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Original Article

Indian Shipping Industry – Vital for The India Story

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ABSTRACT
India is a nation on the move. With the world's largest population and an economy that has shown immense potential and is considered a bright spot amongst major economies, the 'India Story' is an important facet of the global financial eco-system. And the seas are a major facilitator in this 'story'. India moves about 95% of its trade by volume and 68% by value through maritime means. It is, therefore, readily evident that India has major dependencies on the seas for its economic wellbeing, sustenance, and growth. The maritime industry/ sector has a crucial role in the India story and more importantly her economic story. The maritime sector encompasses shipping, ports, inland waterways, exploration industry, containers, pollution control and maritime security; each with their own diverse activities/ entities. There have been some policy initiatives unveiled in the recent past. However, policy formulations without on ground practical implementation will not help in realising the true potential of India's maritime sector. It is, therefore, important to examine the various facets of the maritime trade & industry whilst concurrently looking at India's ports and the infrastructure and technical challenges they are faced with, connectivity to facilitate trade becoming more competitive and aligning to global standards before finally looking at few aspects of technology to be future- prepared with regards to adoption of environmentally prudent policies and practices. This is done using government reports/ sources, interviewing and seeking inputs from subject matter experts in the field and with data from open-source resources.
Keywords: Globalization, International, International Relations, Trade, Economic Development, Transportation Economics, Shipping.

INTRODUCTION
"Many of our best opportunities were created out of necessity…" Sam Walton, Founder of Wal Mart (Walton, 1999) India's Maritime Trade. India is bestowed with substantial natural resources, some of which it exports. However, there are many raw material imports to power its economy too. Further, considering the rapid rate of growth and their projections, India also imports/ exports other goods and equipment and materials (India: Asia's Star of the Next Decade | Morgan Stanley, n.d.). An analysis of the Ministry of Commerce and Industry, Government of India trade data highlights top five export destinations are USA, UAE, Netherlands, China and Singapore and top five imports originate from China, UAE, USA, Russia and Saudi Arabia (Trade Statistics - Mcommerce, 2024). None of these are connected by land. Primary exports happen from SEZ Jamnagar (Reliance), Nhava Sheva Port Mumbai, Mundra, Chennai, Delhi Airport, Mumbai Airport, Mumbai Port, Visakhapatnam and Chennai Airport. Imports include ports/ terminals at Vadinar and Paradip These data reiterate that India uses the sea extensively for her sustenance and growth. The ships that carry trade, therefore, are critical enablers/ connectors of the India story. It is only logical that the Indian shipping industry be analysed/ assessed.

India's Shipping Industry
The Chairman of the National Shipping Board, Dr Sanjeev Ranjan, who was also Secretary Shipping in the GoI, during a wide-ranging discussion/ interview with the author brought out a few salient aspects about India's shipping industry.

- India has all building blocks for a vibrant shipping industry. However, it has not been competitive enough.
- Some nations have been able to strike the right balance, India has some distance to go.
- COVID-19 did not impact the Indian shipping industry much due to the pro-active approach of the GoI.
- India always understood the strategic nature of the shipbuilding industry. The Indian Navy ship design and construction is a clear indication.

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Many shipyards have developed infrastructure and competence/ capabilities courtesy Indian naval orders.

- The MIV provides a clear roadmap for India's shipping industry.

When we talk of the shipping industry, it is important that we look at India's shipbuilding, an important pillar. India, as per the Ministry of Ports, Shipping and Waterways, has 28 shipyards. These include eight public sector yards, six under the Centre and two under state governments, and 20 private sector yards (Shipping | Ministry of Ports,Shipping and Waterways, n.d.). Ship building capacity is defined in terms of maximum carrying capacity of the ship that can be built by a shipyard. It is measured as Dead Weight Tonnage (DWT). In India, the maximum DWT capacity is with Cochin Shipyard Limited (CSL) at 110 thousand DWT (Shipping | Ministry of Ports,Shipping and Waterways, n.d.). The maximum capacity of the private sector, as per the same report is 9 thousand DWT. A new private player who has emerged in the recent years is the Larsen and Toubro shipyard at Katupalli, Tamil Nadu. They have ambitious goals set for themselves, including manufacture of tankers and Ro-Ro ships (New Construction - Commercial Shipbuilding | Shipbuilding | L&T India, n.d.). Globally, shipbuilding is led by China (44%), Republic of Korea (32%), Japan (18%), Philippines (1%) with the rest of the world making up a mere 5% (Nations, 2023). India contributes less than 1%, a drop from the early 2000s when it was in the top 10 shipbuilding countries of the worl (India's Proposed Plan to Revive Domestic Shipbuilding Industry, 2022). From 2016, the GoI has come out with many initiatives/ policy documents. These include (SBR FINAL 2020 21.Pdf, n.d.): -

