Data Collection Survey on Cross-border Maritime Traffic in South Asia

Final Report

March 2016

JAPAN INTERNATIONAL COOPERATION AGENCY

PADECO Co., Ltd.
Overseas Coastal Area Development Institute of Japan
Japan Economic Research Institute Inc.
Oriental Consultants Global Co., Ltd.

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Abbreviations and Acronyms

ADB	Asian Development Bank
AHPPL	Adani Hazira Port Pvt. Ltd.
APDPPL	Adani Petronet (Dahej) Port Private Ltd.
APSEZ	Adani Ports and Special Economic Zone
ASEAN	Association of South-East Asian Nations
APTA	Asia Pacific Trade Agreement
BBIN MVA	Bangladesh, Bhutan, India, and Nepal Motor Vehicle Agreement
BDT	Bangladesh Taka
BIMSTEC	Bay of Bengal Multi-Sectoral Technical and Economic Cooperation
BIWTA	Bangladesh Inland Water Transport Authority
CAGR	Compound Annual Growth Rate
CAREC	Central Asia Regional Economic Cooperation
CBTA	Cross-Border Traffic Agreement
CER	Coastal Economic Region
CFS	Container Freight Station
CICT	Colombo International Container Terminal
CONCOR	Container Corporation of India Ltd.
CPA	Chittagong Port Authority
CPEC	China-Pakistan Economic Corridor
CPS	Country Partnership Strategy
CT	Container Terminal
DFC	Dedicated Freight Corridor
DMIC	Delhi-Mumbai Industrial Corridor
DWT	Deadweight
EDI	Electronic Data Interchange
EPZ	Export Processing Zone
EU	European Union
FDI	Foreign Direct Investment
FTA	Free Trade Agreement
GDP	Gross Domestic Product
GRDP	Gross Regional Domestic Product
GSM	Geographical Simulation Model
GSP-LDC	Generalized System of Preferences- Least Developed Countries
GTICT	Gateway Terminals India Container Terminal
HDC	Haldia Dock Complex
ICD	Inland Container Depot
ICT	Inland Container Terminal
IDE	Institute of Developing Economies
INR	Indian Rupee
IWAI	Inland Waterway Authority of India
IWT	Inland Waterway Transport
JCT	Jaya Container Terminal
JICA	Japan International Cooperation Agency
JNP	Jawaharlal Nehru Port
JNPT	Jawaharlal Nehru Port Trust
KDS	Kolkata Docks System
KICT	Kattupalli International Container Terminal
KPT	Karachi Port Trust
MGW	Mega Watt
MICS	Model for International Container Simulation
MOPEMR	Ministry of Power, Energy and Mineral Resources

MOS	Ministry of Shipping
MSC	Mediterranean Shipping Company
MT	Million Tons
MTEU	Million Twenty-Foot Equivalent Unit
NH	National Highway
NTB	Non-Tariff Barrier
NW	National Waterway
OD	Origin and Destination
ODA	Overseas Development Assistance
POL	Petroleum, Oil and Lubricants
PPNB	Project Proposal National Budget
PPP	Public Private Partnership
PQA	Port Qasim Authority
QICT	Qasim International Container Terminal
RCEP	Regional Comprehensive Economic Partnership
RORO	Roll on Roll off
SAARC	South Asian Association for Regional Cooperation
SAFTA	South Asian Free Trade Area
SAPTA	SAARC Preferential Trading Arrangement
SASEC	South Asian Subregional Economic Cooperation
SEZ	Special Economic Zone
SPLA	Sri Lanka Ports Authority
SWOT	Strength, Weakness, Opportunity and Threat
TEU	Twenty-Foot Equivalent Unit
TRIPS	Trade-Related Aspects of Intellectual Property Rights
UNESCAP	United Nations Economic and Social Commission for Asia and the Pacific
UNESCO	United Nations Educational, Scientific and Cultural Organization
USD	United States Dollar
VTMS	Vessel Traffic Management System
VTD	Vessel Tracking System
WeBOC	Web Based One Custom
WTS	World Trade Service

Summary

Summary

1. Introduction

1.1 Background

The South Asia Region[1] is experiencing significant economic growth, and has the potential to become one of the core global economic regions in the future. Currently, the population in the region is approximately 1.7 billion, or, 2.5 times the population of the Association of South-East Asian Nations (ASEAN). Moreover, its Gross Domestic Product (GDP) has also reached a level comparable to ASEAN, with expectations for the economy and population to grow further.

In order to strengthen the international transportation trunk line network, it is crucial not only to enhance land transportation within South Asia, but also to improve maritime transportation (ports and sea route) and to reinforce connectivity with land transportation through port infrastructure development for both “hard” and “soft” aspects.

The growth of maritime traffic, which was prominent in previous years, has noticeably slowed since the beginning of 2015. However, it is certain that in the long run, demand for maritime traffic will reach a level appropriate for the level of economic activities of the subject area. As this Survey tries to examine the maritime transport picture leading up to 2030, short-term phenomena such as the one currently faced by the shipping industry are assumed to be smoothed out over the long-term.

Objectives of the Survey are to:

1. Propose macroeconomic scenarios, industry and supply chain scenarios and freight transport scenarios for major industries for the South Asia Region, with 2030 as the target year, in consideration of relations with other regions.

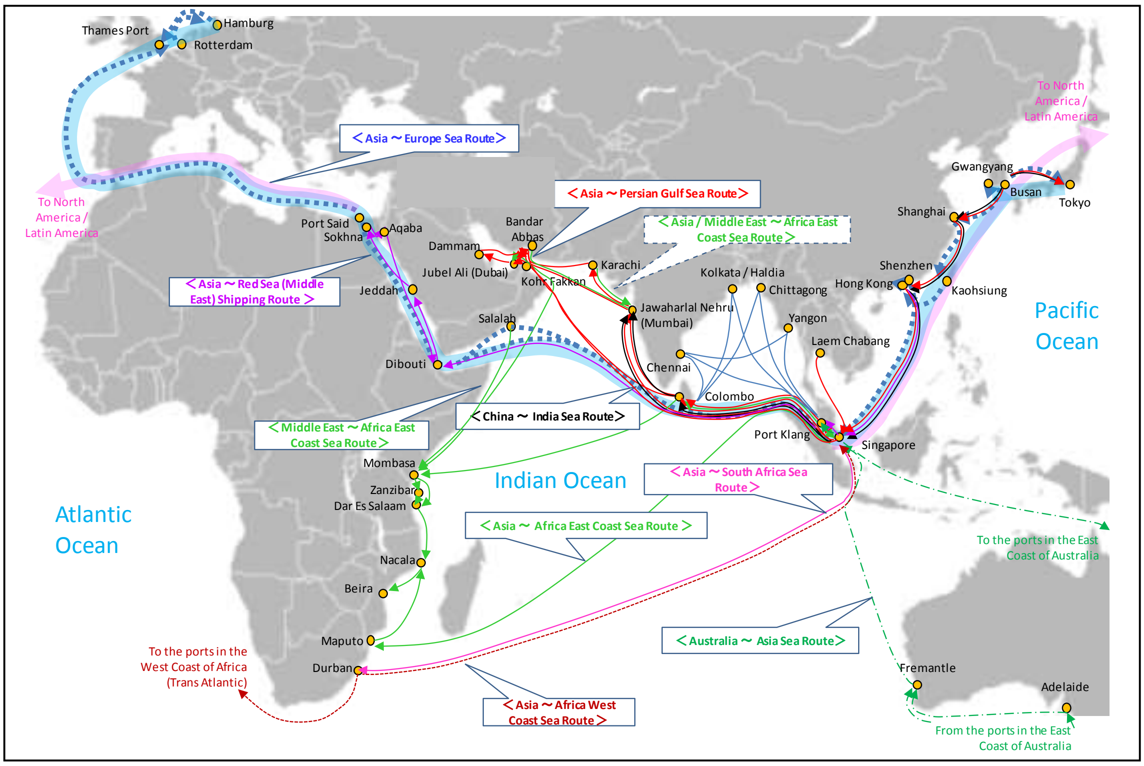
2. Formulate recommendations on the direction and possibilities for JICA cooperation for ports and maritime transportation in South Asia. This is achieved by identifying short-term and mid- to long-term challenges in the formation of international arterial transportation networks in the South Asia region, considering the above scenarios.

1.2 Survey Area

Field survey covers the following countries in South Asia: India, Bangladesh, Pakistan, and Sri Lanka

Figure 1.1 shows the shipping network of the coverage area.

[1] In this report Region with capital R indicates global Region such as South Asia Region or South East Region whereas region with small r indicates areas within a country such as state in India or division in Bangladesh.

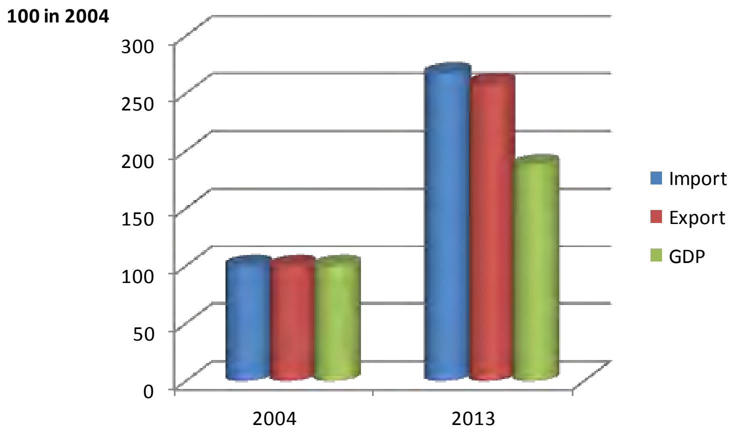


Source: Survey Team

Figure 1.1 Location Map of the Sea Route Network

The main transportation mode covered in this Survey is maritime transportation (ports and sea route). In addition, inland and coastal shipping transportation that deal with maritime transportation and are important in terms of international arterial transportation networks are included.

The long-term relationship between the level of economic activity and volume of import/export is evident in the figure below. Every 1% increase in GDP accompanied a 1.6% increase in import/export growth, or an elasticity of import/export with respect to GDP of 1.6. This region's import/export is largely borne by maritime transport.



Source: Survey Team

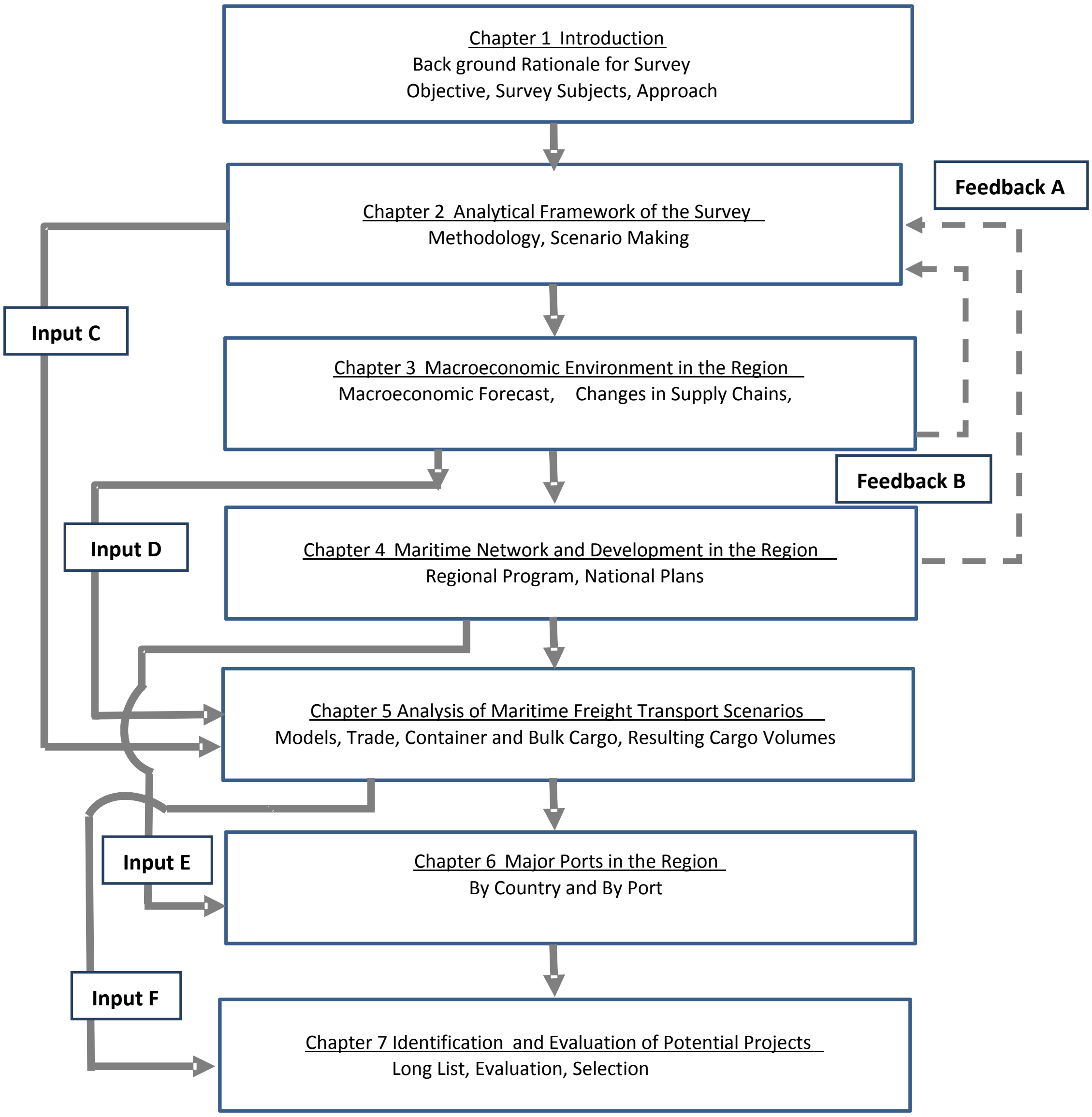
Figure 1.2 Growth of GDP and Import/Export in South Asia

1.3 Country Visits and Seminars

The Survey involved two rounds of country visits for data collection. The first was done from mid-July to mid-August 2015. The second included visits to Bangladesh, India, Pakistan, Sri Lanka, and Thailand from mid-September to late October 2015. A Regional Seminar was held in Colombo, Sri Lanka in mid-December 2015. Senior officers in the public and private sectors, academic and research community, and international development partner organizations were invited to the Seminar.

1.4 Structure of This Report

This report consists of seven chapters. Figure 1.3 illustrates the structure of the report and inter-relationships among chapters.



Feedback A: Data Availability & Principality Assessment
Feedback B: Practicality Assessment
Input C: Model Structure
Input D: Macroeconomic Data
Input E: Compatibility Assessment
Input F: Freight Volume, Transport Cost, and Investment Cost

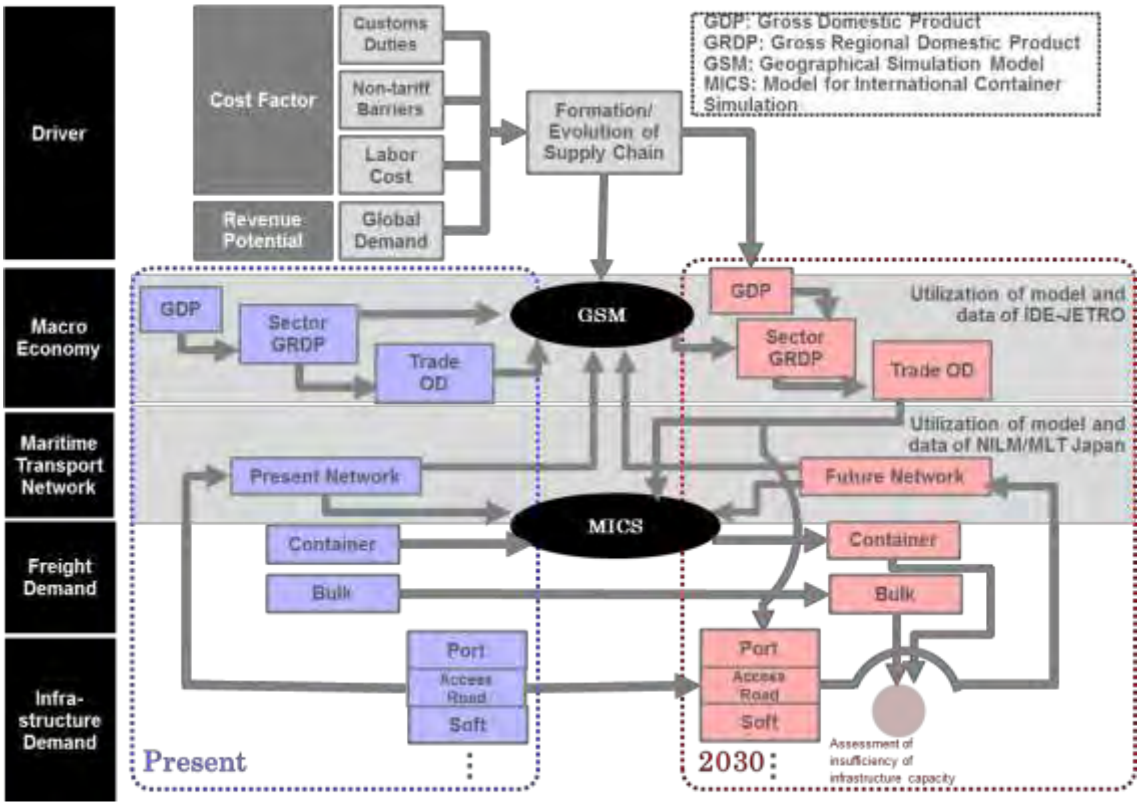
Source: Survey Team

Figure 1.3 Structure of the Report

2. Analytical Framework of the Survey

2.1 Overview of the Methodology

Future demand for freight transport is forecast based on the following chart:



Source: Survey Team

Figure 2.1 Scenario Analysis Flow

2.2 Macroeconomic Scenario

As a basis for forecasting the transport demand, the following three macroeconomic scenarios are prepared with the target year of 2030: 1) ***Upside Case*** (with a probability of 20-25%), in which the regional economic growth will be accelerated under the smooth implementation of the development plans in each country and region; 2) ***Base Case*** (with a probability of 50-60%), in which the regional economic growth will be in line with the general consensus (as in those by international organizations); and 3) ***Downside Case*** (with a probability of 20-25%), in which the regional economic growth will slow down as a result of unsuccessful implementation of the above mentioned development plans. In the Upside and Downside Cases, economies are assumed to grow 30% faster and slower than the Base Case, respectively.

Table 2.1 Economic and Industry Development Scenarios

	Downside Case	Base Case	Upside Case
Assumptions			
Tariff cut (within the Region & vis-à-vis the rest of the world)	No change	Moderate pace	Aggressive
Removal of non-tariff barriers (same as above)	No change	Moderate pace	High pace
World demand	Slow down	Moderate growth	Accelerate
Channel			
Development of supply chains (within the Region & vis-à-vis the rest of the world)	No change	Moderate	Fast
Outcomes			
Macroeconomic growth (within the Region)	Slow down	Moderate growth	Accelerate
Transport demand (within the Region & vis-à-vis the rest of the world)	Slow down	Moderate growth	Accelerate
Infrastructure demand (within the Region)	Slow down	Moderate growth	Accelerate

Source: Survey Team

2.3 Industry and Supply Chain Scenarios

Based on the three macroeconomic scenarios mentioned in Section 2.2, the industry and supply chain scenarios for the Region are prepared with a target year of 2030. In doing so, existing industry allocation, resource endowment, and the current supply chains in the Region have been examined and the future changes are shown for each scenario. The industries covered by this analysis include automobile, machinery (construction machinery and machine tool), textile/ garments and crude oil and oil-related products.

2.4 Freight Transport Scenarios

Taking the macroeconomic, industry and supply chain scenarios into consideration, freight transport scenarios are generated with a target year of 2030. This considers both intra-Regional and inter-Regional cargo movements.

