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Seaborne Trade between South Asia and Southeast Asia

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Abstract

This paper examines the seaports responsible for handling the majority of trade around the Bay of Bengal and identifiesthe projects that will enable trade and contribute to improving maritime infrastructure. It reviews the nature, potential evolution,and primary types of maritime trade around the bay, and analyzes the ships carrying that trade. It also reviews the potential changes that would have a significant impact on trade patterns, with special consideration of the Indian East Coast Corridor study. The paper likewise examines the main ports on the Bay of Bengal to understand their history, regulatory regimes, purpose, capabilities, primary specifications, constraints, productivity, fitness for purpose when compared to other ports in comparable situations, and their opportunities to improve and develop. Finally, the paper develops strategic options through which the seaports around the baycan adjust and develop to support the evolution of trade. The paper provides policy recommendations on how constraints can be addressed.

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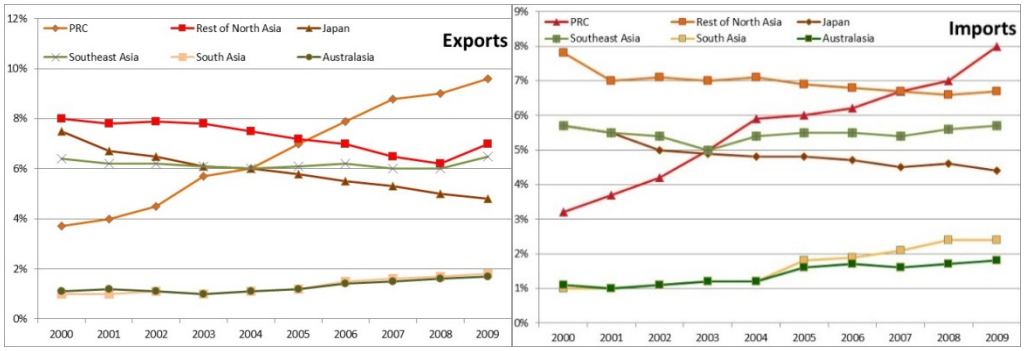
1. INTRODUCTION

This paper examines the seaports responsible for handling the majority of trade around the Bay of Bengal with a view to identifying projects that will enable trade and contribute to improving maritime infrastructure. The studyreviews the nature of trade in and around the bay and the ways in which trade could evolve. It also analyzes the primary types of maritime trade and the ships that carry that trade. Next, it reviews the changes that could have a significant impact on trade patterns, with special consideration of the Indian East Coast Corridor study. The paper examines the main ports on the Bay of Bengal to understand their history, regulatory regimes, purposes, capabilities, primary specifications, constraints, productivity, fitness for purpose when compared to other ports in comparable situations, and their opportunities to improve and develop. Finally, the paper develops strategic options through which the seaports around the Bay of Bengal canadjust and develop to support the evolution of trade, and assesses policy, practical, and other constraints.

2. TRADE AROUND THE BAY OF BENGAL

Maritime transport is essential to the world's economy as over 80% of world trade measured by volume is carried by sea. It is the most cost-effective way ofmoving goods and raw materials around the world (ITF Transport Outlook 2013). Figure 1 shows the distribution of world trade by region. Recent trends show continued but slower growth for the People's Republic of China (PRC).

Figure 1: Breakdown of International Trade by Region, Imports and Exports



Source: ICF–GHK based on World Trade Organization data.

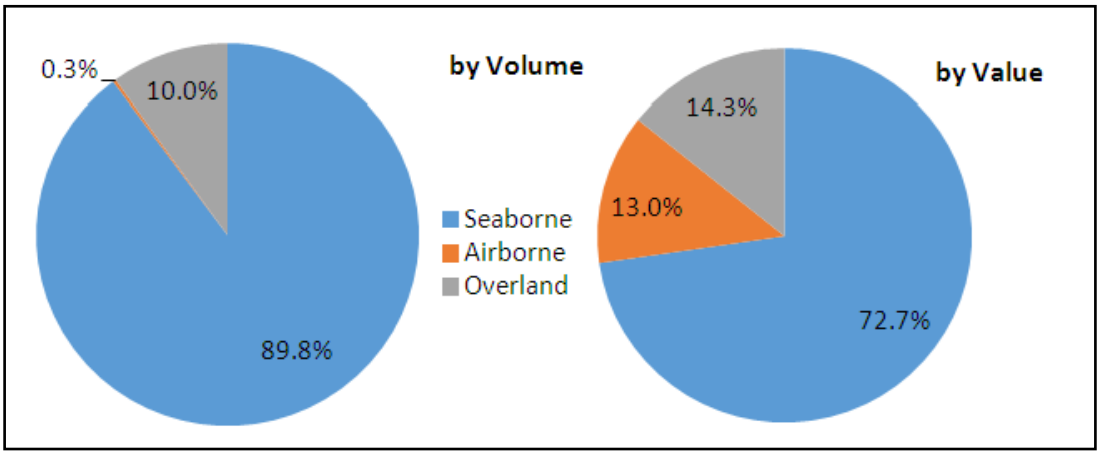
There is a major difference between the value and volume of trade. Considered in tonnage terms, the value of "one ton" of trade of coal, for example, is valued at $80–$90 per ton[1], petroleum products $610 per ton,[2]and containerized cargo $6,500 per ton.[3] It is interesting to note that the share of world trade carried by sea measured by value is considerably less than when assessed by volume or tonnage.

[1] 5,600 kcal coal at market prices, March 2014.

[2]BW 380 ex Singapore market.

[3]Based on OECD lower-quartile estimates of container values and mean load 15t per container in line with actual loads from ports around the Bay of Bengal providing a low estimate of value per ton.

Figure 2: International Trade by Mode, Assessed by Value and Volume



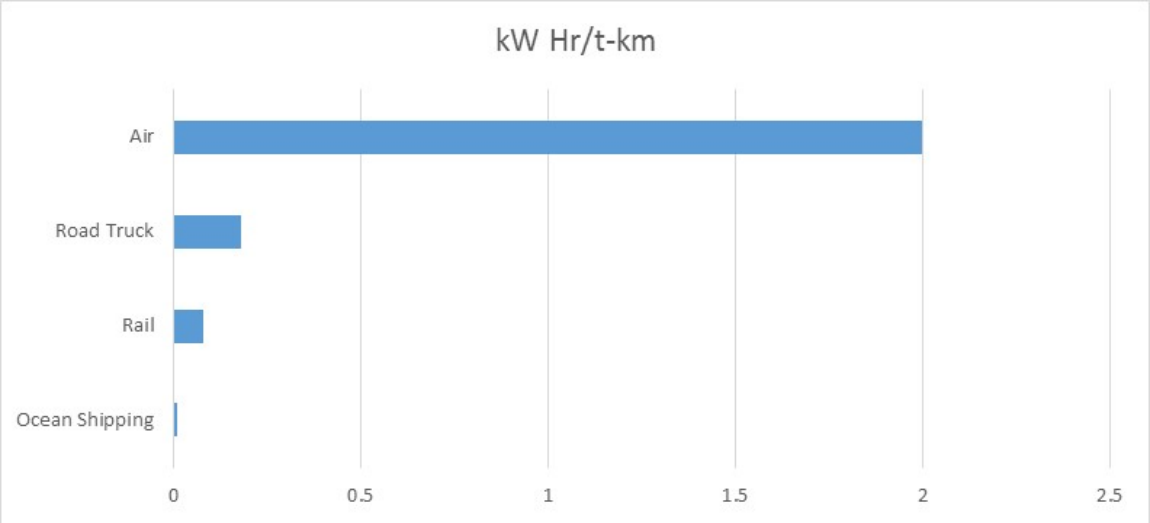
Source: UNCTAD (2013).

When focusing on connecting South Asia and Southeast Asia, three strategic factors to be taken into account are: (i) sea freight is substantially cheaper per ton than road haulage or rail haulage; (ii) haulage distances between the regions are long; and (iii) interconnectivity of road and rail networks across the two regions is limited. Of these, only the last one can realistically be changed.

Figure 3 shows the differential in energy requirements for transport. Given that energy costs represent a high percentage of transport costs and other costs for seaborne trade are significantly lower than for road or rail, the energy differential can be taken as a proxy for the cost differential between the transport modes. There is evidence that when trade is transported by sea, it is more sensitive to transport costs given the highly competitive nature of the shipping sector.

Figure 3: Energy Input into Transport Costs

(kW hoursper ton-kilometer)



Source: Michel and Noble (2008).

Table 1 and Table 2 show, respectively, the road (and by implication rail) distances between key population centers in the Bay of Bengal. Table 3 and Table 4 show the multipliers over sea transport costs of road and rail costs (adjusted for differences in distances).

Table 1: Distances between Population Centers by Road
(kilometers)

	Kuala Lumpur	Bangkok	Singapore	Ho Chi Minh City
Kolkata	4,650	3,400	5,000	4,200
Chennai	6,300	5,050	6,750	5,860
Chittagong	3,775	2,500	4,150	3,300
Yangon	2,200	950	2,560	1,750

Source: Compiled by authors.

Table 2: Distances between Population Centers by Ship
(kilometers)

	Kuala Lumpur[a]	Bangkok[b]	Singapore	Ho Chi Minh City
Kolkata	3,300	5,220	3,720	5,020
Chennai	3,100	5,000	3,500	4,800
Chittagong	3,050	4,950	3,450	4,750
Yangon	2,100	4,000	2,500	3,800

[a]Port Klang, the entry port for Kuala Lumpur, is in the same conurbation as Kuala Lumpur.

[b]Laem Chabang, the entry port for Bangkok, is a worst case assessment for trade into Thailand from South Asia. It is 110km to the south of Bangkok on the eastern seaboard of Thailand and assessment using the older Bangkok Port would be better

Source: Compiled by authors.

Table 3: Overall Road Transport Costsas Multipliers of Seaborne Costs

	Kuala Lumpur	Bangkok	Singapore	Ho Chi Minh City
Kolkata	8.45	3.91	8.06	5.02
Chennai	12.19	6.06	11.57	7.33
Chittagong	7.43	3.03	7.22	4.17
Yangon	6.29	1.43	6.14	2.76

Note: Multiplier is the total cost for road transit divided by total cost for seaborne transport.

Source: Compiled by authors.

Table 4: Overall Rail Transport Costs as Multipliers of Seaborne Costs

	Kuala Lumpur	Bangkok	Singapore	Ho Chi Minh City
Kolkata	3.52	1.63	3.36	2.09
Chennai	5.08	2.53	4.82	3.05
Chittagong	3.09	1.26	3.01	1.74
Yangon	2.62	0.59	2.56	1.15

Note: Multiplier is the total cost for rail transit divided by total cost for seaborne transport.

Source: Compiled by authors.

With the exception of cross-border trade and some potential for a Bangkok–Yangon rail connection, seaborne trade will maintain a major cost advantage over land-based trade for the foreseeable future. This is because even if appropriate road and rail links existed, the difference in cost between seaborne trade and rail-based trade would on average be more than 2.5 times, and for road-based trade be more than 6 times.

