Policy Brief

Roadmap for India's Dominance in Global Shipbuilding

Bhaskar Sengupta and Shantanu Bose

Abstract

India has demonstrated her prowess in cutting edge technology, be it pharma, information technology or automobile industry. So why has the maritime industry and shipbuilding -- which has the potential to be the highest employment creator industry -- fallen by the wayside? While merchant shipbuilding in the country has been moribund, our Naval shipbuilding has come of age with the delivery of "State of the Art" Stealth Frigates and Corvettes and the maiden sailing of the Aircraft Carrier recently. It is not widely known that of the three services that comprise India's Armed Forces, the Navy is at the forefront of indigenising its equipment/requirements. While the Naval shipbuilding ecosystem is not bereft of challenges, it provides a perspective to the issues plaguing the larger maritime construct of the country. A composite national approach that encompasses intellectual property creation, large production runs(scale), standardisation, and a strong Make in India thrust are the building blocks of a robust shipbuilding ecosystem which will ultimately take India to global dominance in shipbuilding.

The maritime industry of India presents a fascinating story with startling contradictions. We are a nation with a vast coastline of over 7500 kms. Our ports handle one of the highest cargo loads of various types of commodities. However, the

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The authors are Commanders who have retired from the Indian Navy.

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fleet ownership at these ports is overwhelmingly foreign and foreign flagged. When we delve deeper into shipbuilding, the contrast becomes even more acute. We account for only 0.6% of global new shipbuilding orders as on date. It is, therefore, germane to question the Indian maritime 'construct'. India has demonstrated her prowess in cutting edge technology, be it pharma, information technology or automobile industry. So why has the maritime industry in general, and especially shipbuilding -- which has the potential to be the highest employment creator industry-- fallen by the way side? While our global trade has gone up by leaps and bounds, why have we for so many decades allowed our own goods to be ferried overwhelmingly by foreign flagged and foreign built ships? These questions deserve honest introspection at the national level.

In this seemingly gloomy chronicle, there is an interesting twist: the Military Shipbuilding scenario presents a very different sight. While merchant shipbuilding in the country has been moribund, our Naval shipbuilding has come of age with the delivery of "State of the Art" Stealth Frigates and Corvettes and the maiden sailing of the Aircraft Carrier recently. It is not widely known that of the three services that comprise India's Armed Forces, the Navy is at the forefront of indigenising its equipment/requirements. This is even more remarkable given that a warship far dwarves any equipment that the Army or the Airforce use in terms of size, complexity as well as cost. These factors notwithstanding the Navy has been able to "*Make in India*" the bulk of its equipment because of policies it put in place a long time ago, leading to the evolution of an ecosystem that makes possible this state of affairs.

The Indian Navy embarked on her journey "*Buyers Navy to Builders Navy*" with the construction of the Leander Class Frigates in the 1960s. The Navy commenced with the development of hull forms and then experimented with amalgamating Eastern bloc origin equipment with Western derived hull forms onboard the Godavari class. These experiments, in a sense, emboldened the Indian Navy to design and build ships with Indian origin equipment and achieve 90% indigenisation in the ASW Corvette, a frontline warship.

Samaddar (2018) estimated the quantum of the untapped market of Indian shipbuilding for Indian cargo. While the Naval shipbuilding eco-system is not bereft of challenges, it provides a perspective to the issues plaguing the larger maritime construct of the country. This article proposes a pathway to arrive at global dominance in shipbuilding. It examines the issues that ail the Indian shipbuilding ecosystem, both military and commercial, and looks at successful models outside India. Khanna, (2018)

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has already provided an insight to the Chinese strategy. The solution lies in both technical (within shipyards) and policy domains.

In the last few years there has been progress on the policy front by way of formation of Rules for Inland shipping (Inland Vessels Bill), the National Waterways, and the development of six new greenfield ports. A lot of ground still needs to be covered to bring in synergy among all stakeholders, namely, customers, shipowners and shipbuilders. A composite national approach that encompasses intellectual property creation, large production runs (scale), standardisation and a strong **Make in India** thrust has been identified as the building blocks of a robust shipbuilding ecosystem which will ultimately take India to global dominance in shipbuilding.

The article is organised in the following manner. It begins by discussing India's maritime conundrum. Thereafter, it looks deep into the military shipbuilding scenario and the solutions to make it more competitive vis-à-vis the Chinese model. The commercial shipbuilding is addressed next, suggesting ways for it to secure the trickle-down benefits of the military shipbuilding measures. We conclude with a summing up of our arguments and the policy implications that follow.

India's Maritime Conundrum

India is the world's second largest population with a huge coast-line. It is witnessing rising consumption and yet has not made any headway in the global shipbuilding industry. The figures bring out some jigsaws in the overall puzzle.