Cargo types considered include “Container Cargo”, “Non-Container Cargo”, “RORO Cargo” (i.e., that carried by RORO or vehicle carriers on trucks/trailers), and “Bulk Cargo” (i.e., major commodities including crude oil, petroleum products, coal, iron ore and grain).

2.4.1 International Shipping Scenario

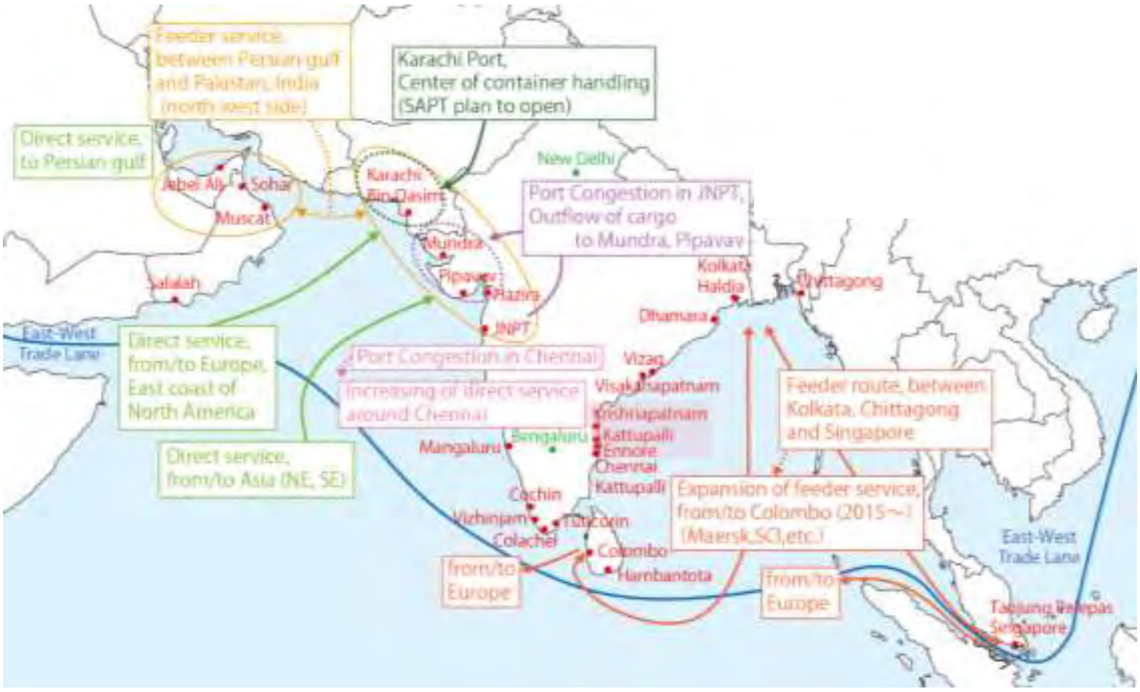
(1) Container Trades

The following three cases are assumed based on the considerations above:

- Case 1: Larger vessels up to a certain size;
- Case 2: Larger vessel enlargement as needed; and
- Case 3: Increased service frequency as needed.

Regional Overview

The current state of the shipping network in the South Asia Region is illustrated in the figure below.

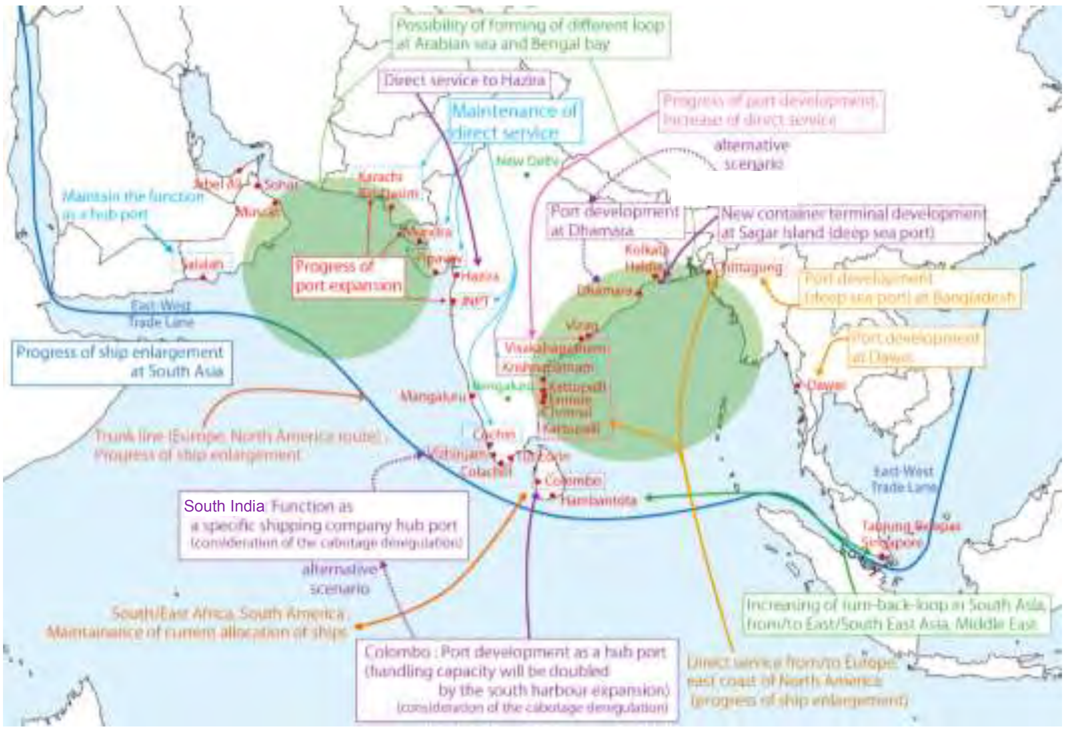


Note: "East-West Trade Line" in this figure is illustrated as an approximate route and not connected to calling ports.
Source: Survey Team

Figure 2.2 Current Shipping Network

<u>International Shipping Network in the Future</u>

Figure 2.3 depicts the assumed international shipping network around the Region.



Note: "East-West Trade Line" in this figure is illustrated as an approximate route and not connected to calling ports.
Source: Survey Team

Figure 2.3 Future International Shipping Network

(2) Non-Container Trade

In principle, dry and liquid bulk cargoes are transported directly from the origin ports to the destination ports without transshipment between. Therefore, no specific cases attributed to this transport means is assumed for non-container trade. Instead ship expansion is assumed due to the increase in import/export volume based on the Industry and Supply Chain Scenario. Likewise, the trade by RORO and vehicle carriers is not considered.

2.4.2 Inland Logistics Network

A large number of inland logistics infrastructure improvements are assumed in formulating future scenarios for the inland logistics network, on a country-by-country basis.

3. Macroeconomic and Industrial Environment in the Region

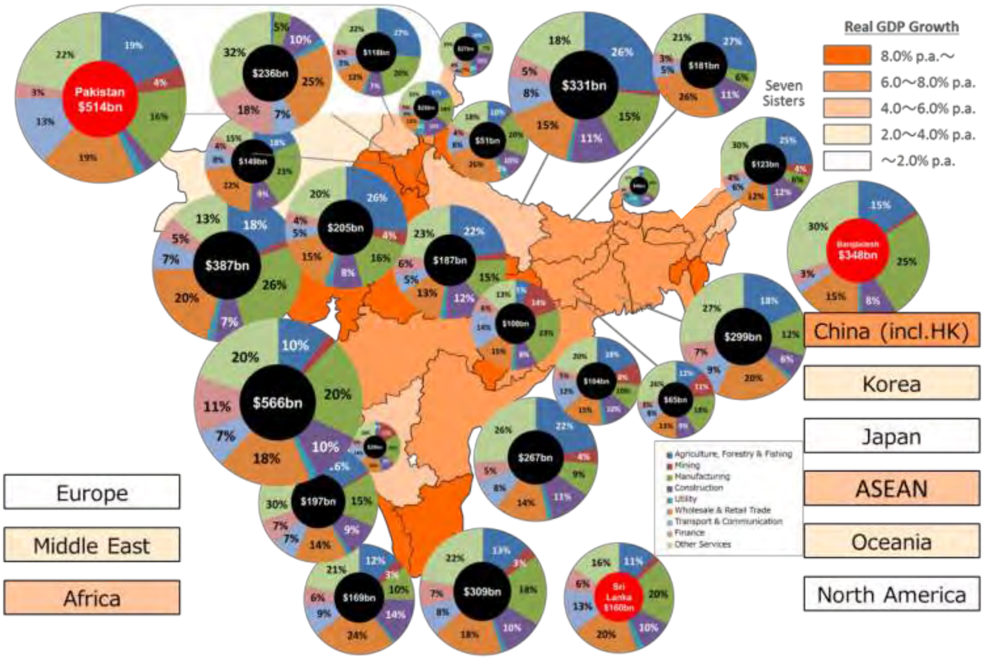
3.1 Overview

Macroeconomic conditions of the countries covered by this survey vary by country and state. Of these, India is far larger than the others, followed by Pakistan, Bangladesh and Sri Lanka. Compared to the rest of the world, some of the states in India grow as fast as high-growth countries such as China, and much faster than the developed world.

However, the ratio of intra-regional trade to whole trade was as low as 4.0% in 1996, which further declined to 3.1% in 2011. This rate is much lower than other regions, such as the EU (around 60%) and ASEAN (over 20%).

3.2 Economic Status in the Region

Growth of the Region in recent years stands out in the global economy, suggesting the most dynamic change compared to other parts of the world for the next couple of decades. Figure 3.1 visualizes the result of the forecast, in which the countries and states with higher growth are shown in darker colors, and the sector composition of GDP (or GRDP) is shown in the pie chart.



Source: Survey Team

Figure 3.1 Forecast for GDP/GRDP Growth and Sector Composition in the Region up to 2030

3.3 Existing Supply Chain Structure

In general, supply chains within the Region are still immature, in which exports of higher value-added items from India, as well as the intra-regional trade of primary commodities, are the majority. As for the imports from India, primary products are the major items for Bangladesh and Pakistan. In Sri Lanka, under FTA with India since 2000, the majority of imports are the final products such as transport equipment, refined oil products, biomedical and chemical products. However, almost no import of intermediate materials is observed except for textiles. This low dependency on regional trade can be attributed to: (i) tariff and non-tariff barriers resulting from historical and political reasons; (ii) insufficient logistics infrastructure such as roads and ports; and (iii) low priority placed on facilitating as trade partners.

Going forward, the development of the supply chains will depend on labor intensive sectors leveraging low cost labor (as in sewing), as well as on those focusing on huge domestic demand in India, at least for the time being. In the medium-to-long term, further strengthening of supply chains can be expected, assuming that the Region will become a 'consumption center' on the back of the expansion of high net worth and middle income classes. Furthermore, if the role of India increases as an export hub for emerging markets, as already is being seen in the automobile and biomedical sectors, it will be critical to obtain inputs (raw materials and intermediate goods) within the region to be competitive vis-à-vis China and ASEAN.

3.4 Needs of the Private Sector

The operating environment and future direction of Japanese companies in the Region are examined. As of now, the number of companies operating in the Region has not even reached that of Thailand alone, but is on the rise in recent years. Factors such as 'low barriers to communication' and 'ease to employ workers' contribute to the increasing presence of Japanese companies in the Region. Going forward, this trend is likely to continue, thanks to the expansion of the domestic markets, as well as to the advantageous geographical location of the Region, right in the center of the network with ASEAN, Middle East, Africa and Europe, which can further encourage Japanese companies to operate in the Region.

As for the investment climate, these countries share challenges in terms of: (i) insufficient infrastructure (e.g. power, logistics and distribution); (ii) inefficient administrative procedures (taxation and relevant procedures, sudden change in policy, etc.); and (iii) increased labor costs.

3.5 Supply Chain Structure in 2030

In order to estimate the future structure of the supply chains, the data for industrial production as well as trade flows have been projected to the year 2030, considering the following drivers:

1) Change in the global demand (based on the GDP/GRDP growth forecast)
2) Gradual tariff reduction is assumed.
3) Gradual tariff barrier reduction is assumed.

Summary of Analysis

First, regional trade dependency in South Asia is less likely to increase dramatically. Instead, the region will be playing a greater role in the global supply chains. Second, there are likely to be countries mainly focused on meeting domestic demands, such as India and Pakistan, and countries with placing a greater emphasis on external demands, such as Bangladesh and Sri Lanka. Lastly, it is critical for each industry to be able to add higher values to their products, not only to play a greater role in the global supply chains, but also to extend the domestic industry structure toward downstream production stages.

4. Maritime Network and Development Programs in the Region

4.1 Overview of Regional Maritime Network

Overview of the Ports in South Asia

Ports in the South Asia Region are located in the middle of the world's busiest East-West maritime trade lane. The access to the east coast of North America is also relatively good by stretching further from Europe. The geopolitical importance of South Asian ports is increasing, firstly as a gateway to the Indian Ocean Rim Region with the growing trades with the Middle East and East Africa, as well as a secondary gateway to the Indo-Pacific Region with deepening economic cooperation with the Southeast Asian countries.

Colombo Port recorded the largest throughput of 4.9 million TEU, including 3.7 million TEU (75%) of transshipment. The second largest number volume handled was at JNPT in India (4.5 million TEU). In terms of transshipment containers, Colombo alone is playing the role of a regional hub port. In terms of non-container cargo, dominant ports include: (i) Chittagong and Mongla for Bangladesh; (ii) Kandla (especially liquid bulk) and Paradip (especially thermal and coking coal) for India; (iii) Karachi and Bin Qasim for Pakistan; and (iv) Colombo, Trincomalee and Golle for Sri Lanka.

Overview of the Maritime Transportation Related to South Asia

Container Trades: The exports from South Asia amount to 5.3 million TEU, nearly 3.4% of total world exports. The imports to South Asia amount to 5.5 million TEU, nearly 3.5% of the world's total imports. It is noteworthy that the intra-Regional movements in South Asia are merely 156,000 TEU, which is smaller than any other intra-Regional movements in the world. Located in the middle of the East-West trade lanes, the South Asian ports are covered by 3 major hub ports - Singapore (or Tanjung Pelepas, Port Klang), Colombo and Salalah (or Jebel Ali).

Non-Container Trades: The volume of imported coal to South Asia amounts to 230 million ton, which represents an 18.7% share of total world coal imports. India both imports and exports iron ore, although the export volume has sharply declined in the recent five years with the Indian Government's control of illegal mining. Crude oil import to South Asia amounts to 189 million ton, which represents a 10.3% share of world imports. Exports of petroleum products and chemicals from South Asia amount to 67 million ton with a 7.4% share in world exports. India has 0.6 million ton of vehicle exports with a 2.2% share in the world exports.

Issues Facing Ports in South Asia

Privatization: Global terminal operators are participating in the operation of major ports in South Asia. While the concession policies adopted by individual governments may be effective in reducing their financial burden and in improving operational efficiency of ports, privatization is sometimes subject to volatility.

Development of Deep Sea Ports: Though considerable growth in demand is expected in the future, the ports in South Asia do not seem to have sufficient depth. Deep sea ports need to be developed in a timely manner, otherwise permissible drafts will sooner or later become a bottleneck in promoting trade in the South Asia Region.

Connectivity with the Hinterlands: Inland waterways are underutilized in Bangladesh and Pakistan. The Government of India has a plan to develop five major railway corridors along the "Golden Quadrilateral". Six national waterways are being developed and maintained by the Inland Waterway Authority of India.

Possibility of Developing a New Transshipment Hub: It can be argued that there will be an opportunity to develop a new hub port somewhere in South Asia, on the grounds that the 20.2% transshipment ratio of the South Asia Region is relatively low compared to other Regions. Any new hub ports to be developed in South Asia in future should target the mega container carriers as potential users.

Limitation on the Enlargement of Ship Size and Frequent Callings: At the ports in South Asia, with the exception of Colombo, enlargement of ship size for Europe and Mediterranean trade lanes is almost reaching a limit due to the restriction of berth depth. Likewise it may also become difficult for shipping lines to increase frequency of calls when berthing windows become saturated.

4.2 Regional Programs for Freight Transport Development

Regional cooperation organizations or forums play a coordinating role in development of Regional infrastructure in the South Asia Region. There are five main organizations or forums involving most or all of the subject countries of this survey:

1) The South Asian Association for Regional Cooperation (SAARC);
2) Bay of Bengal Multi-Sectoral Technical and Economic Cooperation (BIMSTEC);
3) South Asian Subregional Economic Cooperation (SASEC);
4) Central Asia Regional Economic Cooperation (CAREC); and
5) The United Nations Economic and Social Commission for the Pacific (UNESCAP).

In addition, South Asia and ASEAN have initiated some important corridor development concepts to link each other's markets. On the other hand, China has proposed the One Belt, One Road (OBOR) initiative, which comprises the Silk Road Economic Belt and 21st Century Maritime Silk Road that are aimed at building across the continent transport network and thereby promoting economic exchanges with countries along the route.

4.3 National Development Plans

The investment plans included in the respective national development plans of the four countries are described below.

Bangladesh: The Ministry of Shipping (MOS) forecasts that container traffic demand through Bangladesh in 2030 would be around 6.90 million TEU. Development of the Chittagong, Mongla and Payra ports, as well as the development of a new deep sea port at Matabari, are planned. A protocol for using inland waterways between Bangladesh and India was agreed on in 2015 to encourage trade with the northeast provinces of India and Myanmar.

India: The Government of India launched a new initiative called "Sagar Mala Project" in October 2014. This aims to integrate development of the ports, the industrial clusters and the hinterland, as well as to develop an efficient evacuation system through road, rail, inland and coastal waterway means. Through the Sagar Mala Initiative, total cargo traffic handled at Indian ports is expected to increase by five times over the next 20 years from 934 million ton in the 2012/2013 to 4,668 million ton in 2032/2033.

Pakistan: Pakistan joined CAREC in 2010. Karachi Port and Port Bin Qasim are expected to function as gateway ports to the Central Asian countries and Northwest China. As a result of participation in the CAREC program, the traffic volume on regional corridors (CPEC) through the two ports and newly developing Gwadar Port is assumed to increase. The enhancement of land transportation capacity from Karachi Port / Port Bin Qasim / Gwadar Port to neighboring member countries of CAREC will be required.

Sri Lanka: For the Port of Colombo, the existing container terminal and surrounding related existing port facilities at Jaya Container Terminal (JCT) will be upgraded by renovating existing facilities. A dry port functioning as an inland container depot will be established in Colombo near the port, the Trincomalee Port will be developed to address increasing coal imports, the Galle Port will be developed, and Phase 2 of the development of Hambantota Port are being or will be implemented or considered.

The rehabilitation/reinforcement of the existing port facilities at Manner, Point Pedro and Kankesanturai (near Jaffna) is to develop a multipurpose terminal for handling general cargo, containers, bagged cargo, as well as RORO service. This terminal would serve as a regional port to prepare for increasing trade with Indian ports in the near future.

5. Analysis of Maritime Freight Transport Scenarios

The general framework for analyzing freight transport demand against various scenarios is shown in Chapter 2 Analytical Framework of the Survey.

5.1 Containers

The Model for International Container Simulation (MICS), which includes the land and maritime intermodal network, is employed, using the results of the macro economic analysis. Several simulations were carried out to examine various future development scenarios as shown in the Figure below. Main conclusions derived from the simulation results are as follows:

- Container traffic volume at India's busiest port, JNPT, is expected to increase to 6.5 (8.8, 4.6) million and 3.9 (5.9, 3.3) million TEU in the 2030 base (Upside, Downside) case for export and import cases, respectively. Since capacity of JNPT is insufficient at present, the expansion of JNPT or construction of alternative port(s) is needed to accommodate the increased demand for 2030 cargo movements and to further facilitate trade in India.

- With the improvement of JNPT access (congestion alleviation) and the DFC project, container cargo volume in JNPT decreases by 0.95 million TEU from 10.42 million TEU, in case the access road for JNPT and DFC improving projects are not conducted. As DFC is developed, shippers (particularly to/from Delhi) modify their port choice to ports on India's West Coast. At Chennai Port, the container cargo volume will decrease by 0.36 million TEU from 1.83 million TEU.