- Financial Assistance Policy on Shipbuilding (2016)
- Grant of Infrastructure Status (2016)
- Atmanirbhar Bharat Policy (Revised in 2020)
- SOP for chartering/ procurement of tugs (2020)
- Pradhan Mantri Matsya Sampada Yojana (2020)

In addition, the GoI has come out with the all-encompassing MIV. The MIV has identified 150 initiatives across 10 themes to enhance the capabilities and competitiveness of India's maritime sector (MIV 2030 Report.Pdf, n.d.). These efforts/ initiatives will have a lead time before any changes can be discerned. It may be illustrative to see the models followed by other countries to reach where they have.When we look at the Chinese and Korean ship-building models the main aspects that emerge are government support for loans(Lee, 2002) with industry favourable terms, review of taxes to help companies, sustained focus on R&D and availability of skilled manpower whilst concurrently creating clusters of excellence (Cortright, 2006). India aspires to achieve these, and the same have been incorporated into the MIV. The MIV does mention setting up of Maritime Development Fund of ₹25,000 crores (approximately US $3.05 Bn as per May 2023 exchange rate). It also alludes to providing standardised policy for banks to lend for vessel financing (MIV 2030 Report.Pdf, n.d., P.146). However, a perusal of the Statistics of India's Ship Building and Ship Repairing Industry 2020-21 in respect of the various shipyards is very illustrative; they are primarily looking at the Indian Navy to provide them orders, with other orders being of minor vessels. If the Navy is the only agency, how can the system evolve and grow further?The other aspect is of manpower. The below table, extracted from the MIV, is particularly telling.

Table 1: Cost Comparison of Global Shipbuilding Industry

	Material Costs (60-70% of vessel costs)			Labor Cost (30-40%)				Financing		
Country	Steel	Other Material	Relative MatL Cost	Labor rate	Productivity	Net Labor Cost	Relative Labor Cost	Vessel cost (Relative)	Financ-ing cost	Total cost of Ownership
	30-40% of material costs	60-70% of material costs		$/mhr	Mhr/CGT	$/CGT			Rate of interest (%)	
	100%	100%	100%	3-4	150-180	620	100%	100%	10-12%	100%
	90%	85%	87%	5-6	50-60	300	48%	75%	2-5%	74%
	95%	85%	89%	15-20	10-15	325	52%	78%	1-2%	78%
	95%	87%	90%	20-25	10-15	350	56%	80%	0-1%	79%

Note: Productivity analysis basis analysis for 9 major shipyards across China, Japan and South Korea, Other material costs basis relative costs for marine equipment and other overheads (power, etc.). India vessel cost does not include subsidy.
Source: International Journal of Business Performance Management, OECD, Industry Expert discussions

[Source: Maritime India Vision 2030]

What clearly emerges is that manpower in India lags, both in skill and productivity. This needs to be addressed on priority.

PORTS

India, as brought in earlier, undertakes about 95% of its trade by volume and 68% by value through maritime means (Annual Reports | Ministry of Ports,Shipping and Waterways, n.d., p.4). The gateways to maritime trade are ports.

On-ground Perspectives. Shri Arun Kumar Gupta, Managing Director of India Ports Global Private Limited (currently responsible for managing the Shahid Beheshti Port in Chabahar, Iran, and the former Chairman and Managing Director of the SCI), and Shri Vikram Dingley, Director (Technical & Offshore), SCI and his Shipbuilding team members were the experts whose inputs were sought. The key points they raised include: -

- Indian ports are at a nascent stage of technology adoption and have a long way to go.
- Draft, infrastructure & operational challenges, and professional management skills beset Indian ports.
- The arrival of foreign players in the Indian port sector is a welcome development as they have introduced global best practices.
- There is a plausible disconnect between Sagarmala project and the recently introduced National Logistics Policy.
- The proposed trans-shipment hub in the Great Nicobar Island is on the International Shipping Lane and accrues advantage in that context.
- Turn-around time at Indian ports is a challenge.
- As ports embrace advanced technologies, they must concurrently undertake relevant risk assessment and take mitigating measures.
- India has not encouraged investment in heavy engineering equipment that is at the heart of port operations.
- Draft, efficient port equipment including navigational aids and IT Systems are some of the key challenges.
- The global supply-chain crisis has been overcome to a major extent.
- India has made steady progress on the 'liquid' side in comparison to the 'container cargo' side.

A Closer Look. The study of some of the aspects raised above will provide a plausible way ahead to enhance efficiencies and make Indian ports more competitive at the global level. These include Draft, Infrastructure & Operational Challenges, and Technology adoption.

