnage, and elevating India's competitiveness on the world stage.

The issues in formulating such a registration process are myriad and complicated ranging from ownership, management and control, crew manning, taxation, trade corridors, build requirements, national security, etc. Given the complexity of the issues involved and the urgent need to strengthen India's maritime rankings, a comprehensive analysis supported by extensive stakeholders' consultation is imperative. This approach will ensure that the guidelines for the IISR are pragmatic, globally benchmarked, and effectively incentivise shipping companies to Flag in India.

## Endnotes

- <sup>1</sup> Refer, Table II.2, Leading flags of registration, 1 January 2025, Source: Review of Maritime Transport, 2025,
- <sup>2</sup> Refer, Maritime Amrit Kaal Vision 2047, p. 12. See also p. 333 highlighting critical challenges in Ship Registration process. Retrieved from: [https://shipmin.gov.in/sites/default/files/Maritime%20Amrit%20Kaal%20Vision%202047%20%28MAKV%202047%29\\_compressed.pdf](https://shipmin.gov.in/sites/default/files/Maritime%20Amrit%20Kaal%20Vision%202047%20%28MAKV%202047%29_compressed.pdf)
- <sup>3</sup> Port Community System (PCS 1x) is a single window web application, which allows the port community stakeholders to access the centralized repository to view transactions. The users of this system also can track and trace the cargo or container details. Through this application, they can also avail the real time vessel, finance, transport, cargo and container status. "Indian Ports Association Launches 'PCS 1x' to Increase Ease of Doing Business". Retrieved from: <https://www.pib.gov.in/PressReleaseIframePage.aspx?PRID=1555546>
- <sup>4</sup> National Logistics Portal (Marine) is a national maritime single window platform

encompassing complete end-to-end logistics solutions to help exporters, importers, and service providers exchange documents seamlessly and transact business. The overarching NLP Marine Vision is to cater to various stakeholders in G2G, G2B and B2B model. Sagar Setu. Retrieved from: <https://nlpmarine.gov.in/landings/about-new>

<sup>5</sup> See Note 2. p. 9

<sup>6</sup> Refer, p.23. Judgement of the ICJ. Retrieved from: <https://www.icj-cij.org/sites/default/files/case-related/18/018-19550406-JUD-01-00-EN.pdf>

<sup>7</sup> UNCTAD's Review of Maritime Transport, 2024, pp – 67& 65 respectively. Retrieved from: [https://unctad.org/system/files/official-document/rmt2024\\_en.pdf](https://unctad.org/system/files/official-document/rmt2024_en.pdf)

<sup>8</sup> Refer, UNCTAD's *Review of Maritime Transport*, various issues.

<sup>9</sup> Refer, "Innovation of the Global International Ship Registry System: Evolution Process and Future Reforms", Jihong Chen, Jianghao Xu, Qingfeng Zhao, Zeng Yuan, Li Li, Huangziyi Chen, Yinuo Liu, Yuan Xiang (2024) *Ocean and Coastal Management* 257.

<sup>10</sup> Section 21 states, "1. Indian ships.—For the purposes of this Act, a ship shall not be deemed to be an Indian ship unless owned wholly by persons to each of whom 2 [any] of the following descriptions applies:— (a) a citizen of India; or [(b) a company or a body established by or under any Central or State Act which has its principal place of business in India; or (c) a co-operative society which is registered or deemed to be registered under the Cooperative Societies Act, 1912 (2 of 1912), or any other law relating to co-operative societies for the time being in force in any State.] Section 22 states, "Obligation to register. —(1) Every Indian ship, unless it is a ship which does not exceed fifteen tons net and is employed solely in navigation on the coasts of India, shall be registered under this Act".

<sup>11</sup> Compiled from various fleet composition of Indian Owned Shipping Companies

<sup>12</sup> Prepared from Quarterly Tonnage Statement, DG Shipping, Retrieved from: <https://betadgs.dgshipping.gov.in/nautical-wing/nw-quarterly-tonnage-system>





# India and the Future of Maritime Arbitration: Charting the Course through Global Waters

Pankaj Kapoor

Shipping has long been recognised as the world's first truly global industry, connecting diverse jurisdictions through intricate contractual and commercial relationships. This inherently international nature gives rise to disputes that are often ill-suited for resolution before domestic courts. Arbitration, with its neutrality, flexibility, and global enforceability, has consequently become the preferred mechanism for dispute resolution in maritime matters.