- Transshipment volumes in South Asia are overwhelmingly handled in Colombo. Transshipment container volume at the Colombo Port in 2030 is 6.8 million TEU, which is 3.13 times higher than the 2013 volumes for the estimated case. As for hub port competition in the South Indian region, if a new South hub port is established in South Indian region, the transshipment volume at the Colombo Port in 2030 will be approximately 6.0-7.0 million TEU, representing a doubling of the volume in 2013.

- Under the hinterland investment case, Mongla Port is utilized and compared to the without the road and rail access improvement to the Port. For total imports and export throughput in the case with, Mongla Port will see an increase of 0.41 million TEU compared with a decrease of 0.61 million TEU at Chittagong Port. Kolkata and Haldia ports also increase their container throughput by 0.15 and 0.059 million TEU for the base case, respectively. In the comparison between the 2013 base case and the 2030 without case, all container flows by road, rail, and inland waterway increase by 430,000, 571,000 and 390,000 TEU, respectively. Road dominates with a mode share of 84.2%, followed by rail at 13.9%, and barges at 1.8% in 2013. In 2030, the road share falls to 50.8%, with rail at 30.9%, and barge at 18% in case all transport related infrastructure investment is conducted.

- Regarding Pakistan, Pakistani border crossing services improvement and CAREC and CPEC corridors development would enable Pakistani ports to function as true gateways to the Arabian Sea. The effects of such inland transport improvement are high. Without CPEC, import/export containers from neighboring countries through Pakistani ports would be three quarters of the projection. As for Gwadar port development, it is expected to occupy 8.9% of total container volume of Pakistani ports, which is equivalent to 400 thousand TEU

Economic Scenario (2030 OD)

Base Case (Scenario A)
Growth ratio of container trade (2013-2030): 2.43
- JNPT: 11.1 mil TEU by 2030
- Colombo: 6.9 mil TEU for T/S by 2030
- Chittagong: 2.7 mil. TEU by 2030

Without Scenario

Without investment on DFC and port of JNPT and Chennai (Scenario D)
- 10.4 and 1.8 million TEU in JNPT and Chennai Port for base case (with case)
- Container throughput in JNPT will be 9.47 million TEU, if all JNPT related projects are not completed (0.94 million TEU decrease).
- In Chennai Port, 1.83 million TEU will be handled without hinterland project (0.36 million TEU decreased)

Without Ferry and Railway investment (Scenario G)
- Increase of 55,700 EU for ferry/RORO service
- Increase of 12,300 TEU for railway service at railway bridge
- Container throughputs for each port in South India and Sri Lanka are not significantly changed.

Without Bangladesh hinterland investment (Scenario H)
- Modal share between Dhaka and Chittagong port:
  · [2013] road 84.2%, rail 13.9%, barge 1.8%
  · [2030 Base] road 50.8%, rail 30.9%, barge 18.3%
  · [2030 without] road 63.1%, rail 29.8%, barge 7.2%
- Container volume of Mongla is increased for 2030 with hinterland investment

Without CAREC and CPEC Gateway Project (Scenario I)
- Without CPEC scenario, export containers from other countries are estimated at 24,000 TEU (57% decrease from base case, and decreased particularly from Xinjiang)
- Without CAREC scenario, import containers to other countries are estimated at 61,000TEU (32% decrease from the base case). Export containers from Central Asia decreased from 8,200 to 2,900 TEU

Upside Case (Scenario B)
Growth ratio of container trade (2013-2030): 2.92
- JNPT: 14.7 mil TEU by 2030
- Colombo: 8.9 mil TEU for T/S by 2030
- Chittagong: 4.1 mil. TEU by 2030

Downside Case (Scenario C)
Growth ratio of container trade (2013-2030): 2.04
- JNPT: 7.9 mil TEU by 2030
- Colombo: 5.7 mil TEU for T/S by 2030
- Chittagong: 2.3 mil. TEU by 2030

Additional Scenario

Additional efficiency on Colombo port and new hub port in South India (Scenario E)
- In case additional efficiency in Colombo and a newly constructed hub port in South India, transshipment container in Colombo port in 2030 will be approximately 6.0-7.0 million TEU.

Additional Port Construction (Gwadar port) (Scenario J)
- In the additional port development scenario, export container volumes at Pakistani ports are estimated to be 2.19 million TEU in total.
- Gwadar Port, which is the newly developed port in the scenario, is estimated to have 400,000 TEU

Source: Survey Team

Figure 5.1 Summary of the Scenarios for the Simulation Analysis

5.2 Analysis of Non-Container Cargo Movement

5.2.1 Introduction

Demand of non-container (hereinafter referred to as bulk cargo) is forecasted based on its typical characteristics that "single bulk cargo is transported by a single shipper".
Targeted bulk cargoes are 1) coal, 2) iron ore, 3) non-ferrous materials (hereinafter referred to as non-ferrous), 4) grain crops (hereinafter referred to as grain), 5) crude oil and petroleum products (hereinafter referred to as petroleum), and 6) liquid gas (hereinafter referred to as natural gas). Future cargo volumes are estimated considering "current volumes handled", "scenario of economic trend" and "scenario of industrial trend and supply chain trend", as well as "future plans recognized through interviews by the JICA Survey Team".

5.2.2 Future Projection of Bulk Cargo Transport

Future volumes of bulk cargo are estimated as shown in the graphs and tables below. In terms of the growth ratio between 2013 and the target year of 2030, cargo volume is estimated to increase approximately 3.69 times in the Base Case, approximately 4.55 times in the Upside Case, and approximately 3.02 times in the Downside Case. These estimates are based on the above-mentioned "scenario of economic trend" and "scenario of industrial trend and supply chain trend".
Methodology of future projection of bulk cargo transport will be mentioned below.

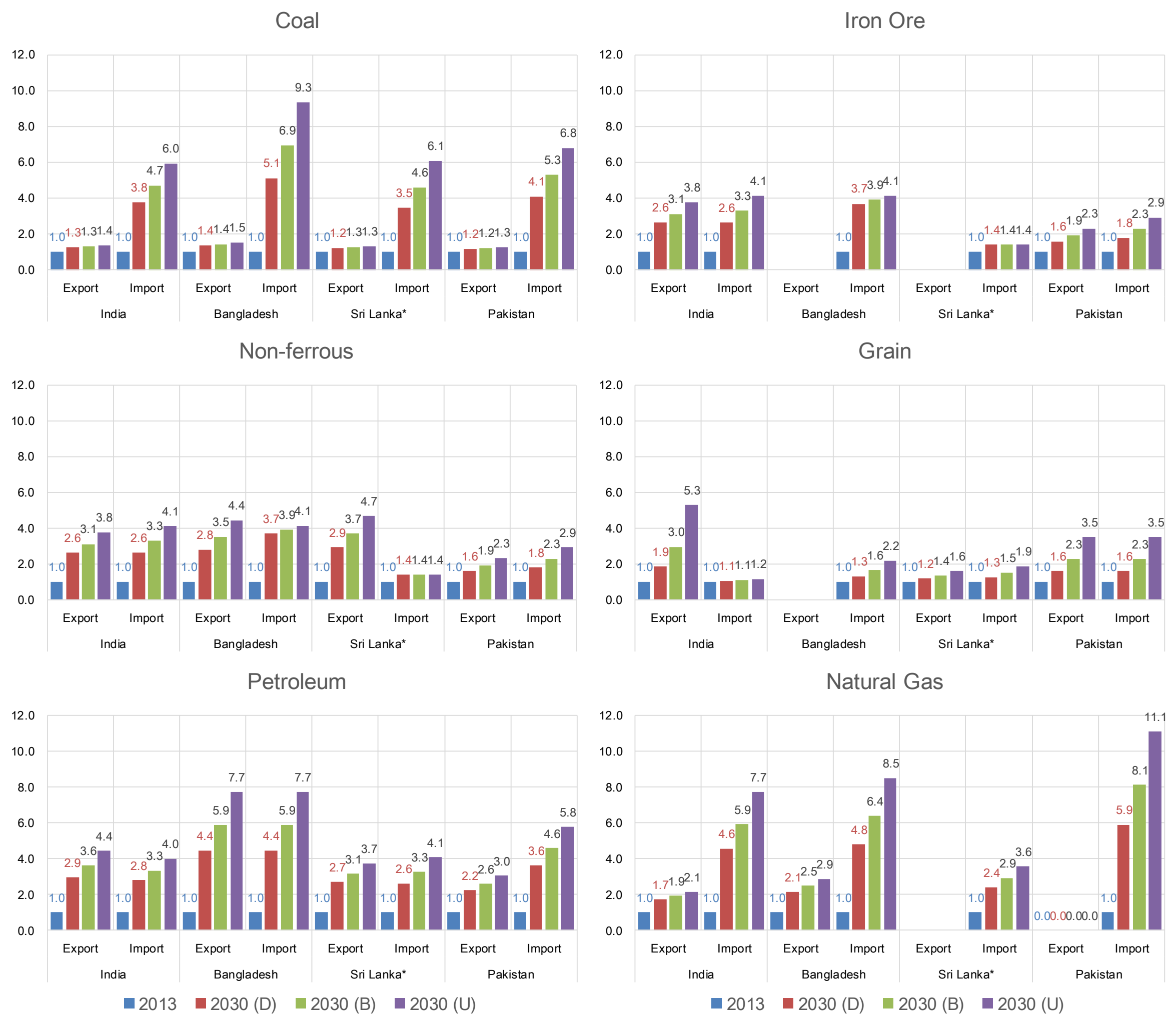


Figure 5.2 Estimation Results of Bulk Cargo (2013 ratio)

Table 5.1 Estimation Results of Bulk Cargo

Base Case (unit: 1,000 ton)

		Coal		Iron Ore		Non- Ferrous		Grain		Petroleum		Natural Gas		Total		
		Export	Import	Export	Import	Export	Import	Export	Import	Export	Import	Export	Import	Export	Import	Total
India	2013	48,350	194,435	40,038	3,938	6,252	3,551	4,092	737	79,614	265,076	76	19,342	178,423	487,079	665,501
	2030	62,854	915,771	125,019	12,988	19,513	11,719	12,129	816	287,980	884,309	146	114,313	507,641	1,939,914	2,447,556
	2030/2013	1.30	4.71	3.12	3.30	3.12	3.30	2.96	1.11	3.62	3.34	1.93	5.91	2.85	3.98	3.68
Bangladesh	2013	0	176		34	0	3		3,262	111	2,032	0	35	111	5,542	5,653
	2030	0	1,220		132	0	10		5,377	652	11,920	0	224	652	18,884	19,536
	2030/2013	1.45	6.93		3.91	3.51	3.91		1.65	5.87	5.87	2.48	6.38	5.87	3.41	3.46
Sri Lanka	2013	11	974		0	35	2	8	828	84	5,449		262	138	7,516	7,654
	2030	14	4,481		0	128	2	11	1,239	265	17,826		766	419	24,316	24,734
	2030/2013	1.27	4.60		1.40	3.70	1.40	1.35	1.50	3.15	3.27		2.92	3.03	3.24	3.23
Pakistan	2013	0	3,647	52	300	469	2	774	594	533	9,507		98	1,828	14,148	15,977
	2030	0	19,292	101	687	901	5	1,745	1,340	1,382	43,505		795	4,128	65,624	69,752
	2030/2013	1.22	5.29	1.92	2.29	1.92	2.29	2.26	2.26	2.59	4.58		8.11	2.26	4.64	4.37
Total	2013	48,361	199,232	40,091	4,271	6,756	3,558	4,874	5,421	80,342	282,065	76	19,738	180,500	514,285	694,785
	2030	62,868	940,764	125,120	13,807	20,543	11,737	13,885	8,771	290,279	957,560	146	116,099	512,840	2,048,738	2,561,578
	2030/2013	1.30	4.72	3.12	3.23	3.04	3.30	2.85	1.62	3.61	3.39	1.93	5.88	2.84	3.98	3.69

Upside Case (unit: 1,000 ton)

		Coal		Iron Ore		Non- Ferrous		Grain		Petroleum		Natural Gas		Total		
		Export	Import	Export	Import	Export	Import	Export	Import	Export	Import	Export	Import	Export	Import	Total
India	2013	48,350	194,435	40,038	3,938	6,252	3,551	4,092	737	79,614	265,076	76	19,342	178,423	487,079	665,501
	2030	65,755	1,156,955	151,041	16,243	23,574	14,630	21,650	863	353,537	1,062,535	162	149,129	615,718	2,400,356	3,016,074
	2030/2013	1.36	5.95	3.77	4.12	3.77	4.12	5.29	1.17	4.44	4.01	2.14	7.71	3.45	4.93	4.53
Bangladesh	2013	0	176		34	0	3		3,262	111	2,032	0	35	111	5,542	5,653
	2030	0	1,644		140	0	11		7,069	857	15,670	0	299	857	24,833	25,690
	2030/2013	1.54	9.34		4.14	4.44	4.14		2.17	7.71	7.71	2.86	8.49	7.71	4.48	4.54
Sri Lanka	2013	11	974		0	35	2	8	828	84	5,449		262	138	7,516	7,654
	2030	14	5,914		0	162	2	14	1,546	314	22,195		934	503	30,592	31,095
	2030/2013	1.31	6.07		1.40	4.68	1.40	1.60	1.87	3.72	4.07		3.56	3.64	4.07	4.06
Pakistan	2013	0	3,647	52	300	469	2	774	594	533	9,507		98	1,828	14,148	15,977
	2030	0	24,835	121	874	1,084	7	2,707	2,078	1,621	54,825		1,087	5,533	83,705	89,238
	2030/2013	1.26	6.81	2.31	2.92	2.31	2.92	3.50	3.50	3.04	5.77		11.08	3.03	5.92	5.59
Total	2013	48,361	199,232	40,091	4,271	6,756	3,558	4,874	5,421	80,342	282,065	76	19,738	180,500	514,285	694,785
	2030	65,769	1,189,348	151,162	17,257	24,820	14,650	24,370	11,557	356,328	1,155,224	162	151,449	622,611	2,539,486	3,162,097
	2030/2013	1.36	5.97	3.77	4.04	3.67	4.12	5.00	2.13	4.44	4.10	2.14	7.67	3.45	4.94	4.55

Downside Case (unit: 1,000 ton)

		Coal		Iron Ore		Non- Ferrous		Grain		Petroleum		Natural Gas		Total		
		Export	Import	Export	Import	Export	Import	Export	Import	Export	Import	Export	Import	Export	Import	Total
India	2013	48,350	194,435	40,038	3,938	6,252	3,551	4,092	737	79,614	265,076	76	19,342	178,423	487,079	665,501
	2030	60,451	731,081	105,900	10,368	16,506	9,339	7,584	780	234,848	740,734	131	88,411	425,420	1,580,714	2,006,133
	2030/2013	1.25	3.76	2.64	2.63	2.64	2.63	1.85	1.06	2.95	2.79	1.73	4.57	2.38	3.25	3.01
Bangladesh	2013	0	176		34	0	3		3,262	111	2,032	0	35	111	5,542	5,653
	2030	0	903		125	0	10		4,324	494	9,036	0	168	494	14,565	15,060
	2030/2013	1.36	5.13		3.70	2.79	3.70		1.33	4.45	4.45	2.14	4.78	4.45	2.63	2.66
Sri Lanka	2013	11	974		0	35	2	8	828	84	5,449		262	138	7,516	7,654
	2030	13	3,380		0	101	2	10	1,039	226	14,302		627	351	19,351	19,702
	2030/2013	1.22	3.47		1.40	2.92	1.40	1.19	1.25	2.69	2.62		2.39	2.54	2.57	2.57
Pakistan	2013	0	3,647	52	300	469	2	774	594	533	9,507		98	1,828	14,148	15,977
	2030	0	14,956	84	538	750	4	1,226	941	1,189	34,412		579	3,250	51,430	54,680
	2030/2013	1.18	4.10	1.60	1.79	1.60	1.79	1.58	1.58	2.23	3.62		5.90	1.78	3.64	3.42
Total	2013	48,361	199,232	40,091	4,271	6,756	3,558	4,874	5,421	80,342	282,065	76	19,738	180,500	514,285	694,785
	2030	60,465	750,319	105,984	11,031	17,358	9,356	8,820	7,084	236,758	798,485	131	89,785	429,515	1,666,060	2,095,574
	2030/2013	1.25	3.77	2.64	2.58	2.57	2.63	1.81	1.31	2.95	2.83	1.73	4.55	2.38	3.24	3.02

Source: Coal, Iron Ore, Grain, Petroleum: [India] Indian Ports Assosiation, Indian Customs Data. Grain except the handling of Indian Minor ports. [Others] World Trade Service (IHS)

Non-Ferrous, Natural Gas: [All Countries] World Trade Service (IHS), [India] Indian Customs Data.

*Based on above source, JICA survey team estimated.

5.2.3 Summary of Bulk Cargo Volume Projection

(1) Bangladesh

Coal, Iron Ore, Petroleum

Ports of Matabari and Payra, etc. have development plans for increasing demand of coal and iron ore, and petroleum. These plans are expected to satisfy the future cargo demand (exclude upside case of petroleum).

Non-Ferrous, Natural Gas

Estimated future cargo volumes of non-ferrous mineral and natural gas are not so much. For this reason, current port handling capacity is assumed to be sufficient in the future (2030).

Grain

Lack of port handling capacity against future cargo volume of grain is a matter of concern. For this reason, it is necessary to further port development plans in Bangladesh.
In addition, because of the necessity of the expansion of port handling capacities in Chittagong, improvement of existing facilities are planned to be done by PPP scheme.

(2) India

Coal

Lack of port handling capacity against the future cargo volume of coal is a matter of concern with the exception of the new port plan of Sagar Island (offshore of Kolkata). For this reason, it is necessary to further port development plans for coal cargo in India.

Iron Ore

Lack of port handling capacity against the future cargo volume of iron ore is a matter of concern in port of Visakhapatnam and Paradip. For this reason, it is necessary to further port development plans for iron ore cargo in these ports.

Non-Ferrous

Estimated future cargo volume of non-ferrous is not so much with the exception of port of Tuticorin. For this reason, current port handling capacity is assumed to be sufficient in the future (2030) with the exception of port of Tuticorin (Port of Tuticorin is necessary to further port development plans).

Grain

Lack of port handling capacity against the future cargo volume of grain is a matter of concern at port of Kandla port (Kandla port is necessary to further port development plans). In addition, current port handling capacity of the other ports is assumed to be sufficient in the future (2030).

Petroleum

Lack of port handling capacity against the future cargo volume of petroleum is a matter of concern with the exception of Mormugao and Tuticorin port, etc. For this reason, it is necessary to further port development plans for petroleum cargo with the exception of these ports.

Natural Gas

Lack of port handling capacity against the future cargo volume of natural gas is a matter of concern with the exception of ports of New Mangalore and Visakhapatnam. These ports are necessary to have further port development plans.

(3) Pakistan

Coal

Port of Karach and Bin Qasim have development plans for dedicated coal terminal. Because of this, port handling capacity is assumed to be sufficient in the future (2030).

Petroleum

Although, the port of Bin Qasim have development plans of new Oil/LNG terminal, lack of port handling capacity against the future cargo volume of petroleum is concerned in Pakistan. For this reason, it is necessary to have further port development plans.

Iron Ore, Non-Ferrous, Grain, Natural Gas

Estimated future cargo volume of iron ore, non-ferrous, grain, natural gas are not so much. For this reason, current port handling capacity is assumed to be sufficient in the future (2030).

(4) Sri Lanka

Coal

Port of Hambantota and Trincomalee have development plans for coal terminal. Because of this, port handling capacity is assumed to be sufficient in the future (2030).

Petroleum

Lack of port handling capacity against the future cargo volume of petroleum is concerned in Sri Lanka. For this reason, it is necessary to have further port development plans in the future.

Iron Ore, Non-Ferrous, Grain, Natural Gas

Estimated future cargo volume of iron ore, non-ferrous, grain, natural gas are not so much. For this reason, current port handling capacity is assumed to be sufficient in the future.