In conclusion, reviewing the geography of South Asia and Southeast Asia, the following are apparent:

- Haulage distances between population centers used as a proxy for economic activity are substantial (Tables 1 and 2).
- The majority of trade between South Asia and Southeast Asia will be go by sea for the foreseeable future.
- All trade with Sri Lanka has to travel by sea or air (meaning any rail or road trade has to be re-handled).
- All trade with Indonesia and Brunei Darussalam has to travel by sea or air (again, other trade modes have to be re-handled).
- Significant trade by land transport between South Asia and Southeast Asia is limited to cross-border trade between Bangladesh and India, Bangladesh and Myanmar, and Myanmar and Thailand (this may extend to a rail connection to Bangkok in the future).

2.1 Seaborne Trade around the Bay of Bengal

In considering seaborne trade around the Bay of Bengal, three primary facets to consider are the nature of the cargo being moved (liquid bulk, dry bulk, or containers), how the cargo is being moved (the ships and the ports), and the origin and destination of the trade (origin, destination, and haul length). This study looks briefly at these facets with respect to trade around the Bay of Bengal.

2.2 Nature of the Cargo BeingMoved

The three primary types of cargo that represent the majority of seaborne trade are containers (primarily for merchandised goods transport), liquid bulk (the main volume being crude oil and petroleum products), and dry bulk (the main volume being coal, iron ore, grains, bauxite,[4] and fertilizer).[5] Two other categories exist because they have specialisthandling requirements: roll on roll off (RORO) and general cargo. These are not discussed in this report as they represent less than 5% of the total trade volume, a small volume compared to the trade mentioned above.

Overall the volume of Asian trade in 2012 was 9,165 million tons (t). Figure 4 shows the breakdown of Asian trade by nature of seaborne cargo. If the average weight of a container is taken as 15t/twenty-foot equivalent unit (TEU) this suggests that over 95% of trade in Asia is either container, liquid bulk, or dry bulk. In terms of growth rates, this varies by port, country, and nature of seaborne cargo. Overall in the last 5 years, container growth has been about 5% per annum,[6] liquid bulk trade has been about 10% per annum, and dry bulk trade about 30% per annum.[7] Regulatory factors have been as influential as economic drivers in these growth rates, and falls in commodity imports can be as influential as increases, for example a ban on iron ore exports from some states in India.

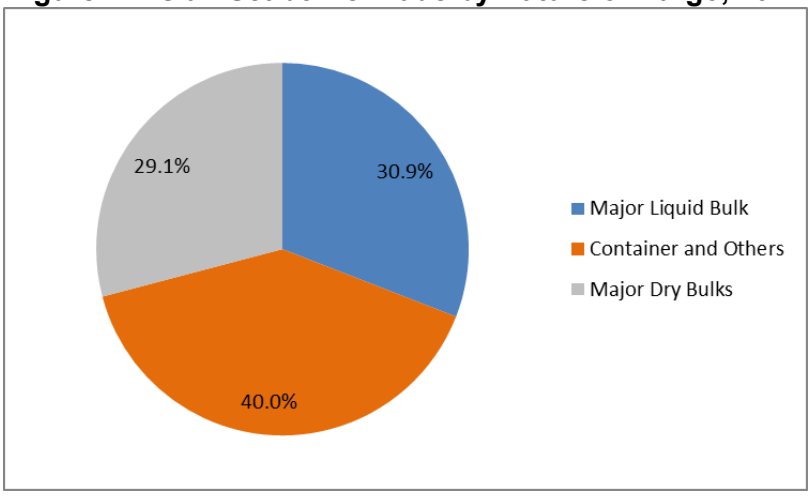
[4]Representing all ores of aluminum.

[5]Fertilizers are primarily phosphate rock.

[6]This may be constrained by the availability of container handling facilities.

[7]This is almost exclusively related to coal imports to India.

Figure 4: Asian Seaborne Trade by Nature of Cargo, 2012



Source: UNCTAD(2013).

Table 5 compares the tonnage handled at South Asian ports. The table suggests container trade has a far smaller share of trade in volume than in the rest of Asia.

Table 5: Port Throughput, Container, and Other Tonnage

	TEU	Other tonnage	Date of Statistics
India			
All ports	8,331,000	473,851,000	2012
Bay of Bengal	2,352,000	191,749,000	2012
Sri Lanka	2,316,849	10,370,312	2012
Bangladesh	1,392,104	43,140,042	2011
Myanmar	380,675	5,328,432	2011
After Correctionfor Transshipment[a]			
India			
All ports	8,331,000	473,851,000	2012
Bay of Bengal	2,352,000	191,749,000	2012
Sri Lanka	731,864	19,436,947	2012
Bangladesh	1,392,104	43,140,042	2011
Myanmar	380,675	5,328,432	2011

t = ton, TEU = twenty-foot equivalent unit.

[a]There is a need to add the weight of transshipped containers to the volumes for inbound and outbound volumes. Without this, the actual net trade volume is incorrect. In the first table the average weight of a TEU taking gross figures is under 5t/TEU, an impossibly low figure. In the second table the average weight of a TEU taking gross figures is around 26t/TEU; this is high, but is plausible after making a further adjustment for general cargo traffic.

Source: Sri Lanka Ports Authority, India Ministry of Shipping, Myanmar Port Authority, Chittagong Port Trust, and Mongla Port.

2.3 How the Cargo is Moved

Trade around the Bay of Bengal depends on seaborne transport that in turn depends on the availability of ships and ports. The following sections examine the ships and

ports operating in and around the Bay of Bengal and how these may change in the short and medium term. They do not examine customs and trade regulations but do comment on other significant regulations that impact seaborne trade patterns and how they may develop.

Ships

The availability of ships for international trade is not at present a concern; container ships, bulk carriers, and most forms of tankers are in oversupply, and shipping companies are struggling to deploy them effectively at profitable rates. Although ship availability for international trade is not a problem, ship availability for coastal or domestic trade around the Bay of Bengal is substantially affected by cabotage laws, that is, laws designed to ensure foreign ships are not allowed to trade between two domestic ports. All four countriesaround the Bay of Bengal have varying levels ofcabotage regulations and enforce them in different ways. These cabotage restrictions are summarized as follows:

- India's coastal trade (shipping cargo on local routes) is reserved for ships registered in India, and foreign ships are allowed to operate only when Indian ships are not available.
- Bangladesh and Myanmar reserve inland waterways and domestic trade for ships, barges, and inland waterways craft registered and operated by domestic owners.
- Sri Lanka has only a very limited coastal trade and is subject to regulations similar to those in India.

India's cabotage law hasa significant potential external impact. In theory, ships operating between ports in Sri Lanka and ports in India come under the same regulations as domestic shipping; in return Indian ships can operate in Sri Lanka. However, India does not at present enforce this restriction. This allows international feeder operators to use Colombo as a hub to distribute containers to Indian ports. If India were toenforce the law, the two probable outcomes would beeither that transshipments into India would move to ports on the Strait of Malacca or close to the Arabian Gulf (for example, Dubai and Salalah), or that one or two hub ports would develop in India and distribute containers around the coast through domestic container services (a line from Chennai to Valapardam, for example). These outcomes may resolve themselves in India's favor though that cannot be assured as this would require substantial expansion and change in the Indian shipping and port sector. In the short to medium term there would be significant disruption and an increase in container shipping costs into India.

The development of a hub as described above is part of the development plan for Valapardam on the west coast of India. This development has been restricted by the lack of supportive cabotage regulations. The minor relaxations effected have failed to attract international operators into multiple calls in India or into the India domestic market; this is because the investment cost outweighs the benefit given the short-term horizon allowed by the relaxation.

Cabotage is an emotive political subject in most countries. This is certainly true in India. With the exception of India, there would appear limited impact from cabotage on trade around the Bay of Bengal. For India it is one element constraining the development of the domestic coastal container trade; it is probable that there are ways to amend the Indian cabotage regulations or encourage the development of the domestic container trade within the existing regulations. Either of these could have a significant impact on trade patterns and the cost of transport into and around India.

The nature of ships trading into ports in and around the Bay of Bengal is reviewed in Table 6. This also examines in brief the potential changes to these ships over the short and medium term. The key conclusions are:

Container ships will grow in size significantly and require substantially deeper draft container terminals to enable growth and its associated transport cost reduction to happen.

There will be limited growth in other types of ships, although the total number of larger ships serving dry bulk and liquid bulk trade will increase, requiring the development of additional deep water berths.

Table 6: Ships Trading in the Bay of Bengal

	Current Ships	**Prospective Ships**	**Why and HowTradeWillEvolve**
Traditional (rakyat)	Small < 500 GRT	No change	The impact of unitization of cargo on cost will erode market
Petroleum products and chemicals	Up to Handysized (30,000 DWT)	An increase to Handy max (50,000 DWT) may occur	Volume driven based on import requirements and strategy/regulation of IOC
Crude oil	Limited number of VLCC (300,000 DWT+) and AFRAMAX (180,000 DWT) used Panamax (80,000 DWT) andHandymax (50,000 DWT) also used	Some further use of VLCCs may occur but AFRAMAX (180,000 DWT) most likely preferred ship	Dependent on refinery development, import requirements, and source
Dry bulk • Coal • Iron ore	Some ports take Capes (150,000 DWT) others limited to Handy (30,000 DWT)	Focus likely to be on Mini-capes (120,000 DWT) and Panamax (80,000 DWT) because of Indonesian supply limits	Dependent on power station and terminal developments; terminals will need to be close to industrial users to minimize land transport
Agribulk	Up to Handy sized (30,000 DWT)	An increase to Panamax (80,000 DWT) may occur	Volume driven based on import requirements
Containers	Up to 3,500 TEU	Change from feeder operations to direct calls Ship size increased to 6,500 TEU short term and up to 9,000 TEU over longer term; some ULCS may make direct calls	Most relevant to manufactured goods/merchandise goods Development of hub ports on Indian mainland would depend on changes to cabotage and subsidiary port developments

DWT =deadweight tons, GRT = gross registered tons, IOC = international oil company, TEU = twenty-foot equivalent unit, ULCS = ultra large container ship, VLCC = very large crude carrier.

Source: Authors' survey of major shipping operators cross-checked with local port statistics.

Ports

Port capability around the Bay of Bengal can be described in three primary areas that have similar characteristics. These are the northern and eastern Bay of Bengal, dominated by their location on major river deltas, the Irrawaddy, the Ganges, and the Brahmaputra; the east coast of India, where there are deep water port locations; and Sri Lanka, an island with some of the great harbors of the world. Map1highlights the locations of major ports, proposed ports, new developments, and interesting minor ports around the Bay of Bengal.

The east coast of India is not well served for ports, though initiatives from the Government of India, state governments, and the private sector are to an extent beginning to address this concern. However, the distance between ports and the lack of dedicated, international standard container handling capacity remain major problems.

Table 7 provides an overview of the capabilities and productivity of these ports. Ports need to serve significant populations (with their associated economic activity), industrial areas and concentrations (often associated with significant population density), and areas that produce and export primary resources, coal, iron ore, and agribulk; and offer strategic transshipment or logistical opportunities.