This article examines the evolution of maritime arbitration and its growing acceptance worldwide, the digital transformation triggered by the COVID-19 pandemic, and India's potential to emerge as a global maritime arbitration hub through institutional developments such as the Gujarat Mediation and Arbitration Centre (GIMAC) at the GIFT City. Drawing upon Supreme Court precedents, this article argues that India's progressive arbitration jurisprudence and maritime ambitions collectively position it to play a transformative role in the future of global maritime dispute resolution.

## Background

Since antiquity, the sea has been both a conduit of commerce and a crucible of civilisation. The maritime industry, by its very nature, transcends territorial boundaries and embodies global interdependence. Shipping connects shipowners, charterers, cargo interests, insurers, financiers, and port authorities across jurisdictions – making it arguably the world's first truly international industry.

This transnational character, however, brings with it legal complexity. Disputes in maritime trade often straddle multiple legal systems, raising issues of jurisdiction, applicable law, and enforcement. Domestic courts, constrained by procedural rigidity and territorial limits, are ill-equipped to efficiently resolve such matters. Arbitration, by contrast, offers neutrality, commercial sensibility, and the assurance of global enforceability under the New York Convention on the Recognition and Enforcement of Foreign Arbitral Awards 1958.

The 2007–08 Global Financial Crisis exemplified this necessity. As freight rates and charter values plummeted, disputes multiplied across the shipping world. Arbitration emerged as the preferred route, providing a neutral forum insulated from national bias and ensuring awards could be enforced across borders.

In India, the maritime sector – bolstered by the Sagarmala Project and the expansion of port-led infrastructure – has increasingly intersected with the evolution of arbitration law. The confluence of these trends has placed India at the cusp of becoming a credible global venue for maritime arbitration.

## Evolution of Maritime Arbitration

Maritime arbitration is deeply rooted in commercial custom. Historically, maritime merchants relied on neutral adjudicators to resolve disputes efficiently. Modern maritime arbitration continues this tradition through arbitration clauses embedded in Charterparties, Bills of Lading, and other Contracts of Affreightment.

A standard clause often stipulates:

*“Any dispute arising under this Charterparty or any Bill of Lading issued hereunder shall be referred to arbitration in London, one arbitrator being appointed by each party, in accordance with the Arbitration Acts 1996 or any statutory modification thereof for the time being in force.”*

This clause embodies two cardinal principles of arbitration – party autonomy and neutrality. The Supreme Court of India has repeatedly affirmed these principles. In *Harmony Innovation Shipping Ltd. v Gupta Coal India Ltd.* (2015) 9 SCC 172, the Court held that the choice of seat determines not only the curial law but also the supervisory jurisdiction of courts, underscoring that party intention governs the arbitral process. Similarly, in *Cargill International SA v Bangladesh Sugar & Food Industries Corporation* (1996) 4 SCC 59, the Court upheld London as the agreed seat, emphasising the sanctity of contractual stipulations in cross-border maritime transactions.

The evolution of Indian arbitration jurisprudence – particularly post-*Bharat Aluminium Co. v Kaiser Aluminium Technical Services Inc.* (2012) 9 SCC 552 (“BALCO”) – has

aligned domestic law with global standards. BALCO marked a decisive shift by holding that Part I of the Arbitration and Conciliation Act 1996 does not apply to foreign-seated arbitrations, reinforcing the principle of territoriality and respecting party autonomy in international arbitration. This decision effectively clarified the distinction between domestic and international arbitration, giving autonomy to foreign-seated arbitrations from Indian court interference.

Earlier, in *Atlas Export Industries v Kotak & Co.* (1999) 7 SCC 61, the Court had already signaled its openness to international commercial arbitration, rejecting the contention that referring disputes to a foreign arbitral tribunal offended Indian public policy. This marked an early recognition of the global character of commercial contracts and India's commitment to cross-border enforceability.

