Perspective plan for Port-led Industrial Development of the Coastal Economic Clusters

May 2016

CONTEXT

The Sagarmala initiative was conceived by the Government of India to address the challenges and capture the opportunity of port-led development comprehensively and holistically. Sagarmala is a national programme aimed at accelerating economic development in the country by harnessing the potential of India's coastline and river network.

A Strategy & Programme Management consultant ("the Consultant") was appointed by Ministry of Shipping, Government of India/ Indian Ports Association for conducting Sagarmala study. Table 1 below lists down the deliverables to be submitted during the course of the study.

Table 1

S.No	Deliverable
1	Inception report depicting the methodology, variances if any, timelines, work plan
2	Draft report on cargo traffic projections & logistics bottlenecks
3	Final report on cargo traffic projections & logistics bottlenecks
4	Draft report on capacity enhancement / shelf of projects (including report on National Multi-Modal Transportation Grid) with high level cost estimates for major ports
5	Final report on capacity enhancement/shelf of projects with high level cost estimates for major ports
6	Report on identification of sites for new port development
7	Report on government imperatives including financing plan
8	Report on PMO structure
9	Perspective plan for Port-led Industrial Development of the Coastal Economic Clusters
10	Draft Final Report covering all elements
11	Final report based on stakeholder consultations

This report focuses on deliverable 9 – Perspective plan for Port-led Industrial Development of the Coastal Economic Clusters. This report covers parts of Section G of Terms of Reference (TOR). Extracts from TOR pertaining to this deliverable are highlighted below in Table 2.

Table 2

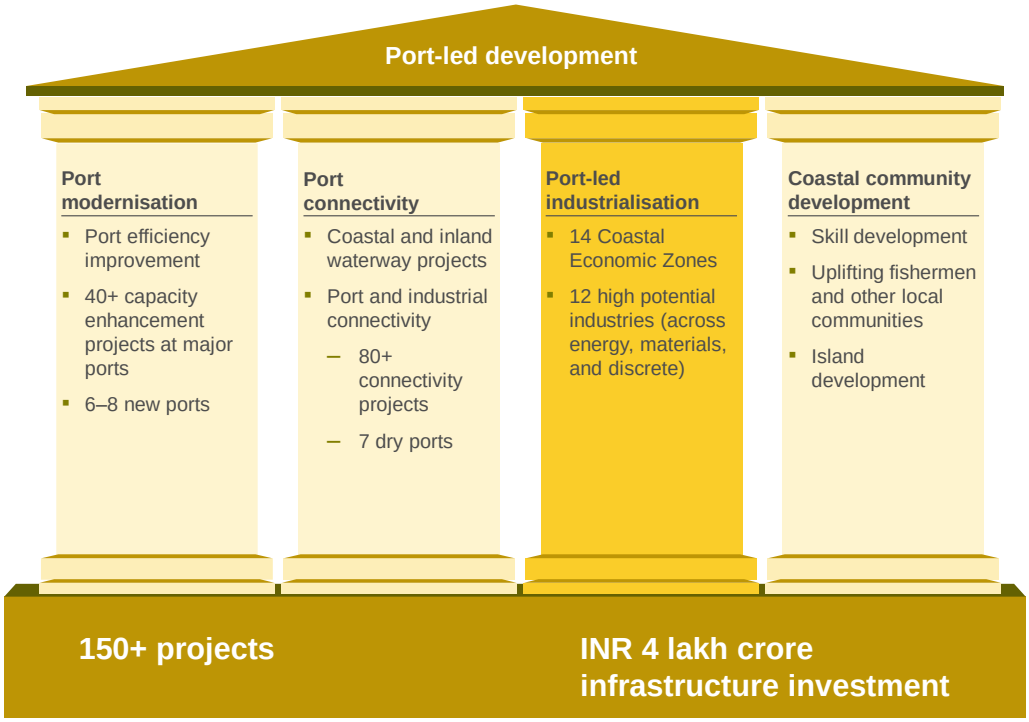
	Scope of work	Deliverable
1	Map out the economic and industrial base of the immediate hinterland of the port (i.e a radius of 100 KMs) or the "Coastal Economic Clusters"	This has been covered in the section 1.4 of this deliverable
2	Identify the potential impact of the port development plans on the industrial landscape of the Coastal Economic Clusters	This has been covered in this report in individual sections of the high potential industries
3	Identify industries that have high potential for growth and job creation based on competitive advantage of the Coastal Economic Clusters and port dependencies	The selection of high potential industries has been covered in the section 1.3 on discrete manufacturing industries

1. Perspective plan for Port-led Industrial Development of the Coastal Economic Clusters

Port-led industrialisation is the third pillar of the port-led development model (EXHIBIT 1.1). Ports play a crucial role in reducing domestic logistic costs and facilitate EXIM oriented manufacturing by reducing logistics time and variability. Many countries with large coastlines like China have leveraged ports for aiding industrialisation.

EXHIBIT 1.1

Sagarmala: Port-led development



An integrated and comprehensive plan for port led industrialisation has been developed which combines the growth potential of port-linked industries with the competitive location for each industry. These locations have also been mapped to the relevant major and non-major ports in the region which can most optimally facilitate the movement of cargo from the industrial locations. Reduction in overall logistics cost has been the overarching rationale for shortlisting industries and locations for port-led industrialisation. The different industries under port-led industrialisation can be classified under three archetypes: energy, material and discrete manufacturing.

Oil refining and thermal power plants are the main industries that come under the energy archetype of port-linked industries. Similarly, under materials, steel and cement constitute the major part. This study identifies six discrete manufacturing sectors (including automotive) as high potential after the three-step evaluation process.

Overall twelve major industries covering energy, material and discrete manufacturing have been identified for port linked industrialization. Invested capital, gross value added, and direct employment have been estimated using the Annual Survey of Industries. Investment required in land and supporting infrastructure (like roads, utility provision, etc.) for the proposed industrial parks is based on Indian benchmarks. Based on the calculations, there could be potential to generate around 40 lakh new jobs and INR 7–8 lakh cr investment from the industry (Table 1).

Table 1

	Proposed industrial clusters	**Investment in land** (INR cr)	**Investment in basic infrastructure** (INR cr)	**Potential industrial investment** (INR cr)	**Employment potential** (lakh)	**Incremental GDP** (INR cr)
Energy	2 refinery and petrochemical clusters	7,200	1,200	45,000	0.1	20,000
	4 gas-based petrochemical clusters	1,500	250	16,000	0.3	5,500
	3 coastal power clusters	20,000	3,500	75,000	0.2	15,000
Material	2 steel clusters	18,000	3,000	1,35,000	2.5	80,000
	2 marine clusters	6,000	1,000	40,000	2.5	10,000
	2 cement clusters	1,300	200	50,000	0.1	9,000
	1 automotive cluster	4,000	700	55,000	2.5	25,000
Discrete	2 food processing clusters	4,300	700	50,000	3	9,000
	2 science and technology clusters (electronics, instruments)	6,000	1,000	1,40,000	7	60,000
	3 apparel clusters	8,500	1,500	50,000	10	20,000
	3 leather and footwear clusters	5,000	1,000	25,000	6	13,000
	3 furniture clusters	6,000	1,000	60,000	4.5	20,000
	Total	**~85,000–90,000**	**~12,000–15,000**	**~7,00,000–8,00,000**	**~40**	**~3,00,000**

The port led industrialisation program would be delivered through Coastal Economic Zones (CEZs) and industrial clusters. Coastal Economic Zone is an important aspect of the Sagarmala program and will be the main vehicle for kick-starting port led industrialisation in India.

Within each CEZ, there will be multiple industrial clusters categorized under energy, material and discrete industries. Competitive locations for these industries have also been shortlisted with the aim to reduce the overall logistic costs. Other factors of production that impact competitiveness like availability of raw material and skills, supporting infrastructure and existing industrial agglomeration have also influenced the selection of locations. This has been broadly aligned with state industrial plans. Similarly, existing and proposed ports that can most optimally serve the proposed industrial locations, have been mapped.

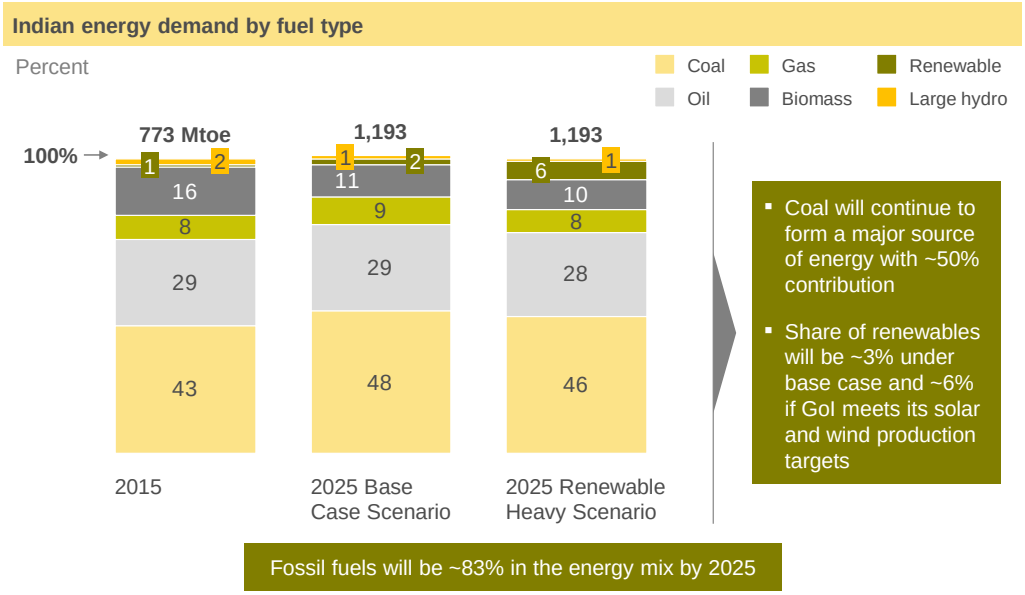
Hence, major and non-major ports, industrial units and evacuation infrastructure have been linked into a single system at a regional level through the concept of CEZs. A CEZ would typically comprise a few coastal or coast proximate districts, and would constitute a planning unit to align various infrastructure elements within the CEZ. The exact districts covered under the CEZ could evolve.

1.1 Energy industries

India's energy demand is estimated to grow from 773 MTOE in 2015 to about 1,200 MTOE in 2025. Coal, Oil and Gas are expected to remain central to the energy supply mix with coal at 46 to 48 per cent and oil and gas combined at 36 to 38 per cent (EXHIBIT 1.2).

EXHIBIT 1.2

Projections for India's energy supply mix over next 10 years



Nuclear is less than 0.5%
1 MTOE – mn tonnes of oil equivalent – The amount of energy released by burning one MT of crude oil
2 Renewables include small hydro, solar, wind and biomass

SOURCE: IEA website; bottom up forecast

1.1.1 Oil and gas

Opportunity for India

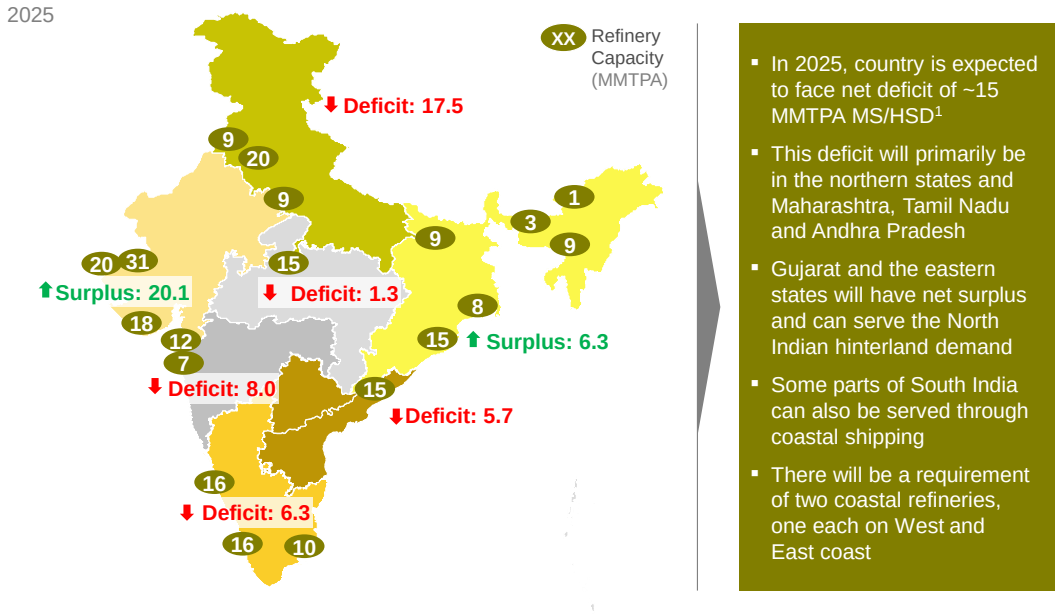
As discussed in chapter 1, India's current oil refining capacity is ~219 MTPA. With refining expansion projects already announced, the capacity is estimated to increase to around 280 MTPA by 2025. Of this, 30 MTPA is earmarked for exports from SEZs. Hence, only 250 MTPA may be available for serving domestic demand.

Demand for petroleum products is estimated to grow to ~270 MTPA creating a shortfall of 15–20 MTPA for MS/HSD (EXHIBIT 1.3). Based on the analysis of regional MS/HSD flows, this deficit will primarily be in the North Indian states along with Maharashtra, Tamil Nadu and Andhra Pradesh. Gujarat and the eastern states will have net surplus and can serve the North Indian hinterland demand. Some parts of South India can also be served through coastal shipping.

Two coastal refineries of ~10 MTPA may be required to serve the deficit in the country, one each on the West and East coast. These could be developed as port-based energy and petrochemical complexes. Prioritising coastal areas for setting-up new refineries will help to reduce logistics cost as most of the crude processed in the Indian refineries is imported through ports.

EXHIBIT 1.3

By 2025, India may face ~15 MMTPA MS/HSD deficit which may require construction of two greenfield refineries

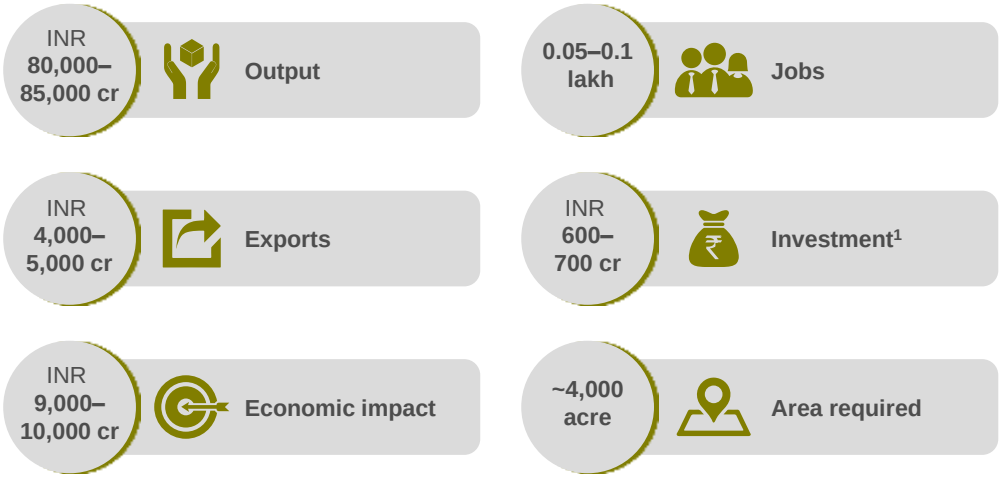


1 Assumes RIL Jamnagar and Essar Oil export nothing while Reliance SEZ exports 100% product

Coastal refineries will also enable setting-up downstream petrochemical sectors as Naphtha produced from the refineries could be used as a feedstock for petrochemical production. While deficit in Andhra Pradesh could be met through the product pipeline, greenfield refineries could come up in Southern Maharashtra and Southern Tamil Nadu. The potential impact from setting up a 10 MTPA greenfield refinery housing petrochemical manufacturing is shown in EXHIBIT 1.4.

EXHIBIT 1.4

Potential Impact from each refinery and petrochemicals cluster



1 Investment includes only internal roads and provision for water, sewage, electricity and land levelling

1.1.2 Petrochemical clusters

Opportunity for India

The consumption of petrochemicals has risen at a consistent rate of around 6 per cent in the last few years. Demand in 2006–07 was ~22 MTPA which rose to around ~33 MTPA in 2013–14. Polymers has been a mainstay of this demand with a consistent share of around 25 per cent. The category has recorded a growth of 8 per cent over years. Performance plastics, although a small category, grew at the highest rate of 12 per cent in this timeframe

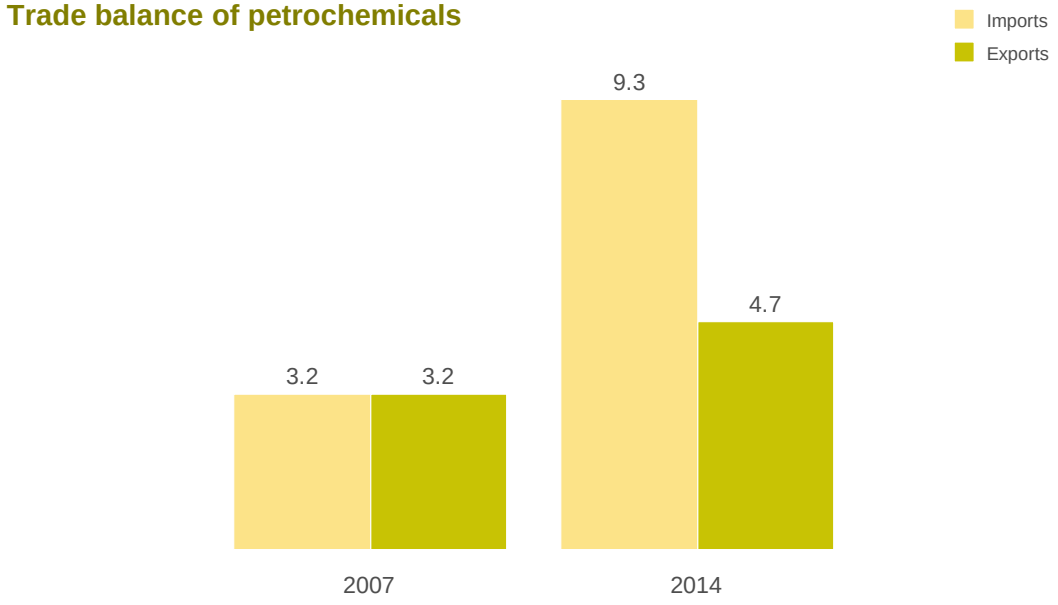
Petrochemical demand is strongly correlated to GDP growth in the country. If India's GDP grows by 6 to 7 per cent over the next 10 years, the demand for petrochemicals could be in the range of 60 to 70 MTPA by 2025.

In 2013–14, total installed capacity for petrochemicals production was around 33 MTPA. Operating at around 85 per cent capacity utilisation, the country produced around 28 MTPA of petrochemicals in 2013–14, an increase from 21 MTPA in 2006–07.

The rising gap between domestic demand and production of petrochemicals has increased India's dependence on imports. It is interesting to note that from zero trade balance in 2000, India's net trade balance in petrochemicals in 2014 was negative at around 4.6 MTPA (EXHIBIT 1.5).

EXHIBIT 1.5

Trade balance of petrochemicals



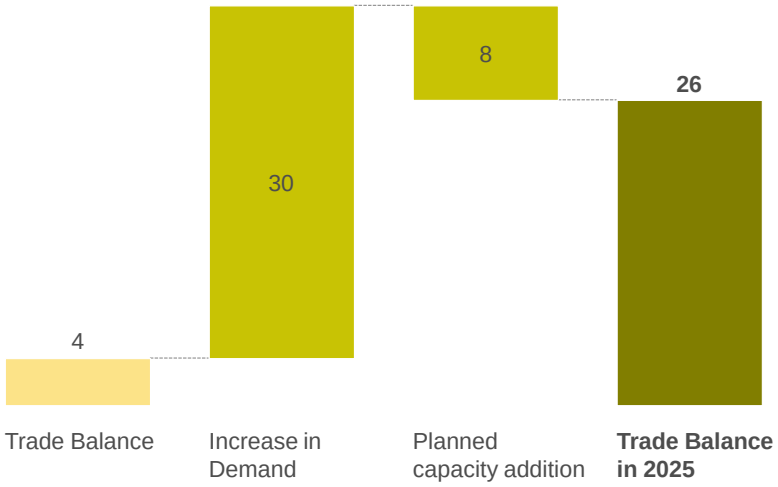
SOURCE: MLCPCSTAT14

Planned capacity expansion

It is expected that around 8 MTPA of petrochemical production capacity may be commissioned in the next 10 years. As mentioned earlier, the demand of petrochemicals might rise to around 60 MTPA and production might rise to 40 MTPA in the optimistic case. It is evident that India may require significant capacity addition or else the import dependence will further increase. Around 25 MTPA of additional production capacity may be required to eliminate country's import dependence for petrochemicals (EXHIBIT 1.6). The competitiveness of these plants will need to be carefully examined under various feedstock price scenarios.

EXHIBIT 1.6

Trade balance in 2025 with planned capacity addition



SOURCE: MLCPCSTAT 14

Feedstock for petrochemicals

Petrochemical plants use naphtha or gas as feedstock. Some plants are purely naphtha or gas-based, while others use dual feed.

Availability of naphtha: India produces around 18 MTPA of naphtha which is around 8-10 per cent of refinery crude throughput capacity. Some of the domestic consumption of naphtha happens in petrochemical plants with the balance being used as a feedstock for power generation, fertiliser plants and refineries. As Indian refineries expand capacity from the current ~220 MTPA to ~280 MTPA in 2025, the amount of naphtha produced domestically may grow to ~25 MTPA and ~20 MTPA of it can be used for petrochemical production in the optimistic case. With additional petrochemical plants coming up, the export of naphtha seems unlikely, as most of it may be used in domestic production of petrochemicals.

Availability of gas: Domestic gas production was around 25 MTPA in 2013–14 and no significant increase in supply from domestic sources is expected in the near future. There is currently ~20 MTPA of operational terminal infrastructure for re-gasification of LNG imports at Dahej, Hazira and Dabhol with another 5 MTPA awaiting pipeline connection at Kochi. Projects of around 45 MTPA capacity have been announced to come in the next 10 years.[1]

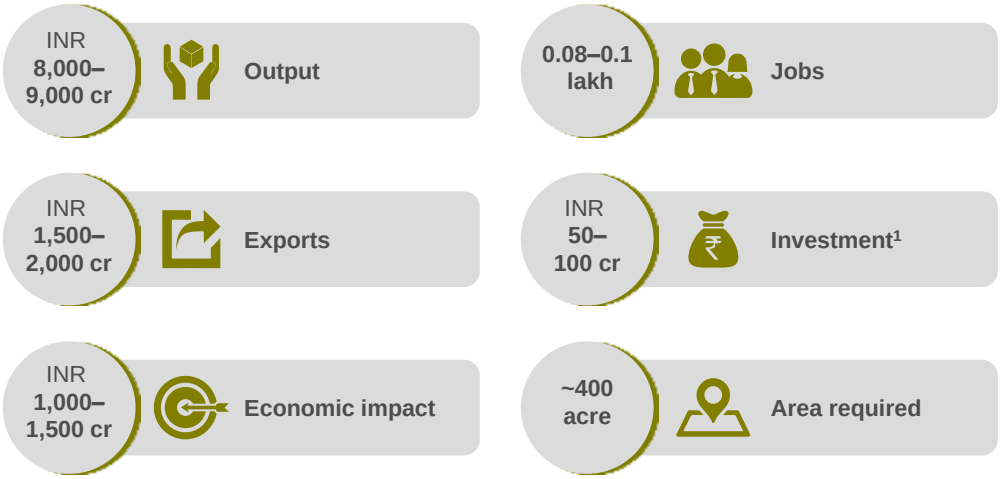
Based on the above assessment, the incremental capacity of petrochemical plants could be set up in locations where greenfield refineries are coming up (Maharashtra, Tamil Nadu) and at locations where LNG import terminals are coming up (Mundra, Mangalore, Kakinada and Ennore).

The potential impact from a ~1 MTPA petrochemical plant is shown in EXHIBIT 1.7.

[1] Natural Gas Infrastructure in India - 2030

EXHIBIT 1.7

Potential Impact from each gas-based petrochemicals cluster



1 Investment includes only internal roads and provision for water, sewage, electricity and land levelling

1.1.3 Thermal power complexes

Opportunity for India

India's demand for coal in 2014–15 was around 850 MTPA, primarily from coal-fired power plants. With installed capacity of more than 250 GW, there was a peak deficit of around 5 per cent[2]. Power demand in the country could reach 280 GW by 2020. If power reforms are successful and there is mass electrification, then due to the "24x7 power to all" the peak demand could be higher. While there is a push towards renewable energy and significant capacity addition is planned under solar and wind projects, coal-based thermal power plants may still continue to meet more than 70 per cent of the country's power requirement.

Tamil Nadu and Maharashtra are both industrial states with high power demand. Maharashtra has the highest consumption in the country with ~138 bn units, while Tamil Nadu's consumption is ~93 bn units. As both the states continue to dominate the urban and industrial landscape of the country, the power demand is expected to witness a steady growth for the next 10 years. Significant capacity expansion in these states may be required—power demand in Maharashtra is likely to reach around 400 bn units by 2025, while Tamil Nadu's demand may be close to around 300 bn units.[3]

Pithead plants are more economical as it is cheaper to wire the power than transporting thermal coal from the minehead to plants near the demand centres. However, capacity may also be set up within the respective states with coal being transported. South Eastern and Mahanadi coalfields are expected to account for bulk of the growth in coal production. Coastal power complexes can leverage the coastal shipping of thermal coal from MCL to significantly reduce the logistics cost which could be as high as 30 per cent of the cost of power production.

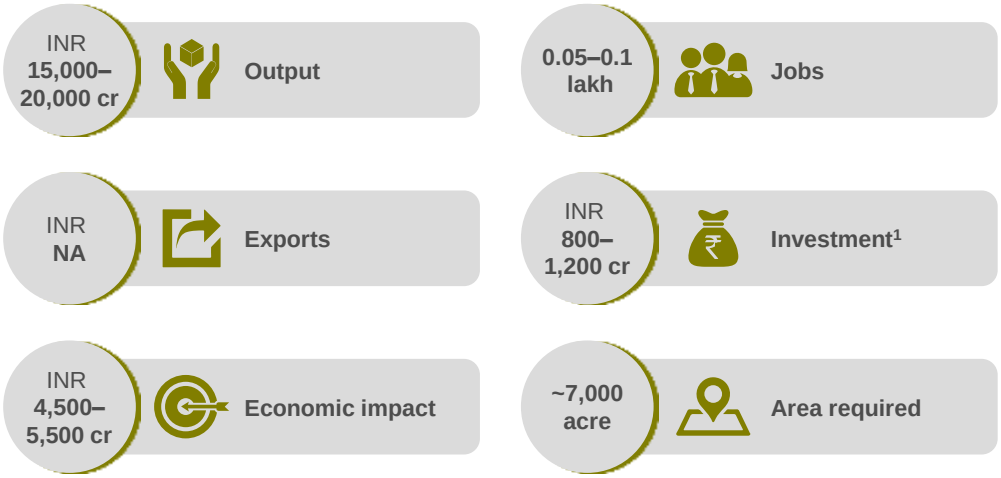
2 CEA

3 CEA data used for projections

Tamil Nadu is already a successful model, with plants at Tuticorin, Ennore, and Chennai leveraging coastal shipping. Southern Andhra Pradesh also leverages coastal shipping through its power complex in Krishnapatnam. Logistics cost of transporting thermal coal through rail-sea-rail route is around 40 per cent cheaper than the rail only route. Power plants located at coastal locations benefit the most from the difference as the cost of last mile transportation is minimal. Sirkazhi in Tamil Nadu, Vodarevu in Central AP and Vadhavan in Maharashtra could be the potential locations for building power complexes to support the power demand of these states. Coastal power complexes also have the natural advantage of access to water. The potential impact from a 5 GW power complex is shown in EXHIBIT 1.8. Some of these are already under planning.

EXHIBIT 1.8

Potential impact from each power cluster



1 Investment includes only internal roads and provision for water, sewage, electricity and land levelling

1.2 Material industries

India could reduce cost of logistics by 25 to 30 per cent for serving the coastal demand of construction materials, e.g., steel and cement. While the traditional model of setting up capacity for these has been close to the hinterland, a part of the future capacity could be developed in coastal regions. Coastal steel clusters can have a multiplier impact on downstream sectors, e.g., shipbuilding and automotive.

1.2.1 Cement clusters

Industry overview

India's cement industry has grown from 160 MTPA capacity in 2004 to 362 MTPA in 2014. India is now the second largest global producer of cement. While the global cement market is on a downturn, the cement demand in India is projected to grow to 700–800 mn tonnes by 2025 under the base case scenario of GDP growing at 7 to 8 per cent per annum[4]. One tonne of cement requires 2 tonnes of raw materials. Volume of material to be transported for the cement industry may reach 1.6 bn tonnes by 2025. Logistics contribute about 25 to 30 per cent of the cost for cement. Logistics efficiency is critical for making existing capacity more competitive (EXHIBIT 1.9).

4 CMAI, International Cement Reviews

EXHIBIT 1.9

Logistics is the largest cost item in the cement industry

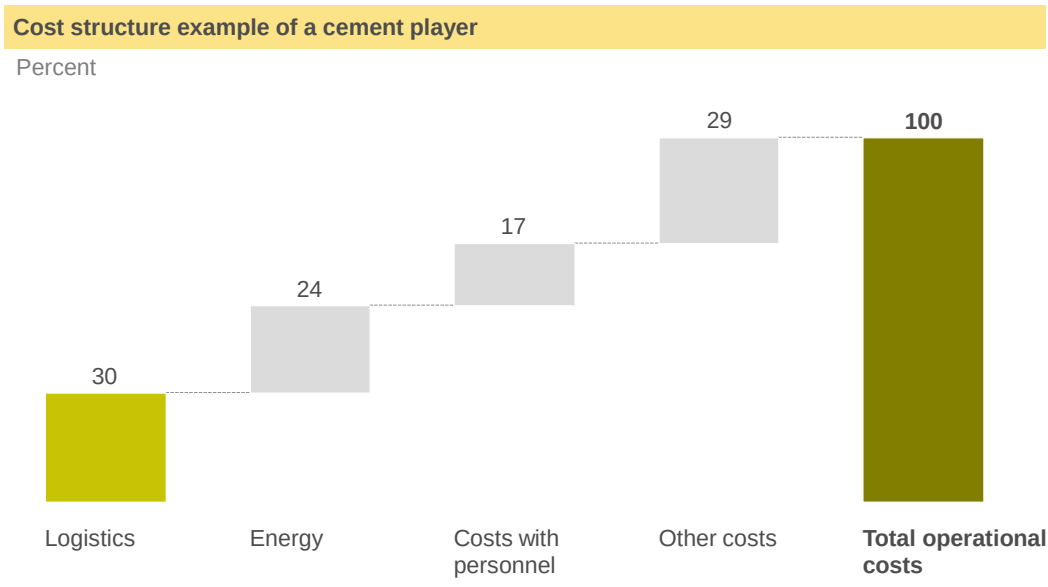
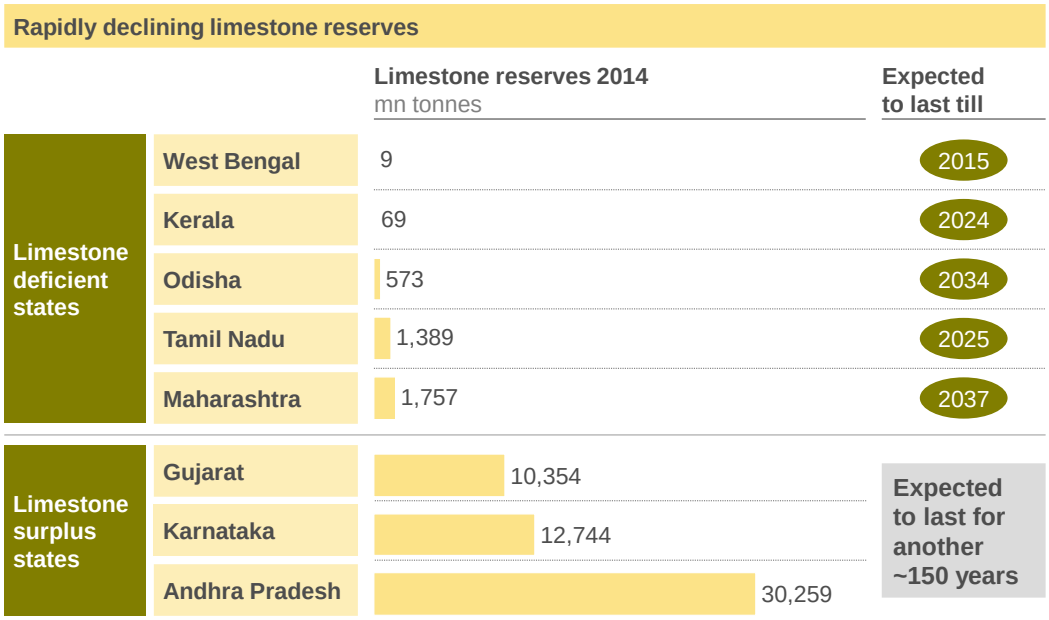


EXHIBIT 1.10

Limestone reserve mapping for maritime states



SOURCE: International cement review, Planning commission report

Opportunity

The traditional mode of setting up cement capacity in India has been inland plants located close to limestone reserves. EXHIBIT 1.10 shows that five coastal of states West Bengal, Kerala, Odisha, Tamil Nadu and Maharashtra have limited and declining limestone reserves. On the other hand, Andhra Pradesh, Karnataka and Gujarat have excess limestone reserves that can support future capacity development.

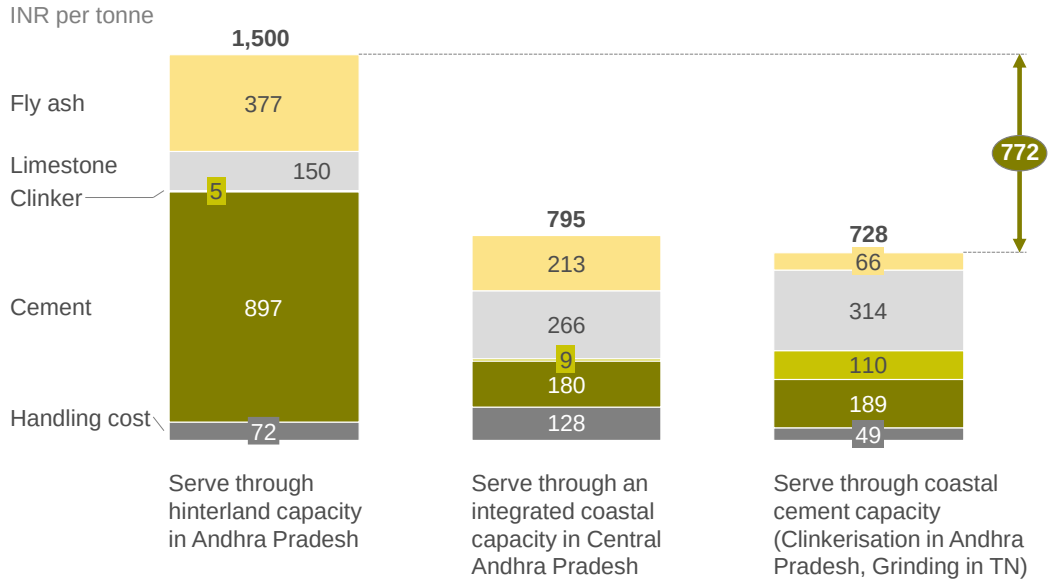
Cement demand in the limestone deficient coastal states is expected to grow to 190 mn tonnes in 2025 from the current 86 mn tonnes. Of ~100 MTPA of additional capacity required, 40 MTPA could be through coastal clinkerisation clusters in southern Gujarat and central Andhra Pradesh, with grinding units at ports close to demand centres, e.g., Mumbai, Cochin, Chennai/Ennore, Kolkata, etc. This configuration could save INR 700-800 per tonne (10 to 15 per cent of total delivered cost of cement) compared to serving this demand through hinterland plants located close to limestone reserves. The savings are driven by lower cost of fly ash and cement transport to demand centres (EXHIBIT 1.11).

By 2025, this 40 MTPA coastal cement capacity could be expected to save around INR 2,500 cr per annum in logistics cost. Based on the mapping of limestone reserves in India, two possible locations for setting up these clusters could be considered. In Gujarat, Kutch, Junagarh and Bhavnagar are districts with the highest limestone reserves. In Andhra Pradesh, Guntur, Nalgonda, Kurnool and Cudappah are districts with the highest limestone reserves. These clusters could host the clinkerisation units while receiving ports could host the grinding units (EXHIBIT 1.12). The potential impact from a 20 MTPA cement cluster is shown in EXHIBIT 1.13.

EXHIBIT 1.11

Coastal cement plants provide logistics cost saving of ~INR 700–800 per tonne

Cement logistics cost for serving limestone demand in Chennai beyond 2020



SOURCE: DGCIS data – 2013-14

EXHIBIT 1.12

Gujarat & Central Andhra Pradesh are potential locations for coastal cement clinkerisation clusters, with grinding units near demand centres

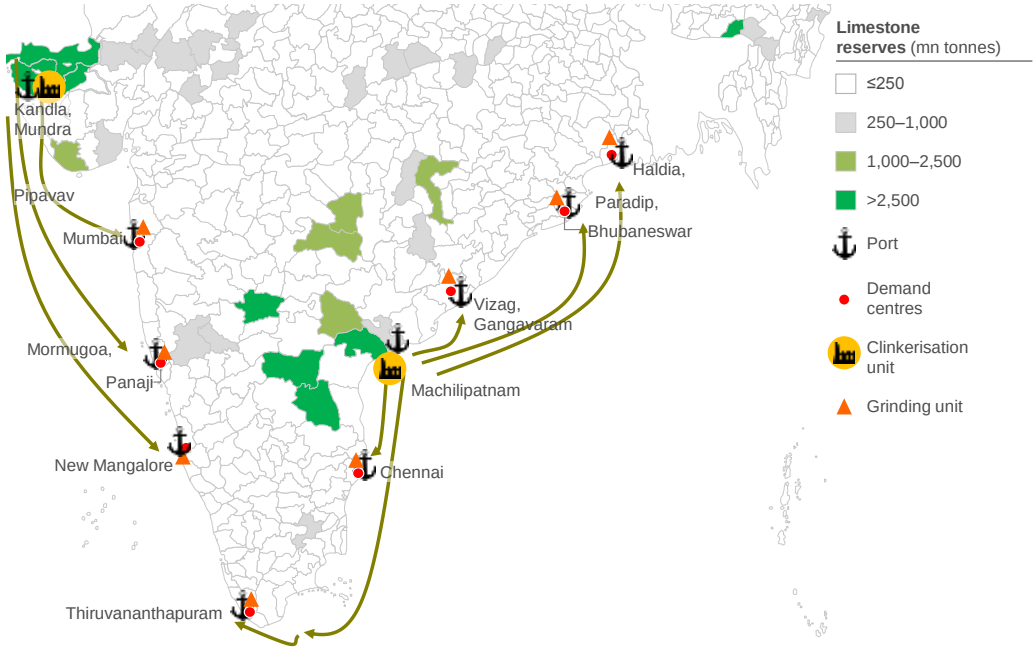
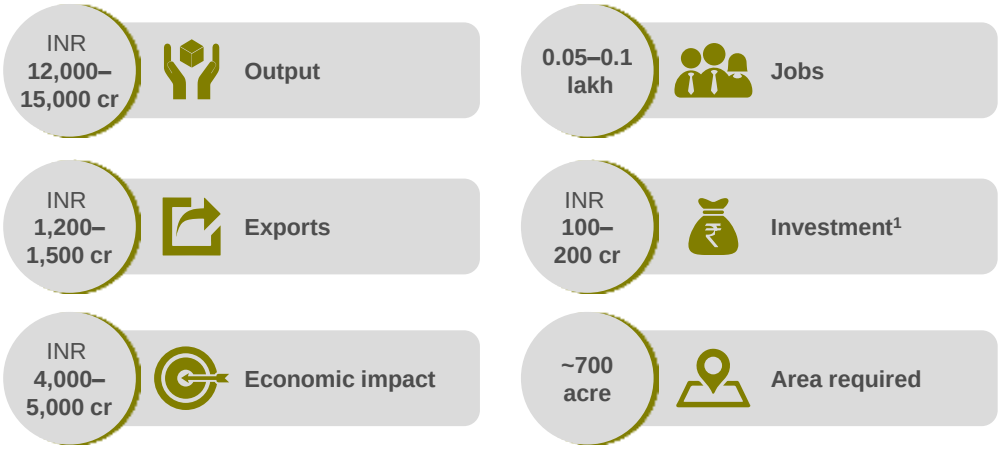


EXHIBIT 1.13

Potential impact from each cement cluster



1 Investment includes only internal roads and provision for water, sewage, electricity and land levelling

1.2.2 Steel clusters

The traditional pattern of setting up steel capacity in India has been hinterland plants located close to iron ore reserves. Of the current 103 MTPA steel capacity, ~85 MTPA follows this model. About 16 MTPA capacity is coastal, of which 3 MTPA is located close to iron ore reserves (e.g., RINL Vizag) and 13 MTPA is located close to demand centres[5] (e.g., Essar Hazira and JSW Dolvi) (EXHIBIT 1.14).

