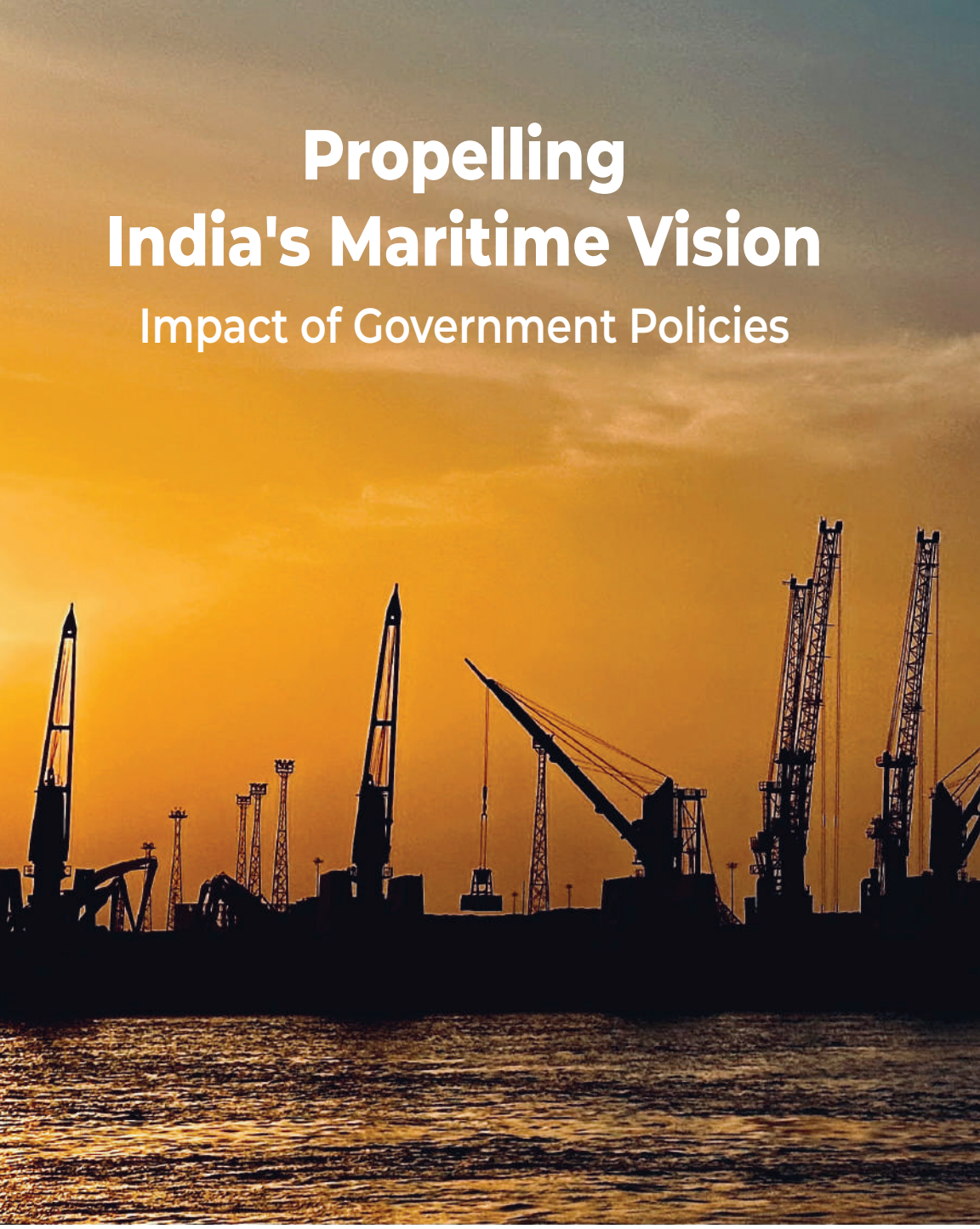
Propelling India's Maritime Vision

Impact of Government Policies



RIS@40

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

Hon'ble Union Minister of Ports, Shipping and Waterways Shri Sarbananda Sonowal

"Led by Hon'ble PM Shri Narendra Modi Ji's Maritime India Vision 2030, CMEC will pave way for seamless, cost effective trade and commerce with our neighbours including the BIMSTEC nations."

Shri Sarbananda Sonowal
Hon'ble Minister,
Ports, Shipping and Waterways,
Government of India

Propelling India's Maritime Vision: Impact of Government Policies

Propelling India's Maritime Vision: Impact of Government Policies

RIS@40

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

ISBN: 81-7122-178-5

Published in 2023 by:

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

Zone IVB, 4th Floor, India Habitat Centre
Lodhi Road, New Delhi - 110 003, India
Tel.: +91-11-24682177-80; Fax: +91-11-24682173-74
E-mail: dgoffice@ris.org.in
Website: www.ris.org.in

Contents

Section IV: Technology

Foreword

The Indian maritime industry has begun to develop at an unprecedented speed, bringing in technology, finance and human resources at a vast scale. For investors this brings in enormous possibilities to be involved with the growth story of the industry.

All of these are also happening when the global maritime industry is also going through a furious pace of changes. Those are spurred by related but also some independent drivers.

The thought behind the developing Indian story is the Maritime Vision—2030, announced by Hon'ble Prime Minister Shri Narendra Modi. It is a bold statement of India's intentions in the sector. According to him,"India is very serious about growing in the maritime sector and emerging as a leading Blue Economy of the world. Our leading focus areas include: Upgrade current infrastructure, Create next-generation infrastructure, Boost the reform journey".

Along with the Sagarmala programme that has an investment ambition of Rs 6 lakh crores for implementation during 2015 to 2035, the Maritime India Vision seeks to plough in another Rs 2.25 lakh crores.

These are massive numbers. It is to offer a perspective on those plans, the Global Maritime India Summit 2023 has brought together a galaxy of industry leaders, statesmen and knowledge leaders for a stock taking in Mumbai this week.

India is open to adopt the best practices from the world. And, as Hon'ble Prime Minister Shri Narendra Modi has said, "Continuing with our focus on trade and economic linkages with the BIMSTEC and Indian Ocean Rim nations, India plans to enhance investment in infrastructure and facilitate mutual agreements by 2026".

At the Ministry of Ports, Shipping and Waterways, sustained work is underway to implement all aspects of these priorities. This year itself, the ministry has organised a Chintan Shivir at Munnar, Kerala where stakeholders from each sector arrived to offer their points of view.

One of those goals for instance, India is committed to is the promotion of the use of renewable sources of energy in the maritime sector. India is in the process of installing solar and wind-based power systems at all the major ports across the country. The aim is to increase usage of renewable energy to more than 60% of total energy by 2030 in three phases across all Indian ports.

Another of these priorities is to also initiate holistic development of island infrastructures and ecosystem. Those lessons will be valuable to help the islands of the Indian Ocean to tackle the impact of climate change and yet pursue economic growth.

The third is to make regulatory institutions become adept to protect the interests of business as investments volumes rise across the sector, yet offer a fair deal for the billions of Indians on the pricing of these services.

A key element in these perspective is how to make the Indian shipping industry, including ship building gather the necessary mass to expand volumes, yet also become the technology leader in the sector. Related to this theme is the question of upgradation of skills of the Indian mariner community.

This book "*Propelling India's Maritime Vision: Impact of Government Policies*" does a valuable service in this context. Across its pages, distinguished leaders from India's top scientific, maritime institutions, practitioners and economists have offered practical and therefore highly implementable lessons on how to pursue these priorities.

Each of the essays written with the audience of GMIS in mind, examines, how each of the priorities cohere with the overall goal

of making India's maritime sector dynamic and able to soak in the swell of investments.

Securing larger investments in the Indian maritime sector is, like the voyage of an adroit captain, steering a ship. The destination is that of investments, the risks are those posed by climate change. Along with are those posed by the needs of

Global shipping business and expansion of ports will largely happen in the Indian Ocean where India will play a significant part. Challenges will appear at every stage. This book, brought out by CMEC at RIS, seeks to address those challenges and offer solutions, cognizant of the government priorities.

Sachin Chaturvedi
Director General, RIS

T.K. Ramachandran, IAS
Secretary, Ministry of Ports,
Shipping & Waterways,
Government of India

Preface

There is no doubt in the past few years, the ministry of ports, shipping and waterways (MOPSW) has carried out substantial reforms in the sector enveloping finance, the pricing structure and in the legal framework for the sector. This edition of the Global Maritime India Summit is the right window to offer investors a view of the vast range of these reforms and also assure them of the Green direction the ministry has set sail for.

This was therefore the appropriate setting for the Centre for Maritime Economy and Connectivity (CMEC) to supplement the efforts made by MOPSW to bring out a volume of essays which speaks on each of these topics. As the readers would be aware, CMEC was set up by MOPSW as a joint venture between Delhi based India's premier trade and technology think tank Research and Information Systems for Developing Countries (RIS) and the Indian Ports Association in January, 2023, to act as a policy advisory institution for the ministry.

The current volume in your hands has a clear objective. The reforms in the Indian maritime sector are not only happening, they are also enveloping new dimensions, to serve the rapidly growing interests of the Indian economy in trade and commerce. This volume seeks to bring some of India's most erudite commentators on the sector to explain the needs of the reforms and the course they have taken. The authors, naturally take the next step of observing how these reforms will add to the nautical muscle of the economy.

In each essay written by renowned experts from the maritime think tanks, private sector and leading universities, the reform agenda is thus carefully explained. This is most necessary for the investors to take a synoptic view of the reforms and their sequence. The scale of investment in every branch of business in the maritime

sector is substantial and the realisation window, long. For taking a view to invest, this clarity, we feel was therefore, essential to offer. To provide more value addition, the end of this volume, we have brought together all the reforms undertaken in the past few years, as a ready reference section.

We have also been carefully cognisant of the global environment in which the maritime sector of the Indian economy has begun to branch out. It is a period when the global economy is going through an acute series of fluctuations, ranging from the recent pandemic to the global wars, tracking the multiple sources from where there is a huge thrust up in new technologies and the prime need to push the agenda towards a sustainable climate goal, all of these are reflected in the following pages.

We have been lucky to have begun with a foreword, penned by Shri TK Ramachandran, Secretary, MOPSW who has captured the challenges in a few sharp paragraphs.

The chapters in this volume, have been arranged theme wise. The first section examines the range of reforms brought in the regulatory architecture of the sector and why they provide a highly necessary platform for the investors. To elucidate these further, it also includes a chapter on matching the reforms with how this has benefitted the coal sector. It closes out with a chapter on India Middle East Europe Corridor, explaining why this is the most important investment idea to have come about in this sector with India as the cornerstone.

The next section begins with a review of the very difficult challenge of staffing in the sector. The industry indeed faces a challenge of recruiting, motivating and retaining the workforce. It is this concern which provides the perspective for the next chapter, of what the shipping industry will need to compete with the global leaders. It closes out with a chapter from the private sector on how the reforms have progressed so far.

Section III explores potential areas of investments in maritime sector and how to further incentivize the shipping sector. In Subsequent Section IV each of the three chapters in the section on technology reminds the reader that it is the innovation race which will segregate the winners in the global maritime sector. Investment in ports or on board on voyages have to merge the concerns of efficiency, cost effectiveness and the need to do good for the globe will have to be threshed out. It is this environment that justifies the nature of the reforms made in the Indian maritime policies. It is this menu which is now open for the global investors to partake of.

One shall be remiss if in this context one does not acknowledge the huge and unstinted support provided by the entire MOPSW along with all the attached offices, in this endeavour. Our sincere thanks to Professor Sachin Chaturvedi, Director Genral, RIS. Thanks are also due to the entire team for their support.

Last by not the least, the young and highly energetic team at CMEC has really understood what makes for the delicious amalgam of research and policy advisory work. They have outdone themselves.

Subhomoy Bhattacharjee
Centre Head, CMEC

The quotes at the beginning of each chapter are extracted from the speeches by Shri Sarbananda Sonowal, Hon'ble Minister, Ports, Shipping and Waterways, Government of India

Section I

Regulatory Architecture & New Avenues

“The biggest benefit of transition to market linked tariff is that a level playing field will be provided to the PPP concessionaires at Major Ports to compete”

1

Reforms Rolled Out in the Financial Architecture of Indian Ports: Why these Matter

Subhomoy Bhattacharjee* *and* Kartik Kishore**

The financial viability of the ports in India will get an upswing thanks to three key changes carried out by the Ministry of Ports, Shipping and Waterways (MOPSW). These are a) Revision of Model Concession Agreement (MCA), 2021, b) Formulation of Tariff Guidelines, 2021 and c) Establishment of the Society for Affordable Resolution of Disputes - Ports (SAROD)

Investors in any sector need certainty in the use of their money. They are comfortable with business risks but would not wish additional risks. For the ports business, which has a long lead time, this is of even more concern.