## The International Character of Shipping and the Necessity of Arbitration

A single maritime transaction may involve a ship registered in one state, owned by a company incorporated in another, chartered by a third, insured by an underwriter in a fourth, and carrying cargo financed in a fifth. The result is a complex web of legal relationships governed by multiple jurisdictions.

Litigation in national courts is, therefore, fraught with difficulties—conflicts of law, parallel proceedings, and challenges in enforcing judgments abroad. Arbitration, in contrast, functions as a transnational mechanism that mitigates such fragmentation. The 1958 New York Convention—ratified by over 170 countries, including India—ensures that arbitral awards are recognised and enforced almost universally.<sup>1</sup>

The Supreme Court has consistently reinforced this pro-enforcement policy. In *Renusagar Power Co Ltd. v General Electric Co.*

(1994 Supp (1) SCC 644), the Court upheld enforcement of a foreign award, laying down that “public policy” under Section 7(1)(b) (ii) of the Foreign Awards (Recognition and Enforcement) Act 1961 must be narrowly construed. This principle was reaffirmed in *Shri Lal Mahal Ltd. v Progetto Grano Spa* (2014) 2 SCC 433, where the Court limited judicial interference, holding that enforcement could be refused only if the award violated India's most basic notions of morality and justice.

Further, in *Centrotrade Minerals and Metal Inc. v Hindustan Copper Ltd.* (2020) 5 SCC 694, the Supreme Court upheld a two-tier arbitration clause providing for appeal to a foreign arbitral tribunal, describing it as “consistent with international commercial practice.” The decision underscored that India must foster a legal environment encouraging enforcement of foreign awards in line with the New York Convention.

In *Union of India v Vedanta Ltd* (2020) 10 SCC 1, the Court reiterated that Indian courts are bound to adopt a pro-enforcement bias, recognising the autonomy of international commercial arbitration and refusing to expand public policy exceptions beyond the narrow *Renusagar* test.

Moreover, arbitration offers confidentiality, speed, and procedural flexibility—virtues particularly prized in the shipping industry, where commercial decisions must be swift and reputational risks minimised. Maritime disputes often hinge on technical expertise relating to charterparty performance, demurrage, seaworthiness, and deviation—all areas better suited to resolution by industry specialists than by generalist courts.

## Expanding Powers and Modern Doctrines in Maritime Arbitration

(i) *Kompetenz-Kompetenz* and Judicial Minimalism

The Arbitration and Conciliation Act 1996

incorporates the Kompetenz-Kompetenz doctrine under Section 16, allowing arbitral tribunals to rule on their own jurisdiction. This principle, endorsed by the Supreme Court in *Kvaerner Cementation India Ltd. v Bajranglal Agarwal* (2012) 5 SCC 214, prevents premature judicial interference and preserves arbitral autonomy. In the maritime context, where jurisdictional questions often arise from multi-tier dispute resolution clauses or multi-party contracts, this autonomy ensures procedural continuity.

The Court has consistently urged minimal judicial intervention. In *Duro Felguera SA v Gangavaram Port Ltd.* (2017) 9 SCC 729, it held that the purpose of the 1996 Act was to minimise court interference and uphold the autonomy of parties in appointing arbitrators – an observation especially relevant for commercial port and maritime contracts.

#### **(ii) Interim Relief and the Power to Preserve Maritime Assets**

Section 9 of the 1996 Act empowers Indian courts to grant interim measures in aid of arbitration, including the detention, preservation, or sale of goods and vessels. This provision aligns with maritime realities, where assets are transient and easily dissipated. The Supreme Court in *Sundaram Finance Ltd. v NEPC India Ltd.* (1999) 2 SCC 479 held that courts can grant pre-arbitral interim measures even before the arbitral tribunal is constituted. In shipping disputes, such orders – akin to maritime liens or arrests – are often critical to securing claims pending arbitration.