Draft. According to research on cargo handling at the major ports that India's Parliamentary Standing Committee on Transport, Tourism, and Culture released on December 21, 2018, the cargo management at Indian ports does not meet international standards. Additionally, they emphasised how this adds costs and requires more time. Further, they emphasised the need for considerable capital dredging (SCR Summary Cargo Handling Major Ports.Pdf, n.d.). The same Committee also reaffirmed this in their most recent report, released in March 2023 (Parliamentary Panel Says India Needs Increased Draft Depth at All Ports to Handle Large Vessels - Times of India, n.d.). This reinforces the views of Shri Arun Gupta, Managing Director of India Ports Global in his responses to the questionnaire wherein he mentioned that 'draft is one of the challenges in managing ports in India'.There are 12 government owned major ports in India, six on each coast (Annual Reports | Ministry of Ports,Shipping and Waterways, n.d.). The data, considered relevant is indicated as follows (where data other than that from Ministry of Shipping report has been used, necessary source details have been appended): -

Table 2: List of Major Ports and Maximum Draft Depth

Ser	Location	Name of Port	Draft (mts), max
1.	Kolkata	Syama Prasad Mookerjee Port	8.0 (*Kolkata-Kolkata Port Trust*, n.d.)
2.	Paradip	Paradip Port	14.5
3.	Visakhapatnam	Visakhapatnam Port	14.5/ 18.1
4.	Chennai	Chennai Port	15 - 16.5
5.	Ennore	Kamarajar Port Limited	15
6.	Tuticorin	V.O.Chidambaram Port	14.2
7.	Kochi	Cochin Port	12.5
8.	New Mangalore	New Mangalore Port	14.0

Ser	Location	Name of Port	Draft (mts), max
9.	Mormugao	Mormugao Port	14
10.	Mumbai	JNPT	15
11.	Mumbai	Mumbai Port	12
12.	Kandla	Deendayal Port	14.1

[Source: (HOME :: Welcome to Paradip Port, n.d.), (Berth Details | Port of Chennai, n.d.), (Permissible Draft Dated 29-11-2022 | New Mangalore Port Authority, n.d.), (Facilities, n.d.), (Terminals, n.d.), (Mumbai Port Authority, India, n.d.), (Indian Private Ports & Terminals Association - IPPTA, n.d.)]A study of tankers, bulk carriers and cruise liners bring out the following in terms of their size and draft vis-à-vis Indian ports: -

- Cruise liner, considering their necessity to enter ports of varied infrastructure and locations have a draft ranging up to a maximum of 9.1 m in the Oasis of the Sea class of the Royal Caribbean Cruise liners (Garrison, 2019). They will be able to enter most Indian ports.
- The size and draft of oil tankers (both crude and product) is dependent on their routeing; tankers of the Suezmax size (125,000 to 199,999 T) have a draft of about 20 mts (Gibi, 2021). Therefore, these cannot enter any Indian port, the reason India has created many Single Point Moorings (SPM) outside harbours for trade in crude and product.
- The bulk carriers too have varied sizes. Anything greater than a Panamax (draft 12.04 mtrs) will face challenges at some ports. The Neopanamax (draft 15 mtrs) can enter some Indian ports (Bulk Carrier Ship Types, n.d.).
- Compare it with China, wherein they have created ships with carrying capacity of more than 400,000 T to ply between many ports in China and Brazil with a draft of 25 mtrs.

The Government of India's Niti Aayog noted the need to open dredging operations to private firms in a December 2018 study, highlighting the need to boost competitiveness and provide additional options for ports in India to maintain sufficient depth to attract larger vessels (Need to Open up India's Dredging Market to Boost Ports Trade: NITI Aayog, 2018). Even though the same was stated by both a Parliamentary Standing Committee and the Government of India's own Niti Aayog, hardly much actually happened on ground. This can be determined by the fact that the MIV, issued on November 19, 2021, also emphasises the necessity of having a higher draught in India's ports to improve their capacity to handle large vessels, almost three years after the earlier reports (MIV 2030 Report.Pdf, n.d., p.14).To take advantage of the "economy of scales," it is, therefore, imperative that India's ports review their strategy for increasing draft depth. Dredging activities must also be opened to private operators in India.

Infrastructure and Operational Challenges. In response to a question about Indian ports and their infrastructure and operational challenges, Shri Vikram Dingley, from the Shipping Corporation of India, and his shipbuilding team members highlighted the following: -

- The turn-around time at Indian ports is approximately 2.5 days in comparison to global average of 1-2 days.
- Last-mile connectivity is a major impediment in smooth movement of cargo to/ from hinterland.
- There is a need to adopt multi-modal transport, particularly inland waterways, for industrial commodity transfer.
- There has been under-investment in infrastructure across various sectors, including ports.