* CMEC Centre Head.
** CMEC Policy Researcher.

An investor will be willing to consider the business risk of rise and flow of traffic at a terminal, but will be baulked if there are more risks like not being able to set prices attractively to bring in more ships, or if there is a dispute with the landlord who has leased out the terminal has the cover of a protracted dispute resolution to scare him from contesting those in courts.

As India now rushes to compete with the global mega ports, offering a certainty in the finance for the investors has thus become the sine qua non to bring in finance, for the targets set. The principal target is that by 2030 more than 85 per cent of the cargo handled at the major ports should be by the means of Public Private Party operators or concessionaires, which essentially means companies, whether in the private or the public sector.

This is an admirable target because it makes clear how sharp is the challenge in terms of timelines. MOPSW has already broken up some of the targets into implementable bits. For instance 31 port projects involving mechanization and modernization have been identified to be developed on PPP basis to be completed by 2024-25. To put these numbers in perspective, all the berths in the Major Ports are expected to be mechanised by 2030, a seven year target. These are all subsumed in the Maritime Vision—2030.

This context brings into relief the enormity of the three reforms undertaken by MOPSW. Combined these reforms, perform a singular duty. They offer the certainty to the investors that their financial arrangements with the government shall be on rock solid footing.

All of these are based on the premise that the governance model of the ports will be based on what is called the Landlord Model. In other words, the Port Trust or any other government entity with the ownership rights shall not also try to operate the business end. The Revision of Model Concession Agreement (MCA), 2021 is based on this premise. It restricts the power of the landlord in

dealing with the operators which will run the terminals. It not only makes clear the responsibilities and obligations the authority and private party with the landlord but also introduces clauses related to the termination payment prior to Commercial Operations Date (COD), changes in cargo due to unforeseen circumstances as well as permissible changes in regulations.

What are the aspects that the new MCA 2021 offers:

1) The total project cost shall be deemed to be modified to the extent of variation in Price Index occurring in respect of Adjusted Equity.

2) Payment of Royalty by private operators to port shall be based on per Million Tonnes of Cargo handled instead of Percentage of Gross Revenue Basis.

3) Rates of royalty per Million tonnes of of Cargo/TEUs will be indexed so as account for variations in the Wholesale Price Index (WPI) rates announced by the Ministry of Commerce and Industry.

4) The royalty payment to ports will undergo the same variation as WPI variation which is a rise for general inflation and is not an increase on royalty.

5) The Agreement has scope for provisions assuring revenue window of up to 45 years and with provisions to update those

As a Parliamentary Standing Committee examine the changes note appreciative, these should enhance Ease of Doing Business (EoDB) in the ports sector in India.

Why so? Because in the absence of this revision, it becomes necessary for the parties planning to enter the business with a major port, to work out customised contracts. Those contracts by their very nature can become opaque as parties try to work out favourable terms for themselves. A standardised model concession agreement wipes out such possibilities. Given that all and sundry shall be drawing up such contracts, the model frees up valuable space for MOPSW to work out policy issues instead of having to read each agreement for hidden risks.

It is the same concern that animates the second piece of reform, viz Formulation of Tariff Guidelines. These guidelines allow the concessionaires at these Major Ports to set tariffs as per market dynamics and sharing of revenue with the Port Authority as per the bid condition and Concession Agreement.

It is necessary at this stage to pause and consider, the huge significance of the Guidelines. Almost since Independence, successive governments have worked on the premise that the ports should not compete on price. Instead their draw for building volumes at the terminals should be the services they offer. While laudable, this has made the ports entirely dependant on the now defunct government body, Tarif Authority for Major Ports to change prices in any direction.

Returns on capital for the ports were therefore necessarily set at rock bottom rates as there was a long time lag when they could change prices, in response to changing global dynamics of the business. This in turn, made the ports dependant on government financing to build up new facilities and offer faster turnaround. It is no surprise then that till now only 35% of total berths at major ports are mechanised. The only exception is Kandla which has all of its berths mechanised. Given the global challenges, MOPSW has right decided that all port terminals must be mechanised by 2030. It is therefore essential that the ports must earn the money to make that happen.

The investment required for the ports to make those happen is upwards of Rs 2.5 trillion, just under the Maritime Vision —2030. In fact it is only now that with the removal of the cobwebs of arbitrary price fixation removed that the scale of investments are being drawn up. To give an example two existing major ports Deendayal Port and Paradip Port, have been identified to be transformed into Mega Ports having cargo handling capacity of 300 plus MTPA. The proposed Vadhavan Port up stead of Mumbai will also be developed

as another Mega Port, having a similar cargo handling capacity of above 300 MTPA.

The third leg of this reform is the change in the arbitration procedures in the sector. This is the establishment of the Society for Affordable Resolution of Disputes - Ports (SAROD). In harmony with the name, a musical instrument, it is really music for the investors.

There is no way to assume that despite all the precautions of free pricing and non arbitrary concession agreements, there shall not be disputes between the lessors, the terminal operators and the landlords, the port authorities. In May 2022, MOPSW has issued the 'Guidelines for dealing with stressed PPP Projects at Major Ports' for reviving the stuck projects and unlocking blocked capacity".

The changes are in sync with the proactive steps the other departments of the government has brought in to alter the environment for arbitration in India. To put all of that in context, plenty of regulatory changes are happening in the field of arbitration in India. Before 2023 is out the Centre will make public a report of an expert committee to recommend reforms in the Indian Arbitration and Conciliation Act of 1996.

Arbitration happens when parties to a contract seek to avoid a court case, seeking instead a reconciliation mediated by an informed agency. It is a huge business globally with the seats usually located in the financial capitals of the world. Not a surprise that where arbitration works fast, investments follow suit.

Once the parties choose arbitration as the mode of dispute resolution, the Indian Arbitration and Conciliation Act, 1996 has to become applicable for such proceedings. But till now, due to the perceived weakness of the arbitration eco system and the tendency of civil courts to interfere with such awards, cases have moved to foreign seats, mostly Singapore and London.

Sarod, as the name suggests is the platform that can make arbitration less taxing. More over, in the event of constitution of a statutory Adjudicatory Board as per provisions of Major Port Authorities Act, 2021 or such other forum with powers to receive and adjudicate upon disputes between the concessionaires and the landlords, all disputes not settled through conciliation, can alternatively be referred to this Board with the mutual consent of the parties, and of course in accordance with the applicable laws.

That these matter is made clear by the response of the investors. Already demands are streaming in to make some of these provisions, apply for existing contracts too. For MOPSW, the demands demonstrate that the steps have arrived at the right time.

For a new sector like that of ports that these have begun to roll out in unison is a huge game changer. A PPP agreement with an easy means to settle disputes outside of court offers the safety of capital essential to swing the investments. For investors peeking into the Indian maritime sector, these are thus the biggest possible inducements to make their decisions.

"India is at the centre of global maritime attention, with prominent trade corridors to both Europe and Russia originating from here"

2

IMEC Can Be A Game Changer in Continental Integration

Amitendu Palit*

Eight members of the G20 collectively announced the launch of the India-Middle East-Europe economic corridor (IMEC) at the recently concluded G20 Leaders' Summit in New Delhi[1]. The members include the European Union (EU), France, Germany, India, Italy, Saudi Arabia, United Arab Emirates (UAE), and the United States (US). The corridor has captured significant attention on account of its geo-economic and geo-strategic prospects.

The economic geography of the IMEC is noteworthy in terms of the regions it will span and the countries it will draw in. Beginning from India in South Asia, the IMEC will advance to West Asia and the Middle East by connecting India to the UAE and the Saudi Arabia, and further to Jordan and Israel. This part of the IMEC is being described as its *eastern* corridor, connecting India and the

* Advisor – CMEC & Research Lead, ISAS, National University of Singapore.

Middle East through the Arabian Gulf, which is popularly referred to as the Persian Gulf as well.

The Arabian Gulf has water borders with several countries of the Middle East[2], including the UAE and Saudi Arabia. The Gulf has an exceptional strategic significance in terms of it being the main mode of movement of energy products from the Middle East to the rest of the world. Several West Asian members of the Organisation of Petroleum Exporting Countries (OPEC) are located around the Arabian Gulf. From among IMEC members, these include Saudi Arabia and the UAE.

The second component of the IMEC comprises the *northern* corridor, connecting the Arabian Gulf to the continent of Europe[3]. The connection will advance from Israel westward, through the Mediterranean Sea, into Greece, Italy, France and further to Germany.

Looked at in the light of the aggregate economic geography that the eastern and northern corridors bring in between them, the area primarily comprises an economic belt beginning from the South Asian region, stretching across the Middle East, and extending further into Southern and Western Europe. This is a route that is primarily maritime in character and will indeed be so in the proposed IMEC too.

The first part of the route, which is the eastern corridor, will arguably link ports on India's west coast to those in the UAE and Saudi Arabia. There is already considerable maritime traffic on these routes. For example, maritime cargo movement from the Mumbai port on India's west coast to Jebel Ali and Abu Dhabi ports in the UAE, currently take around 5.6-5.9 days, while that for the King Abdul Aziz (Dammam) port in Saudi Arabia take around 6.8 days[4]. From an Indian perspective, as well as global and regional business perspectives, the key appeal of the eastern corridor will be in whether these shipping times would shorten following the inception of the IMEC. This will depend upon the quality of

advanced trade facilitation measures, like digitally enabled cargo clearances, paperless invoicing and other cost-cutting features getting plugged into dedicated ports of the Eastern corridor. Both existing as well as upcoming maritime capacities (e.g., Tuna Tekra terminal at Kandla) on India's west coast need to seize the latest facilitations. The same factors will also influence the efficiency of the second part of the IMEC – the northern corridor – connecting the Arabian Gulf to Europe. Over here, again, much will depend on the dedicated ports that connect from Haifa in Israel to various ports in Italy, France and other parts of Europe.

The Suez Canal[5] currently is the most active shipping route for moving cargo from India to Europe and vice-versa. Connecting the Mediterranean and the Red Seas, the Suez Canal, located in Egypt, is the quickest route for shipping freight from countries bordering the Indian Ocean, to the continent of Europe. As of now, goods moving from the Mundra port on India's west coast to the Venice port in Italy through the Suez Canal, take more than a month to reach their destination[6]. The appeal of the IMEC, in this respect, will be in it offering a viable option for cutting down the cargo movement time.

The IMEC does offer a unique value proposition. The two maritime corridors – east and north – are being connected to each other through a railway route. The rail route will run through the UAE, Saudi Arabia, Jordan, and Israel. This is where the IMEC goes *multi-modal* and attempts to offer an economically viable alternative to shipping goods from India to Europe through the Suez Canal.

The cost efficiency of the IMEC is proposed to be achieved through the rail transit that will run through the Middle East. Goods from India after reaching the designated IMEC ports at the UAE and Saudi Arabia, will be transported by rail, primarily to the Haifa port in Israel, from where they will be shipped to their eventual destinations in Europe.

The idea of proposing an alternative route to the Suez Canal is certainly an appealing proposition. The unprecedented disruption caused to global supply chains in March 2021, after a Taiwan-based 400-meter-long container became stuck in the canal sideways[7], provides strong imperative for searching alternative solutions. From an Indian perspective, the urgency of identifying an alternative is especially significant.

India's trade volumes with Europe are expected to rise significantly upon the completion of its ongoing free trade agreement negotiations with the European Union (EU) and the United Kingdom (UK). Both these upcoming FTAs will be supplemented by the FTA that India has already signed with the UAE and the one that it is expected to be negotiated in future with Israel. The higher volume of trade will offer a diverse array of opportunities to Indian businesses, particularly the MSMEs, for integrating closer in global supply chains. To ensure that the prospect materializes, it is essential to safeguard supply chains. The priority is high for those supply chains that are of a critical nature in the sense of their disruptions having profound implications for national economic securities, such as food, energy products, precious metals, and medicines.

Like all other multi-modal connectivity projects, the IMEC's eventual success will depend on how efficiently the shipping and rail modes synchronize with each other. This synchronization will depend heavily on the cutting-edge new-generation trade facilitation that is required to be brought to the project. It is heartening to note that the ideation of the project has digital connectivity as one of its important priorities. Advanced digital connectivity is essential for obtaining robust processes in end-to-end container shipping, without which, the larger gain of achieving economic efficiency through lower costs will not be realized.