Sea Transport	Commodity	India's Global Position in Volume Handled
Energy	Oil Consumption	3rd
	Coal Usage	3rd
Agriculture	Rice Production	2nd
	Wheat Production	2nd
	FertilizerProduction& Consumption	2nd
	Palm Oil Imports	1st
Metal	Steel Production	3rd
	Ore Production	4th
Manufacturing	Textiles	3rd
	Automobile Manufacturer	4th
Forest Products	Timber	<10th
	Paper Pulp	<10th

Table 1. Select Items that Move on Ships

Contrast Table 1 with the World fleet by deadweight (tonnes) and we see another set of numbers as follows:

		Number of vessels Uead-weight tonnage (thousands of tons)		Number of vessels) je				
	Country or territory	National flag	Foreign or international flag	Total	National flag	Foreign or international flag	Total	National flag as percentage of total (dead-weight tonnage)			
1	Greece	774	3 597	4 371	64 977	265 199	330 176	19.7			
2	Japan	988	988 2 853 3 841 38 053 185 562 223 615	2 853 3 841 38 053 185 562 223 615	38 053 185 562	38 053 185 562 2	38 053 185 562 223 615	38 053 185 562	053 185 562	17.0	
3	China	3 556	1 956	5 512	83 639	99 455	183 094	45.7			
4	Germany	319	2 550	2 869	11 730	95 389	107 119	11.0			
5	Singapore	240	2 389	2 629	2 255	101 327	103 583	2.2			
6	Hong Kong (China)	95	1 497	1 592	2 411	95 396	97 806	2.5			
7	Republic of Korea	801	825	1 626	14 019	63 258	77 277	18.1			
8	United States	943	1 128	2 071	13 319	55 611	68 930	19.3			
9	Norway	549	1 433	1 982	4 944	54 437	59 380	8.3			
10	Bermuda	21	473	494	1 215	53 036	54 252	2.2			
11 12	16 India			885	5	126	1 01	1 17 974	6 878		
13	Monaco	16	405	421	3 856	35 467	39 323	9.8			
14	Denmark	139	805	944	1 521	37 691	39 212	3.9			
15	Turkey	633	889	1 522	8 034	19 207	27 241	29.5			
16	India	885	126	1.011	17.974	6.878	24.852	72.3			

Table 2. Ranking of Countries by DWT

While India still figures in the tonnage list, but in the list of ships by value, with 1% of global fleet strength, India does not figure in the Top 20. Paradoxically, according to data from the University of Bremen's Institute of Shipping Economics and Logistics, about 36% of the Indian-owned merchant fleet is flagged outside India.

The Government had released a plan for maritime cluster in 2011 to align maritime growth with the Indian economy. Clear targets for growth were set for the shipbuilding/ repair/ancillary industry for 2020. The focus of the agenda was the following:

- Create 2.5 million jobs;
- Increase India's global share to 5% of shipbuilding;
- Increase India's share to 10% in repairs;
- Develop strong R&D and design capabilities for commercial shipbuilding;
- Reach 30 million GRT fleet strength.

Despite such aggressive aims, Indian shipbuilding has regressed in the last decade

and many shipyards are on the verge of closure. Table 3 tells the story.

Table	3.	Status	of	Shipyards	over	the	Last	Decade
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Shipyard	Category	Status in 2020	Status Active
Cochin Shipyard	Large/PSU (MOS)	Active	Active
Mazagon Docks Ltd	Large/PSU (MOS)	Active	Active
Garden Reach Shipbuilders	Large/PSU (MOS)	Active	Active
Gpa Shipyard	Medium/PSU (MOD)	Active	Active
Hindustan Shipyard	Large/PSU (MOS)	Active	Active
I & T Shipyard	Large/PSU (MOS)	Active	Active
Reliance Naval Engineering	Large/Private	Active	Inactive/Referred to NCLT
Hooghly Docks & Port Engineers	Small/PSU (MOS)	Signs of Strain	Strained (Now taken over by CSL)
Shalimar Works Ltd	Small/State PSU	Signs of Strain	Inactive
Alcock Ashdown	Small/State PSU	Signs of Strain	Inactive/Referred to NCLT
Bharati Shipyard	Medium/Private	Signs of Strain	Inactive/Referred to NCLT
ABG Shipyard	Large/Private	Signs of Strain	Inactive/Referred to NCLT
Tebma Shipyard	Medium/Private	Signs of Strain	Inactive/Referred to NCLT
Modest Shipyard	Small/Private	Active	Inactive
Chowgule & Co	Small/Private	Active	Active
Shoft Shipyard	Small/Private	Active	Active
Dempo Shipyard	Small/Private	Active	Active
Timblo Shipyard	Small/Private	Active	Strained
Waterways Shipyard	Small/Private	Active	Strained
Siddharth Marine	Small/Private	Active	Strained
Vijay Marine	Small/Private	Active	Strained
A.C. Roy	Small/Private	Active	Active
Titagarh Marine	Small/Private	Active	Active



For a moment let us contrast this with the journey of our neighbours in the east.