International examples of large coastal steel clusters include Pohang in South Korea which benefit from logistics cost saving, flexibility in sourcing raw material, and better linkage with global markets. About 75 per cent of the total steel capacity in South Korea is coastally located. India could aspire for 25 to 30 per cent of its steel capacity to be coastal by 2025. This could entail setting up new coastal capacity of ~40 MTPA. Coastal steel plants located close to iron ore reserves connected via a slurry pipeline could, on average, save INR 900 per tonne. Coastal capacities near demand centres could be even more cost effective (EXHIBIT 1.15). Based on demand projections till 2025, two new 20 MTPA capacity steel clusters could be developed and existing coastal clusters could be further advanced.
40 MTPA of coastal steel capacity could save around INR 3,500 cr per annum in logistics cost by 2025 compared to setting up new capacity close to iron ore reserves. These savings are on account of:

- **Minimised inland logistics for coking coal:** Saves INR 1.5 per tonne-km due to import of coking coal directly at steel plants
- **Reduction in steel transportation through coastal shipping:** Saves INR 1.30 per tonne-km in steel transportation due to coastal shipping
- **Use of new technology (slurry pipelines):** These offer a low cost method of transporting iron-ore fines from mine to coast – INR 0.70 per tonne-km compared to INR 1.50 per tonne-km for rail. In addition, pelletisation at the dispatch port location also leads to valuable iron-ore fines being utilised for domestic production.

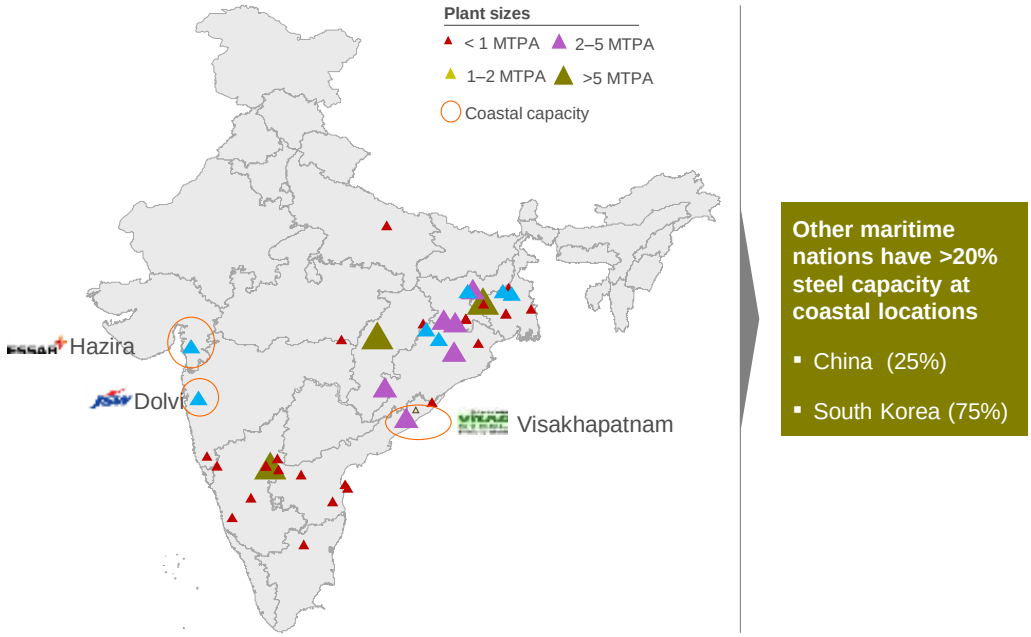
Specifically, two additional coastal steel clusters could be developed close to demand centres near Chennai and Dolvi (EXHIBIT 1.16), in addition to expansion of the current coastal cluster in Visakhapatnam.

5 Ministry of steel

The potential impact from a 20 MTPA steel cluster is shown in EXHIBIT 1.17.

EXHIBIT 1.14

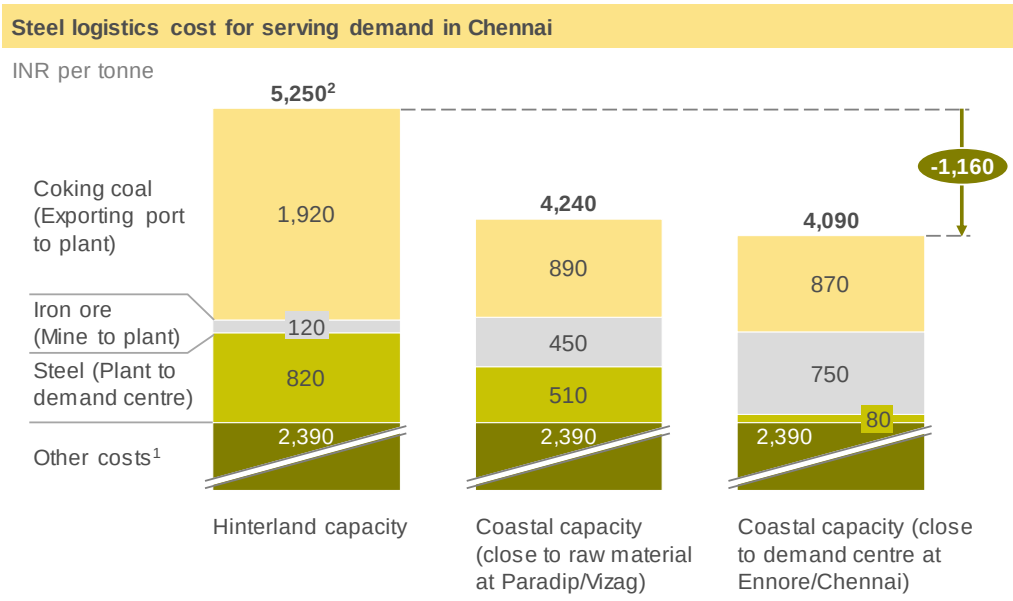
Coastal steel capacity in India



SOURCE: Ministry of steel; VDEH plant facts

EXHIBIT 1.15

Coastal steel plants provide logistics cost saving of ~INR 1,000 per tonne

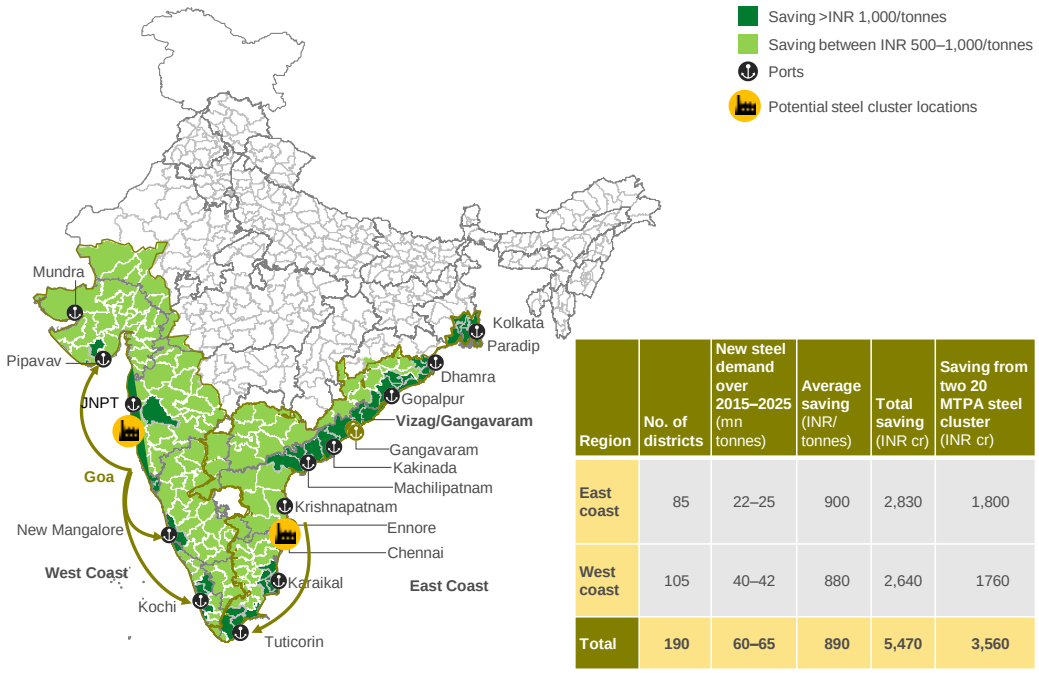


1 Other cost includes internal logistics cost and logistics cost for other materials such as refractory, spares, etc.
2 Base case logistics cost is estimated as 15% of total steel production cost

SOURCE: DGCIS data – 2013-14

EXHIBIT 1.16

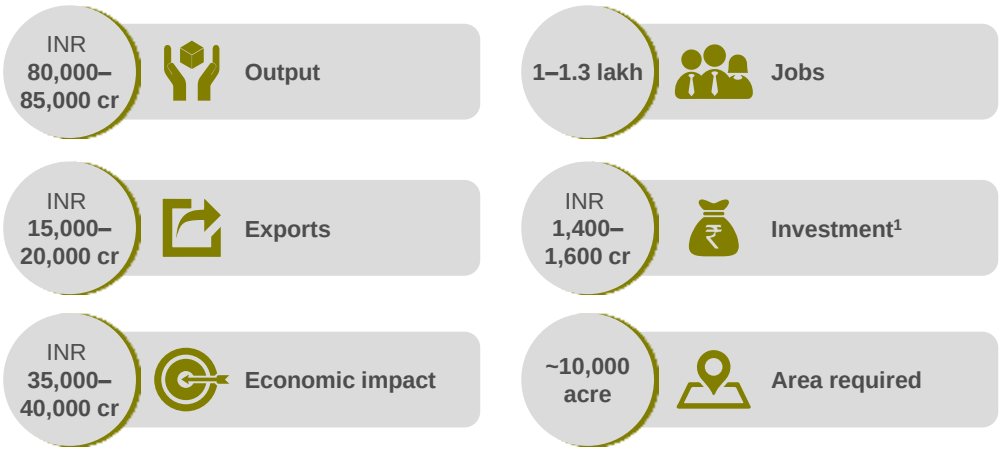
Two new proposed steel clusters (40 MTPA capacity) that would save the economy annual savings of ~INR 3,500 cr



Region	No. of districts	New steel demand over 2015–2025 (mn tonnes)	Average saving (INR/ tonnes)	Total saving (INR cr)	Saving from two 20 MTPA steel cluster (INR cr)
East coast	85	22–25	900	2,830	1,800
West coast	105	40–42	880	2,640	1760
Total	**190**	**60–65**	**890**	**5,470**	**3,560**

EXHIBIT 1.17

Potential Impact from each steel cluster



1 Investment includes only internal roads and provision for water, sewage, electricity and land levelling

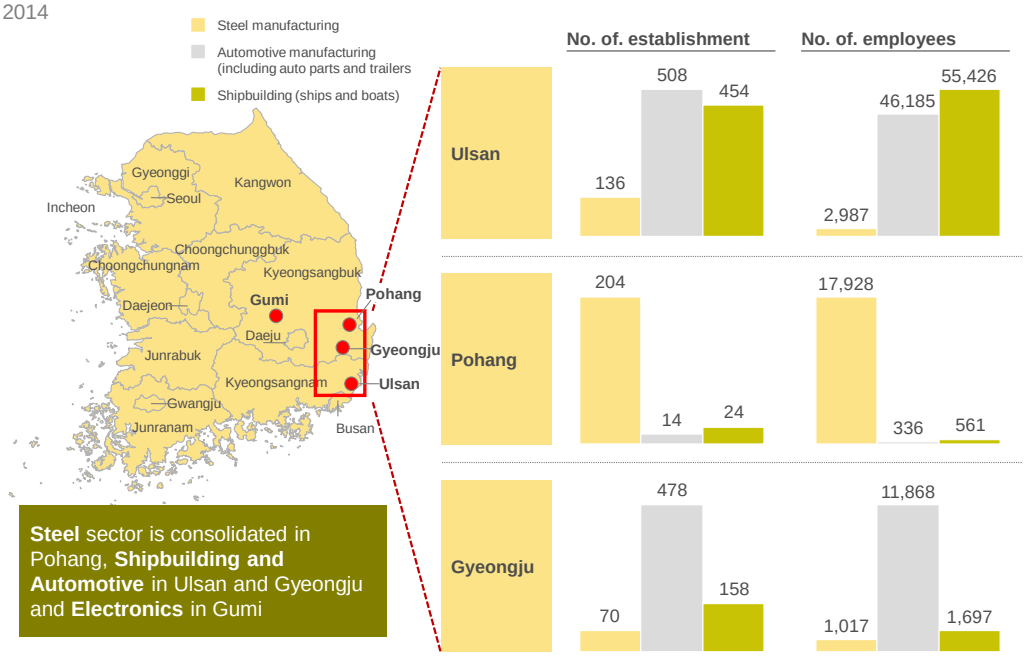
1.2.3 Maritime cluster based on “steel-multiplier”

Over time, the coastal steel clusters in India could be expanded into steel based manufacturing clusters focusing on shipbuilding, automotive and other ancillary activities. Logistics cost is a significant component of the overall costs in shipbuilding, automotive, etc., and steel is a major raw material for these downstream industries. Considering the port linkages, it is optimum for these industries to be co-located. Steel contributes 25–30 per cent of the cost of a newly built ship while the engine contributes another 15–20 per cent. In automobiles, the cost of steel is 20–22 per cent. Therefore, there are strong synergies between steel-shipbuilding-automobile.

Global success story

South Korean Maritime cluster– Pohang-Ulsan-Gyeongju

2014



SOURCE: KOSIS

One-third of South Korea’s economic growth between 1980 and 2010 was contributed by steel and related downstream sectors. Steel in Korea is consolidated in Pohang, shipbuilding and automotive in Ulsan and Gyeongju and electronics in Gumi. All these locations are in close proximity to each other, reducing the logistics cost of input materials. The role of government was instrumental in the growth of steel and downstream industries. The Government of South Korea selected Pohang as a location for building a national steel mill (POSCO) in 1967 considering availability of land, port and other utilities. Development of Ulsan as a major industrial cluster came from the government’s plan to foster heavy and chemical industries. From 1962–1966, the government developed infrastructure including roads, civil works, harbours, etc., in the region. It attracted Hyundai motors to invest in Ulsan in 1968, Hyundai Heavy Industries (HHI) in 1972, Samsung in 1979 and Daewoo in 1981.

POSCO's growth was supported by multiple factors- adoption of new technologies, capital and resource commitment to R&D, development of deep water ports and JV investments in other countries. POSCO adopted new technologies and facilities from Japan and Europe like

larger scale blast furnace, continuous casting equipment, etc. Establishment of two world's leading research organizations- Pohang University of Science and Technology (POSTECH) and Research Institute of Industrial Science and Technology (RIST) helped in the growth of POSCO. South Korea also replicated Japanese strategy of using large bulk carriers coupled with international investments to secure long-term access to iron-ore.

Shipbuilding sector's growth was also supported by a number of factors – focus on advanced technologies, efficient operations and use of external know-how. HHI obtained advanced shipbuilding technologies from European shipbuilders: Dockyard designs from Scottish Naval architecture firm – A&P Appledore, Ship design and operating instructions from Scottish shipbuilding firm – Scottlithgrow. Experienced European shipbuilders worked as employees of HHI for first 3 years. HHI also obtained production know-how from Kawasaki shipbuilding company of Japan. During the period of overcapacity and price competition in the 1970s, HHI altered its product mix away from VLCCs to smaller high value ships and branched into off-shore structures.

As of 2014, Pohang had 204 establishments for steel manufacturing providing employment to ~20,000 people. Ulsan and Gyeongju together have ~1,000 automotive and ~600 shipbuilding units providing employment to ~115,000 people.

1.2.4 Marine clusters

Global trade flows

Shipbuilding market is currently dominated by China, Korea and Japan which cumulatively account for ~90 per cent of the world's shipbuilding capacity. China and Japan are dominant in bulkers while South Korea dominates container vessels, tankers and gas carriers (EXHIBIT 1.18).

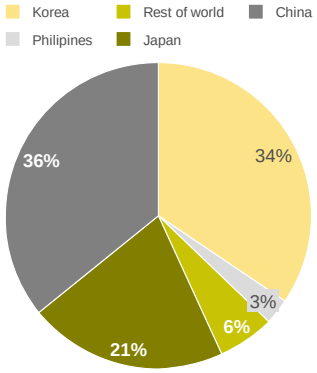
Shipbuilding is a cyclical industry and is currently on a downturn with excess capacities globally. After the peak in deliveries in 2011, the industry's output is decreasing and reached 91.2 mn DWT in 2014. However, strong demand is expected in the long term, driven by shipping companies' move towards ultra-large vessels, demolition of the old vessel fleet and growth in global exports. This demand is expected to go up to ~150 mn DWT by 2025 and ~300 by 2035 (EXHIBIT 1.19).

EXHIBIT 1.18

MARKET TRENDS

China, Korea and Japan account for ~90% of the world's production; China and Japan specialise in bulk carriers, while Korea leads in container ships

4 countries dominate global vessel production



Deliverables of new buildings, major vessel types and countries where built (2014, thousands of GT)

	China	Republic of Korea	Japan	Phili-ppines	Rest of World	World total
Oil tankers	2,896	4,781	891	-	466	9,034
Bulk carriers	13,304	1,588	10,791	869	167	26,719
General cargo	585	329	199	-	372	1,485
Container ships	4,986	9,135	188	995	735	16,039
Gas carriers	119	3,528	666	-	14	4,328
Chemical tankers	113	185	188	-	57	543
Offshore	714	1,485	51	-	956	3,206
Ferries and passenger ships	92	5	27	-	787	892
Other	42	835	391	-	147	1,415
Total	**22,851**	**21,872**	**13,392**	**1,865**	**3,682**	**63,662**

India commands only ~0.5% of the global shipbuilding market share

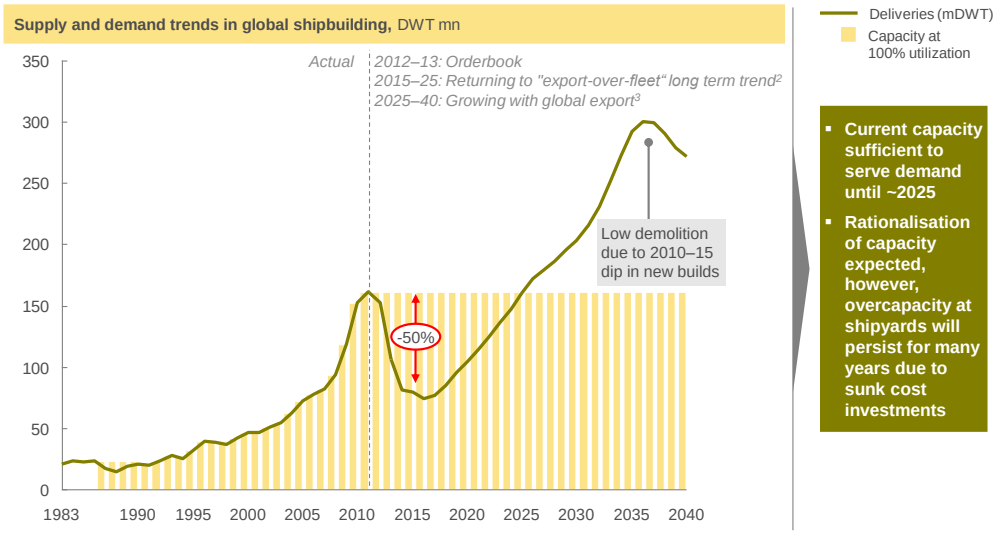
Note: Propelled seagoing merchant vessels of 100 GT and above. More detailed data on other countries where vessels were built is available under http://stats.unclad.org/shipbuilding.

SOURCE: UNCTAD secretariat, based on data provided by Clarkson's Research

EXHIBIT 1.19

MARKET TRENDS

Globally, overcapacity at shipyards expected next years, however, strong growth in the longer term is expected

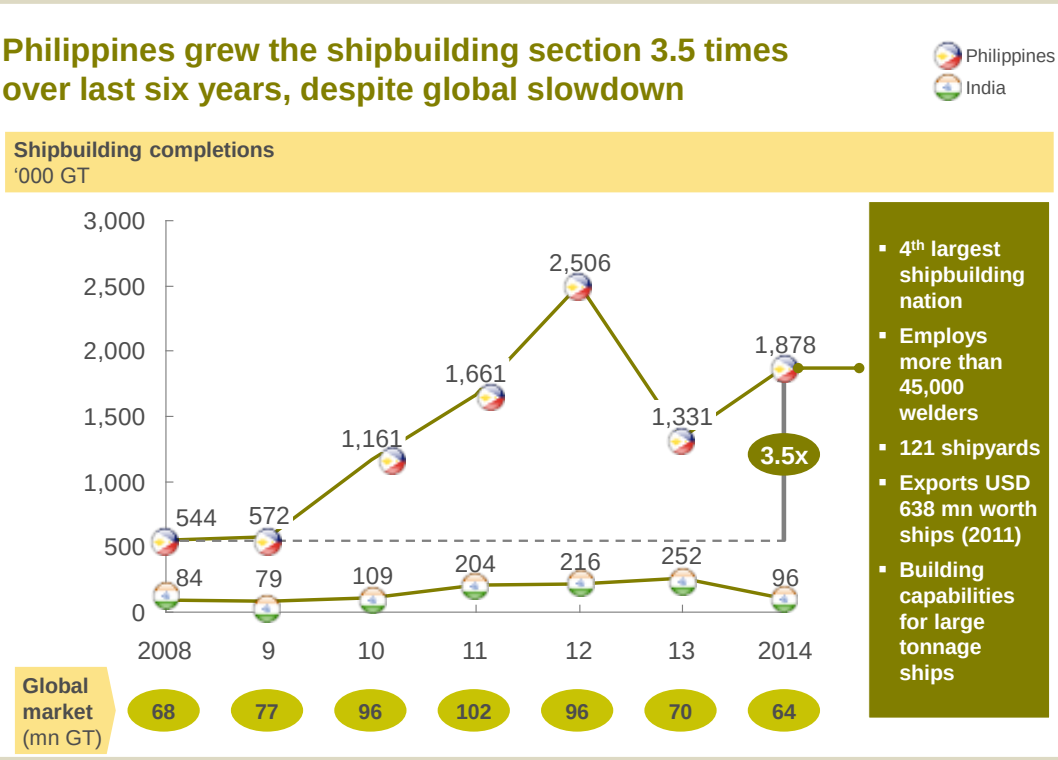


1 Capacity measured as maximum output last 5 years. Capacity at 2011 level in forecast period
2 Oversupply eliminated and shipping market returning to supply-demand balance
3 Fleet growing with global export from 2015, demolition estimated using average 25 year lifetime and
SOURCE: Clarksons; Global Insight; expert interviews; team analysis

Global success story[6]

Despite the global slowdown, Philippines has been able to grow its shipbuilding sector 3.5 times over the last 6 years and has become the 4th largest shipbuilding nation. The shipbuilding sector in Philippines, comprising of 121 shipyards, employs more than 45,000 welders.

Philippines grew the shipbuilding section 3.5 times over last six years, despite global slowdown



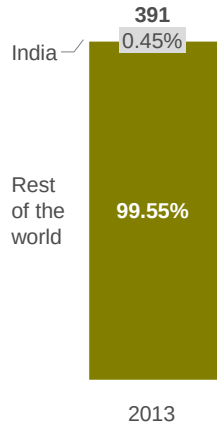
Shipbuilding Industry in India

India currently accounts for only ~0.45 per cent of the global shipbuilding market. General cargo, bunkering and platform supply vessel accounted for most of the vessel deliveries (in DWT terms) in 2015. Drilling or production platforms and dredgers are the main exports from India and over 60 per cent of the shipbuilding in India is for Singapore and UAE based entities (EXHIBIT 1.20, 4.21, 4.22 and 4.23).

EXHIBIT 1.20

India currently produces only ~0.5% of world's ships

World shipbuilding production capacity
mn, DWT



Indian shipyards[1]	Ownership	mn DWT	# of ships
ABG	Private	0.49	48
Pipavav	Private	0.30	4
Bharati	Private	0.22	31
Cochin	State owned	0.11	16
Chowgule	Private	0.08	18
Alcock Ashdown	Private	0.06	6
Others[2]	–	0.05	14

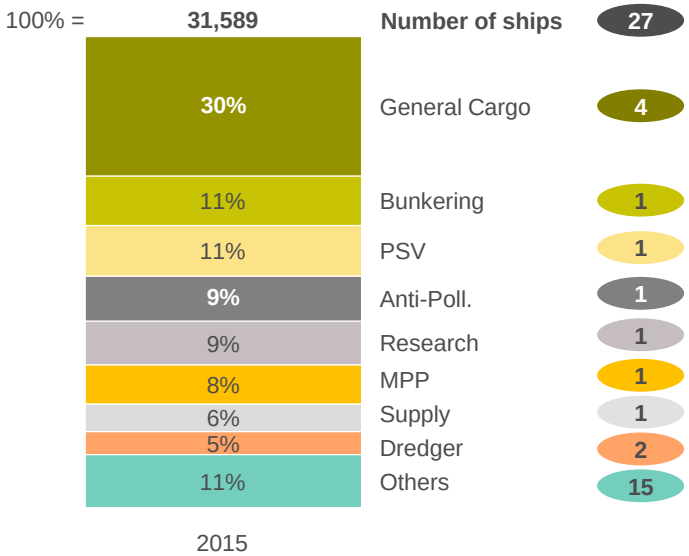
1 Top 7 by DWT production capacity
2 Includes L&T, Tebma, etc.

SOURCE: Drewry Maritime Services

EXHIBIT 1.21

Shipbuilding deliveries in India – By type of vessel

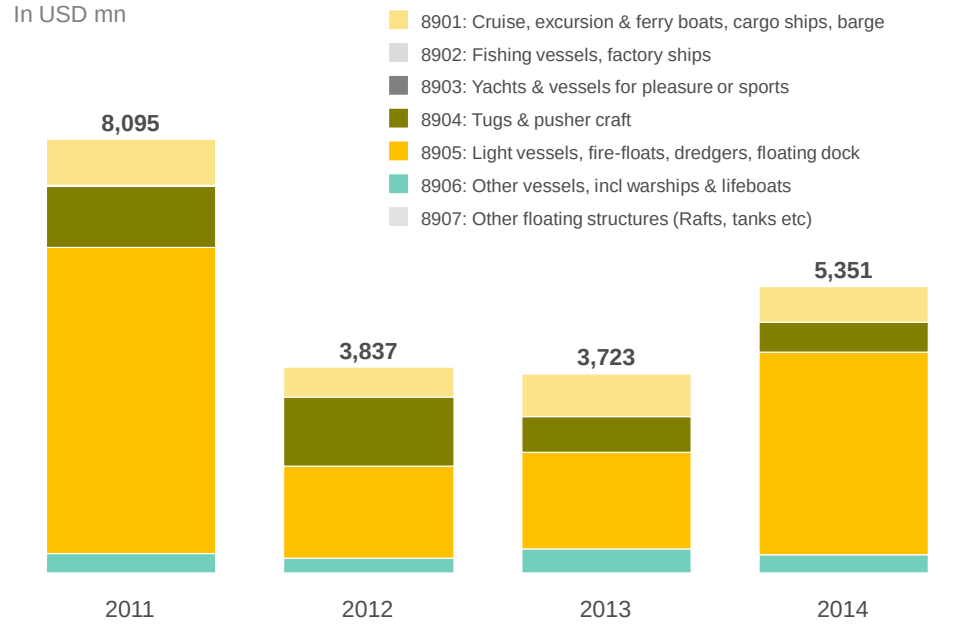
DWT



SOURCE: Clarksons

EXHIBIT 1.22

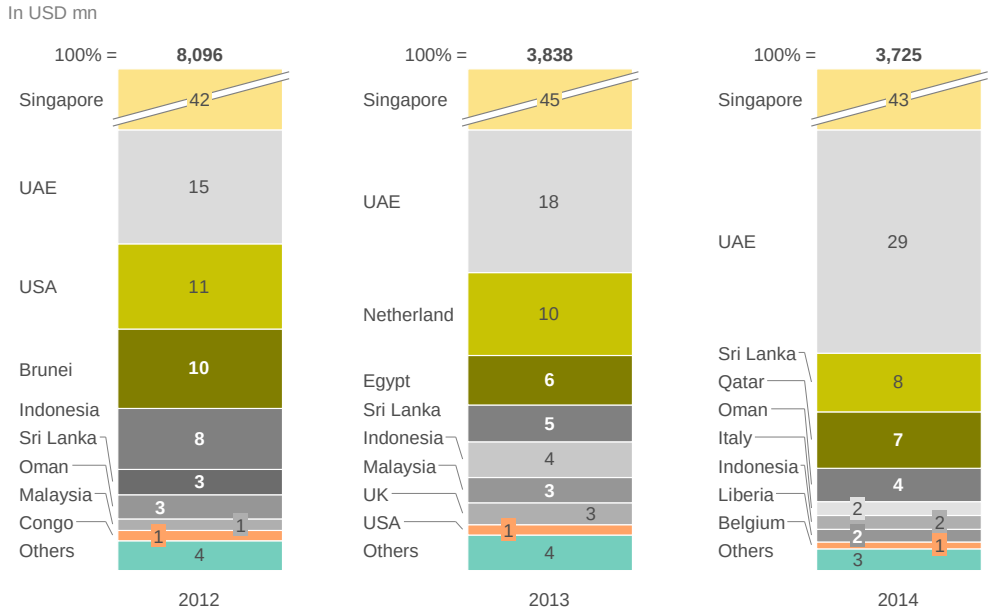
Foreign exchange earnings through shipbuilding activities in India



SOURCE: Ministry of commerce and industry, HS code: 89 ships, boats and floating structure

EXHIBIT 1.23

Foreign exchange earnings through shipbuilding activities in India



SOURCE: Ministry of commerce and industry, HS code: 89 ships, boats and floating structure

Opportunity for India

India could target 3–4 mn DWT shipbuilding industry by 2025, through a combination of some smart choices and government support. Indian shipyards are competent at building smaller size/ specialty vessels. They could focus on building specialty and coastal vessels less than 80m length (e.g., offshore supply vessels, anchor handling tugs, etc.).

The Government of India has recently introduced policies and initiatives for development of the sector. These initiatives are expected to reduce the unfavorable cost differential faced by the Indian shipyards (EXHIBIT 1.24).

Opportunity in defence sector (EXHIBIT 1.25), growth in coastal shipping, and replacement of the existing vessel fleet could the drivers of growth of the shipbuilding industry in India.

Given the cyclical nature of the shipbuilding industry, it is important to complement shipbuilding with ship repair facilities.

India could develop two potential locations for marine clusters: Gujarat and Tamil Nadu. Pipavav, Dahej and Hazira ports in Gujarat have shipyards and Alang has a ship breaking yard. The potential marine cluster could leverage the existing ecosystem and with steel supplies from Hazira. Similarly, Kattupali in Tamil Nadu has a large shipyard and near a proposed steel. The potential impact from the proposed marine cluster is shown in EXHIBIT 1.26.

EXHIBIT 1.24

Key Government Policies and Initiatives instituted by Union Government for the development of shipbuilding sector

Initiatives	Description
1 **Financial assistance for local shipbuilders**	▪ **Introduction of INR 4,000 cr financial assistance policy for 10 years –** Financial assistance to be granted to Indian shipyards equal to 20% of the lower of "Contract price" or the "Fair Price" of each vessel built by them for a period of 10 years commencing 2015–16. Rate of 20% to be reduced by 3% every three years
2 **Exemption from Customs and central Excise duty**	▪ Exemption from Customs and Central Excise Duties on inputs used in Shipbuilding
3 **Infrastructure status**	▪ **Grant of infrastructure status to shipyards –** To help Indian shipyards avail flexible structuring of long term project loans, long term funding from infrastructure funds at lower interest rates and longer tenure equivalent to the economic life of their assets ▪ Shipyards to have access to relaxed External Commercial Borrowing norms, issuance of infrastructure bonds for meeting working capital requirements and benefits under IT Act, 1961
4 **FDI in shipbuilding**	▪ Permit for 100% FDI in shipbuilding
5 **Revision of domestic eligibility criteria**	▪ All Govt. departments and agencies shall undertake bulk tendering for their vessel related requirements with deliveries starting from 2016–17 and will grant a Right of First refusal for Indian shipyards for such orders till 2025. From 2025, only Indian build vessels are to be procured by these agencies

SOURCE: Ministry of Shipping

EXHIBIT 1.25

INDIA OPPORTUNITY

Defence: ~USD 23 bn orders under execution and ~USD 51 bn in pipeline

Surface ships

Present orders		Future orders (3-5 years)[3]	
Project	**App. value** INR cr	**Project**	**App. value** INR cr
P15B[1], P17 A[1]	55,000	16 ASW SWC	15,300
6 CG OPVS, 2 SLOPVs, 2 FPV & 11 FICs, MCMV[2]	37,500	Next Gen Missile Boats	12,000
4 ASW Corvette, 8 LCU MK-IV, 4 WJFACs, P17A[1]	28,500	Next Gen Corvettes	24,500
IAC* , 20 CG FPV	3,100	Next Gen Frigates	35,000
IPVs/Midget Submarines	4,000	Next Gen Destroyers	50,000
5 NOPVs	2,500	04 Survey Vessels – Large	3,500
3 Cadet Training Ships	485	Survey Vessel (trg)	2,500
6 Survey Vessels	800	02+02 LPD Vessels	14,500
15 Interceptor Boats	270	Fleet Support Ships/Other Support Vessels	9,000
54 Interceptor Boats, 7 CGOPVs, Floating Dock	2,500		
80 FICs	150		
~ USD 20 bn opportunity		**~ USD 25 bn opportunity**	

Submarine

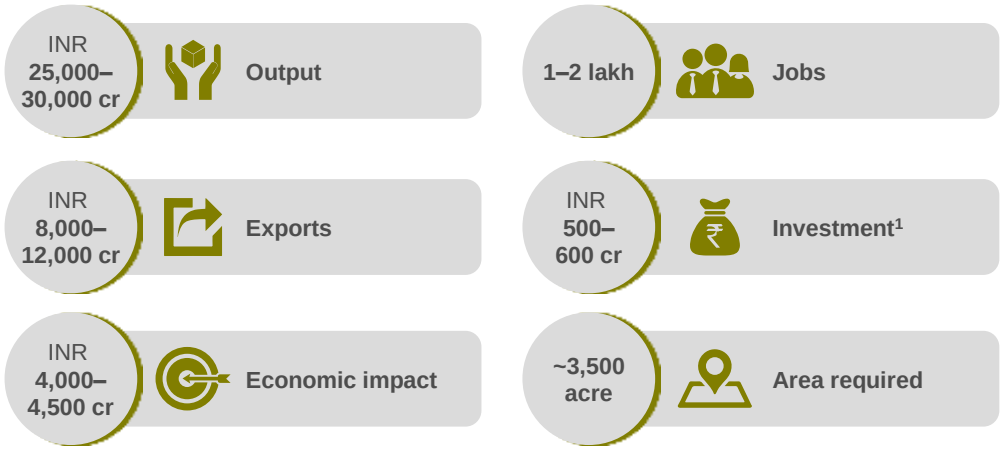
Project	**App. value** INR cr	**Project**	**App. value** INR cr
P 75[1]	10,000	P-75 I	75,000
Nuclear Submarine SSBN[1]	10,000	Other Submarine Projects	>10,000
~ USD 3 bn opportunity		**~ USD 26 bn opportunity**	

1 EDC 2022; 2 EDC 2025 3 To be implemented from 2020–2030

SOURCE: Expert interviews; Ministry of Defence, Ministry of Shipping

EXHIBIT 1.26

Potential impact from each marine cluster



1 Investment includes only internal roads and provision for water, sewage, electricity and land levelling

1.2.5 Automotive clusters

Global trade flows

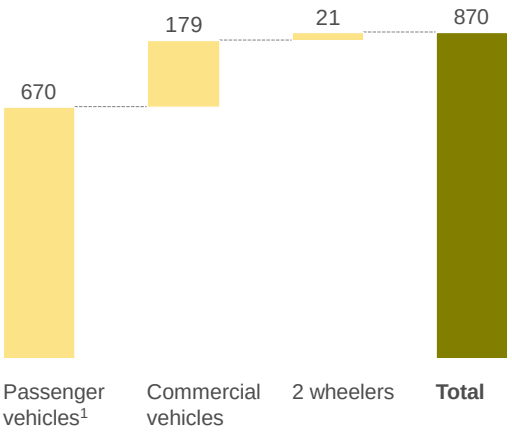
Global automotive production across two-wheelers, commercial vehicles and passenger vehicles—reached USD 2.5 trillion in 2013, recovering from a low of USD 1.4 trillion in 2009. Exports comprised 35 per cent of the global automotive production in 2013, recording a value of USD 870 bn. Passenger vehicles (including three-wheelers) formed the biggest share in global exports at USD 670 bn followed by commercial vehicles and two-wheelers. Germany is the largest exporter followed by Japan, the US, Mexico, South Korea, Canada and the UK (EXHIBIT 1.27).

India accounts for 3 per cent of the global auto production but its share of global exports is only 1 per cent. Also, India's exports comprise just 12 per cent of its total production suggesting a huge potential for global footprint expansion. EXHIBIT 1.28 shows India's individual shares and the corresponding export value in the three auto segments, indicating reasonable share in the export of two-wheelers.

EXHIBIT 1.27

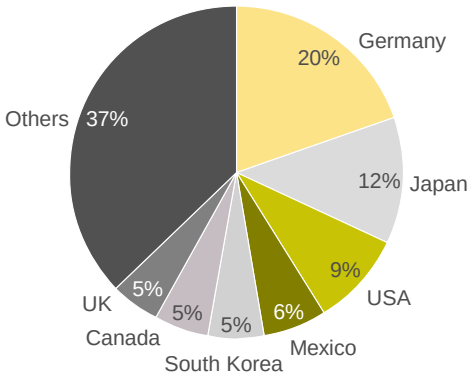
Passenger vehicles have the biggest share in the global automotive exports

Global automotive exports, 2013, USD bn



Share of global automotive exports

Global automotive exports, 2013, Percent



1 Including 3-wheelers

SOURCE: ITC trade map

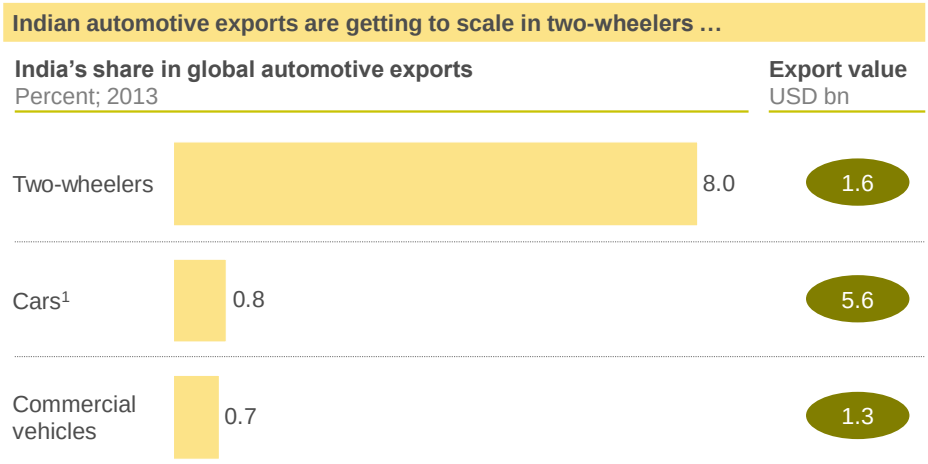
Indian automotive industry

The Indian automotive industry has been growing at around 9.6 per cent between 2005 and 2015 while exports have grown at around 18.9 per cent. The industry achieved a gross turnover of USD 67.6 bn in 2012–13 and is projected to reach USD 300 bn by 2026 according to SIAM.

The country produced 23.4 mn units of vehicles in the year 2014–15, serving a domestic demand of 19.8 mn units and exporting 3.6 mn units. The split of domestic sales and exports for the different automobile segments for 2014–15 is shown in EXHIBIT 1.29. South Africa, Sri Lanka, Nigeria, Bangladesh, the UK and Algeria are the top importing countries from India (EXHIBIT 1.30).