#### **(iii) Standards of Reasonableness and Judicial Review**

In *ONGC Ltd. v Western GECO International Ltd.* (2014) 9 SCC 263, the Court expanded the “public policy” ground for setting aside awards to include fundamental principles of justice and reasonableness. Although

later refined in *Associate Builders v DDA* (2015) 3 SCC 49 and *Ssangyong Engineering & Construction Co. Ltd. v NHA1* (2019) 15 SCC 131, these decisions collectively underscore the balance between judicial supervision and arbitral finality – a balance vital to international maritime arbitration’s credibility.

Similarly, in *Venture Global Engg LLC v Tech Mahindra Ltd.* (2018) 1 SCC 656, the Court harmonised respect for foreign awards with limited judicial oversight, demonstrating a pragmatic balance between sovereignty and global commercial expectations.

### **The COVID-19 Catalyst: Digital Transformation in Maritime Arbitration**

The COVID-19 pandemic marked a paradigm shift in global dispute resolution. As physical hearings became impossible, arbitral institutions rapidly transitioned to online platforms, accelerating the digitisation of arbitration.

In maritime disputes – often involving parties, witnesses, and experts across continents – the adoption of virtual hearings proved particularly efficient. The London Maritime Arbitrators Association (LMAA), the Singapore Chamber of Maritime Arbitration (SCMA), and the Hong Kong Maritime Arbitration Group (HKMAG) promptly issued protocols for virtual proceedings, ensuring procedural fairness, confidentiality, and cybersecurity.

Indian arbitral practice followed suit. The Supreme Court in *Cognizance for Extension of Limitation, In re* (2021) 5 SCC 452 endorsed digital hearings and electronic filings, signalling institutional acceptance of technology in judicial and arbitral processes. Even after pandemic restrictions eased, hybrid hearings combining physical and virtual participation have persisted, reducing costs and expanding access to international arbitration.

## India's Emerging Role: Institutional Innovation and the Gujarat Mediation and Arbitration Centre (GIMAC)

India's maritime ambitions are reflected in its legislative and institutional reforms. The establishment of the Gujarat Mediation and Arbitration Centre (GIMAC) at GIFT City – conceptualised under the aegis of the Gujarat Maritime University (GMU) – is a milestone in this journey.

GIMAC's design embodies a modern, integrated approach to dispute resolution. Illustrated in Box 1, the GIMAC provides arbitration and mediation facilities tailored for maritime and commercial disputes, supported by sectoral regulators such as the Gujarat Maritime Board and the Directorate General of Shipping. Situated strategically near India's major west coast ports – Mundra, Kandla, and Pipavav – GIMAC offers proximity to maritime trade hubs while leveraging GIFT City's status as an International Financial Services Centre (IFSC).

### Box 1: About GIMAC

Gujarat International Maritime Arbitration Centre (GIMAC), a Centre of Gujarat Maritime University (GMU) is on a mission to organize and manage arbitration, mediation and expert determination proceedings in disputes related to the maritime and shipping sector. GIMAC is housed at the Gujarat International Finance Tec (GIFT) City in Gandhinagar.

With envisaged access to the experienced arbitrators, legal professionals practicing in the maritime and admiralty law as well as professionals and experts from the maritime and shipping sector, the GIMAC intends to shape up the ADR mechanism for quick and effective dispute resolution in the maritime and shipping sector and compete at par with other globally renowned maritime arbitral institutions.

- GIMAC aims to provide a framework for maritime arbitration and mediation specifically tailored to the needs of the maritime and shipping community.
- GIMAC has its own set of modern arbitration and mediation rules based on the UNCITRAL model (a globally recognized standard), being drawn up in consultation with senior legal professionals associated with premier arbitral institutions.
- GIMAC has empanel experienced body of arbitrators, mediators and experts specializing in wide range of maritime & shipping related fields and practices in jurisdictions across the world.
- GIMAC provides special procedures (such as, consolidation of proceedings, appointment of an emergency arbitrator) – mechanisms which are not available in ad hoc proceedings.
- GIMAC aims to bring a fair and trustworthy, faster and cost-effective dispute resolution mechanism catering to the needs of domestic and global maritime and shipping community.
- GIMAC's ADR services is available to all the contracting parties without any paid membership requirements

Source: GIMAC, <https://gimac.in>

GIMAC's emergence coincides with India's legislative push for arbitration reform. The Arbitration and Conciliation (Amendment) Acts of 2015 and 2019 introduced measures promoting institutional arbitration, transparency, and time-bound proceedings. In *Perkins Eastman Architects DPC v HSCC (India) Ltd.* (2020) 20 SCC 760, the Supreme Court reiterated the need for neutrality and independence in arbitrator appointments, reinforcing institutional arbitration's significance.