The Strategic Imperative of Commercial Shipbuilding

The terror attack on Mumbai of 26/11 was a reminder of how important the maritime boundary is and how open it is. It was an attack from the sea that maimed Mumbai. Thankfully, while the awareness relating to maritime security seems to have increased, awareness of the need for a robust and strong commercial merchant marine has not.

This is an important dimension, especially as India steps into the Indo-Pacific as a key player. The region is geopolitically contested, but it is also one of the most commercially vibrant sea lanes: some 46% of global trade passes through these waters and 50% of India's trade is now carried through this region, second only to the Arabian Sea's routes. This is big business. India's imports of crude oil, LPG, food, coal and fertiliser supplies, which constitute the country's commercial security — are all carried on foreign-owned shipping vessels for an estimated freight bill of \$52 billion in value annually as corroborated by Table 1.

There are several implications of this situation. One, as a large importing nation with negligible commercial shipping assets India is disadvantaged in every quid pro quo where it is granted market access. Two, India has a home-grown asset: its human capital. Indians comprise the world's third-largest cohort of seafarers on merchant marine vessels, a substantial number of whom work for global shipping companies. Three, in a war-like situation, India has no home-owned ships to carry its energy and food supplies and will have to pay precious foreign exchange for exorbitant freight and insurance premiums. A country that benefits largely here is the UK, whose Lloyds Syndicates is the market leader, with approximately 20% of the \$29-billion global insurance and reinsurance business. Any crisis – from piracy to sanctions reprisals – causes insurance rates to spike, sometimes at a huge price.

Four, Norway and China are becoming centres of financing for Indian shipping. However, Indian businessmen are buying assets in the other flags since the Chinese and Norwegian banks and financial institutions (FIs)will not fund assets flagged in India. A vessel need not be Indian for it to provide shipping services in India and carry Indian cargo. So Indian businessmen find it convenient to take Norwegian or Chinese funding (either through debt or on lease) and flag assets outside of the Indian shipping regime to conduct their business. As a result, India subsidises the creation of these foreign assets by paying for such services.

Five, navies came into existence to protect national trade and trade lanes. Today, the most aggressive players in maritime trade negotiations are the countries with the largest merchant marine fleets. The top five ship-owning economies (in terms of deadweight tons or DWT, indicating the size of a ship) are Greece, Japan, China, Germany and South Korea, with a combined controlled fleet tonnage of 1.06 billion DWT. This represents 57.9% of world merchant fleet tonnage.

India can catch up with its competitors and build a merchant fleet. To be truly secure, the country needs an Indian Merchant Marine in parallel with a Military Marine. India is spending \$6.48 billion in new defence capability for its navy. The Indian National Shipowners Association estimates that an expenditure of approximately \$5.2 billion every year can equip India respectably with an additional merchant fleet. This is just 10% of the estimated annual freight paid to foreign ships by India's export trade. In this regard our demonstrated technical capability to deliver merchant ships is noteworthy. Table 4, is a PSU shipyard's track record.

SI.	Туре	Numbers
а	Cargo Liners	58
b	General Cargo cum multi-purpose vessels	15
С	General Cargo cum Container (Shortance Pioneer Class)	04
d	27000 DWT Bulk Carriers	07
е	42750 Tonnes Bulk Carriers	03
f	Offshore Supply Vessels	04
g	Drill Ship	01
h	Tugs	15
i	Passenger Ferries	12

Table 4. Major Merchant Ships built by a representative Indian Yard

India's ally, Japan, serves as an example. It invested in building a merchant fleet a decade ago. Ensured long-term contracts for movement of its imports on vessels owned by Japanese companies, it is now the third largest in the world. It has learned the importance of having its own marine third-party insurance. This enables Japanese ships the comfort of insurance against third party claims, such as pollution liabilities or collisions, which is otherwise not available during sanctions, thanks to the concentration of these services in the West. China too has its own third-party maritime liability insurance company. Not only does this assist a country strategically, but also helps the national fleet hedge its insurance costs against unfair and inflated premiums.

Military vs Commercial Approach- A study in Contrast

The commercial shipbuilding scenario has been plagued by a complete lack of outlook. Acquisition by a large shipowner is illustrative:

Туре	ННІ	STX	DSME	SAMSUNG	CHINA	INDIA(CSL/HSL)
Tankers (Nos)	11	6	2	2	2	1
DWT	1,566,000	440,208	293,000	300,000	99,004	93,222(CSL)
Tankers (Nos)	7		1			
DWT	769,824		319,000			
Bulk (Nos)		14			1	
DWT		941,362			81,696	
Dry Cargo	2					1
DWT	115,598					45,792 (HSL)
Container	2					
DWT	57,850					
Total	22/2.5 M	20/1.4M	3/0.6 M	2/0.03M	3/0.18M	2/0.13M
Built no indigen	ous capability, cap	pacity or skills and	d resulted in outg	o of FOREX and lo	oss of Indian Job) 5.