6. Major Ports in the Region

6.1 Bangladesh

Assessments of major ports in Bangladesh, namely Chittagong, Mongla, and Matabari, as well as the planned port of Payra and inland waterway river ports and Dhala River, in terms of 1) geographic conditions, 2) port facilities, 3) cargo traffic, 4) hinterland connectivity and 5) development plan are summarized below:

- Bangladesh requires a deep sea port to receive large ULCS type container ships, and bulk carriers of coal, LNG for power plants development, which will generate sustainable national economic growth.
- CPA, MPA and Payra port authorities shall implement their proposed projects to meet the increasing traffic demands as per the schedule.
- For the development of a new deep sea port at Matabari, an exclusive port development study should be carried out to accommodate cargo traffic demand, which is forecast to exceed capacity of the existing terminals in Chittagong, Mongla and Payra ports after 2025.
- Direct connectivity of roads and railways to the ports shall be developed to improve the logistics system of sea cargo between the ports and industrial estates in the hinterland
- BIWTA/BIWTC shall implement the proposed development projects for inland waterway transport facilities, since roads and railway connectivity have certain limitations in accommodating additional traffic. On the other hand though, IWT has immense potential and is underutilized.
- The development of human resources of port authority staff is required for development, management, and administration of deep sea ports, which is expected to be implemented by PPP.

6.2 India

Through the assessment of major ports, namely Kolkata, Haldia, Paradip, Visakhapatnam, Tuticorin, Chennai, Ennore, Cochin, New Mangalore, Mormugao, Mumbai, JNPT, and Kandla, as well as some private ports such as Krishnapatnam, Kattupalli, Mundra, Kakinada, Dahej, Hazira, Pipavav including the planned ports of Colachel and Vizhinjam, the following issues have been identified:

- Significant expansion of port capacity is required – for instance: (i) Tuticorin, Kolkata and Haldia for containers; (ii) Kandla for coal; (iii) Paradip for iron ore; and (iv) Ennore for petroleum.
- The rapidly increasing cargo throughput at Indian ports will require enhancement of rail connectivity and capacity, as well as road connectivity. In addition, inland waterways should be further utilized.
- The maximum allowable drafts at Kolkata and Mumbai are severely limited compared to that at other major ports. This means these ports are unable to accommodate larger vessels. Chennai and Tuticorin, where the depth of berths is 14 m or less, may also need deeper berths to handle container and bulk cargo.
- Technical cooperation for 1) capacity development concerning port planning and operation, and 2) implementation of port projects under a PPP scheme, should be considered.

6.3 Pakistan

Assessments of major ports in Pakistan, namely Karachi, Bin Qasim and Gwadar identified the following issues:

- The development of an approach channel and second inner channel by PQA is considered essential for accelerating port services/ activities and achieving sustainable national economic growth. Port Bin Qasin functions as a national gateway port for import/export containers for industries operating in the industrial estate and for bulk cargo import of coal, LNG for power plants in Sindh and Punjab provinces. PQA should make efforts to implement the proposed project, otherwise growth of the national economy will stagnate.
- KPT will complete Phase 1 and begin operation of the Karachi Deepwater Container Terminal (KDCT) at Keamari Groyne as a transshipment terminal.
- KPT should implement the proposed projects listed in the business strategic plan as per the schedule, which will enhance connectivity from KDCT to Karachi through the development of an elevated approach and motorway corridor, railways, and cargo village industrial park, as well as through the conversion of the oil terminals into a multipurpose liquid bulk terminal.
- The Gwadar Port Authority shall develop the required port and its supporting facilities as per the schedule to provide the target service required under the CPEC agreement.

6.4 Sri Lanka

Key findings from the assessment of major ports in Sri Lanka, namely Colombo including Colombo South Harbor, Hambantota, Trincomalee and Galle, are indicated below:

- The long-term nationwide port development plan in Sri Lanka shall be studied for the purpose of integrated re-development of the city and the harbor. The colonial buildings around the port area should be preserved to promote tourism.
- The antiquated terminal facilities in the Colombo Port shall be modernized to meet the current and future demands.
- The development of a coal terminal at the Trincomalee port area is a project impacting national economic viability and supports the National Energy Supply plan.
- The port facilities of the three main ports along the northern coastal area should be enhanced.
- SLPA shall implement the development projects for Colombo Port in alignment with the proposals of the Western Region Megapolis Master Plan. For instance, the out-of-date terminal facilities in Colombo Port shall be renovated to modern facilities to meet the current and future demands.
- Establishment of a dry port as Inland Container Depot shall be developed near the Colombo Port area.
- SLPA shall implement the proposed new berth as multipurpose berthing facilities and protection facilities (breakwater) to receive cargo ships and occasional visiting passenger cruise ships in Galle Port.
- The volume of exchanging goods and peoples will increase between southern India and northern parts of Sri Lanka. The trunk road (A9 Road) from this area to Colombo had already been developed, with potential industrial park development along the trunk road. Considering the development of such future prospects, it is proposed to implement port facility enhancement at three main ports (Manner, Point Pedro and Kankesanturai) in the northern coast area.
- With maximum effort, SLPA shall endeavor to make the Colombo Port, along with the South Harbor, among the top container ports in the world by providing better service in terms of a shorter transshipment time and a reasonable competitive tariff to the users.

6.5 Direction of Port Development

Direction of port development in South Asia is proposed as follows:

- Bangladesh: In light of the rapid growth of container and several kinds of bulk cargo, it is necessary to augment the cargo handling capacity at Chittagong and Mongla, and consider the development of new port(s). The development of a deep sea port at Matabari merits special attention since the absence of deep sea ports has been an issue for the country. With respect to the development of Payra Port which is of great interest to the Government, division of roles with other ports in the country, as well as technical and economic viability of the project should be analyzed.
- India: It is urgent to boost the container handling capacity at Visakhapatnam and Tuticorin. It is also necessary to increase the container handling capacity at Kolkata and Haldia, as well as Chennai and JNPT for 2020. In terms of bulk cargo, Visakhapatnam and Paradip seem to require additional capacity to handle iron ore. Mumbai, Ennore, Cochin and some other ports will need more capacity to handle petroleum around 2020. Measures are being taken at Visakhapatnam where expansion of container and iron ore terminals are being prepared by respective concessionaires, as well as at Mumbai which is expecting development of the 5th Oil Terminal. In this regard, other ports need implementation of substantial capacity expansion, such as outer harbor projects at Tuticorin, Paradip, Chennai, Ennore and Cochin, development of a satellite port called Wadhavan in Dahanu, to the north of Mumbai, since land for port expansion is limited for JNPT. The State of West Bengal expects a rapid increase in container and bulk cargo traffic, but both Kolkata and Haldia have limited water depth. Thus, the project to develop a deeper port in Sagar Island is essential.
- Pakistan: Karachi needs to increase its container handling capacity, since it seems it is nearly at capacity. It is also necessary to generally expand major ports, namely Karachi, Bin Qasim and Gwadar, as a rapid increase of cargo traffic of coal and petroleum for the country is expected.
- Sri Lanka: The need to expand container handling capacity at Colombo for the year 2020 could be addressed by continuous development of container terminals at Colombo International Container Terminal (CICT) in the South Harbor, which is partially operational. On the other hand, a plan for gradual conversion of the old port area such as the Jaya Container Terminal should be developed, since the container handling in the old port area is likely to be shift to the CICT and South Asia Gateway Terminal (SAGT). In addition, development of a coal terminal at Trincomalee should be explored, since the demand for coal in the country is expected to grow quickly.

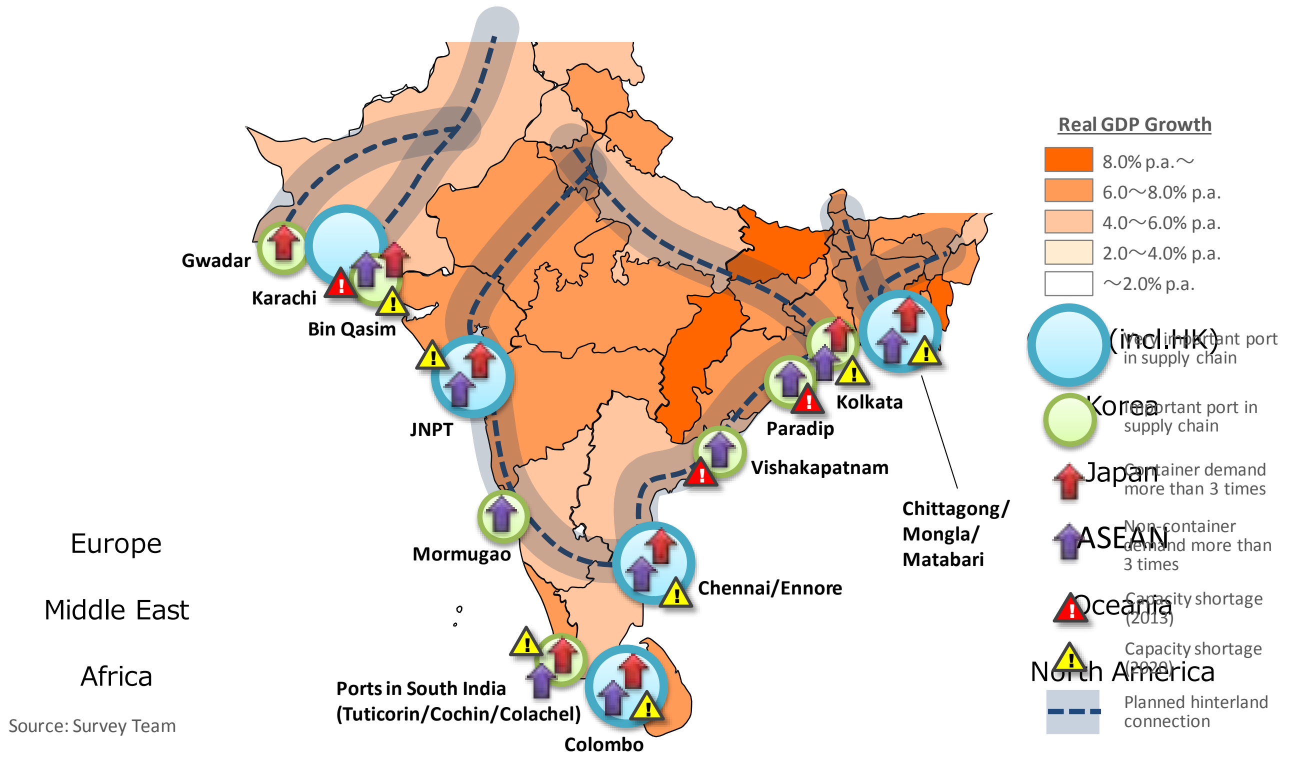
A project long list has been prepared and is presented in Chapter 7, which is comprised of projects that align with the above direction of port development, taking account of views and information shared by stakeholders during the survey.

7. Identification and Evaluation of Potential Projects

7.1 Overview

This chapter examines each of the projects identified in the preceding chapter and comes up with a list of projects that have high potential to be undertaken in the future. In extracting high potential project, conclusions of the preceding chapters are explicitly taken into account. Series of analysis in this Survey has identified the areas of high economic growth as hinterland of ports, areas of crucial node in the supply chain (presented in Section 3.5), ports of high growth potential in container/non-container traffic (presented in Sections 5.1 and 5.2), and ports with limitation in capacity and infrastructure constraining further growth (presented in Section 6.5). In particular, results of the preceding scenario analysis as well as the assessment of individual ports are incorporated in the project evaluation in the following ways. By applying these criteria, shortlist projects are those highly align with the scenarios and have potential to contribute to realize the scenarios.

The aforementioned information is summarized in Figure 7.1 below and interpreted as categorical indicators to screen the long listed projects.



Note: Red and purple arrows represent increase of freight demand in 2030 is larger than 3 times of that in 2013. "Physical bottleneck" represent critical lack of capacity and/or draft of ports. This figure is based on results of "base case" in macroeconomic, supply chain, and freight transport scenarios.
Source: Survey Team

Figure 7.1 Summary of Results of Scenario Analysis

1) Ports in Bangladesh (Chittagong/Mongla/New deep sea port)

Chittagong and Mongla ports are the gateway for Bangladesh and inland countries/states and play an essential role in the supply chain for these areas. However, due to limitation of expandability of Chittagong, development of a new deep sea port is highly demanded to respond expanding traffic. Improvement of multimodal connectivity is also needed to maximize potential of the area.

2) Kolkata area

This area is the gateway for growth states and inland countries/states. It is necessary to increase capacity and draft of the port and enhance connectivity with hinterland in order to accommodate expanding demand of container and non-container cargos.

3) Paradip/Vishakapatnam/Mormugao

These ports are located important area on the supply chain and freight corridor. Non-container demands grow fast, and in particular, Paradip faces problems of limited capacity and draft.

4) Chennai/Ennore area

This area is a gateway to serve hinterland of high potential in industrial growth. This will be accelerated by expected improvement of rail connectivity. That will result in dramatic growth of both container and non-container cargos. In the meantime, limitation of capacity and draft is an issue to enjoy the big potential.

5) Ports in South India (Tuticorin/Cochin/Colachel)

High increase of demand in South India is expected. However, especially at Tuticorin, increase of capacity and draft is necessary to be undertaken not to miss the opportunity. There will be potential to be a new transshipment port, though it may be subject to various factors including development of another port in this area, decision of shipping lines, and improvement of efficiency of the Colombo Port.

6) JNPT and neighboring ports

JNPT is the largest gateway in India to serve high potential area for industry, and freight demand will be further stimulated by expected improvement of rail connectivity. However, capacity and expandability of the port is quite limited, hence it is necessity to share demands among ports nearby.

7) Karachi and Bin Qasim

This area is a gateway for Pakistan and Central Asia. Development of deep sea terminal at Karachi has been underway to accommodate demand. On the other hand, restriction of traffic due to channel condition is a concern at Bin Qasim, where coal demand for power generation will grow significantly. At both areas, industrial development around the port will enhance industrial supply chain.

8) Gwadar area

Although it is an isolated area at present, development of the entire corridor will contribute to increase of trade of inland countries. Majority of container traffic will stay in Karachi.

9) Colombo

It will maintain a dominant role as the regional hub. Port infrastructure has been developed, and further improvement of efficiency is expected.

7.2 Evaluation of Projects

Each of the projects identified in the preceding chapter are examined resulting in a long list of 46 projects for which funding sources have not been identified and therefore are candidates to undertake in the future. Projects are in three categories:

1) Sea Port: sea port and maritime infrastructure (including infrastructure, dredging, and equipment) (32 projects);

2) Other Infrastructure: access and supporting infrastructure including inland water transport (10 projects); and
3) Soft Component: soft component for improvement efficiency and connectivity (4 projects).

For the evaluation, a multi-criteria approach has been applied, which includes five categories of criteria. Each criterion has been graded A (= 2 point), B (= 1 point), or C (= 0 point), based on objective information.

Strategic Importance

Consistency with national development plan(s):	A (identified as a potential project in the plan(s)) B (consistent with development direction) C (not consistent)
Expected synergies with other programs/ projects:	A (existence of project plans adding high synergistic impact) B (existence of project plans adding moderate synergistic impact) C (no project plans adding synergistic impact)

Economy/Industry

Growth potential of hinterland area*:	A (high growth (more than 6% p.a.) in economic size of the hinterland area) B (moderate growth (more than 4% p.a.) in economic size of the hinterland area) C (limited growth (less than 4% p.a.) in economic size of the hinterland area)
Importance of port in regional supply chain*:	A (used for multiple trade flows in the supply chain) B (used for several trade flows in the supply chain) C (scarcely related to supply chains)

* Reference to analysis in section 3.5

Freight Demand and Investment Efficiency

Freight Volume Increase*:	A (large demand to be handled: more than 1 million TEU or 10 million ton) B (medium demand to be handled: more than 0.1 million TEU or 1 million ton) C (small demand to be handled)
Investment Efficiency*:	A (large demand to be handled per investment: more than 10 TEU/10,000 USD or 10 ton/100 USD) B (medium demand to be handled per investment: more than 1 TEU/10,000 USD or 1 ton/100 USD) C (small demand to be handled per investment)

* Reference to analysis in the sections 5.1 and 5.2

Efficiency Improvement

Improvement of efficiency by elimination of bottlenecks*:	A (resolution of existing capacity shortage) B (resolution of capacity shortage expected in near future) C (no substantial change)
Connection with other modes for access and exit:	A (improvement of connection) B (sufficient connection) C (limited connection)

* Reference to analysis in the sections 6.5

Ease of Implementation

Maturity of the project:	A (examined in detailed design) B (examined in feasibility study) C (no preparatory studies)
Negative impact on natural/social environment:	A (no negative impact) B (possibility of negative impact/not enough information) C (significant negative impact)

Projects listed in the following tables are high and medium priority in terms of the criteria specified above.

Table 7.1 High and Medium Priority Projects (Sea Port)

ID	Country	Location	Project Name	Scheme	Estimated Cost (Mil USD)	Evaluation
SP-B-4	Bangladesh	Mongla	Development of New Container Terminal	Finance	135	High
SP-B-5	Bangladesh	Matabari Area	Development of Deep Sea Port	Finance	1,000-1,200	High
SP-I-1	India	Kolkata	Sagar Island Project	Finance	1,179	High
SP-I-3	India	Paradip	Outer Harbour Project	Finance	769	High
SP-I-4	India	Ennore	Greater Kamarajar Port Project	Finance	1,153	High
SP-I-5	India	Chennai	Development of New Outer Harbour to the North of the Bharathi Dock	Finance	784	High
SP-I-6	India	Tuticorin	Development of Outer Harbour	Finance	2,078	High
SP-I-8	India	Cochin	Cochin Outer Harbour Project	Finance	377	High
SP-I-10	India	Wadhavan (Dahanu)	New Port (Multi Cargo) at Wadhavan	Finance	923	High
SP-P-6	Pakistan	Bin Qasim	Feasibility Study of Capital Dredging of Access Channel and Development of a Second Inner Channel	Development Survey and Finance	202	High

ID	Country	Location	Project Name	Scheme	Estimated Cost (Mil	Evaluation
SP-S-1	Sri Lanka	Colombo	Expansion of JCT Facilities for Handling Inland Containers	Finance	300	High
SP-I-2	India	Kolkata	Diamond Harbour Container Terminal Project	Finance	181	Medium
SP-I-7	India	Colachel	Development of Colachel Port at Tamilnadu	Finance	828	Medium
SP-I-9	India	Mormugao	Multi-purpose Cargo Terminal	Finance	143	Medium
SP-S-2	Sri Lanka	Hambantota	Development of RORO Terminal for Specialized Large RORO Ships	Finance	150	Medium
SP-S-7	Sri Lanka	Trincomalee	Development of a New Coal Terminal by Expanding the Existing Jetty or Building a New Terminal at Sampur	Develop-ment Survey and Fiannce	300-500	Medium

Source: Survey Team

Table 7.2 High and Medium Priority Projects (Other Infrastructure)

ID	Country	Location	Project Name	Scheme	Estimated Cost (Mil USD)	Evaluation
OI-P-1	Pakistan	Karachi	Development of Cargo Village Industrial Park / Off Dock Facility	Finance	200	High
OI-S-2	Sri Lanka	Colombo	Modernization of Road Network within the Port Premises	Finance	300	High
OI-S-3	Sri Lanka	Colombo	Establishment of Dry Ports in Sri Lanka	Finance	100	High
OI-B-4	Bangladesh	Dhaka	Installation of VTS at Heavy Traffic Routes	Finance	50	Medium

ID	Country	Location	Project Name	Scheme	Estimated Cost (Mil USD)	Evaluation
OI-P-2	Pakistan	Bin Qasim	Development of Japan Special Economic Zone, Dhabeji, Thatta	Develop-ment Survey and Finance	100	Medium

Source: Survey Team

Table 7.3 High and Medium Priority Projects (Soft Component)

ID	Country	Location	Project Name	Scheme	Estimated Cost (Mil USD)	Evaluation
SO-I-1	India	Nation-wide	Technical Cooperation Project – Capacity Development Concerning Port Planning and Operation	Technical Cooperation	1.5	High
SO-S-1	Sri Lanka	All Ports in Sri Lanka	Study of a Long term Nationwide Ports Development Project	Develop-ment Survey/ Technical Cooperation	2	High
SO-R-1	Regional	Regional	Technical Cooperation Project – Capacity Development Concerning Implementation of Port Projects under PPP scheme	Technical Cooperation	1	High
SO-B-1	Bangladesh	Inland Waterways (Nation-wide)	Nationwide Hydrographic Survey of All National Inland Waterway Channel	Develop-ment Survey/ Technical Cooperation	30-50	Medium

Source: Survey Team

In Bangladesh, projects to develop new container terminals are given the highest priority to address critical shortages in capacity that would constrain high growth potential of this country. Projects for improvement of inland waterways would follow, which are expected to relieve the high concentration of port access traffic on roads and facilitate cross border freight movement among the SASEC region.