These developments collectively enhance India's credibility as a potential maritime arbitration hub—particularly for disputes involving South Asian, Middle Eastern, and East African parties seeking a neutral yet geographically proximate forum.

## Comparative Perspectives: Learning from Global Maritime Arbitration Centres

The success of London, Singapore, and Hong Kong as maritime arbitration centres offers instructive lessons. Please refer Annexure 1.

**London Maritime Arbitrators Association (LMAA):** The LMAA's dominance rests on its procedural predictability and industry expertise. With thousands of awards rendered annually, it exemplifies how standardisation and efficiency attract parties globally.<sup>2</sup>

**Singapore Chamber of Maritime Arbitration (SCMA):** SCMA's model of non-administered arbitration—supported by clear procedural guidelines—offers flexibility without bureaucratic constraints. Singapore's judiciary, as seen in *PT First Media TBK v Astro Nusantara International BV* [2014] 1 SLR 372, has consistently upheld minimal judicial interference.<sup>3</sup>

**Hong Kong Maritime Arbitration Group (HKMAG):** HKMAG leverages Hong Kong's common law tradition and proximity to mainland China's shipping industry, providing bilingual procedures and enforceable awards under the New York Convention.<sup>4</sup>

For India, adopting global best practices—specialised maritime arbitrator panels, standardised procedural rules, and digital case management—will be essential for GIMAC's international competitiveness.

## Challenges and the Way Forward

Despite progress, several challenges remain. India must continue refining its legal and institutional frameworks to align with international expectations of neutrality, efficiency, and predictability.

### (i) Judicial Intervention and Delays

While BALCO and Centrotrade have strengthened India's arbitration jurisprudence, lower court intervention in arbitral processes remains a concern. Streamlined appellate scrutiny and consistent enforcement of foreign awards are necessary to sustain investor confidence.

### (ii) Capacity Building and Arbitrator Expertise

Maritime arbitration demands specialised knowledge in admiralty law, shipping practice, and international trade. Institutions like GMU and the Indian Maritime University must invest in training arbitrators and legal professionals in maritime-specific dispute resolution.

### (iii) Legislative Synchronisation

India's ongoing efforts to harmonise the Arbitration Act with international standards should be complemented by reforms in the Admiralty (Jurisdiction and Settlement of Maritime Claims) Act 2017, ensuring coherent interaction between judicial arrest proceedings and arbitral claims.

## Conclusions

Maritime arbitration stands at the intersection of commerce, law, and global governance. Its strength lies in neutrality, expertise, and the global enforceability of awards. The evolution of doctrines such as *Kompetenz-Kompetenz*, the refinement of the public policy test, and

the digital transformation of arbitration have collectively reinforced its efficacy in resolving maritime disputes.

India, endowed with strategic geography, expanding port infrastructure, and progressive legal reform, is poised to emerge as a credible maritime arbitration hub. The establishment of GIMAC at the GIFT City signifies not merely institutional innovation but a declaration of India's aspiration to play a leadership role in global maritime dispute resolution.

If sustained through judicial restraint, institutional capacity, and international collaboration, India's maritime arbitration framework can indeed chart a new course—one where global waters converge upon Indian shores for justice, efficiency, and commercial integrity.

The establishment of a maritime arbitration hub in India will directly complement the Maritime Amrit Kaal Vision (MAKV) 2047

by strengthening the country's position as a global maritime services hub. A credible and efficient dispute resolution ecosystem will foster investor confidence, attract international shipowners and financiers to conduct business under Indian jurisdiction, and reduce capital outflows currently spent on foreign arbitrations. This, in turn, supports MAKV 2047 targets of increasing India's share in global ship leasing and ship financing, promoting ease of doing business in maritime trade, and enhancing India's tonnage and port competitiveness. Moreover, with a maritime arbitration hub integrated within initiatives such as GIFT City's International Financial Services Centre (IFSC), India can emerge as a self-sufficient centre for legal, financial, and technical maritime services, thereby contributing substantially to the realization of MAKV 2047's goal of transforming India into a top-tier global maritime power.