Table 5. Representative Orders of Merchant Vessels by an Indian Owner

The contrast between South Korea and India is stark. A country with insignificant internal market has ventured into shipbuilding as a vehicle for nation building. Shipbuilding is a "Mother Industry". It spawns a plethora of downstream industries like

Ship Repair Orders are mostly placed on foreign shipyards in China, UAE and Colombo

engines, pumps, generators, valves, foundries. It has a multiplier effect of 8.08, i.e., for every job created in the shipyard a total of 8.08 jobs are created in the downstream value chain. The China model has certain advantages, that India also enjoys. A large internal market enabled China to create an efficient shipbuilding industry, which could then compete in the international market. The paper explores in the succeeding paragraphs a roadmap for leveraging these advantages to reach commanding heights in shipbuilding.

Logically, the Commercial ship freight index (globally accepted index being the Baltic Dry Index) follows the trends of Global trade. This is depicted clearly in Graph 1.



Graph 1. Baltic Dry Index (BDI), World Gross Domestic Product (GDP) and Crude Oil Price (C.O. Price) in the period from 10.2014 to 04.2020

The tonnage deliveries (that is shipbuilding) lag the global freight index. This is represented graphically in Figure 2 by the Baltic Dry Index and tonnage completions. The boom to bust cycle in commercial shipbuilding can be overcome by having the naval shipbuilding orders to sustain expertise and infrastructure during the downturn. Another focus can be to ensure that coastal shipping and Indian flagged ships needing repairs patronize Indian shipyards only. This has been the basis of Cabotage Laws that

have been adopted by many nations. The Jones Act of the US being the most notable one.



Graph 2. Graphical Display of Baltic Dry Index and Tonnage Completed

In contrast to commercial shipbuilding in the country, the journey of Defence shipbuilding has been as follows:

Table 6. Orders of the Indian Navy



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Naval Shipbuilding Macro-Environment

Naval and Merchant Ship business have their points of similarities and dissimilarities. There are similarities in their required skillsets. In many ways the two are complementary. The shipbuilder can very well be the same, be it merchant or military. This has been amply demonstrated by China, Italy and South Korea. Naval Ship construction requires cutting edge technology and merchant ship construction requires speed and efficiency. While Naval and merchant ships serve diverse sectors, the technical aspects have similarities. There are some differences in construction philosophies from which lessons can be drawn for each other, and cross pollination can take place.

Production Run

Naval Shipbuilding had embarked on indigenisation decades before the slogan "Make in India" was invented. While Naval Ship Design has matured and DGND is now bringing out **State-of-the-Art** designs, problems in the supply chain for equipment continue to impede growth. This is mainly due to short production runs with a large variety and small numbers. Thus, most equipment, even standard ones like pumps, compressors, valves, junction boxes, are made to order and not mass produced. This problem is accompanied by issues of type approval, which are fraught with inordinate delays and nonstandard products in the Naval inventory. One look at the Naval orders is illustrative.

Project	P 15	P 15A	P 17	P 28	P 17A	LCU	WJFAC	FPVs	ASW SWC
Nos	03	03	03	04	07	08	05	05	08+08*

Table 7. Production Run IN? CG

*02 ASW SWCs are two distinct designs with no commonality.

While many of the above projects have similar hull forms, their equipment fit is distinct. Thus, the effort put in by vendors to type test and develop an equipment does not ensure orders for the future projects. As a result, no vendor has set up a production lines for any Naval equipment. In contrast, the PLA Navy has on order 45 ships of the same class of corvettes. Not surprisingly, this has given equipment manufacturers the necessary incentives to set up robust production lines. As a spinoff, the equipment has found traction in other projects as well.

The Competitive Environment

The Naval Shipbuilding programme in India has moved to a competitive regime, where shipyards starved of orders, are putting in unsustainable bids to stay afloat in the short run. Such desperate measures, in the long run, will be detrimental to the entire shipbuilding ecosystem of the country.

The Chinese Model

A look at the PLA Navy's (PLAN) strategy is relevant for forging India's strategy. Shipbuilding costs are linked to scale which is evident from the PLAN trajectory. The PLAN has since 2008 delivered the 30 Jiangkai II Class Frigate of 4000 tonne displacement out of 50 on order. Parallelly, 41 out of 71 Jiangdao Class Corvettes have been delivered.