In India, large port projects are given high priority. These ports could resolve bottlenecks on supply chains in the region, and thereby boost growth of the hinterland and activities of enterprises including Japanese ones. Impacts of these hard investments will be further enhanced with technical cooperation to develop capacity concerning port planning and operation.

In Pakistan, the study of capital dredging of access channel and development of second inner channel of Port Bin Qasim is a high priority project. This project is expected to alleviate capacity limitation of the channels, which is an important point to handle coals for power plants. Industrial development projects beside Karachi and Bin Qasim could be considered a second priority.

In Sri Lanka, the long-term development plan of ports in the country may be the starting point to further elaborate and detail specific port development projects for Colombo and other ports in the country.

Within region as a whole, one key common issue is improving efficiency by adopting a PPP scheme. Each country faces challenges in making the scheme work. Technical cooperation to develop capacity for realizing successful PPP port projects will be desirable for the whole region.

Main Report

1. Introduction

1.1 Background

The South Asia Region[1] is experiencing significant economic growth, and has potential to become one of the core global economic regions in the future. Currently, the population in the region is approximately 1.7 billion, or, 2.5 times the population of the Association of South-East Asian Nations (ASEAN). Moreover, its Gross Domestic Product (GDP) has also reached a level comparable to ASEAN, with expectations for the economy and population to grow further. The region is attracting interest from Japanese companies as a location to expand their overseas business, not only as a traditional low-cost processing base, but also as an area with a high consumption potential.

The intra-regional trade ratio in the Region, as defined as the proportion of trade among South Asian countries out of the sum of all trade, has been low due to historical and political reasons. However, with the Free Trade Agreement (FTA) in effect through Regional cooperation associations (notably the South Asian Association for Regional Cooperation (SAARC) and ASEAN), as well as the execution of bilateral and multilateral agreements, trade with the surrounding region such as South East Asia has been activated. This has increased interest in strengthening economic relationships. In particular, for neighboring ASEAN member countries, Myanmar's democratization and economic reform as well as the formation of the ASEAN Community in 2015 has heightened attention to intra-regional cooperation and momentum for improved connectivity.

Under these circumstances, the Japan International Cooperation Agency (JICA) commissioned the "Data Collection Survey on Transport Infrastructure Development for Regional Connectivity in and around South Asia" (hereinafter, "South Asia Land Transportation Survey") in 2013 on the land transport sector. This survey was conducted from the perspective of both necessary "hard" and "soft" measures to improve the broad transport infrastructure and strengthen the economic and trade relationships of South Asia and the surrounding regions. In the study, certain priority projects were proposed.

In order to strengthen the international transportation trunk line network, it is crucial not only to enhance land transportation within South Asia, but also to improve maritime transportation (ports and sea route) and to reinforce connectivity with land transportation through port infrastructure development for both "hard" and "soft" aspects. With the expectation that the strategic development of maritime transport infrastructure in South Asia will play an important role in the formulation of supply chains in and out of Asia and also to support Japanese companies planning to expand into the markets in South Asia and surrounding regions, a study on the maritime transport sector, complementing the "South Asia Land Transport Survey," was deemed necessary.

In this Data Collection Survey on Cross-border Maritime Traffic in South Asia, or the subsequent study to the one mentioned above, information on maritime transportation of the Indian Ocean Rim trade coverage region, and detailed data on the industries and port infrastructure and their improvement plans, etc. of South Asia were gathered in the field. Furthermore, maritime transportation demand forecasts were completed. Direction and possibilities for JICA cooperation in the South Asia port and maritime transportation sectors were identified and appropriate recommendations were formulated.

[1] In this report, Region with an upper-case "R" indicates a global Region such as the South Asia Region or South East Asia Region, while Region with a lower-case "r" indicates areas within a country such as a state in India or a division in Bangladesh.

The growth of maritime traffic, which was prominent in previous years, has noticeably slowed since the beginning of 2015. Traffic between Asia in 2015 (up until July), particularly East Asia and Europe, has been lower compared to each month of the previous year. Also, in the third quarter of 2015, traffic between Asia and North America was substantially lower than that during the previous year. Many shipping companies are feeling squeezed as they increased capacity considerably, anticipating further robust growth, particularly through the launching of mega-container ships. This has resulted in an over-supply of capacity. The downturn in the shipping industry may continue for a couple of years or even longer. However, it is certain that in the long run, demand for maritime traffic will reach a level appropriate for the level of economic activities of the subject area. As this Survey tries to examine the maritime transport picture leading up to 2030, short-term phenomena such as the one currently faced by the shipping industry are assumed to be smoothed out over the long-term. More details on this issue are presented in Section 4.1.2 (4).

1.2 Objectives

The two objectives of the Survey are to:

1) Propose macroeconomic scenarios, industry and supply chain scenarios and freight transport scenarios for major industries for the South Asia Region, with 2030 as the target year, in consideration of relations with other Regions.

2) Formulate recommendations on the direction and possibilities for JICA cooperation for ports and maritime transportation in South Asia. This is achieved by identifying short-term and mid- to long-term challenges in the formation of international arterial transportation networks in the South Asia region, considering the above scenarios.

1.3 Survey Area

Details for the survey area are as follows:

- Field surveys will cover the following South Asia countries: India, Bangladesh, Pakistan, and Sri Lanka

- The international arterial maritime transportation network region will cover the following: trade between the Indian Ocean Rim region (including Africa, Middle East, ASEAN, Europe, Far East) and field survey countries identified above

- Countries covered for information gathering and interviews of maritime transportation logistics companies: Hong Kong, Singapore, and Thailand (all of which have a sizeable influence on trade in the Indian Ocean Rim region and host the headquarters of various Asian maritime transport logistics companies

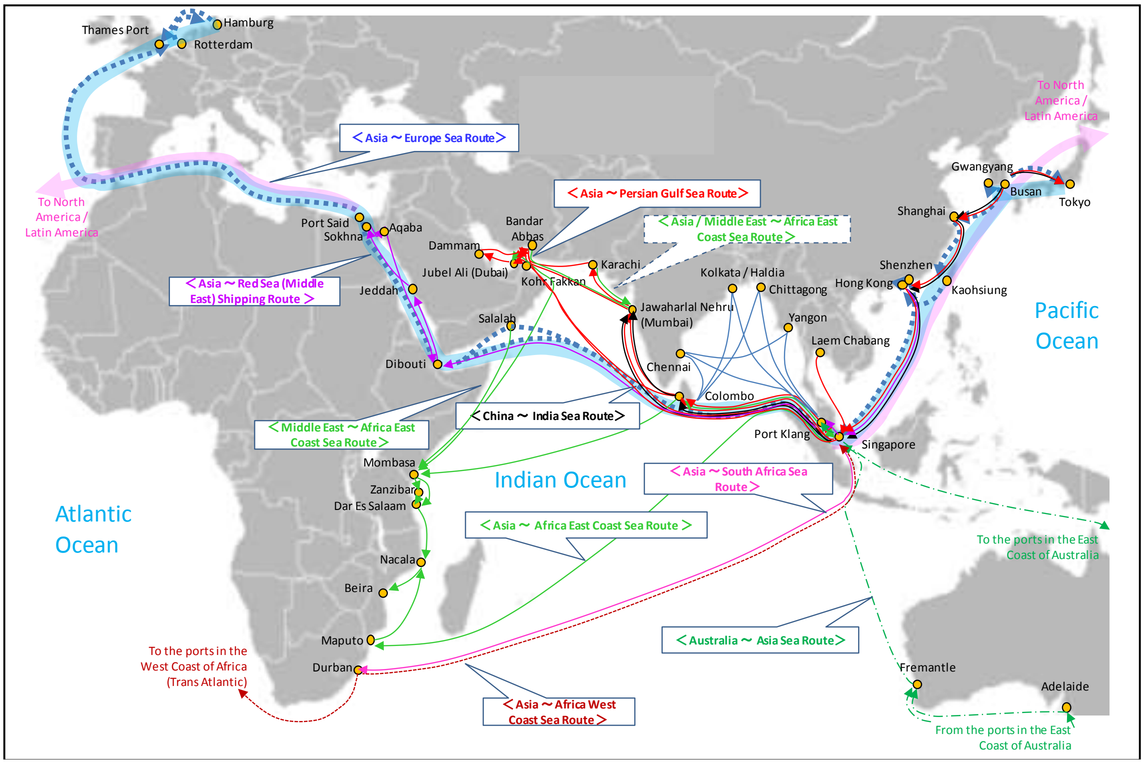
Team members visited some 30 ports in the Region, collecting detailed information from eight additional ports. These ports were selected due to their importance in cross-border freight. Those ports serving only domestic freight were not included in site visits.

Table 1.1 lists ports included in the survey. Figure 1.1 depicts the shipping network within the coverage area.

Table 1.1 Ports Visited for Surveys

Country	Ports Visited during the 1st Field Survey	Ports Visited during the 2nd Field Survey	Secondary Data Collection
Bangladesh	Chittagong, Mongla, and ports around Dhaka (including Narayanganj/Pangaon)	---	Matabari Area
India	Mundra/ Kandla, Mumbai/ JNPT, Cochin, Tuticorin, Paradip, and Kolkata	Hazira, Mormugao, New Mangalore, Kattupalli/ Krishnapatnam, Visakhapatnam, Kolkata, Colachel/ Vizhinjam	Pipavav, Dahej, Chennai/ Ennore/ Kakinada, and Haldia
Pakistan	Port Bin Qasim, and Karachi		Gwadar
Sri Lanka	Colombo, Hambantota, Trincomalee, and Galle	Colombo, Trincomalee	

Source: Survey Team



Source: Survey Team

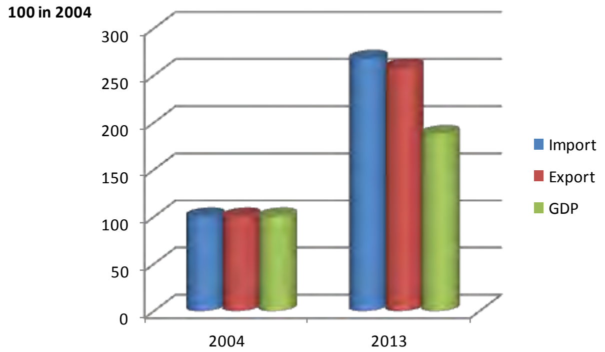
Figure 1.1
Location of Ports Covered in the Survey and Principal Maritime Routes

The main transportation mode covered in this Survey is maritime transportation (ports and sea route). In addition, inland and coastal shipping transportation that deals with maritime transportation and are important in terms of international arterial transportation networks are included. Thus, Kolkata/Haldia Port in India and ports surrounding Dhaka, including Mongla and Narayanganj Ports, are the subject of the Survey. Moreover, access roads and railways connected to the ports in the region are the subject of the analysis of port development challenges.

1.4 Survey Approach

1.4.1 Approach

The long-term relationship between the level of economic activity and volume of import/export is evident in the figure below. While the Region's aggregate GDP grew 1.9 times from 2004 to 2013, import/export grew 2.6 times in value. In terms of annual growth rate, the former registered 7.2%, while the latter 11.3%. In other words, every 1% increase in GDP accompanied a 1.6% increase in import/export growth, or an elasticity of import/export with respect to GDP of 1.6. The region's import/export is largely borne by maritime transport.



Source: Survey Team based on the World Development Indicator

Figure 1.2 Growth of GDP and Import/Export in South Asia

The economic structure of an area and its relationship with other areas determines the types of commodities transported and origin/destination of the commodities. Generally, when the level of GDP per person is low in a reasonably open economy, import/export grows much faster than GDP (as does the need for maritime transport). Maritime traffic is expected to grow faster than GDP growth in South Asia for some time. Despite the recent downturn in maritime traffic in the world, it is certain that maritime traffic in South Asia will grow substantially for the coming years.

However, in order to determine which ports and connecting roads and rail links require major expansion, one needs to examine the spatial and structural changes in industries that produce such traffic and changes in shipping routes and industry. Many interrelated factors must be taken into account.

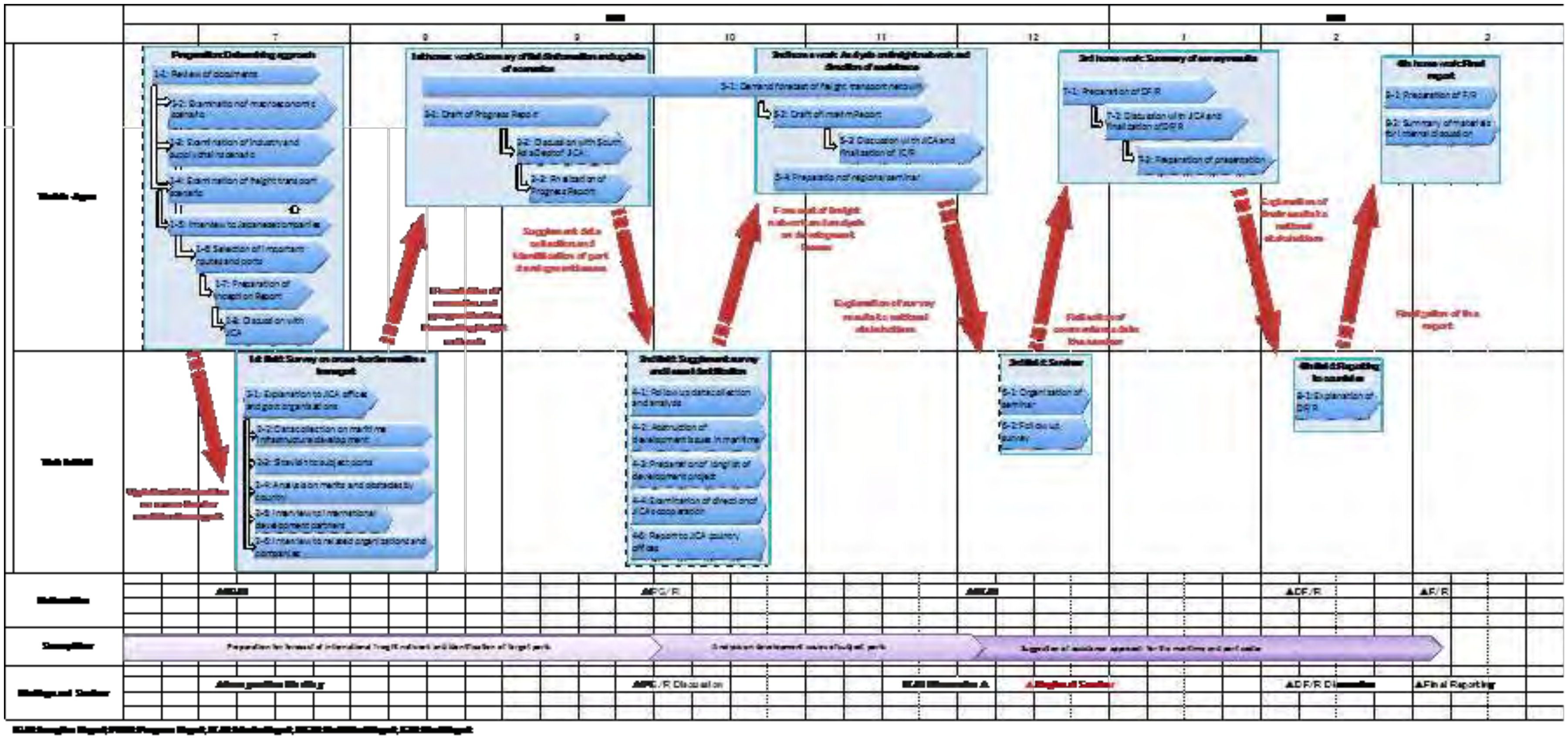
Approaches adopted for the Survey are as follows:

1) Formulate several "macroeconomic scenarios" for the Region covered in the survey area.
2) Analyze intra-regional and inter-regional supply chains for important industries in detail and then formulate "industry and supply chain scenarios" in line with the macroeconomic scenarios formulated in 1).
3) Examine "freight transport scenarios" (i.e., future scenarios for the maritime network and port access land route networks) that take into account strategies for private maritime companies as well as macroeconomic scenarios and industry/supply chain scenarios formulated in 1) and 2).
4) Examine the possibility for spatial development related to hinterland for the development of scenarios for non-container bulk cargo transport.
5) Propose both hard and soft projects that are highly desirable for future regional cooperation and expansion of private sector business opportunities through analysis of the scenarios

formulated in 1), 2), and 3).

One of the distinctive features of the Survey is the analysis of supply chains and their future development. Subjects for the Survey include the following industries: textile/garment, automobile, machinery, and crude oil/oil related products. These four categories of commodities constitute more than half of total trade of each country, with the exception of India (whereby these four industries constitute a quarter of the total). The direct application of goods flows for the four industries is inappropriate to assess maritime transport infrastructure needs transport. What matters foremost to infrastructure is the total, not fraction of the total. Thus, the examination of goods flows generated by the four industries provides a better sense of the future direction of maritime transport in the Region.

The flow chart on the following page describes the data collection and analysis process adopted for the Survey.



Source: Survey Team

Figure 1.3 Survey Process Flow Chart

1.4.2 Tasks

This Survey was carried out from July 2015 to February 2016, adhering to the tasks and the schedule shown in Table 1.2. The outline of work flow is as follows:

- During preparation in Japan, the Survey Team examined the direction and methodology of the Survey and developed hypothetical scenarios for the macro-economy, industry and supply chain, and freight transport based on available data.
- During the first round of field work, the Survey Team collected updated information and examined the hypothesis. Concurrently, the Survey Team analyzed needs for port and maritime sector assistance.
- During the first round of home office work in Japan, the Survey Team updated the scenarios and formulated models to forecast demand for freight transport. In addition, the Survey Team examined development issues identified during the first round of field work.
- During the second round of field work, the Survey Team collected information for examining development issues and cooperation projects. After returning to Japan, the Survey Team worked to complete demand forecasts and set the direction and methodology to examine candidate cooperation projects.
- A Regional seminar was held to discuss results of the above tasks with stakeholders of the subject countries. The Survey Team prepared a Draft Final Report that reflected comments from the seminar and JICA discussions. In addition, the Survey Team selected priority projects from a long list of candidate projects.
- The Survey Team traveled to the subject countries to present the Draft Final Report. After incorporating comments from the stakeholders and JICA discussions, the Survey Team submitted the Final Report.