The UNCTAD report of 2022 provides data iro median time spent in port for container ships in 2021. Further, the report also provides data of top 25 global ports for Container efficiency performance for 2021. There is no Indian port in the list. Colombo, Sri Lanka is ranked 24/25 having improved its ranking from 33 in 2020 (Review of Maritime Transport 2022 | UNCTAD, n.d., p.85). The data iro Indian ports for average berthing delays was collated from reports/ data/ website of each major Indian public port. The average pre-berthing delay, in hours, at each port is tabulated below: -

Table 3: Average Pre-Berthing Delay - Indian Ports

Ser	Location	Name of Port	Average Pre-Berthing Delay (hrs)
1.	Kolkata	Syama Prasad Mookerjee Port	49.3(*India*, n.d.-c)
2.	Paradip	Paradip Port	6.2
3.	Visakhapatnam	Visakhapatnam Port	≤ 1
4.	Chennai	Chennai Port	50(*India*, n.d.-b)
5.	Ennore	Kamarajar Port Limited	≤ 1
6.	Tuticorin	V.O.Chidambaram Port	4.32
7.	Kochi	Cochin Port	11.23
8.	New Mangalore	New Mangalore Port	32
9.	Mormugao	Mormugao Port	54
10.	Mumbai	JNPT	6.48
11.	Mumbai	Mumbai Port	2.4
12.	Kandla	Deendayal Port	60

[Source: (1685619741_Final_English_Annual Report_2021-22.Pdf, n.d.), (Performance Indicators:KPL, n.d.), (Newsletter Korkai Oct- Dec 2021.Pdf, n.d.), (Port Performance 2021-22.Pdf, n.d.), (New Mangalore Port, n.d.), (India, n.d.-d), (Operating Performance Profile, n.d.), (India, n.d.-a)]These statistics reinforce the views put-forth by Shri Dingley and his team. The delays can be attributed to berthing/ unloading/ loading/ clearances iro customs, and unberthing. This gets further compounded by the adoption of technology still being in its nascency, as got reinforced in the responses from on-ground practitioners.

Technology Adoption. Due to an attack on its management information system (MIS), the Jawaharlal Nehru Port, Mumbai, had to reroute ships from its Container Terminal to other neighbouring ports in February 2022 (Nair, 2022). A.P. Moller Maersk, the largest Danish shipping company, and the Port of Los Angeles' main cargo facility were both victims of malware attacks in June 2017. The corporation had to use every tool it could think of after the attack, including manual excel sheets, WhatsApp, and Twitter, to load and unload ships and monitor their movements between ports. Additionally, the corporation lost out on sales between $200 and $300 million. The International Maritime Organization and the French maritime behemoth CMA CGM both experienced cyberattacks in 2020 (Bloomberg/London, 2020). The above illustrates how technological interdependence is embedded into the very fabric of the maritime industry, making it vulnerable. This was emphasised by mercantile marine practitioners on the ground as well as subject matter experts from the Indian industry (who wished to remain anonymous), as also an IT legal expert, Dr. Karnika Seth of Seth Associates: -

- Ports can reduce vulnerability to attacks by having mechanisms that detect abnormal activity and immediately redirect the same.
- Creation of a disaster recovery plan is mandatory.
- Constant risk assessment needs to be undertaken and mitigation measures put in place and regularly exercised.
- Proactive 'perimeter' monitoring is crucial.
- IT Security in most countries is not geared to stop DDoS attacks.
- It is mostly not possible to identify actors responsible for DDoS attacks.
- It is highly impossible to prosecute actors responsible for DDoS attacks.
- There is always a feasibility of having international agreements to enhance IT Security. Therefore, there is a need for India to sign the Cybercrime convention.
- 'Actors' who undertake cyber attacks on Indian infrastructure can be prosecuted under Sec 66 of the IT Act read in conjunction with Section 43.

CONNECTIVITY

Last mile connectivity to the ports is one of the major constraints in smooth movement of cargo to/ from the hinterland. Significant savings can be achieved by shifting movement of industrial commodities like

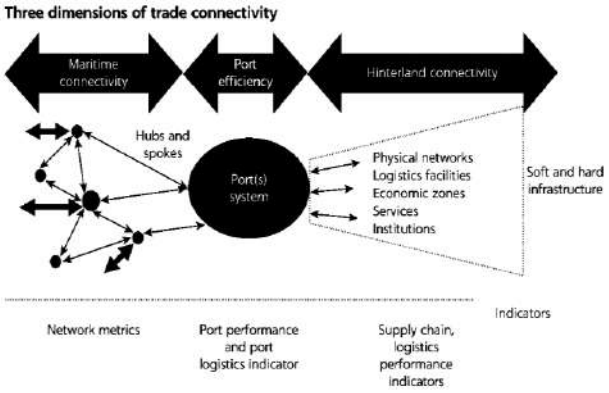
coal, iron ore, cement and steel to coastal and inland waterways.

Shri Vikram Dingley, Dir (Tech & Offshore), SCI

Sending one container through a ferry from Mundra to Vadinar is cheaper than by going through the road. One thing is cheaper, the second thing is the time taken is also lesser.