The SIPRI estimate of the Chinese defence budget to be USD 254 billion as of 2020 against an Indian defence budget of USD 66 billion. While breakups of the Chinese defence budget are opaque, it is conservatively estimated that the PLAN capital budget is around USD 14.25 billion against USD 3 billion for India. Quantitatively, this difference translates into an annual delivery of 15 major PLAN ships against 2-3 in case of India. It is evident that the conversion ratio of capital to assets for the PLAN is far superior. Tonne for tonne PLAN cost works out to 60% of Indian cost.

Analysis of the reasons for these efficiencies reveal the following:

- **Concurrent Construction:** All Chinese shipyards are engaged in concurrent construction. This allows **cross pollination** of dual use technologies and processes between civil and military applications.
- **Tight timelines:** This is a single most important factor to contain cost. China delivers a frigate at an average time of 3 years compared to India's 8 years.
- Amalgamation of shipyards: Chinese shipyards have been consolidated into the China State Shipbuilding Corporation (CSSC), and the China Shipbuilding Industry Company (CSIC), two mega-conglomerates. CSSC manages shipbuilding activities in the south and east of the country, while CSIC looks after west and north.
- High Local Content: The indigenous content of PLAN ships is around 90%. India

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is very close at 70-80%.

- **Colossal Production Runs:** This has been the single largest contributor to their low cost. The R&D, design, and testing costs of a ship and its equipment are almost equal to one ship. Accordingly, if you build 3 ships, you pay for 4. For the PLAN frigates, this cost is amortised over 50 ships. The arithmetic thereafter is indisputable. Also, equipment manufacturers find a standardised production line sensible, with benefits of reliable quality and shorter production time.
- **Corporatisation of R&D:** In all,28 of the 30 naval and marine R&D institutions in China have been placed under the CSIC. These institutions have developed Gas Turbines, Nuclear Reactors, Diesel Engines, Sonars, Radars, etc. Some of these institutes are even placed inside university campuses and leverage the academia of the country.

From the above one can see the underlying logic of the Chinese model. China created scale and size. Their sizable internal market provided the springboard. They displayed strategic intent and took a "Leap of faith". India also has a sizable internal market, albeit lesser but comparable to China. At present our yards are closing due to lack of orders. A change in the Business Construct will reverse the decline that is brought out in Table 3 above.

Way Ahead

A series of measures need to be put in place to move defence shipyards to the next level.

Amalgamation of Shipyards: At present, shipyards are competing in an adversarial environment to survive. We need to move to a collaborative arrangement, where shipyards pool in their resources and complement their mutual strengths. An enabling environment will be created, wherein shipyards will find it easier to retain their skills and cross-pollination of ideas will get a stimulus. This model has been followed by Italy and China successfully. Both have created a holding company for all the defence shipyards. Shipyards will be able to pool in their efforts in R&D, design, logistics and become leaner and more agile. Spill-over of work can move seamlessly from one shipyard to the next to balance their loading. **Standardisation of Hull forms/ classes for longer product runs**: The Navy should standardise a finite set of hull forms and assign shipyards for each hull form. Orders are placed on benchmarked prices to shipyards having core competencies in the respective class of ships. This should be coupled with larger production runs to achieve economies of scale for both construction and equipment selection. The incremental and marginal benefits of cost, time and labour over the production of 4 ships in a leading Shipyard of the country has been found to be around 30%.

Standardisation of Equipment: In the past, equipment was made to order and specifications in an environment where capacities and capabilities were nascent. Indian industry has made great strides since then. Equipment manufacturers of valves, pumps, switch gear, electrical junction boxes, etc., have created huge capacities. It is time Indian Navy standardises and rationalises specifications of these products so that standard equipment is readily available for ship construction.

Internal Measures - The Micro-Environment

Shipyards themselves need to take certain measures for their own existence, such as:.

- a) Development of Ancillary Industries: While Shipyards traditionally had large manufacturing capabilities in the past, they now need to upgrade themselves from manufacturers to "System Integrators". As a first step, vendor base development with a focus on ancillary industries of equipment should be of primary focus within the ecosystem of each shipyard. The Ministry of Defence (MoD) has also been giving greater focus on this facet.
- b) Development of Service Vendors: An enabling environment within the shipyard needs to be created assiduously, with a focus on service vendors. Vendors need assurance of stable and predictable workload to incentivise them to invest in building capacities and capabilities.
- c) Agile Organisation: Shipyards should now apply an "Agile" philosophy. The cornerstone of an "Agile" organisation is a cross functional team. Shipbuilding, at the end of the day, is a project management exercise in system integration. Compared to a Silo or Line Organisation, agile methodology is relevant for shipbuilding in the sense that it caters for Work Breakdown Structure (WBS) in a dynamic environment.

Commercial Shipbuilding Macro-Environment

The Nature of the Business

Ship production starts with secured orders so that yards do not build up the inventory of ships. Essentially, shipbuilding is a derived industry, and the ship owner needs to find a bankable project, the decision model for a ship order is depicted in Figure 2.