Map 1: Ports on the Bay of Bengal

Source: ADB.

In this context,it can be concluded from Map 1 and Table 7 that the following are necessary:

- Development of alternatives to Kolkata and Haldia
- Encouragement of the development of Ennore rather than further development at Chennai

- Identification and encouragement of new ports or the further development of minor ports between Krisnapatnam and Kakinada, and Vizag and Paradip
- Improvement of container handling facilities in terminals of management at Vizag
- Improvements to the channel and terminal management at Kakinada
- Development of additional terminals and especially dedicated container terminals at as many ports that focus on bulk handling and industrial cargoes as is practical
- Effective integration of private ports into hinterland infrastructure planning
- Development of hinterland infrastructure that focuses on the ports as well as seeks to integrate and support trade within India
- Development of a replacement port for Chittagong through either the development of a new deepwater port to serve, or acceptance that Chittagong cannot be replaced or further developed and a logistics strategy based on floating terminals needs to be developed

Sri Lanka is presently well served for port capability. There is scope for a review of the ports outside Colombo to ensure they have a clear market focus and that terminals within the port are developed to exploit their key advantages. Without prejudging more detailed studies, Tricomalee may have a role as a liquid or dry bulk hub for South Asia (and potentially further afield). Hambantota needs to identify appropriate industrial development opportunities and focus on supporting these developments through the provision of supporting terminals.

The development of ports at Sittwe, Kyaukpyu, and Dawei should not be allowed to distract Myanmar from its key port infrastructure need, which is the further development and/or replacement of Yangon/Thilawa. In many ways the situation of these ports is similar to that of Chittagong except that the problems are far easier to resolve. The development of hinterland infrastructure to support Thilawa should provide an effective solution for many years but not obviate the need for the identification of a green field site for a 100-year port to eventually supplement and replace both Yangon and Thilawa.

Sittwe, Kyaukpyu, and Dawei are projects that solve other countries' problems or are visionary commercial developments. None of them provide substantial opportunities in the short term to support development across Myanmar. One potential exception to this is if a major oil refinery were to be developed at Kyaukpyu or Dawei. This would be a major benefit, though is probably not something that Myanmar should focus on in the short to medium term.

Addressing the issue of cabotage through the four countries to permit an increase in coastal and inland waterways trade may stimulate and encourage trade and permit the development of hub ports that could lead to a major reduction in transport costs without substantial investment.

Table 7: Ports around the Bay of Bengal

Port	Country	Channel (depth/length)	Trade	Primary Cargoes	Containers	Liquid Bulk	Dry Bulk	Comments
Trincomalee	Sri Lanka	22m/short	< 5mtpa < 0.05 TEU	Intended for liquid and dry bulk	No containers	Limited operations can accept VLCC Productivity depends on tanker	Limited operations	Formerly a major naval base and petroleum product storage base, the port has been blighted by decades of civil war. It would be an excellent location for a bulk hub but has very limited demand in its own hinterland.
Hambantota	Sri Lanka	17m/short	< 5mtpa < 0.05 TEU	Cars and bunker fuel, targeting containers and bulk	No containers	Limited operations	Limited operations	A new port built with the support of the PRC Without substantial supporting industrial development it may only grow through cannibalizing traffic currently handled in Colombo.
Colombo	Sri Lanka	16m/short	30 mtpa 4.3m TEU	Containers and general cargo	Can accept largest container ship afloat Handling capacity at present in oversupply International standard operations	Limited operations	Limited operations	The recently operational outer harbor development has provided the port with excess container capacity for the foreseeable future. The location in the city constrains development and causesroad congestion and social impact issues.
Kairaikal	India	15.5m/10km	< 10 mtpa < 0.05 TEU	Cement, coal, and liquid bulk	No containers	Aframax tankers Productivity depends on tanker	Cape-sized carriers 900 tph (600 tph actual)	A new private port that has excess capacity and ambitious development plans, but is still to provide concrete proof of its market. Has development potential. Not within a major city.
Chennai	India	15.5m/7km	55.7 mtpa 1.6m TEU	Containers, cars, general cargo, and coal	Can accept largest container ship afloat Handling capacity at present in oversupply International standard operations	Aframax tankers Productivity depends on tanker Limited storage	Mini-capes 400–600 tph productivity rates below standard	One of India's major ports; its development has been constrained by the city, which surrounds the port. The outer harbor developments have provided adequate handling capacity and constrained the growth of Ennore, a port intended to provide bulk handling capacity to replace that at Chennai.
Ennore	India	16m/4km	14.9 mtpa < 0.05 TEU	Coal and limited other cargo	No containers	Aframax tankers Limited operations Productivity depends on tanker Short of storage	Mini-capes 1,000–3,000 tph	One of India's major port developments by the Government of India with support from ADB. Can approach world class productivity. Has development potential. Not within a major city.
Krisnapatnam	India	22m/12km	21mtpa	Coal, construction	No containers	Up to VLCC Productivity depends	Cape sized	A private port that has established its position withrespect tocoal handling.

Port	Country	Channel (depth/length)	Trade	Primary Cargoes	Containers	Liquid Bulk	Dry Bulk	Comments
			< 0.05 TEU	materials, grain, limited liquid bulk		on tanker	750–1,000 tph Considerable open and covered storage capacity	Good productivity level achieved. Has development potential. Not within a major city.
Kakinada	India	11.5m/short	11mtpa < 0.05 TEU	Alumina, chemicals, liquid bulk, has had container calls Offshore supply base	Limited container operations	Handy max at berth, deep draft tankers as STS transfers Productivity depends on tanker Short of storage capacity with impact on logistics costs.	Handy max at berth, increase in size of ship to be expected is required to achieve reduction in logistics costs.	Developed by the Government of Andhra Pradesh, the port appears to be struggling to identify its market. Though calling itself deep water, the port does not have deep water compared to other ports on the east coast of India.
Visakhapatnam	India	16m/22km	67 mtpa 0.35m TEU	Iron ore, coal, liquid bulk (crude), alumina	Container berth able to accept regional container ships Unable to berth two ships at once, reducing ability to act as hub Productivity not international standard but impacted by volumes	Up to VLCC 5,500 tph pumping capacity. No capacity issues.	600 tph unloading 3,000 tph loading Good open storage capacity No capacity issues	One of India's major ports, it is a key industrial port. It has the potential for further development but the water space area is limited and becoming congested.
Paradip	India	13.5m/2.5km	54.1 mtpa < 0.05 TEU	Iron ore, coal, liquid bulk (crude), fertilizer	No containers	Upto VLCCs 5,000 tph pumping capacity. No capacity issues.	1,250 to 2,500 mtpa No capacity issues	One of India's major ports, it is an industrial port. It has the potential for further development.
Dhamra	India	17.5m/18km	11 mtpa < 0.05 TEU	Coal (import/coastal trade),iron ore, limestone	No containers	No liquid bulk	2,500 tph unloading 5,000 tph loading Good open storage capacity	Developed as a bulk terminal, the port has established a clear market. Productivity is world class. Has development potential. Not within a major city.
Haldia	India	8.0m/120km	43.2 mtpa 0.6m TEU	Iron ore, coal,and petroleum products, some containers	Container berth able to accept small feeders ships Productivity below international standards	Upto Panamax and light Aframax Productivity depends on tanker Storage capacity affects efficiency of liquid bulk operations and increases logistics costs	500 tph unloading	Conceived as a replacement for Kolkata Port but has significant approach channel issues that stifle its growth. It handles mainly bulk cargoes which are generated by local industry. Productivity is affected by ship size and the enclosed dock nature of the port.
Kolkata	India	8.0m/220km		Containers and		Limited operations	Limited operations	Located within the city and has a long approach channel. Its replacement is long

Port	Country	Channel (depth/length)	Trade	Primary Cargoes	Containers	Liquid Bulk	Dry Bulk	Comments
				general cargo				overdue.
Mongla	Bangladesh	7.0m/80km	< 5mtpa < 0.05 TEU	General cargo and small bulk	The port handles a limited number of containers and cannot be assessed on basis of productivity	Only handy tankers can call Productivity depends on tanker There is a shortage of storage capacity but marine access main determinant of impact on logistics costs	Bulk products mainly handled in bags, limited bulk handling capability	A relatively small river port that has significant quay length. If the industrial area around the port develops, the market for the port will also develop. The approach channel and its maintenance make it hard to justify the operation of the port; periods of low water impact confidence in the port. Further development relies on maintaining a vision for the long-term future of the port.
Chittagong	Bangladesh	8.5m/160km	43 mtpa 1.5m TEU	Containers and a broad range of other cargoes	Container berth able to accept small feeder ships Productivity below international standards (10 to 15 moves per crane hour) Resolution relies on management improvements and small-scale operational reorganization	Only handy to handy max tankers can call Productivity depends on tanker There is a shortage of storage capacity that affects the efficiency of liquid bulk operations and increases logistics costs.	Limited operations	Port development limited by depth of the approach channel and surrounding city. The potential to provide alternative deepwater facilities is constrained by cost and a lack of sites. The development of a greenfield port or floating transshipment terminals is the most likely solution. Both could be adopted. Floating LNG terminals and methods of improving productivity of container handing at anchor have been proposed.
Sittwe	Myanmar	5.0m/15km To be 8.0m/25km	< 5mtpa < 0.05 TEU	General cargo bound for land-locked parts of India and local cargo	No containers	Limited operations	Limited operations	Sittwe port is currently under development as part of the Kaladan Multimodal Transit Transport Project, which intends to provide better access to land-locked parts of India with a view to economic development, poverty reduction, and security. The development has an inland waterway and road component as well. Further development of the port will be restricted by the lack of a clear market.
Kyaukpyu	Myanmar	18m/short	N/A < 0.05 TEU	Liquid bulk and gas	No market at present In theory the port will be able to handle ULCS. Moving these out of the port to a market will depend on road connectivity to be developed	Upto VLCCs Internal standard of operations with high capacity pumps and tank storage	At present no planned operations	Conceived as a gateway for the PRCto accept crude imports and avoid the Straits of Malacca. The port has limited local market potential. Road connectivity may provide a limited container and general cargo market in the southwestof the PRC. Unlikely to support anything other than a local market in Myanmar because of major hinterland connectivity issues and the need in particular for road

Port	Country	Channel (depth/length)	Trade	Primary Cargoes	Containers	Liquid Bulk	Dry Bulk	Comments
								connections to cross a mountainous area.
Yangon/Thilawa	Myanmar	7.5m/64km	18 mtpa[a] 0.45m TEU	Containers, some liquid bulk, timber, construction materials	Container berth able to accept small feederships Productivity below international standards (15 moves per hour per crane) but has capacity at Thilawa to move to international standards quickly and with minimal investment	Small handy tankers can call Productivity depends on tanker There is a shortage of storage capacity that affects the efficiency of liquid bulk operations and increases logistics costs.	Limited operations	A riverine port, Yangon is severely constrained by the surrounding city and is in urgent need of relocation. Thilawa, close to Yangon, has similar channel constraints though these can be ameliorated more easily than in Yangon. Started in 1995, Thilawa was conceived as a replacement for Yangon but its development was constrained by sanctions and the load limits on key bridges between Thilawa and Yangon. Further remedial work is also required on the rail connection at Thilawa. Japanese-led industrial developments are slowly creating a market for Thilawa.
Dawei	Myanmar	18m/short	N/A < 0.05 TEU	Container, liquid bulk, and general cargo	Under development	Under development	Under development	The port is a bold strategic development that will rely on the industrial areas to surround it to provide the market for the port. Thailand, proposed as the market for the port, is too far from the port, which is better supported by Map Tha Phut and Laem Chabang and not well enough connected to the port by road.