Capt Rajat, Mundra Port

The two statements above, one from a policy perspective and the other from a practitioner, bring to fore the views on India's maritime trade connectivity. However, it is also important to highlight that there have been improvements, even if modest. India has increased the share of cargo shipped using modal transport from 0.5% to 2%. Also, there has been a 19% year-on-year growth in the volume of cargo transported in the last five years. Further there are over 5000 km of navigable inland waterways under development (MIV 2030 Report.Pdf, n.d., p.8). So, what is connectivity? The World bank Group in its report on 'Maritime Networks, Port Connectivity and Hinterland Networks in the Mediterranean' identifies 'trade connectivity' having three components/ independent dimensions. These are shipping/ maritime networks [all facets of shipping up to the port, which we have looked at earlier], port performance [that we delved into] and hinterland connectivity that contributes to development and utilising supply chains that are maritime in nature (Arvis et al., 2019, p.xvii). The essence of this has been captured in the figure below.



When we are looking at 'connectivity', we are primarily focussing on the aspects to the right side of the figure including physical networks (roads/ multi-modal transport systems etc), logistic facilities, economic zones, services, and associated institutions.An assessment of these parameters iro India should help us identify challenges and probable way ahead.

India's Road Networks. India's Minister for Road Transport & Highways, Shri Nitin Gadkari, whilst addressing a conference celebrating nine years of the present government highlighted that India's road network grew 59% in this period. This has helped India surpass China in terms of road network to become the second largest in the world, after USA ('India's Road Network Grew 59% in 9 Years, Now Second Largest after US', 2023). A news report from 2021 in The Conversation also highlights that not only in terms of length, but even in terms of density, India's roads fare better than both the USA and China. However, the report also adds that India's road network is very poor as only 3% of the total roads are highways and a majority of these are only two lanes (Kailthya & Kambhampati, 2021). These highways, however, carry about 40% of total traffic. The International Road Federation (IRF), with headquarters in Geneva, Switzerland is a not-for-profit organisation that has identified development of roads and road networks as its mission through knowledge transfer and information sharing. The organisation has presence across five continents and has a chapter in India too (Who We Are - Official Website of the International Road Federation (IRF), 2023). The organisation maintains data on various modes of transport and for different countries. A comparison of the USA, China and India was undertaken in respect of road networks to assess where does India stand, particularly considering the news report in The Conversation above highlighting India's poor road network. It can be inferred that India's road network, whilst evolving, is substantial and robust and hence the news report may not be giving the complete picture. In terms of movement of freight transport by road, rail and waterways India

must improve its metrics. Further, whilst India has a good road network, China has more iro highways, the arteries for movement of freight. These highways are what spur connectivity and trade. The Bharatmala Pariyojana, launched in 2017, envisages India's national highways to carry 70-80% of total road traffic (Roadways in India - Road Industry, Network, Projects & FDI, n.d.). This should address the shortfall in road network for movement of trade freight. Further, to connect ports through coastal roads with main highway network, the GoI has ordered for construction of 2000 km of roads. Similarly, construction of about 9000 kms of roads, as economic corridors, will also be undertaken. Going by the track record, it is most likely to be completed on schedule, and this will provide the necessary fillip to maritime trade movement by roads into hinterland.

Multi-modal Network. The methodology of transporting goods, by a single operator, from one place to another using different modes of transport defines what constitutes multi-modal transport, and as a corollary the network a multi-modal network (Vishvas, 2015). In addition to legislation and government policy, Information Technology (IT) has helped the process of facilitating multi-modal transport in India to a major extent. Indian governmental agencies, including the Customs, have been quick to adapt and adopt changing technology. The Customs has introduced the Indian Customs EDI (Electronic Data Interchange) System (ICES) to facilitate expeditious custom clearance of India's international trade, both imports and exports (Multimodal Transport in India – a Basic Perspective, n.d.). Further, the completion of the two dedicated freight corridors (DFC), and further additions later, is expected to help revitalise the rail-freight logistics in India (Dedicated Freight Corridors, n.d.). The addition of inland waterways too will add to the pervasiveness and efficiency of India's multi-modal transport (Multimodal Transport in India – a Basic Perspective, n.d.). However, inland waterway creation/ management/ maintenance is fraught with challenges. As a very senior government functionary at the apex level, who wished to remain anonymous, confided, the inland waterways are fraught with multiple challenges. These include, but are not restricted to: -

- The suspect nature of perennial rivers in India view vagaries of weather.
- The need to maintain required depths to ensure smooth movement of riverine logistics. This is expensive and has technical limitations as also the availability and constant moving of dredging equipment to undertake dredging to maintain required depths.