The bottom-line is that Buyers buy capacity or capability, not ships per se. Ships are capital goods and a ship owner prepares a business case to assess the value of the ship. Thus, a purchase decision for a ship is very distinct from an intermediate good. The long lag between an investment decision and asset realisation also poses business challenges. Some of the issues that confront an owner are as follows:

- Economic condition
- Cargo profile and variability in its profitability

- Human capital
- Technology and International Conventions

The South Korean Model

South Korea embarked on a journey of nation building through Ship Construction in the 1970s. A host of measures to create an enabling environment, encompassing legal, policy measures, fiscal and non-fiscal incentives were put in place. The relevant acts promulgated are as follows:

- Shipbuilding Encouragement Act, promulgated in March 1958
- Shipbuilding Promotion Act, promulgated in March 1967
- Machinery Promotion Act, established in July 1967
- Long-term Shipbuilding Industry Promotion Plan, introduced in March 1973
- National Investment Fund (INF), created in the late 1970s
- Rationalization Plan of the Maritime Industry of July 1985
- Enforcement of Rationalization of Management of Shipbuilding Industry, 1989

The fiscal measures put in place are as follows:

- Government subsidies of 30%
- Loans up to 50% of cost of ship at 5%
- No Cabotage! A policy of "Our Cargo in our own Ships" exists to this day

The Case for India

A look at an inverted map of the Indian peninsula is worth a thousand words as can be seen in Figure 3.

The shipbuilding Industry is both capital and labour intensive. A large number of subcontractors are employed in the shipbuilding industry, and they number almost 80% of the entire work force. As per the KPMG report, the labour multiplier for ship

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Figure 3. Our Potential Reach

building is 8.08. To put things in perspective, the Mahatma Gandhi National Rural Employment Guarantee Act (MNREGA) employs 140 persons annually in the 100-day work scheme. In comparison, shipbuilding employs 80 persons in a productive job year-on-year. A comparison of the employment generation with automobile and rural roads is as follows:

Table 8. Employment Generation Possibility

Employment generated by investment of Rs 1 Crore acros	s sectors
Automobile	6
Auto with ancillary	28
Shipbuilding	16
Shipbuilding with ancillary	80
Rural roads	109

There is a strong correlation between World GDP, Seaborne trade and World Active Fleet as indicated in the table below:

Table 9. Correlation between GDP, Seaborne Trade and Active Fl	Table	9.	Correlation	between	GDP,	Seaborne	Trade	and	Active	Flee	t
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Indicators	GDP vs Seaborne	Seaborne trade vs	Active Fleet vs
	trade	Active Fleet	GDP
Correlation	0.94	0.79	0.83

Nations that have built sizable fleets have benefitted. The table 10 speaks for itself.

Tahle	10	Global	shinhuilding	share
Iable	10.	GIUDAI	Shipbunung	Share

Shipbuilding Share (GT)	2015	2016	2017
China	37.24%	33.49%	36.04%
South Korea	35.00%	38.12%	34.42%
Japan	19.00%	20.01%	19.96%
Philipines	2.61%	1.80%	3.01%
Viet Nam	0.85%	0.65%	0.52%
India	0.04%	0.06%	0.15%

The figure 4 encapsulates the essence of the case in a single visual.



Figure 4: Need for Domestic Commercial Shipbuilding

Contours of the Strategy

This brings us to the moot point. Does India need a shipbuilding industry? The answer is not too difficult to find. The disproportionate ratio of cargo being carried by foreign owned ships, the huge coastline of India and the employment generation potential of shipbuilding make a compelling case for a nationwide focussed approach to take the competition in shipbuilding to the market leaders. Table 7 above is illustrative of the compelling employment generation potential of ship building vis-à-vis various industries reasons. It is, therefore, imperative that we devise a strategy to reach that goal.

Where to Compete

Having decided on forging ahead, there is a need to identify the market that the industry can serve. For a start we need to target the low hanging, i.e., Indian companies for Coastal Cargo and Inland Cargo. Coupled with a thrust on higher share of the overall cargo (from present 6% to 30%) this will create huge economies of scale and attendant lower costs. Thus, Indian products will start becoming attractive in the international market. For example, as the automobile sector started to service the domestic market, the huge economies of scale and competition elevated Indian automobiles to the international market, The same strategy can be replicated for ship-building. A "leap of faith" needs to be taken

Product Mix

Ship production starts with secured orders so that yards do not build up inventory of ships. Buyers buy capacity or capability, not ships per se. Ships are capital goods and a ship owner prepares a business case to assess the value of the ship. Thus, a purchase decision for a ship is very distinct from an intermediate good.