EXHIBIT 1.28

India has a significant share in global two-wheeler exports but minimal share in other product segments

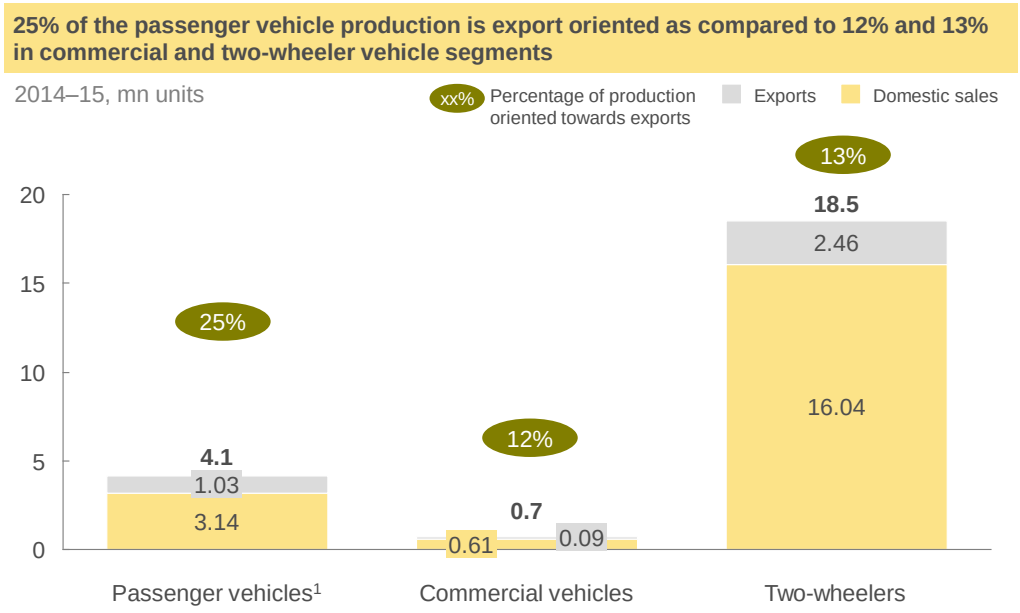


1 Including three-wheelers

SOURCE: Comtrade data

EXHIBIT 1.29

India's production and export volumes of different vehicle segments in 2014–15



1 Including 3-wheelers

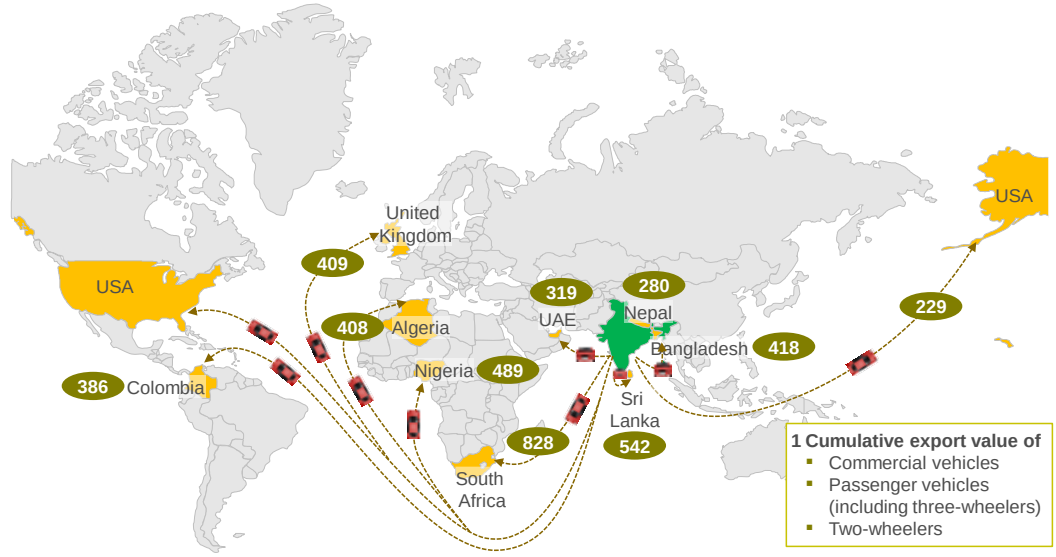
SOURCE: IHS data, Comrade data, SIAM

EXHIBIT 1.30

Automotive cargo flows from India

Automotive export cargo[1]

USD mn, 2014



Top 10 countries account for ~50% of the automotive export from India

SOURCE: ITC Trade Map

Automotive clusters in India

India has five key automotive clusters which have significant export volumes:

- **Northern India cluster:** It comprises Gurgaon, Manesar, Haridwar and Pantnagar and has many established automotive players including Hero, Maruti, TVS and Bajaj. This cluster primarily uses Mumbai, Pipavav and Mundra ports for exports. Despite being far inland, this cluster has a high share of exports.

- **Sanand:** Ford, Maruti and Tata have set up manufacturing plants in this cluster for manufacturing passenger and commercial vehicles. The cluster has been developed recently.

- **Chennai/Hosur:** This cluster is dominated by passenger vehicle manufacturers including Nissan, Ford, Toyota and Hyundai. However, this also has presence of commercial vehicle manufacturers. This cluster uses Chennai and Ennore ports for exports.

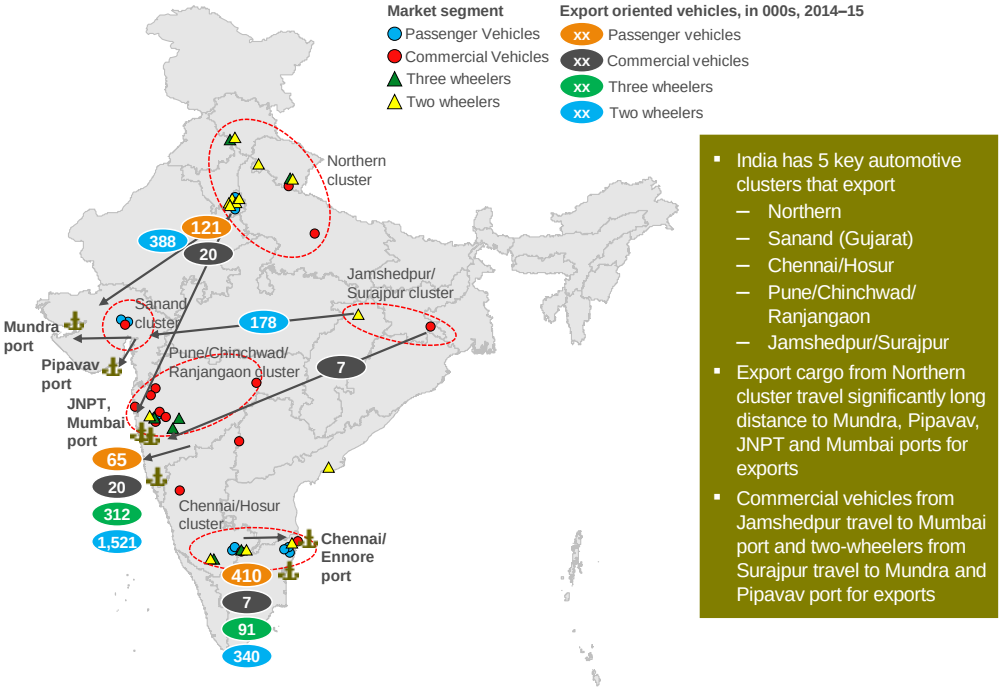
- **Pune/Chinchwad/Ranjangaon:** This cluster has many manufacturing plants for commercial vehicles. Tata and Mahindra are the key players in this region. This cluster uses Mumbai and ports in Gujarat for export.

- **Jamshedpur/Surajpur:** Tata currently manufactures commercial vehicles in Jamshedpur and Yamaha manufactures two-wheelers in Surajpur.

EXHIBIT 1.31 shows the automotive export cargo flows from the different manufacturing clusters.

EXHIBIT 1.31

Key automotive production clusters in India



SOURCE: Interviews with key stakeholders

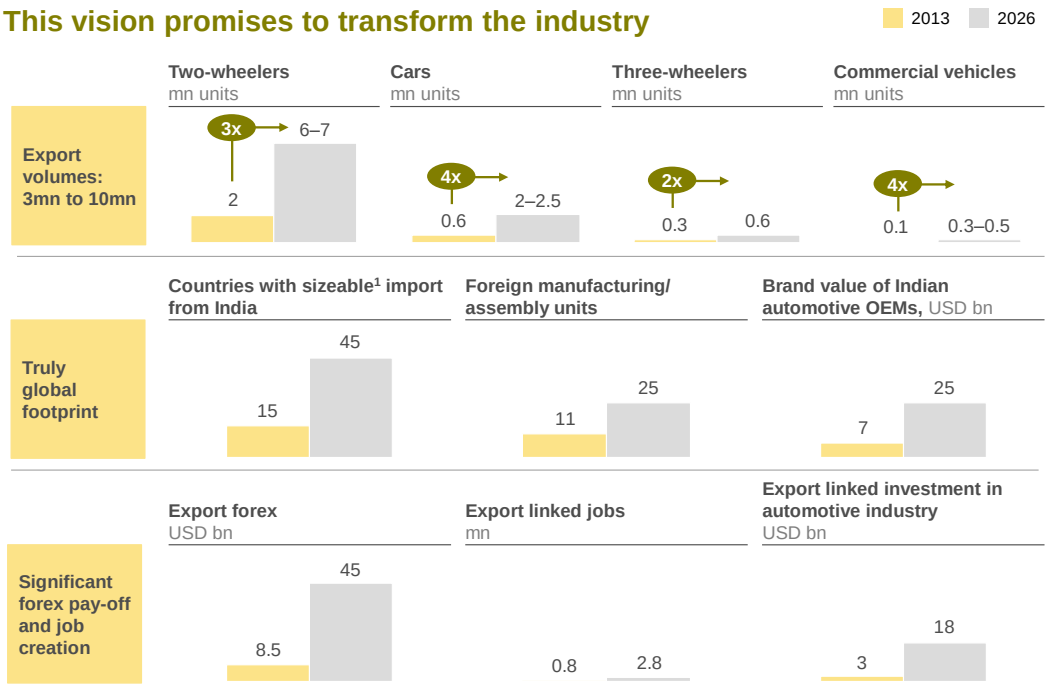
Opportunity for India

A mature industry ecosystem providing best-in-class cost, quality and technology advantages positions India to capture a higher share of the global export market. While it needs to establish a strong hold in the passenger and commercial vehicles segment, India already has a significant share in the global export volumes of two-wheelers.

The industry's export vision is to increase export volumes to about 10 mn by 2026, which may trigger significant and tangible positive pay-offs for the economy by:

- Generating foreign exchange of USD 45 bn (against the current USD 8.5 bn)
- Creating 2 mn new export linked jobs
- Attracting new investment of USD 15 bn to the industry (EXHIBIT 1.32)

EXHIBIT 1.32



1 Higher than target global average share of exports from India (i.e., 3%) by 2026

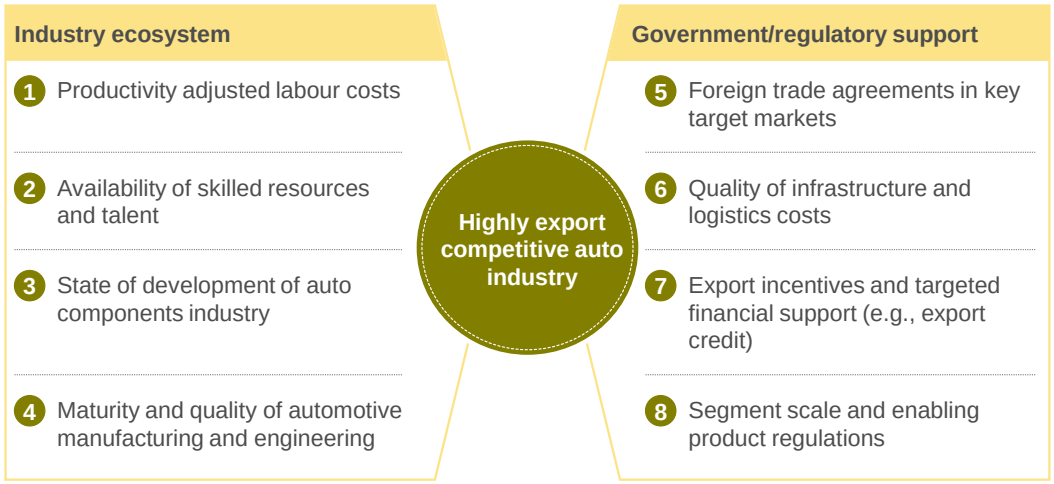
SOURCE: SIAM: Accelerating exports and globalizing the Indian auto industry

Challenges faced and the role of port-led industrialisation

India's 8 per cent share in the two-wheeler segment is a testimony to its potential in making a global mark in the sector. However, India faces tough competition from a number of other countries, including Mexico, South Korea, China, Thailand and Turkey, which are witnessing rapidly growing automotive exports. To identify the challenges for the Indian automotive sector, export competitiveness was benchmarked against key automotive exporting countries. The assessment was done in two parts – industry ecosystem and government/ regulatory support comprising of eight factors (EXHIBIT 1.33 and 4.34).

EXHIBIT 1.33

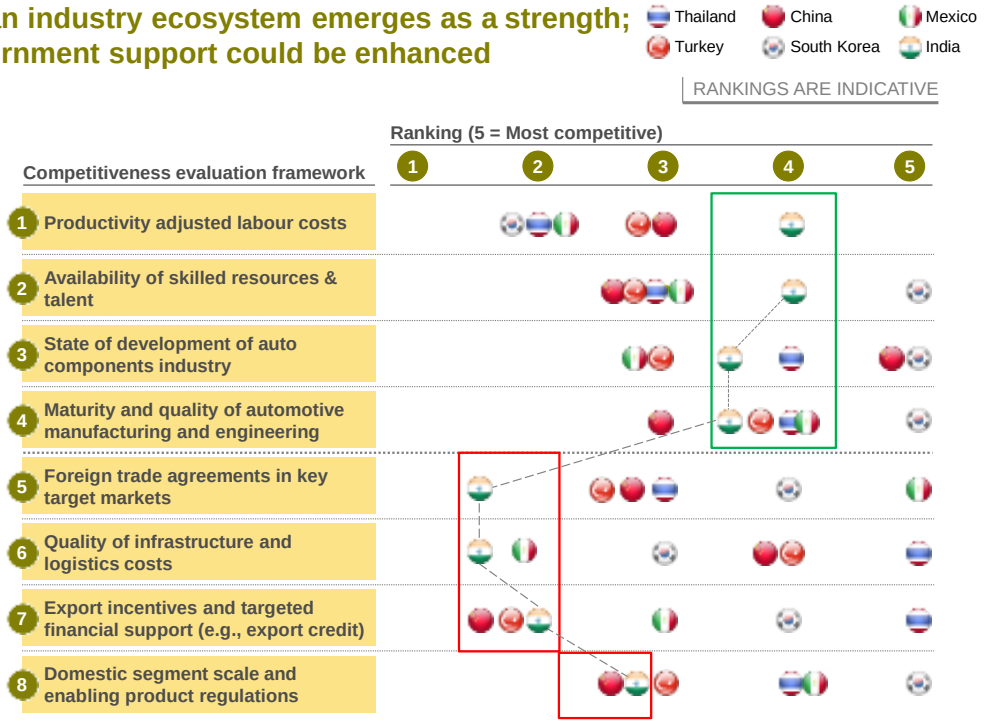
India's auto export competiveness was assessed on a set of eight success factors



SOURCE: SIAM: Accelerating exports and globalizing the Indian auto industry

EXHIBIT 1.34

Indian industry ecosystem emerges as a strength; government support could be enhanced



SOURCE: WIS; World Bank reports; press search; EIU; IHS database

Role of ports and logistics infrastructure

India scores poorly on the quality of infrastructure and logistics costs which is key for driving export competitiveness. Export cargo moving from the manufacturing clusters to the ports, especially from the Northern cluster is subjected to high inland logistics cost. Transit time of cargo, including processing time at the port, varies from 7 to 17 days for a distance of 1,400 km. This has implications on the time buffer that automotive manufacturers keep for planning the logistics of export-oriented cargo.

Logistics inefficiency impacts cost in two ways—direct freight cost and the inventory cost during transit. As described in EXHIBIT 1.35, freight and insurance contribute around 1 to 2 per cent to the export price of a passenger vehicle. For an industry where the OEM operates at a 6 to 7 per cent margin (on export price), the share of logistics cost is significant.

It is, therefore, important to develop a port-led industrialisation strategy for the sector. Some possibilities include:

- **Port linkages of existing clusters:** Due to the limited "Ro-Ro" handling capacity at Maharashtra ports, the automobile cargo from Pune cluster goes to Gujarat ports, travelling longer distances. Going forward, Vadhavan port could be developed with sufficient handling facilities for automotive cargo

- **Expansion of Sanand cluster in medium to long term:** Currently, a significant part of automotive exports happens from the inland Northern cluster. Even though Sanand has come up as a new cluster proximate to the Gujarat ports, it still has a small share in the total exports from India. Sanand could evolve as an export hub in the medium term, with adequate linkages to the ports of Mundra and Pipavav

The potential impact from the proposed automotive cluster is shown in EXHIBIT 1.36.

Global success story[7]

A large part of export-oriented manufacturing in other nations is port-based, e.g., the Samutprakarn cluster in Thailand has emerged as a world-class export hub hosting 500+ automotive players and directly employing close to 2 lakh workers. The presence of a deep-sea port in Rayong near the industrial estate hosting OEMs was one of the critical success factors for this cluster.

Another international example of a thriving port-based automotive manufacturing cluster is of Bremen in Germany which comprises the city of Bremen and the seaport city of Bremerhaven. Bremen is known as the car city, housing leading automobile manufacturers and automotive technology suppliers. Bremerhaven port is one of the largest car ports in the world with storage and parking capacity of 1,20,000 cars. It is a port of call for nearly 1,500 automobile carriers. The cluster has also become a centre of scientific excellence that includes automotive research. There are various research and development institutions at the Bremen Technology Park. Automotive companies collaborate on technology creation with education & research institutions in the area, thereby creating an entire ecosystem for the automotive sector.

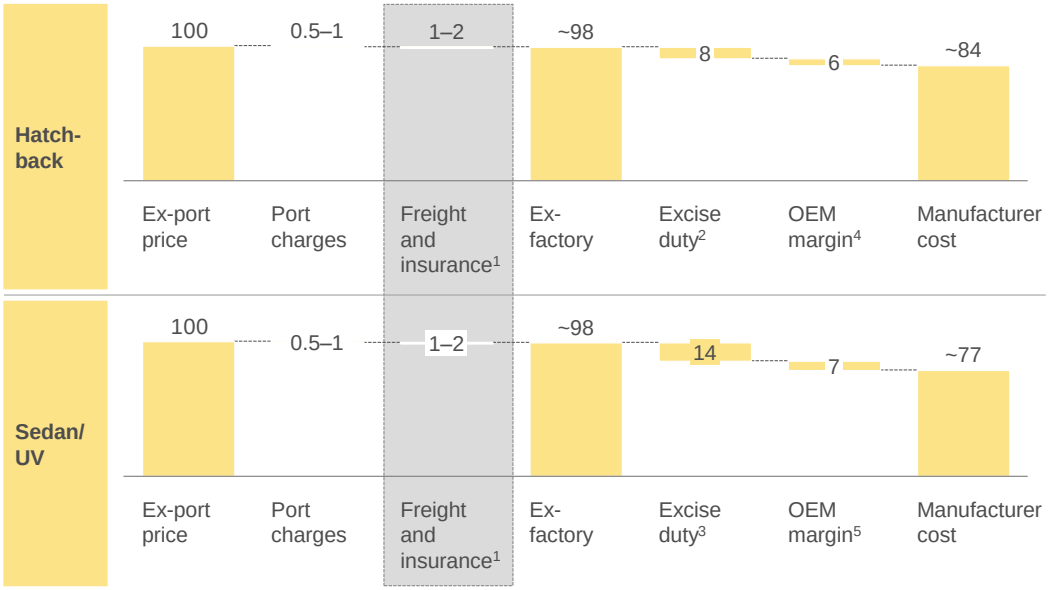
7 Press research

EXHIBIT 1.35

Breakdown of value chain cost of passenger car

FOR EXPORT FROM INDIA

Percent

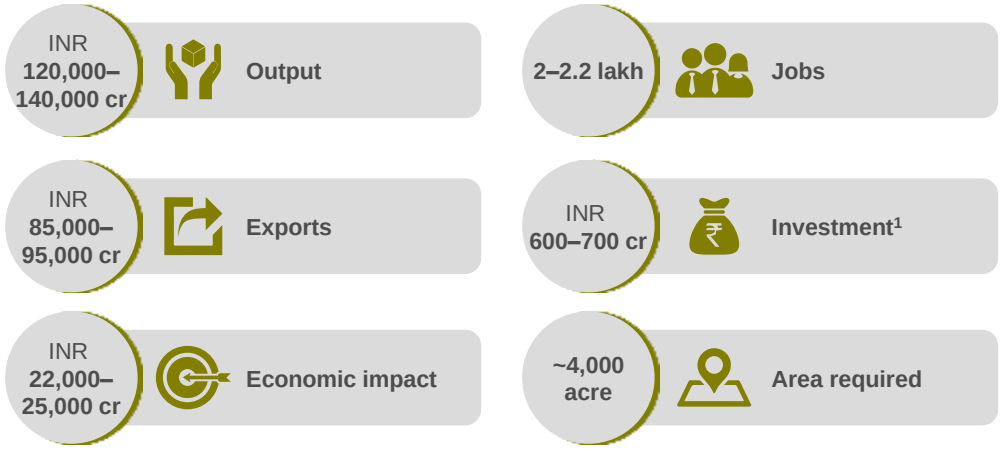


Note: Typical figures for India market; may differ substantially across brands and OEMs
1 Variable between 0–1% and location; 2 10% excise on manufacturer cost and margin
3 22% + INR 10,000 excise duty for cars >4,000 mm in length; 4 6–8% OEM margin on manufacturer cost
5 8–10% OEM margin considered on manufacturer cost and margin

SOURCE: Expert interviews

EXHIBIT 1.36

Potential Impact from the automotive cluster



1 Investment includes only internal roads and provision for water, sewage, electricity and land levelling

1.3 Discrete manufacturing clusters

Several nations have leveraged export-oriented/import-substituting discrete manufacturing for bridging trade deficit. The “Make in India” programme of the Government of India will be instrumental in promoting discrete manufacturing in India. Port-based or port-proximate manufacturing could play a pivotal role in supporting this initiative. Ideally, ports could target sectors where they could take the lead and make manufacturing more competitive. This study identified high potential sectors for port-based or port-proximate manufacturing. A total of twenty nine possible sectors were evaluated through a filtering criteria comprising five dimensions and eight parameters. Six sectors—electronics, furniture, automotive, apparel, leather and footwear and food processing—emerged as high potential after the three-step filtration process (EXHIBIT 1.37 and 4.38).

EXHIBIT 1.37

Summary of the selection process

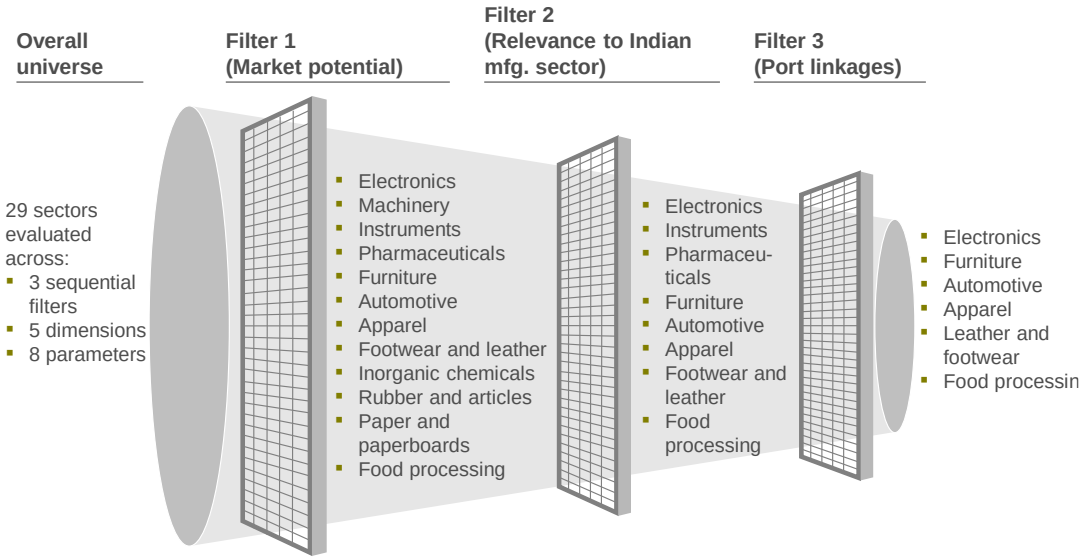
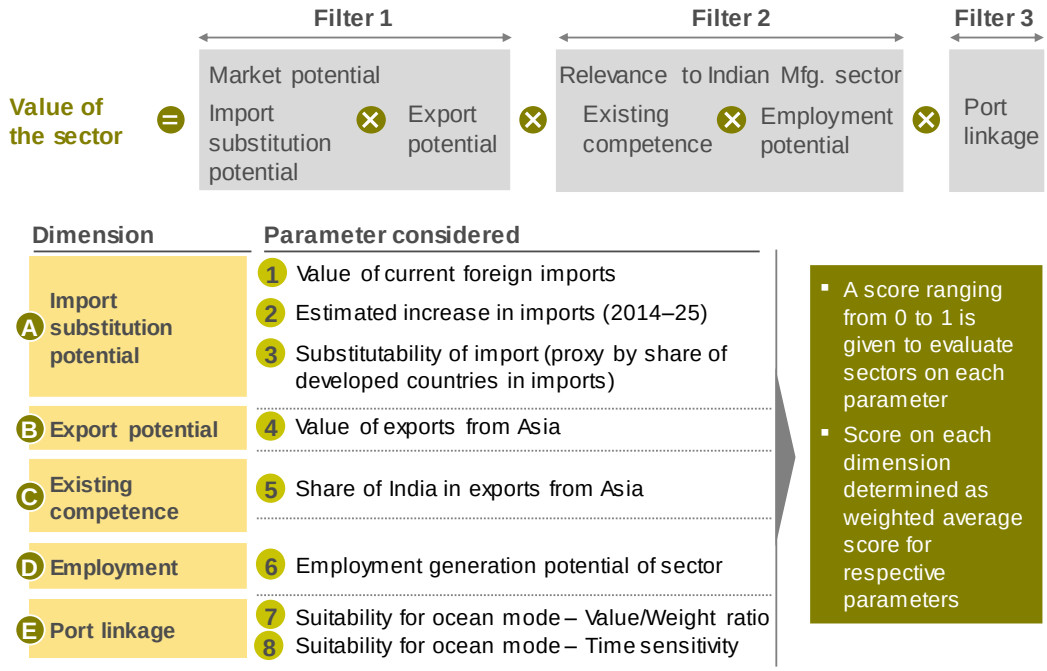


EXHIBIT 1.38

Discrete manufacturing selection criteria



The value of a sector to be selected for port-based or port-proximate manufacturing may be defined in terms of three factors – market potential, relevance to Indian manufacturing and linkages to the port. These three factors then become the most suitable filters for selection:

Market potential: Any sector selected for port-based or port-proximate manufacturing would need to have the potential to substitute current imports and generate exports. For the purpose of the study, four parameters across both dimensions were considered:

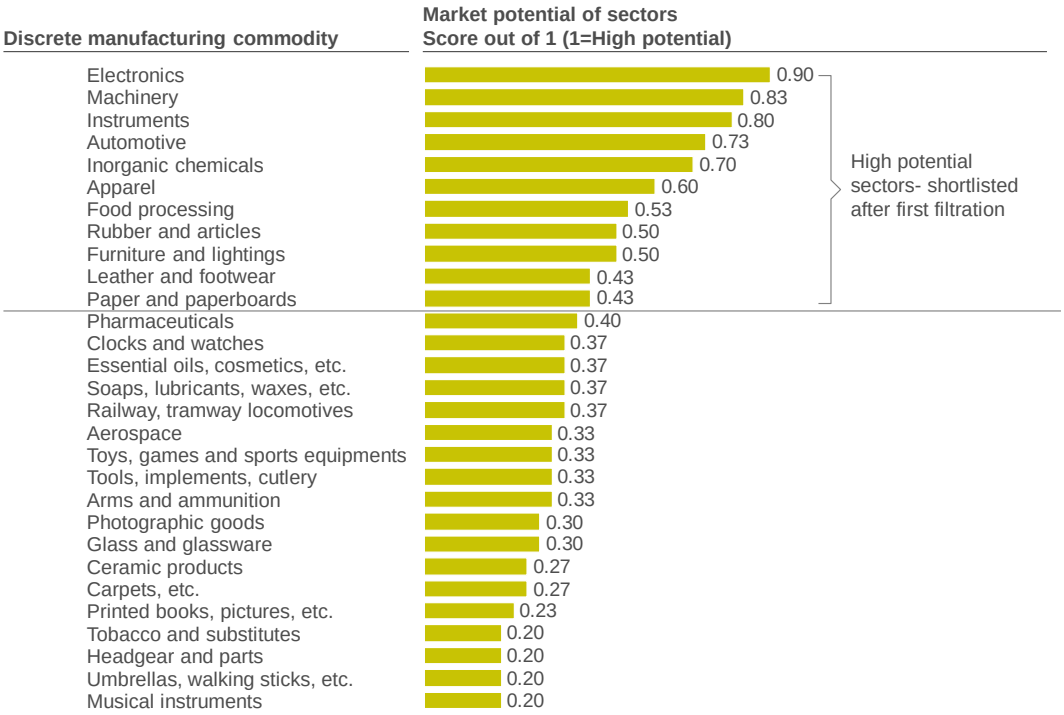
- **The import substitution potential** of a sector has been assessed on three factors – quantum of current foreign imports, estimated increase in import requirement over the next 10 years (assuming past growth rate) and substitutability of imports (proxy indicator of share of developed economies in imports into India used for this).

- **The export potential** of a sector has been assessed based on quantum of exports from Asia. This may serve as an aspirational benchmark for India.

Eleven high-potential sectors were shortlisted after the first filter. These were then evaluated for their relevance to the Indian manufacturing sector (EXHIBIT 1.39).

EXHIBIT 1.39

Scoring of discrete manufacturing sectors: Market potential (filter 1)



Relevance to Indian manufacturing: Two factors were examined to establish relevance of sectors:

- **Existing competence** of India in a sector has been assessed based on its share in exports from Asia.
- **Employment generation potential:** Employment intensity of the sector, measured in terms of direct employment per INR cr of value added, has been used as an indicator.

  Eight sectors were shortlisted after the second filter which were then evaluated for their linkages to port (EXHIBIT 1.40).

Linkages to port: If a sector has adequate linkages to a port, it is considered suitable for port-based or port-proximate manufacturing. This has been assessed based on the suitability of ocean mode of transport by using value-to-weight ratio and time sensitivity index as proxies. These explain if the cargo generated by a sector is suitable for ocean mode of transport in comparison with other modes (EXHIBIT 1.41).

The following six industries were shortlisted for port-led manufacturing:

- **Labour intensive sectors:** 1) Apparel, 2) Leather and footwear; 3) Furniture, 4) Food processing
- **Skill/knowledge intensive sectors:** 1) Electronics, 2) Automotive.

EXHIBIT 1.40

Scoring of discrete manufacturing sectors: Relevance to the Indian manufacturing sector potential (filter 2)

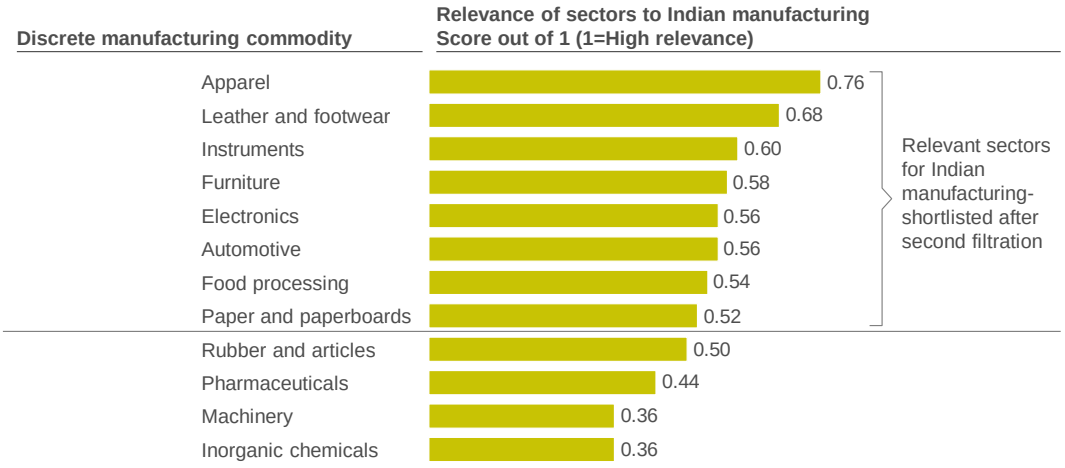
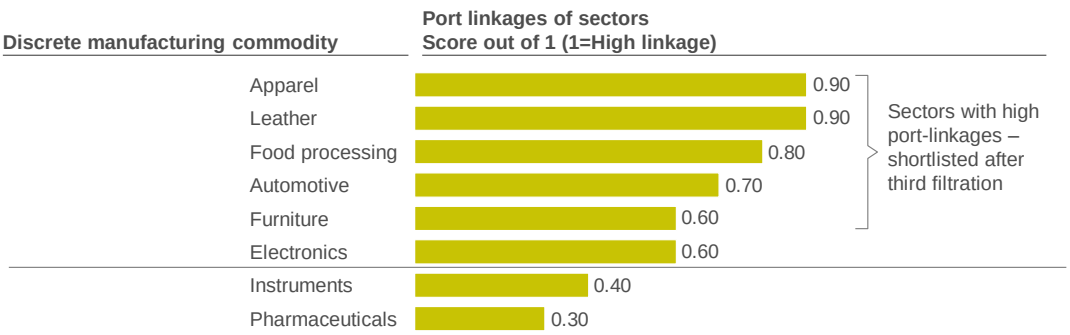


EXHIBIT 1.41

Scoring of discrete manufacturing sectors: Port linkages (filter 3)

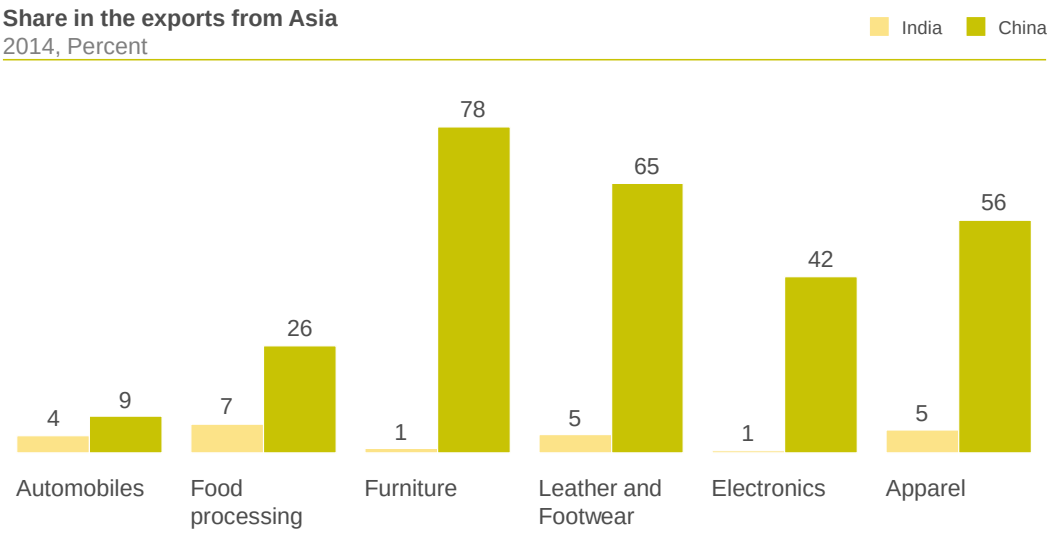


India's total exports of goods in 2014 were around USD 317 bn. Apparel had the largest share of around 7 per cent. Cumulatively, the six sectors contributed around 18 per cent to the total goods exports. India has set a target of increasing the exports of goods and services to USD 900 bn by 2020[8]; goods may continue to contribute ~ 60-70 per cent in the total mix. Exports from these six sectors exports could grow to from USD 60 bn currently to USD 210 bn by 2025. EXHIBIT 1.42 shows the comparison of India's share in exports from Asia vis-à-vis China for the shortlisted sectors.

8 DIPP

EXHIBIT 1.42

Share of India vis-à-vis China in Asia's exports

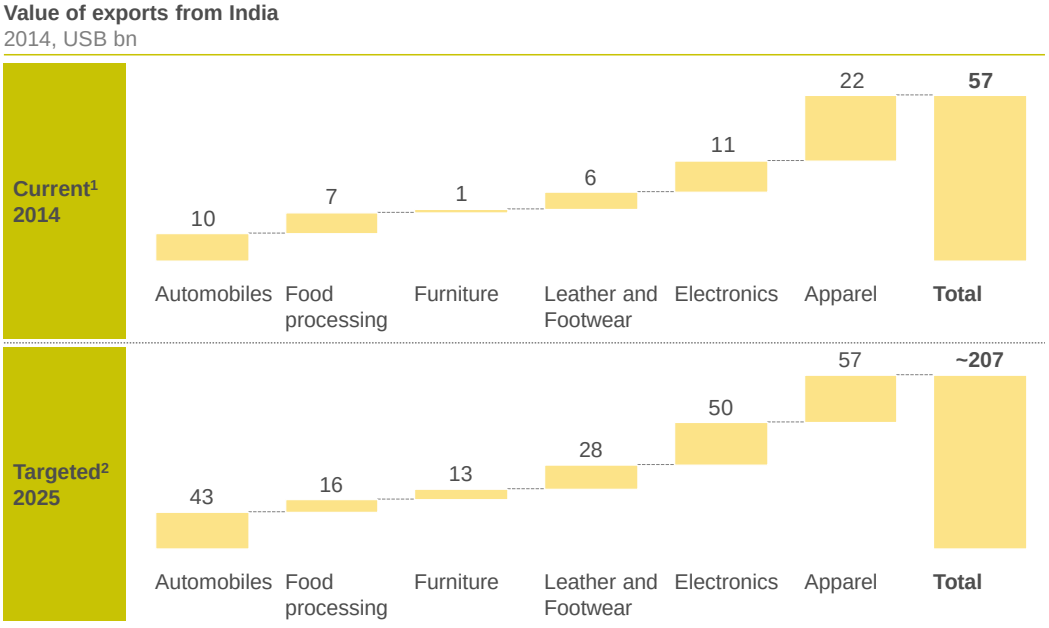


SOURCE: ITC trade map

Indian could aspire to increase the share of exports for these sectors and aim to be among the top five exporting countries in Asia. These sectors may then have a cumulative contribution of around 20 per cent in the export basket leading to exports of around USD 200 bn by 2025. EXHIBIT 1.43 shows the current (2014) and the targeted export value from these sectors in 2025.

EXHIBIT 1.43

Current and expected share of shortlisted discrete manufacturing sectors



1 India's total goods export in 2014: ~ USD 320 bn
2 India's target to capture position amongst the top 4–5 exporting countries from Asia by 2025, Asia's exports from these sectors expected to grow at past CAGR
SOURCE: ITC trade map

Assuming business-as-usual growth of hinterland clusters, a significant part of the increased exports (~USD 90 bn) from these sectors could come from port-based or port-proximate manufacturing clusters.

Sector	**Exports (2014),** USD bn	**Targeted exports (2025),** USD bn	**Estimated exports under BAU,** USD bn	**Estimated increase in exports from new clusters,** USD bn
Automobiles	10	43	27	16
Food processing	7	15	8	7
Furniture	1	13	3	10
Leather and Footwear	6	28	17	11
Electronics	11	50	18	32
Apparel	22	57	44	13

1.3.1 Apparel clusters

Opportunity for India

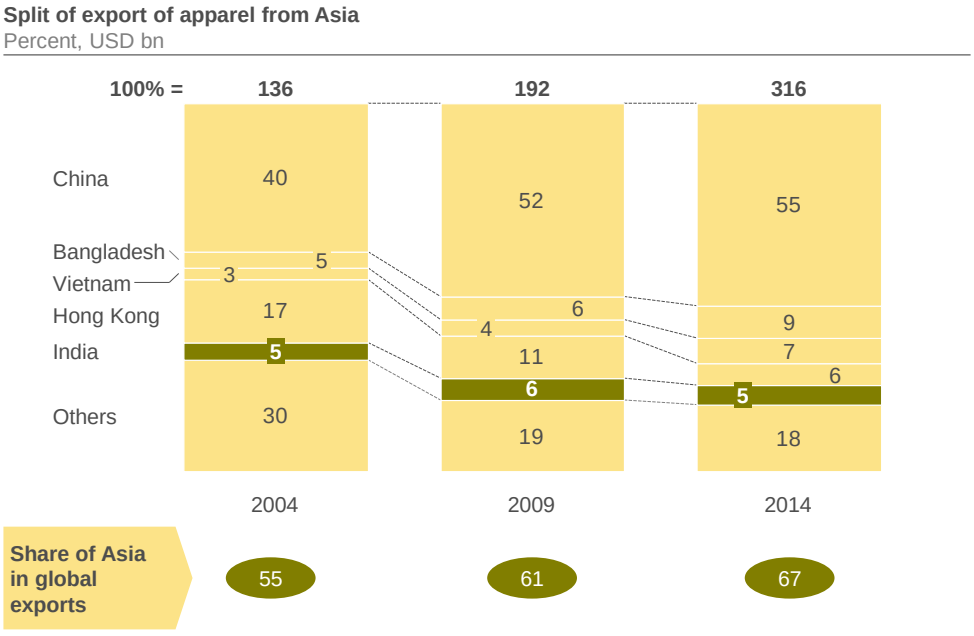
India has raw material-based competitive advantage in apparel manufacturing. It is the third largest cotton producer in the world. The downstream activities of converting cotton to textile and then to apparel are highly labour-intensive.