Table 1.2 Tasks and Work Schedule

	2015						2016		
	July	August	September	October	November	December	January	February	March
Task1: Preaparation in Japan									
Task1-1: Review and analysis of existing documents									
Task1-2: Examination of macroeconomic scenario									
Task1-3: Examination of industry and supply chain scenario									
Task1-4: Examination of freight transport scenario									
Task1-5: Interview to Japanese companies									
Task1-6: Selection of important routes and ports									
Task1-7: Preparation of Inception Report									
Task1-8: Discussion with JICA									
Task2: First Field Work									
Task2-1: Explanation to JICA offices and government organizations									
Task2-2: Data collection on maritime infrastructure development									
Task2-3: Site visit to subject ports									
Task2-4: Analysis on merits and obstacles by country									
Task2-5: Interview to international development partners									
Task2-6: Interview to related organizations and companies									
Task3: First Home Work									
Task3-1: Draft of Progress Report									
Task3-2: Discussion with South Asia Department of JICA									
Task3-3: Discussion with JICA and finalization of Progress Report									
Task4: Second Field Work									
Task4-1: Follow up data collection and analysis									
Task4-2: Abstruction of development issues in maritime secotr									
Task4-3: Preparation of long list of development project									
Task4-4: Examination of direction of JICA's cooperation for maritime sector									
Task4-5: Report to JICA country offices									
Task5: Second Home Work									
Task5-1: Demand forecast of freight transport netowrk									
Task5-2: Draft of Interim Report									
Task5-3: Discussion with JICA and finalization of Interim Report									
Task5-4: Preparation of regional seminar									
Task6: Third Field Work									
Task6-1: Organization of regional seminar									
Task6-2: Conduct of follow up survey									
Task7: Third Home Work									
Task7-1: Preparation of Draft Final Report									
Task7-2: Discussion with JICA and finalization of Draft Final Report									
Task7-3: Preparation of presentation material for explanation in the field									
Task8: Fourth Field Work									
Task8-1: Explanation of Draft Final Report to stakeholders									
Task9: Fourth Home Work									
Task9-1: Preparation of Final Report									
Task9-2: Summary of materials for internal discussion									
Deliverables	▲ IC/R ▲ Inauguration Meeting		▲ PG/R			▲ IT/R ▲ Regional Seminar		▲ DF/R	▲ F/R

IC/R: Inception Report, PR/R: Progress Report, IT/R: Interim Report, DF/R: Draft Final Report, F/R: Final Report

Source: Survey Team

1.5 Country Visits and Seminars

The Survey involved two major sets of country visits for data collection. The first set of visits was conducted from mid-July to mid-August 2015, and included visits to four South Asian countries (Bangladesh, India, Pakistan, and Sri Lanka). The first set of visits also included Hong Kong, Singapore, and Thailand, which host various headquarters of Asian maritime transport logistics companies. The second set of visits included Bangladesh, India, Pakistan, Sri Lanka, and Thailand from mid-September to late October 2015. The objectives of these country visits were to collect: (i) macroeconomic and industry/trade information, as well as requirements for infrastructure development expressed by private companies; (ii) freight and logistics information; (iii) current conditions and issues and development plans related to ports and access infrastructure; and (iv) current and planned assistance by other development partners for both hard infrastructure and soft aspects.

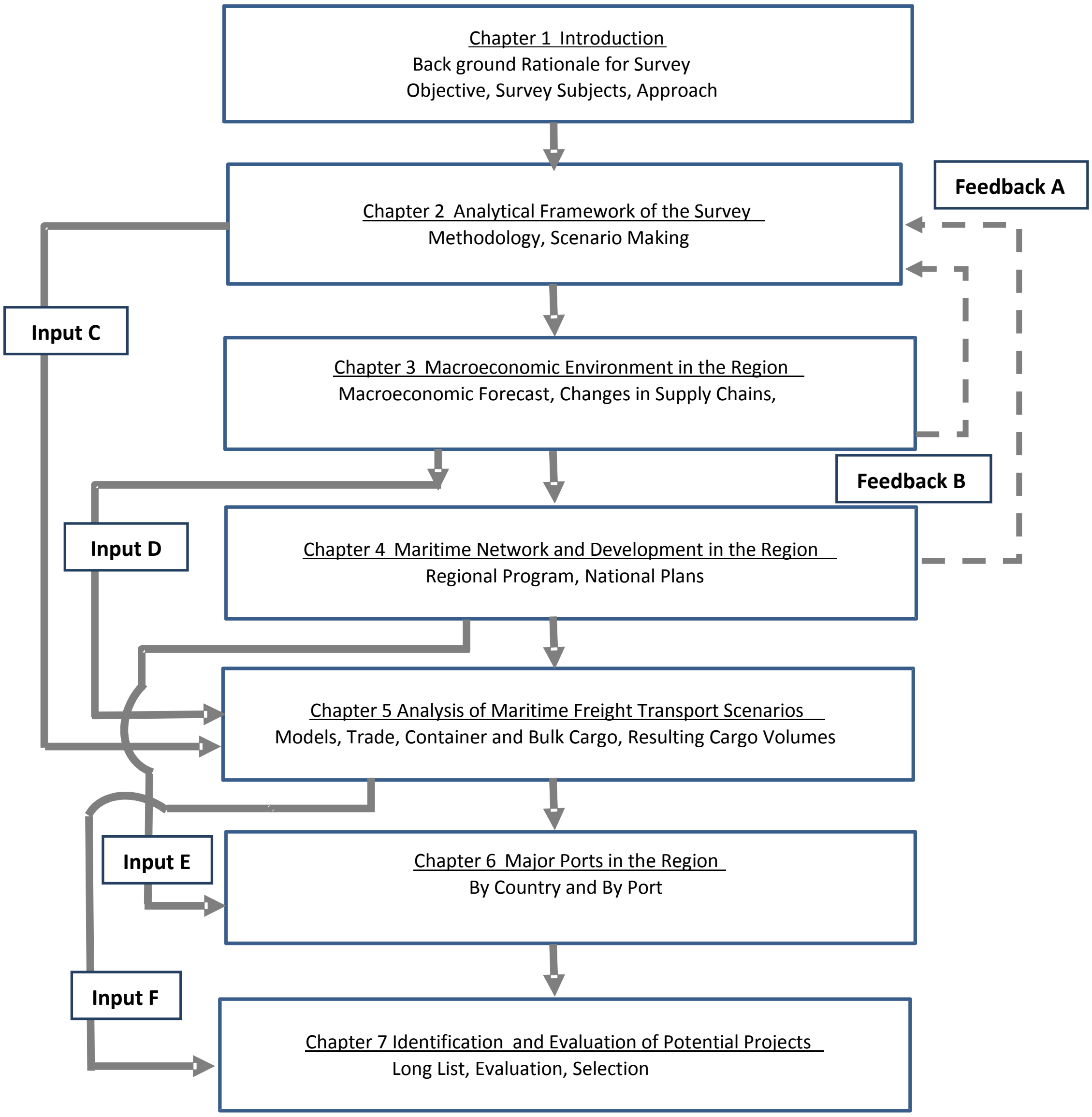
A Regional Seminar was held in Colombo, Sri Lanka in mid-December 2015. Senior officers in the public and private sectors, academic and research community, and international development partner organizations were invited to the Seminar. The aim of the Seminar was to present the survey findings and obtain comments and inputs from diverse stakeholders with a view to enhance and improve the Survey results. The participants expressed a large number of comments.

A final visit was conducted to explain the contents of the Draft Final Report to government organizations in the four South Asian countries and obtain comments and inputs on the Report.

1.6 Structure of This Report

This report consists of seven chapters. Chapter 1, this chapter, introduces the background, scope and actual schedule of the survey. Chapter 2 describes the analytical framework of the survey, including analysis methods and steps taken in determining future development scenarios. Chapter 3 discusses the macroeconomic and industrial development of the Region, at present and in the future. Chapter 4 presents maritime transport infrastructure in the Region in the context of Regional as well as national development efforts. Chapter 5 illustrates computerized models and their outputs to depict the overall picture of the future of maritime transport demand. Chapter 6 discusses issues associated with maritime transport in general and each of the major ports in the Region, by country and by port, anticipating demand as determined in the previous chapter. Finally, Chapter 7 discusses the results of the evaluation of potential projects as identified in the foregoing processes. A long list of projects was created and underwent a multiple criteria evaluation. A number of projects were selected that had a reasonable chance of becoming the subject of possible future JICA assistance.

The noted steps were not always conducted in a sequential manner. During the actual surveys, numerous feedback processes took place that resulted in the modification of tentative findings from previously completed activities and processes. Figure 1.4 illustrates the structure of the report and inter-relationships among chapters.



Feedback A: Data Availability & Principality Assessment
Feedback B: Practicality Assessment
Input C: Model Structure
Input D: Macroeconomic Data
Input E: Compatibility Assessment
Input F: Freight Volume, Transport Cost, and Investment Cost

Source: Survey Team

Figure 1.4 Structure of the Report

2. Analytical Framework of the Survey

2.1 Overview of the Methodology

In the Survey, a number of development scenarios have been developed to analyze possible cases in the future of the Region from different aspects, including macro economy, industry and trade, and freight transport, and these scenarios are related to each other. This chapter describes the framework of each of scenario's development.

Future demand of freight transport is forecasted following the steps as described below:

Step 1: Country by country macroeconomic forecasts are made by synthesizing available macroeconomic forecasts by various international organizations and these are designated as the base case. Two additional cases were formulated in that one assumes the economies to grow at rates 30% higher than the base case (upside case scenario) and the other assumes those to grow at rates 30% lower that the base case (downside case scenario). The former reflects, among other things, successful implementation of improving the transport network in the Region, and the other, at least partially, reflects failure in improving the transport network in the Region.

Step 2: Country level macroeconomic forecasts are broken down into regional level macroeconomic, sector by sector, forecasts by means of applying the Geographic Simulation Model (GSM).[1]
The model incorporates changes in the transport network as well as economic production/consumption in regions and the transport networks connecting them to each other. Changes in supply chains are embedded in the process. The end result of this step is matrices representing from which region to which region goods flow in monetary terms, sector by sector. The current version of GSM for South Asia covers only Bangladesh, India and Sri Lanka due to data availability. GSM could not be applied to Pakistan because of lack of data sufficiently detailed for regions within Pakistan. Cargo demand of each region of Pakistan is derived directly from trade statistics.

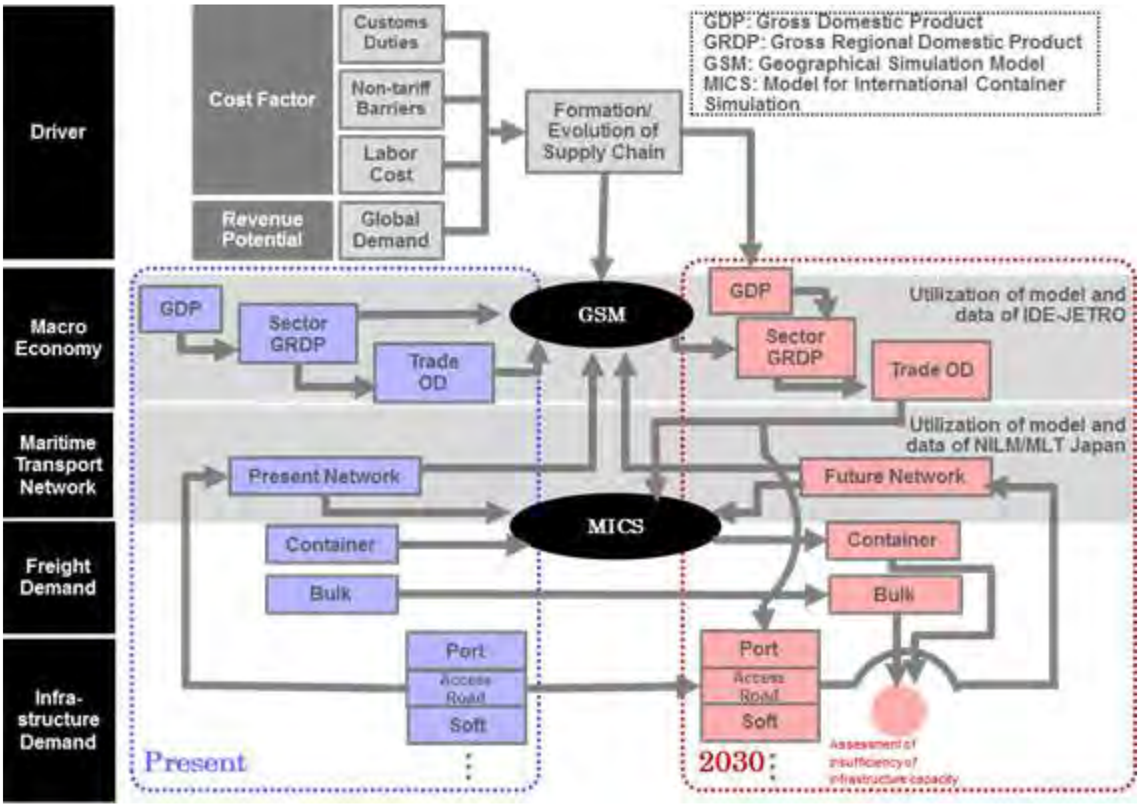
Step 3: Inter-regional flows of goods of sectors that are containerized are then fed into the Model for International Container Simulation (MICS)[2] international maritime transport model, after converting values to freight ton, that incorporates worldwide goods production and consumption and maritime and land transport networks with particular attention to the South Asia Region. The model produces estimated freight flows in every point in the combined maritime and land transport network in terms of freight ton and TEU. Several scenarios as to the future shape of the transport network are tested. In actual application, two separated sets of the model have been constructed due to the data limitation as mentioned above; one centered on the three countries of Bangladesh, India and Sri Lanka, and the other centered on Pakistan with connections with CAREC countries.

Step 4: For bulk cargo, freight volumes by goods in each case are estimated by assigning trade amounts to each region and major ports.

Step 5: Freight volumes thus obtained for each of subject ports and land access transport links are compared with planned capacities of such infrastructure to assess plans and formulate recommendations for port and land access links and soft measures.

The above procedures are illustrated in Figure 2.1.

[1] GSM is a spatial economic type model developed by the Institute of Developing Economies, Japan External Trade Organization (IDE-JETRO).
[2] MICS is a maritime container traffic assignment simulation model developed by Research Institute of Infrastructure of Ministry of Land Infrastructure and Transport of Japan.



Source: Survey Team

Figure 2.1 Scenario Analysis Flow

2.2 Macroeconomic Scenario

As a basis for forecasting the transport demand, the following three macroeconomic scenarios are prepared with the target year of 2030: 1) ***Upside Case*** (with a probability of 20-25%), in which the regional economic growth will be accelerated under the smooth implementation of the development plans in each country and region, 2) ***Base Case*** (with a probability of 50-60%), in which the regional economic growth will be in line with the general consensus (as in those by international organizations), and 3) ***Downside Case*** (with a probability of 20-25%), in which the regional economic growth will slow down as a result of unsuccessful implementation of the above mentioned development plans. In the Upside and Downside Cases, economies are assumed to grow 30% faster and slower than the Base Case, respectively.

Table2.1 summarizes the likely changes associated with the three cases. Variables include changes in tariff and non-tariff barriers, as well as the world demand, which are highly relevant to the development of supply chains detailed in the next section. More specifically, the ***Upside Case*** corresponds to a successful development of the supply chains, the ***Base Case*** to a certain extent of supply chain development, and the ***Downside Case*** to almost no change of the supply chains from the current status.

Table 2.1 Economic and Industry Development Scenarios

	Downside Case	Base Case	Upside Case
Assumptions			
Tariff cut (within the Region & vis-à-vis the rest of the world)	No change	Moderate pace	Aggressive
Removal of non-tariff barriers (same as above)	No change	Moderate pace	High pace
World demand	Slow down	Moderate growth	Accelerate
Channel			
Development of supply chains (within the Region & vis-à-vis the rest of the world)	No change	Moderate	Fast
Outcomes			
Macroeconomic growth (within the Region)	Slow down	Moderate growth	Accelerate
Transport demand (within the Region & vis-à-vis the rest of the world)	Slow down	Moderate growth	Accelerate
Infrastructure demand (within the Region)	Slow down	Moderate growth	Accelerate

Source: Survey Team

As a basis of these scenarios, Base Case GDP/GRDP growth rates in the countries/states in the Region, as well as the rest of the world (Table 2.2), have been prepared in the following sequence.

1) Trend of the real GDP/GSDP growth and its sector composition for the past four years have been analyzed for the four countries.
2) Growth patterns in the four countries for the periods 2014-18, 2019-23 and 2024-30, have been identified, taking into account the degree of maturity in industrial development. More specifically, growth in the countries/regions with relatively greater potential are classified as ‘accelerating’, those with declining potential as ‘decelerating’ and those in between as ‘even pace’.
3) Image of the industry structure as in 2030 has been drawn, given the current sector composition (share of each sector --- agriculture/forestry/ fishing, mining, manufacturing, construction, utility, wholesale/retail trade, transport/communication, finance, other services --- to overall GDP), prospects on the commercial/trade agreements and the demand growth forecast for the rest of the world (based on the GDP forecast up to 2030, as summarized in Table 2.3[1]).
4) Sector GDP data for the four countries (and the states for India) as in 2030 have been prepared, considering the results for 2) and 3).
5) The result of 4) has been fine-tuned through the feedback from the tentative forecast of trade flows and industry output obtained through the step introduced in the next section,[2] to further update the sector GDP/GRDP forecast. (This process was repeated until the forecast numbers became consistent.)

In that sense, the macroeconomic forecast is based on, and consistent with the future image of the industries and supply chains behind them, which is the basis of estimating transport demands. One caveat, however, is that the forecast is purely based on the potential of each sector in the four countries, and has been derived separately from the impact of infrastructure development.[3]

As a result, real GDP for the four countries up to 2030 is expected to grow at an average pace of 5.8% p.a.,[4] which is competitive against other growth centers such as China. i.e., the region is likely to be one of the most dynamic growth area in the world.

[1] Real GDP growth forecast for the rest of the world has been prepared considering the long-term forecast results by some of the major research institutes.
[2] These feedbacks, however, are limited to the sectors selected for the supply chain analysis only.
[3] In other words, at least a similar pace of infrastructure development as occurred in the past four years has been implicitly assumed.
[4] Compared with the forecast of real GDP growth up to 2020 by IMF (World Economic Outlook Database, October 2015), this forecast may appear slightly conservative --- 6.0% p.a. for Bangladesh, India and Sri Lanka (compared with IMF’s 6.8%, 7.5% and 6.6% p.a., respectively) and 4.7% for Pakistan (same level as the forecast by IMF), as some degree of deceleration is assumed after 2020 for some of the countries. Also for India, the impact of rebasing in 2015 has been removed, which makes the forecast number slightly lower, but keeps the trend in line even with the rebased forecast.

Table 2.2 GDP/GRDP Forecast for the Countries/States in the Region

(Unit: % p.a.)