The IMEC has also drawn great attention for its geo-strategic significance. Providing a distinct alternative to the ongoing

China-driven cross-continental connectivity project – the Belt and Road Initiative (BRI) – the IMEC has varied stakeholders, in terms of the large number of prominent global economic and political powers that have come behind it. It complements India's ongoing geo-strategic engagement with the US, Israel, and the UAE, described as the I2U2[8], as well as its deepening and expanding strategic links with the Gulf region and Europe. Over time, as the initiative blossoms and dedicated parts and pieces start coming together, the IMEC can be a game-changer in continental integration, driven by its geo-political and geo-economic prerogatives.

Endnotes

1 Fact Sheet: World Leaders Launch a Landmark India-Middle East-Europe Economic Corridor. The White House, September 9, 2023. https://www.whitehouse.gov/briefing-room/statements-releases/2023/09/09/fact-sheet-world-leaders-launch-a-landmark-india-middle-east-europe-economic-corridor/

2 Strait of Hormuz, Strauss Center, The University of Texas at Austin. https://www.strausscenter.org/strait-of-hormuz-about-the-persian-arabian-gulf/

3 "Memorandum of Understanding on the Principles of an India -Middle East – Europe Economic Corridor', The White House. https://www.whitehouse.gov/wp-content/uploads/2023/09/Project-Gateway-Multilateral-MOU.pdf

4 As estimated from Ports.com http://ports.com/sea-route/port-of-mumbai,india/port-of-abu-dhabi,united-arab-emirates/#/?a=0&b=12698&c=Port%20of%20Mumbai%20,%20India&d=Port%20of%20Mina%20Jabal%20Ali%20(Jebel%20Ali)%20,%20United%20Arab%20Emirates

5 'The Suez Canal: A Man-Made Marvel Connecting the Mediterranean Sea and the Red Sea', marineinsight, 7 July 2022. https://www.marineinsight.com/maritime-history/a-brief-history-of-the-suez-canal/

6 https://www.shipafreight.com/tradelane/india-to-italy/

7 'Blocked Suez Canal raises new threat to global supply chains', Nikkei Asia, 25 March 2021. https://asia.nikkei.com/Business/Transportation/Blocked-Suez-Canal-raises-new-threat-to-global-supply-chains

8 I2U@, US Department of State. https://www.state.gov/i2u2/

Section II
Skilling and Port Operations

“The vision of Amrit Kaal under the dynamic leadership of Prime Minister Shri Narendra Modi is for creation of excellent employment opportunities for the youth. We have to work hard to make shipping a fast-growing sector so that India can become a world leader in maritime infrastructure as well as a lead player in the maritime economy”

3

Developing Maritime Capabilities and Skill Development of Seafarers

Malini V. Shankar*

According to the latest Staffing Annual Review and Forecast report published by Drewry in June 2023, the shortfall in the supply of officers has reached a record high. The report further states that in 2023 the gap has widened to a deficit equivalent to about 9% of the global pool, as against a 5% shortfall the previous year, and

* IAS (Retd.), Vice Chancellor, IMU.

the highest level since Drewry first started analysing the seafarer market 17 years ago. Based on the current supply of seafarers, it is estimated that the deficit is likely to continue for the coming years, i.e. 2023-2028. While this has raised fears about manpower cost inflation, it also presents an opportunity for the youth who aspire to join the maritime workforce.

Maritime training has multiple objectives - safety and security, compliance with external regulations, increasing commercial efficiencies and effectiveness, managing crew competency, and career development for seafarers. The effectiveness of the STCW regime, specifically its contribution to maritime safety, security and protection of the marine environment, is dependent on its implementation and application. This has become challenging in the context of rapidly changing technology and safety requirements.

A study conducted by the MaTID (Maritime Training Insights Database) Report brought out by World Maritime University had identified a number of training priorities promptly. Among those, technology-related training, safety culture and skills, environmental and competence training were seen as the highest priority for trainers.

Future Skill and Competence Needs – a Report by SkillSea published in April 2020 identified the following key areas that need attention:

- Response to rapid development of technologies on board
- Soft skills in leadership & management
- Bridging programmes that complement the IMO based education
- Bridge the distances between shore-based & seagoing profiles (transversal skills between occupational profiles)

The SkillSet report concludes that “society requires skill sets between nautical studies, engineering, and management. These include information technology, data science, environmental science, law and financing”.

The development of autonomous ships and digitalisation call for data analytics and predictive analysis skills such as dispersed crew & remote operation, cargo tracking, cargo condition monitoring, logistics & value chain, smart port operations, traffic & fleet management.

The application of new technologies, i.e. integrated bridge systems, environmental information perception, collision avoidance path planning, cyber-physical systems, track control, internet of things, cloud computing, big data, automation, remote control, satellite and communication, fault diagnosis and etc., will no doubt bring new requirements to seafarers' navigation knowledge and skills, and pose great challenges for Maritime Education and Training .

Going beyond aspects of technology, let us hear what industry experts have to say:: "The biggest challenge for seafarers is understanding data" (DNV CEO Knut Orbeck-Nilssen); "Seafarers should know how to interact with computers to respond to challenges" (President of Kornsberg Maritime). Not to speak of communication skills - the skill required for documentation, drafting letters, writing reports are missing across the maritime industry.

A study conducted on the marine accidents using the worldwide accident investigation reports for the period of 2010–2019 revealed that the severity of marine accident is positively associated with natural factors; seafarers with poor theoretical knowledge and less sea experience are more likely to be involved in accidents of serious consequences .

Teaching/ Learning Methodologies

Latest developments in education prescribe outcomes based and experiential learnings. The pedagogical evolution in traditional educational institutions tend to lag behind the rapid technological

advancements. Professional articles in cognitive science which flag the trends in attention span of present-day students and the consequent need to engage them actively through enhanced interactive methodology in transferring knowledge and skills. Peer-to-peer learning has been recognised as a tool to enable this. A major objective is to improve the comprehension and communication skills of the student/ cadet - getting up in class to teach involves intense reading, conceptual comprehension and clarity in expression. These are skills that are imperative for the success of the student in the working world.

Preparing personnel for crossover from technical positions to management calls for refresher courses and integrated view. The need to identify specific areas in maritime sector that can benefit from up-skilling and re-skilling. The academic institutions can implement a skill upgradation programme in consonance with the needs of the maritime industry

Role of faculty

Education is not about just absorption of content, but the ability to distil, dissect, apply mind, analyse. It is about the capacity to stimulate young minds – to think for themselves, identify issues, contemplate constant improvement, and to provide solutions.

Faculty development plays an important role in enabling these attributes and contributing to an institution's overall health. Institutions have been able to get by with minimum focus on learning outcomes assessment plans, technology strategies, and adequate support for faculty development. Whatever challenges higher education will face, there will, no doubt, be a need to help faculty members adapt and thrive. Faculty members need to look at it as an opportunity to stay on the cutting edge rather than as an admission of weakness.

We as members of maritime fraternity need to bolster the sector – ship building, ship ownership, increasing the number of Indian seafarers, enhancing the quality of training and education, ensuring refresher training, and building leadership roles. This can be achieved through laying equal if not greater emphasis on nurturing and forming capable and committed teaching fraternity in the maritime sector.

Research

Robotics, AR & VR, additive printing, alternative fuel, modular construction, even on-board waste management are fertile areas of research where support from the maritime industry with regard to the identification of training would go a long way in enhancing the quality of training.

Stress factors

A lower average number of crew members as a consequence of advances in modern ship financing has led to a higher level of responsibility for each seafarer. On an average, crew staffing has decreased from an average of 30, down to 20 seafarers on board of container ships, within the past 40 years. The quick port rotation of vessels with only short stays in port and frequently changing crews has also affected the social dynamics on board.

Multitude of regulations of IMO and ILO regulations imposes immense stress on the crew in terms of compliances. Mentorships at each level – by the MTIs as well as by industry – will definitely mitigate the situation

Role of Industry

The staffing industry indeed faces a challenge of recruiting, motivating and retaining the workforce, given the facts that there

is a reported shortage of officers and seafarers, the mental and physical health issues, and the propensity to migrate to offshore jobs. The majority of industry remains deeply invested in the welfare of seafarers and maintaining the delicate equilibrium between their well-being and the cost effectiveness of the business.

Opportunities exist for industry and academia to join efforts in maritime education and research. Establishing Centres of Excellence for Skilling, investing in industry-relevant research projects that enables lab- to – land applications, contemplating a system of sustainable mentoring of cadets and young professionals, and from the academia's point of view, ensuring a steady stream of professionals who are committed to sharing knowledge and skills in the classroom. The Maritime India Vision 2030 is a document that has highlighted the prospects and action points to take us to 2050 and beyond. It is up to us to make that happen.

“We invite all the maritime stakeholders in India and globally to be part of the investment opportunities at Global India Maritime Summit 2023. Under the visionary leadership of Prime Minister Shri Narendra Modi ji, India is spearheading the advancement of regional trade within BIMSTEC region, taking a prominent role in the development of various regional projects. India is actively driving the establishment of 5,000 km of multi-country waterways, a significant initiative that will effectively facilitate trade and transportation across the region”

4

Adani Ports: Heralding Stellar Operations and Unparalleled Growth

Karan Adani*

Adani Ports and Special Economic Zone Ltd (APSEZ), a part of the globally diversified Adani Group, has evolved from a port company to an integrated transport utility providing an end-to-end solution from its port gate to the customer’s gate. It is the

* CEO, Adani Ports & SEZ Ltd.

largest port developer and operator in India with six strategically located ports and terminals on the west coast of India (Mundra, Dahej, Tuna and Hazira in Gujarat, Mormugao in Goa and Dighi in Maharashtra) and six ports and terminals on the east coast (Dhamra in Odisha, Gangavaram and Krishnapatnam in Andhra Pradesh, Karaikal in Puducherry, and Kattupalli and Ennore in Tamil Nadu) representing 26% of the country's total port volumes, thus providing capabilities to handle vast amounts of cargo from both coastal areas and the hinterland.

The ports, with a combined capacity of around 580 million metric tonnes per annum (MMTPA). are strategically located to facilitate trade and connect India to global logistics supply chains. The company is involved in several expansion projects, including the development of India's most automated container transshipment port at Vizhinjam in Kerala and a 4 MMTPA bulk terminal in Haldia port, West Bengal.

The company aims to evolve as India's largest integrated transport utility company and the world's largest private port company by 2030. Its international operations include the Haifa Port in Israel (acquired in FY 23) and the development of a container terminal in Colombo, Sri Lanka (under construction).

APSEZ pioneered the concept of Science-Based Targets Initiative (SBTi) in India, the third port company in the world to do so. Its vision is to achieve carbon neutrality by 2025, validating its commitment to emission reduction targets to control global warming at 1.5°C above pre-industrial levels and become carbon-positive by 2030.

Over the years, APSEZ has evolved into a provider of integrated port infrastructure services, of which the Mundra SEZ in Gujarat is a landmark validation. Commemorating a landmark journey, the Mundra Port is celebrating 25 years of path-breaking operations, highlighting its expansion and evolution as one of the largest ports

globally. Since berthing its first ship, MT Alpha on 7 October, 1998, the port has consistently demonstrated a visionary approach, unwavering ambition and impeccable execution, positioning itself as one of the premier and technologically advanced ports on the global map.

Emerging as a crucial trade gateway, the Mundra Port has grown into a multimodal hub that drives trade and fortifies economic progression. From its modest inception, it has ascended to prominence and has contributed over Rs. 2.25 lakh crore to the state and national exchequer in the past 25 years, emphasising its central role in India's economic framework. Also, it has generated employment exceeding 7.5 crore man-days since inception.

From a handful of tonnes in 1998, Mundra went on to handle 100 MMT in 2014, the first in India to do so. Today, the port handles over 155 MMT (again the first in India), which constitutes nearly 11% of India's maritime cargo. Mundra is also the EXIM gateway for container traffic. In fact, 33% of India's container traffic flows through the port across a dedicated freight corridor that offers the unique facility of double-stack containers from the northern hinterland to Mundra.

Commenting on Mundra Port, Adani Group Chairman Mr Gautam Adani said, *"Mundra, for me, is much more than just a port. "*

Today, Mundra is a showcase of world-class infrastructure. The importance of Mundra can be gauged from the fact that it is likely to be a part of the India-Middle East-Europe Economic Corridor (IMEC), an MoU for which was signed in September 2023 by Saudi Arabia, the European Union, India, the UAE, France, Germany, Italy, and the U.S. on the sidelines of the G20 Leaders Summit in New Delhi. These countries are expected to meet in November 2023 to firm up the details.

Two proposed corridors are proposed under the IMEC: the east corridor connecting India to the Arabian Gulf and the northern

corridor connecting the Arabian Gulf to Europe. The idea is to increase road, rail, and maritime connectivity to increase the movement of goods and services between India, the UAE, Saudi Arabia, Jordan, Israel, and Europe.