Km = kilometer, LNG = liquefied natural gas, m = meter, mtpa = million tons per annum, PRC = People's Republic of China, STS= ,TEU = twenty-foot equivalent unit,ULCS = ultra large container ship, VLCC = very large crude carrier.

[a]Estimate based on Myanmar Port Authority ship calls data.

Source: Authors' survey of port trusts, port operators,and terminal operators.

2.1.3Where Cargo is being Moved from and to (origins and destinations of trade)

Table 8 and Table 9 provide an overview of international trade, imports, and exports from countries in South Asia and Southeast Asia with major coastlines around the Bay of Bengal.

Table 8: Analysis of Exports ofSouth Asian and Southeast Asian Countries around Bay of Bengal

Country	**Value of Exports** ($ billion)	**Commentson Export Partners**
India	294 (est. 205.0 by sea[a]) Agriculture – 42.33 Energy/minerals – 64.38 Manufactured – 179.92	51.6% from top 5 partners (Singapore ranked 5th at 4.6%) Exports to ASEAN less than10% Exports to South Asia less than 5%
Sri Lanka	9.38 (est. 7.0 by sea) Agriculture – 2.72 Energy/minerals – 0.10 Manufactured – 6.50	68.3% from top 5 partners (none of top 5 partners in ASEAN) Exports to ASEAN less than 5% Exports to South Asia less than 5%
Bangladesh	25 (est. 18.0 by sea) Agriculture – 1.30 Energy/minerals – 0.28 Manufactured – 23.40	86.1% from top 5 partners (none of top 5 partners in ASEAN) Exports to ASEAN less than 3% Exports to South Asia less than 5%
Myanmar	8.9 (est. 3.2 by sea) Agriculture – 3.03 Energy/minerals – 4.17 Manufactured – 1.69	42% to Thailand, mainly primary products transported by land Significant land exports to India and PRC Seaborne exports to ASEAN less than 5% Exports to South Asia less than 5%

ASEAN = Association of Southeast Asian Nations, PRC = People's Republic of China.

[a] Authors' estimates based on UNCTAD datasets from published statistical reviews.

Source: World Trade Organization, International Trade Statistics 2013.

Table 9: Analysis of Imports ofSouth Asian and Southeast Asian Countries around Bay of Bengal

Country	**Value of Imports** ($ billion)	**Commentson Import Partners**
India	489.67 (est. 350.0 by sea) Agriculture – 25.43 Energy/minerals – 209.78 Manufactured – 188.27	42.5% from top 5 partners (none of top 5 partners in ASEAN) Imports from ASEAN less than 10% Imports from South Asia less than 5%
Sri Lanka	19.13 (est. 15.0 by sea) Agriculture – 2.27 Energy/minerals – 4.05 Manufactured – 11.21	58.5% from top 5 (India rank 1st at 19.7% and Singapore ranked 5th at 7.2%) Imports from ASEAN less than 15% Imports from South Asia less than 5%
Bangladesh	34.13 (est. 30.0 by sea) Agriculture – 9.76 Energy/minerals – 3.21 Manufactured – 19.55	50.8% from top 5 partners (Indonesia 5th ranked 5.1%, mainly energy related) Imports from ASEAN less than 15% Imports from South Asia less than 5%
Myanmar	9.2 (est. 4.0 by sea) Agriculture – 0.83 Energy/minerals – 2.21 Manufactured – 6.45	76.9% from top 5 partners, 27% from Singapore thought to be transshipped (rebadged from other countries), 11.4% from Thailand transported by land Imports from South Asia less than 5%

ASEAN = Association of Southeast Asian Nations.

Source: World Trade Organization, International Trade Statistics 2013.

In reviewing the statistics when considering trade between Southeast Asia and South Asia, two key conclusions can be reached:

- Southeast Asia is not a major seaborne trading partner of South Asia. Including dry bulk, liquid bulk, and containers, less than 10% of trade in South Asia is with Southeast Asia.
- Southeast Asia is more important to South Asia than vice versa.

If bulk products such as coal, petroleum products, and transshipped trade whose origin is unclear were removed from the equation, less than 5% of manufactured trade into South Asia would clearly originate from Southeast Asia.[8] The PRC, the European Union, and the United States are more important trading partners of South Asia at present than is Southeast Asia.

2.1.4 Seaborne Trade and How It May Evolve

The evolution of trade around the Bay of Bengal will be driven by macroeconomic factors and logistical/infrastructure responses to those factors. Withrespect to regional trade, the South Asian Association for Regional Cooperation and the South Asia Free Trade Area are positive factors through their impacts on tariff and non-tariff barriers to trade. On a more cautionary note, the limited ability of governments around the Bay of Bengal to stimulate economic growth and trade development through applying a fiscal stimulus to their economies, for example through substantial investment in infrastructure to support growth, also has to be considered when examining the speed and development of trade in the region.

India's growth has been driven by trade in services and domestic consumption rather than trade in merchandise. That said, major expansion in car manufacturing and the exploitation of primary resources is having a positive impact on trade and growth. Further growth in car exports, for example, will drive further development in external trade.

A continuation of relatively slow container growth and the need for further coal, iron ore, and petroleum-related liquid bulk (crude or product imports) is the most likely scenario. However, it should be noted that India's container penetration in terms of domestic transport remains half the international standard, and a spurt of container growth with associated reductions in transport costs stimulating further trade expansion could happen.

The shift of the garment trade from centers in the PRC and Viet Nam to Bangladesh has been a significant driver of economic growth and growth of external trade in Bangladesh. There is no obvious reason why this shift should not continue and spur further and more diversified manufacturing growth in Bangladesh, which will further drive external trade. This growth is likely to lead to increasing pressure on an already strained port system.Investment in Chittagong port or a new port will be critical to sustaining long-term growth.

Myanmar has the potential for a rapid economic expansion albeit from a low base of activity. The country is resource rich and has an underdeveloped pool of cheap labor. The country has the potential to expand rapidly through a combination of resource exploitation stimulating domestic consumption and export-led growth pushed by initially labor-intensive manufacturing, such as garments. All of these will require substantial improvements to government regulatory actions.

[8]Statistics are potentially confused by the port of destination and origin quoted on transshipped containers and petroleum products distributed from storage.

Developments in Sri Lanka have significant positive and negative potential impacts on regional trade; in particular on the external trade of Bangladesh, eastern India and to a lesser extent Myanmar. Slow implementation of the Colombo outer harbor development plan has already caused significant damage to Colombo as a transshipment hub. This damage may be repaired but it is unlikely. Further threats to its current role exist, not least the further development of ports in India (Chennai and Valapadam, for example). The volume of transshipment undertaken has significant benefits in terms of transport costs for the economy of Sri Lanka. This advantage will reduce as Indian ports improve and could decrease further if the volume of transshipment starts to fall substantially. This is a possible though unlikely scenario.

There is a range of potential trade pattern change agents related to infrastructure, transport, and port developments, including inland waterways (Irrawaddy, the Deltas, etc.), the Indian east coast corridor, eastern Indian port developments (and coastal trade), Colombo outer harbor, Dawei, Sittwe, and Kyaukpyu port developments, and development of supply chains across the region and with Southeast Asia. The impact of these could be amplified by three factors that suggest that South Asia has suppressed demand for trade. One example is that container growth is often related to population growth. South Asian population growth remains high, but the level of containerization in South Asia is only about half that in the rest of the world, suggesting that with appropriate facilities it could double in a relatively short timeframe. Second, as industrial expansion and export-oriented growth and trade develop, there is a multiplier effect between growth and trade. This means container growth can be 2 or 3 times the rate of growth of GDP.

The development of inland waterways such as the Irrawaddy, Ganges, and Brahmaputra deltas could provide a unique opportunity to provide high quality and low cost transport systems to large areas of West Bengal, Bangladesh, and Myanmar. This development would be critically dependent on providing effective long-term solutions to issues at Kolkata, Haldia, Chittagong, and Yangon. The development of the Rhine and inland waterways trade in Europe and the Mississippi are two examples. But, the risks are also highlighted by the history of the Irrawaddy Flotilla Company that was the world's largest and most effective user of inland waterways to provide cargo movement prior to it being sunk in 1942.

It is unclear how effective the India east coast corridor project would be in supporting international trade. By cutting overall transport costs and improving the competitive position of India, it could provide a solution to the shortage of ports on the east coast of India. The improvement of eastern Indian ports combined with an expansion of coastal trade could be complementary to the corridor as well as encouraging for growth in India's international trade. Colombo outer harbor development and the maintenance of adequate or excess container capacity ensure that some transshipment over the short term will relocate from Singapore and other Malacca Strait ports to Colombo. This will improve trade with Europe in terms of connectivity and cost and thus stimulate trade. In the longer term, other developments are likely to reduce the relative importance of Colombo and its impact on trade patterns. As noted above, we believe that Dawei, Sittwe, and Kyaukpyu port developments are projects that solve other countries' problems or are visionary commercial developments. However, should a major oil refinery be developed at Kyaukpyu or Dawei, a major change to trade patterns across the Bay of Bengal can be anticipated. This would imply that petroleum product trade would remain in relatively small tankers, andwould interact with cabotage restrictions in unpredictable ways.

Integration of production across the region and with Southeast Asia is fundamentally dependent on the development of regional container trade in terms of direct

connectivity and reliability. This is something of a chicken and egg situation. Integration cannot happen without the move to regional trading patterns, since transshipment adds costs and potential delays.

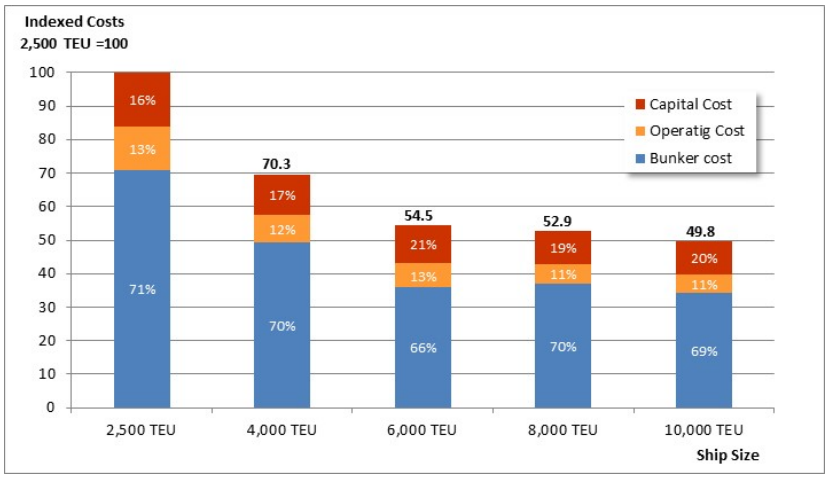
3. CONTAINER TRADE

The Changing Container Trade and Its Implications for Ports in the Bay of Bengal

Containerization has transformed shippingover the last 50 years.[9] From a situation where merchandised trade relied on general cargo ships, now almost all merchandise trade is handled in containers. It is almost impossible to conceive of a country or region being well integrated into world, or regional trade, without high quality and low cost access to seaborne container trade.