## Annexure 1

### International Maritime Arbitration Centres

| Arbitration Centre                                          | Maritime Focus                                                                                           | Strengths / Best Practices                                                                                              | Procedural Tools / Features                                                  |
|-------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------|
| London Maritime Arbitrators Association (London)            | Dedicated maritime arbitration body; dominant for charterparty, bills of lading, cargo, hire, demurrage. | Specialist arbitrators; small/intermediate claims tracks; virtual hearings and AI-use guidelines; predictable outcomes. | Small Claims & Intermediate Claims Procedures; guidance on virtual hearings. |
| Singapore Chamber of Maritime Arbitration (Singapore)       | Maritime-specialist institution for Asia-Pacific shipping disputes.                                      | Maritime-specific rules; strong court support; good enforceability; resources on virtual hearings.                      | Maritime panels; interim measures; emergency arbitrator provisions.          |
| Singapore International Arbitration Centre (Singapore)      | Institutional arbitration centre; used for commercial and shipping matters.                              | Strong case management; emergency arbitrator; expedited procedures; consolidation/joinder options.                      | Emergency arbitrator; expedited formation; active case management.           |
| Hong Kong International Arbitration Centre (Hong Kong)      | Major Asian centre for shipbuilding, charterparty, insurance disputes.                                   | Flexible procedures; clear interim-measure provisions; virtual hearing toolkit.                                         | Administered rule set with practice notes; virtual hearing tools.            |
| DIAC – Dubai International Arbitration Centre (Dubai / UAE) | Regional hub for maritime and trade disputes in MENA.                                                    | Modern rules (2022); consolidation/joinder; expedited & emergency procedures; strong court support.                     | Emergency arbitrator; expedited rules; updated fee tables.                   |

Source: Author's own compilation.

## Endnotes

<sup>1</sup> United Nations Convention on the Recognition and Enforcement of Foreign Arbitral Awards (New York, 10 June 1958), available at <https://www.newyorkconvention.org/english>

<sup>2</sup> Visit, <https://lmaa.london/> for further details

<sup>3</sup> Visit, <https://www.scma.org.sg/> for further details

<sup>4</sup> Visit, <https://www.hkmac.org.hk/> for further details





# RIS

Research and Information System  
for Developing Countries

विकासशील देशों की अनुसंधान एवं सूचना प्रणाली

RIS specialises in issues related to international economic development, trade, investment and technology. It is envisioned as a forum for fostering effective policy dialogue and capacity-building among developing countries on global and regional economic issues. The focus of the work programme of RIS is to promote South-South Cooperation and collaborate with developing countries in multilateral negotiations in various forums. Through its following centres/forums, RIS promotes policy dialogue and coherence on regional and international economic issues.



The word “DAKSHIN” (दक्षिण) is of Sanskrit origin, meaning “South.” The Hon’ble Prime Minister of India, Shri Narendra Modi, inaugurated DAKSHIN – Global South Centre of Excellence in November 2023. The initiative was inspired by the deliberations of Global South leaders during the Voice of the Global South Summits. DAKSHIN stands for Development and Knowledge Sharing Initiative. Hosted at the RIS, DAKSHIN has established linkages with leading think tanks and universities across the Global South and is building a dynamic network of scholars working on Global South issues.



AIC at RIS has been working to strengthen India’s strategic partnership with ASEAN in its realisation of the ASEAN Community. AIC at RIS undertakes research, policy advocacy and regular networking activities with relevant organisations and think-tanks in India and ASEAN countries, with the aim of providing policy inputs, up-to-date information, data resources and sustained interaction, for strengthening ASEAN-India partnership.