India's share in exports from Asia has remained stagnant at 5 per cent (EXHIBIT 1.44). Analysis of global trade flows reveals that while China has consolidated its position, Bangladesh and Vietnam are emerging as the next "hot spots" for export-oriented apparel manufacturing.

In 2013, a survey of 29 chief procurement officers (CPO) of leading apparel companies indicated that around 72 per cent planned to decrease sourcing from China in the next five years. However, India ranked a distant third, after Bangladesh and Vietnam as a substitute (EXHIBIT 1.45).

EXHIBIT 1.44

India's share of apparel exports from Asia has remained stagnant at ~5%



SOURCE: International trade database by ITC

EXHIBIT 1.45

Chief purchasing officers plan to move some of their sourcing out of China over the next 5 years, Bangladesh top emerging sourcing market

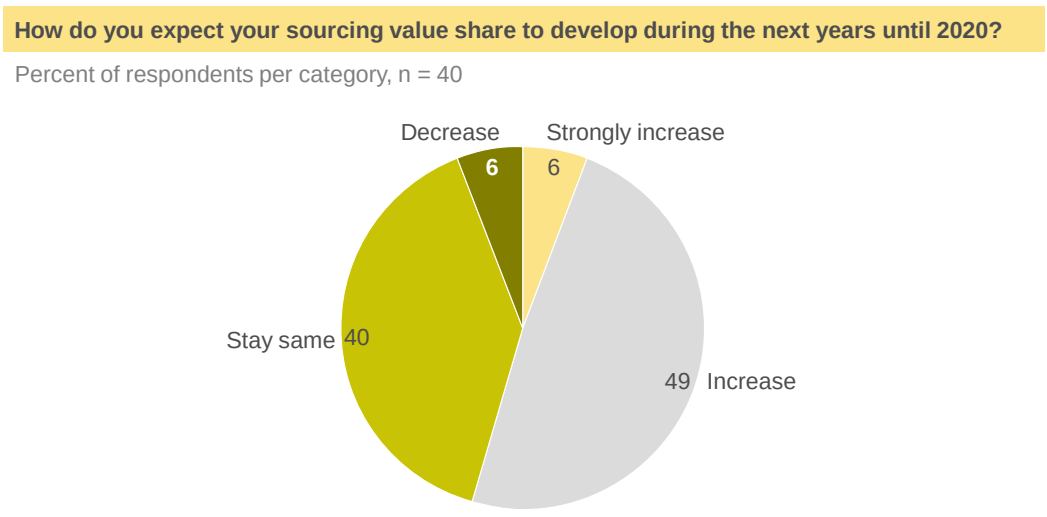
SOURCE: Public report - What's next in apparel sourcing

If India were to target a 10 per cent share in apparel exports from Asia (close to Bangladesh's current share) by 2025, it could grow to ~USD 60 bn by 2025.

80 per cent of sourcing companies are present in India, even though India's share of their wallet is only about 6 per cent. More than half of the CPOs based in India would like to increase sourcing from here (EXHIBIT 1.46).

EXHIBIT 1.46

More than 50% of CPOs want to increase their sourcing share from India



SOURCE: Public report – What's next in apparel sourcing

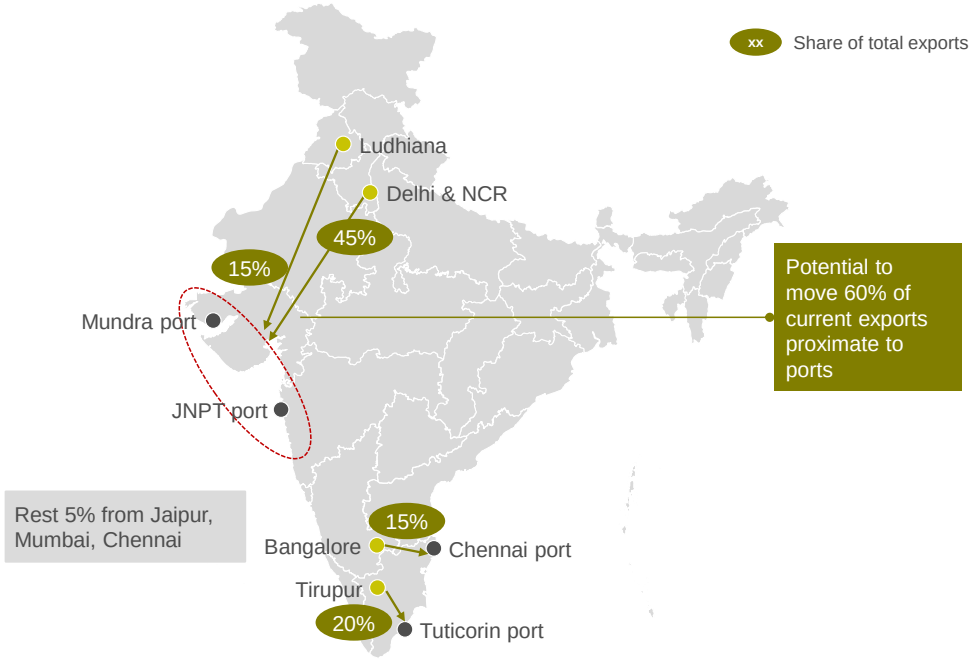
Challenges faced and the role of port-led industrialisation

Port-based manufacturing could help the industry overcome two key impediments in India's rise as an export hub:

- **Lead time:** Responsiveness of supply-chain and low and predictable lead time has been the primary selection factor expressed by buyers. For India, the logistics lead time is longer than the manufacturing process, creating a major disadvantage. A significant portion of Indian apparel exports are transported by air (at 5 times the logistics cost compared to shipping) due to non-reliability of road, rail and port infrastructure against short and fixed turnaround times. Based on the analysis of "origin–destination" pairs of apparel, nearly 60 per cent of the current production is located distant from the ports (EXHIBIT 1.47).

EXHIBIT 1.47

Origin–destination pairs for apparel exports in India



SOURCE: Discussions with industry

- **Sub-scale operations:** Apparel manufacturing in India is dominated by small-scale, stand-alone firms that are not able to compete with other low-cost nations. India has about 11,000 apparel manufacturing firms in comparison with around 18,000 firms in China, which produce 20 times more apparel by volume.

In addition to these port-related factors, restrictions on importing man-made fabric in India also put export-oriented manufacturing at a disadvantage with respect to other competing nations. Man-made fabrics could cut down wastages from 8–9 per cent to 1–2 per cent, thereby improving the overall competitiveness of the industry.

Setting-up port-based or proximate manufacturing clusters could help address these issues and significantly increase the competitiveness of apparel manufacturing. Welspun is a good example of setting up an at-scale facility (800 acres, 14,000 workers, own power supply) and a close-to-port location (50 km away from India's largest container port, Mundra).

To replicate the Welspun success model, three or four “apparel parks” could be set up in the country, linking cotton-producing regions with ports. A mapping of cotton-producing regions in India shows three possible locations for setting up these clusters (EXHIBIT 1.48).

Saurashtra region in Gujarat: Amreli, Bhavnagar, Jamnagar, Rajkot, Surendranagar and Ahmedabad are among the highest cotton-producing districts in this region.

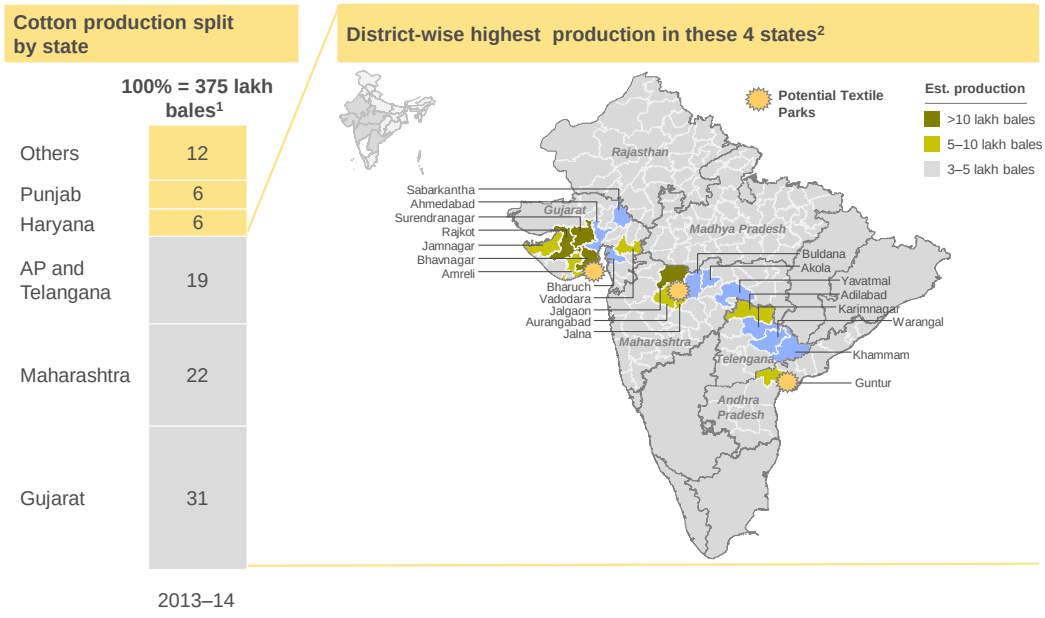
Central Andhra Pradesh: Guntur is a key cotton-producing district. This cluster can also tap into cotton being produced in Khammam, Warangal, Karimnagar and Adilabad districts in Telangana.

Vidarbha region in Maharashtra: Jalgaon, Aurangabad, Jalna, Buldana and Akola are they key cotton-producing districts in this region.

The potential impact from a proposed apparel park is shown in EXHIBIT 1.49.

EXHIBIT 1.48

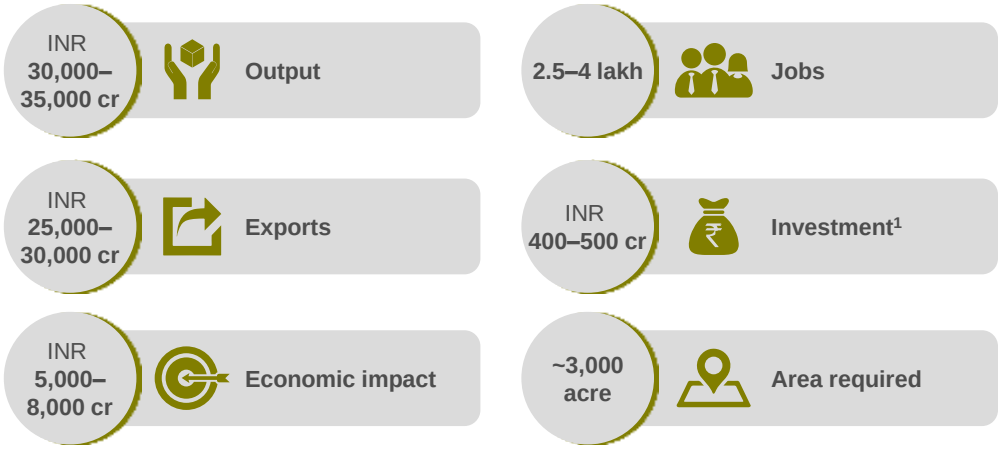
Three clusters of cotton production in India that can be linked to port based apparel clusters



1 of 170kg
2 Based on “Cotton statistics at a glance” published by Directorate of Cotton Development & National Centre for Integrated Pest Management

EXHIBIT 1.49

Potential Impact from each apparel park



1 Investment includes only internal roads and provision for water, sewage, electricity and land levelling

1.3.2 Leather and footwear clusters

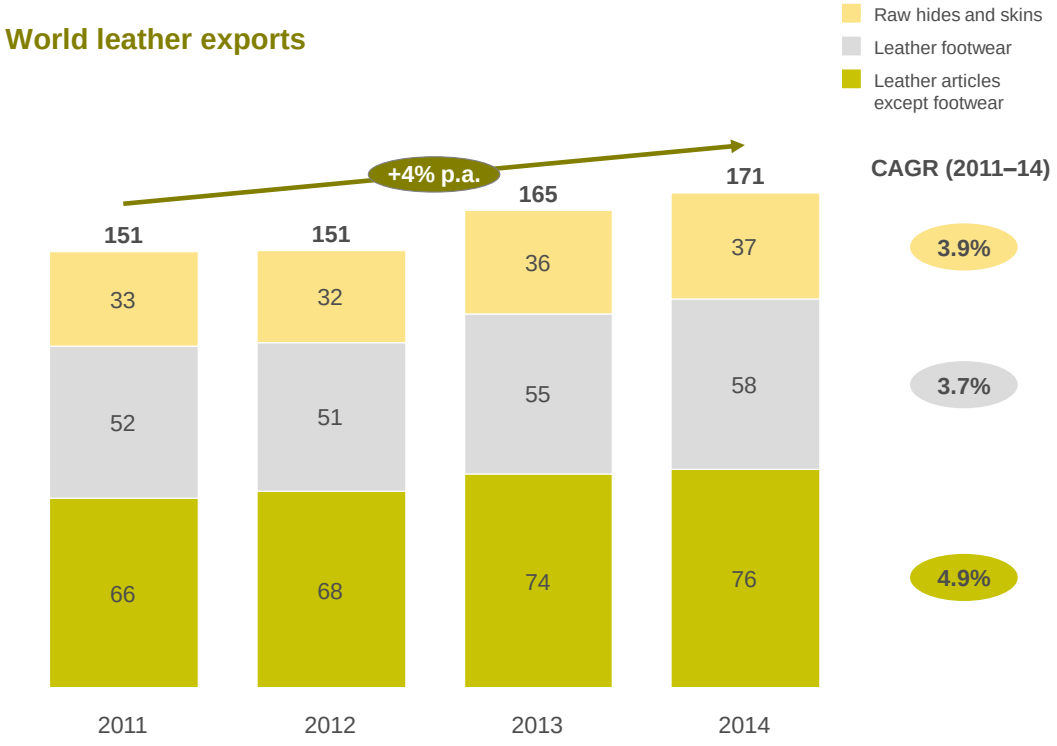
Global trade flows

The global leather industry is USD 80 bn in size, with China being the largest producer and US being the largest consumer. Industry revenue is forecasted to reach USD 91 bn, with a CAGR of 3 to 4 per cent, over the next five years. There are four segments of leather products—footwear, finished leather, saddlery and harness, leather apparel and leather goods. Footwear, along with by apparel and goods, forms the major share of the leather industry. About 65 per cent of global leather goes into the production of leather footwear. Leather and leather goods trade globally was around USD 170 bn in 2014 growing at 4 per cent per annum in the last few years (EXHIBIT 1.50). Around 80 per cent of it is from the export of leather goods and footwear. China has the largest share of exports in leather footwear and other leather articles, followed by Italy. In exports of raw hides and skins, Italy takes the first place followed by the US and Brazil

Leather is a highly traded commodity, on average, global leather trade accounts for around 75 per cent of total leather production.

EXHIBIT 1.50

World leather exports



SOURCE: ITC trade map

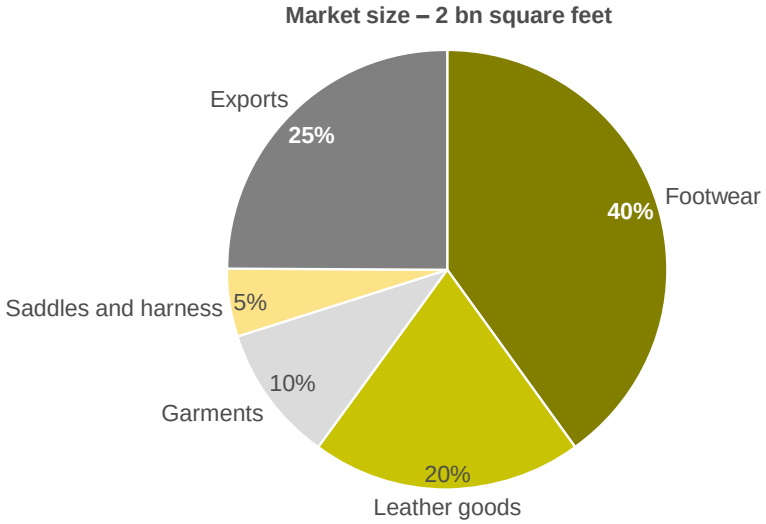
The Indian leather industry

The livestock population in the country is 512 mn consisting of cattle, buffalo, sheep, goat, pig, etc. This serves as the source of a steady supply of around 2 bn square feet of leather for the industry every year of which a quarter is exported (EXHIBIT 1.51).

Besides access to raw material, India has a natural advantage in this labour-intensive industry in terms of workforce. Leather and leather products' industries together employ over 2.5 mn Indians, primarily belonging to the economically weaker sections, of which 30 per cent are women.

EXHIBIT 1.51

Leather consumption in India



SOURCE: CLE

Leather clusters in India

The industry is an important foreign exchange earner. India exported around USD 6 bn of leather and associated products in 2014. Exports have grown rapidly, achieving annual growth of around 9 per cent over the last four years.

The three major leather clusters which have significant export volumes are (EXHIBIT 1.52):

- Tamil Nadu has a significant concentration of exporting units (~33 per cent). Perambur, Chennai, Ambur and Ranipet constitute the leather cluster, primarily using the Chennai port to export leather-related products.
- Uttar Pradesh has around 28 per cent of exporting units spread across Kanpur, Noida, Faridabad and Agra. Most of the leather articles are exported through container ports in the west, e.g., Mundra and JNPT.
- West Bengal: Kolkata houses a leather cluster in the Bantala region and exports through ports on the east coast.

The top five destinations for Indian leather products were with the US with 13.3 per cent share, Germany with 12.8 per cent, the UK with 12.5 per cent, Italy with 8.4 per cent and Hong Kong with 7.4 per cent respectively. The top 10 countries account for more than 75 per cent share of leather and related products (EXHIBIT 1.53).

EXHIBIT 1.52

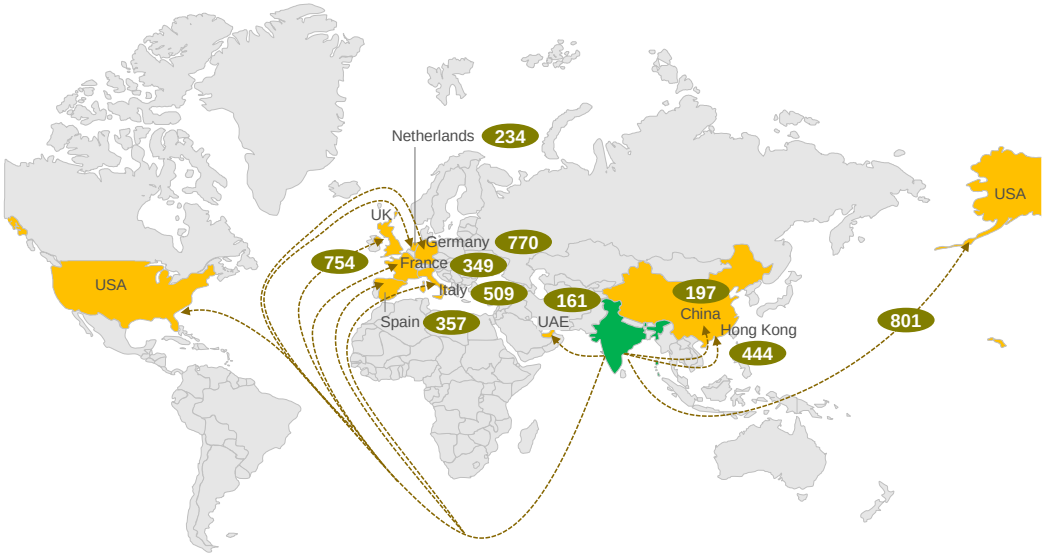
Leather production centres in India

EXHIBIT 1.53

Leather cargo flows from India

Leather export cargo

USD mn, 2014



Top 10 countries have 75%+ share of leather exports from India

SOURCE: ITC Trade Map

Opportunity for India

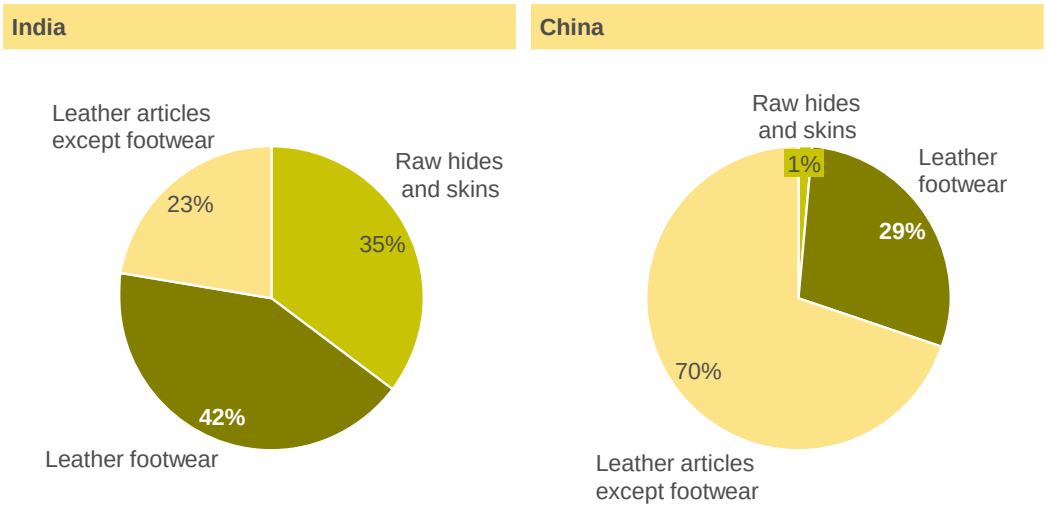
At 42 per cent, footwear forms the largest share of leather and leather products exports from India. India has grown tremendously from being a raw leather exporter to becoming a supplier of high value-added products in the last few decades.

Indian leather exports are around 3.5 per cent of India's export basket. Leather and leather goods together accounted for 1.8 per cent of India's total exports in 2013–14, compared to 2.9 per cent in 2004–05. Although India is the second largest manufacturer of leather footwear after China, our exports were only 5.6 per cent of the total 2,065 mn pairs produced in 2014.

The industry may find it difficult to meet the export target of USD 14 bn by 2016–17 for which about 6.2 bn square feet of leather is required, more than thrice the present production. Even at a more realistic target of doubling its exports to USD 10 bn in 2016–17 from USD 5 bn in 2013–14, the Indian leather industry may need an additional 3 bn square feet of raw hide, which needs more than export substitution.

EXHIBIT 1.54

Comparison of Indian and China Leather Export Split – 2014



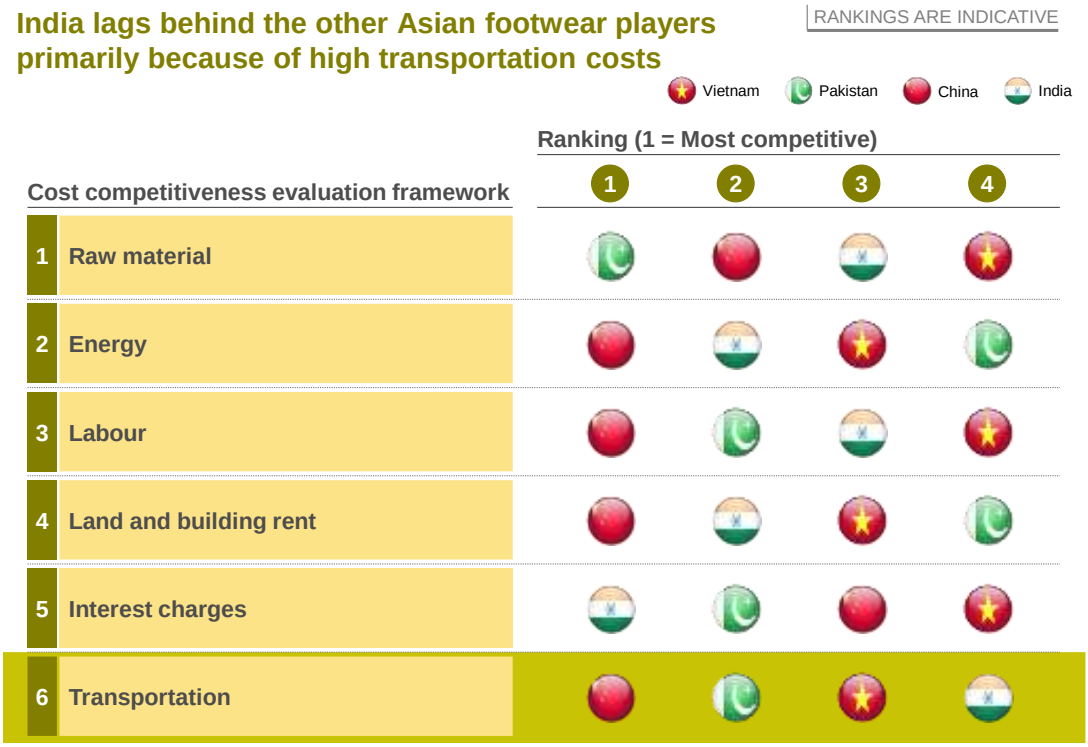
As shown in the EXHIBIT 1.54, China has a much higher share in value-added leather articles—footwear, apparel and goods while India exports large amounts of raw hides and skins. India needs to change this.

Challenges faced and the need for port-led industrialisation

The shortage of raw material is not the only challenge for the industry in India. When compared to China and Vietnam, Indian leather products in the international market are of higher cost, due to:

- Half the labour productivity of China or Vietnam in leather manufacturing
- Relatively high dependence on imports for inputs needed for footwear, garments and goods
- Another challenge is the unorganised structure of the Indian leather manufacturing. Nearly 85 per cent of the industry consists of very small manufacturers, who are often uncompetitive
- Infrastructure in China is more developed than India across all utilities – electricity, water, roads and ports
- Most of the big leather clusters in India are land-locked, transportation costs are higher for manufacturing units (EXHIBIT 1.55)

EXHIBIT 1.55



Role of ports and logistics infrastructure

Building leather clusters near ports could reduce transportation costs involved in product exports and input imports.

Port-proximate manufacturing has played an important role in the competitiveness of leather footwear and leather goods manufacturers in China. Wenzhou is a port-based footwear cluster and is known as shoe capital of the world.

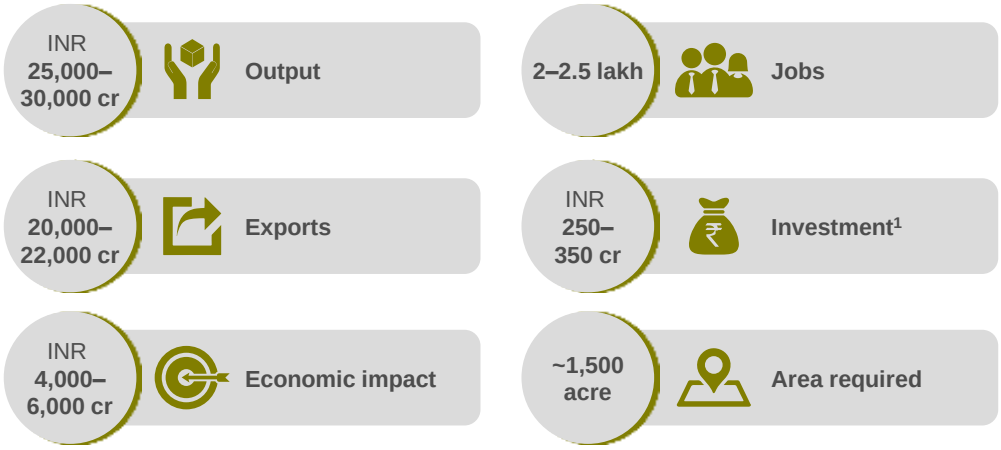
However in India, only the Chennai leather clusters leverages port. Several other clusters could be developed with a similar focus. In these clusters, there will be need to augment the raw material base, enhance capacity, modernise and upgrade leather units, address environmental concerns, develop human resource, support traditional leather artisans, address infrastructure constraints and establish institutional facilities.

Bihar is excellent for development of the leather industry owing to the availability of raw materials, traditional skills and labour and proximity to NW1. The leather complex at Bantala near Kolkata can also be connected to Haldia port. Similarly, in the South, Perambur may be connected to Chennai or Ennore ports to reduce travel and export costs. Leather clusters in other parts of Tamil Nadu, such as Ambur and Ranipet could also emerge.

The potential impact from the proposed leather and footwear cluster is shown in EXHIBIT 1.56.

EXHIBIT 1.56

Potential Impact from each leather and footwear cluster



1 Investment includes only internal roads and provision for water, sewage, electricity and land levelling

1.3.3 Food processing clusters

Global trade flows

The global food processing industry was estimated to be USD 3,200 bn in 2010[9], and can be categorised into eight major segments—meat, marine, fruits and vegetables, vegetable oil, dairy, grain mills, ready-to-eat and other foods, and animal feed. The industry contributes around 7 per cent to global exports. Sector-wise contribution to global export volumes in 2001 and 2013 and corresponding growth rates for the same period is shown in EXHIBIT 1.57.

Fruits and vegetables, grain mills, marine and meat formed the biggest part of global exports in processed food segments. It is also important to note that grain mills, ready-to-eat foods and vegetable oil were the fastest growing segments. The US is the single biggest market for sale of processed food, while the US, Europe and Japan together account for over 60 per cent of the total retail processed food sales in the world[10]. India's share in global exports has been estimated to be around 1.2 per cent[11]. Sugar and sugar confectionery, animal and vegetable fats and oils, dairy products and frozen and preserved meat, and fish and marine products command the biggest share. EXHIBIT 1.58 shows the split of global demand for processed food and the split of global exports between countries.

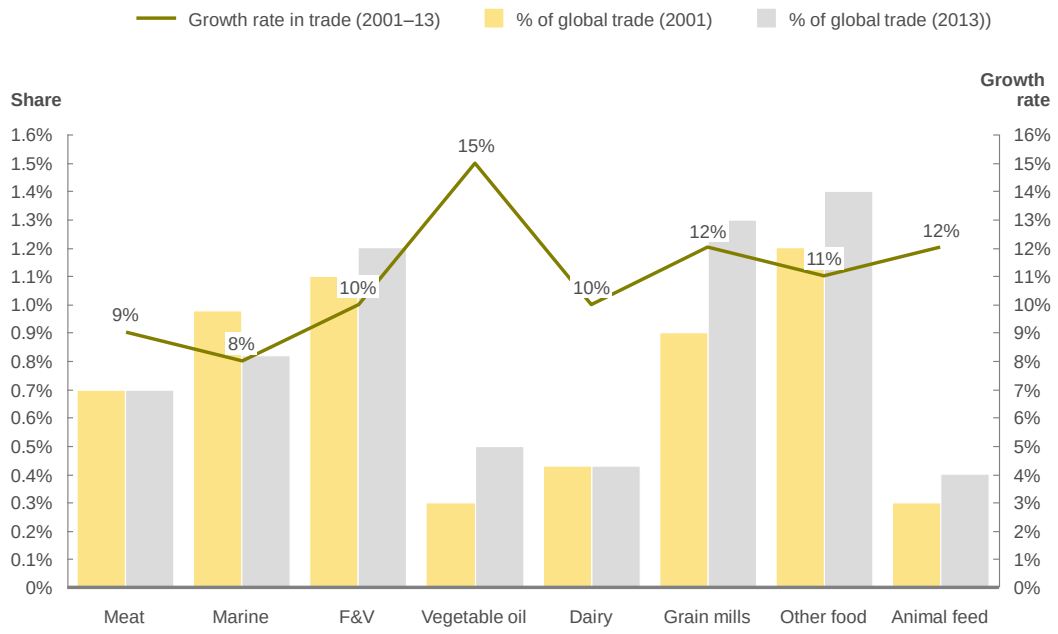
9 Gyan Research and Analytics Pvt Ltd., 2012

10 Cygnus APF Quarterly Report, May 2007

11 Government of India, National Manufacturing Competitiveness Council (2009). Enhancing firm level competitiveness Indian food and agro-processing industry: Strategies and road map development

EXHIBIT 1.57

Segment-wise contribution to global exports 2001–13

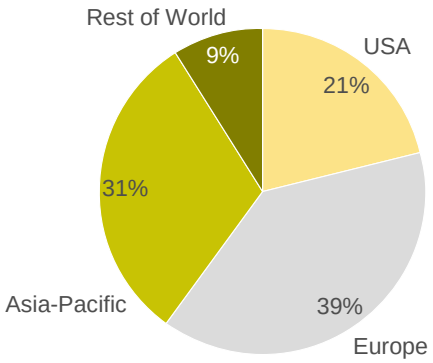


SOURCE: ITC Trade Map, VCIC Conceptual Development Plan

EXHIBIT 1.58

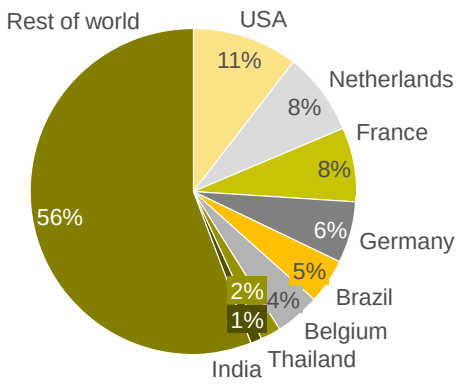
Share of global processed food market

Global processed food market demand, Percent



Split of global exports of processed food

Global exports of processed food, Percent



SOURCE: FICCI Knowledge paper on "Processed food and Agribusiness", Cygnus APF Quarterly Report, May 2009, GOI National Manufacturing Competitiveness Council, 2009

Indian food processing Industry

The Indian food processing industry was estimated to be USD 121 bn in FY 2012[12] and ranks fifth in the world in exports, production and consumption. It contributes around 9 per cent of the GDP in manufacturing and around 11 per cent of the GDP in agriculture[13].

Indian exports of processed food and related items rose at a CAGR of 23.3 per cent during FY 11–15 reaching

12 D&B Research

13 MOSPI Annual Report 2014-15

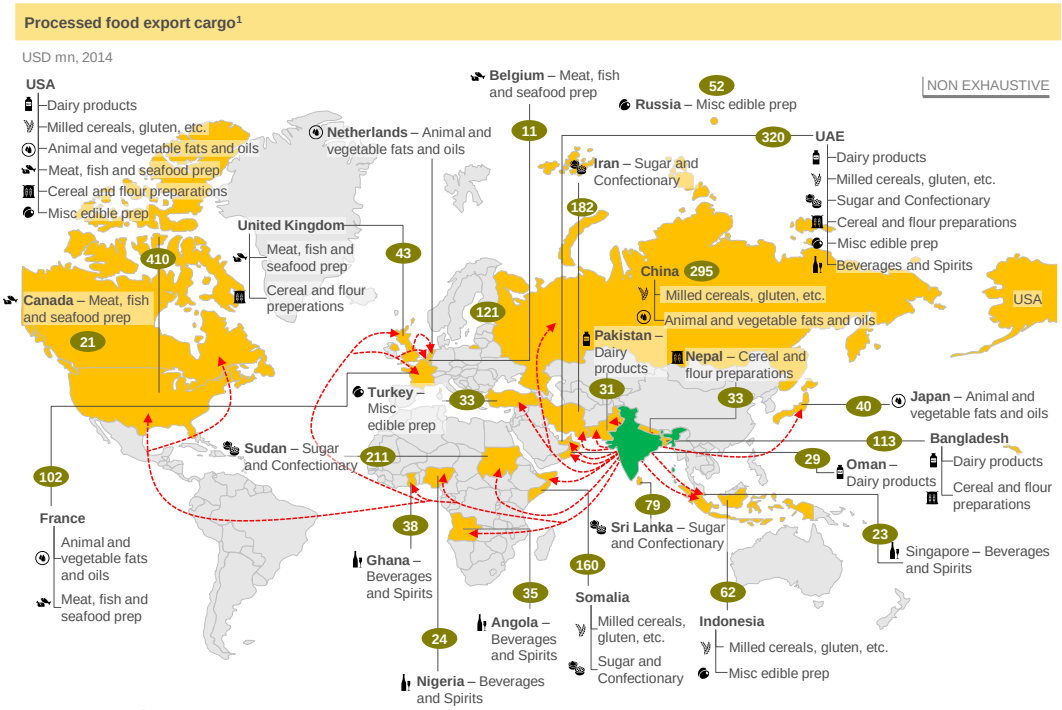
USD 21.5 bn in FY 2015[14]. The share of processed food exports in total food exports was 32 per cent in FY 2014.

US, Bangladesh and the UAE are the major countries that import processed food and agriculture-related products from India. US, Canada and Belgium are also major importers of processed marine foods from India. EXHIBIT 1.59 shows the export value of some key processed food categories from India in 2014.

[14] IBEF

EXHIBIT 1.59

Processed food cargo flows from India



SOURCE: ITC Trade Map

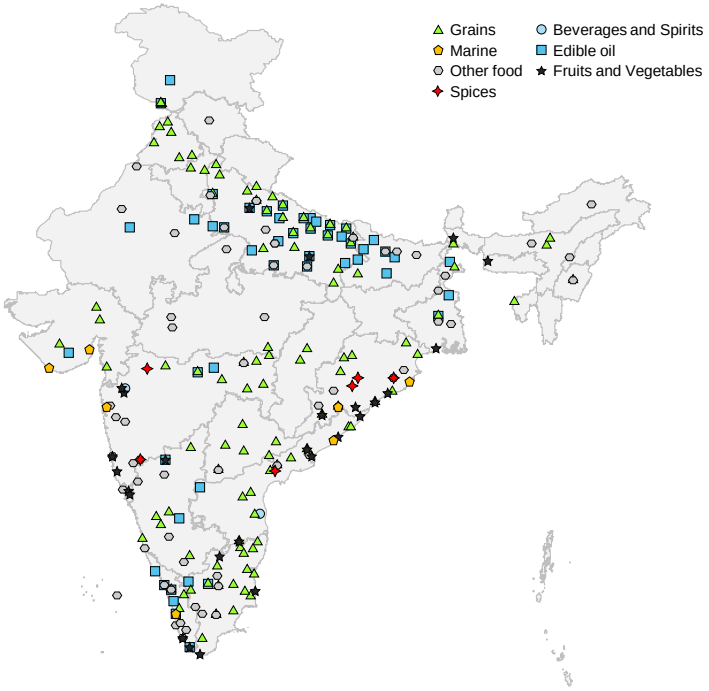
Food processing clusters in India

Small-scale and unorganised sectors account for around 75 per cent of the total food processing industry in India (EXHIBIT 1.60). SMEs in the food processing industry are spread across the country. In the organised sector, Andhra Pradesh, Gujarat, Maharashtra and Uttar Pradesh have the maximum share. EXHIBIT 1.61 shows the share of different states in the organised food processing units.

Andhra Pradesh is the centre for fruits, vegetables and grain processing; Gujarat is the centre for edible oils and dairy, Maharashtra for fruits, vegetables, grains and beverages while Uttar Pradesh has food processing units across most product categories.

EXHIBIT 1.60

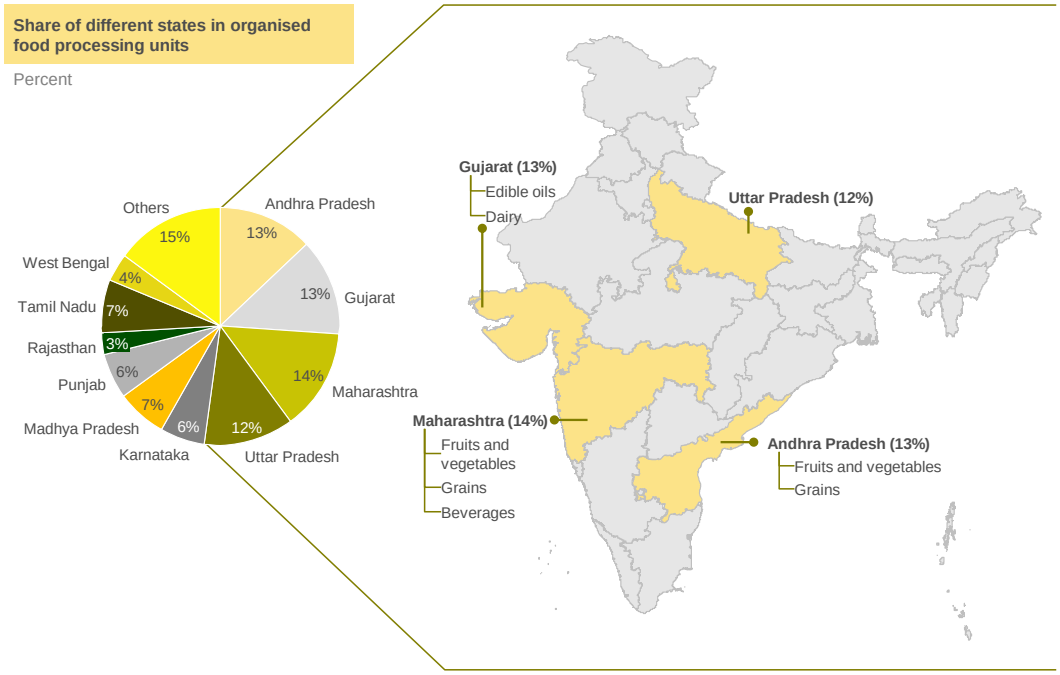
Footprints of processed food segment in unorganised sector



SOURCE: Cluster observatory

EXHIBIT 1.61

Key food processing clusters in India: Organised sector

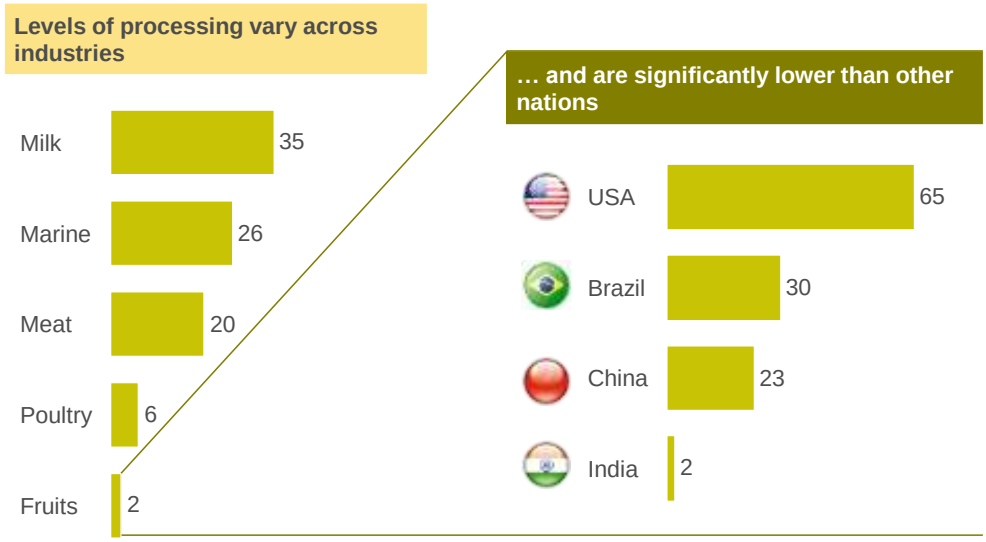


SOURCE: GOI Ministry of Statistics and Programme Implementation (2010) Annual Survey of Industries

EXHIBIT 1.62

Levels of food processing in India are much lower than those in other countries

Processing level (Percent)



SOURCE: Ministry of food processing Annual Report, 2009–10

Opportunity for India

India is the second largest producer of food after China. India processes much less than other countries across segments (EXHIBIT 1.62).