Two primary drivers have allowed the container revolution to usher in spectacular growth in global trade over the last 50 years. The first is unitization, which has a substantial impact on handling and transport costs; so long as a port has an effective container terminal, unitization is possible. The second is scale and the benefits of scale in terms of unit cost. Put simply, there is a strong relationship between the size of the container ship and the cost per TEU of operating container ships. Figure 5indicates the nature of thisrelationship,and is based on relatively old technology in terms of ship hull forms and engines. The relationship has been strengthened by advances in technology over the last 10years.

Figure 5: Relationship between Container Ship Size and Operating Costs



TEU = twenty-foot equivalent unit.

Source: Balancing the Imbalances in Container Shipping, AT Kearney (acknowledging Drewry).

At present, the three major, interlinked transformational trends of container trade are: (i) introduction of new “mega” ships carrying 12,500–18,000 TEU, (ii) older “mega” ships carrying 6,000–9,000 TEU being relegated to minor shipping routes well before their useful life has expired, and (iii) the emergence of a large number of underused container ships carrying 3,000–6,000 TEU. The impact of these trends on container trade in the Bay of Bengal will be to increase pressure for container shipping lines to use ever larger ships to carry the volumes of containers being generated from the region. This translates into pressure on ports and container terminals to be ready to

[9]Containerization is the use of a standard size and design of boxes that can be pre-packed with a broad range of cargoes.

accept larger ships, or see volume move to those ports that can accept large ships. Unless ports can provide the improved access, they will remain or return to shipping containers to “mega” hubs for transshipment, or the hinterland of those ports that can accept the larger ships will grow, causing longer drayage of containers by road. Both these will increase the overall cost of transporting the container. By implication, transport cost as a percentage of overall costs increases for merchandise goods, making the hinterlands of the affected ports less competitive in the global or regional economy.

3.1 Merchandise Trade around the Bay of Bengal and between South Asia and Southeast Asia

Merchandise trade is almost exclusively handled in containers. The main container ports on the Bay of Bengal based on 2012 port statistics are Chennai (India), 1.6 million TEU per annum; Kolkata/Haldia (India), 0.6 million TEU per annum; Chittagong (Bangladesh), 1.5 million TEU per annum; and Thilawa/Yangon (Myanmar), 0.45 million TEU per annum. A number of other ports (Vizag, Mongla, and Kuttapalli, for example) do handle containers but, either because they are new or handle small volumes, they do not provide helpful information on the main container trade in the region. It should be noted that very few containers are transshipped at any of these ports. Colombo, which is a significant transshipment center, handles 4.0 million TEU with 70% being transshipped, leaving approximately 1.2m TEU as origin and destination containers.

From an analysis of WTO trade statistics, less than 10% of these containers would appear to be destined for Southeast Asia; this assertion is not supported by analysis of container destination data from these ports of origin. Analysis of port data suggests a far higher percentage of the containers are routed to Singapore, Colombo, Port Klang, and Port of Tanjung Pelepas, the major regional transshipment centers. However, further integration of South Asia and Southeast Asia through trade will depend significantly on the further development of the container trade in the Bay of Bengal and the container line connections the ports in the Bay of Bengal develop with ports in ASEAN, and to some extent East Asia.

In comparison, the origin and destination containers handled by the major ports of Southeast Asia are Port Klang, 3.7 million (another 6.4 million were transshipped);Singapore, 6.5 million (another 26.0 million were transshipped);Penang, 1.4 million (limited transshipment);and Port of Tanjung Pelapas (PTP), 7.7 million (almost all transshipment).

Table 10: Major Container Ports in South Asia and Southeast Asia

Port	TEU Handled 2013	Channel Depth/Length	Tidal	Max. Ship (TEU)	Nature of Container Trade
South Asian Ports on Bay of Bengal					
Chennai	1.60	15.5 m/7 km	No	18,000	Europe trade (to 5,000 TEU) Regional trade (to 4,500 TEU) Feeders (to 3,500 TEU)
Kolkata/Haldia	0.60	8.0 m[a]/220 km	Yes	2,000	Feeder ships (to 1,200 TEU)
Vizag	0.35	16.0 m/22 km	No	18,000	Occasional calls only
Chittagong	1.50	8.5 m/160 km	Yes	4,000	Feeder ships (to 2,000 TEU)
Thilawa/Yangon	0.45	7.5 m/64 km	Yes	3,500	Feeder ships (to 2,000 TEU)
Major South Asia and Southeast Asia Transshipment Ports					
Colombo	4.30	15.0/short		18,000	Major transshipment port
Port Klang	10.10	16.0/short		18,000	Major transshipment port
Port of Tanjung Pelapas	7.60	15.0/short		18,000	Major transshipment port
Singapore	32.50	16.0/short		18,000	Major transshipment port
Original and Destination Ports in Southeast Asia					
Laem Chabang	6.10	16.0/short	No	18,000	Europe trade (to 12,000 TEU) US trade (to 8,000 TEU) Feeders (to 5,000 TEU) Domestic/barge calls
Penang	1.30	11.0/17 km	Yes	6,600	Regional trade (to 5,000 TEU) Feeders (to 2,500 TEU) Berge calls
Tanjung Priok[b]	6.40	12.5m/10 km	No	6,600	Regional trade (to 4,500 TEU) Feeders (up to 3,500 TEU) Domestic (small ships)
Saigon	3.05	13.5m/20 km	No	12,500	Europe trade (to 12,000 TEU) US trade (to 8,000 TEU) Feeders (to 5,000 TEU) Domestic/barge calls

Km = kilometer, TEU = twenty-foot equivalent unit, US = United States.

[a]To be reconfirmed with Kolkata Port Trust.

[b]This will increase to 18,000 TEU on completion of the first terminal in New Priok during 2014.

Source: Authors' survey of port and terminal operators and shipping lines.

The nature of the container ships calling into the ports is also of interest when considering the nature of merchandise trade in the Bay of Bengal. Almost all containers from South Asian ports are transshipped before reaching their final destination. Put another way; every container lifted from these ports has to be taken off at least one container ship to be put on another before it reaches its final destination. Table 10 compares the container trades in the major ports of South Asia and Southeast Asia. It also compares the relevant primary characteristics of the port of direct relevance to container shipping.

The nature of container trade in ports on the Bay of Bengal is further explored in Tables 11–14. Care needs to be taken when reviewing container ships calls. Many major shipping companies offer services that apparently call at ports such as Chittagong, Chennai, and Kolkata. However, when these calls are examined the services are not operated by the major shipping lines but represent vessel sharing agreements or slot charters between shipping lines. One example of this is that OOCL, Wan Hai, and Hapag Lloyd advertise such services but the service is actually provided by Sea

Consortium (X-Press Feeders). Tables 11–14 detail the actual container services calling at Yangon/Thilawa, Chittagong, Kolkata/Haldia, and Chennai.

Table 11: Container Services into Yangon
(estimated annual capacity: 450,000–500,000 TEU)

Company	Ships	Capacity (TEU)	Frequency	Annual Capacity	Service
KMA	3	473	Weekly	50,000	Singapore, Port Klang, Yangon
PACC	-	-	Tramp	-	Singapore, Yangon
RCL	2	600 est.	2 per week	125,000	Singapore, Yangon
ACL	2	200–1,000	2 per week	100,000	Singapore, (Port Klang), Yangon
Myanma Five Star	2	350–400	2 per month	35,000	Singapore, Port Klang
Sea Consortium	3	1,100	Weekly	120,000	Singapore, Port Klang, Yangon

TEU = twenty-foot equivalent unit.

Source: Authors' compilation from internet, shipping media, and port gazettes.

Table 12: Container Services into Chittagong
(estimated annual capacity: 1,800,000 TEU)

Company	Ships	Capacity (TEU)	Frequency	Annual Capacity	Service
RCL	8	500–1,500	5 per week	650,000	Singapore, Chittagong or Klang, Chittagong
ACL	4	500–1,000	2 per week	150,000	Singapore, Chittagong
Sea Consortium	4	1,600–1,800	2 per week	350,000	Colombo, Chittagong
Sea Consortium	9	1,100–1,800	4 per week	650,000	Singapore, Chittagong Port Klang, Chittagong

TEU = twenty-foot equivalent unit.

[a] ACL also provides a service every 2 weeks to Mongla.

Source: Authors' compilation.

Table 13: Container Services into Haldia and Kolkata
(estimated annual capacity: 765,000 TEU)

Company	Ships	Capacity (TEU)	Frequency	Annual Capacity	Service
RCL	10	500–1,000	5 days rolling	100,000	Singapore, Kolkata
RCL	1	1,000	2 per month	50,000	Singapore, Haldia
ACL	5	500–1,000	10 per month	170,000	Singapore, (Port Klang), Kolkata
ACL	2	500–1,000	4 per month	70,000	Singapore, (Port Klang), Haldia
Sea Consortium	5	850–1,200	3–4 days rolling	210,000	Singapore, (Port Klang), Kolkata
Sea Consortium	4	700–950	4 days rolling	165,000	Colombo, Kolkata

TEU = twenty-foot equivalent unit.

Source: Authors' compilation.

Table 14: Container Services into Chennai
(not fully comprehensive, potential capacity 2,000,000 TEU+, 60%+ feeder)

Company	Ships	Capacity (TEU)	Frequency	Annual Capacity	Service
CMA-CGM/Hapag Lloyd	7	4,250	Weekly	N/A (100,000–400,000)	Full European string
Maersk	7	3,400	Weekly	N/A (100,000–300,000)	Full European string
Maersk	4	2,900	Weekly	N/A (100,000–250,000)	Far Eastern Loop
NYK/Sea Consortium	4	1,650	Weekly	N/A (50,000–150,000)	Thailand Express and Kattupalli
Hyundai	4	2,200	Weekly	N/A (150,000–200,000)	Asia Express (Rep. of Korea), Vizag and Kattupalli
NYK/RCL/Samudera	4	1,600	Weekly	N/A (50,000–150,000)	Thailand Express
MSC	2	1,928	Weekly	200,000	Colombo Express (dedicated feeder)
Sea Consortium	2	3,200	2 per week	650,000	Colombo, Chennai
Sea Consortium	2	800–1,400	2 per week	230,000	Chennai

TEU = twenty-foot equivalent unit.

Source: Authors' compilation.