CMEC has been established at RIS under the aegis of the Ministry of Ports, Shipping and Waterways (MoPS&W), Government of India. CMEC is a collaboration between RIS and Indian Ports Association (IPA). It has been mandated to act as an advisory/technological arm of MoPSW to provide the analytical support on policies and their implementation.



FITM is a joint initiative by the Ministry of Ayush and RIS. It has been established with the objective of undertaking policy research on economy, intellectual property rights (IPRs) trade, sustainability and international cooperation in traditional medicines. FITM provides analytical support to the Ministry of Ayush on policy and strategy responses on emerging national and global developments.



BEF aims to serve as a dedicated platform for fostering dialogue on promoting the concept in the Indian Ocean and other regions. The forum focuses on conducting studies on the potential, prospects and challenges of blue economy; providing regular inputs to practitioners in the government and the private sectors; and promoting advocacy for its smooth adoption in national economic policies.



FIDC, has been engaged in exploring nuances of India’s development cooperation programme, keeping in view the wider perspective of South-South Cooperation in the backdrop of international development cooperation scenario. It is a tripartite initiative of the Development Partnership Administration (DPA) of the Ministry of External Affairs, Government of India, academia and civil society organisations.



FISD aims to harness the full potential and synergy between science and technology, diplomacy, foreign policy and development cooperation in order to meet India’s development and security needs. It is also engaged in strengthening India’s engagement with the international system and on key global issues involving science and technology.



As part of its work programme, RIS has been deeply involved in strengthening economic integration in the South Asia region. In this context, the role of the South Asia Centre for Policy Studies (SACEPS) is very important. SACEPS is a network organisation engaged in addressing regional issues of common concerns in South Asia.



Knowledge generated endogenously among the Southern partners can help in consolidation of stronger common issues at different global policy fora. The purpose of NeST is to provide a global platform for Southern Think-Tanks for collaboratively generating, systematising, consolidating and sharing knowledge on South South Cooperation approaches for international development.



## India Maritime Report 2025-26

### Uniting Oceans, One Maritime Vision: India's Maritime Strides

The CMEC-RIS's *India Maritime Report 2025-26* titled "Uniting Oceans, One Maritime Vision: India's Maritime Strides" presents a rich content of India's maritime journey, with particular focus on achievements, best practices, challenges, and the way forward. Written by eminent industry experts and research scholars, this Report presents a total 32 chapters on a variety of maritime issues, reflecting India's strategic vision under the *Maritime India Vision 2030* and *Maritime Amrit Kaal Vision 2047*. India is uniquely placed to become a global maritime hub. The Report not only discusses India's maritime heritage, it also analyses the trends in maritime trade, investment and finance. The Report highlights the need for resilient maritime corridors, improving supply chain security, and promoting inclusive and sustainable growth. It underscores the need for technological advancements, which can integrate the complex supply chain network of multimodal transportation, further enhancing transparency and improving security and reliability. The Report calls for adequate human capital formation and skills, which are crucial for maritime growth through increased productivity, innovation, and efficiency. It has also brought forward several cross-cutting maritime issues on blue economy, dredging, tonnage tax, ship registry, maritime arbitration, cruise tourism, and maritime security. The Report reiterates India's maritime role, which is collaborative, demand-driven and outcome-focused – adding capacity where partners want it, reinforcing rules that benefit all, and keeping the ocean open, stable and prosperous towards uniting oceans with one maritime vision.

The *Uniting Oceans, One Maritime Vision: India's Maritime Strides* provides valuable lessons that go beyond trade and connectivity. By incorporating perspectives from history, culture, economics, technology, security and environmental science, this Report offers deep insights into India's evolving maritime relations while moving towards *Viksit Bharat 2047*. The Report will be a useful reference to all stakeholders including investors, private sector professionals, practitioners, academicians, and policymakers.



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**CMEC**

Centre for Maritime Economy  
and Connectivity

समुद्री अर्थव्यवस्था व संयोजन केंद्र

Zone IV B, 4th Floor, India Habitat Centre, Lodhi Road, New Delhi 110 003, India

Tel.: +91-11-24682177-80, E-mail: [dgoffice@ris.org.in](mailto:dgoffice@ris.org.in), Website: [www.ris.org.in](http://www.ris.org.in)



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