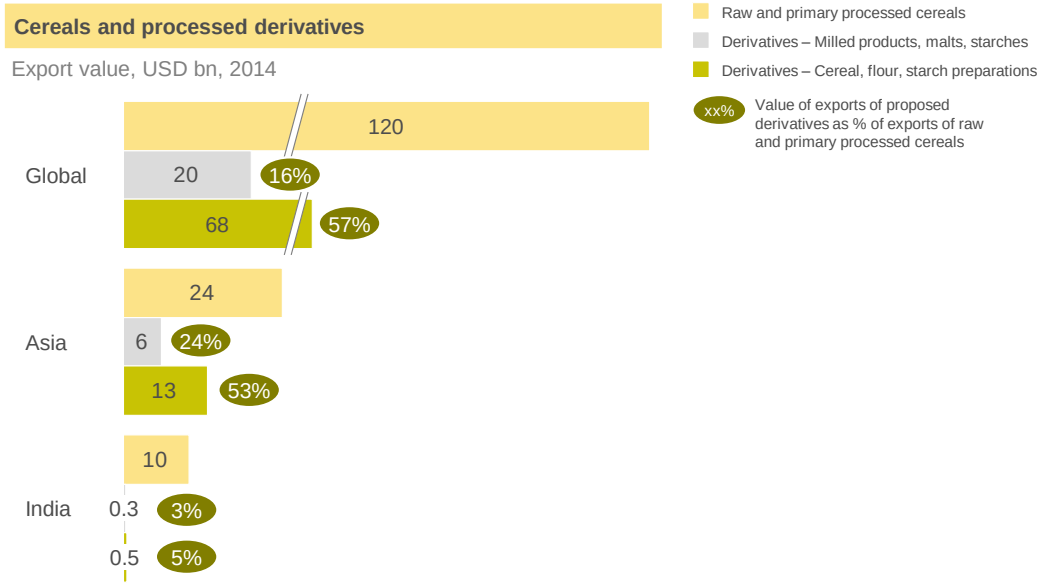
Even though India has been a major exporter of food, processed foods form a very small share in India's export share across all kinds of products:

- **Cereals and processed derivatives:** India is one of the largest exporters of cereals, including wheat, rice, barley and oats, contributing around 40 per cent of the total exports from Asia in 2014. However, in comparison, the export of value-added derivatives of cereals forms a very small share in the export basket of India (EXHIBIT 1.63). In 2014, value of export of milled products, malts and starches was 3 per cent of the value of export of cereals as compared to the average 24 per cent from Asia and 16 per cent globally. This suggests a huge untapped potential of value addition in food processing of cereals for exports from India.

- **Meat, fish and marine products:** India is one of the largest exporters contributing around 20 per cent to the total exports from Asia in 2014. However, the value of export of processed derivatives of meat, fish and marine products is merely 1.4 per cent of the value of export of raw, frozen and preserved meat, fish and marine products. This figure was around 41 per cent and around 20 per cent for Asia and the world respectively (EXHIBIT 1.64).

EXHIBIT 1.63

India's export basket comprises mainly of raw and primary[1] processed cereals

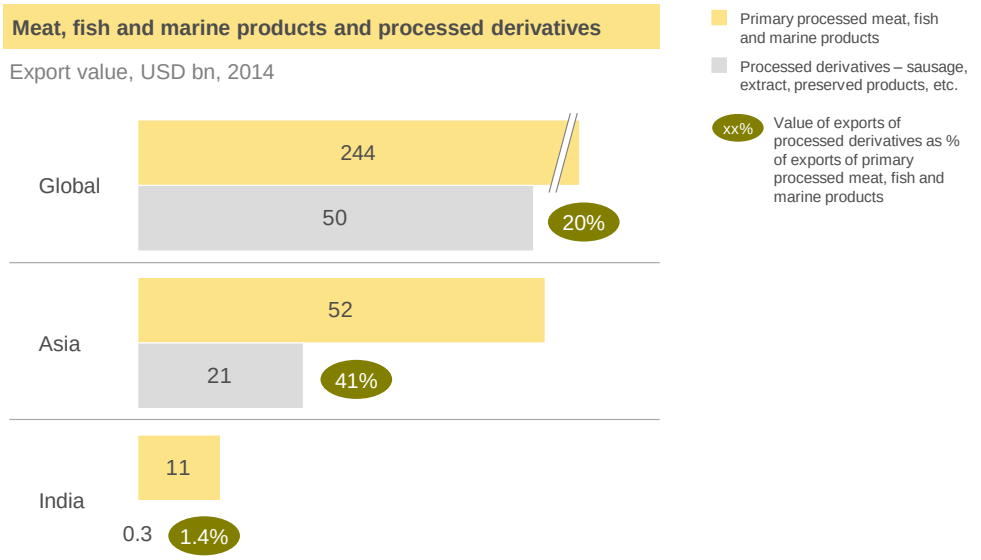


1 Primary processing refers to quick and simple transformation of food like packaging, milling of rice, etc.

SOURCE: ITC Trade Map

EXHIBIT 1.64

India's export basket comprises mainly of primary[1] processed meat, fish and marine products

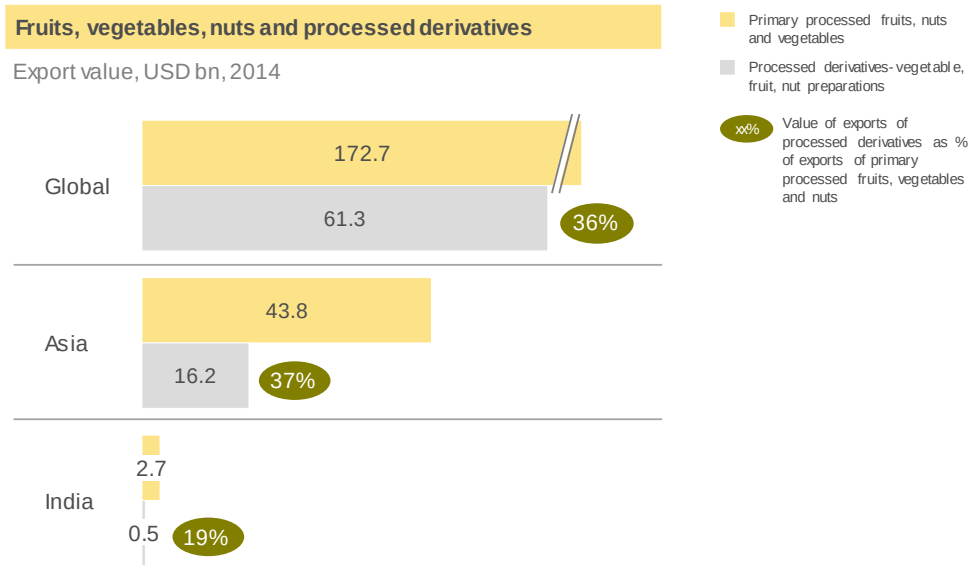


1 Primary processing refers to quick and simple transformation of food like packaging, milling of rice, etc.

SOURCE: ITC Trade Map

EXHIBIT 1.65

India's export basket comprises mainly of primary[1] processed fruits, vegetables and nuts



1 Primary processing refers to quick and simple transformation of food like packaging, milling of rice, etc.

SOURCE: ITC Trade Map

- **Fruits, vegetables and nuts:** The value of export of processed derivatives of fruits, vegetables and nuts from India was 19 per cent of the value of export of primary processed fruits, vegetables and nuts in 2014. Owing to higher value-added food processing, this figure was around 37 per cent and around 36 per cent for Asia and the world respectively (EXHIBIT 1.65).

This suggests a huge potential for manufacturing processed derivatives from cereals, meat, fish and marine products and fruits, vegetables and nuts in India. The industry's aspiration is to triple food processing levels in India from around 7 per cent in 2010 to 20 per cent in 2020 by augmenting manufacturing capacity in secondary and tertiary processing, increasing cold storage and warehouse capacity and developing skilled resources to manage different steps of the food processing value chain[15]. The expected impact could be:

- 20 to 40 per cent increase in farm incomes
- 50 per cent reduction in wastage levels
- Around 20 to 30 mn direct and 60 to 80 mn indirect jobs

Considering the small domestic market for processed foods in India currently, the aspired growth in the processed food industry has to be fuelled by exports. This requires that the industry prepares itself for high export competitiveness.

Challenges faced and the role of port-led industrialisation

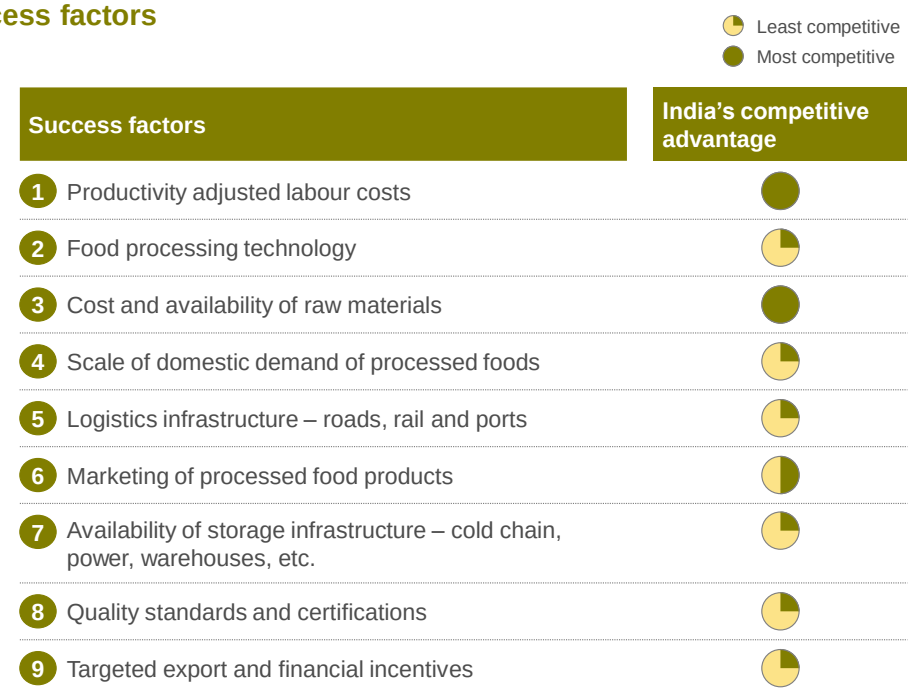
15 FICCI's India Food Processing: Mission 2020

India is resource rich but absence of domestic scale, outdated technology, inefficient logistics and supply chain and unavailability of infrastructural facilities constrains food processing. India faces tough competition from China, Brazil, Thailand, Germany, Indonesia and Vietnam in the processed meat, fish and marine foods market. Greece, Italy, the Netherlands, France and Belgium are the main competitors in the cereal derived food products' segment.

An analysis of India's export competitiveness reveals that India ranks favourably on productivity adjusted labour costs and availability and cost of raw materials (EXHIBIT 1.66). However, it lags behind on most of the other aspects of the industry ecosystem and government and regulatory support required for the sector. India also lacks in food processing technology and availability of support infrastructure required for the industry. There are severe constraints due to the non-availability of or limited access to quality control and testing infrastructure, storage facilities and inefficient supply chain and logistics infrastructure leading to huge wastages and high costs of processed food products.

EXHIBIT 1.66

India's food-processing competitiveness was assessed on a set of nine success factors



Role of ports and logistics infrastructure

Due to the perishable nature of most food products, it is particularly important to have efficient logistics to reduce transportation time of both raw materials and finished products. Transit cost is also an important factor in the overall product cost where India already has a disadvantage. Therefore, port infrastructure and hinterland connectivity are extremely important for export-oriented cargo.

Global success story

There are international cases of food parks which have thrived primarily because of the optimal location, e.g., Penang International Halal Hub in Malaysia which caters to sea food processing, herbs extraction, bakery products, canned foods and beverages, and others. This hub is strategically located between the large markets of India and China and has linkages to good ports. The location is complemented by efficient transport infrastructure and availability of skilled resources through the Penang Skill Development Centre. It is also monitored by the Halal Industry Development Corporation which laid down the guidelines for HALMAS status – an accreditation given to Halal Park operators as a mark of excellence indicating that the products are of the highest quality. Companies eligible under the guidelines also receive various fiscal incentives, such as tax and income tax exemptions.

Considering the export orientation of the food processing sector, it is important that Mega Food Parks be port-based or have adequate linkages to ports. Possible locations include:

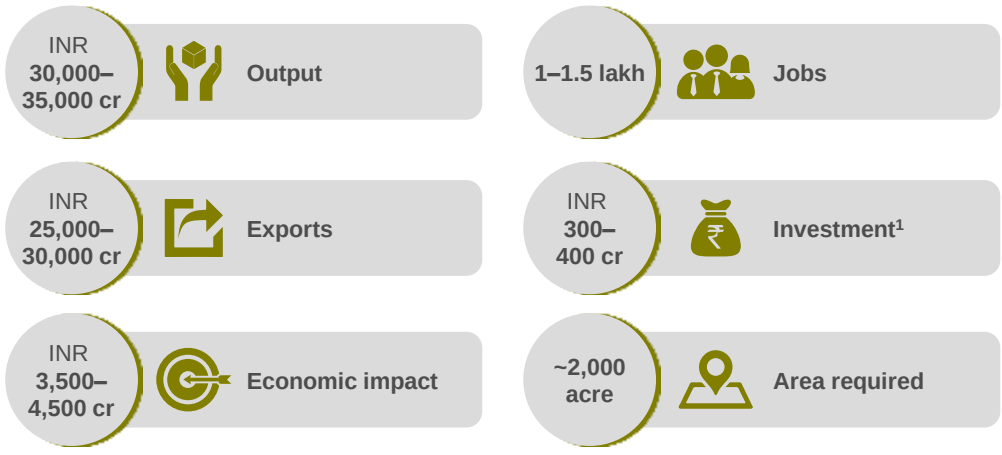
- Kakinada in Andhra Pradesh: Since Andhra Pradesh has the necessary factors of production, including proximity to raw materials, port infrastructure and existing industrial agglomeration, it is most suitable for a port-based Mega Food Park with significant export orientation of value-added food products of rice, fruits and vegetables. The proposed Mega Food Park could also draw synergies from VCIC where food processing is a focus sector with Kakinada, Gannavaram and Yerpedu–Srikalahasti as the proposed nodes for development.

- Southern Maharashtra: The state is a leading producer of mango, cashews and fish. However, food processing is currently done using traditional methods and oriented primarily towards domestic consumption. A Mega Food Park specialising in the manufacturing and export of value-added products from mango, cashews and fish can come up in resource-rich districts of Ratnagiri and Sindhudurg, closely linked to Jaigad and Vijaydurg ports.

The potential impact from food processing industrial cluster is shown in EXHIBIT 1.67.

EXHIBIT 1.67

Potential Impact from each food processing cluster



1 Investment includes only internal roads and provision for water, sewage, electricity and land levelling

1.3.4 Furniture clusters

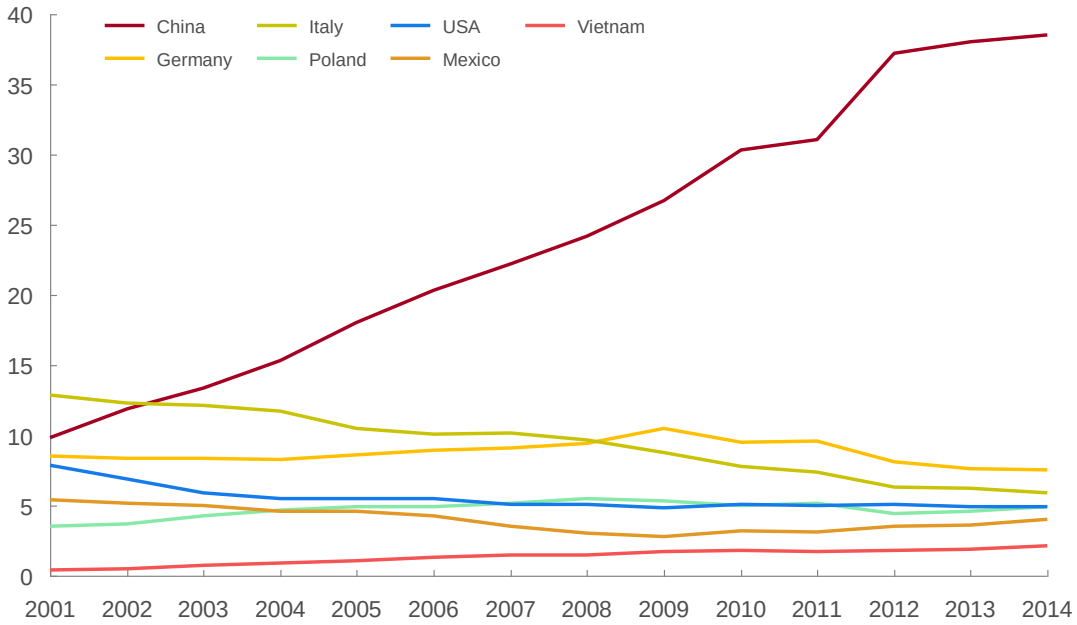
Global trade flows

The global furniture market comprises six major categories and amounted to around USD 420 bn in 2014 and is pegged to grow at around 3.5 per cent Y-o-Y to reach USD 450 bn by 2019. Globally, furniture is a highly traded commodity with global exports of USD 242 bn, which amount to 58 per cent of consumption. Global exports are primarily driven by four of the six key categories—office and domestic furniture (USD 85 bn), seats (USD 73 bn), lamps and lightings (USD 54 bn) and mattresses (USD 16 bn). In the furniture market, across all categories, China is a dominant force with 40 per cent share in global exports (EXHIBIT 1.68). The largest importers are the US (24 per cent) and Germany (10 per cent).

Vietnam has grown its share in global export five times in the last 15 years owing to the availability of cheap raw material and labour. India has less than one per cent share of global exports. (EXHIBIT 1.69).

EXHIBIT 1.68

Global furniture markets exports

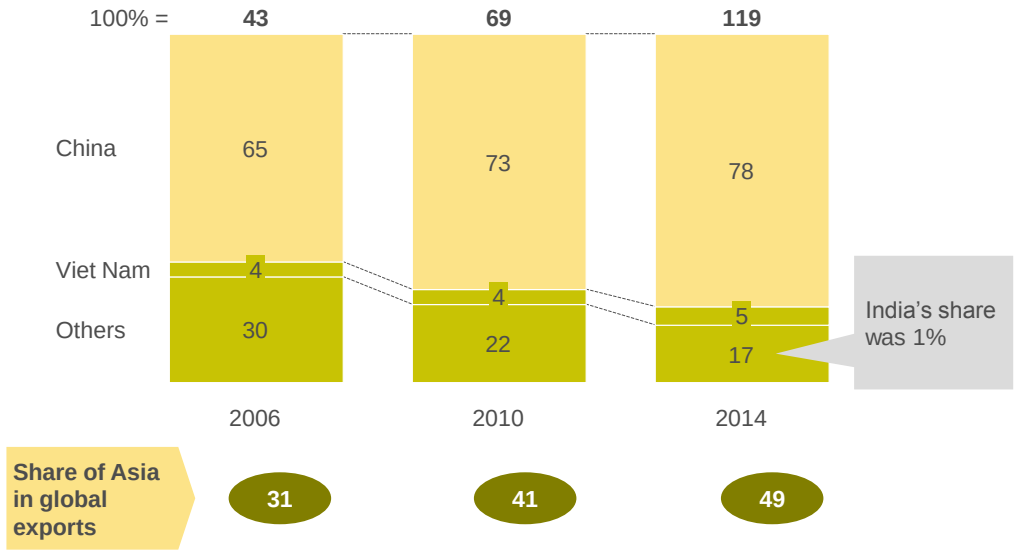


SOURCE: ITC Trademap

EXHIBIT 1.69

China has a near monopoly in export of furniture from Asia

Split of export of "Furniture, Lighting, signs and pre-fabricated buildings" from Asia
Percent, USD bn



SOURCE: International trade database by ITC

Import markets are primarily developed economies. The US is the largest importer with 24 per cent share in global imports, followed by Germany (10 per cent), the UK (5 per cent), France (5 per cent), Canada (4 per cent) and Japan (4 per cent). Key trade flows in the world are primarily from China to the developed economies. Another major trend in the global trade is the flow of furniture from markets with cheaper labour to the markets in proximity, e.g., Mexico to the US (EXHIBIT 1.70).

EXHIBIT 1.70

Key global trade flows

From …	… to	**Trade** (in USD bn)
China	US	24.1
Mexico	US	9
US	Canada	5.5
China	Japan	5.17
Canada	US	4.5
Poland	Germany	4.4
China	Germany	4.1
China	UK	4
China	Malaysia	3.1
China	Singapore	3
China	Australia	2.9
China	Hong Kong	2.6
China	Canada	2.5
China	Russia	2.4
China	UAE	2.3
US	Mexico	2.3
Germany	France	2.2
China	Netherlands	2.2
Vietnam	US	2.2
Italy	France	2.1

SOURCE: ITC Trademap

The Indian furniture industry

Demand for furniture in India increased at 12 per cent annually from 2007 to 2014, forming a USD 25 bn market.

Home furniture is the largest segment in the Indian market contributing to roughly 65 per cent of the overall market, whereas the other large sectors of the global market like lamps and lightings and seating contribute only 2.5 per cent and 8 per cent respectively.

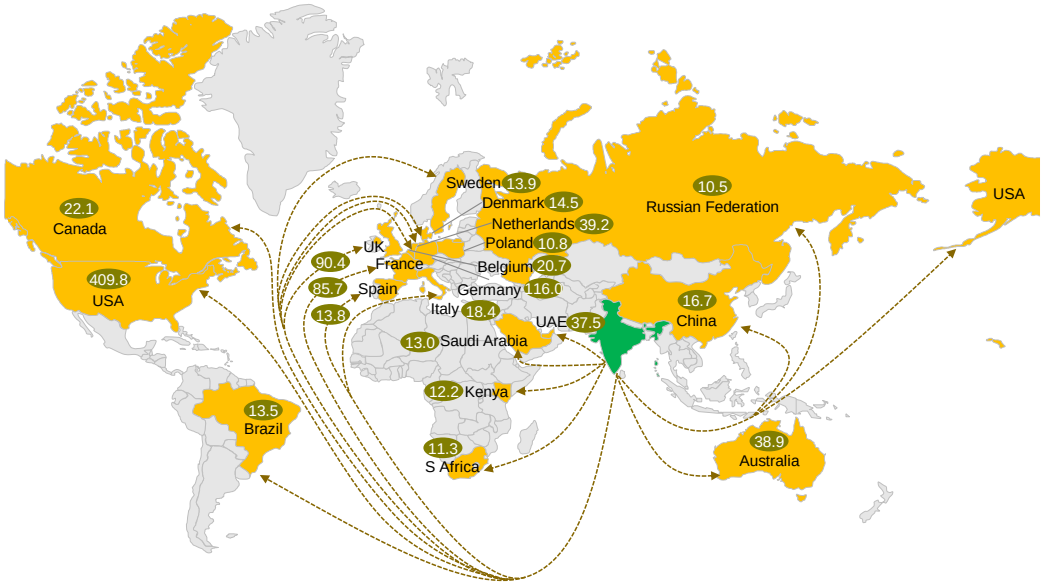
India has been exporting the maximum share of furniture to the US and the UK accounting for 47 per cent of the total export. India is primarily a self-sufficient market with both exports and imports being less than 5 per cent of the overall market. EXHIBIT 1.71 shows key cargo flows in from India.

EXHIBIT 1.71

Furniture cargo flows from India

Furniture export cargo

USD mn, 2014



SOURCE: ITC trade database

Furniture clusters in India

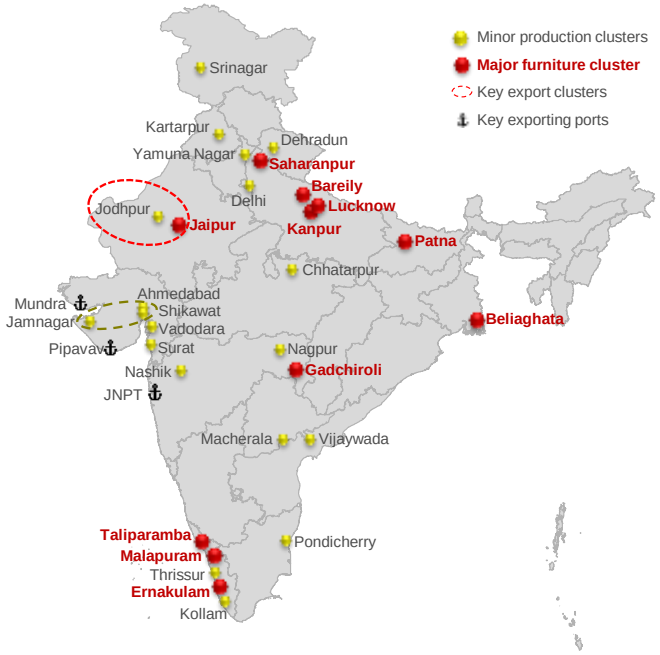
Furniture in India is manufactured in key pockets that include:

- Jaipur – Marble – Rajasthan
- Kanpur – Steel Furniture – UP
- Saharanpur – Wood Furniture – UP
- Lucknow – Steel Furniture – UP
- Malappuram – Wood Furniture – Kerala
- Ernakulum – Wood Furniture – Kerala
- Taliparamba – Wood Furniture – Kerala
- Gadchiroli – Bamboo – Maharashtra
- Bareilly – Cane and Bamboo – UP
- Beliaghata – Lamp – West Bengal
- Patna – GLS Lamps – Bihar

Mundra is the largest exporting port from the country, contributing to around 70 per cent of furniture exports. Mundra primarily gets its cargo from its immediate hinterlands in Kutch and secondary hinterlands of North India, mainly the Rajasthan belt (Jodhpur and Jaipur). Pipavav is the second biggest port in terms of volume catering to the South Gujarat and Rajasthan clusters. Only two other clusters in the country are oriented towards exports, while the majority serve domestic demand (EXHIBIT 1.72). India could build on its large domestic market, traditional craft skills and the trend of shifting production centres to make a substantial dent in the export market.

EXHIBIT 1.72

Key clusters in India



Challenges faced and the role for port-led industrialisation

India may need to resolve some of its constraints:

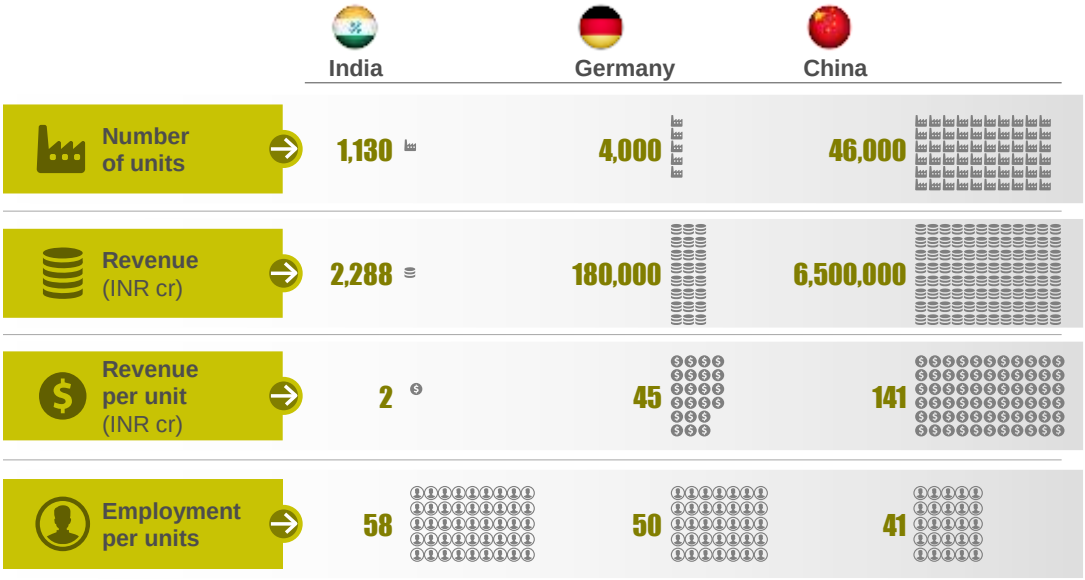
- **Sub-scale operations** - India has 1,384 registered manufacturing units for furniture production in India. Units are much smaller and highly labour-intensive in comparison with Germany and China (EXHIBIT 1.73).

- **Import dependence for raw material –** India is heavily dependent on sourcing wood from other countries. Currently, India imports around 5 mn cubic metres of wood primarily through Mundra and Kandla ports.

- **Logistics cost -** Logistics cost of the finished product contributes around 10 to 12 per cent overall value, while importing raw materials contributes another 5 per cent. Hence, port-based clusters could be cost-effective and help in reducing the overall cost of exports from the country (EXHIBIT 1.74).

EXHIBIT 1.73

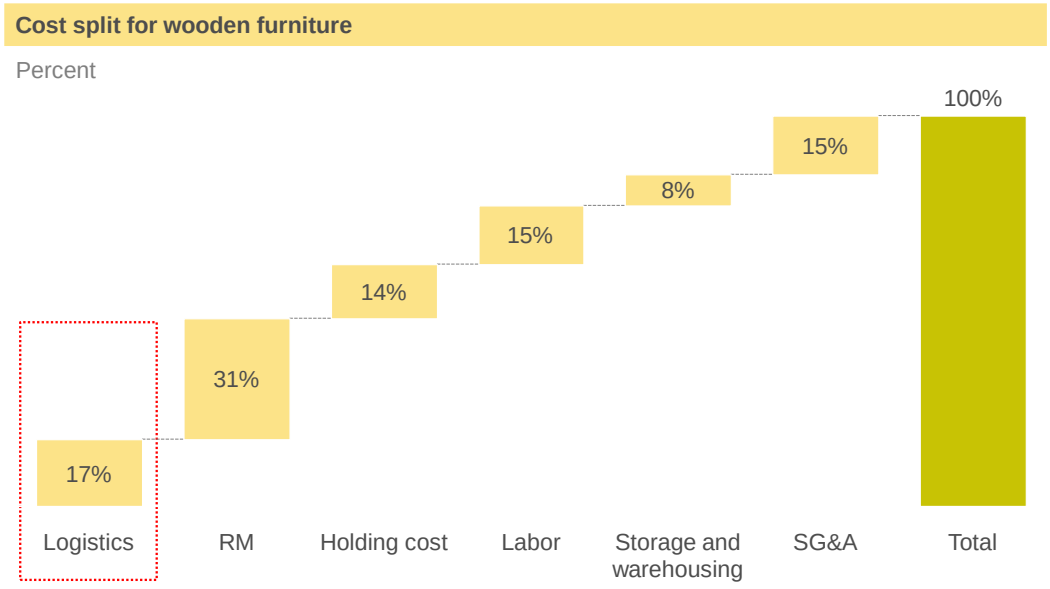
Comparison of Indian units in terms of size to global examples



SOURCE: ASI, FAO International furniture market, China light manufacturing yearbook

EXHIBIT 1.74

Furniture cost breakdown



SOURCE: Market research

Role of ports and logistics infrastructure

China is the biggest producer of furniture and the biggest importer of timber in the world. In China, around 70 per cent of the overall capacity is installed coastally (EXHIBIT 1.75). Malaysia is similar (EXHIBIT 1.76).

EXHIBIT 1.75

70% of the installed capacity in China is coastal

SOURCE: China light manufacturing yearbook

EXHIBIT 1.76

Malaysia is a major furniture exporter with furniture clusters located in close proximity to major ports

Facts and figures

- Furniture industry is mainly **export-oriented, with 90%** of production exported
- In 2013, total furniture export was valued at **RM7 bn**
- Ranked **as the top eight furniture exporter** globally, and **top two in Southeast Asia** after Vietnam
- Main export markets include the United States, Japan, Australia, Singapore and the United Kingdom
- Over **2,400 furniture companies** in Malaysia, mostly in Peninsular Malaysia

Furniture clusters are mostly in Peninsular Malaysia

Northern clusters

- Penang, Sungai Petani (Kedah) and Ipoh (Perak)

Klang Valley

- ~570 establishments
- Port Klang is the closest port

Malacca

- Main cluster at Bukit Rambai
- Located ~10–15 km from Malacca port

Muar

- Home to 700 establishments
- Accounts for 45–50% of Malaysia's furniture export
- Located near major ports in Johor

Other clusters in Johor

- Another ~350 furniture companies in the rest of Johor

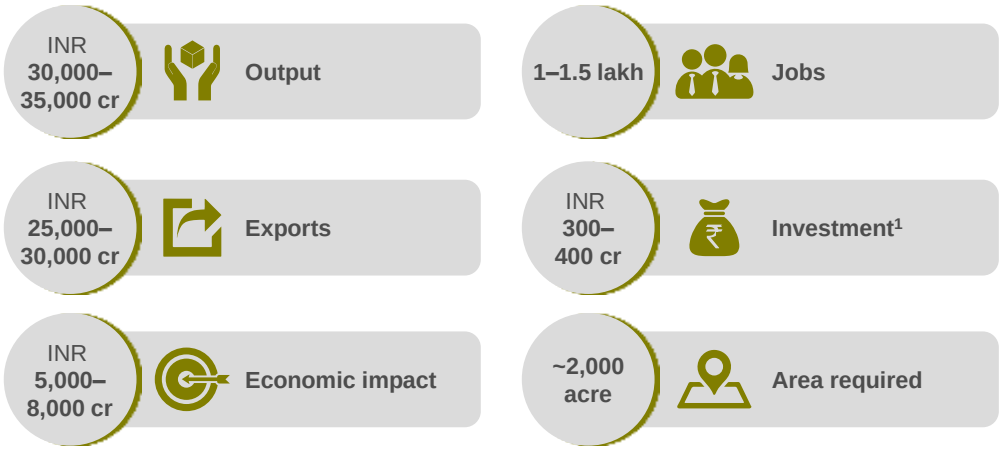
SOURCE: Ministry of International Trade and Investment; Malaysian Furniture Promotion Council; furniture cluster association

Going forward, it seems logical to develop coastal clusters for exports-based manufacturing, as discussed in the previous section. Given that the current manufacturing set-up is present in Kerala, it would be ideal to develop it further. There is also significant potential to expand the current clusters in Gujarat and Assam. For Gujarat, the raw material of marble is available close to the existing sites. A concerted effort in trying to make these clusters export competitive can go a long way.
Additionally, the existing bamboo processing industry could also be upgraded to an export-centric cluster with proper connectivity to the ports. The proposed ICD in North Bengal along with the existing NW2 can play an important role in making this cluster exports competitive.

The potential impact from the proposed furniture cluster is shown in EXHIBIT 1.77.

EXHIBIT 1.77

Potential Impact from each furniture cluster



1 Investment includes only internal roads and provision for water, sewage, electricity and land levelling

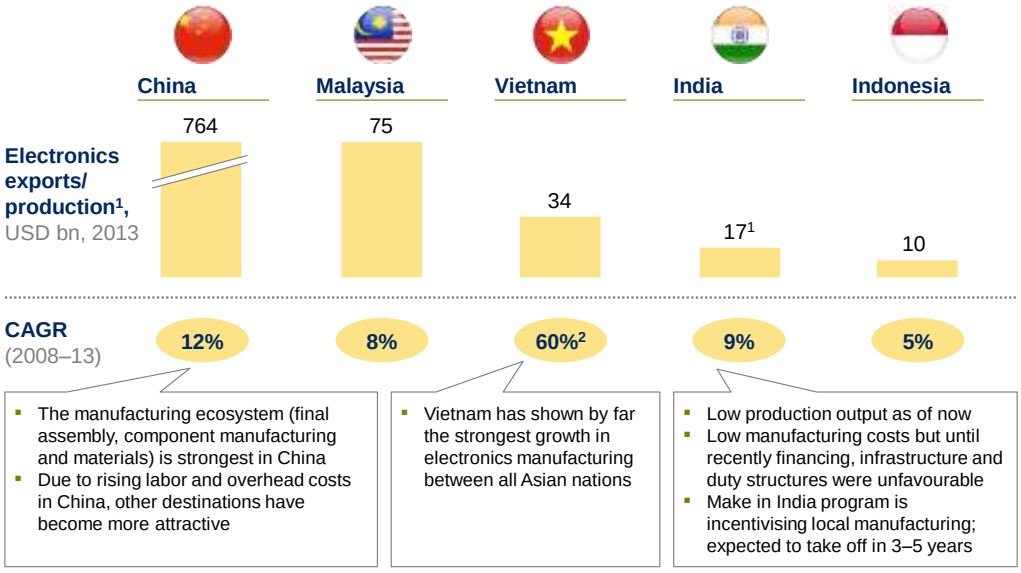
1.3.5 Electronics clusters

Global trade flows

In Asia, China is the leading manufacturer of electronic goods followed by Malaysia and Vietnam. The manufacturing ecosystem is strongest in China but due to rising labour and overhead costs, other destinations are becoming more attractive. Vietnam has shown the strongest growth in electronics manufacturing among all the Asian nations (EXHIBIT 1.78). With the "Make in India" programme which incentivises local manufacturing, electronics manufacturing is expected to take off in the coming years.

EXHIBIT 1.78

China is by far the largest electronics manufacturing hub in Asia, but other destinations are starting to emerge



1 Local electronics production for India, electronics exports for all other countries; 2 2009–14

SOURCE: Miti, Vietnam GSO, BDG Asia, IESA, China National Bureau of Statistics

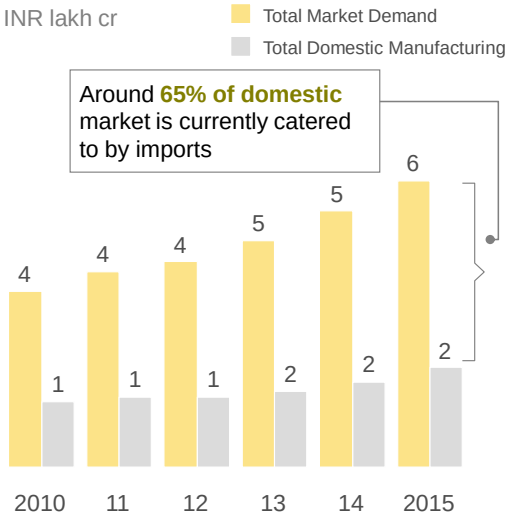
The Indian electronics industry

The demand for electronics has grown at a consistent pace in the country, reaching INR 6 lakh cr in 2015. Communication and broadcasting equipment and consumer electronics form the majority of the demand. However, the production sector has not been able to keep pace with the demand and has remained static at around INR 2 lakh cr. This has led to ~65 per cent of the domestic demand being served through imports in 2015 (EXHIBIT 1.79 and 4.80).