Therefore, there are many 'connectors' that are currently in the 'variables' category that need to be addressed, the reason Shri Dingley and his team cautioned that, 'Last mile connectivity to the ports is one of the major constraints in smooth movement of cargo to/from the hinterland'.

Logistic facets of India's Maritime Trade. The GoI, to tap into India's vast coastline, geographic location, and waterways with potential to spur economic activity, launched the Sagarmala Project in 2015. This envisages development of manufacturing clusters close to ports to enhance export competitiveness, which would optimise the Export-Import (EXIM) movement of goods/ trade (SAGARMALA | Ministry of Ports,Shipping and Waterways, n.d.). Economic Zones will play an important role.Sachin Menon, working with KPMG in India, writing on India's Special Economic Zone scheme flagged that whilst the SEZ exports have increased dramatically, they have not enjoyed success like China. He further added that many countries are offering better benefits and ecosystem for trade. Therefore, India needs to review its 'Ease of doing Business'(Special Economic Zone Scheme in India, 2023).

National Logistics Policy. The vision of the policy, as highlighted and promulgated through The Gazette of India, Extraordinary, No 4385 dated September 28, 2022, is to build a trustworthy logistics system to ensure inclusive growth. Its endeavour is to create an eco-system that matches global standards by 2030, something enunciated in the MIV too. It also promulgates the Comprehensive Logistics Action Plan (CLAP) with various responsibilities allotted to different ministries under the GoI. This also complements the PM GatiShakti National Master Plan (NMP) (National Logistics Policy | India Logistics, n.d.).

The Technology Frontier And Taking On Competition"Those that will bet on the grey economy will have a grey future, and those that, like in India, are betting on the green economy will have a

dominant role in the global economy in the decades to come."

António Guterres, United Nations Secretary-General (How Trade Helped Cochin International Become the World's First Solar Powered Airport, n.d.)Shri Arun Kumar Gupta, MD India Ports Global Pvt Ltd, sharing his concluding thoughts in the questionnaire on India's Ports and Maritime Industry remarked, 'Indian ports need to go green'. This is a sentiment echoed in the MIV where Chapter 9 deals with Safe, Sustainable & Green Maritime Sector. It is important to qualify what the author means by 'green'. Whilst the GoI and the MIV primarily focus on reduction of Green House Gases (GHG), in the author's opinion, 'green' includes not only emissions standards, but building and operating standards too. The MIV puts forth the National Action Plan to promote Green Shipping, wherein it emphasises on alternate fuels, restricting entry for ships without basic GHG standards, charging stations for electric vehicles (EVs) and alternate fuels (SAGARMALA | Ministry of Ports,Shipping and Waterways, n.d., p. 235). Whilst postulating and hoping for things to happen is required, on ground action is more relevant. In this context, the Cochin International Airport project of creating a 12 Mega Watt solar plant on 45 acres of land is noteworthy. It not only reduced the power bill, but also made the airport self-sustaining using green energy (Thachil, 2019). This is a model worthy of emulation by India's ports. Land is one of the main criteria to create solar infrastructure. To put things in context, the 12 major Indian ports, between them, have about 110,000 hectares (approximately 270,000 acres) of land ("Chunk of 1.10 Lakh Hectares Land With Ports to Be Utilised to Develop Industries: Shipping Minister," 2020). Therefore, green energy generation, including possibly wind power generation, should be looked at for feasibility and subsequent implementation as a first step. It will entail investments, but those are necessary. The MIV does mention that some of the ports, including Cochin Port, have installed green energy sources for power generation. It, however, highlights the need to do more ("Maritime India Vision 2030," 2021).

Green Fuel Conundrum. There was realisation about the harmful effects of conventional fuels commencing late 1950s. Edward Teller, a Hungarian born American Theoretical Physicist and one of the fathers of the Hydrogen Bomb articulated the same during a conference organised by the Columbia University in 1959, aptly titled 'Energy and Man'. He highlighted that fossil fuels were contaminating the atmosphere and there was a need to find alternates (Energy and Man : A Symposium : Columbia University. Graduate School of Business : Free Download, Borrow, and Streaming : Internet Archive, 1960, p.56-58). The oil industry knew but continued to profit from the 'black gold' (Franta, n.d.). It, therefore, highlights the way 'interests' decide on action. And it is in play today, more than ever.There are various views on what is the best way forward in terms of energy. Executives with oil majors highlight that further expansion of fossil fuels is necessary (Noor, 2023). This is reiterated by various authors who 'bat' for using gas in the book 'The Next Stop'. It looks at how natural gas will help India's transition to a clean energy future (Mehta, 2021). JP Morgan, the banking major, in a 2020 report highlighted that the 'Future is Electric' and went onto explain the reasons for the same (Morgan, 2020). And to add to the mixture, India is betting majorly on Hydrogen and is looking at achieving a 'early starter' advantage (Dykes, 2023). And the GoI is looking at a combination of all 'green energy' options and to become a major player in the Global Green shipping space (PIB, Untitled Page, n.d.).Therefore, navigating this multi-narrative, multi-interest driven energy basket is not an easy task. However, India's ports need to align with the GoI directives and ensure expeditious transition to 'green' energy for sustenance and operations.