APSEZ's integrated services across three verticals – ports, logistics and SEZ – have enabled it to forge alliances with leading Indian businesses, making it an undisputed leader in the Indian port sector. Through its subsidiary, Adani Logistics Ltd., APSEZ operates three logistics parks at Patli in Haryana, Kila-Raipur in Punjab and Kishangarh in Rajasthan. With the ability to handle 5,00,000 20-foot equivalent units (TEUs) annually, the logistics business is growing at a rapid pace.

Along with its expertise in providing end-to-end logistics solutions, operational excellence, low-cost operations and synergies through acquisitions, APSEZ was certified as a Great Place to Work in FY 2021-22.

APSEZ was ranked the first globally across all emerging markets in the transport and logistics sector by Moody's ESG Solutions in its assessment for 2022. It was ranked first among 59 Indian companies and ninth among 844 companies in emerging markets globally across all sectors/industries. The rating agency evaluated the company on a range of indicators, policies, processes and systems covering environment, human rights, corporate governance, human resources and community involvement.

APSEZ's ambitious goals and strategic investments have positioned it as a major player in the Indian infrastructure and logistics sector, both domestically and internationally, with a strong emphasis on sustainability and ESG initiatives.

Section III
Advancing Investments

“Going by the ‘Transformation via Transportation’ vision of PM Modi ji, we have given increasing importance to rejuvenate our rich and complex inter web of riverine system to act as an effective alternative mode of communication for both cargo and passenger traffic. It has been established that inland waterways is the most cost effective, efficient, environment friendly mode of modern transportation.”

5

Potential Areas of Investment to Strengthen Connectivity between India and Bangladesh

Saurabh Bandyopadhyay*

India was the first country to establish diplomatic relations with Bangladesh in 1971 and both countries stand out as reflecting a decent partnership in terms of generational links of culture and socio-economic bondages. Sustained trade is one of the key kindreds among these two countries and it may graciously be noted that during

* Senior Fellow, NCAER.

the COVID-19 pandemic, the supply chain between the two countries continued without interruption. Improving this connectivity further is important for the enlargement of bilateral trade and investment potential, especially for Bangladesh and the eastern part of India. In this regard, ensuring seamless connectivity between these two countries is the most important factor in facilitating the trade intensity of India and Bangladesh. Opening up of Chattogram Port for transit and transhipment of goods and allowing regular movement of goods through the Permanent Standing Order of the National Board of Revenue (NBR) of Bangladesh stands testimony to the India- Bangladesh economic partnership. The move will help cut down the inland distance of the northeastern states by half if a multimodal route synchronization is effectively applied. However, this requires substantial investment, not only on the Indian side but also in the relevant part of Bangladesh.

The inauguration of the Maitree Setu (Friendship Bridge) on 9th March 2021, connecting Sabroom of India with Ramgarh of Bangladesh over the river Feni is an important development. Sabroom, which is just 80 km away from the Chattogram port, makes Tripura the 'Gateway of Northeast', with the potential to uplift the regional economy. This is a milestone phase in the direction of enhancing connectivity and is an exemplar of the closer integration of the BIMSTEC region and the larger Southeast Asia.

Located on the banks of the Karnaphuli River, Chattogram is Bangladesh's main seaport and handles over 90 per cent of the country's export-import trade. Mongla port, on the other hand, is Bangladesh's second-largest seaport and lies close to the shore of the Bay of Bengal near Khulna city. It may be noted in this context that India is developing two Indian Economic Zones at Mirsarai and Mongla. Over 350 Indian companies are working in Bangladesh now. This recent development will drastically reduce the cost and time of transferring goods from one state to the other. For instance, the land route between Kolkata and India's northeastern states is

more than 1,200 kilometres while Chattogram and Mongla ports are located at almost half the distance.

Therefore, the overburdened Petrapole-Benapole route may be replaced with the new route leading to a substantial reduction in delays for cargoes. In this regard, there are multiple routes[1] that can come up as potential corridors to connect major economic clusters in the northeastern region to Chattogram through road, rail, and waterway routes. It may be noted that within the northeastern region, the logistic cost is on the higher side. In order to reduce the same, ADB suggested the opening of the Sabroom– Ramgarh– Chattogram route to further reduce the distance between the northeastern region and Chattogram, thereby reducing the cost of transportation. There is also the possibility of movement of non-bulk cargoes by sea using roll-on roll-off mode through Chattogram to the northeastern region. However, massive investment is required to build up a dedicated freight corridor from Chattogram through the Akhaura-Agartala- Guwahati route. The method of investment could be a Private-Public Partnership (PPP) with the right of construction to be deliberated to a private entrepreneur on an agreed design and allowing operation of the project for a specified time period. There could be a BOO (Built-Own-Operate) model too Furthermore, multi-modal connectivity from Chattogram via Ashugunj, covering the entire Silchar strait to Agartala could be a game changer for facilitating trade for inland India to the northeast region as well as between India and Bangladesh. On all counts, the reduction of procedural delays and turnover time should be of the utmost prerequisite to attract a large quantum of investment for strengthening and enhancing the connectivity of relevant routes between India and Bangladesh

[1] Asian Development Bank Report (2021): Using Chattogram Port as a Transshipment Hub for the North Eastern Region of India, July

"India stands firmly on its commitment to developing environmentally conscious shipping solutions"

6

Incentives for the Shipping Sector in Tune with India's Green Commitments

Anil Devli*

The shipping business now has to factor in a costly transition The International Maritime Organisation's green regulations like other countries will impact India, given that Indian flag coastal and EXIM shipping is but a subset of international shipping. So Indian shipping companies also have to comply with the costs of the green protocol.

Here is a quick recap of the green initiatives of IMO. In 2021, its Marine Environment Protection Committee (MEPC 76) adopted three different regulations: the energy efficiency indicator (EEXI) for existing ships which is a technical design standard applied to existing ships; the carbon intensity indicator (CII) which is an

* CEO, Indian National Shipowners' Association (INSA).

annual requirement for vessels to note their carbon emissions and the ship energy efficiency management plan (SEEMP), which is a management plan that all ships need to have on board indicating how the ship intends to meet the CII requirements. All of this became effective from 1st of January 2023. Further, MEPC 78 finalized more guidelines for the upcoming EEXI, CII and SEEMP regulations. It also approved a new sulphur emission control area in the Mediterranean. This will have an impact on key trading routes and will have some definite cost implications.

The most recent objectives of the 2023 GHG reduction strategy are enhancing IMO's efforts to sync with global efforts like Paris Agreement and the United Nations 2030 Agenda for Sustainable Development to reduce GHG emissions in international shipping and to identify actions the international shipping sector should implement while addressing impacts on States and at the same time supporting the consistent development of global trade and maritime transport services.

In specifics, the headline 2023 mid-term goals are to review carbon intensity of ships with a view to strengthen the energy efficiency design requirements for ships, to reduce carbon intensity of international shipping by at least 40% by 2030 compared to 2008, to increase uptake of zero or near-zero GHG emission technologies, fuels and/or energy sources to represent at least 5% and striving for 10% of the energy used by international shipping by 2030, to peak GHG emissions from international shipping as soon as possible and to reach net-zero GHG emissions by 2050.

As can be seen from the facts above, there is global consensus on the need for shipping to further reduce emissions but global shipping is still grappling with two fundamental issues: (i) which the is chosen fuel and technology and, (ii) finance to buy and use the new technology.

There is a plan to set up an International Maritime Research Fund (IMRF) which would be funded by a US $2-a-tonne tax on

fuel and administered by a board run by the IMO. One source of concern is the manner in which this fund would be appropriated to countries. It is important to set the guard rails on the utilization and distribution of these funds.

There is also hope that biofuels will play an important role in shipping over the coming years, as a green fuel. Several Indian shipping companies are working with the use of biofuels as the "green fuel". However, there are uncertainties about its efficacy as the only alternate green fuel for a ship's engine and the scalability of its production. Therefore, as yet, shipping cannot rely solely on biofuels as the only solution to its greening efforts. The maritime sector will need to continue to explore other options to reach net zero emissions. This means combining biofuels with more energy efficiency measures for carbon-neutral shipping which brings us again to the moot question of funding these green measures. To what extent bio-fuels become cheaper than fossil fuel shall be watched keenly.

Closer home, there are some more critical issues of INSA member companies which the government could look into. The primary concern is the need for competitive funding. Indian shipping faces several constraints in sourcing finance to buy new and second-hand ships. As foreign shipping companies compete directly with Indian ships for India's EXIM and coastal cargoes, funding for Indian ships needs to be on internationally competitive terms. While loans are procured by Indian shipping companies from Indian banks, they face two constraints: one that the cost of funds is much higher than the rate available to foreign shipping companies and two that the tenor of loans is far shorter than the commercial life of the ship. These two factors affect the ability of Indian ships to be competitive as the per day costs of just servicing these loans taken to purchase the said asset are much higher compared with foreign ships. As a solution, a dedicated source for ship finance may be considered.

The government may also consider why is it often easier to import shipping services into India compared to providing shipping services as an Indian company.

The Green Indian Coastal Scheme

Shipping has the highest potential to save on emissions as it has the ability to carry large quantities of cargo volumes on a single ship.

For example, if 60,000 tons of cargoes were to be carried over 2,000 kms across India then it would require 4,000 trucks or just a SINGLE ship! This translates into vastly different fuel consumption. The fuel consumed by sea would be 156.62 tonnes versus fuel consumption of 3,720 tonnes by road. This clearly highlights the potential of sea transportation in saving on fuel emissions, be they—carbon, methane or sulphur.

Just as the government has rightly promoted carbon lowering mechanisms such as the Faster Adoption and Manufacturing of (Hybrid &) Electric Vehicles (FAME) scheme for electric vehicles (EVs) in India, it could look into the shipping sector too. In some sectors, India has already demonstrated its ability to absorb and catalyse transformation at a commendable scale like the renewable energy sector. One common sector that can help reduce emissions of all sectors in the Indian economy is the transportation sector—especially the mode of coastal shipping.

As shipping and India both have green targets that have to be met, both these commitments can be dovetailed into a scheme that would encourage shippers to use inland waterways and the sea to transport domestic goods.

“GMIS 2023 is aligned with Prime Minister’s vision of ‘Atmanirbhar Bharat’ and captures a wide range of opportunities for Public Private Partnerships, with investment opportunities of Rs.10 lakh crore already identified across the sector with potential to generate more than 15 lakh job opportunities”

7

Building on Trends in Indian Port Sector

Goutam Gupta*

The Ports, Shipping and Waterways Ministry, in the last nine years, have taken many initiatives to automate Indian Major Ports under the flagship programme of Sagarmala to make Indian Major Ports as one of the most competent systems in the entire globe. These have led to significant benefits. In this article, we examine some fresh areas where the returns could be even higher.

1. Port Infrastructure : Ports are adopting advanced technologies to automate processes, such as terminal operations, cargo handling,

* Advisor (Traffic & Shipping), Syama Prasad Mukherjee Port, Kolkata.

and transportation, resulting in increased efficiency and reduced human error. They are also implementing advanced technologies, such as the Internet of Things (IoT), Artificial Intelligence (AI), and blockchain, to enhance port operations, improve data management, and ensure greater security.

Some of the key technologies used in ports globally include artificial intelligence (AI), the Internet of Things (IoT), robotics, automation and cloud computing. These technologies allow ports to operate more efficiently and improve their capacity to manage large volumes of cargo.

A significant example in this context is of cruise shipping . Large investments are being channelised into it. However, it has to be kept in mind that calling at a port does not solely depend on the Cruise Line. It largely depends on the expectations, experience and the feedback of the cruise passengers. Therefore, passenger experience at a port needs to be taken care of. AI can certainly play a significant role in enhancing the experience of cruise passengers and offering various activities. The ways AI can help are as follows:

- Personalized Recommendations: AI-powered recommendation systems can help cruise passengers discover personalized and tailored activities and experiences based on their interests and preferences. By analyzing past booking data and behavior, AI algorithms can suggest relevant activities, excursions, and local experiences to each passenger, making their trip more enjoyable and personalized.
- Real-time Language Translation: Many cruise passengers come from different parts of the world and speak different languages. AI-powered language translation systems can be integrated into onboard systems, allowing passengers to communicate seamlessly with crew members, fellow passengers, and locals. This can greatly enhance the passenger experience by reducing language barriers.

- Predictive Maintenance: AI can be used to predict maintenance requirements and potential equipment failures at the Terminals, enabling operators to carry out repairs before they become critical issues. This can reduce the risk of breakdowns during cruise calling, minimize downtime, and ensure a smooth and seamless passenger experience.
- Virtual Reality Experiences: Virtual reality can be used to offer immersive experiences for cruise passengers. For example, AI-powered VR systems can simulate popular tourist attractions, allowing passengers to experience them without leaving the ship. This can add value to the cruise experience and provide passengers with unique, engaging experiences.
- Intelligent Chatbots: AI-powered chatbots can provide passengers with instant and accurate information about onboard services, activities, and destinations. Chatbots can help passengers plan their itinerary, book excursions, and answer common queries in real-time. This can greatly enhance the passenger experience by providing quick and reliable information.