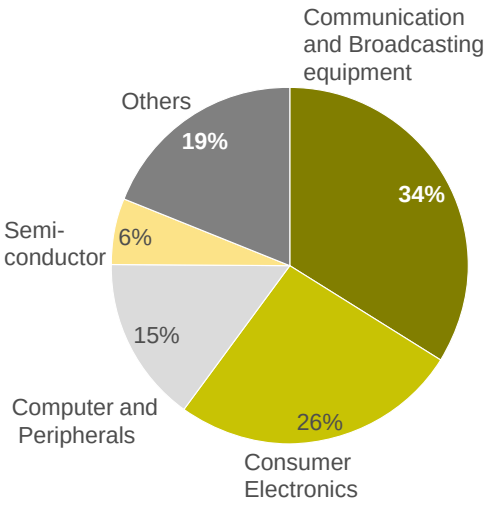
EXHIBIT 1.79

Indian electronics and IT hardware demand has grown at a steady pace of 10% CAGR in the last 5 years

Indian Electronics and IT Hardware Market Size



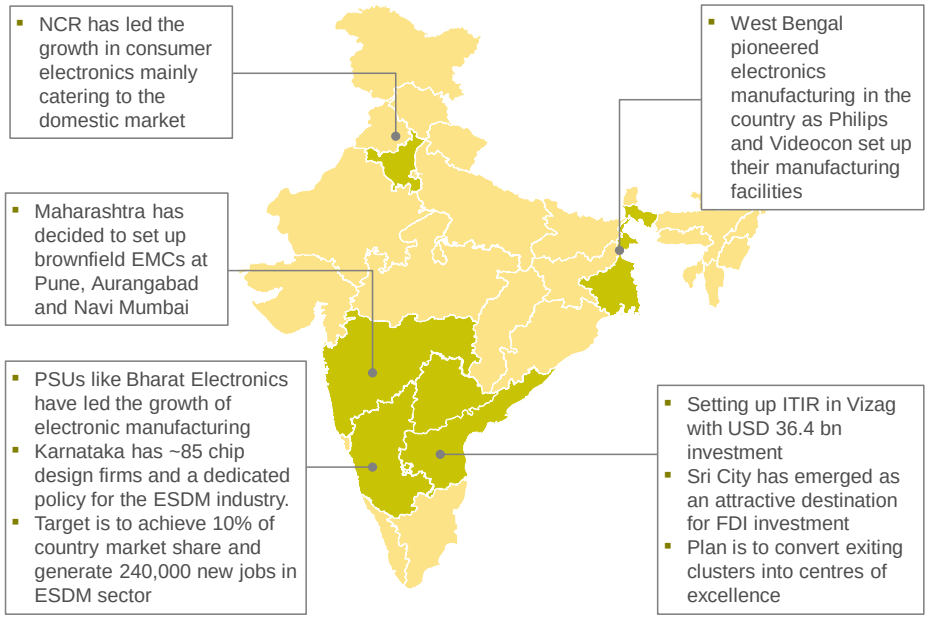
Break up of Indian Electronics and IT Hardware Sector in 2015



SOURCE: NSDC report on Electronic and IT Hardware

EXHIBIT 1.80

Domestic manufacturing in Electronics cluster in India has been led by NCR, West Bengal and Karnataka with Andhra Pradesh and Maharashtra stepping up recently



SOURCE: iesaonline.org; www.dqindia.com

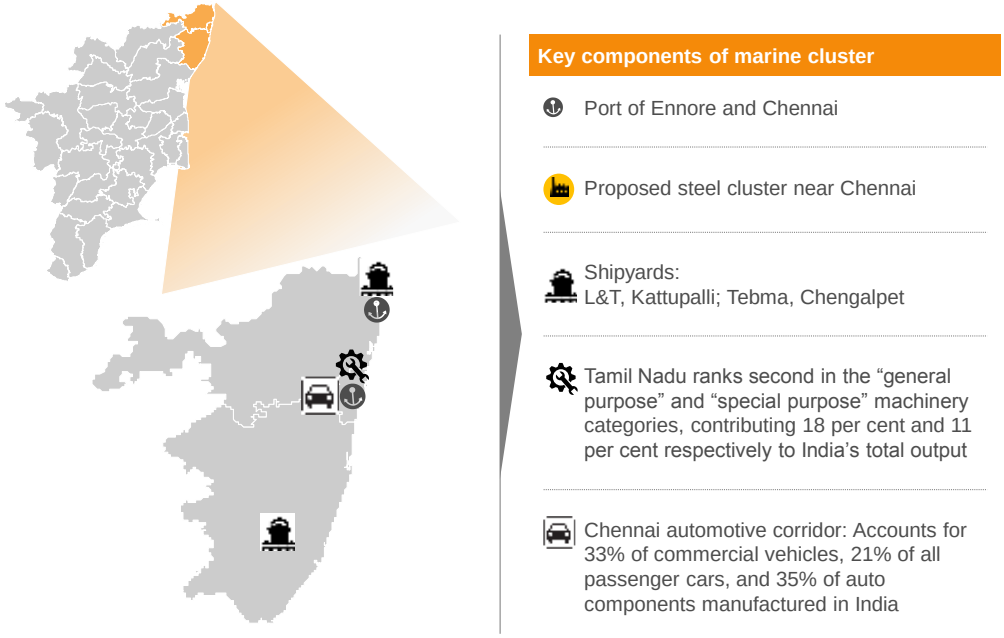
Tamil Nadu

Tamil Nadu, too, has certain enabling conditions for a maritime cluster (Exhibit 1):

- Ports of Ennore and Chennai
- A proposed steel cluster near Chennai
- Shipyards: L&T, Kattupalli; Tebma, Chengalpet
- The state ranks second in the “general purpose” and “special purpose” machinery categories, contributing 18 per cent and 11 per cent respectively to India’s total output
- The Chennai automotive corridor accounts for 33 per cent of commercial vehicles, 21 per cent of all passenger cars, and 35 per cent of auto components manufactured in India.

EXHIBIT 81

Tamil Nadu has enabling conditions for maritime cluster



Opportunity for India

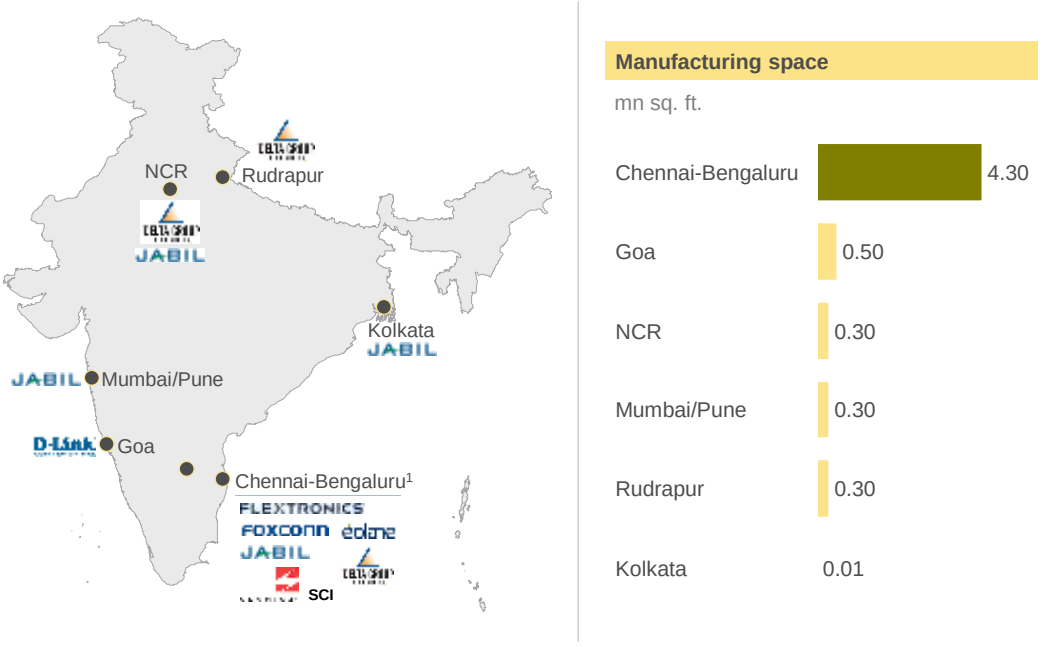
In 2014, India imported electronics items worth nearly USD 40 bn. At the current growth rate, electronics import could reach USD 85 to 100 bn by 2025.

In addition, there is a huge and expanding export market that India could tap into. Total exports of electronics from Asia was USD 1.9 trillion in 2014 and had been growing at the rate of 5 per cent per annum over the last seven years. India's share in exports from Asia is a miniscule 0.5 per cent. India could build onto three distinct sources of competitive advantages for electronics manufacturing:

- **Strong and growing domestic demand**
- **Already established as an electronics design hub:** Nearly 2,000 chips are designed per year in India with more than 20,000 engineers working in this field.
- **Emerging centre for downstream assembly operations:** India has started undertaking downstream activities of assembly operations. For example, Sri City in Andhra Pradesh is emerging as a centre for mobile phone assembly operations (EXHIBIT 1.81).

EXHIBIT 1.82

Chennai–Bengaluru cluster is emerging as the largest assembly cluster



1 Including Pondicherry

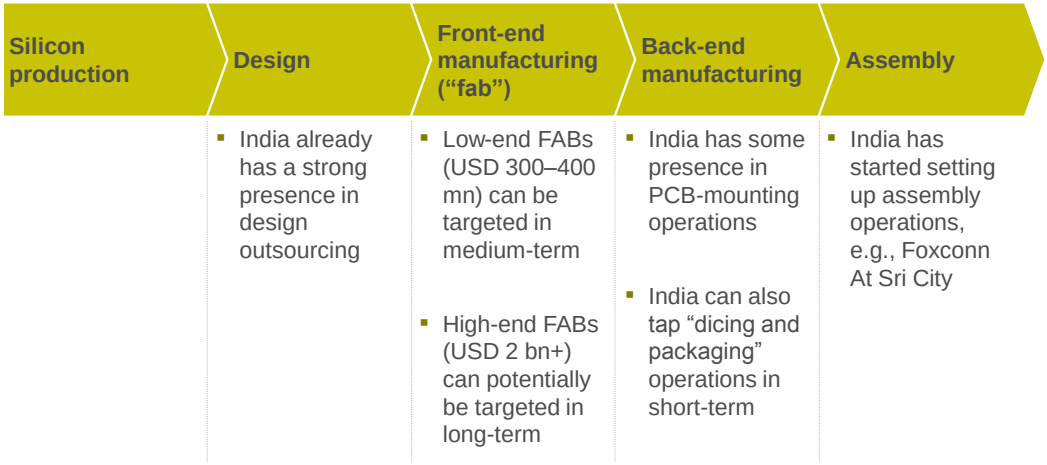
SOURCE: NVR

India focuses on the low value-added part of electronics manufacturing (assembly operations) and does not have significant footprint in upstream activities (fabs). India could target "dicing and packaging operations" in the medium term. Over a medium-to-long term, India could target to establish a "fab", which is a manufacturing facility for wafer and chip production. Setting up a high-end fab today requires capital investments of more than USD 5 bn. India could target low-end fabs in the medium term, i.e., USD 300 to 400 mn investments, focusing on analog chips,

subsequently attracting a high-end fab in the long term. A typical electronic supply chain is shown in EXHIBIT 1.82.

EXHIBIT 1.83

Electronics supply chain



Challenges faced and the role of port-led industrialisation

The National Policy on Electronics (2012) lays out the vision of developing the domestic electronics sector (ESDM) to achieve a turnover of around USD 400 bn, attract investment of around USD 100 bn and generate around 28 mn jobs.
A comparison between India and competitor countries on a number of non-cost factors reveals that India fares poorly on the legal and regulatory environment and is average on logistical efficiency (EXHIBIT 1.83).

EXHIBIT 1.84

Comparison of countries on certain key non-cost factors

Description	China	Malaysia	Vietnam	India	Indonesia
A **Managerial talent**: Availability, competition for and turnover					
B **Technical talent**: Availability, competition for and turnover					
C **Logistics efficacy**: supplier availability, utilities, transportation (e.g., roads, ports and airports)					
D **Legal and regulatory environment** (e.g., customs clearance), contracts, and tax systems					
▪ Ease of doing business rank[2]	84	18	90	130	109
▪ Enforcing contracts rank[1]	35	29	47	186	172
E **Ramp-up challenges**: 1-time costs (e.g., utilities, construction, hiring of talent)					

1 Out of 189 nations – Only these rankings have been updated with 2014 World Bank data
2 World bank 2016 data
SOURCE: Expert interviews; World Bank

Role of ports and logistics infrastructure

Electronics manufacturing tends to have a global supply chain spanning across countries and continents. Port-proximate locations could be a critical success factor for setting up fabrication units to link them with global supply chains:

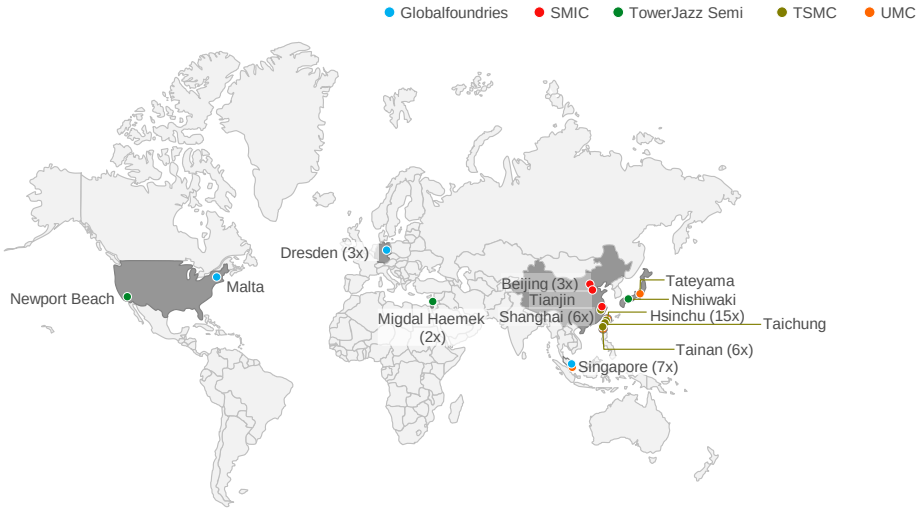
- **Import of raw materials:** India could continue to import the raw materials needed for dicing and packaging operations (in the short term) and for wafer production (in medium-to-long term). Many of these are classified as “photo-sensitives” and begin to lose yield after a period of 35 to 40 days.
- **Linkage with export markets:** The domestic demand for electronics chips in India could be insufficient to keep the fab fully loaded. The cost of not loading a fab for one day could be USD 1 to 2 mn. The most feasible business model for India could be for a global player to set up the fab in India to source their global requirement in addition to serving local demands.

Of the 48 fabs across the globe, owned by top-five semi-conductor foundries, 42 are within 40 km of a sea port (EXHIBIT 1.84).

EXHIBIT 1.85

Nearly all the Fabs across the world are port-based or port-proximate

Regional front-end FAB distribution (status: in production) of Top-5 semiconductor foundries[1]



- Out of 48 FABs (includes expansions) in production
- 41 (85%) are based in the Asia-Pacific region, 5 in EMEA and 2 in North America

1 Top-5 vendors (TSMC, UMC, GF, SMIC, TowerJazz) are holding a 2012E revenue share of close to 90%
2 Includes FAB expansions
3 200mm equiv.

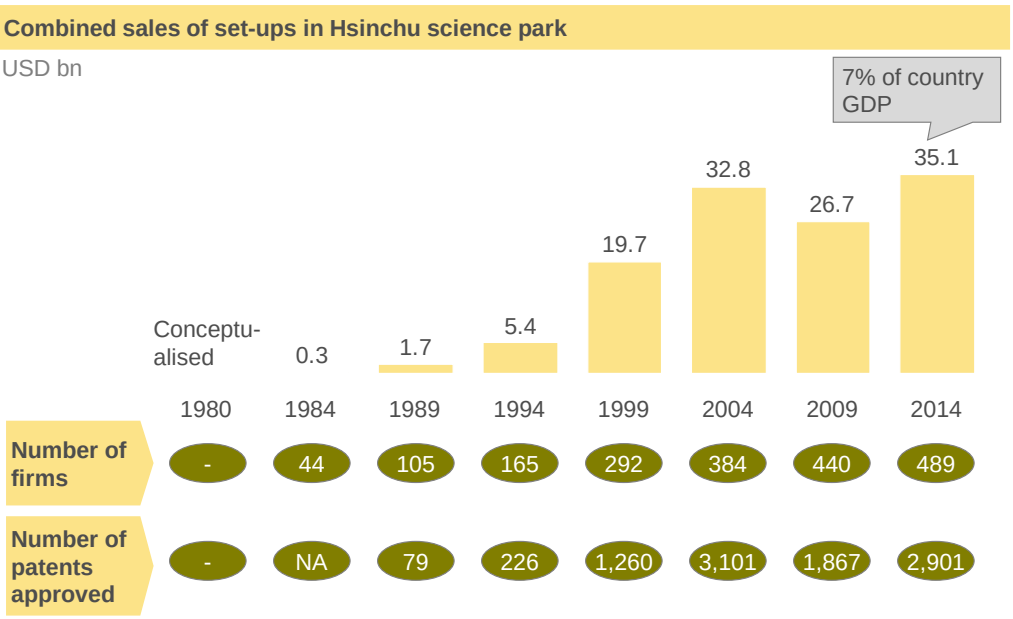
SOURCE: iSuppli (4Q 2012); WorldFABWatch (2Q 2012)

Global success story

Successful port-based or port-proximate clusters create disproportionate value for the nation in terms of value added, exports and jobs. For example, the Hsinchu Science Park has grown to be a USD 35 bn revenue zone, which is equivalent to 7 per cent of Taiwan's GDP, starting from scratch in 1980 (EXHIBIT 1.85). The Chittagong Export Processing Zone generates USD 2 bn of exports, primarily apparel, which is equivalent to 2.5 per cent of Bangladesh's GDP. Value-added at Port of Antwerp is 6 per cent of Belgium's GDP.

EXHIBIT 1.86

Hsinchu science park has grown to be a USD 35 bn revenue zone, starting from scratch 35 years ago



SOURCE: Hsinchu science park bureau, ministry of science and technology, Taiwan

Kick-starting upstream manufacturing may require an "ecosystem" approach. India may need to set up a "Science and Technology Park" and create this ecosystem, instead of piecemeal electronics clusters as these may need to be backed by strong technical research capabilities.

The selection of location for setting up the electronics manufacturing clusters could depend on two criteria:

- **Availability of urban and social infrastructure:** "Science and Technology Parks" may need to attract expats and Indians working abroad in high-tech industries. An existing developed social and urban infrastructure (e.g., proximity to research universities, international airports, metropolitans) may be a key success factor.

- **Synergies with other sectors:** By 2020, almost 35 per cent of total car costs may be related to electronics components. Hence, a science and technology park can derive synergies from other proximate automotive cluster (EXHIBIT 1.86).

Based on these considerations, possible locations for setting up the first "Science and Technology Parks" in India could be Northern Maharashtra (Mumbai or proximate) as it would have synergies with the Pune/Satara-based automotive cluster and Northern Tamil Nadu/Southern Andhra Pradesh as these locations would have synergies with the Chennai/Ennore-based automotive cluster. Both these locations also have an established urban and social infrastructure which is required for the development of science and technology parks.

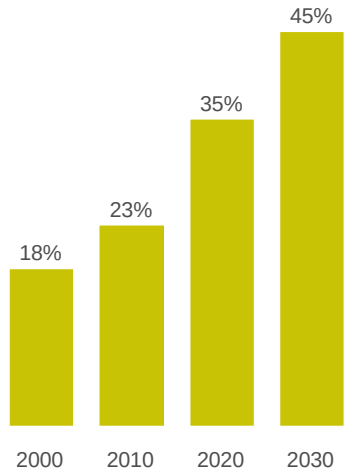
The potential impact from the proposed Science and Technology park is shown in EXHIBIT 1.87.

EXHIBIT 1.87

High synergies between automotive and electronics clusters

Electronics to account for 35% of car costs by 2020 globally

Automotive electronics cost as a % of total car cost, global average



Functional area	Evolving features
Safety	▪ Pedestrian recognition ▪ Collision alert ▪ Accident emergency call
Navigation	▪ On-board/removable navigation device ▪ Traffic control system
Entertainment	▪ In-vehicle OS ▪ Cloud functionality ▪ Internet connectivity
Convenience	▪ Communication with service centre

SOURCE: PTW-Hawk survey; strategy analytics

EXHIBIT 1.88

Potential Impact from each electronic cluster

INR 1,50,000–1,70,000 cr — Output	2.5–3.5 lakh — Jobs
INR 90,000–100,000 cr — Exports	INR 450–550 cr — Investment[1]
INR 25,000–35,000 cr — Economic impact	~3,000 acre — Area required

1 Investment includes only internal roads and provision for water, sewage, electricity and land levelling

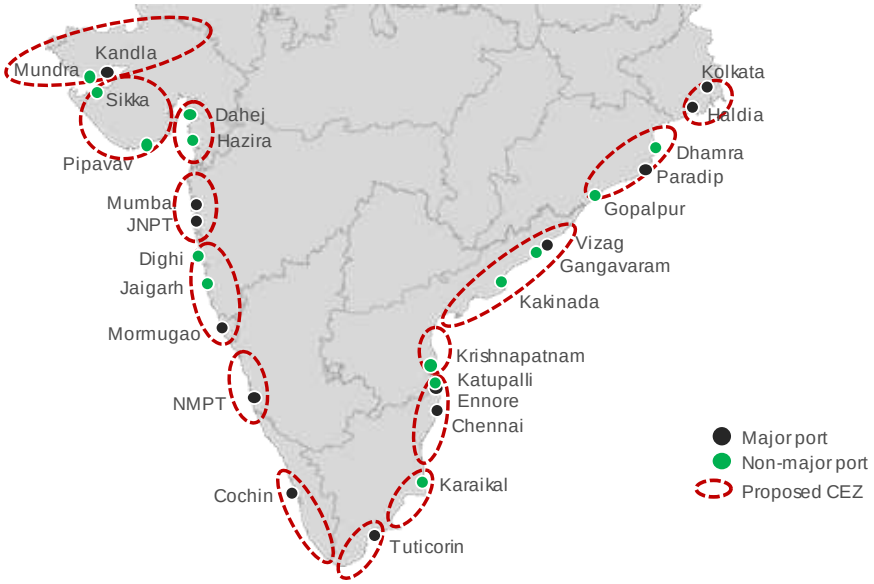
1.4 Coastal economic zones

Coastal Economic Zone (CEZ) is a concept introduced under Sagarmala as the focal point for development along India's coastline. It envisions ports to actively participate and contribute to economic development of India similar to other large global ports are doing for their respective nations. The CEZs could be spatial economic regions comprising a group of coastal districts or districts with a strong port linkage. Each CEZ could be in the immediate hinterland of ports (existing and new proposed ports), in a radius of 100 km with a sizeable domestic market along with export potential. Within each CEZ, there will be multiple industrial clusters, each with discrete land bank and a minimum size based on analysis of scale economics for a given industry. These are bounded land parcels that could actually house industrial units and requisite infrastructure.

Fourteen coastal economic zones have been identified along the coastline of the country, with each coastal state having one or more CEZ. These CEZs have been geographically mapped out covering one or more districts, and potential industries relevant for each CEZs have been proposed. Each of these CEZs is also mapped to the nearby ports (EXHIBIT 1.88).

EXHIBIT 1.89

Proposed coastal economic zones



The chart below gives details of the possible geographical coverage, port linkages and high potential industries for each of the coastal economic zones.

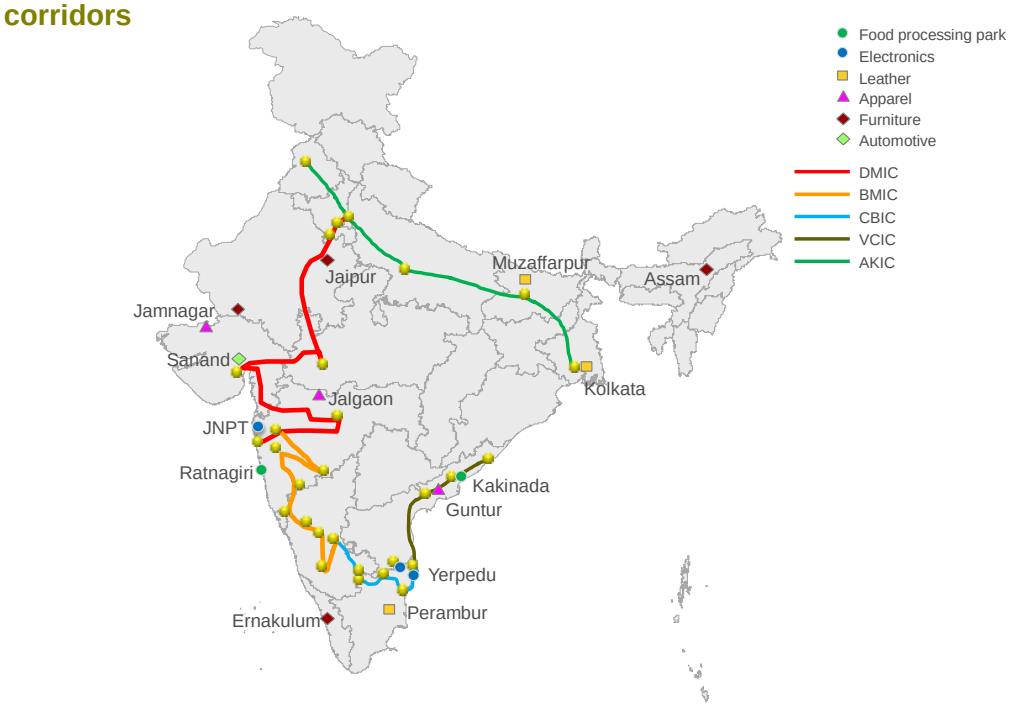
	CEZ	Probable districts	Port	Potential industries	Other sample projects
1	Kachchh – Gujarat	Kachchh	Kandla, Mundra	Petrochemicals, Cement, Furniture	LPG import terminals, container and bulk terminals at Kandla port
2	Saurashtra – Gujarat	Junagarah, Amreli, Bhavnagar, Ahmedabad	Pipavav, Sikka	Apparel, Automotive	Connection of western DFC to Pipavav, Expressway from Sarkhej to Pipavav
3	Suryapur – Gujarat	Bharuch, Surat, Navsari, Valsad	Dahej, Hazira	Marine clusters	Connection of western DFC to Hazira, Ro – Pax Ferry Services between Gogha and Dahej
4	North Konkan – Maharashtra	Nashik, Thane, Mumbai, Pune, Raigarh	JNPT, Mumbai	Power, Electronics, Apparel	Vadhvan port, Expressway from Ahmedabad and Dighi to JNPT, Terminals in Nhava Creek
5	South Konkan – Maharashtra	Ratnagiri, Sindhudurg, North Goa, South Goa	Dighi, Jaigarh, Mormugao	Refining, Steel, Food processing	Up gradation of SH 164 to connect Jaigad port to NH 17, Connectivity of NH 17 to North and South banks of Dighi port
6	Dakshin Kanara – Karnataka	Udupi, Dakshin Kannada, Kodagu, Mysore	Mangalore	Petrochemicals	Railway line from Bellikeri port to Ankola, Food grain and fertiliser handling facility in NMPT
7	Malabar – Kerala	Ernakulam, Alappuzha Kollam, Thiruvanthapuram	Kochi	Furniture	Food grain import terminal, fertiliser bagging facility
8	Mannar – Tamil Nadu	Kanniyakumari, Tirunelveli, Thoothukudi	Tuticorin	Apparel, Refining	Enayam port, Expressway to Enayam, Road to Hare island, container berth at Tuticorin
9	Poompuhar – Tamil Nadu	Cuddalore, Perambalur, Ariyalur, Tiruchirappallu, Thanjavur, Thiruvarur, Nagapattinam	Cuddalore	Leather processing, Power	Sirkazhi/Cuddalore port, Road connectivity to Cuddalore port
10	VCIC South – Tamil Nadu	Thiruvallur, Chennai, Kancheepuram	Chennai, Ennore and Katupalli	Steel, Petrochemicals, Electronics, Shipbuilding	LNG import terminal, Rail link to KPL, MLT-2 at Ennore

	CEZ	Probable districts	Port	Potential industries	Other sample projects
11	VCIC Central – Andhra Pradesh	Chittoor, Nellore	Krishnapatnam	Electronics	Upgradation of road connecting Krishnapatnam port to Nellore, road to Krishnapatnam Port from Naidupeta
12	VCIC North – Andhra Pradesh	Guntur, Krishna, West Godavari, East Godavari, Visakhapatnam, Vizianagaram, Srikakulam	Vizag, Kakinada	Food processing, Petrochemicals, Cement, Apparel	Machilipatnam/ Vodarevu port, Oil jetty at Vizag, road from Machilipatnam to NH-SH-46
13	Kalinga – Odisha	Puri, Jagatsinghapur, Cuttack, Kendrapara, Jajapur, Bhadrak	Paradip, Dhamra	Petrochemicals, Marine processing	Paradip outer harbour, IWT terminal, Heavy haul, LPG import terminal
14	Gaud – West Bengal	Purba Medinipur, South twenty Parganas	Kolkata, Haldia	Leather processing	Sagar port, ICD, LPG import terminal, expressway from Durgapur to Haldia

These 14 coastal economic zones are also envisaged to tap synergies with the planned industrial corridors. The Government of India has planned for five industrial corridor projects—the Delhi–Mumbai Industrial Corridor (DMIC), Bengaluru–Mumbai Economic Corridor (BMEC), Chennai–Bangalore Industrial Corridor (CBIC), Visakhapatnam–Chennai Industrial Corridor (VCIC) and Amritsar–Kolkata Industrial Corridor (AKIC) to provide a thrust to manufacturing and industrialisation. Industries could be developed at selected nodal points along the corridors, leveraging their inherent strength on raw materials, labour, connectivity and infrastructure. These corridors could facilitate the government's push in the manufacturing sector to "Make in India". Several projects could be undertaken to provide essential infrastructure—widening roads, setting up railway linkages and connectivity with ports at nodal points. It is essential to tap into the potential of the manufacturing industry and utilise it by developing discrete manufacturing clusters alongside the industrial corridors. The proposed industrial clusters under Sagarmala have been mapped to the corridors—Apparel cluster in Guntur could fall on the VCIC near the Kakinada node and the other cluster in Jalgaon could be on the DMIC and BMEC. The leather clusters proposed in Muzaffarpur and Kolkata could fall on the AKIC and leather clusters in Perambur could fall on the twin corridors of CBIC and VCIC. The proposed Mega Food Park could draw synergies from the VCIC where food processing is a focus sector for development at the Kakinada node. The electronics clusters proposed in northern Maharashtra could fall on the DMIC at the JNPT node. The cluster may also benefit from being on the western DFC. The other electronics cluster has been proposed near the Yerpedu–Srikalahasti node, to be developed as a focus industry under the VCIC (EXHIBIT 1.89).

EXHIBIT 1.90

Most of the proposed discrete manufacturing clusters lie on industrial corridors



SOURCE: Make in India website

The states are expected to come forward to work with the centre to develop these CEZs and the corresponding industrial clusters. All the 14 CEZs come under the influence area of major or non-major ports. The influence area is considered flexible and districts covered under the CEZ could change in the future depending upon the industry growth.

It is envisaged that of the 14 CEZs, three or four could be taken up as early pilots, and the learning from these replicated across other CEZs. The early pilot CEZs could be shortlisted on the basis of availability of large contiguous land parcels, access to urbanisation and supporting infrastructure, prime manufacturing locations and availability of deep draft container terminals.

ANNEXURE (Maritime Clusters)

CONTEXT

The Sagarmala initiative was conceived by the Government of India to address the challenges and capture the opportunity of port-led development comprehensively and holistically. Sagarmala is a national programme aimed at accelerating economic development in the country by harnessing the potential of India's coastline and river network.

A Strategy & Programme Management consultant ("the Consultant") was appointed by Ministry of Shipping, Government of India/ Indian Ports Association for conducting Sagarmala study.

This report covers Section F of Terms of Reference (TOR) – Marine cluster development

Contents

Maritime clusters

Maritime clusters: A new concept for India

A maritime cluster is a group of co-located firms and businesses focused on the maritime sector generating positive synergies between their activities. Michael Porter described it as a "geographically proximate group of interconnected companies and associated institutions in a particular field, including product producers, service providers, suppliers, universities, and trade associations, from where linkages or externalities among industries result." The Indian government has recently introduced policies and initiatives to develop the shipbuilding sector and reduce the unfavourable cost differential of Indian shipyards. Maritime clusters can help to further this goal.

Phases/components of a maritime cluster

A maritime cluster comprises the following:

- Shipyards: These form the centre of any maritime cluster and can focus on building specialty and coastal vessels less than 80 m long (offshore supply vessels, anchor handling tugs, etc.)
- Ancillary units for shipbuilding: Since shipbuilding (like other assembly industries) needs a strong ecosystem of suppliers and service providers, ancillaries can also be developed as part of the cluster in proximity to the shipyards. These will include supporting and related industries like fabrication, machining, engineering services, design services plus a number of specialised suppliers
- Service providers for the shipping industry: Another component of the cluster could be services focused on shipping and shipbuilding, like shipping agencies, ship owners, banks, law firms, classification and registers of ships, etc.
- Tourism: Cruise tourism, beach tourism, water amusement parks, aquariums
- Marine products: Fisheries and aquaculture

Benefits of a maritime cluster

Co-locating these various components offers the following benefits:

- Positive synergies between the participants by inducing mutual interaction and cooperation
- Reduced production costs, inventory costs and logistics costs
- Shorter lead time for critical supplies (if the suppliers are located in the cluster)
- Access to common infrastructure, reducing costs for development authorities

Some of the key clusters in the global maritime sector are found in Brazil, China, Denmark, France, Germany, Italy, Japan, Netherlands, Norway, Russia, Singapore and South Korea. The maritime cluster in Japan consists of fishing, shipbuilding and ship repair, shipping, maritime and port services. Japan has a market share of around 20 per cent in the world's shipbuilding market. South Korea, where the government has provided solid support through its policies and initiatives, has a

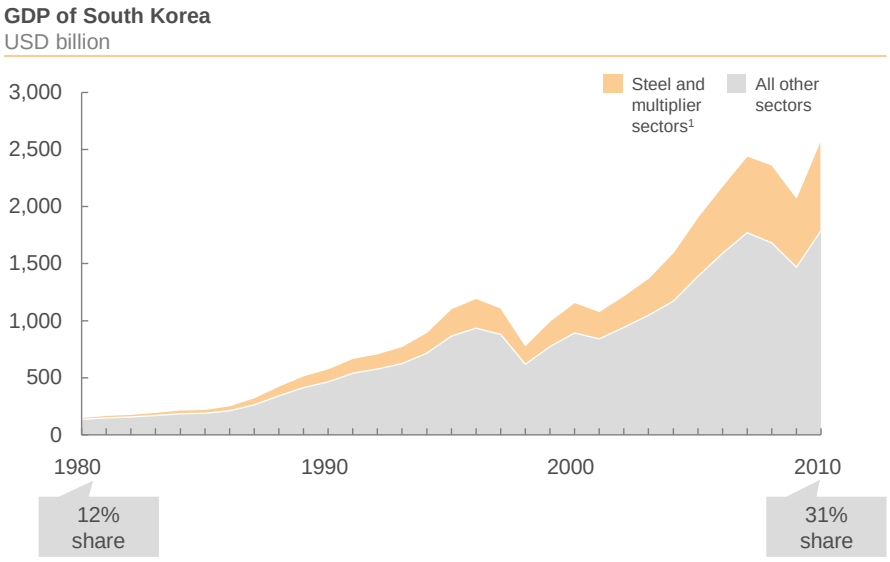
market share of 34 per cent. We discuss a South Korean maritime cluster in greater detail in the case study.

Case study: South Korea

Steel and multiplier sectors played a pivotal role in the growth of the South Korean economy. Ports helped to boost steel and downstream “multiplier industries” such as automotive, and shipbuilding, through port-based steel, automotive and shipbuilding facilities (Exhibits 2 and 3).

EXHIBIT 91

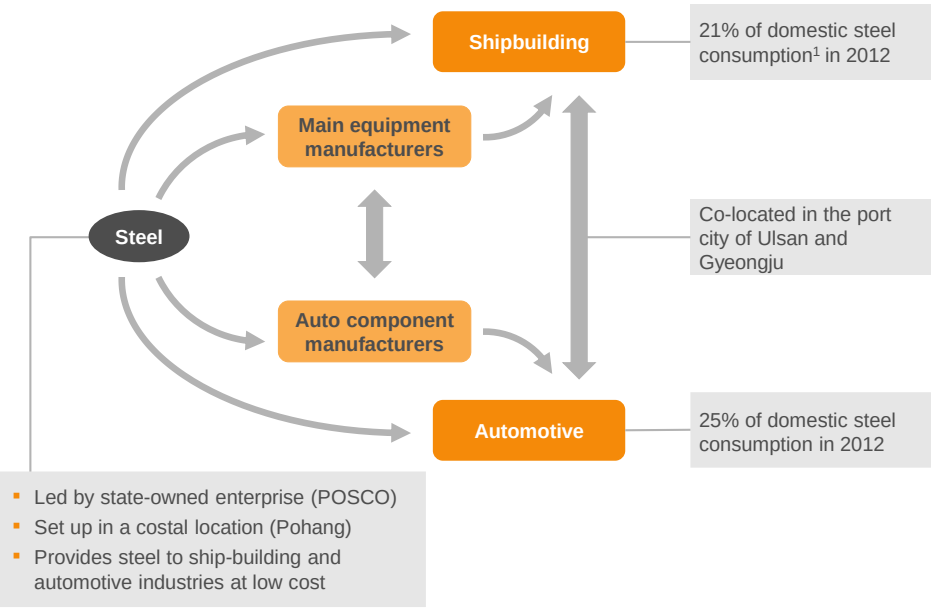
Steel and “multiplier sectors” played a pivotal role in the growth of the South Korean economy



1 Iron & Steel; Fabricated metal products; Machinery, equipment, appliances; Automotive; Shipbuilding; Electrical machinery, Communication equipment

EXHIBIT 92

South Korean maritime cluster: Steel–Shipbuilding–Automotive



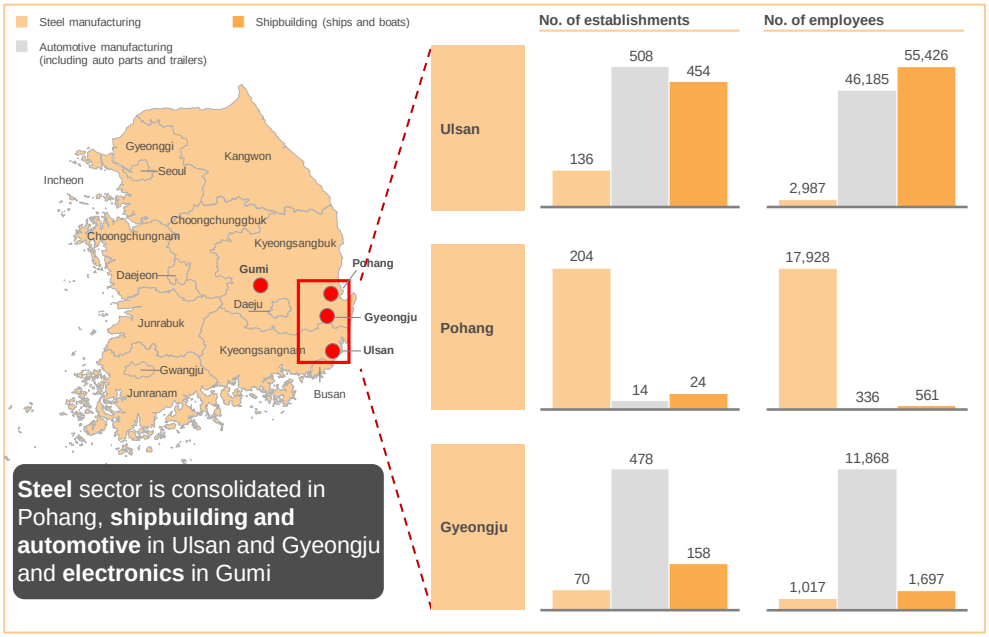
1 ~77.6% of Korean steel plate shipments went for shipbuilding in 2012

SOURCE: Working party on Shipbuilding: Peer review of the Korean shipbuilding industry and related government policies

A successful example of a maritime cluster is Pohang–Ulsan–Gyeongju in South Korea (Exhibit 4). The government set up a coastal steel cluster at Pohang to ensure low-cost access to imported iron ore, coking coal and to facilitate access to global markets. Between 1980 and 2010, one-third of South Korea's economic growth came from steel and related downstream sectors. Steel in Korea is consolidated in Pohang (204 establishments, employing around 20,000 people); shipbuilding and automotive in Ulsan and Gyeongju (around 1,000 automotive and around 600 shipbuilding units, together employing around 115,000 people); and electronics in Gumi. Logistics costs of input materials drop due to the close proximity of these three locations.

EXHIBIT 93

South Korean marine cluster: Pohang–Ulsan–Gyeongju



SOURCE: KOSIS

The government of South Korea selected Pohang as a location for building a national steel mill (POSCO) considering availability of land, port and other utilities. Ulsan developed as a major industrial cluster due to the government's plan to foster heavy and chemical industries. From 1962 to 1966, the government developed infrastructure (roads, civil works, harbours, etc.) in the region. It attracted Hyundai Motors to invest in Ulsan in 1968, Hyundai Heavy Industries (HHI) in 1972, Samsung in 1979 and Daewoo in 1981.