Transitioning to Green Shipbuilding. Two Italian academics, Dangelico and Potrandolfo formulated an approach to provide a workable definition of 'green' (Dangelico & Pontrandolfo, 2010). They highlighted that environmental impact determines the 'green' quotient. The three categories/ triumvirate of environmental impact are: -

- Less Negative - lesser impact than conventional products
- Null impact
- Positive impact - contributes to the environment.

When we look at shipbuilding, the main stages involved include, but are not restricted to (Shipbuilding Process: All Stages From Design To Sea Trials, n.d.): -

- The Design Spiral including Lines and General Arrangement plan.

- The Production Stages; Panel/ Section/ Block Fabrication, Erection, Outfittings (Pre/ Dock/ Quay), Painting, Launching, Sea Trials and tests.

Indian shipbuilders and policy formulators, therefore, need to undertake a holistic assessment of our competencies/ capabilities at the various shipyards on a fast-track basis under the 'green' triumvirate criteria. To illustrate, 'green' energy adoption would fall under the 'positive impact' category. Once identified, the shipyards need to work towards transitioning expeditiously towards the 'positive impact' category in maximum parameters.

The PLI Fillip. The GoI launched the Production Linked Incentive (PLI) scheme in March 2020. This was with the aim of providing a boost to India's manufacturing sector, as also enhance competitiveness of Indian manufacturers globally (Production Linked Incentive (PLI) Schemes in India, n.d.). Introduced initially for three sectors, the scheme has now been expanded to include another 10 sectors, including Metals & Mining. The outlay for the schemes in various sectors total about $26 Bn (PLI SCHEME, n.d.).The metals and mining are a crucial sector. The PLI scheme aims to enhance production of speciality steel production. China is the world's largest producer of steel, with a staggering Billion plus tons (1032.8 Mn tonnes) of production for 2021-22. India is the second largest producer. India's capacity is 118.2 Mn tonnes ('World Steel in Figures 2022', n.d.).Shipping industry is a major consumer of steel, including for manufacture of containers, commonly known as Twenty-foot Equivalent Units or TEUs. The TEUs are typically either owned by shipping lines/ by container leasing companies/ or the shippers themselves due to their organisational requirements (Samuels, 2021). However, when it comes to production, there are three Chinese companies that have cornered close to 96% of the world's dry cargo containers (Miller, 2021). China has created the eco-system, has the steel industry to produce the steel, has heavy-engineering prowess to create machinery to enhance productivity, factors that have enabled them to dominate the global space for TEUs.In India, the main player when it comes to containers is CONCOR. It plays a major role in the inland transportation of containers by rail.(Container Corporation of India Ltd :: A Navratna Company, n.d.) Based on the Chinese monopoly highlighted above, India has been exploring the feasibility of extending the PLI Scheme to container production in the country (Das, n.d.). This initiative, if implemented, will help India in the medium to long term. Similar PLI scheme would need to be extended to shipbuilding to make India competitive in the region, if not global landscape.

RECOMMENDATIONS

India has travelled a long road to reach where it has today, both as a nation and as responsible state in global affairs, particularly economic affairs. What happens in India over the next seven to 10 years will determine the way India shapes the world. And its trade and commerce are the most pivotal aspects of determining the way forward. With the seas being the gateways of India's trade and commerce, India's maritime sector, including ship building, have a vital role to play. Some of the important aspects that will determine how India will shape up are enumerated in the succeeding paragraphs.

Policy Stability. A speaker, who wished to stay anonymous, said to me during an interaction at the National Defence College, India makes very good policies, but their implementation is very poor. This probably leads to review of policies and creation of more. Businesses look for policy stability, as that helps them undertake holistic financial planning and lifecycle costing for their investments and likely returns, they can anticipate. Instability in policy is an anathema and businesses tend to stay clear of such locations. India, having enunciated MIV should now stay the course and ensure its wholehearted implementation.

Bureaucratic Processes. Policy formulation must be backed by pragmatic execution. Bureaucracy is the facilitator for ensuring seamless transition of policy to on ground implementation. Singapore is a prime example of this. They ensured the people who ran the government were good (Yew, 2012). While the MIV does enunciate what needs to be done to achieve the envisaged roadmap, we must be cognisant of the reality that India though a maritime nation does not have maritime consciousness as lamented by many. There is a need for MoE indices for the goals laid out wrt the MIV and regularly monitored through transparent bureaucratic processes. The reason being formulation of policy/ recommendations must be backed by on-ground action. The fact that successive Parliamentary Standing Committees as also the Niti

Aayog have highlighted limitations, and yet not much on-ground actions have been undertaken is a worrying factor. This will ensure course corrections, where necessary, can be provided to ensure success of the MIV.The efficacy of the NLP/ CLAP and the NMP will hinge on the conscientious execution and implementation of the identified landmarks and salient events by all stakeholders. Any variation may have an adverse impact on the entire plan, which in turn will unhinge the 'India Story'.