The fact that ships are non-standard has been the bane of the shipbuilding industry. It is necessary to promote a few standard designs (2 tankers, 2-3 bulk carriers, 2-3 container). The benefit of a standard design is that not only the structure is standardised, the equipment fit also gets standardised. As a result, long term visibility of orders and hence significantly lower costs can be achieved. Shipbuilders can erect a pipeline of downstream equipment at lower cost and timelines also. At present we have a laissez faire regime, where the ship parameters and equipment fit are not standard. The cost as a result is atleast 40% higher with attendant higher timelines. This is highly relevant

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because a new equipment will also have requirement for Type testing, which is a longdrawn affair. Type testing requirement is redundant for a proven equipment. We r do not propose barring non-standard designs, but want to promote the case for standard designs offered at a very competitive cost. Owners can opt for a tailor-made design, albeit at a premium price. This strategy was adopted also by China. Flagging ships in India should be mandated for all Coastal cargo to create a sizable volume for Indian Ships.

To make a beginning, it is worthwhile to look at the replacement market in India. The total tonnage above 24 years is 1 million GRT, at present. The number of ships that will be required to be replaced in the next 10 years is over 700. Considering an annual growth rate of 4%, this will translate to 136 ships per year and a total cost of Rs 58,3940 million. To meet International Benchmark timelines, it is prudent to **standardise**

- 02 designs of Bulk Carriers (say,15,000 and 30,000 GRT) with equipment fit
- Oil tankers each (say, 15,000 and 30,000 GRT)
- 01 design of Container ships (say, 400 TEU)

This will create sizable economies-of-scale and will have a spill-off effect in the downstream equipment OEM ecosystem.

Coastal Shipping

India has 111 National Waterways. Nine are more than 500 kms long, and 38 are over 100 kms. NW1 is around 1600 km long. A minimum depth of 2 mts is maintained throughout. Thus, inland vessels of around 1000 DWT can ply unrestricted round the year. Challenges of 18 pontoons exist, which need to be addressed. With all these challenges this system carried 32 million metric tonnes in Apr -Jul 21 as per Inland Waterways Authority of India (IWAI) records. That is 3% of inland cargo. IWAI targets inland cargo to increase to 200 million tonnes per annum, which is a very low benchmark. The paper advocates benchmarking with the European and China percentage to reach 30% of inland cargo. Therefore, inland and coastal or Short Sea shipping is another sector that will play a transformational role in this endeavour. A comparative table of

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the multimodal mix of India, China and US are as follows:

Mode	India %	China %	US %	Target for India
Coastal	6	30	14	Target set to achieve 12% by 2025
Road	57	22	37	40% road freight rides on 1.4% of national highways
Rail	36	47	48	Already at full capacity
Air	1	1	1	Specialised cargo

Table 11. Multimodal Mix of India, China, and US

The operational costs of shipping are Rs 0.75 per ton-km as against Rs 1.18 for rail and Rs 1.31 for road. The product mix that is amenable or transportation by river or sea are the following:

- Minerals
- Grain
- Bulk commodities Fertilisers, Cement, steel
- Product fuel
- Vehicles 2-Wheeler (W), 3W, 4W

Coastal/ Inland riverway cargo can potentially jump from 6% share to 20% share. This translates to 300 million metric tonnes per annum (MMTA) from the present day 107 MMTA in the next 5 years.

Fiscal & Policy Measures

Several bold financial initiatives will have to be taken as a leap of faith for Indian Built and Indian Flagged ships. To name a few:

- Create a Shipping ecosystem focussed capital market to sustain financial assistance and subsidies. The Naval Financing model provides a series of milestone-based stage payments that match the cash flow of the shipyard. This will significantly unburden the requirement of debt financing for shipyards.
- Low interest ship financing schemes.

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- Commercial bank loans underwritten by the government
- Subsidies and shipyard credit
- Create a lease finance model to rival the Norwegian and Chinese offers.

Environmental Measures

India has demonstrated its ability to steer successful models by way of Central Authorities working in mission mode. The National Highways Authority of India (NHAI) and the Airports Authority of India (AAI) are shining examples of creation of world class infrastructure, be it Airports or Highways with a nation-wide footprint. Accordingly, the paper proposes an Integrated Shipbuilding and Shipping policy which will be "A whole of government approach" to coordinate between builders, users and owners. Create a mother special purpose vehicle (SPV), say, National Shipbuilding Corporation to subsume the role of the CSSC for the entire Shipbuilding ecosystem. This organisation will be the central repository of design and specification for Indian ship design and specifications to create a shipbuilding pipeline. A model relationship matrix is as follows:



Figure 5: Model Organisation Matrix

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- Declare Shipbuilding a strategic sector with clear goals and mission.
- Harmonise with other National programmes like Sagarmala, Make in India, Atmanirbhar Bharat, etc.
- Develop human capital under the aegis of "Skill India" to create a pool of "tradesmen".
- Benchmark efficient yards to weed out inefficiency.
- Immediate stop to the liberal cabotage environment and operationalise the mantra of "Indian Goods in Indian Ships".