Multiple factors supported the growth of POSCO: the adoption of new technologies, capital and resource commitment to R&D, development of deep water ports, and JV investments in other countries. POSCO adopted new technologies and facilities from Japan and Europe, like larger scale blast furnace and continuous casting equipment. South Korea replicated the Japanese strategy of using large bulk carriers coupled with international investments to secure long-term access to iron-ore. The establishment of two of the world's leading research organisations—Pohang University of Science and Technology (POSTECH) and Research Institute of Industrial Science and Technology (RIST) also helped (Exhibit 5).

EXHIBIT 94

POSCO's strategies supported by Korean State

Strategies	Actions taken
Adoption of new technologies and facilities from others	▪ POSCO adopted new technologies and facilities from Japan and Europe, e.g., automation, larger scale blast furnace, continuous casting equipment, etc. ▪ Technology transfer from 2 Japanese steel producers- Nippon steel and Mitsubishi Heavy Industries ▪ Focus on superior quality steel and scale of production to lower costs
Capital and human resource commitment to R&D	▪ Establishment of two world's leading research organizations- Pohang University of Science and Technology (POSTECH) and Research Institute of Industrial Science and Technology (RIST)
Personnel policies	▪ Military style operation to foster strong motivation among workers ▪ Extensive training program that facilitates very low rates of turnover and absenteeism
Development of deep-water ports	▪ Development of deep-water ports in Young Il Bay and Kwangyang Bay ▪ Replicate Japanese strategy of using large bulk carriers coupled with international investments and bargaining skills to secure long-term access to iron-ore
JV investments in other countries	▪ Expansion of raw material strategy for securing stable sources of supply ▪ Two international JV investments in coal- Miller Pohang Company and POSCAN

SOURCE: The Steel and Shipbuilding Industries of South Korea: Rising East Asia and Globalization

EXHIBIT 95

Ship-builder's strategies supported by Korean State

Strategies	Actions taken
Focus on advanced technologies	▪ HHI obtained advanced shipbuilding technologies from European shipbuilders: Dockyard designs from Scottish Naval architecture firm- A&P Appledore, Ship design and operating instructions from Scottish shipbuilding firm- Scottlithgrow
Focus on efficient operations	▪ Development of operations practices to reduce production time, eg. welding of small number of bigger blocks ▪ Use of Goliath cranes, barges and air-pressure driven skids
Use of external resources and know-how	▪ Experienced European shipbuilders worked as employees of HHI for first 3 years ▪ HHI obtained production know-how from Kawasaki shipbuilding company of Japan
Diversification	▪ During the period of overcapacity and price competition in the 1970s, HHI altered its product mix away from VLCCs to smaller high-value ships, branched into off-shore structures
Government support	▪ Grant of temporary monopoly over steel structure ▪ Issue of order that Korea's crude oil imports be carried by Hyundai group ▪ Extensive government subsidies for infrastructure and acquiring oversea credit for HHI

Due to the nature of the steel and shipbuilding industries as generative sectors that require massive capital investments and technological innovations, it requires frequent involvement of and subsidies by governments

– Shin and Yoo, 2004

SOURCE: The Steel and Shipbuilding Industries of South Korea: Rising East Asia and Globalization

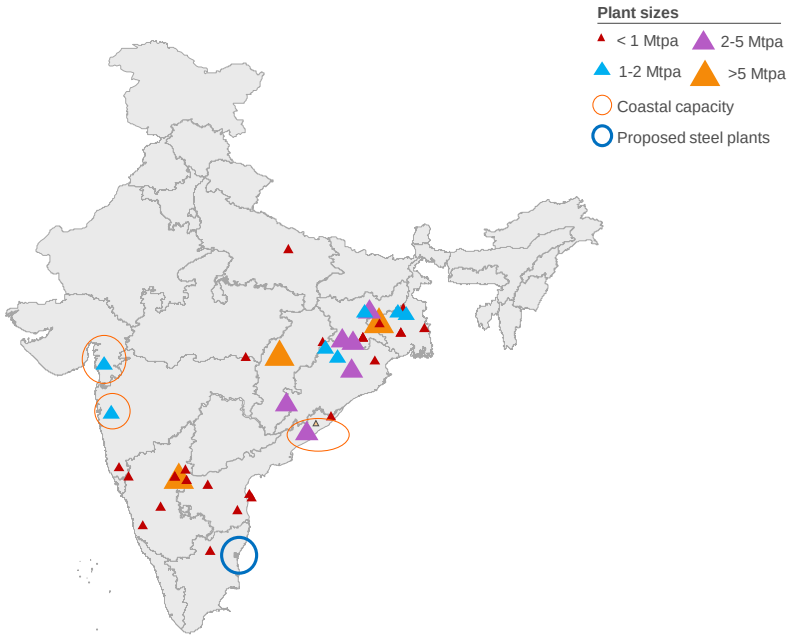
The growth of the shipbuilding sector was also supported by a number of factors: focus on advanced technologies, efficient operations and use of external know-how. HHI obtained advanced

shipbuilding technologies from European shipbuilders—dockyard designs from Scottish Naval architecture firm A&P Appledore, ship design and operating instructions from Scottish shipbuilding firm Scott Lithgow. Experienced European shipbuilders worked as employees of HHI for the first three years. HHI also obtained production know-how from Kawasaki, a shipbuilding company from Japan. During the period of overcapacity and price competition in the 1970s, HHI altered its product mix away from very large crude carriers (VLCCs) to smaller, high-value ships and branched into off-shore structures (Exhibit 6).

Potential cluster locations in India based on steel multiplier appear in Exhibit 7. Other parameters for identifying potential locations are discussed in detail later in this report.

EXHIBIT 96

Potential locations for maritime clusters in India based on steel multiplier



SOURCE: Ministry of Steel; VDEH plant facts

Market assessment

This segment focuses on the market potential and opportunities for various components of the maritime cluster.

Shipyards

Demand and supply

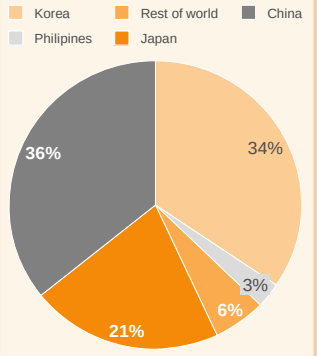
China, Japan and South Korea account for around 90 per cent of the world's production (Exhibit 8).

EXHIBIT 97

MARKET TRENDS

China, Korea and Japan account for ~90% of the world's production; China and Japan specialise in bulk carriers, while Korea leads in container ships

4 countries dominate global vessel production



Deliverables of new buildings, major vessel types and countries where built (2014, thousands of GT)

	China	Republic of Korea	Japan	Phili-ppines	Rest of world	World total
Oil tankers	2,896	4,781	891	-	466	9,034
Bulk carriers	13,304	1,588	10,791	869	167	26,719
General cargo	585	329	199	-	372	1,485
Container ships	4,986	9,135	188	995	735	16,039
Gas carriers	119	3,528	666	-	14	4,328
Chemical tankers	113	185	188	-	57	543
Offshore	714	1,485	51	-	956	3,206
Ferries and passenger ships	92	5	27	-	787	892
Other	42	835	391	-	147	1,415
Total	**22,851**	**21,872**	**13,392**	**1,865**	**3,682**	**63,662**

India commands only ~0.5% of the global shipbuilding market share

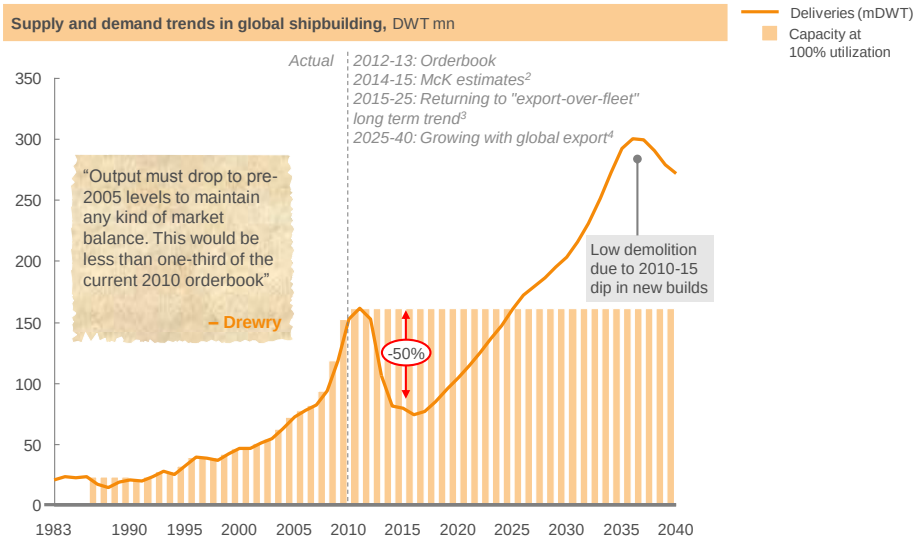
Note: Propelled seagoing merchant vessels of 100 GT and above. More detailed data on other countries where vessels were built is available under http://stats.unclad.org/shipbuilding.

SOURCE: UNCTAD secretariat, based on data provided by Clarkson's Research

Globally, shipyards can expect to have significant overcapacity in the next few years, but will see strong growth in the longer term. The existing capacity, which far outstrips deliveries (in mn DWT) is sufficient to serve demand until around 2030 (Exhibit 9).

EXHIBIT 98

Significant overcapacity at shipyards expected in near future, but strong growth in the longer term



1 Capacity measured as maximum output last 5 years. Capacity at 2011 level in forecast period
2 Proprietary forecast model from McKinsey's shipbuilding experts
3 Oversupply eliminated and shipping market returning to supply-demand balance
4 Fleet growing with global export from 2015, demolition estimated using average 25 year lifetime and

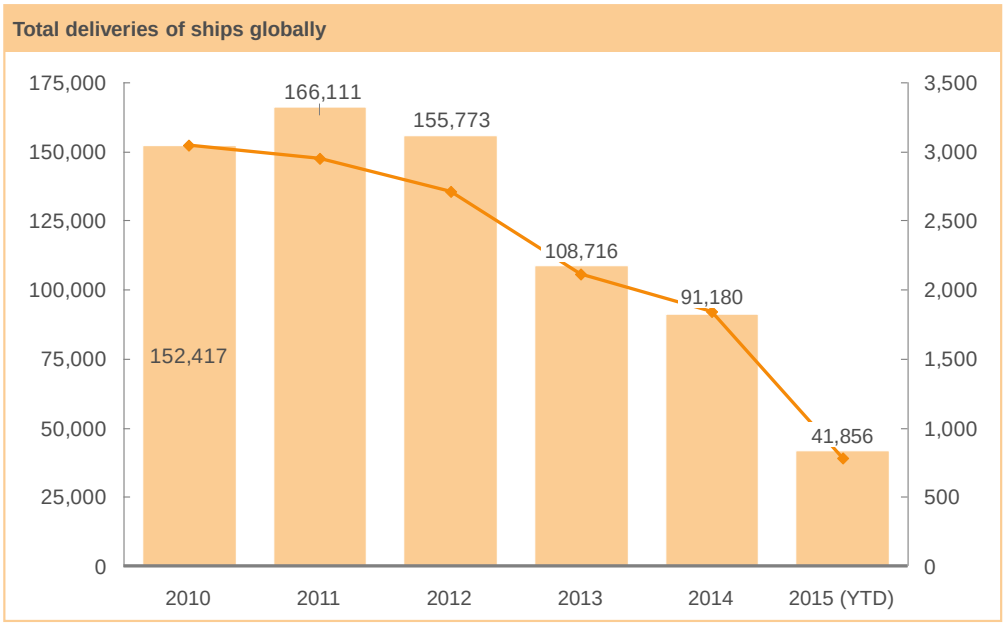
SOURCE: Clarkson; Global Insight; expert interviews; McKinsey analysis

While some rationalisation of capacity is expected, this overcapacity will persist for many years due to sunk cost investments. New deliveries of vessels globally have been sharply declining since 2010 (Exhibit 10).

EXHIBIT 99

MARKET TRENDS

New deliveries of vessels globally have been declining sharply since 2010



SOURCE: Clarkson

Key enablers for the industry

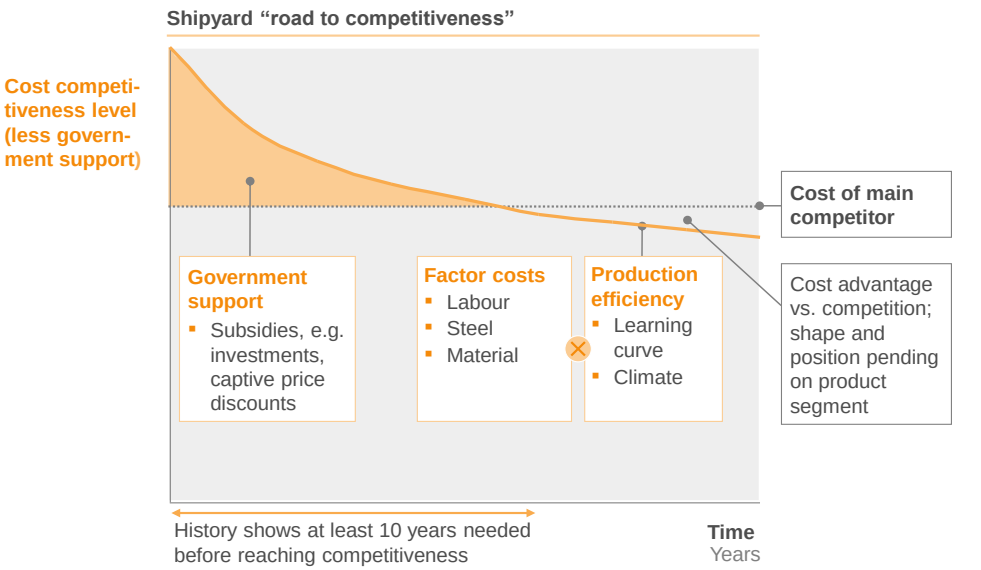
Given that the factor costs in the industry are driven by labour and steel, government support on various fronts is a crucial enabler for the shipbuilding industry (Exhibit 11).

EXHIBIT 100

GOVERNMENT SUPPORT

Government support might be needed to reach cost competitiveness in a build-up phase

ILLUSTRATIVE



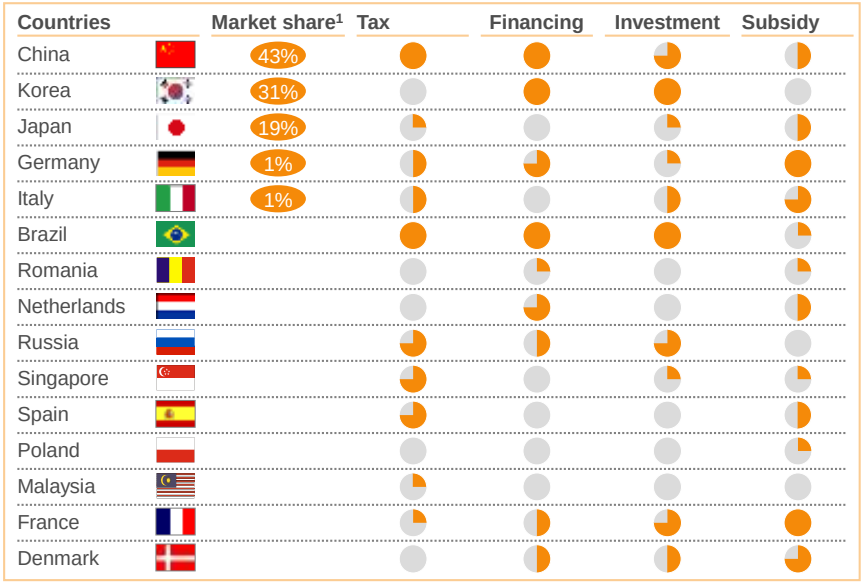
SOURCE: McKinsey analysis

Globally, shipbuilding is a highly subsidised industry (Exhibit 12). Governments have used various measures to boost shipbuilding in their own countries. These include incentives and stimulus packages such as:

- Heavily subsidising the industry: All leading shipbuilding countries use one or more type/s (tax, financing, investment, subsidies) of incentives to support their shipbuilding industries. Nine of the 15 countries studied use three or more types of incentives.
- Financing operations and demand: Governments across the globe provide loans and loan guarantees on favourable terms (low interest rate, high leverage ratio) to shipyards to finance their ongoing operations, and to ship buyers to finance their orders.
- Supporting R&D and innovation: Research and development and innovation incentives are very popular among countries, with seven of the 15 countries providing these.
- Creating national champions: Countries with strong and growing economies (China, Russia and Brazil) are encouraging local shipyards to grow to be global players through direct ship orders (from large state-owned companies) and selective distribution of subsidies (to large-scale shipyards).
- Overcoming the effects of the crisis: Most governments supported their shipbuilding industries to overcome the global economic crisis. Even China and Brazil—two countries least affected by the crisis—have provided significant financing and investment support for their countries.

EXHIBIT 101

Extent of government support for shipbuilding industry



1 Million CGT output in 2013

SOURCE: Clarksons and McKinsey

The government of China has been an invaluable support in ensuring that China attains the world leadership spot by cushioning the industry in terms of tax, financing, investment and subsidies. Measures include VAT rebates, encouraging banks to offer low-interest loans, investing in R&D for high-technology vessels and speeding up the decommissioning and replacement of old ships through subsidies for new vessels built by domestic shipyards.

South Korea's government, too, has repeatedly offered its shipbuilding industry a stimulus through financing, subsidies and investments. It offers tax concessions for restructuring and M&A, refund assurances to foreign buyers, support for the growth of domestic suppliers, and subsidises the cost of steel plates to cut shipbuilding costs by around 8 per cent.

Potential for shipbuilding in India

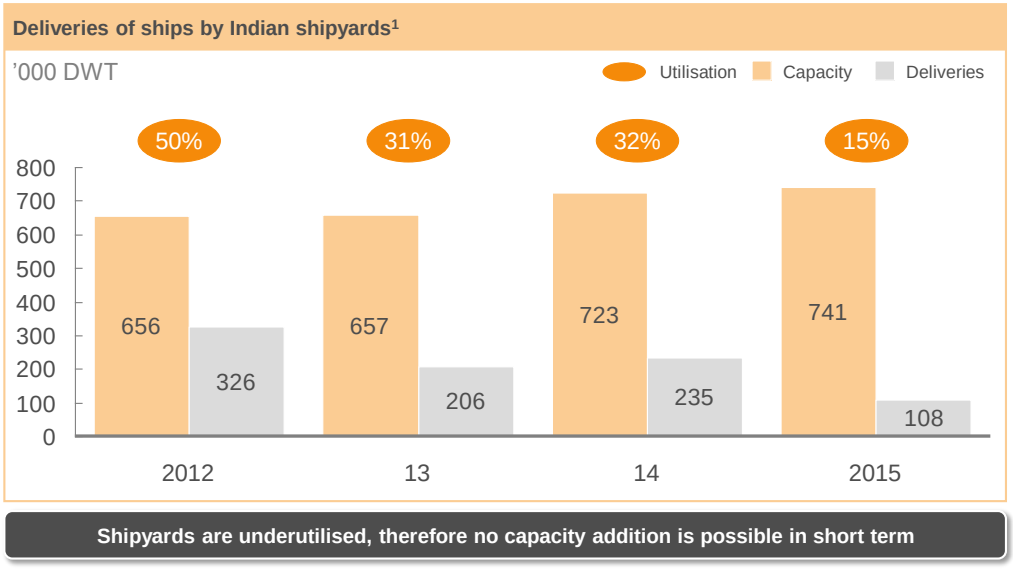
India has a mere 0.5 per cent of the global shipbuilding market share. The utilisation figures for Indian shipyards have dropped since 2011, from around 50 per cent to just 15 per cent utilisation[1]. Since current capacity is already underutilised, adding further capacity is a long-term need, but does not require immediate attention (Exhibit 13).

1 This does not include India's Defence shipyards

EXHIBIT 102

MARKET TRENDS

Utilisation of Indian shipyards has decreased since 2011

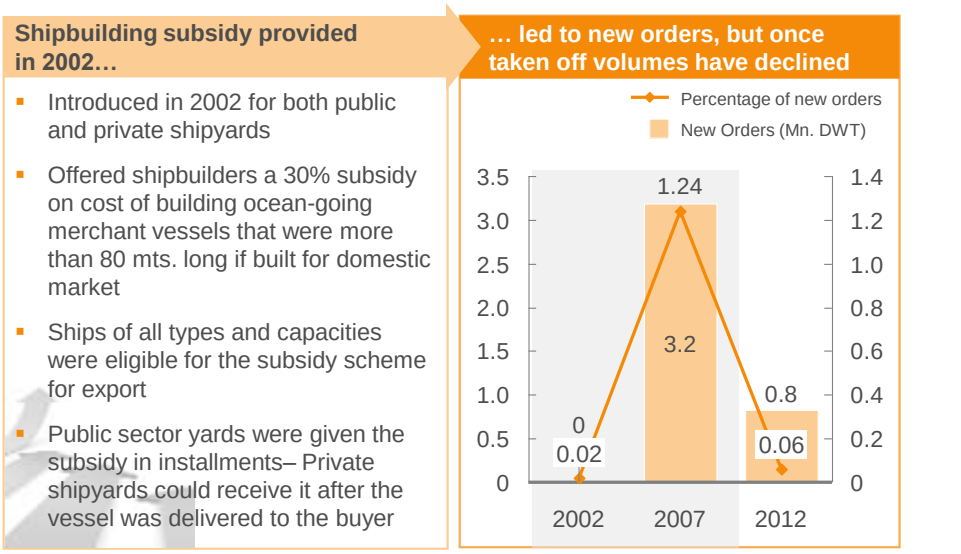


1 Defence Shipyards not considered

A subsidy scheme in 2002 gave shipbuilding some impetus, but once the subsidy was withdrawn in 2007, volumes declined again. The major cost differential between Indian shipyards and their competitors consists of the statutory taxes (Exhibits 14 and 15).

EXHIBIT 103

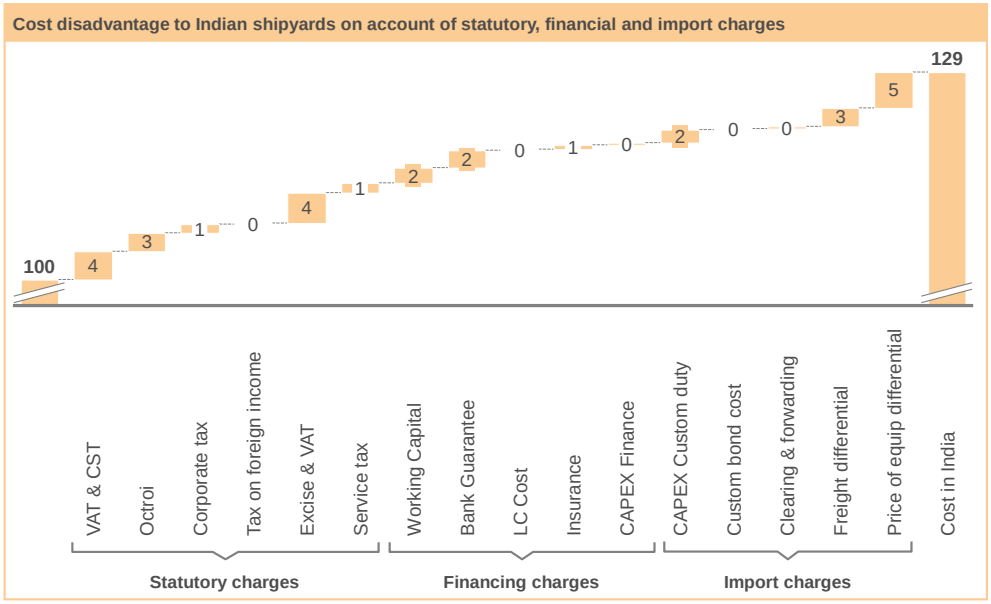
While Subsidy scheme in 2002 provided the impetus; volumes have dipped considerably since subsidy was taken off in 2007



SOURCE: Institute for Defense Studies and Analyses, Press Trust of India, Ministry of Shipping

EXHIBIT 104

Statutory taxes are a major component of the cost differential faced by Indian shipyards vis-à-vis competition



SOURCE: Report of Working Group for Shipbuilding & Shiprepair Industry for the 11th Five Year Plan

India has scope to add around 3 to 4 mn DWT of capacity by 2025. There will be demand for shipbuilding due to the replacement needs of the existing fleet, increased indigenisation of Indian flagged vessels for EXIM trade and increased domestic coastal shipping. An optimistic scenario calculates around 4.2 mn DWT of shipbuilding capacity addition. In case of replacements, the average age of India's fleet of ships as in 2015 was around 25 to 30 years. Indian shipyards can cater to around 40 to 60 per cent of replacement needs. In case of indigenisation, the share of Indian flagged vessels in the EXIM trade can increase from 10 per cent to 30 to 40 per cent. And the share of Indian manufactured vessels is expected to rise from the current 20 per cent to around 40 or 50 per cent. In case of coastal shipping, vessels will be required to cater to the additional opportunity of 220 to 360 MTPA depending on the base versus optimistic scenario (Exhibit 16).

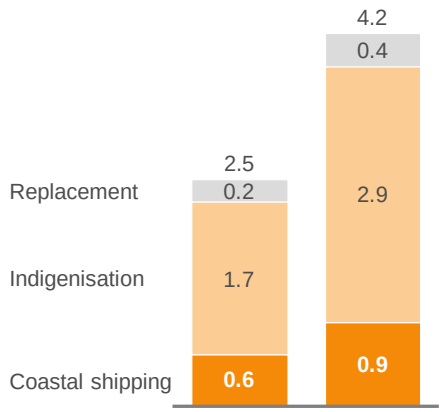
EXHIBIT 105

INDIA OPPORTUNITY

Potential of 3-4 mn DWT annual capacity addition by 2025

2025

Shipbuilding capacity addition in different scenarios (mn DWT)



Assumptions

Replacement

- India has a fleet of 1246 ships as of 30th Nov, 2015 with capacity of 15.37 million; avg. age of vessel is 25-30 years
- 40-60% of replacement need catered by Indian shipyards

Indigenisation

- Share of Indian flagged vessels in EXIM trade increasing to 30-40% from current 10%
- Share of Indian manufactured vessels to increase from current 20% to 40-50%

New coastal

- Additional opportunity of 220-360 MTPA depending on base and optimistic scenarios
- Average distance covered – 2,500 km

1.4.1.1.1

Given that the utilisation of existing shipyards is low, capacity addition will be undertaken only in the medium to long term. The proposed maritime cluster will therefore centre on existing shipyards.

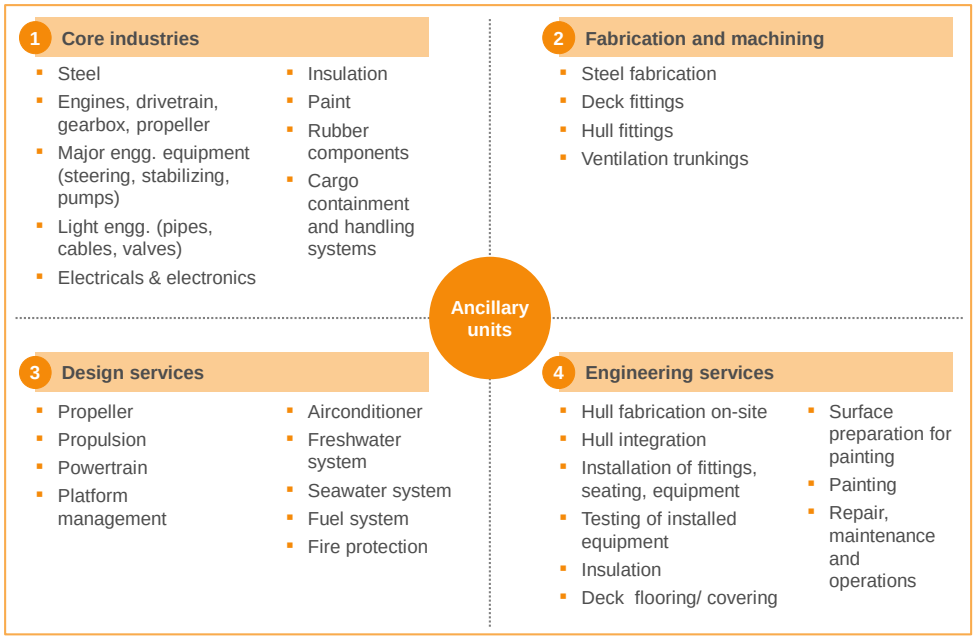
Ancillary

The shipbuilding supplies industry can be divided into four major categories (Exhibit 17):

- Core industries
- Fabrication and machining
- Design services
- Engineering services

EXHIBIT 106

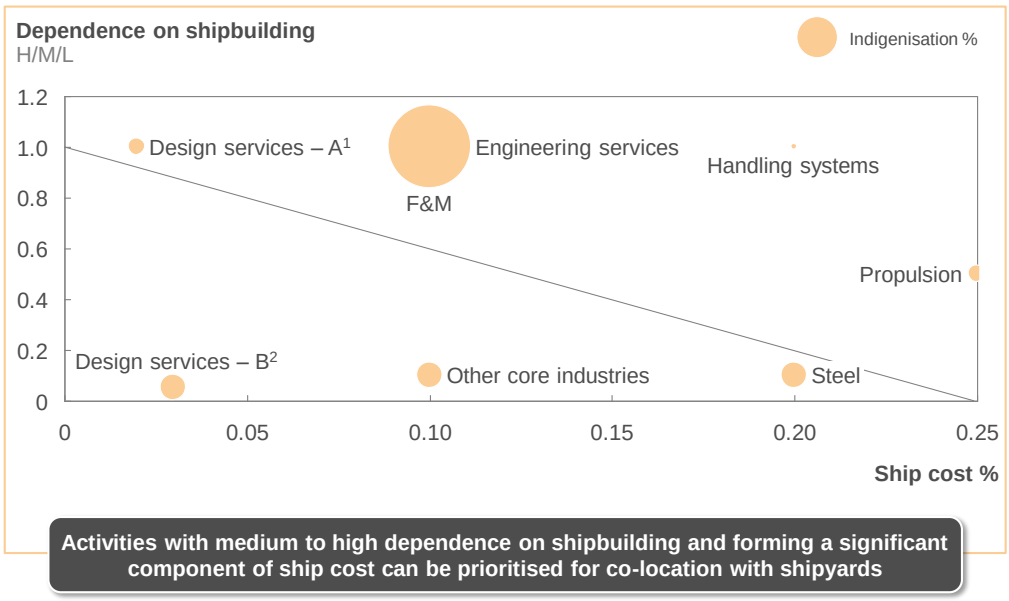
The supplies industry can be divided into four categories



Shipbuilding suppliers who can be co-located with shipyards as part of the maritime cluster are identified based on their dependence on shipbuilding and contribution to overall ship cost (Exhibit 18). High dependence on the shipbuilding industry implies that most of the output from ancillary industry is dedicated for shipbuilding activities. Activities with medium to high dependence on shipbuilding, that also form a significant portion of ship cost, can form part of the cluster on priority.

EXHIBIT 107

Framework for identifying potential ancillaries for maritime cluster



1 Propeller, propulsion, powertrain, platform management
2 Airconditioner, freshwater system, seawater system, fuel system, fire protection

Based on the framework, the ancillaries market is worth around INR 5,000 cr, with engineering services and fabrication and machining offering the greatest potential by 2025 (Exhibit 19). Moreover, the segment is fragmented and most services are offered by local players who can establish themselves near the shipyards for operational and financial benefits.

EXHIBIT 108

INR 5,000 cr addressable market size for ancillaries

ATTRACTIVENESS

Low Medium High

Ancillary	Base market size[1] (INR cr)	2025mMarke size[2] (INR cr)	Current indigenization	2025 indigenization	Addressable market (2025)
Engineering services	300	1,500	100%	100%	1,500
Fabrication and machining	300	1,500	100%	100%	1,500
Handling systems	600	3,000	0%	30%	900
Propulsion	750	3,750	5%	30%	1,125
Design services – A	60	300	5%	50%	150

1 Base Market Size: INR 3,000 cr
2 Total market size: INR 15,000 cr calculated assuming Revenues/DWT = INR 50,000/DWT and Deliveries = 3mn DWT

Engineering services, fabrication and machining have high attractiveness based on 2025 addressable market and colocation with shipyards.

Cargo handling systems and propulsion systems for ships have medium attractiveness when compared to engineering services, fabrication and machining. Most equipment is imported and Indian manufacturers are capable of serving only small ships. Given that indigenisation for these activities is negligible and shipbuilding demand is low, firms operating in this category can set up companies in the maritime cluster after a few years. Some of the big suppliers of propulsion system are Wartsila, Rolls Royce and Caterpillar. Cargo handling and containment systems vary depending upon the type of the vessel. Equipment required for a crude tanker includes a ballast system, cargo oil tanks, tank cleaning equipment, cargo heating and venting system. Companies providing such equipment include Aalborg Sunrod, Sewon, Kockumation, SAAB and Consilium.

Large foundries and a machinery setup, as required, can come up in conjunction with the propulsion and cargo handling industries in the maritime cluster.

Services

The prominent ports of the world (Singapore, Rotterdam, Hong Kong) are all supported by strong, cluster-based maritime services infrastructure. The cluster provides a positive, synergistic effect by attracting business for the maritime industry and improving the economics for the cluster participants.

In Singapore, the maritime industry contributes about 7 per cent to national GDP and employs over 170,000 workers. The major services operational in the Singapore cluster are ship broking, bunkering services, marine insurance services, shipping finance, maritime legal and arbitration services, and the Singapore registry of ships. The maritime services industry in Hong Kong, too, is highly evolved. Overall services contribute 93 per cent to the national economy, and the share of maritime services within that is around 0.45 per cent.

India can target to achieve a 0.2 per cent share of maritime services in overall GDP by 2025. Given an expected GDP of USD 6 trillion in India by 2025, and a services share of 50 per cent, we can expect the maritime services industry to be worth around USD 6 billion by 2025.

The maritime industry in India is very fragmented, existing in small pockets[2]:

- Chennai/Ennore/Tuticorin: Maritime education, marine engineering, ship owners' base, liquid cargo
- Goa: Bulk port, shipbuilding, ship repairs, marine tourism, etc.
- Gujarat: Shipping lines, maritime consulting firms
- Kochi/Mangalore: Ship repair, shipbuilding, container cargo, LNG, etc.
- Mumbai/JNPT: Maritime education, ship repair, shipbuilding, ship finance, ship owners, etc.

The presence of international ship owners and service providers is also limited. An effective services cluster can be developed in four stages, as suggested in the pre-feasibility report conducted by GMB for the marine services cluster in Gujarat.

- Stage 1: Focus on attracting local industry and port operators in the state; select Indian charterers, brokers, law firms and banks can be potential tenants
- Stage 2: Attract players from India to the cluster along with some select overseas players. The cluster can move from Stage 1 to 2 only after successfully implementing tax reforms and changing the existing regulatory framework
- Stage 3: By this stage, cluster synergies will be apparent, creating many more business opportunities for the maritime sector firms in the cluster. Global ship operators and owners will also be interested in the cluster.
- Stage 4: Consolidate the gains and progress of previous stages and carry forward the momentum.

Marine tourism

India's 7,500 km long coastline and an inland river transport network of over 14,500 km make the country an ideal destination for developing marine tourism. This can include a variety of water-based tourist activities that attract a wide range of people from around the world—aquariums,

[2] Roadmap on the development of Maritime Clusters in Gujarat

dolphinariums, waterparks, marine museums, cruise tourism and the opportunity to try water sports (Exhibits 20, 21, 22).

India is one of the most popular tourist destinations in Asia. A large number of its tourist destinations are in close proximity to either the coast or the inland water network. Coastal states such as Kerala registering a high growth rate of revenue from tourism, a CAGR of over 17.5 per cent during 2005–10, have already shown the way for optimising the returns from this industry[3]. Led by India's economic growth in the recent past, increasing per capita incomes have also been fuelling the domestic demand for leisure travel.

EXHIBIT 109

Cruise tourism: Royal Caribbean's Anthem of the Seas

ANTHEM OF THE SEAS

Characteristics and features

Ship statistics

- Launching date: Spring 2015
- Maximum passenger capacity: 4,905
- Length: 348 m (1,142 ft)
- 16 decks
- Of 2,090 cabins, 1,570 will have balconies

New features

- Inside cabins feature real-time views of the ocean and destinations
- A 70 m poolside movie screen
- Bumper cars, roller skating, basketball court, circus school
- Indoor pool with retractable roof

Dynamic dining

- Eliminates set dining times and main dining rooms, replacing them with 18 restaurant options, flexible dining times and dining spaces

Impressions

SOURCE: Company website; Press articles; Cruise Market Watch

[3] IBEF (2011). *Tourism and Hospitality.* India Brand Equity Foundation.

EXHIBIT 110

Aquarium type amusement park: Discovery Cove, Orlando, USA

Background

Discovery Cove is a theme park in Orlando, owned and operated by SeaWorld Parks & Entertainment

- **Activities/ attractions**
  - "Talk, touch, play and swim" with bottlenose dolphins
  - Coral reef where guests can swim and snorkel with thousands of tropical fish, sting rays, etc.
  - Over 250 tropical birds
  - Several beaches, waterfalls and a rainforest
  - Shark-filled lagoon
- **Facts**
  - Investment of **US$ 300 mn**
  - Size of 30 acres/ 130,000 mn sq m
  - Sister park of SeaWorld Orlando
- **Strategy**
  - Limit the number of guests (1,300 per day) in order to provide exclusivity and ensure personal experience with wildlife
  - In return, guests are willing to pay an admission price that far exceeds the industry average (~US$ 260)

EXHIBIT 111

Water park: Port Aventura, Spain

Costa Caribe Aquatic Park

- The waterpark is part of the Port Aventura area, but guests can choose to only visit the waterpark
- The area **is themed like the Caribbean** (with over 5,000 species of tropical plants, beaches and Latino and Reggae music)
- The waterpark section is **~ 50,000 sq m** large (of which **8,500 sq m is water**)
- In 2013 alone, the waterpark grew 14,000 sqm
- 3 new water slides opened in 2013
- Most of the park is outdoors but one large pool with several mid-sized water slides is indoors
- Over **16 attractions** available for all age groups
- 5 restaurants are located within the waterpark area
- Features Europe's highest free fall waterslide

Park statistics

- 65% of all park visitors are domestic and 35 international guests
- 45% of all international guests are French
- About a quarter of all guests stay overnight
- 30% of the generated revenue comes from the hotel business on site
- 77% of all visitors are visiting with their families
- The park counts over 75 restaurants
- The four hotels have approximately 2,000 beds
- Room occupancy is at 72%
- 2013 EBITDA margin was 40%

SOURCE: Company website; Press search

Cruise tourism

The Asian cruise market is expected to grow at around 8 per cent per annum, and to double its passenger volume by 2020. According to the Asia Head of Carnival Cruise Lines, Pier Luigi Foschi, "The market potential for cruising in Asia is huge as the total potential number of cruise passengers

could reach 3.7 million by 2017, and double to over seven million by 2020." With the recently proposed Sagarmala project, cruise tourism should get a much needed boost in India.
With just a few players (Carnival, Royal Caribbean and Norwegian) dominating around 90 per cent of the Asian market for cruise tourism, the sector can be described as oligopolistic. India does not really feature yet among the Asian cruise destinations, which choose a home port based on demand factors rather than supply factors. These factors, in decreasing order of importance, are:

- Local market size
- Airport passenger throughput and flight connectivity
- Proximity to attractive destination ports
- Attractiveness of home port city to tourists
- Safety

Indian ports (Mumbai, Goa, Mangalore and Cochin, all on the western coast) only serve as ports of call for international cruises that connect Asia and the Middle East. There is great potential for India to change this. Mumbai, Goa and Kochi can all serve as home ports for international cruises—they are much in demand and cruise lines already call at these ports. India can also promote domestic cruises that combine inland tourism with a sea cruise with religious, cultural and heritage themes (Exhibit 23, 24, 25 and 26).