2. **Green Port Initiatives:** The Ministry of Ports, Shipping and Waterways has been working towards developing green ports across the country and have taken various initiatives and 'Harit Sagar' guidelines have been issued in May 2023.
- As part of Green Port Initiatives, the Major Ports may consider the following:
- To promote operation of Roll on-Roll off /Ro-pax ships with an objective of introducing a modal shift of transportation of domestic cargo from road to sea. This would give the land transporters a bigger action radius. It will have twinfold benefits of promoting coastal shipping and at the same time in eliminating carbon emission per cargo carrying trucks thereby mitigating the effects of climate change. However, it has to be kept in mind that in order to be successful & a viable mode of transport, Ro-Ro/

Ro-Pax ferry services need to bring about significant reductions in distance and travel time for vehicles/passengers by providing direct connectivity between two points, taking advantage of the shortest distance, usually across bodies of water. This will eliminate the need for taking circuitous long distance routes or taking indirect other modes of transport. These advantages will be lost if the ferry services plan to operate along the route having parallel road connections, making those challenging from the point of view of customer support as significant reduction in travel time will not be achieved as vehicles/passengers cannot reach their destinations faster compared to other modes of transport. Moreover, Ro-Ro/Ro-Pax ferries need to integrate with other modes of transportation, such as railways and road networks. This will create seamless intermodal connectivity, allowing passengers to easily transition between different modes of transportation without significant delays.

- To convert conventional warehouses to 'Green Warehouses' to reduce carbon footprint. The warehousing segment in India is expected to witness significant growth in the coming days. This can be ascribed to the increasing demand for last mile distribution and growing preference for co-warehousing among manufacturers, suppliers, logistics companies as well as start-ups. The damand for quality warehouses is far out-stripping supply at the moment. Total Major Port owned warehousing space stands at 733247 sq. ft and all are conventional warehouses. These conventional warehouses produce both indoor and outdoor pollutants causing a significant impact on the environment and human health. It is estimated that a conventional warehouse emits 200-250 tonnes of carbon-di-oxide per annum. Major Ports need to consider converting their conventional warehouses to Green Warehouses, in phases, through private participation as Green Warehouse is a facility with low environmental impact. It is designed to minimise production of waste and energy

consumption and a recycling plant for re-use of the wastes will help to minimise the environmental impact It is estimated that a Green warehouse will help in minimising the environmental impact by 40% compared to a conventional warehouse.

- Accepting Larger Vessels at Indian ports: It is a general perception that Indian Major Ports are not deep enough to accept larger vessels. This perception has emerged from the fact that ~30 percent of the total container traffic at Indian Major Ports is transshipped at International Hub ports. Around 40-45% of the Indian containerised cargo is handled by the Port of Colombo only. This type of situation has arisen as the Container Terminals in strategically located. Also it may be a useful idea to tap into the co-operative agreement among ocean carriers which serves as a strategic alliance among them on global trade routes to achieve economies of scale and economies of scope.
- Shipping alliances help to reduce variable costs through usage of shared resources namely the ships. With such alliances, larger shipping lines can utilise the resources of all the members in the alliance. These shared resources have lead to a particular service of an alliance having ships of varied sizes with varying draft requirements. Therefore, in order to attract a service of an alliance, a particular container terminal has to have the draft for the largest vessel in the service to avoid discrimination. Hence, development of a transshipment hub in India with a draft adequate to host the biggest container ships currently operating and automated terminal infrastructure is the need of the hour. Once done, this will lead to multiple benefits like forex savings, employment generation, retention of Indian EXIM data, logistics efficiency improvement, improved tax collection etc.

Section IV
Technology

“As per the vision of Prime Minister the Mission LiFE movement is going to be an India led global movement for collective action to protect & preserve Environment”

8

India's Green Shipbuilding Ambitions: A Bright Future Ahead

D.Rajasekhar; D.Narendrakumar; *and*
P.S. Deepak Sankar*

Introduction:

As the world reels from the impact of various environmental breakdowns, industries are required to play their role to reduce the negative impacts and disturbances to nature. The shipping industry is no exception; being a transport mode that facilitates much of global trade and key to the offshore oil and gas industry. The shipping industry is also feeling the pressure to clean up its act and take actions to contribute to a cleaner environment. Due to the rapid and positive change of economic growth, the shipbuilding industry has been growing fast that has resulted in increase in the work load of shipyards.

* National Institute of Ocean Technology, Chennai.

The switch to safer, more effective, and environmentally friendly shipping is a huge opportunity for India's development. The green transition has several benefits. This includes promoting industrial development and raising competitiveness. Energy use, transportation costs, local air and noise pollution, traffic congestion, and the consequences of climate change will also be reduced. This transition is best driven through partnerships as part of forums, alliances, coalitions, and others. Collaborative projects can fast-track the industry's uptake of greener and more innovative solutions. Such initiatives will identify great opportunities and find cutting-edge solutions to overcome the current ecosystem's barriers.

Green shipbuilding is the process of building ships that are more environmentally friendly and sustainable. This can involve using alternative fuels, energy-efficient technologies, and eco-friendly materials. India is poised to become a global hub for green shipbuilding. With its growing economy, abundant natural resources, and skilled workforce, India has all the ingredients necessary to succeed in this rapidly growing industry.

Latest trends in Green Shipbuilding:

There are a number of latest technologies available for green shipbuilding, including:

- **Alternative fuels**: Green ships can use alternative fuels, such as LNG, biofuels, hydrogen, and ammonia, instead of traditional fossil fuels like heavy fuel oil. Alternative fuels are more environmentally friendly and produce fewer emissions.
- **Energy efficiency**: Green ships are designed to be more energy-efficient. This can be achieved through improved hull designs, hydrodynamic optimization, and the use of advanced propulsion systems like hybrid or electric propulsion.

- **Emission control technologies**: Green ships can use emission control technologies, such as exhaust gas scrubbers and selective catalytic reduction (SCR) systems, to reduce air pollution from engine emissions.
- **Renewable energy**: Green ships can use renewable energy sources, such as solar panels and wind turbines, to generate electricity and support onboard systems, reducing the reliance on conventional power sources.
- **Design and materials**: Green ships can be designed using lightweight and durable materials, such as advanced composites and high-strength steels. This can help to reduce fuel consumption and emissions.

Some of the latest technologies in green shipbuilding include:

- **Air lubrication systems**: Air lubrication systems create a thin layer of air bubbles between the ship's hull and the water. This reduces friction and drag, which can lead to significant fuel savings.
- **Solid oxide fuel cells**: Solid oxide fuel cells (SOFCs) are a type of fuel cell that can generate electricity from a variety of fuels, including hydrogen, methane, and ammonia. SOFCs are very efficient and can produce zero emissions.
- **Wave energy converters:** Wave energy converters (WECs) can generate electricity from the energy of waves. WECs can be installed on ships to provide them with renewable energy.
- **Wind turbines**: Wind turbines can be used to generate electricity on ships. Wind turbines are particularly effective on large ships, which can have a large sail area.
- **Solar panels**: Solar panels can be used to generate electricity on ships. Solar panels are most effective on ships that operate in sunny climates.

These are just a few of the latest technologies available for green shipbuilding. As technology continues to advance, we can expect

to see even more innovative and sustainable green shipbuilding technologies in the future. The adoption of these technologies will help to make the shipping industry more environmentally friendly and reduce its impact on climate change.

A number of Indian shipyards are already building green ships. For example, Cochin Shipyard Limited (CSL) has delivered a number of electric and hybrid ferries, and Larsen & Toubro Shipbuilding Limited (L&T) is building India's first LNG-powered ferry.

Key Factors:

India's green shipbuilding ambitions are being driven by a number of factors, including:

- **The growing global demand for green ships**. As the shipping industry becomes more aware of its environmental impact, there is a growing demand for green ships that are more fuel-efficient and produce fewer emissions.
- **India's abundant natural resources**. India has abundant natural resources that can be used to build green ships, such as solar and wind energy.
- **India's skilled workforce**. India has a large and skilled workforce that can be trained to build green ships.
- **The Indian government's support for green shipbuilding.** The Indian government is committed to promoting green shipbuilding, and it has launched a number of initiatives to support the industry.

Key Benefits:

India's green shipbuilding ambitions have the potential to create a number of benefits for the country, including:

- **Job creation.** The green shipbuilding industry is a labour-intensive industry, and it has the potential to create a significant number of jobs in India.

- **Economic growth**. The green shipbuilding industry is a growing industry, and India's participation in this industry could boost the country's economy.
- **Environmental benefits**. The construction and use of green ships will help to reduce the environmental impact of the shipping industry.

Key Opportunities:

Here are some specific opportunities for green shipbuilding in India:

- **Building green ships for the domestic market:** The Indian shipping industry is growing rapidly, and there is a growing demand for green ships from Indian shipowners. Indian shipbuilders can capitalize on this opportunity by building green ships for the domestic market.
- **Exporting green ships to other countries:** As mentioned above, the global demand for green ships is growing. Indian shipbuilders can export green ships to other countries and take advantage of this growing market.
- **Building green ships for specific industries**: Some industries, such as the renewable energy industry and the tourism industry, have a specific demand for green ships. Indian shipbuilders can build green ships for these industries and meet their specific needs.
- **Developing new green shipbuilding technologie**s: Indian shipbuilders can develop new green shipbuilding technologies and export them to other countries. This will help India to become a global leader in green shipbuilding.

The opportunities for green shipbuilding in India are immense. With the right support, India can become a global leader in this industry and make a significant contribution to reducing the environmental impact of the shipping industry.

Key Challenges:

While green shipbuilding has many benefits, it also faces a number of challenges in India. Some of the key challenges include:

- **High initial costs**: Green shipbuilding often involves the use of more expensive technologies and materials, which can lead to higher upfront construction costs.
- **Lack of standardization**: There is a lack of standardization in the green shipbuilding industry, which can make it difficult for shipbuilders and shipowners to select the most suitable green solutions.
- **Lack of skilled workforce**: There is a shortage of skilled workers in the green shipbuilding industry, which can make it difficult for shipyards to adopt new technologies and processes.
- **Despite these challenges**, there is a growing interest in green shipbuilding in India. A number of Indian shipyards are already building green ships, and the Indian government is committed to promoting green shipping. With the right support, India has the potential to become a global leader in green shipbuilding.

Key Initiatives:

The Indian government has taken a number of initiatives to promote green shipbuilding in the country, including:

- **Launching the National Green Shipping Policy (NGSP)**: The NGSP, launched in 2020, aims to reduce the environmental impact of the Indian shipping industry. The policy includes a number of initiatives to promote the construction and use of green ships, such as financial incentives for shipyards and shipowners, and the development of green shipbuilding standards and regulations.
- **Establishing the Green Shipbuilding Incentive Scheme (GSIS):** The GSIS, launched in 2021, provides financial assistance to shipyards for the construction of green ships. The

scheme provides a subsidy of up to 20% of the construction cost of a green ship.

- **Launching the Green Shipbuilding Technology Development Scheme (GSTDS)**: The GSTDS, launched in 2022, supports the development of new green shipbuilding technologies in India. The scheme provides financial assistance to research institutions and companies for the development of new green shipbuilding technologies.
- **Promoting the use of green fuels:** The Indian government is promoting the use of green fuels, such as LNG and biofuels, in the shipping industry. The government has also announced plans to develop a national green hydrogen policy to support the use of hydrogen as a fuel in the shipping industry.
- **Investing in research and development**: The Indian government is investing in research and development to develop new green shipbuilding technologies. The government has also established a number of centers of excellence in green shipbuilding at various universities and research institutions.

Solutions & Way Forward:

The Government & all Stakeholders shall work collaboratively on developing a number of new initiatives to promote green shipbuilding, such as:

- **Reinforce Shipowners' financial capacity and access to capital:** Access to capital is limited, hindering the necessary financing from accelerating the green transition. Many shipowners struggle financially and cannot invest in expensive fleet renewal programmes. Green financing schemes should be encouraged to increase cash flow from the public, private and non-profit sectors. State guarantee schemes and favourable loan schemes can be established to fund the development of more environmentally-friendly ships.