	Actual	Forecast					
					2013/14-29/30		
	2009/10-12/13	2013/14-17/18	2018/19-22/23	2023/24-29/30	Base Case (*1)	Upside Case (*2)	Downside Case (*3)
Bangladesh	6.3	6.2	6.0	5.7	6.0	7.8	4.2
India	7.3	6.0	6.0	6.0	6.0	7.8	4.2
Andhra Pradesh	6.8	6.0	5.5	5.0	5.5	7.2	3.9
Arunachal Pradesh	6.6	7.0	7.0	7.0	7.0	9.1	4.9
Assam	15.4	7.0	7.0	7.0	7.0	9.1	4.9
Bihar	21.4	9.0	8.0	7.0	8.0	10.4	5.6
Goa	9.9	8.0	7.0	6.0	7.0	9.1	4.9
Gujarat	9.9	8.0	8.0	7.0	7.7	10.0	5.4
Haryana	8.8	7.0	6.5	6.0	6.5	8.5	4.6
Himachal Pradesh	7.6	6.0	6.0	6.0	6.0	7.8	4.2
Jammu & Kashmir	5.6	5.5	5.5	5.0	5.3	6.9	3.7
Jharkhand	10.3	6.5	6.0	6.0	6.2	8.0	4.3
Karnataka	5.6	5.0	5.0	5.0	5.0	6.5	3.5
Kerala	8.9	7.0	6.5	6.0	6.5	8.5	4.6
Madhya Pradesh	9.7	8.0	7.0	6.0	7.0	9.1	4.9
Chhattisgarh	13.6	10.0	9.0	8.0	9.0	11.7	6.3
Maharashtra	8.4	6.0	6.0	6.0	6.0	7.8	4.2
Manipur	12.1	6.5	6.5	6.5	6.5	8.5	4.6
Meghalaya	7.6	7.0	7.0	7.0	7.0	9.1	4.9
Mizoram	9.9	10.0	9.0	8.0	9.0	11.7	6.3
Nagaland	5.7	5.5	6.0	6.0	5.8	7.6	4.1
Orissa	6.5	6.0	6.0	6.0	6.0	7.8	4.2
Punjab	6.0	5.5	5.5	5.0	5.3	6.9	3.7
Rajasthan	9.4	6.0	6.0	6.0	6.0	7.8	4.2
Sikkim	24.1	8.0	7.0	6.0	7.0	9.1	4.9
Tamil Nadu	8.9	6.0	6.0	5.5	5.8	7.6	4.1
Tripura	9.0	9.0	8.0	8.0	8.3	10.8	5.8
Uttar Preadesh	6.6	6.0	6.0	5.5	5.8	7.6	4.1
Uttarakhand	10.3	7.0	7.0	6.0	6.7	8.7	4.7
West Bengal	20.7	6.5	6.5	6.0	6.3	8.2	4.4
Andaman & Nicobar Islands	9.2	7.0	6.5	6.0	6.5	8.5	4.6
Chandigarh	15.3	10.0	9.0	8.0	9.0	11.7	6.3
Delhi	9.1	10.0	9.0	8.0	9.0	11.7	6.3
Pudcherry	11.6	7.0	6.0	6.0	6.3	8.2	4.4
Pakistan	3.6	5.0	4.5	4.5	4.7	6.1	3.3
Sri Lanka	7.5	6.0	6.0	6.0	6.0	7.8	4.2
					2014-30		
	2010-13	2014-18	2019-23	2024-30	Base Case	Upside Case	Downside Case
Japan	1.8				1.0	1.3	0.7
China (including Hong Kong)	8.5				4.9	6.3	3.4
Korea	3.9				2.0	2.6	1.4
ASEAN	6.0				4.8	6.4	3.3
Oceania	2.6				2.5	3.2	1.7
North America	2.3				1.8	2.4	1.3
Europe	1.0				1.5	2.0	1.1
Middle East	4.7				3.5	4.6	2.4
Africa	4.0				4.4	5.8	3.1
Others	4.0				4.3	5.7	2.9

Sources:
(*1) Survey Team
(*2) 30% faster than the Base Case for all countries and regions.
(*3) 30% slower than the Base Case for all countries and regions.

Table 2.3 Long-Term Macroeconomic Forecasts by Major Institutions

	21 Century Public Policy Institute (2012)	HSBC (2012)	PwC (2011)	Conference Board (2014)	Goldman Sachs (2007)	PIDA (2010)	Forecast for this study	
	2010-30 PPP	2014-30 Real	2009-50 PPP	2014-25 Real	2014-30 Real	2014-30 PPP	2014-30 Real	Source
East Asia								
Japan	0.4%	0.7%	1.5%	0.8%	1.2%		1.0%	JICA Study Team
China	4.6%	6.0%	4.7%	4.7%	5.0%		5.0%	JICA Study Team
Hong Kong				1.1%			1.1%	Conference Board
Taiwan				1.8%			1.8%	Conference Board
Korea		2.9%	2.2%	1.8%			2.0%	JICA Study Team
ASEAN								
Philippines		7.8%			5.2%		6.0%	JICA Study Team
Indonesia		4.3%	4.6%	4.8%	4.7%		4.5%	JICA Study Team
Malaysia		6.3%		4.6%			4.3%	JICA Study Team
Singapore		2.8%		3.1%			3.0%	JICA Study Team
Vietnam		5.5%			6.6%		6.0%	JICA Study Team
Thailand		3.9%					3.5%	JICA Study Team
South Asia								
India	4.6%	5.6%	6.1%	4.2%	6.0%		6.0%	JICA Study Team
Bangladesh		5.5%			5.3%		6.0%	JICA Study Team
Pakistan		4.3%			5.0%		4.7%	JICA Study Team
Sri Lanka		5.3%					6.0%	JICA Study Team
Oceania								
Australia		2.3%		2.3%			2.3%	JICA Study Team
New Zealand		3.2%		2.8%			3.0%	JICA Study Team
North America			2.4%					
US	1.4%	1.3%	2.4%	2.1%	2.3%		1.8%	JICA Study Team
Canada		2.2%	2.4%	1.9%	2.0%		2.0%	JICA Study Team
Europe								
Germany	0.3%	1.3%	1.6%	1.5%	0.9%		1.4%	JICA Study Team
UK	1.1%	1.7%	2.3%	1.5%	1.7%		1.5%	JICA Study Team
France	0.9%	1.3%	2.2%	1.2%	1.7%		1.2%	JICA Study Team
Italy		1.7%	1.7%	0.7%	1.0%		1.2%	JICA Study Team
Spain		2.9%	1.9%	1.3%			1.5%	JICA Study Team
Russia	2.2%	4.1%	2.6%	1.5%	3.3%		1.7%	JICA Study Team
Austria		2.2%		0.8%			1.0%	JICA Study Team
Belgium		1.1%		1.6%			1.2%	JICA Study Team
Cyprus		3.4%		-0.1%			2.0%	JICA Study Team
Czech Republic		4.5%		2.0%			2.0%	JICA Study Team
Denmark		0.7%		1.6%			1.0%	JICA Study Team
Finland		1.3%		0.9%			1.0%	JICA Study Team
Greece		2.7%		0.5%			1.0%	JICA Study Team
Hungary		4.7%		2.1%			2.0%	JICA Study Team
Iceland				1.2%			1.2%	Conference Board
Ireland		2.8%		2.8%			2.8%	JICA Study Team
Luxembourg		2.4%		1.4%			1.5%	JICA Study Team
Malta				1.2%			1.2%	Conference Board
Netherlands		1.2%		1.5%			1.4%	JICA Study Team
Norway		1.1%		1.6%			1.4%	JICA Study Team
Poland		3.2%		1.4%			1.5%	JICA Study Team
Portugal		2.8%		0.9%			1.3%	JICA Study Team
Sweden		0.9%		1.9%			1.3%	JICA Study Team
Switzerland		2.2%		2.0%			2.0%	JICA Study Team
Belarus		4.7%					4.7%	HSBC
Bosnia & Herzegovina		5.8%					5.8%	HSBC
Bulgaria		3.7%					3.7%	HSBC
Croatia		3.6%					3.6%	HSBC
Latvia		4.4%					4.4%	HSBC
Lithuania		3.2%					3.2%	HSBC
Romania		5.9%					5.9%	HSBC
Serbia		6.1%					6.1%	HSBC
Slovak Republic		3.5%					3.5%	HSBC
Slovenia		2.4%					2.4%	HSBC
Ukraine		7.0%					7.0%	HSBC
Middle East		**4.1%**						
Turkey		4.9%	4.1%	1.9%	3.9%		3.0%	JICA Study Team
Saudi Arabia		4.1%	4.1%	2.5%			2.5%	JICA Study Team
Iran		4.4%			4.1%		4.0%	JICA Study Team
United Arab Emirates		4.0%		3.5%			4.0%	JICA Study Team
Bahrain		4.8%					4.8%	HSBC
Israel		1.9%					1.9%	HSBC
Jordan		5.8%					5.8%	HSBC
Kuwait		4.8%					4.8%	HSBC
Lebanon		5.0%					5.0%	HSBC
Libya		4.7%					4.7%	HSBC
Morocco		4.0%					4.0%	HSBC
Oman		4.4%					4.4%	HSBC
Qatar		2.1%					2.1%	HSBC
Syria		4.9%					4.9%	HSBC
Tunisia		4.7%					4.7%	HSBC
Yemen		2.0%					2.0%	HSBC

	21 Century Public Policy Institute (2012)	HSBC (2012)	PwC (2011)	Conference Board (2014)	Goldman Sachs (2007)	PIDA (2010)	Forecast for this study	
	2010-30 PPP	2014-30 Real	2009-50 PPP	2014-25 Real	2014-30 Real	2014-30 PPP	2014-30 Real	Source
Africa		**4.9%**				**6.7%**		
Algeria		5.5%		3.6%		6.1%	3.6%	JICA Study Team
Angola		3.7%				7.4%	3.7%	HSBC
Benin						7.7%	7.7%	PIDA
Botswana						5.8%	5.8%	PIDA
Burkina Faso						6.8%	6.8%	PIDA
Burundi						6.4%	6.4%	PIDA
Cameroon		3.9%				6.6%	3.9%	HSBC
Cape Verde						6.4%	6.4%	PIDA
Central African Republic						7.1%	7.1%	PIDA
Chad						3.7%	3.7%	PIDA
Comoros						3.8%	3.8%	PIDA
Congo, Dem. Rep.						6.9%	6.9%	PIDA
Congo, Rep.						6.7%	6.7%	PIDA
Cote d'Ivoire						7.2%	7.2%	PIDA
Djibouti						7.0%	7.0%	PIDA
Egypt, Arab Rep.		5.2%	0.2%	4.6%	5.1%	7.1%	4.5%	JICA Study Team
Equatorial Guinea						1.7%	1.7%	PIDA
Eritrea						3.5%	3.5%	PIDA
Ethiopia		6.0%				7.7%	6.0%	HSBC
Gabon						5.2%	5.2%	PIDA
Gambia, The						7.2%	7.2%	PIDA
Ghana		6.3%				7.2%	6.3%	HSBC
Guinea						4.0%	4.0%	PIDA
Guinea-Bissau						4.7%	4.7%	PIDA
Kenya		5.3%				8.0%	5.3%	HSBC
Lesotho						6.6%	6.6%	PIDA
Liberia						6.7%	6.7%	PIDA
Libya						5.2%	5.2%	PIDA
Madagascar						7.4%	7.4%	PIDA
Malawi						7.6%	5.0%	JICA Study Team
Mali						7.2%	7.2%	PIDA
Mauritania						6.8%	6.8%	PIDA
Mauritius						3.9%	3.9%	PIDA
Morocco				4.3%		6.6%	4.3%	Conference Board
Mozambique						7.6%	7.6%	PIDA
Namibia						5.5%	5.5%	PIDA
Niger						6.9%	6.9%	PIDA
Nigeria		4.4%			6.1%	8.3%	4.5%	JICA Study Team
Rwanda						6.8%	6.8%	PIDA
Sao Tome and Principe						6.0%	6.0%	PIDA
Senegal						6.4%	6.4%	PIDA
Seychelles						5.0%	5.0%	PIDA
Sierra Leone						6.6%	6.6%	PIDA
South Africa		2.1%		1.7%		5.1%	2.0%	JICA Study Team
Sudan						6.2%	6.2%	PIDA
Swaziland						4.6%	4.6%	PIDA
Tanzania		7.5%				7.6%	7.5%	HSBC
Togo						6.4%	6.4%	PIDA
Tunisia						5.4%	5.4%	PIDA
Uganda		5.1%				6.6%	5.1%	HSBC
Zambia						6.9%	6.9%	PIDA
Zimbabwe						4.1%	4.1%	PIDA
Others								
Brazil	2.3%	3.1%	3.9%		3.8%		3.5%	JICA Study Team
Mexico		3.9%	3.6%		4.2%		3.5%	JICA Study Team
Argentina		3.3%	4.0%				3.5%	JICA Study Team
Bolivia		7.3%					7.3%	HSBC
Chile		5.1%					5.1%	HSBC
Colombia		4.3%					4.3%	HSBC
Costa Rica		4.6%					4.6%	HSBC
Cuba		2.1%					2.1%	HSBC
Dominican Republic		4.8%					4.8%	HSBC
Ecuador		6.0%					6.0%	HSBC
El Salvador		5.0%					5.0%	HSBC
Guatemala		4.4%					4.4%	HSBC
Honduras		5.5%					5.5%	HSBC
Panama		4.9%					4.9%	HSBC
Paraguay		6.6%					6.6%	HSBC
Peru		6.4%					6.4%	HSBC
Uruguay		2.9%					2.9%	HSBC
Venezuela		3.2%					3.2%	HSBC
Azerbaijan		6.2%					6.2%	HSBC
Kazakhstan		5.9%					5.9%	HSBC
Uzbekistan		7.4%					7.4%	HSBC
Turkmenistan		6.9%					6.9%	HSBC

Note: Growth rates are annualized average for the forecast period.
Source: Survey Team from various statistics.

2.3 Industry and Supply Chain Scenarios

Based on the three macroeconomic scenarios mentioned in 2.2, the industry and supply chain scenarios for the Region are prepared with the target year of 2030. In doing so, existing industry allocation, resource endowment, and the current supply chains in the Region have been examined and the future changes are shown for each scenario. The industries covered by this analysis include automobile, machinery (construction machinery & machine tool), textile/ garments and crude oil & oil-related products. These sectors have been selected, considering; 1) the relatively large impact on the volume of maritime transport, and 2) the depth of layer for supply chains, with a view to capturing the possible structural changes in the future. In this sense, sectors with relatively large volume of trade flows, but with fewer production stages, are not included in this analysis. Having said that, the coverage of the trade flows by the four sectors is quite high (except India, with a greater share of agro products, chemicals, gems, etc.).

Table 2.4 Trade Flow Coverage for the 4 Sectors

Overall (Import + Export) (Value: $ mn)

	Year	Export	Import	Total
Bangladesh	2011	24,314	41,222	65,535
India	2014/15	310,338	448,033	758,372
Pakistan	2014	24,722	47,545	72,267
Sri Lanka	2014	11,295	19,244	30,540

4 Sectors (Import + Export) (Value: $ mn)

	Year	Export	Import	Total
Bangladesh	2011	20,104	19,314	39,418
India	2014/15	61,107	112,346	173,453
Pakistan	2014	14,844	29,748	44,592
Sri Lanka	2014	6,105	10,130	16,235

4 Sectors / Overall

	Year	Export	Import	Total
Bangladesh	2011	82.7%	46.9%	60.1%
India	2014/15	19.7%	25.1%	22.9%
Pakistan	2014	60.0%	62.6%	61.7%
Sri Lanka	2014	54.0%	52.6%	53.2%

Sources : UN Comtrade
Bangladesh: Survey of Manufacturing Industries (Statistics & Information Div.)
India: Custom Data (Directorate General of Commercial Intelligence & Statistics), Annual Survey of Industries (Central Statistics Office), Cotton Production (Cotton Corporation of India)
Pakistan: Census of Manufacturing Industries (Bureau of Statistics), Pakistan Economic Survey (MOF)
Sri Lanka: Annual Survey of Industries (Dept. of Census & Statistics)

The supply chains for these sectors in 2030 are detailed in Section 3.5, along with the detailed methodology of estimation.

2.4 Freight Transport Scenarios

Taking the macroeconomic scenarios and industry, and, the industry and supply chain scenarios into consideration, freight transport scenarios are provided with the target year of 2030 considering both intra-Regional and inter-Regional cargo movements.

Cargo types considered include "Container Cargoes", "Non-Container Cargoes", "RORO Cargoes (carried by RORO or vehicle carriers on trucks/trailers)", and "Bulk Cargoes (major commodity-wise for crude oil, petroleum products, coal, iron ore and grain)"

The following points are considered:

2.4.1 International Shipping Scenario

(1) Container Trades

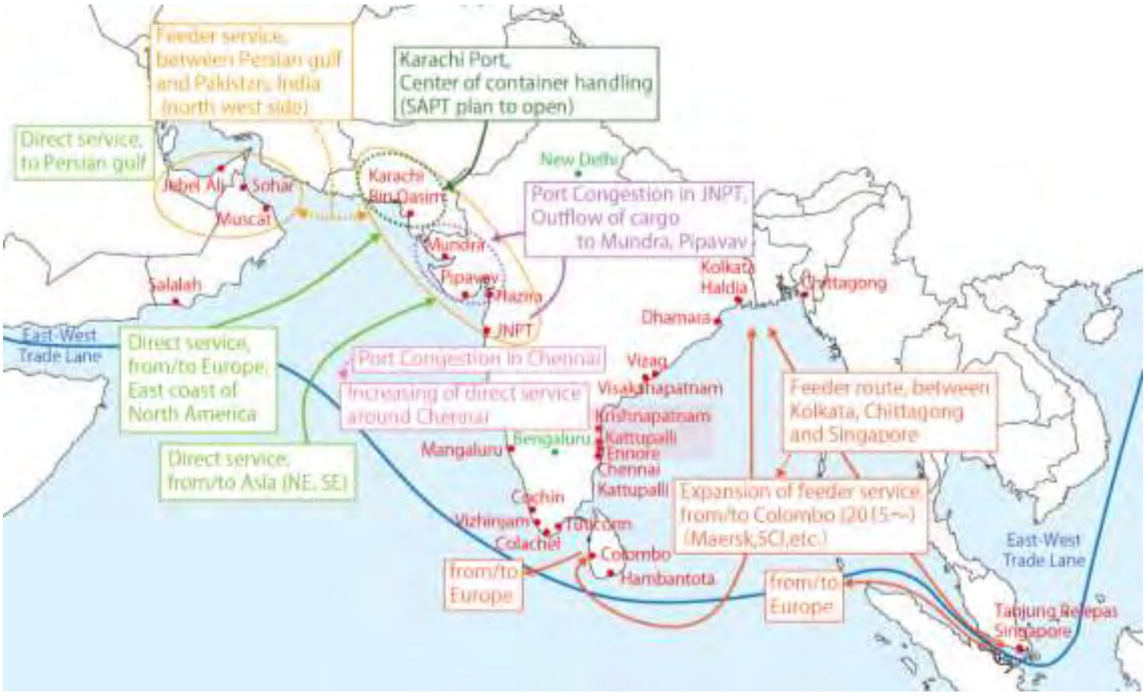
There are two means for shipping lines to cope with an increase in cargo volume; introducing larger ships and/or increasing the frequency of calls. Ship enlargement is suitable for direct transportation from the origin regions to the destination regions. Increase of frequency will lead to enhancing the hub & spoke networks by using more feeder ships. The International Shipping Scenarios are given depending on which type is dominant. The following 3 cases are assumed based on the considerations above:

Case 1: Vessel enlargement until a certain size
Case 2: Vessel enlargement as needed
Case 3: Increasing service frequency as needed

Case 1 is used to understand the average behaviors of various shipping lines, and it may be the most probable case. Case 2 assumes an increase in long-distance direct services calling at some specific ports where the cargo volume is concentrated. Case 3 assumes an increase in feeder loops to covert multiple ports where the cargo volume is dispersed.

<u>Regional Overview</u>

Current state of the shipping network in the South Asia Region is as illustrated in Figure 2.2. Characteristics of major ports by marine area are described below.



Note: "East-West Trade Line" in this figure is illustrated as an approximate route and not connected to calling ports.
Source: Survey Team

Figure 2.2 Current State of the Shipping Network (Image)

1) Sri Lanka/South India

- Currently Colombo Harbour is by far the dominant hub port in South Asia.
- Comparing South Asia as a whole to other Regions (particularly to East Asia which is also located along the route to Europe), the ratio of transshipment cargo is small.
- An important issue is whether or not another viable transshipment hub port will emerge in south Asia.