EXHIBIT 112

Marine Tourism – Potential for international and domestic cruises

International Cruises	▪ India can potentially have 2-3 home ports: Mumbai, Goa and Kochi – Cruise lines are already calling at these ports – Mumbai and Goa have an established demand while Kochi is popular amongst international tourists
Domestic Cruises	▪ India can promote domestic cruise circuits combing inland tourism with sea cruise: – Cruises linking leisure, cultural and religious tourist destinations near the coast – Inland tourism from ports to tourist places

EXHIBIT 113

Potential domestic cruise circuits for India

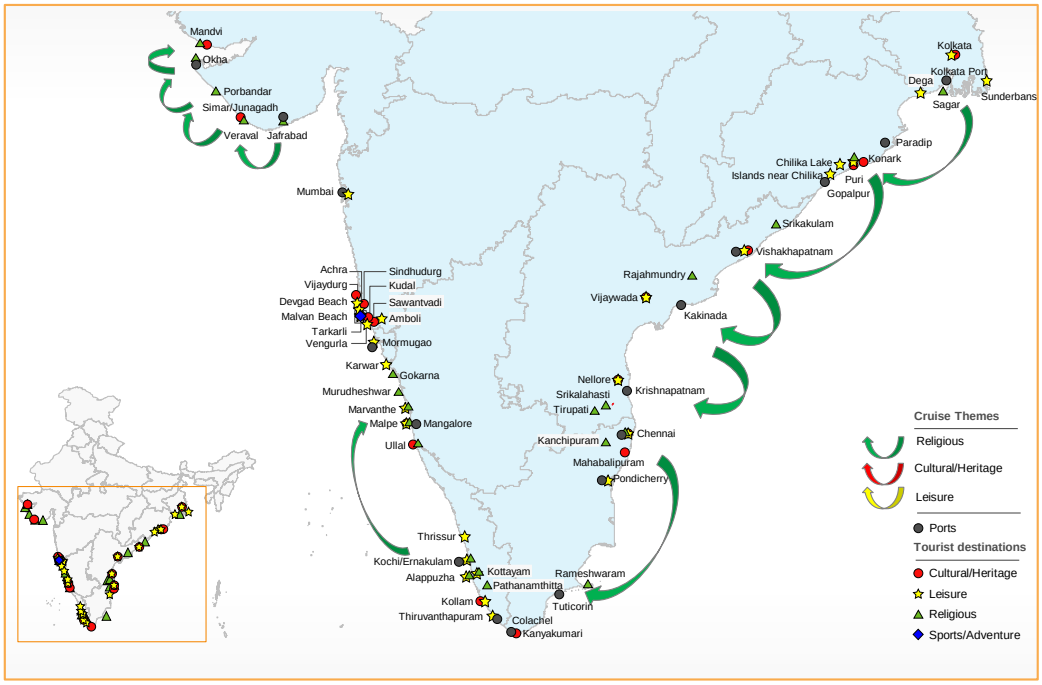


EXHIBIT 114

Potential domestic cruise circuits for India

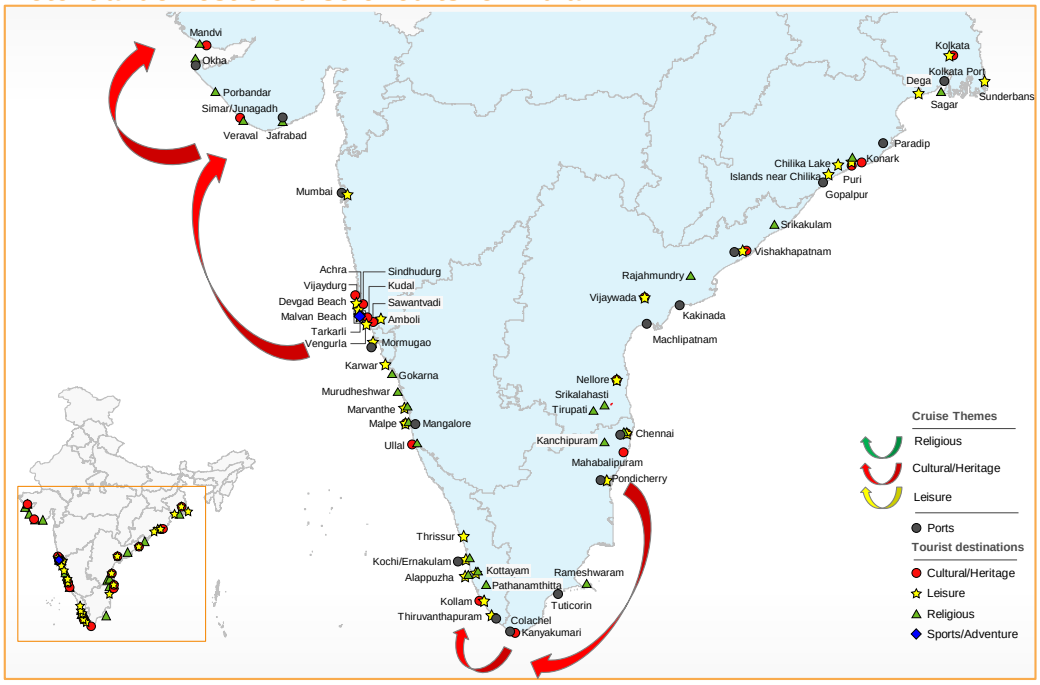
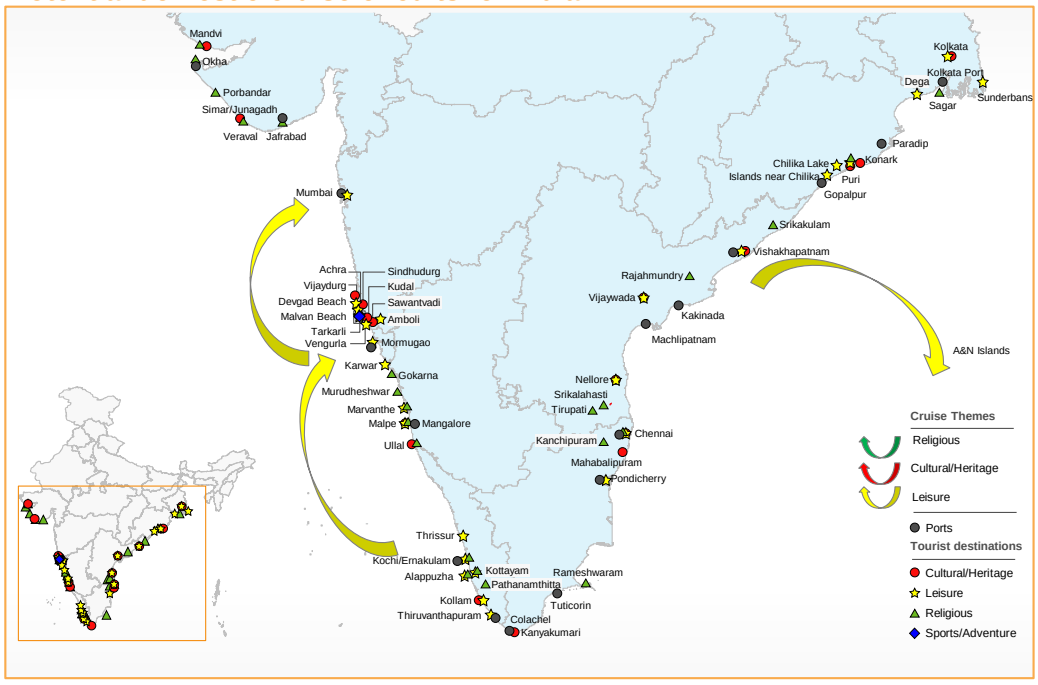


EXHIBIT 115

Potential domestic cruise circuits for India



While there is a strong potential for marine tourism in India especially cruise tourism, the focus within the maritime clusters would be on retail and leisure developments.

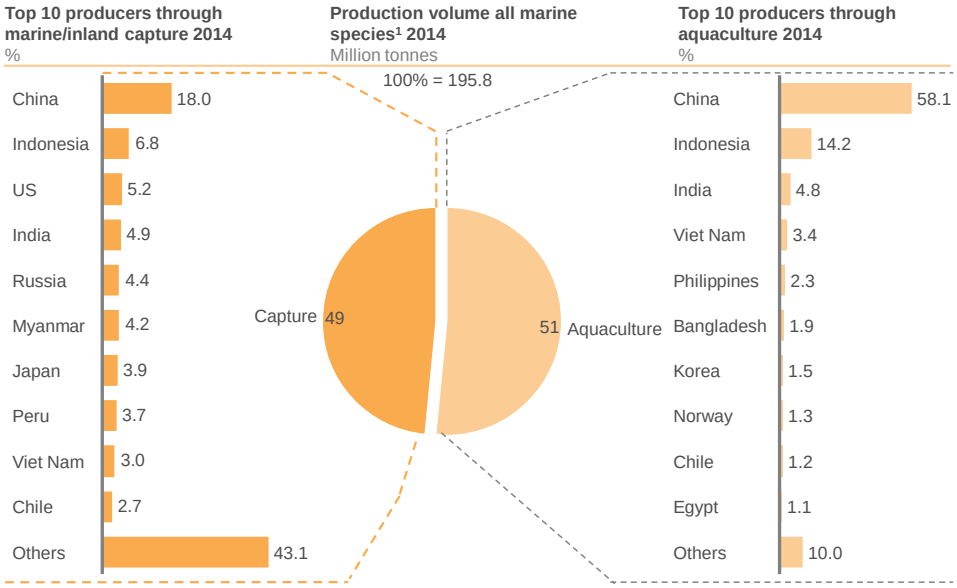
Marine products

Globally, the fisheries sector contributes around USD 220 bn in value, as well as 55 mn direct jobs and 15 per cent of the world's animal protein. While constraints on fish supply sources might slow down volume growth in the future, the rise in production and prices has till date driven a steady industry growth of around 5 per cent.

As of 2014, aquaculture accounted for around 50 per cent of all fish consumption and all fish production in the world. Asia is the world's biggest fish producer, with China alone accounting for over half of all global production, mainly from aquaculture. In further good news for the industry, health concerns, economic growth, and increasing populations mean that overall fish consumption is expected to increase by around 50 per cent by 2030[4].

EXHIBIT 116

Asia is the biggest fish producer, with China alone accounting for more than half of global production, mainly from aquaculture



1 Differs from slide 7, which includes only fish. Includes over 20 million tons of non-fish marine species. Without seaweed, etc. the share of China is expected to be lower than shown here

SOURCE: Fishstat plus

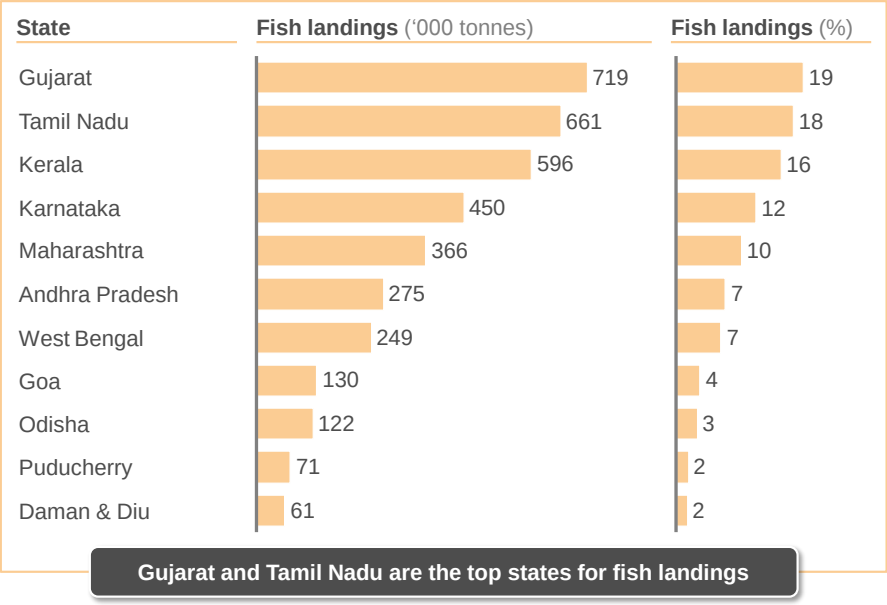
India is the fourth-largest fish producer through marine/inland capture and third-largest through aquaculture (Exhibit 27). The top two states for fish landings in India are Gujarat and Tamil Nadu, at 19 and 18 per cent respectively (Exhibit 28).

4 FAO, press search

EXHIBIT 117

Indian fisheries industry

2013-14



Gujarat and Tamil Nadu have been identified as the potential locations for development of maritime cluster in India. Existing fish landing centres in these two states can form part of the proposed cluster. In addition to providing employment, fishing industry would contribute to the overall maritime economy of the state in turn proving beneficial for the cluster.

Location assessment

Gujarat and Tamil Nadu emerge as the two possible locations for maritime clusters in India based on an assessment of four important factors.

Assessment parameters

- Shipyard: Given that existing shipyards are already underutilised, there is no need for a greenfield shipyard and a maritime cluster should develop around an existing shipyard
- Manufacturing strength: Shipbuilding is an intensive assembly industry requiring inputs and materials from a variety of industries like steel, engineering equipment, wood, non-ferrous metals, etc. Synergies between cluster participants will be enhanced if the location has a strong manufacturing ecosystem
- Size of ports and shipping sector: High port traffic makes the location more attractive for maritime service providers
- Synergies with other steel dependent industries such as automotive: A strong automotive industry can attract equipment suppliers for engines, gearbox and drivetrain, in turn helping the shipbuilding industry.

Gujarat

Gujarat has certain enabling conditions for a maritime cluster (Exhibits 29, 30):

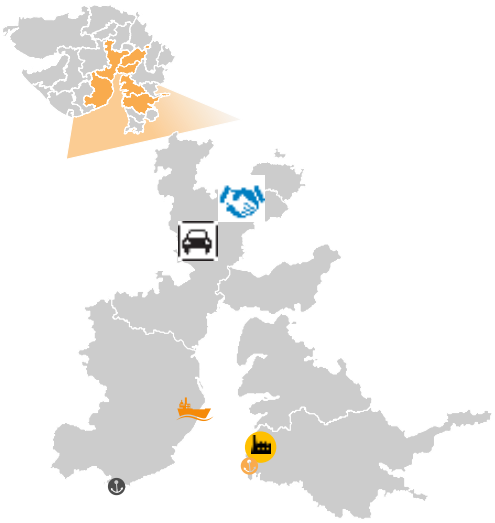
- Port of Pipavav: Gateway port that can handle 1 million TEU traffic
- Essar Hazira plant with a capacity of around 10 MMTPA to supply steel to this cluster
- Sisoiya Alang Shipyard, one of the biggest ship-breaking yards in the world
- Gujarat International Finance Tec-City (GIFT), a new central business district between Ahmedabad and Gandhinagar that can host maritime service providers like lawyers and brokers.
- Sanand Auto Cluster, an emerging auto hub hosting Tata, Ford, Hitachi and Peugeot.

In addition, Gujarat has many operational shipyards:

- ABG Shipyard Ltd. in Surat, Dahej
- L&T in Hazira
- Shoft Shipyard Pvt. Ltd. in Kaladara village
- Pipavav Shipyard Ltd. in Pipavav
- Modest Infrastructure Ltd. in Bhavnagar
- Wadia Boat Builders in Billimora
- Alcock Ashdown Ltd. in Bhavnagar, Pipavav

EXHIBIT 118

Gujarat has enabling conditions required for maritime cluster (1/1)

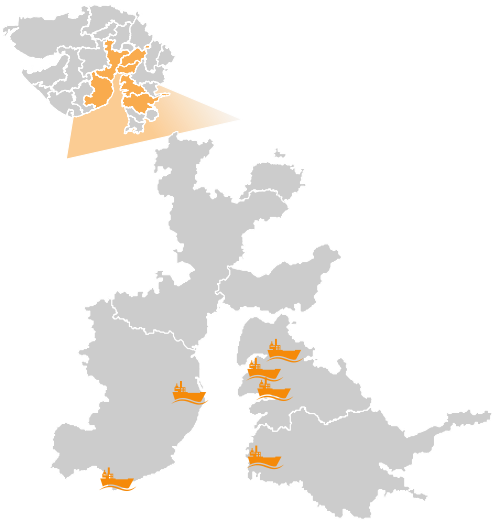


Key components of maritimee cluster

- Port of Pipavav: Gateway port that can handle 1 million TEU traffic
- Essar Hazira plant with a capacity of ~10 MMTPA to supply steel to this cluster
- Sisoiya Alang Shipyard, one of the biggest ship-breaking yards in the world
- Gujarat International Finance TecCity (GIFT), New central business district between Ahmedabad and Gandhinagar that can host marine services like lawyers, brokers etc
- Sanand Auto Cluster, an emerging Auto hub hosting Tata, Ford, Hitachi and Peugot

EXHIBIT 119

Gujarat has enabling conditions required for maritime cluster (2/2)



Operational shipyards

- ABG Shipyard Ltd.: Surat, Dahej
- L & T: Hazira
- Shoft Shipyard Pvt. Ltd.: Kaladara village
- Pipavav Shipyard Ltd.: Pipavav
- Modest Infrastructure Ltd.: Bhavnagar
- Wadia Boat Builders: Billimora
- Alcock Ashdown Ltd.: Bhavnagar, Pipavav

Gujarat maritime cluster

The maritime cluster in Gujarat will consist of:

- Existing shipyards
- An ancillary cluster at Bhavnagar with retail and leisure components

- A services cluster in Ahmedabad or GIFT city
- Existing fish landing centres

The Gujarat Maritime Board (GMB) is already working on some of the components of a maritime cluster. These plans can be integrated into the proposed maritime cluster for accelerated development and implementation. The GMB has proposed setting up a services-based cluster in Gujarat. A pre-feasibility study has been conducted to evaluate the potential of such a cluster. GMB is also undertaking the development of a Marine Shipbuilding Park or cluster based shipyards at Old Bhavnagar Port.

Services

As the state capital and an educational hub, Ahmedabad provides the right talent base for service-oriented jobs. GIFT city provides the right infrastructure environment for a services-based cluster. Pre-feasibility study by GMB evaluates the development of services cluster on a land parcel in Ahmedabad or construction of a tower in GIFT city.

Making the maritime cluster a reality requires around 600,000 sq ft of office space across the four stages of development (Exhibit 31, 32, 33 and 34).

EXHIBIT 120

SERVICES

600,000 sq ft of office space is required across four stages

Stages	Details	Details	Office space
Stage 1	▪ Local freight forwarders ▪ Shipping lines ▪ Port agents ▪ Bunker suppliers	▪ Stevedores/Misc. ▪ Banks ▪ Law firms ▪ Government offices	120,000 sq ft
Stage 2	▪ Indian ship owners ▪ Indian operators ▪ Charterers	▪ Indian brokers ▪ Technical consultants	200,000 sq ft
Stage 3	▪ Overseas operators & ship owners ▪ Overseas broker/Law firms	▪ Global technical services providers ▪ Global charterers/Trading house	130,000 sq ft

- **Stage 4 will consolidate the gains and progress of previous stages and would carry forward the momentum**
- **Space requirement for this stage will be 150,000 sq. ft.**

SOURCE: GMB: Pre-feasibility report for establishment of marine clusters

EXHIBIT 121

SERVICES

Stage 1 details

Target market	Total estimated demand universe	No. of Units	Space per unit	Space requirement (sq ft)
Gujarat freight forwarders	More than 20 large freight forwarders	5	4,000	20,000
	More than 30 Medium size forwarders	5	2,000	10,000
	More than 100 small freight forwarders	10	1,000	10,000
Shipping lines	More than 20 major shipping lines in India	5	4,000	20,000
	More than 30 medium NVOCCs	3	2,000	6,000
Port agents	More than 20 port agents	5	4,000	20,000
Bunker suppliers	More than 10 bunker suppliers	5	1,000	5,000
Stevedores/ Misc.	More than 30	5	1,000	5,000
Banks	More than 15 financial institutes	5	2,000	10,000
Law firms	More than 10 law firms in India	2	1,000	2,000
Govt. offices	Various government offices to be targeted	6	1,000	6,000
Charterers	More than 50 firms	6	1,000	6,000
Total				**1,20,000**

SOURCE: GMB: Pre-feasibility report for establishment of marine clusters

EXHIBIT 122

SERVICES

Stage 2 details

Target market	Total estimated demand universe	No. of Units	Space per unit (sq ft)	Space requirement (sq ft)
Indian ship owners	More than 7 large ship owners – INSA members	3	5,000	15,000
	More than 15 medium size ship owners – INSA members	5	3,000	15,000
	More than 30 small ship owners – (INSA members + barge owners)	10	2,000	20,000
Indian & overseas operators	7 Indian and 11 overseas operators in the category of large ship operators	5	3,000	15,000
	11 Indian and 11 overseas operators in the category of small ship operators	5	1,000	5,000
Charterers	More than 20 large charterers in India	10	3,000	30,000
	More than 25 small charterers in India	10	1,000	10,000
Indian brokers	More than 10 large Indian brokers	5	5,000	25,000
	More than 15 small brokers	5	2,000	10,000
International brokers	More than 10 brokers with business relations in India.	5	5,000	25,000
Technical consultants	More than 15 technical consultants getting business from India	6	3,000	18,000
Other key institutes	Other miscellaneous firms	6	2,000	12,000
Total				**2,00,000**

SOURCE: GMB: Pre-feasibility report for establishment of marine clusters

EXHIBIT 123

SERVICES

Stage 3 details

Target market	Total estimated demand universe	No. of units	Space per unit	Space requirement (sq ft)
Overseas operators & ship owners focusing on India / regional markets	More than 15 large overseas operators	5	5,000	25,000
	More than 15 medium size ship owners	5	3,000	15,000
Overseas broker/Law firms	More than 15 large firms	5	5,000	25,000
	More than 15 small firms	5	3,000	15,000
Global technical services providers	More than 20 global service providers	5	5,000	25,000
Indian charterers/ Global charterers/ Trading house	More than 50 firms in India and several global charterers	5	5,000	25,000
Total				**1,30,000**

SOURCE: GMB: Pre-feasibility report for establishment of marine clusters

Option 1: Land parcel in Ahmedabad

For evaluating the financial feasibility of developing the cluster on a land parcel in Ahmedabad, requirements are estimated based on infrastructural and development norms (Exhibit 35). An FSI of 2.25 is used for the calculations and the numbers of floors considered for office and government buildings are ten and six respectively.

EXHIBIT 124

Infrastructure norms and assumptions

Area allocation	Value	Unit
Site coverage/ Plot coverage	32%	% of total area
Open area as % of total area	68%	% of total area
Roads and pathways	20%	% of total area
Utilities	10%	% of total area
Open space	38%	% of total area

SOURCE: GMB: Pre-feasibility report for establishment of marine clusters

For built-up area distribution **given in** Exhibit 36, land requirements are calculated (Exhibit 37).

EXHIBIT 125

Built-up area distribution

Item	Stage 1	Stage 2	Stage 3	Stage 4	Total
Office space	120,000	200,000	130,000	150,000	600,000
Commercial area	6,000	10,000	6,500	7,500	30,000
Area for govt./trade offices	82,000	-	41,000	-	123,000
Common area	32,000	-	25,000	-	57,000
Total built-up area	240,000	210,000	202,500	157,500	810,000

SOURCE: GMB: Pre-feasibility report for establishment of marine clusters

EXHIBIT 126

Land requirements for services cluster

Particulars	Total	Stage 1	Stage 2	Stage 3	Stage 4
Office space	**1.4**	0.3	0.5	0.3	0.3
Commercial area	**0.7**	0.1	0.2	0.1	0.2
Area for govt./trade offices	**0.5**	0.3	-	0.2	-
Common area	**0.2**	0.1	-	0.1	-
Roads and pathways	**1.8**	0.6	0.4	0.5	0.3
Utilities area	**0.9**	0.3	0.2	0.2	0.2
Open space	**3.3**	1.1	0.8	0.9	0.6
Total land area	**8.8**	2.8	2.2	2.3	1.6

SOURCE: GMB: Pre-feasibility report for establishment of marine clusters

The financial feasibility of the cluster is assessed based on certain cost and revenue assumptions (Exhibit 38 and 39).

EXHIBIT 127

Cost assumptions

Particulars	Results
Office space development cost	Rs. 1800 per sq ft
Cost of construction of commercial space	Rs. 2000 per sq ft
Cost of construction of utilities	Rs. 1200 per sq ft
Engineering/ mechanical and other utilities	Rs. 350 per sq ft
Water & sanitary facility	Rs. 350 per sq ft
Garden & free space	Rs. 240 per sq ft
Land development cost	Rs. 3,00,000 per acre
Green cover development	Rs. 60,000 per acre
Road construction cost	Rs. 3 crore per km

SOURCE: GMB: Pre-feasibility report for establishment of marine clusters

EXHIBIT 128

Revenue assumptions

Rentals	Average rentals (Rs./sq ft/ month)
Office space	35
Commercial space	100
Common facilities	50

SOURCE: GMB: Pre-feasibility report for establishment of marine clusters

Based on these assumptions, the pre-tax IRR for Option 1 is estimated to be 11.1 per cent in the pre-feasibility study by GMB.

Option 2: GIFT city

Another option for development of services cluster is to construct a building in GIFT city due to the adequate infrastructure available in GIFT city. Such a building/tower would be constructed in one phase over a period of 2 years.

Office space requirement would be the same as Option 1, however the cost of the construction in GIFT city is significantly higher at INR 4250 per sqft of built-up area. Lease rentals for office spaces are around INR 35 per sqft per month. With these assumptions, the IRR in this option is estimated to be 6.7%

Ancillary

The ancillary segment of the maritime cluster can be developed in Bhavnagar. GMB is already working on developing the Marine Shipbuilding Park in the area. It owns a parcel of the land in Old Bhavnagar Port which is to be used for shipbuilding and allied purposes (Exhibit 40 and 41). Ancillaries can thrive based on demand from shipyards in and around Bhavnagar.

EXHIBIT 129

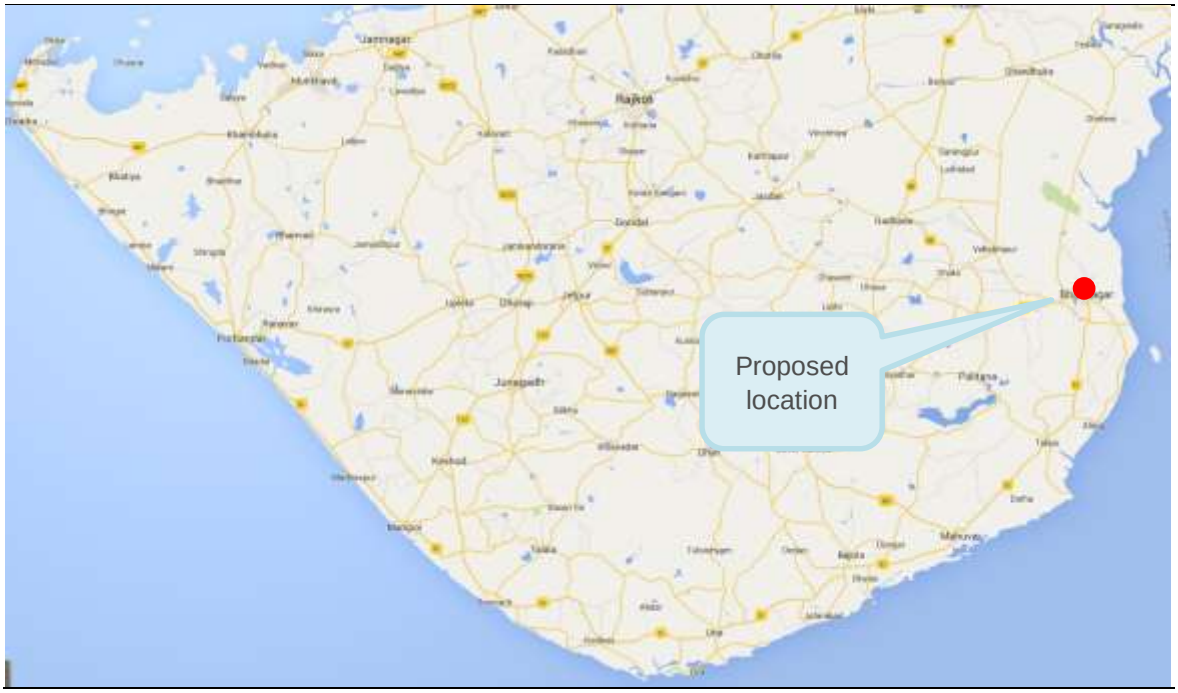
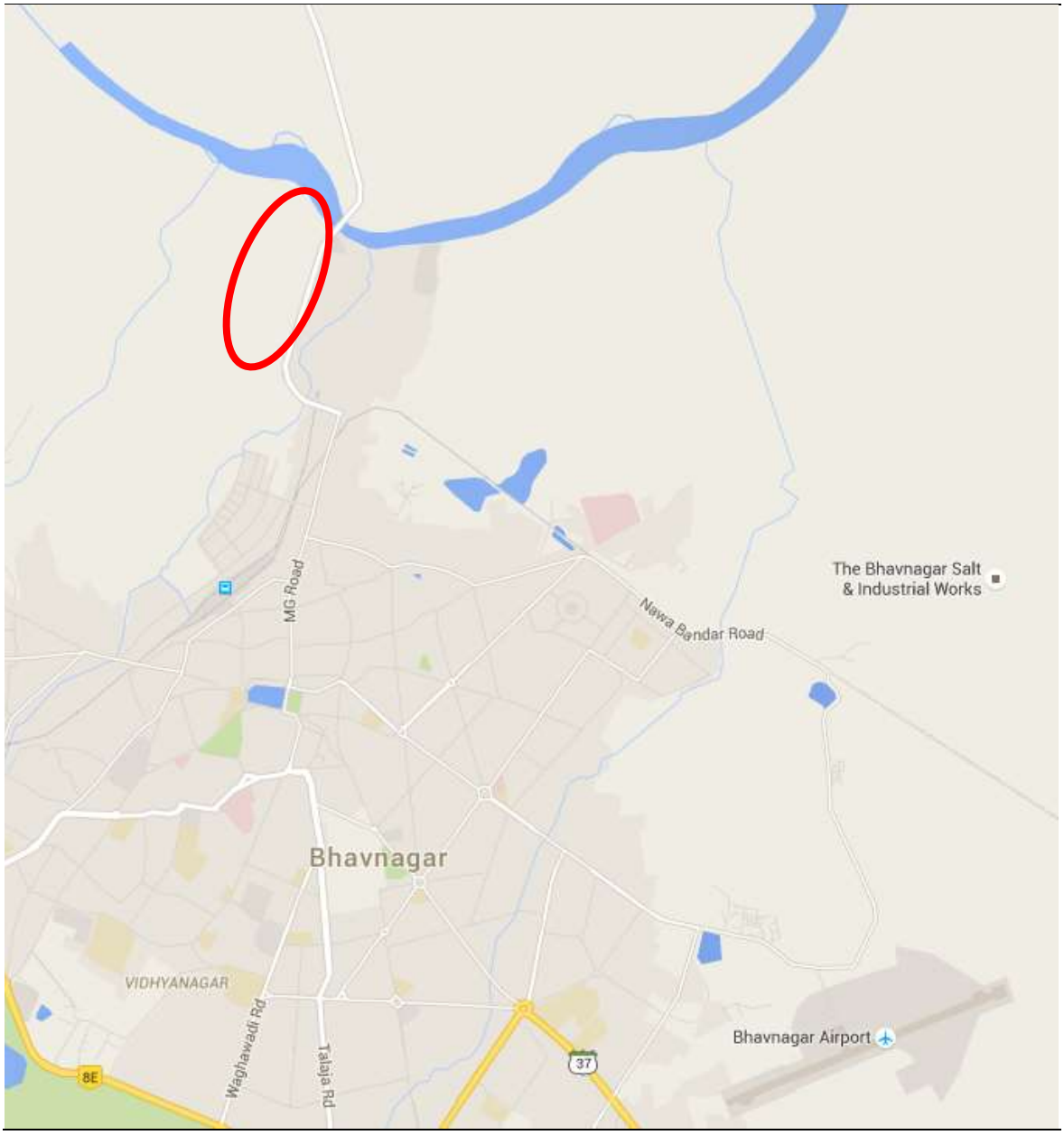


EXHIBIT 130



Units/suppliers that can be targeted as part of the ancillary cluster were identified in the Market Assessment section. Land requirements have been estimated for shipbuilding demand of up to 300,000 DWT. For example, to cater to the requirements of such a shipyard foundry, capacity of 25,000 T would be required. A foundry of this capacity will require about 40,000 to 45,000 sq m or 10 acres of land. Similarly, requirements for other units in the cluster have been estimated based on shipyard capacity (Exhibit 42).

EXHIBIT 131

Land required in the maritime cluster for ancillaries

Units	No. of units	Area per unit (acres)	Total area (acres)
Fabrication and machining	10	1	10
Engineering services	5	1	5
Handling systems	1	5	5
Propulsion	1	5	5
Foundry	1	10	10
Machining for large equipment	1	5	5
Design services (propulsion, propeller, powertrain, platform management)	2	0.5	1
Total			**41**

Eighty acres of land have been earmarked as “Reserved area for shipbuilding/allied purposes” by GMB. Land distribution has been estimated based on industrial and other commercial requirements (Exhibit 43).

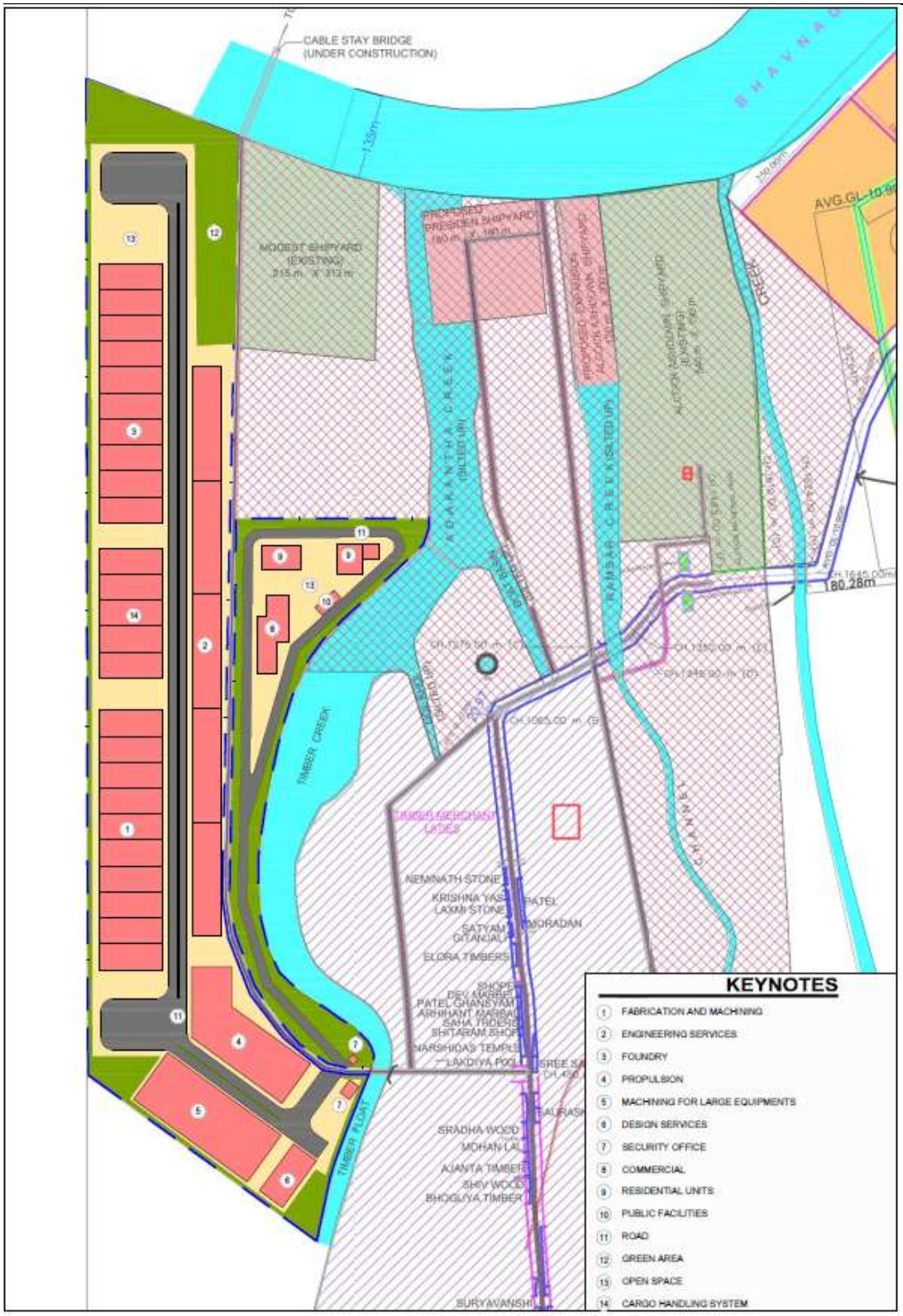
EXHIBIT 132

Land distribution

Category	% of total land	Land (acres)
Industrial	51%	41
Residential	5%	4
Commercial	5%	4
Roads	10%	8
Public facilities	5%	4
Open space	24%	23
Total		**80**

Drawings have been created to illustrate the land distribution and facility planning (Exhibit 44)

EXHIBIT 133



The financial analysis is done to assess the feasibility of the project. Certain land absorption assumptions are made for this purpose (Exhibit 45).

EXHIBIT 134

Absorption assumptions

Industrial Land

Year	Units	Land (acres)	Absorption %
1	5 F&M, 2 ES, 2 DS	8	20%
2	5 F&M, 3 ES	8	20%
3	Handling systems	5	12%
4	Foundry, machining	15	37%
5	Propulsion	5	12%
Total		41	

Commercial and residential land

Year	Absorption %	Land (acres)
1	10%	0.4
2	10%	0.4
3	10%	0.4
4	30%	1.2
5	40%	1.6
Total		4

It is assumed that the ancillaries will be established over a period of five years. Similarly, commercial land absorption assumptions are made over a five-year period. Infrastructure and development norms along with cost and revenue assumptions are considered for estimating the project cash flows (Exhibit 46).

EXHIBIT 135

Infrastructure and development norms, Cost assumptions

Category	FSI
Commercial	1.6
Residential	1.6
Industrial	1.0

Sale and lease assumptions

Category	Units	Rate
Industrial land lease	Rs/sq ft p.a.	70
Commercial lease	Rs/sq ft p.a.	360
Residential space	Rs/sq ft	2,000

Construction cost

Category	Rs/ sqft
Commercial	1,700
Residential	1,200

Equity of INR 80 cr is invested at the beginning of the cluster development. Considering a project timeframe of 15 years and 5 per cent yearly inflation, project IRR is estimated to be 21.5 per cent.

Tamil Nadu maritime cluster

The maritime cluster in Tamil Nadu will consist of:

- Existing shipyards
- Ancillary support and services in Ennore with retail and leisure components
- Existing fish landing centres

To be commercially viable, ancillary industries co-located with shipyards need a strong demand for ships. They gain from proximity to shipyards as it creates efficiencies in the supply chain and generates synergies. Marine services providers need access to infrastructure and a talent base for setting up their offices. The maritime cluster In Tamil Nadu can be developed near Chennai due to enabling conditions like existing shipyards, major ports, steel cluster, automotive and engineering industry, universities and colleges.

A 100-acre land parcel owned by Kamrajar Port Limited (erstwhile Ennore Port Ltd.) has been identified for cluster development ((Exhibit 47 and 48). The L&T shipyard at Kattupalli is around 5 km away. The following sections give details about the services and ancillary activities planned as part of the Tamil Nadu maritime cluster.

EXHIBIT 136

EXHIBIT 137

Services and ancillary

Marine services will require office space of around 60[illegible]ss four stages (Exhibit 49, 50, 51 and 52).

Proposed location

EXHIBIT 138

EXHIBIT 139

EXHIBIT 140

EXHIBIT 141

Units/suppliers that can be targeted as part of the ancillary cluster were identified in the Market Assessment section. Land requirements for these have been estimated based on shipyard capacity (Exhibit 53).

EXHIBIT 142

Land distribution has been estimated based on industrial and other commercial requirements (Exhibit 54).

EXHIBIT 143

Drawings have been created to illustrate this land distribution and facility planning (Exhibit 55).

EXHIBIT 144

A financial analysis assesses the feasibility of the project, based on certain land absorption assumptions (Exhibit 56).

EXHIBIT 145

It is assumed that the ancillaries will be established over a period of five years. Similarly, commercial land absorption assumptions are made over a five-year period. Infrastructure and development norms along with cost and revenue assumptions are considered for estimating the project cash flows (Exhibit 57).

EXHIBIT 146

At the outset, the project will require equity of INR 70 cr. The project timeframe is assumed to be 15 years. Price inflation for revenue and cost figures is assumed to be 5 per cent. With these assumptions, the IRR of the project is estimated at 35.5 per cent.

Implementation action plan

Based on the strong returns of the maritime cluster in Tamil Nadu as well as the Ancillary Services cluster in Bhavnagar, it may be explored whether they can be implemented through the PPP mode. The Service cluster in Gujarat GIFT City appears to have only moderate viability and may need to be initially developed through public funds.

Accordingly the following next steps are suggested

- A suitable implementation structure and PPP model needs to be developed for the 3 developments – i.e Tamil Nadu Maritime Cluster in Kattupalli-Ennore, Gujarat Services Cluster and the Gujarat Ancillary Services Cluster in Bhavnagar. The same needs to be discussed with GMB in case of Gujarat. In case of Ennore-Kattupalli, the Ministry of Shipping can decide the way forward since it owns the land. Nevertheless, consultation with the concerned bodies of the state government (Tamil Nadu Industrial Development Corporation and Tamil Nadu Maritime Board) are recommended
- Post this a detailed project report needs to be prepared for all the three developments through a suitable consultant. This should include detailed infrastructure norms and costing, schematics and detailed designs
- Environment clearances and other approvals would need to be obtained especially for the Ancillary Cluster in Bhavnagar and the Maritime Cluster in Kattupalli-Ennore.
- For projects to be developed on PPP mode, it is recommended that a transaction advisor be appointed to manage the PPP procurement process and select suitable developers for the projects
- For components to be developed by the government (e.g., the Service cluster in Gujarat) office space may need to be purchased or taken on long term lease. A PMC may be hired after completion of DPR and drawings in order to manage the process for procurement of works contracts. Closer to completion, a facilities manager may also need to be appointed for such projects
- In parallel the Ministry of Shipping, in coordination with respective state government agencies, should start discussions with potential anchor tenants for the 3 developments. This process can be taken over by the developed for PPP projects, once on-boarded
- An International Property Consultant may also be hired for leasing out the space for Service clusters in both Ennore and Ahmedabad