- **Continued investment in R&D and coordination of the activities of research institutes and maritime universities:** Maritime research should be promoted by identifying key institutes and their area of research. A database of all feasible green shipbuilding technologies and their associated parameters, such as CapEx, OpEx, lifespan, and fuel/cost-saving potential, should be maintained for awareness and to aid the stakeholders in decision-making.
- **Developing green shipbuilding standards and regulations:** The government shall work on developing green shipbuilding standards and regulations to ensure that green ships are built to a high standard.
- **Train the workforce to adapt to greener technologies:** The role of the maritime workforce is expected to shift dramatically as decarbonization, sustainability, and digital technology advance. Therefore, the maritime workforce will need to be upskilled, and training standards will need to be strengthened to have a smooth green shipbuilding transition.
- **Raising awareness about green shipbuilding:** The government shall raise awareness about green shipbuilding among the public and the shipping industry. To increase awareness among stakeholders about newer technologies and solutions, fact sheets, newsletters, and annual knowledge reports on sustainable shipbuilding can be published.

India's green shipbuilding ambitions are still in their early stages, but the country has the potential to become a global leader in this industry. With the support of the government and industry, India can make a significant contribution to reducing the environmental impact of the shipping industry. Overall, India has a bright future in green shipbuilding.

“We believe that our rich & talented pool of engineers & scientists will provide cutting edge modern solutions able to deal with dynamic challenges of the marine sector”

9

Unlocking Efficiency and Security: Leveraging Blockchain, IoT, AI, and Machine Learning in Port Operations

Sudipta Banerjee*

The maritime industry is the backbone of global trade, facilitating the movement of goods worth trillions of dollars annually. Ports, as crucial nodes in this complex logistical network, play a pivotal role in ensuring efficient cargo handling, security, and environmental sustainability. Traditionally, port operations have been resource-intensive, labor-driven, and often marred by inefficiencies and delays. However, with the advent of cutting-edge technologies like Artificial Intelligence (AI), Machine Learning

* Sr. Deputy Traffic Manager, Deendayal Port Authority, Kandla.

(ML), Blockchain, and the Internet of Things (IoT), the landscape of port operations is rapidly evolving. These technologies are being leveraged to optimize every facet of port management, from cargo handling to security, and even financial transactions. This article delves into how AI, ML, Blockchain, and IoT are being integrated into port operations, reshaping the industry and making it smarter and more efficient.

Since the potential of Blockchain technology started to become more and more evident, various logistics companies and organizations had used the technology for their shipping documentations. Example of Maersk can be taken, who had collaborated with IBM to create TradeLens, a blockchain-based platform for global supply chain management. It focuses on enhancing documentation processes and increasing transparency in container shipping. Likewise, FedEx joined the Blockchain in Transport Alliance (BiTA) and has been exploring the use of blockchain for enhancing the visibility and security of its supply chain and shipping documentation. Blockchain is not the only computer algorithm-based tool which had triggered a paradigm shift in shipping and maritime logistics. Tools like Artificial Intelligence (AI), Machine Learning (ML), and Internet of Things (IoT) have also contributed to revolutionizing the functioning of ports and terminals.

Port of Rotterdam is using AI not only to predict the arrival time of vessels, so that it can optimise the allocation of berths and resources, but also using ML to automate the inspection of containers for contraband and dangerous goods. Port of Los Angeles, perhaps the busiest port in USA, is using AI to monitor the movement of cargo through the port, so that it can identify potential bottlenecks and delays. The port is also using ML to develop predictive models for vessel traffic, which can be used to improve safety and prevent accidents. The Port of Hamburg has used AI to optimize the layout of its terminals and reduce emissions. The port is also using ML to develop predictive models for energy use, so that it can reduce

its carbon footprint. These are just a few examples of how AI and ML are being used in ports around the world. As the technology continues to develop, potential of using these technologies are widening.

AI and ML in Port Operations

AI and ML technologies are revolutionizing port operations by enhancing efficiency, predictive maintenance, and resource allocation. Here's how:

Resource Allocation:

While ML algorithms can analyze historical data to predict future resource requirements, facilitating better decision-making regarding resource allocation, AI can allocate resources dynamically based on real-time data, helping to avoid congestion and optimizing the flow of goods. In addition, AI systems can be used to track the real-time location and status of resources, ensuring optimal allocation and utilization within minimum possible time. Moreover, ML models can predict cargo handling times and optimize workflow, reducing congestion and turnaround times. Synergetic use of AI and ML can be also utilized for automatic allocation of berths based on anchoring schedule of vessels and their declared cargo operations. This may not only minimize congestion at ports but also facilitate better scheduling of vessel movement while minimizing pre-berthing delay.

Predictive Maintenance and Sustainability:

AI-powered predictive maintenance systems analyze data from sensors on port equipment such as cranes, conveyors, and trucks. AI can also analyze data from various IoT sensors to detect any

unusual patterns or anomalies, enhancing security and safety. Machine learning models identify patterns indicative of equipment wear and tear. This allows for scheduled maintenance before critical failures, minimizing downtime and reducing repair costs.

ML algorithms learn from historical data to optimize energy usage, reducing costs and environmental impact. AI can optimize energy consumption in ports by analyzing data from various sources and recommending energy-saving measures. AI along with IoT can monitor and control energy consumption in port operations by adjusting lighting, temperature, and equipment usage. Smart waste management systems powered by AI can enhance the sustainability of port operations by optimizing waste collection and recycling processes.

Security and Safety:

AI-powered video surveillance systems can detect anomalies in real-time, helping prevent theft, accidents, and unauthorized access. Machine learning models can analyze historical data to identify potential safety risks and suggest improvements in processes.

IoT and Port Operations

IoT devices and sensors are being deployed throughout ports to provide real-time data on equipment, cargo, and environmental conditions. This data is crucial for decision-making and optimization:

Smart Containers:

IoT-enabled smart containers can be used for tracking cargo location, temperature, humidity, and other parameters in real-time. This information ensures the quality and security of goods in transit and allows for proactive responses to issues.

Asset Tracking and Traffic Management:

IoT sensors attached to equipment, such as forklifts and cranes, monitor their location and usage. Managers can optimize equipment allocation, reduce idle time, and prevent theft. Moreover, IoT-based traffic management systems can use sensors to monitor vehicle movements within the port. This data enables real-time traffic optimization by dynamically rearranging traffic flow and gate allocation and thereby reducing congestion and improving safety.

Environmental Monitoring:

IoT sensors can measure air and water quality, as well as noise and emissions. This data may help the ports to comply with environmental regulations and reduce their carbon footprint.

Blockchain in Port Operations

Blockchain technology is being integrated into port operations to enhance security, transparency, and traceability of transactions and cargo movements:

Supply Chain Transparency:

Blockchain records create an immutable ledger of cargo movements, from origin to destination. This transparency reduces the risk of fraud and ensures compliance with customs and trade regulations. Blockchain enables secure and tamper-proof financial transactions between various stakeholders in the supply chain. Smart contracts automate payment processes, reducing administrative overhead and disputes. Blockchain can be used to authenticate the origin and authenticity of goods, reducing the risk of counterfeit products entering the supply chain.

Customs Clearance:

Blockchain may simplify customs clearance process by providing a trusted record of cargo contents and origin. This expedites clearance procedures and reduces delays.

The Synergy of AI, ML, IoT, and Blockchain

The true potential of these technologies in port operations is unlocked when they are integrated and work together seamlessly. The synergistic use of AI, ML, Blockchain and IoT technologies in maritime logistics brings forth a new era of efficiency, security, and transparency. The combination of these technologies offers a host of benefits that enhance transparency, security, and efficiency in the complex world of maritime supply chains.

Enhanced Transparency and Visibility:

Blockchain technology provides an immutable and transparent ledger where all relevant data related to shipments, cargo, and transactions can be recorded in real-time. IoT sensors, on the other hand, collect data from various points in the supply chain, including container locations, temperature, humidity, and more. Together, these technologies enable stakeholders to have real-time visibility into the movement and condition of goods throughout the entire supply chain. This transparency reduces the risk of disputes and enables quicker decision-making.

Improved Security:

Blockchain's cryptographic algorithms ensure the security and integrity of data. IoT devices, when connected to a blockchain network, can securely transmit data without the risk of tampering

or unauthorized access. This is particularly crucial in maritime logistics, where the value of cargo is often high, and the risk of cyberattacks is a constant concern.

Streamlined Documentation and Compliance:

Blockchain simplifies the documentation process by digitizing and automating the creation, sharing, and verification of documents such as bills of lading, certificates of origin, and customs paperwork. This reduces the administrative burden, minimizes errors, and ensures compliance with regulatory requirements.

Efficient Supply Chain Management:

The integration of AI, ML, IoT, and blockchain results in more efficient port operations, reducing costs, and environmental impact. Automation and data-driven decision-making streamline processes and reduce human error. IoT devices can provide real-time data on the condition of cargo, helping logistics managers make informed decisions about routing, storage, and handling. Smart contracts on the blockchain can automate certain aspects of logistics, such as triggering payments or releasing cargo upon the fulfilment of predefined conditions, further streamlining the supply chain.

Risk Mitigation:

By providing an immutable record of all transactions and events, blockchain can help in tracing the source of any issues or discrepancies that may arise during the logistics process. This traceability aids in identifying the responsible party and resolving disputes more efficiently, reducing the overall risk in maritime logistics.

Sustainability and Environmental Impact:

The integration of IoT sensors with blockchain can assist in monitoring environmental conditions, such as emissions and fuel consumption, enabling better management of the environmental impact of maritime operations. This data can be used to implement more sustainable practices.

Data Integration:

IoT sensors collect vast amounts of data, which AI and ML algorithms can analyze for predictive insights. Blockchain securely records the results of these analyses, creating a comprehensive and tamper-proof record of operations.

Predictive Analytics:

AI and ML models use data from IoT sensors to predict maintenance needs, optimize cargo handling, and enhance security. These predictions inform decisions made using smart contracts on the blockchain.

Challenges and Considerations

While the integration of AI, ML, IoT, and blockchain holds immense promise for port operations, the upfront costs of implementing these technologies can be substantial, although they are often offset by long-term efficiency gains. Other than the factor of high initial investment, several other challenges and considerations must be addressed, such as:

Data Privacy and Security:

Protecting sensitive data and ensuring the security of IoT devices and blockchain networks is paramount.

Interoperability and Workforce Transition:

Ensuring that various technologies and systems used in ports can communicate and share data effectively is crucial. The adoption of these technologies may require retraining and upskilling of the workforce to manage and maintain them.

Regulatory Compliance:

Port operators must navigate complex regulations governing data privacy, customs, and environmental standards.

In conclusion, the integration of Artificial Intelligence, Machine Learning, IoT, and Blockchain is reshaping the landscape of port operations. These technologies are enhancing efficiency, transparency, and sustainability while reducing costs and risks. Ports that embrace these innovations are poised to become smarter, more competitive, and better equipped to meet the growing demands of global trade. As technology continues to evolve, the synergy of AI, ML, IoT, and blockchain will play an increasingly central role in the future of port operations, enabling a more connected and efficient maritime industry.

“The SAGAR-SETU app of the National Logistics Portal (Marine) would help custodians in easier access to functionalities on a handheld device. Mobile App will ensure data mobility such that approvals & monitoring shall be at the finger tips of port & ministry officials and stakeholders as welle”

10

Technological Advancements Towards Smart Ports

D Kumaran Raju*

Maritime industry has shaped the world history and continues to contribute to the growth of international trade. An estimated 80 per cent of global trade by volume and over 70 per cent by value are seaborne. Because the global environment has been rapidly changing, the maritime transport industry has to work to become increasingly digital and more sustainable in order to cover user requirements and to meet challenging sustainable goals. With the demanding maritime transportation, ports have

* Principal Scientist, National Technology Centre for Ports, Waterways and Coasts, Chennai.

faced increasing pressure to optimize their performance in terms of economic, environmental, energy and functional challenges that impact their sustainability. it is now time for ports that want to maintain competitive power to adopt port digitalization and use advanced technologies to create productive, customer-friendly, efficient, and competitive ports. Innovation in the port business process and the introduction of the latest related technology are important in shaping the future for developing a smart port. Therefore, ports need to pay attention to digitalized port operations and how to harmonize the availability of the service platforms with the legacy system. It is important to introduce emerging technologies such as blockchain, AI and machine learning, robotics, and predictive analytic tools as well as the standardization of port operations and related technology. Another crucial requirement is the gathering of data in an efficient way. Smart ports mean not only port digitalization but also modernization that has less adverse impact on the environment. The best strategies for smart ports in this regard are to minimize their carbon footprint, improve air quality and handle waste in a sustainable way. In addition, ensuring seamless logistics is an important facet in the integration of the whole supply chain with port operations and activities. These initiatives are largely focused on special-purpose Information and Communication Technology (ICT) applications and regulation-based approaches in the setting of smart ports. Given the problems and the new and innovative initiatives, it is essential to promote Research and Development initiatives in the maritime sector and implementation of research findings for improved development and growth of the sector. This can be achieved through Strategic partnerships and collaborations on improving performance of the sector.