Several issues can be identified through examination of the tables:

- 100% of containers from Yangon, Chittagong, and Kolkata are transshipped. From Chennai at least 70% of the containers handled are carried on feeder ships to transshipment terminals, mainly to Colombo. All transshipped containers from these ports are subject to additional costs.
- With the exception of Chennai there are no direct ship calls from any of the top 20 international shipping lines to ports in the Bay of Bengal. Rather all of these lines have slot charters with common feeder operators. This represents a major reduction in competition for one element of the containers' transit, which pushes up costs. To understand the scale of these two companies in respect of these routes it is noteworthy that Regional Container Lines (RCL) and Sea Consortium control 90% of container shipping capacity into Chittagong.
- Although the ports of ASEAN have a much greater range of container services and trade route options, this cannot be fully explained by lower volumes. Penang is smaller than Chittagong and Chennai but has a far greater range of services that call at the port. Location is also a factor.
- The sizes of container ships calling at ports around the Bay of Bengal are small compared to ports in ASEAN, with sizes rarely exceeding 3,000 TEU compared to 6,500–12,000 TEU in comparable ASEAN ports; this increases costs for containers handled at ports in the Bay of Bengal.

3.2 Container Terminals and Merchandise Trade around the Bay of Bengal

Container shipping and therefore merchandise trade is influenced by the container terminals available and used. Only Chennai has what could be described as world-class facilities for container ships. Chittagong, Yangon, and Kolkata both have major physical disadvantages to other container ports because of their long and relatively shallow approach channels. However, Vizag and Paradip have excellent marine

access, but do not handle major container volumes. In the case of Paradip, this is because of the very limited container handling facilities. For Vizag the reason is unclear; it appears to have good hinterland connections and reasonable container handling facilities; the issue may be reliability and marketing.

Further understanding of the impact of container terminals on merchandise trade around the Bay of Bengal can be gained from an examination of the geography of the bay and the distribution of its ports. The distance between significant container terminals around the Bay of Bengal is far greater than, for example, along the coast of the PRC. It is to be noted that this observation takes into account the "gaps" in relative population density along the north coast of Myanmar.

The sizes of container ships calling at container terminals around the Bay of Bengal arenot dictated solely by the capability of the ports to accept ships, but also by the availability of efficient terminals and supporting soft infrastructure. Distance from the major container trade lanes may also be a factor. The average distance from the major trade lanes for ports on the Bay of Bengal is in the order of 1,250 km. For the major ports of ASEAN it is in the order of 500km.

3.3 Conclusions Related to Merchandise Trade around the Bay of Bengal

Several conclusions can be reached on how to improve merchandise trade around the Bay of Bengal and thereby the ability of South Asia and Southeast Asia to improve their level of economic integration andmanufacturing base. These conclusions are as follows:

- The ports and container terminals around the Bay of Bengal need to attract direct calls from major container shipping lines that offer the potential to avoid transshipment or/and a move to in-line [10] transshipment and thus achieve a significant reduction in costs.[11]
- Many ports around the Bay of Bengal need to develop or expand deepwater container terminals. As a minimum, 6,500 TEU ships should be accommodated. Deeper and more capable terminals should be considered.
- There is a need to reduce the distance between container terminals along the coast of the Bay of Bengal where that coastline is heavily populated to reduce the haul distance within the hinterlands and to provide better access to trade opportunities for industry and thereby stimulate economic growth.
- For the foreseeable future, there is going to be a need for good,low-cost transshipment hubs to serve the economies around the Bay of Bengal.

[10] In-line transshipment is where containers are moved from one very large container ship to another at some ports of call along their mutual routes. One ship may call at Shanghai; Hong Kong, China; Singapore; Dubai; Le Harve; Rotterdam; and Hamburg.The second ship may call at Tianjin, Xiamen, Singapore, Antwerp, and Felixstowe. This form of transshipment is very different from hub-and-spoke/feeder transshipment and in effect provides the benefit of a much broader range of direct port-to-port container shipments to shippers with the cost being absorbed by the shipping line to improve their competitive position over other shipping lines.

[11] Authors' estimates suggest direct calls can, over time, achieve costs savings from $100 to $500 per TEU. The savings are from removing transshipment costs and feeder line costs and by increasing competition between shipping lines. These savings can equate to between 20% and 50% of total container shipping costs into ports around the Bay of Bengal.

- There is a need to improve competition and improve access to container feeder services for ports and economies around the Bay of Bengal. These two may be in conflict at times. However, in Bangladesh in particular, close attention would be paid to improving competition in respect of container feeder ships.
- There is a need to research and consider radical solutions to the issues facing some ports with long and shallow approach channels on the Bay of Bengal. These could include major new green field port developments close to the entrance of the ports(in line with trends in Europe and ports such as Saigon) or floating terminals that offer mega ship to local barge transshipment in the northern parts of the Bay of Bengal. These could offer a method of eliminating significant road access issues as well as resolving access to mega container ships.

Impact of Conclusions on Merchandise Trade in the Bay of Bengal on Port Developments

The following sections review, on a port-by-port basis, the impact of the conclusions reached on the main ports around the Bay of Bengal. These conclusions are opined on the basis that port developments are most often focused on the availability of the best deep water.They require excellent access to an economically active hinterland often characterized by a high population density or significant primary production.

Theexpansion of existing port and terminal assets are a focus because they have the two items identified aboveand need additionally available land and water front area to undertake substantial expansion without major social orenvironmental impact.

Karaikal

Karaikal Port is a minor port that has been developed by the private sector under a long concession. The developer is experiencing major financial problems. It needs financial restructuring, a dedicated container terminal, a 10km access road to connect to the closest major highway, a 3km rail connection to ensure rail connectivity, and appropriate planning and development of other supporting hinterland infrastructure.

Chennai and Ennore

Chennai and Ennore are two of India's major ports. Ennore was developed as a new port to which bulk iron ore and coal handled by Chennai could relocate to free development space within Chennai for general cargo and containers. This has not happened in practice with further development and expansion of Chennai undertaken and ongoing. Marine access to both ports is, certainly in Indian terms, excellent. In the future they are in need of coordinated development plans that optimize both port assets, a dedicated container terminal at Ennore port (which would be difficult in view of the overcapacity at present in Chennai port), and plans for a third terminal in Chennai. Road connectivity to Chennai port requires substantial improvement; this is true to such an extent that the promotion of Ennore port over Chennai may be more practical in view of hinterland connectivity; however, this is politically impractical at present.

Kuttapalli

Kuttapalli Port is a minor port regulated by the state government. It has been developed by the private sector under a long concession. The developer is at present trying to divest itself of the port as its primary interest was the construction of the port. However, the port has a sitting management contractor for the container terminal, making it far less attractive to potential investors. The port has a dedicated container terminal and the potential for substantial further development. The hinterland links need further development and in particular a rail connection is required.

Vizag

A major port under the authority of the Government of India, Vizag is an industrial port with substantial coal, iron ore, petroleum products, and chemicals capabilities. These require deeper water than is required for container ships. With respect to containers, in the future there is a need for improvement in the management of the dedicated container terminal to ensure it is seen as a viable origin and destination port by major shipping lines, expansion of the container terminal to provide the ability to handle two regional container ships (6,500 TEU capacity) at the same time, substantial improvement to road connectivity, and adequate rail container handling capacity and connectivity.

Krishnapatnam

One of India's major ports regulated by the Government of India, Krishnapatnam is a collection of bulk terminals withsubstantial coal, iron ore, petroleum products, and agribulk capabilities. These all require deeper water than is required for containers. There is a prima facie case that the hinterland of the port could generate 250,000 TEU per year and in doing so provide justification for a dedicated container terminal. With respect to containers, the port needs development and appropriate management of a dedicated container terminal, further improvement to road connectivity, and further improvement of rail container handling capacity and connectivity.

Paradip

Paradip supports heavy industry through handling substantial coal and iron ore. It also has agribulk capabilities. These all require deeper water than is required for containers. The port has a limited capability to handle general cargo; this capability handles in the order of 10,000 TEU each year of geared container ships. There is a prima facie case that the hinterland of the port could generate 350,000 TEU per year and in doing so provide justification for a dedicated container terminal. The port is one of India's major ports, regulated by the Government of India, it is in need of the development and appropriate management of a dedicated container terminal, improvement to road connectivity, and improvement of rail container handling capacity and connectivity. Container handling within the port may suffer from a "chicken and egg" scenario on a commercial level. Does the generation of container terminal come first or the provision of handling capacity? This comment applies to a number of the smaller ports on the east coast of India.

Dhamra

Developed as a bulk terminal, Dhamra has a master plan that includes the development of a dedicated container handling capacity. The port is a minor port developed by the private sector. The port has limited rail connectivity (single track line) and very poor road connectivity. To be effective as a container port the rail line would require upgrading to a dual track and a 60 km long road to improve connectivity. The corridors needed to build this infrastructure have already been acquired.

Kolkata and Haldia

Kolakata and Haldia are two of India's major ports. With respect to container handling, they have substantial issues, mainly relating to the depth of water in the approach channel and the length of that approach channel. Both ports have substantial issues related to hinterland connectivity but major expenditure on resolving these issues would seem unwise without resolving the primary marine access issue. Haldia, a much younger port than Kolkata, was originally built to replace Kolkata. However, the site selected is on the western bank of one of the world's largest estuaries and one that is

slowly migrating from west to east. Attempting to maintain Haldia is like making an attempt to hold back the sands of time.

Several solutions to develop major new terminals in the region have been suggested. Sagar Island is an option that would provide the best access to deep water, but would require the construction of a major hinterland road connection including at least one major bridge. Terminals at Kulpi on the eastern bank of the estuary have been suggested as a partial solution; the marine access at Kulpi is substantially improved in respect of Kolkata or Haldia but remains far from ideal for containers. Other solutions include substantially improved rail connections with Paradip (or a location on the coast in that direction), the development of major new container terminals at Paradip, and the development of a floating terminal to enable the transfer of containers by barge across the estuary to smaller terminals.

Chittagong and Mongla

The development of Chittagong Port to improve container handling has been discussed for many years. Interim solutions, including the use of offshore moorings to unload containers at anchor, have been implemented. The solutions are (i) a major new green field port development, or (ii) a radical new solution using floating transshipment terminals for containers. Neither of these would be easy to adopt. The Government of Bangladesh has been progressing the development of a new port at Sondia Island. The technical and commercial feasibility of this port is a concern but it would be a critical item of infrastructure not just for Bangladesh, but would also havepotential for landlocked parts of India, Nepal, and Bhutan. The heavy influence of the PRC in the development of this port is therefore a challenge due to diplomatic sensitivities been sovereign nations. Road and rail connectivity are also major issues for Chittagong Port. The further development of Mongla Port for containers is impractical.

Sittwe and Kyaukpyu

Kyaukpyu and Sittwe lack the basic economic activity in the hinterland to sustain significant container calls or justify the development of a dedicated container terminal. This situation will most likely not change for several decades. Hinterland access and the development of road and rail access is complicated by the geography of the port location with rivers and mountains providing challenges to road and rail engineers. The success of this development will be linked to the requirements of the region for bulk handling; if these justify the development of a deepwater port there may, in the distant future be reason to consider container development.