Conclusion

The merchant shipbuilding situation in the present form is disorderly, even chaotic. Under such circumstances, it is expected that orders would be scarce. Whenever a new order is received, the entire design and equipment/ component selection process starts *ab initio*. As a result, the setup cost of construction of both ship, components and equipment is higher by a figure of almost 40%. In the military shipbuilding scenario, while order visibility exists, each production run is 4-8 ships against the Chinese practice of 50-70 ships. This robs the Indian shipbuilders, the benefits of scale. Thus, Indian shipbuilding loses business, and the country is unable to create jobs.

Shipbuilding, besides contributing to the National Industrial Capacity, is an immense employment generator with positive effects on the upstream and downstream integrated ancillaries, MSME and Technology clusters. It also affords the country with an opportunity as an Engine for absorption of Capital and Technology. However, the Fixed Assets and infrastructure in shipbuilding are so specialized, that their usage outside the industry are limited. In effect their market value is for less than "In Use value".

There is, therefore, a need to mould the Shipbuilding Industry in suggested directions for development and nation-building. The assets need to be continuously exploited to accrue the benefits of scale. There is, therefore, a need to adopt a unified and systems approach to align the entire Indian maritime construct to realise "the AtmaNirbhar" ethos. Learnings from the Korean and the Chinese strategies it is essential to give a clear way ahead to achieve this goal. The Korean example for taking up Shipbuilding as a National Initiatives to develop the Backbone Industry in a concerted and systematic manner is worthy of emulation.

An impetus to the Shipbuilding Industry given its significant efficiencies compared to Road, Rail and Air and potential to increase in the Model Split of transportation percentage, underline significant advantages. Initial steps on "Cabotage Laws" akin to the "Jones Act" of the USA would ensure that all Indian Cargo is moved on Indian Flagged, Indian Built and Indian Manned and have a salutary effect in the Indian Shipowners. Concurrently, development of the "Evergreen Ship Repair Industry" and transforming the over 13 major and 176 minor ports into Ship Repair Hubs would generate employment and create Engines of Growth.

Setting up of an empowered authority for the management of Shipbuilding in the country-- both Commercial and Defence-- and for coordinating collaboration between the Ministry of Shipping (MoS) and the Ministry of Defence (MoD) would enable focused attention. This would enable identification of policy initiatives to regulate and sustain the industry and ensure leveraging of capacity, capability, crossfunctional collaboration in the areas of R&D, Training, Manpower Development and innovation / patents.

Constitution of a National Shipbuilding Authority of India by an Act of Parliament would bring all stakeholders under one umbrella and deliver a unified and powerful vision for the future. The general guidelines would be akin to the successful NHAI/ AAI models. The proposed NSAI would :

- a) ensure compliance of the Cabotage Laws for India
- b) ensure repairs of all Indian flagged vessels would be done in Indian Yards
- c) have the power to raise capital by issuing Bonds in the Capital market.
- d) Use the capital raised to fund / place orders with Indian Shipyards to build military commercial vessels. These vessels would be sold/marketed by the NSAI to friendly countries as per the MEA's advice for Military vessels. The fund would also:
 - i) Fund research and development (R&D) and also draw relevant lessons from the Japan, Korea, Vietnam and China models.
 - ii) Set up dedicated marketing offices overseas.
 - To summarise, the following figure encapsulates the vision for the National

Shipbuilding Authority.

Figure 6: Role of Ship building Authority



Cabotage
Financing Support
Ship Repair eco system
R&D
International Lessons Learnt
Japan Korea, Vietnam and China models

The paper does not argue that attaining commanding heights in Shipbuilding is a policy click away. The journey will be a graded process. The increasing prices in global shipbuilding that we are now witnessing reflect improving global sentiments. The Baltic dry index is already at 4000 +. In this backdrop the domestic potential will be 1.5 million DWT annually for the next 10 years, taking into account the replacement market and a modest 12% growth in inland/ coastal cargo. Thus, the confirmed domestic requirement is 15 million DWT. The Naval orders will add a further 1 million CGT to the pipeline. Put together, the internal market is comparable to the Global top 5 order books. An efficient and robust internal market has the potential to lay the foundation for success in the export market, in the same manner as was created for the passenger car sector.

This paper has argued that the strategy described is the appropriate way to change the moribund state of domestic shipbuilding. The potential opportunities that lie both in terms of value addition as well as employment creation can make this sector the new sunrise industry where Indian manufacturing is concerned. The short-term targets that would enable India to achieve its longer term mission would be to increase its global share in shipbuilding to 5% and repairs to 10%, raise the Indian flag fleet to carry 30 million GRT, and create 2.5 million jobs in this process.

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