Viable Clusters. There is a need to review existing shipyards, both public and private to create viable clusters. GoI should provide soft loans to private entities to take over yards that have potential and can be amalgamated into their business chain. There may be a necessity, as argued by India's former Navy Chief Admiral Karambir Singh and Cdr Y Hemant Kumar in their article for the National Maritime Foundation, to look at strategic mergers. Whilst they have propagated for public yards, GoI assistance may help redefine the same for private yards too (NMF, admin, 2023). By creating clusters, both public and private, the right eco-system can be put in place to spur growth of India's shipbuilding. There is a need to consider undertaking a onetime assessment of major Indian ports, identifying those that are financially viable and review facilities. A pragmatic review of operational viability of ports too should be constituted and the difficult decision to shut down those that are a drain on finances needs to be taken. The facilities and equipment as also personnel can be re-skilled and provided job opportunities in the newly formulated clusters.

R&D, Technology and Education/ Skilling. There is an urgent need to review the current systems and institutions that are at the forefront of shipbuilding and revitalise them to contemporary global standards. If warranted, consultants should be employed, and processes reviewed. There is a need to make honest changes on this front. Rapid adoption and absorption of technology is the only way ahead. Similar is the need to adapt and adopt to contemporary and futuristic design and production methodologies for ship building, incorporating green technologies to try and achieve net 'green' neutral if not 'green' positive. There is a need for creation of a moment that will revolutionise the port sector akin to what Unique Payment Interface (UPI) did to India's FinTech industry.

Embrace Green. Indian shipyards need to identify land parcels, allocate appropriate budgetary support, and create effective solar and wind farms to wean off conventional modes of energy expeditiously. There is a need to identify facets of ship designing and building and fitting that can be converted to 'green' and the same should be undertaken on priority. Similarly, the fuel should be 'green' as is being done in other sectors, identified for the shipping sector too, on a 'mission mode'. This needs to be backed by the GoI with adequate budgetary support if the endeavour is to stay relevant in the global maritime space.

The Infra Push. India's infrastructure is contemporary and, in many aspects, matches global standards. However, there are challenges to be surmounted before it can contribute to the 'India Story' in a more concerted manner. India has done commendably to create the second largest road network in the world. And there is a consistent attempt to enhance road infrastructure. However, much needs to be done to further enhance national road system to reduce freight transport times. There is a need to expedite completion of the DFCs to enhance hinterland connectivity. The inland waterway system needs to be pragmatically reviewed for viability, including financial and technical, to be sustainable and be a realistic contributor to enhance logistic efficiencies. The concessions and benefits extended to various operators; ports, roads, economic zones/ clusters, need to be pragmatically reviewed. If the country aspires to achieve global standards, then the concessions and benefits too need to best them to attract customers.There is also a need to open the dredging sector in India. More private players, including foreign vendors, should be allowed to bid and provide services to the ports. This will ensure adequate depths are maintained in Indian ports to make them globally competitive. Further, is the need to extend the PLI scheme to the shipping industry and as a subset also to the container industry and provide it adequate budgetary support. This will ensure that India is self-sufficient in production of containers, at globally competitive prices, which will help in furthering India's stated aim of achieving better logistical efficiencies.

Pragmatism over Overstretch. The global shipping landscape has changed drastically in the last few decades. China with its volume and scale, Japan and

South Korea with their technology and processes are controlling the market. India cannot expect to change things overnight. There is, therefore, a need to be pragmatic.India should focus on the 'connectors' in the maritime sector to begin with. Focus on tugs and small vessels like pilot boats. Buy technology that will enable construct 'green' tugs and harbour vessels. Create suitable clusters, one on each coast with both public and private shipyard participation. They should adopt and adapt to the latest in technology using modern industrial scale robots to ensure enhanced productivity to stay competitive. Work with agencies involved in ancillaries and provide incentives to turn 'green' including in the marine paints segment. Create a niche space and market these capabilities with the singular aim of becoming the sole supplier of green harbour craft to ports across the globe. Once this is achieved in a seven-to-10-year time frame, then the scope and scale can be expanded to larger vessels. This will ensure India's shipbuilding prowess can contribute gainfully to the India Story.

ETHICAL DISCLOSURES

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2. The work has been submitted only to Indian Studies Review Journal of Centre for Studies of Politics and Governance Delhi and it has not been previously published or submitted elsewhere for publication in a refereed or copyrighted publication.

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