Yangon and Thilawa

Yangon Port with its adjunct Thilawa has more than adequate berth capacity to accommodate over 1.5 million TEU per annum in terms of berth length and backup area designed for container operations. However, a key bridge link between Thilawa, where that capacity exists, and Yangon, where the primary demand center is, cannot carry large volumes of container trucks. Other issues that impact container development in Yangon and Thilawa arethe relatively long channel and low water depth. A site for a major new green field port needs to be identified and appropriate basic infrastructure planned and developed to ensure that as Myanmar develops, Yangon does not evolve into a major feeder port in the manner that has happened to Chittagong. The development of inland waterways links from Yangon and Thilawa to Mandalay along the Irrawaddy River should provide access to a considerable hinterland over the next 2or 3decades if Myanmar continues to develop.

Dawei

Dawei Port has reasonable access to deep water but is located at some distance from existing centers of population and economic activity. One suggested basic logic of the port is to attract westbound container traffic from Thailand; this is difficult to justify on commercial or economic grounds when considering the broader market competition for that volume and the relative economics of sea and land transport. The road and rail haulage distances and capacity from existing centers of economic activity ensure that the further development and expansion of Laem Chabang and Penang to serve this traffic would be more attractive. The development of adequate container volumes to attract a broad range of ships calls that provide access to a substantial range of destinations without transshipment appears impractical. The port may have some role in the support of an industrial zone, but that depends on the relative economic benefits of the zone rather than the attraction of the port. In essence, the industry in the zone will have to subsidize the port; this subsidy may be considerable.

Other Ports

There are other small ports that could be considered for development along the east coast of India; Kakinada and Krishnapatnam being the most well-known of these other ports. The issue of ports in Bangladesh is so severe that it is impractical to consider more than one major development. A similar comment applies to Myanmar, where the importance of having port development also needs to be emphasized.

4. LIQUID BULK

4.1 Liquid Bulk Trade

An understanding of trade in liquid bulk primarily requires an understanding of trade in crude oil and petroleum products. Other liquid bulk such as crude palm oil and specialty chemicals are moved in far smaller volumes by tankers that require considerably less water depth to enter a port. An understanding of the liquid bulk trade around the Bay of Bengal can be gained from a review of macroeconomic trends in the petroleum product market that effect the trade, and a country-by-country review of refineries, storage, and the import/export balance for crude and petroleum products.

4.2 Review of Petroleum Products Market

The last few decades haveseen a strategic change in the structure of crude and petroleum products logistics; an evolution away from the transport of crude oil toward the transport of petroleum products. This change is driven by factors including a growing fraction of world crude oil being produced by state-owned companies, more emphasis on investing in refineries close to crude oil production (particularly in the Middle East), growing volumes of oil trading and use of futures and derivatives with the oil products market, and a stronger focus on managing inventory by oil product users.

Over the last 40 years, the petroleum trade, covering both crude and petroleum products shipments, has grown by between 2% and 2.5% per year. According to Arthur D. Little (2009), in 1990, 90% of the petroleum shipments were crude but by 2009 this had fallen to less than 60%; the trend continues. The trend implies petroleum product shipments have grown strongly since 1990, achieving growth rates closer to 10% per year. This is forecast to continue to fall as committed investment in refineries particularly in the Middle East comes into production.

The impact of this on growth in petroleum products storage demand, a key element of port infrastructure, has been significant. It has grown far faster than the rate of growth in total petroleum and crude trades. Indeed, it has grown faster than the petroleum products trade taken on its own. This is because there has been an increase in the diversity of products being refined, traded, and stored. Within broad general specifications of petroleum products such as the motor gasoline's that are evolving clearly differentiated sub-specifications that require discrete storage to prevent contamination.

The analysis supports a view that even with the discovery and development of crude production in many other locations, the Middle East remains (and will remain) the dominant source of supply for many years to come. Despite alternative energies, tar sands, etc., no known developments will make a fundamental difference to the central position of the Middle East in the oil market. The development of refining capacity in the Middle East has outstripped development in all other regions, even the PRC, over the last 20 years. It is forecast to continue to do so over the next 20 years with total Middle East refinery capacity potentially doubling by 2020. Similar trends can be found in most downstream products.

In addition, the market is demanding a broader range of petroleum products. This is typified by the increasing use of more environmentally friendly products, and cleaner, lighter, and more highly specified products for niche uses. This will tend to support shipping smaller packet sizes, cause more concern about contamination, and lead to more change and development required in shipping and storage. So products are being moved in smaller packets and at the behest of a wider variety of end users and middlemen. Traders find the more plural market more interesting, with many more options and strategies through which to make money. Over the last 20years there havebeen more and smaller tankers and substantial growth in storage requirement (and diversity in location and nature of that storage). Because the drivers are still in place, much more of the same should be anticipated over the next 20years. Summarizing, there will be a continuing global dependence on petroleum products for energy, natural global growth in demand for petroleum products, maintenance of the market share of Middle East crude production, and continuing increases in Middle East refining capacity.

4.4 Petroleum Trade Drivers around the Bay of Bengal, Country-by-Country Review

Table 15 provides an overview of production, imports, and consumption of petroleum products in the countries around the Bay of Bengal.

Table 15: Petroleum Sector Balances, 2012
('000 tons)

Data Point	Bangladesh	India	Myanmar	Sri Lanka
Crude production	98	41,965	816	0
Crude imports	1,409	171,729	4	1,932
Refinery production	1,451	207,278	770	1,900
Product imports	3,573	(46,872)[a]	225	2,729
Demand				
NGL/LPG/Ethane	40	15,532	12	199
Naptha	44	11,105	54	63
Mogas	416	15,272	384	709
Av gas	301	5,536	76	315
Kerosene	477	8,229	2	169
Diesel	2,612	62,414	457	1,930
Fuel oil	511	9,542	65	1,140
Other	508	20,323	28	76
Refinery fuel	71	15,422	55	16
Total[b]	4,980	163,316	1,133	4,617

LPG = liquefied petroleum gas, NGL = natural gas liquids.

[a]India exports petroleum products

[b]Excludes marine bunkers

Source: IEA (2013).

With respect to trade in the Bay of Bengal, Table 15 is not very informative. Though India is a net exporter of petroleum products, much of these exports are destined for Europe or Singapore (as a staging port/trading hub). Bangladesh and Sri Lanka import crude to feed local refineries, mainly from the Middle East. Product imports into Myanmar, Bangladesh, and Sri Lanka are driven mainly by external factors relating to supply and demand balance in broader world markets. The growth of Singapore and adjacent petroleum product storage in Malaysia is providing much of the supply into these countries with the original supplies being sourced from ASEAN and other local producers and balancing supplies primarily coming directly into Singapore from the Middle East.

4.5 Review of Impact of Port Infrastructure on Liquid Bulk Trade around the Bay of Bengal

The evolution of this trade is dependent on refinery construction, though the fundamental economics (and politics) of this should favor large refineries close to areas of crude production. This suggests that there will be few refineries developed that impact the structure of trade in the Bay of Bengal. As has been mentioned, the one possible exception to this could be the development of a major refinery complex at Kyaukpyu or Dawei in Myanmar. This would benefit from scale to ensure purchasing power in the crude market and the influence of the PRC in terms of politics. The Jamnagar refinery in Gujarat is an example of how such a refinery could develop, though the risks of any such development remain significant.

It is interesting to note that the evolution of these trades is not likely to be affected by the port facilities provided around the Bay of Bengal. That should not lead to the conclusion that the provision of these facilities and the nature of that provision is not important, but rather that the nature of the trades will not fundamentally change. It is however important to ensure the trades are not stymied by an absolute lack of capacity in terms of berths, and perhaps more relevantly, storage capacity and the storage of strategic reserves. The introduction of larger tankers and the provision of more appropriate and adequate storage to support these trades would reduce the overall cost to the relevant economies of these trades. The following sections examine in more detail that factors that impact petroleum product trade around the Bay of Bengal country by country.

Bangladesh

Table15 shows the supply and demand balance for petroleum products in Bangladesh. The table suggests that product demand could grow very quickly from a relatively low base. Perhaps the two most important facts for Bangladesh are that it has almost no crude production and imports almost all its needs as either crude to feed a refinery that was built in the 1960s or as refined petroleum products. Bangladesh has failed to either modernize its existing refining capacity or develop new capacity. The latest attempt with a Kuwait consortium may be more successful but a general observation that refining is moving to locate near crude production does apply to Bangladesh. It is not a large enough consumer to have very substantial market influence. There is some potential for a consortium that provides crude to assemble a viable proposal to build a refinery.

The current approach to meeting petroleum product demand in Bangladesh will continue. In all probability, growth will be absorbed by increasing imports of petroleum products. This will increase the requirement for product storage and product import capability. To prepare for this, Bangladesh Petroleum has started to develop new storage capacity. Providing more capable import terminals is difficult, though the use of offshore floating storage combined with barges is a relatively simple and well understood solution; though it is noteworthy that if growth is mainly in the form of product imports the tankers usually used are smaller than those for crude.

Myanmar

Table 15 shows the supply/demand balance for petroleum products in Myanmar. The table suggests that as in Bangladesh, product demand could growth very quickly from a low base. This will have very significant implications for port infrastructure unless local refineries are built. Though one of the oldest oil producers in the world, starting in 1853, Myanmar's limited crude production and refining capacity are not adequate to cover its own demand,making the country a net importer. This is partly because Myanmar's upstream petroleum sector is underdeveloped as a result of sanctions, a lack of technical capacity, opaque regulatory policy, and a lack of investment. Myanmar produces a small amount of crude from onshore and offshore fields. Total crude production reached a very modest 21,000 barrels per day (bpd) in 2011. The country has 7.8 trillion cubic feet of proven natural gas reserves (placing it 41st globally) and proven petroleum reserves of 50 million barrels (78th globally). The probability is that unexplored reserves far exceed these figures. Sanctions were in effect lifted in 2012 after political rapprochement within Myanmar. The government now has a policy of securing foreign investment and technical assistance through production-sharing contracts. The impact of this is yet to translate into production.

On the refining side, the country has three small refineries, originally developed to refine domestic crude. These refineries, upgraded in recent years, are Mann

Thanpayarkan and Chauk, with a total capacity of 7,500 bpd, and Thanlyin with a capacity of 11,000 bpd. Refinery investment often follows the development of crude production and a 45,000 bpd is planned near the existing Mann Thanpayarkan refinery. It could also make sense to use the import facilities at Kaukpyu to service a new refinery. Guangdong Zhenrong Energy Company, an oil and commodity trader partly owned by state-run Zhuhai Zhenrong, is scouting for sites in Myanmar[12] to build a 100,000 bpd refinery, the company's chief executive said. The project, estimated to cost $2.5 billion, is likely to be located in the southern port city of Dawei which offers appropriate land area and access to deep water and potential access to Thailand but probably not access to PRC. Refineries at either Kyauphyu or Dawei would have a significant impact on trade in petroleum products around the Bay of Bengal. At an adequate size they would reduce the need for product storage and encourage a barge or coastal tanker-based distribution system to develop in Myanmar.