Digitization

Digitization provides a contemporary opportunity to re-think, re-configure, and optimize current business processes. Maritime transportation also typically involves multiple actors, such as agents, terminal operators and other port services, as well as ships, all providing different types of infrastructure for their immediate collaboration partners. Digitization of all key assets across the common infrastructure creates the foundation for higher predictability. Many Indian ports need to undertake an integrated front-to-back overhaul of the digital landscape as follows. Digital front end: Provides device-, location-, and context-aware customer interfaces and enables ports to deliver a tailored and rich multichannel digital customer experience.

1. Data analytics: Aggregates all the data and makes it available for reporting, analytics and other services. This layer offers tailored customer-centric services and personalized risk profiles by using automated decision engines and artificial intelligence.
2. Enterprise core systems: Contains all systems of record for the core business (operations, vessel logs, daily output, etc.) and its support (risk management, finance, etc.).
3. Infrastructure: Captures all data (both structured and unstructured) for real- time processing and analytics. It envisages cloud solutions replacing on- premises legacy infrastructure.
4. Integration: Manages the integration of applications with external parties based on open Application Programming Interfaces (APls).
5. Cybersecurity: Layer involves incorporation of proprietary interfaces with partners, aggregators, shippers, and clients, with perimeter security and data privacy confined to enterprise systems.

Centre for Excellence e-Governance

Ability of each Major Port to successfully meet digital challenges would improve substantially with the institution of a centralized Digital Centre of Excellence (DCoE) for proper e-governance. DCoE will improve cross-port collaboration and drive ability to scale benefits for prioritized technology initiatives. It will be mandated to guide Major Ports in expediting their digital maturity on key components like ERP, digital applications and network infrastructure and realizing the transition of Major Ports into 'Smart Ports,' aligning with the Maritime India Vision 2030 and Amrit Kaal Vision 2047 Roadmap

The CoE for e-Gov will primarily focus on following goals -

- Standardization of application and technology core components
- Acceleration in adoption of digital solutions (e.g. “must-have” solutions across ports)
- Collaboration with industry to develop new technologies
- Cyber security and compliance across Major Ports

Smart sensing (IoT) and Communications:

The advanced IoT based marine environment sensing will be designed to control some objects, devices, or equipment within the monitored marine environment, in order to adjust some physical and chemical parameters so as to improve the marine environment. Smart ports will be data-driven, use automated devices, Internet of Things (IoT), and leverage analytical technologies for safer and more efficient management of resources. While the design, development, and deployment of an IoT- based marine environment monitoring and protection system is needed to address some critical issues including autonomy, adaptability, scalability, simplicity, and self-healing, following requirements specific to the harsh marine environments should be considered.

Next Generation Smart Ports & Navigation

Digital Twins: Concept for Smart Systems which will enable users to develop data-enabled intelligence in the system. The data we collect from the system and the date generated by the digital twin are able to help us to proactively make effective decisions. digital twin simulation would allow ports to create testing scenarios for possible disruptions to operations, including natural disasters and extreme weather.

E-Navigation: The aim is to develop a strategic vision for e-Navigation, to integrate existing and new navigational tools, in particular electronic tools, in an all-embracing system that will contribute to enhanced navigational safety. As the basic technology for such an innovative step is already available, the challenge lies in ensuring the availability of all the other components of the system, including electronic navigational charts, and in using it effectively in order to simplify, to the benefit of the mariner, the display of the occasional local navigational environment. e-Navigation would thus incorporate new technologies in a structured way and ensure that their use is compliant with the various navigational communication technologies and services that are already available, providing an overarching, accurate, secure and cost- effective system with the potential to provide global coverage for ships of all sizes.

Drive research innovation and technology commercialization through establishing a living lab facility in partnership with CoE of MoPSW and Major ports. Singapore has successfully established a living lab, which focuses on four key areas including innovative infrastructure, data analytics, security and automation. Setting up of a living lab facility at major port with physical testbeds at sea should be evaluated. The proposed facility should be in collaboration with NTCPWC, CICMT and IMU with Major ports as envisioned in MIV 2030.

National Technology Centre for Ports, Waterways and Coasts (NTCPWC) the technology arm of Ministry of Shipping has been envisioned as the centre for technological innovations and evolution of new ideas and breakthroughs for the port and maritime sector. The centre plays a lead and significant role at national level providing scientific support and carry out education, applied research and technology transfer. In addition, provide effective solutions to an extensive range of problems through indigenous and cutting-edge technology support in the Port and Maritime sector. The following indigenous systems were developed as part of Smar Port initiatives for various Major ports and Waterways:

- Next Generation Technology for Hydrometerology monitoring
- Real Time – Underwater Keel ClearanceOnline Dredging Monitoring System
- Indigenous development of Vessel Traffic Management System
- Autonomous Survey Vessel
- Smart Docking Aid
- Just in Time Operations
- e-Vessel tracker application and central command control for Inland Waterways – Smart phone based solution
- BI and analytical tools to improve the Container Port Performance Index of JNPA
- Augmenting DGQI for MoPSW Schemes and improved the score from 1.38/5 to 4.8/5. MoPSW is now ranking number 2 in the overall ranking of Niti Aayog.

NTCPWC envisages towards next step of contributing at Global level through substantial research works in the Digitisation, Smart sensing and communications, Autonomous systems and Robotics, Intelligent navigation, Advanced data analytics and developing next generation smart ports. The centre also aims at establishing Centre for Excellence e-Gov lab realizing the transition of Major Ports into 'Smart Ports,' aligning with the Maritime India Vision 2030 and Amrit Kaal Vision 2047 Roadmap

Section V

List of Major Reforms initiated by MoPSW since July 2021

List of Major Reforms initiated by MoPSW since July 2021

1. **The Inland Vessels Bill 2021** was passed in Lok Sabha on July 29, 2021. The Bill seeks to incorporate unified law for the country, instead of separate rules framed by the States. The registration certificate under the new law will be considered valid all over the country, and separate permissions from states shall not be required. The Bill also provides for a central database for recording the details of the vessels and their crew on an electronic portal. The Bill promotes cheaper and safer navigation, ensures protection of life & cargo and brings uniformity in application of laws related to inland waterways & navigation.
2. **The Major Port Authorities Act, 2021** came into force on 03rd November 2021. The Act provides for regulation, operation and planning of major ports in India and vests the administration, control and management of such ports upon the Boards of major port authorities. The legislation empowers these ports to perform with greater efficiency on account of increased autonomy in decision making and by modernizing their institutional framework.
3. **The Marine Aids to Navigation Act, 2021** has been notified and published in the Gazette of India by Legislative Department, Ministry of Law & Justice on 2nd August, 2021 after getting the President's assent on 31st July, 2021. The Bill was passed by Lok Sabha on 22nd March, 2021 and by the Rajya Sabha on 27thJuly, 2021. The Act aims to replace over 90-year-old Lighthouse Act, 1927, to incorporate the global best practices, technological developments and India's International obligations in the field of marine aids to navigation. The new Act will facilitate harmonized and

effective functioning of aids to marine navigation and vessel traffic services along the Indian coastline.

4. **Model Concession Agreement (MCA)** was announced on 18th November 2021. The new MCA will be applicable to all the future PPP projects at major ports, as well as projects which are already approved by the government but are still under bidding stage.
5. **MyPortApp** was inaugurated on 8th October 2021. The App includes all port details digitally and monitor operations virtually. Targeted towards port users for availing various port services, the App is aimed to promote transparency and easy access of port related information. The app also has various information like vessel berthing, rake & indent, rake receipt, container status, tariff, bills, port holidays, etc. and can be accessed anywhere 24x7 and reach out directly to port.
6. Launch of **Online Competency based Examination** on 2nd December 2021. The online certificate of competency examination is a fully digital artificial intelligence & machine learning powered online examination system which uses remote proctoring and powerful security and surveillance tools built to ensure a fair, transparent and secure examination system.
7. **Tariff Guidelines, 2021** for the PPP projects in major ports were issued on 22nd December 2021. . The need for new guidelines arose consequent upon the new Major Port Authority Act,2021 coming in vogue w.e.f. 3.11.2021. In the new Act, the provision of the erstwhile Tariff Authority for Major Ports (TAMP) stands abolished. The Guidelines allow the concessionaires at Major Ports to set tariffs as per market dynamics. Currently, major port's PPP concessionaires handle around 50% of the total traffic handled by all the major ports in India. The biggest benefit of transition to market linked tariff is that a level playing field will be provided to the PPP concessionaires at major ports to compete with private ports.

PPP concessionaires at major ports were constrained to operate under the stipulations of these guidelines (by TAMP) whereas private operators/PPP concessionaires at non-major ports were free to charge tariff as per market conditions. These new guidelines will be applicable for future PPP projects including the projects which are currently under the bidding stage. Concessions have been given to promote transshipment and coastal shipping. The royalty payable for trans-shipment cargo will now be 1.0 times (from 1.5 times earlier) the normal container. Similarly, for the coastal cargo, the concessionaire has to pay only 40% of the royalty payable for foreign cargo (from 60% earlier) in accordance with coastal concession policy of the government. For transparency, the tariffs so fixed are to be hosted on the website of the concessionaire. These guidelines will usher in an era of market economy for the sector and go a long way in making the Major Ports competitive. He said, the announcement of the market linked tariff guidelines also comes at a time when the Government is celebrating the current week as the 'Good Governance' week.

8. **The Indian Ports Act, 1908** is more than 110 years old. It has become imperative that the Act is revamped to reflect the present-day frameworks, incorporate India's international obligations, address emerging environmental concerns, and aid the consultative development of the ports sector in the national interest.

The draft Indian Ports Bill, 2022 has been issued in August 2022to consolidate and amend the laws relating to ports, for the prevention and containment of pollution at ports, to ensure compliance with the country's obligation under the maritime treaties and international instruments to which India is a party; take measures for conservation of ports; to empower and establish State Maritime Boards for effective administration, control and management of non-major ports in India; provide for adjudicatory mechanisms for redressal

of port related disputes and to establish a national council for fostering structured growth and development of the port sector, and ensure optimum utilization of the coastline of India, as may be necessary, and to provide for matters ancillary and incidental thereto, or connected therewith. Once the bill becomes an Act, it will replace the Indian Ports Act of 1908. . The primary objectives of the proposed bill are four-fold:

- promote integrated planning between states inter-se and centre-states through a purely consultative and recommendatory framework;
- ensure prevention of pollution measures for all ports in India while incorporating India's obligations under international treaties;
- address lacunae in the dispute resolution framework required for burgeoning ports sector;
- usher-in transparency and cooperation in development and other aspects through use of data.

The proposed bill will homogenize and streamline the development of the maritime sector, along with, promoting ease of doing business by eliminating unnecessary delays, disagreements and defining responsibilities. It will incorporate State Maritime Boards in the national framework. Additionally, Maritime State Development Council will ensure cooperative federalism where Centre and State/UT Governments will work together towards preparing progressive road map for the country. The redundant provisions of the Act have been deleted or replaced with contemporaneous provisions. Further, existing penalties in the Act which are outdated have been updated with respect to amounts and offences relevant to present day scenario.

9. **Green Tug Transition Programme (GTTP)** was launched on 22-March, 2023 and aims at making India a 'Global Hub for Green Ship' building by 2030. Under the programme 'Green Hybrid Tugs' powered by green hybrid propulsion systems and subsequently adopting non-fossil fuel solutions

like (methanol, ammonia, hydrogen) will be manufactured and will start working in all major ports by 2025. At least, 50% of all the tugs are likely to be converted into green tugs by 2030, which will considerably reduce emission as the country move towards achieving sustainable development.

10. On 23rd March 2023, **Real-time Performance Monitoring Dashboard** of MoPSW 'Sagar Manthan' was launched having all the integrated data related to the ministry and other subsidiaries. Its key features are data visualization, real-time monitoring, improved communication, data-driven decision making and increased accountability. In future, this dashboard would further be integrated with input from CCTV camera, live streaming from drone, AI based algorithm to map actual progress digital twin feature on board and mobile App for easy access and usability by all stakeholder to increase the efficiency. The launch of 'Sagar Manthan' Dashboard is a development towards digitalization and transparency in the maritime transport sector, and the Ministry of Ports, Shipping and Waterways is committed to supporting the growth of the sector in India.

11. **The Sagar Setu Mobile App** was launched on 31st March 2023. The app has been envisaged with deliverables covering features like login module, service catalogue, common application format, letter of credit, bank guarantee, certification, and track & trace etc. It will provide real-time information of activities that are generally not in reach of the importer, exporter, and customs broker including vessel-related information, gate, container freight stations and transactions on fingertips. It also enables digital transactions for payments required for the clearance process of import and export like container freight station charges, shipping line charges, transportation charges, etc. The app will boost maritime trade thereby enhancing the economy of the country.

12. A draft on '**Sagarmala Innovation and Start-up Policy**' was issued on 10th April, 2023. This draft policy aims at nurturing start-ups and other entities to co-create the future of India's growing maritime sector. This entails intensive collaboration of the organizations to build a strong eco-system facilitating innovation and startups in the country that will drive sustainable growth and generate large scale employment opportunities. It enhances the cooperation and coordination between academic institutions, public sector, private sector and convergence of different schemes and programs to groom fresh ideas and approaches to resolve the issues and challenges to boost up the efficiency in the areas of operation, maintenance, and infrastructure development to create a strong ecosystem for fostering start-ups and innovation in the nation. This will surely promote innovation and entrepreneurship. This policy will enable start-ups to grow and prosper through innovations. The draft policy has identified several key areas for the startup to flourish including decarbonization, optimizing processes through data, maritime education, multi-modal transportation, manufacturing, alternate/ advance materials, maritime cybersecurity, smart communication and marine electronics.

13. **The Discovery Campus of the National Technology Centre for Ports, Waterways and Coasts at IITM, Chennai, Tamil Nadu** was inaugurated on 24th April 2023. This centre aims at enabling research & development for the marine sector enabling solutions towards achieving the ultimate goal of building a robust marine industry in the country. This state-of-the-art centre will ensure advancement in the field of maritime technology, as well as modernisation & upgradation possibilities in the port & operations towards achieving the vision of Atmanirbhar Bharat by 2047.

14. On 5th May 2023, '**M.V. MSS Galena**' from V.O. Chidambaranar Port flagged off as the direct shipping service

between Tuticorin to Maldives. This is also in line with 'Neighbourhood-First Policy' and the vision of security and growth for all in the region. Not only this initiative helped to cut logistic and other costs but also enhanced connectivity and reduced time taken to transport goods between the two countries. This will further give impetus to bilateral trade between India & Maldives & thus will lead to greater trade & economic opportunities & enhance maritime trade links with a renewed vigour between the two countries.

15. **Harit Sagar Guidelines – 2023** were launched on 10th May 2023 and focuses on port development, operation and maintenance while aligning with 'Working with Nature' concept and minimizing impact on biotic components of harbor ecosystem. It lays emphasis on use of clean / green energy in port operation, developing port capabilities for storage, handling and bunkering greener fuels viz. green hydrogen, green ammonia, green methanol / ethanol etc. The objective of guidelines is to minimize waste through Reduce, Reuse, Repurpose and Recycle to attain zero waste discharge from port operations and promote monitoring, based on Environmental Performance Indicators. This also covers aspects of National Green Hydrogen Mission pertaining to ports, development of green hydrogen facility, LNG bunkering, offshore wind energy etc and provides provision for adopting global Green Reporting Initiative (GRI) standard.

16. On 22nd May 2023, five major announcements focusing green shipping and digitisation of the ports were made at the end of the ministry's second Chintan Shibir held in Munnar. The '**Chintan Shibir'** focused to promote green shipping and brining efficiency via digitisation of port operations. The 'Panch Karma Sankalp' as it is called includes five major announcements which are – the ministry will provide 30% financial support for the promotion of Green Shipping; under the Green Tug Transition Programme Jawaharlal Nehru

Port, VO Chidambaranar Port, Paradip Port and Deendayal Port, Kandla will procure two tugs each; Deendayal Port and VO Chidambaranar Port, Tuticorin to be developed as Green Hydrogen Hub; single window portal to facilitate and monitor river and sea cruises; Jawaharlal Nehru Port and VO Chidambaranar Port, Tuticorin to become smart port by next year.

17. On 1st July 2023 a campaign to transform **75 historic Lighthouses into Tourism Spots** was launched and three revamped lighthouses in Dwarka, Gopnath & Veraval were inaugurated as tourist destinations.
18. The maiden run of International Cruise Vessel - **MV Empress, India's first international cruise vessel** - from Chennai to Sri Lanka in Chennai was flagged off on 5th June 2023. This marks the beginning of the international cruise tourism terminal at Chennai heralding a new age of cruise tourism & maritime trade in the country.
19. On 9th June 2023, **'SAGAR SAMRIDDHI'** - the online dredging monitoring system - in order to accelerate 'Waste to Wealth' was launched. The new technology brings in marked improvement against the old system of Draft & Loading Monitor (DLM) system. The system will bring in synergy among multiple input reports like daily dredging report, the pre and post dredging survey data before processing and producing real time dredging report. The 'Sagar Samriddhi' monitoring system will also allow daily and monthly progress visualisation, dredger performance and downtime monitoring; easy location track data with snapshot of loading, unloading and idle time. This system strengthens the Atmanirbhar Bharat and Make in India vision of the government.
20. **The indigenous Differential Global Navigation Satellite System (DGNSS) 'SAGAR SAMPARK'** was inaugurated on 12th June 2023. DGNSS is a terrestrial based enhancement system which corrects the errors and

inaccuracies in the Global Navigation Satellite System (GNSS) allowing for more accurate positioning information. The DGNSS service will help mariners in safe navigation and will reduce the risk of collisions, groundings, and accidents in the port and harbour areas. This will lead to safe & efficient movement of vessels.

21. **The 'Sagar Samajik Sahyog' - Revised Corporate Social Responsibility (CSR) Guidelines 2023** were launched on 27th June 2023 for major port authorities. Under these guidelines, the major ports have been empowered to sanction and approve CSR projects. These guidelines aim to make a lasting impact by addressing the pressing needs of our society, focusing on education, healthcare, skill development, environmental sustainability and community empowerment. The activities included under the CSR projects comprise of health and family welfare, drinking water and sanitation, education and skill development, disaster management, preservation and restoration of environment and ecology and sustainable development goals etc.
22. **Port Health Organisation (PHO)** module under Sagar Setu - National Logistics Portal (Marine) was launched on 3rd August 2023 in an attempt to enable faster and simpler ecosystem to promote Ease of Doing Business (EODB). PHO will conduct disease surveillance, health inspection and quarantine measures to safeguard citizens and port workers.

For further details please visit

1. https://pib.gov.in/newsite/pmreleases.aspx?mincode=46
2. https://pib.gov.in/PressReleaseIframePage.aspx?PRID=1892272

Contributors

Amitendu Palit is an Advisor to Centre for Maritime Economy and Connectivity (CMEC) and Senior Research Fellow and Research Lead (Trade and Economics) at the Institute of South Asian Studies, National University of Singapore. He is an economist specializing in international trade and investment policies, FTAs, supply chains, connectivity, geopolitics of trade and the Indian economy. He sits on the World Economic Forum's Global Future Council on Trade and Investment.

Anil Devli has been involved with the Indian shipping industry for over 20 years. He is currently the Chief Executive Officer of the Indian National Shipowners' Association, an organisation which is involved in furthering the interests of the Indian flag. He has varied experience in the business of ship owning & operations.

D Kumaran Raju is a Principal Scientist at National Technology Centre for Ports, Waterways and Coasts, IIT Madras. He is a Scientific researcher with more than thirty years of rich experience gathered through variety of academic, scientific and operational research projects. Actively involved for past twenty years in various capacities on developing smart and innovative maritime applications, IoT, environmental sensing, 5G communication AI and ML based data analytics for Ports and Defense sector.

D.Narendrakumar is a Scientist in Vessel Management Cell at National Institute of Ocean Technology, Chennai under the Ministry of Earth Sciences. His area of expertise are Strategic planning and management, Synthesis and characterization of nanoparticles, AFM, STM, UV excited photoluminescence study, Particle sizing by spectrophotometer, Nano Electro Mechanical Systems (NEMS).

D.Rajasekhar is an Eminent Scientist, presently working as Scientist-G & Group Director of Vessel Management Cell at National Institute of Ocean Technology, Chennai under the Ministry of Earth Sciences. He is a Fellow in Institute of Engineers (FIE-Marine), a Chartered Engineer C.Eng (India), a Qualified ISO 9000 Lead Auditor, Marine Surveyor / NDT Expert.

Goutam Gupta is an Advisor (Traffic & Shipping) at Syama Prasad Mookerjee Port. He embarked on his professional journey in 1982, joining the Traffic department of Kolkata Port as a Probationary Officer. In 2017, he was appointed as the Traffic Manager of Cochin Port, a position he held until November 2019. He continued to serve Cochin Port as an Advisor, focusing on Business Development & Cruise Facilitation.

Karan Adani is the Chief Executive Officer of Adani Ports and SEZ Limited (APSEZ). He is currently spearheading a transformation at APSEZ to form an integrated logistics company with an objective to add further value for the customers. An economics graduate from Purdue University, USA, he has successfully steered the growth strategy of APSEZ resulting in its rapid expansion from two ports to a string of ten ports and terminals.

Kartik Kishore is a Policy Researcher at Centre for Maritime Economy and Connectivity (CMEC). He is a Gold Medallist and Public Policy professional from Jindal School of Government and Public Policy. He has several publications as op-eds in leading dailies on various policy issues. He has also published a research article in scopus indexed journal.

Malini V Shankar is a career bureaucrat belonging to the 1984 batch of the Indian Administrative Service and has had an illustrious career spanning over three and a half decades. She is currently Vice Chancellor of Indian Maritime University. Her last assignment was

that of Director General Shipping, on the rank and pay of Secretary to Government of India. She obtained her doctoral degree in Institutional Economics from the Indian Institute of Technology, Madras (India) and Management degree from the Asian Institute of Management, Manila, Philippines.

P.S. Deepak Sankar is a Scientist in Vessel Management Cell at NIOT, Chennai. He is a Marine engineer with his bachelor's degree in Mechanical engineering. His areas of expertise include hands on experience on marine engines, maintenance experience on various purifiers and boiler maintenance and bunkering.

Saurabh Bandyopadhyay is a Senior Fellow at NCAER with more than 25 years of research experience. He has undertaken a wide variety of studies, including Railways Passenger and Freight, Ratnagiri Refinery and Petrochemicals, Cement, etc. in the Infrastructure Sector amongst several other sectors.

Subhomoy Bhattacharjee as the Centre Head is currently leading the Centre for Maritime Economy and Connectivity (CMEC) – a think tank under the aegis of Ministry of Ports, Shipping and Waterways (MoPSW), Govt. of India. He is also the Consulting Editor at the Business Standard newspaper. He works on public policy, primarily finance, energy and urban issues.

Sudipta Banerjee had started his career as Class-1 Officer under Traffic in Haldia Dock Complex, KoPT (presently SMP-K) in the year 1997. He was in-charge of dock operations in HDC before taking charge as Sr. Deputy Traffic Manager in DPA August 18, 2021. During his tenure in SMP-K, he had looked after portfolios like allotment of storage, planning and execution of entire ship-face and yard operations of dock, riverine jetties amongst other roles.

A Memorandum of Agreement has been signed between the Indian Ports Association (IPA) and Research and Information System for Developing Countries (RIS), New Delhi in presence of Hon'ble Union Cabinet Minister of Ports, Shipping and Waterway (MoPSW), Shri Sarbananda Sonowal to establish the Centre for Maritime Economy and Connectivity (CMEC) at RIS. The agreement was signed between Shri Rajiv Jalota, Chairman, IPA and Prof. Sachin Chaturvedi, Director General, RIS in the presence of Secretary (MoPSW) and other officials.

CMEC at RIS works to build a coherent and integrated architecture for orderly growth and diversification of India's maritime sector; contribute to establishing one or more regulatory frameworks to encourage investments into the maritime sector including development of a common framework for cooperation and collaboration among the Indian Ocean nations; enhance the contribution of blue economy to the economy particularly for job creation, livelihood diversification, and empowerment of dependent coastal communities; sharing of best practices and establish an India signature on maritime developments; and finally also offer road maps for sustainable utilization for living and non-living marine resources within the maritime boundary of the country. These are done by preparing empirical research studies, policy papers, and establishing of academia-industry linkages in the identified sectors.

Reach us at cmec@ris.org.in

"To shape our maritime prowess into a robust engine of the nation's development, we have given top priority to port-led development. We firmly believe that the immense potential of our coastline strength needs to be harnessed to the fullest."

Shri Narendra Modi

Hon'ble Prime Minister of India

RIS@40

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

Zone IVB, 4th Floor, India Habitat Centre
Lodhi Road, New Delhi - 110 003, India
Tel.: +91-11-24682177-80; Fax: +91-11-24682173-74
E-mail: dgoffice@ris.org.in
Website: www.ris.org.in