Myanmar is an important natural gas producer within Southeast Asia with 75% of production being exported, mainly to Thailand. PRC interests are also seeking to develop gas production in Myanmar. These exports would be handled by pipeline. The PRC exports would use pipelines running from the port of Kyaukphyu to Kunming in the PRC. The concept of the pipelines is to export gas and to provide the PRC with alternative transit routes for its own import requirements. The port and pipelines would allow crude destined for the PRC from the Middle East and Africa to avoid the Malacca Strait, a strategic pinch point in their supply chain. As importantly, it would provide a shorter route for the delivery of crude to the inland southwest of the PRC.

India

India is a far more significant producer, refiner, and consumer of petroleum products than Bangladesh, Sri Lanka, or Myanmar. It may therefore be expected that the situation in respect of petroleum product trade in the Bay of Bengal with respect to India is more complex. However,this is not true because India is a significant net exporter of petroleum products. The associated refining capacity was built to serve first the domestic market and it retains a significant cost advantage over product imports. As demand rises, therefore, domestic distribution through existing channels will deliver products from existing refineries to the domestic market. This may impact coastal (cabotage) trade but this is in general handled by smaller tankers that are able to use a broad range of ports in India. At present, the storage market in India is underdeveloped primarily due to the structure of domestic regulation and distribution.[13]

Sri Lanka

Table 15 indicates the supply and demand balance for petroleum products in Sri Lanka. The table suggests that product demand could be relatively modest. Perhaps the two most important facts for Sri Lanka are identical to those for Bangladesh. The country has almost no crude production and imports almost all its needs as either crude to feed an existing refinery that was built in the 1960s or as refined petroleum products. Sri Lanka is actively engaged in offshore oil and gas exploration. Although gas has been found in the Mannar Basin off the western coast of Sri Lanka, no oil has been discovered yet.

Sri Lanka plans to upgrade its existing refining capacity and develop new capacity. An agreement to develop a new refinery at Hambantota has been signed as part of a

[12]Reuters report available at: http://www.reuters.com/article/2012/01/12/china-myanmar-refinery-idUSL3E8CB7B220120112

[13]The price of the four key petroleum product fractions is controlled by the government.This means that only government-controlled companies can effectively market these fractions.

broader development plan. This refinery is intended to be funded by the PRC. This may make it an exception to the general trend for refineries to be developed close to crude production. The planned refinery is not of sufficient size to impact trade in petroleum products in the Bay of Bengal. Its impact would be to increase imports of crude to Sri Lanka at the expense of petroleum product imports. The port developed at Hambantota is already adequate (or planned to be adequate) to support the proposed refinery. Should the refinery not proceed, additional petroleum product import capacity and most notablyadditional storage capacity will be required. This could be provided on a commercial basis at Hambantota or Trincomalee, and would leave Colombo free to support the demand from the city itself.

5. DRY BULK TRADE

The five main bulk commodities are coal, iron ore, alumina, grain, and fertilizer (phosphate rock).

This paperwill not examine these in detail except to observe their relative importance. Table 16 outlines how each of these impacts trade around the Bay of Bengal. The overall conclusion is that this trade is not sorelevant. The table provides more details withrespect to the coal trade that does have a major impact in Indian ports and has been the base cargo for several actual and proposed private port developments.

Table 16: Analysis of Major Dry Bulk Trades and Their Impact in the Bay of Bengal

	Bangladesh	India	Myanmar	Sri Lanka
Coal	< 1 mtpa	Major importer	Not relevant	< 1 mtpa
Iron ore[a]	Not relevant	Exporter[b]	Not relevant	Not relevant
Alumina	Not relevant	Exporter	Not relevant	Not relevant
Grains	Significant but unstable trade with strong seasonal elements			
Fertilizer				

Mtpa = million tons per annum.

[a] The People's Republic of China, Japan, the Republic of Korea, and Europe account for almost all world iron ore imports.

[b] Some Indian states have banned iron ore exports to protect domestic steelmaking. The government has imposed heavy export taxes that are making Indian exports uncompetitive.

Source: UNCTAD(2013).

In the absence of all but the agribulk trades, the impact of dry bulk on trade and port development will be considerably reduced. The small dry bulk trades use handy and handy max bulk carriers (or smaller). A further factor that could influence the development of these trades is the way in which the use of containers to transport grain has increased over the last 10 years. At appropriate times when freight rates are low this approach can be highly competitive.

Table 17: Coal Production and Imports, 2012
('000 tons)

Data Point	Bangladesh	India	Myanmar	Sri Lanka
Production				
Coking		47,224	0	0
Thermal	1,000	504,296	1,128	0
Lignite		43,491	0	0
Net Imports				
Coking		36,577	0	0
Thermal	1,000	47,740	11	962
Lignite		78,822	0	0

Source: IEA (2013).

The conclusion is that with the exception of India, where ports have evolved already to handle specific dry bulk trades, dry bulk is not relevant to trade in the Bay of Bengal as it impacts public port development. That is not to say that provision for grains and agribulk is not required, but that these trades are not of sufficient scale to support major development. Also, the potential for these trades to be handled as efficiently in containers could influence significantly broader trade development around the Bay of Bengal.

6. CONCLUSIONS, POLICY SUGGESTIONS, AND PROPOSALS

This paperconcludes the following:

- Over 90% of international trade by volume in South Asia and Southeast Asia is transported by sea, in three forms: container, dry bulk, and liquid bulk. Sea transport has a large cost per ton kilometer advantage over other modes of transport. This cost advantage will not be eroded significantly over the next 20years.
- Intraregional trade between South Asia and Southeast Asia is a relatively minor part of their overall international trade (between 5% and 10% of total trade, imports and exports).
- Dry bulk and liquid bulk trade represents a substantial part of overall trade by volume but isconsiderably less important when the value of the trade is considered.Container trade is the critical form of trade to stimulate regional and subregional economic integration as it accounts for most trade in merchandise goods, representing 40% of total trade by volume and a far higher percentage in terms of value. Container trade around the Bay of Bengal is almost exclusively based on the feeding of containers to large container ships at hub ports such as Colombo, Port Klang, and Singapore.
- Improving access to international container trade and reducing the ton per kilometer cost of container transport will promote international trade and intraregional trade in South Asia and Southeast Asia. Access to international container trade can be encouraged by developing main container line calls to ports around the Bay of Bengal and thus avoiding transshipment of containers at hubs. Ensuring deep draft container ships can gain access to ports around the Bay of Bengal (container ships of 12.5 m, 15 m, and in the future 16.0m, can access the ports).

- Distance between dedicated and effective container terminals in ports around the Bay of Bengal should be reduced. Focus should be placed on ensuring that existing and new container terminals around the Bay of Bengal offer world class container handling services, and improving hinterland links (inland waterways, road, and rail) from container terminals with a view to improving container (and other forms of unitization) penetration into domestic transportation markets.

6.1 Policy Proposals

The main infrastructure policy goals proposedforthis report and for further study can be summarized as the replacement of Kolkata, Chittagong, and Yangon/Thilawa with large-scale deepwater ports. This should be combined with appropriate hinterland inland waterway, road, and rail connections. In addition, encouraging the development of inland waterways and the barge companies and services operating on them in West Bengal, Bangladesh, and along the Irrawaddy should be a major policy initiative.

- There should be a policy to support the development of initial small container terminals in ports on the east coast of India.
- There should be a general policy of encouraging the development of hinterland road and rail connections from existing and planned containers terminals.
- Strategic refinery developments may on occasion make sense and lead to broader port development opportunities, but such opportunities need very detailed assessment; specific transport or port policy initiatives should not play a major role in this area.
- The development of dry bulk terminals should be led by energy-related policy or such developments should be led by the private sector.
- Cabotage laws, particular those in India, should be reformed to encourage the development of coastal shipping but such policies and their interaction with local politics and the development of the Port of Colombo should be subject to careful analysis. This is linked to the potential development of a hub port on sub-continental India.
- Competition and the application of competition laws to the container shippingsector should be reviewed with a view to encourage the development of robust competition on cost and service between shipping lines.

6.2 Projects

The specific project suggestions based on the analysis in this report are major port developments with substantial supporting infrastructure requirements, container terminal development, and supporting infrastructure development. These specific suggestions are itemized in Table 18with indicative costs estimates and priority levels from 1 to 5.[14] All project suggestions require further assessment to ensure they provide appropriate economic and commercial benefits. With respect to category 3, illustrative projects identified are not a comprehensive list of potential projects.

[14]Priority 1 being essential for long-term economic development and priority 5 being helpful developments that could be replaced by other alternatives depending on detailed studies.

Table 18: Identified Port Development Projects

Country	Port	Project	Concept Estimate	Priority
Major Port Developments				
Bangladesh	Chittagong	New deepwater port (or floating container transshipment terminal)	$3billion Port $1billion Infra.[a]	1
India	Kolkata/Haldia	New deepwater port (or floating container transshipment terminal)	$1.5billion Port $1.5billion Infra.[b]	1
Myanmar	Yangon/Thilawa	New deepwater port (or floating container transshipment terminal)	$2.5billion Port $1.5 Infra.[c]	2
Container Terminals[d]				
India	Chennai or Ennore[e]	Potential further expansion of container handling capacity	$500million++	3
India	Kairaikal	Container terminal	$400million	4
India	Krisnapatnam[f]	Container terminal	$600 million	4
India	Vizag	Additional container berth	$300million	4
India	Paradip	Container terminal	$400 million	4
Supporting Infrastructure (illustrative only)[g]				
India	Chennai	Road connections	$250million	3
India	Krisnapatnam	Road connections	$200million	3
India	Karaikal	Road and rail connections	$100million	3
Myanmar	Thilawa	Road connections	$300million	1
Myanmar	Irrawaddy River	Inland waterways	$450million	2
Bangladesh		Inland waterways	$600million	2
India	West Bengal	Inland waterways[h]	$250million	2
Other Projects of Potential Interest[i]				
Sri Lanka	Trincomalee	Oil storage hub	$750million	5
Myanmar	Kyaukpyu or Dawei	Cruise oil refinery	$2.0billion++	5

[a]Based on published concepts for Sonadia Port Development, Bangladesh.

[b]Based on layout concepts proposed by Kolkata Port Trust for port on Sagar Island.

[c]Based on authors' unpublished conference papers, planned October 2014.

[d]Based on unpublished terminal developments proposed by major operator in 2013 for ports in India.

[e]Most likely location for evolution into hub port in mainland India on Bay of Bengal.

[f]Marginal project.

[g]Based on unpublished project proposals developed by relevant port companies crossed checked against unit road and rail development costs from authors' previous projects.

[h]Inland waterways covers a range of projects including barge fleet development ($5 million–$50 million), small terminal development ($10 million–$20 million), dredging and other IT/monitoring projects.

[i]Based on unpublished project proposals.

Source: Authors' compilation.

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