2) Bay of Bengal

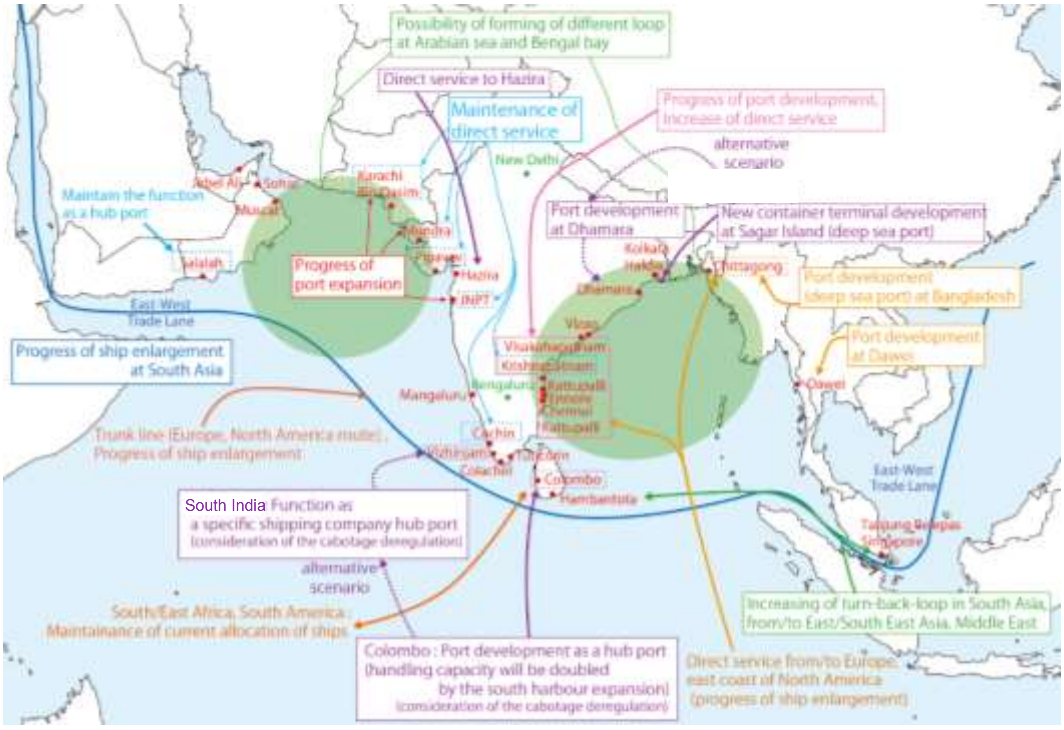
Ports located in eastern as well as western shores of the Bay of Bengal are currently served by feeder services to/from Singapore or Colombo. The shape for future services depends on demand size and policies of major shipping lines. time, and this is

3) Arabian Sea

- Ports such as JNPT, Pipavav, Mundra, Karachi, Port Bin Qasim, etc., are called on by the ships from Europe and the east coast of North America, North East and South East Asia.
- At various ports in North West India (Mundra, Kandla etc.) and Pakistan (Karachi, Bin Qasim etc.), the feeder route network consists of not only the nearest hub ports such as Port Salalah and various ports in the Persian Gulf, but also includes the Sohar port in Oman.

<u>International Shipping Network in the Future</u>

It is deemed that the international shipping network would evolve around the Region as illustrated in Figure 2.3.



Note: "East-West Trade Line" in this figure is illustrated as an approximate route and not connected to calling ports.
Source: Survey Team

Figure 2.3 International Shipping Network (Future Image)

(2) Non-Container Trades

In principle, dry and liquid bulk cargoes are transported directly from the origin ports to the destination ports and no transshipment is involved in between. Therefore, no specific cases attributed from the transport means are assumed for non-container trades, and instead ship enlargement due to the increase in import/export volume based on the Industry and Supply Chain Scenario is considered. Likewise, the trade by RORO and vehicle carriers is also not considered.

2.4.2 Inland Logistics Network

A large number of inland logistics infrastructure improvements are taken into account in formulating future scenarios of the inland logistics network, country by country. Details are presented in Section 5.1.6.

3. Macroeconomic and Industrial Environment in the Region

3.1 Overview

Macroeconomic conditions of the countries covered by this survey vary by country and state, of which India is far bigger in size than the rest, followed by Pakistan, Bangladesh and Sri Lanka. Compared to the rest of the world, some of the states in India grow as fast as the high-growth countries such as China, and much faster than the developed world.

For imports and exports, on the other hand, the Region is structurally in deficit, in which the capability of earning foreign currency through exports has not caught up with the expansion of the domestic demand for imports. Also the Region's export is heavily dependent on the low value-added products such as the primary products and commodities. This is reflected in the low dependency on intra-regional trade. The ratio of intra-regional trade to whole trade was as low as 4.0% in 1996, which further declined to 3.1% in 2011. — This is much lower than other regions, such as EU (around 60%) and ASEAN (over 20%).

3.2 Economic Status in the Region

Growth of the Region in recent years stands out in the global economy, suggesting the most dynamic change compared to other parts of the world for the next couple of decades.

In addition to the supply side, demand side growth potential has been estimated through forecasting per capita GDP in the Region, with a view to identifying both push and pull factors of the flow of goods, as well as the supply chains as channels of the trade flows. These estimations have been reflected on the GDP growth forecast in the Region up to the year 2030.

Figure 3.1 visualizes the result of the forecast, in which the countries and states with higher growth are shown in darker colors, and the sector composition of GDP (or GRDP) is shown in the pie chart. In this survey, the base line forecast is further refined, considering the factors mentioned in 2.2.

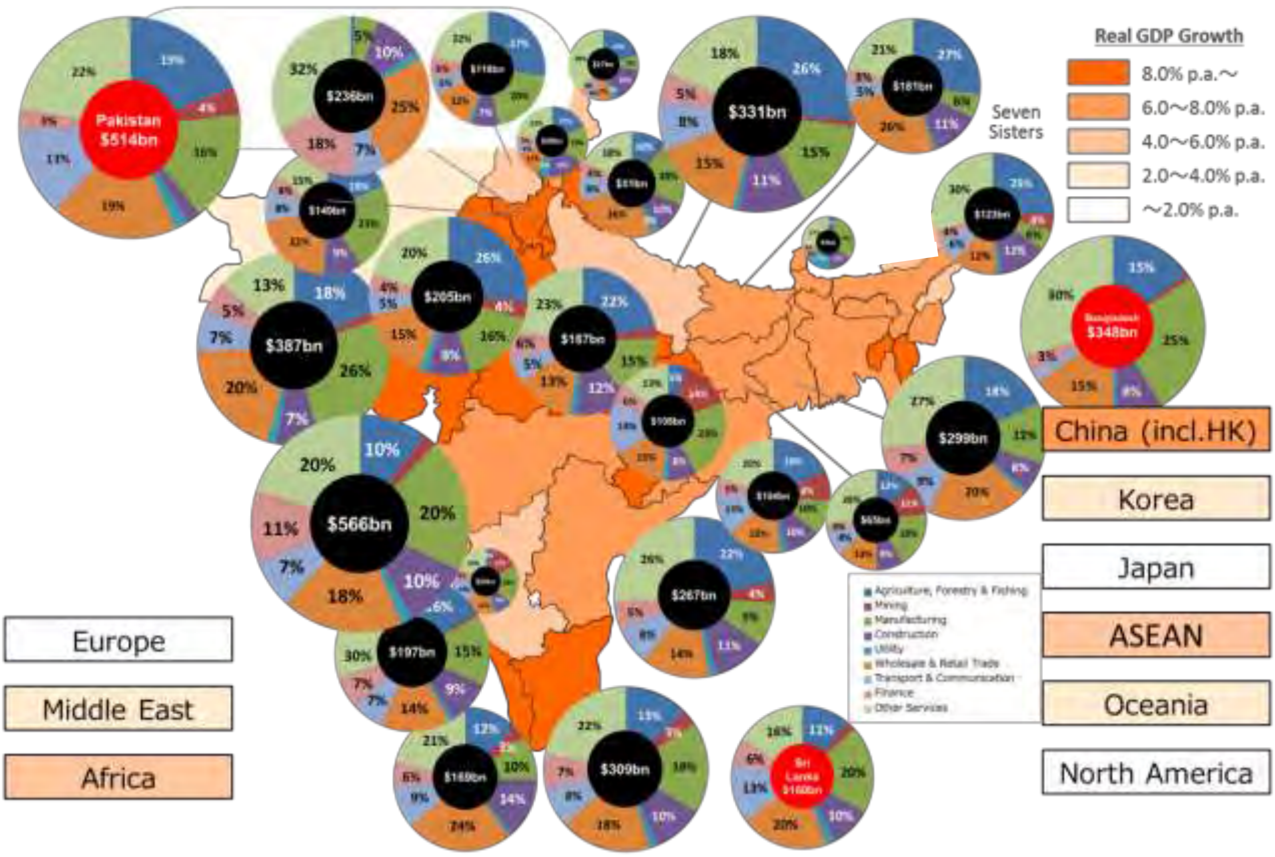
Among the countries in the Region, India, in particular, has quite a few states with high growth, such as those covering Delhi-Mumbai (such as Rajasthan and Gujarat), Delhi-Kolkata (Uttar Pradesh, Bihar, Jharkhand and West Bengal) and the southern states (Kerala and Tamil Nadu), which are expected to be competitive enough vis-à-vis other growth centers including China. Also for other three countries, relatively high growth is expected, as in 6% for Bangladesh and Sri Lanka, and 4.7% in Pakistan. As a region, real GDP for the four countries is likely to expand by 5.8% p.a. up to 2030, and per capita GDP is also expected to grow to a significant extent, suggesting that the majority of the region will experience a rapid expansion of consumption.

The current import / export structure of each country can be summarized as follows.

Table 3.1 Import / Export structure of each country

Bangladesh	**<Export>** About 70% of the garment export (accounting for 80% of the total export) is for US and Europe, which, however, slowed down during the turbulence in EU economy. The government regards Japan, Korea, Australia and Latin America as strategically important countries/regions, and supports the local companies on their diversification of export destinations into these areas.
	<Import> Petroleum products (as fuels for the power plants), steel products, fertilizers and vessels are on the rise. Import of raw cotton, as input for spinning industry, tend to move in parallel with export of garments. Import from China accounts for more than 30% of the total.
India	**<Export>** Crude oil and oil products are the top export items, for which Singapore is the top destination. Also export to Saudi Arabia and Kenya is on the rise. They are followed by gems and jewelries, which declined during the Euro crisis. Increase in agro products, on the other hand, contributes to the overall export growth in recent years, including soy flour (used for fiber supplement called guar gum) and rice (for Africa). For Japan also, crude oil and oil products are the top items, followed by agro-fishery products (materials for fertilizers, etc.), gems and jewelries.
	<Import> Crude oil and oil products account for more than 30% of total imports, which are followed by gold, electronics, diamond, etc. Current account balance is characterized by chronic deficit in trade of goods and income balance, which is partly offset by surpluses in service trade and transfers. Imports from Japan include machinery (steam turbines, molds, lathes, etc.), iron ore, transport equipments (mainly automobiles), etc.
Pakistan	**<Export>** Textiles (on the back of fourth largest production of cotton in the world) and related items (yarn, fabrics, dyed and sewn products) account for more than half of overall exports. Garment export is expanding as the demand has been shifting from China due to an increase in its labor cost, but knit products face tough competition with Bangladesh and other major exporters. For export destination, US is ranked top, followed by China, while those to neighboring Afghanistan is stagnant, due to its political instability.
	<Import> Major items include oil and related products, chemicals, food, transport equipments and related parts, textiles, etc. Oil producing countries account for the largest share as import origins, while import from China is also expanding. From Japan, organic compound (industrial ethyl alcohol, etc.) accounts for one fourth of the total, and used car is also increasing.
Sri Lanka	**<Export>** Textile and garments accounts for more than half, which are followed by tea. For destinations, US, UK and India (on the back of the FTA) come higher in rank, followed by Belgium and Luxembourg (main destinations for gems and jewelries) and Russia (top consumer of tea).
	<Import> Oil products, diamond and precious metals, construction materials, machinery are the main items. Origin countries include India (oil, transport equipments, textiles, construction materials, etc.), China (machinery, textiles, construction materials, etc.) and Singapore (oil products, machinery, etc.).

Source: Survey Team



Source: Survey Team

Figure 3.1 Forecast for GDP/GRDP Growth and Sector Composition in the Region up to 2030

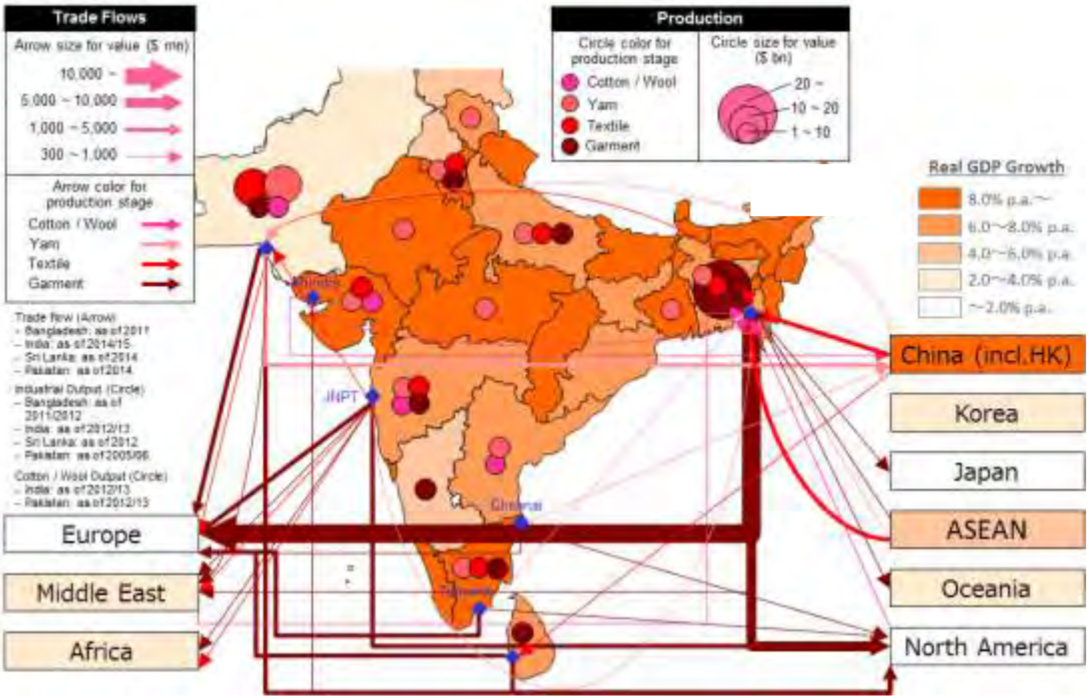
3.3 Existing Supply Chain Structure

In general, supply chains within the Region are still immature, in which exports of higher value-added items from India, as well as the intra-regional trade of primary commodities, are the majority. As for the imports from India, primary products are the major items for Bangladesh and Pakistan. In Sri Lanka, under FTA with India since 2000, majority of imports are the final products such as transport equipments, refined oil products, biomedical and chemical products, and almost no import of intermediate materials are observed except for textiles. This low dependency on the regional trade can be attributed to 1) tariff and non-tariff barriers resulting from historical and political reasons, 2) insufficient logistics infrastructure such as roads and ports, and 3) not necessarily high importance of other countries in the region as trade partners.

As a result of the first round of this survey, current status of the supply chains for the four sectors (textile/garment, automobile, oil/oil-related products and machinery) have been examined, as shown in Figure 3.2 through 3.6.

In these figures, size of an arrow indicates the value of the trade flows, for which the colors show the production stages, whether it is for upstream or downstream of the production. Also, the colors of the circles indicate the same production stages, whereas their sizes correspond to the values of the products.

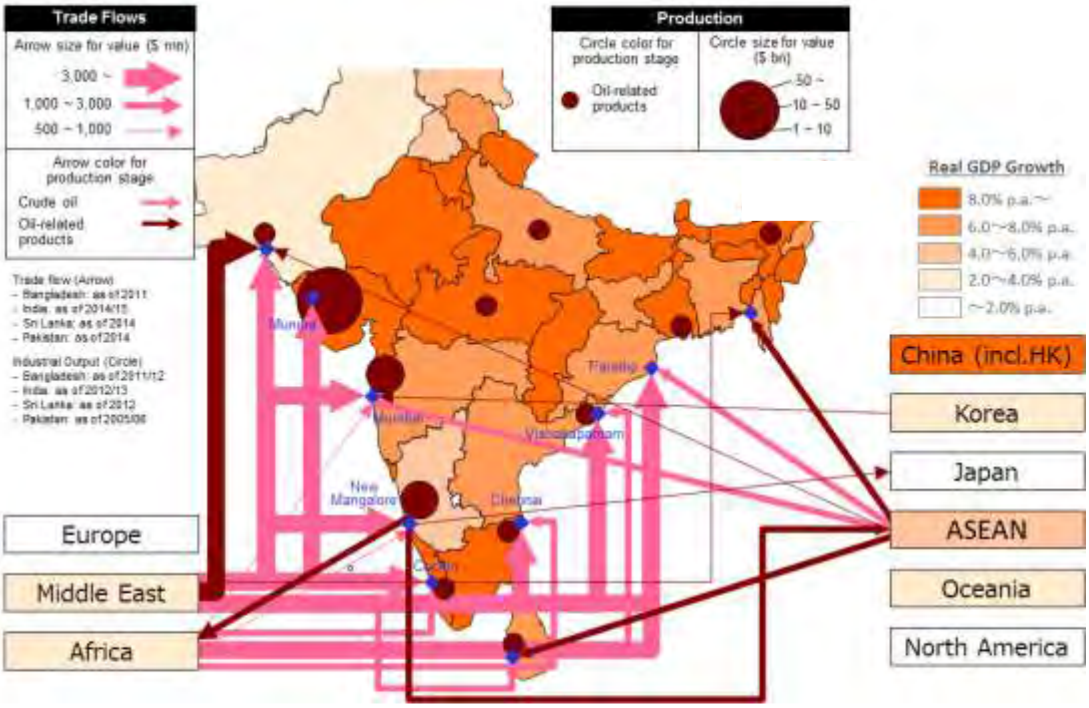
Textile / Garment



Sources: Survey Team, based on the statistics shown in the figure and interviews.

Figure 3.2 Current Status of Supply Chains (2012/13 Price) (1/5)

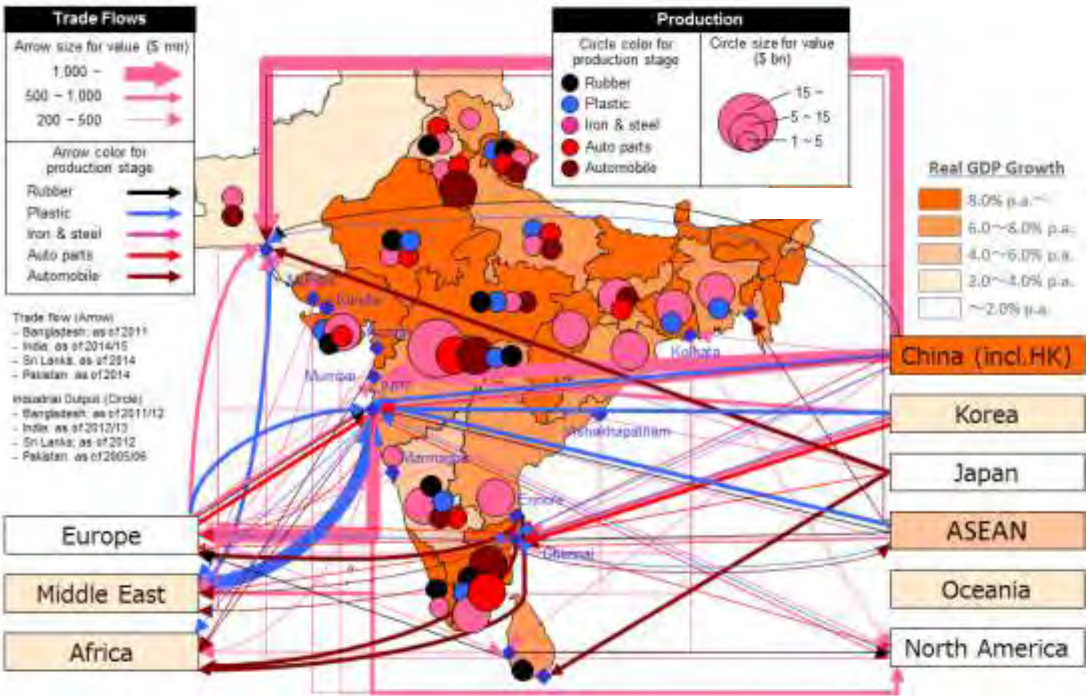
Crude Oil / Oil-Related Products



Sources: Survey Team, based on the statistics shown in the figure and interviews.

Figure 3.3 Current Status of Supply Chains (2012/13 Price) (2/5)

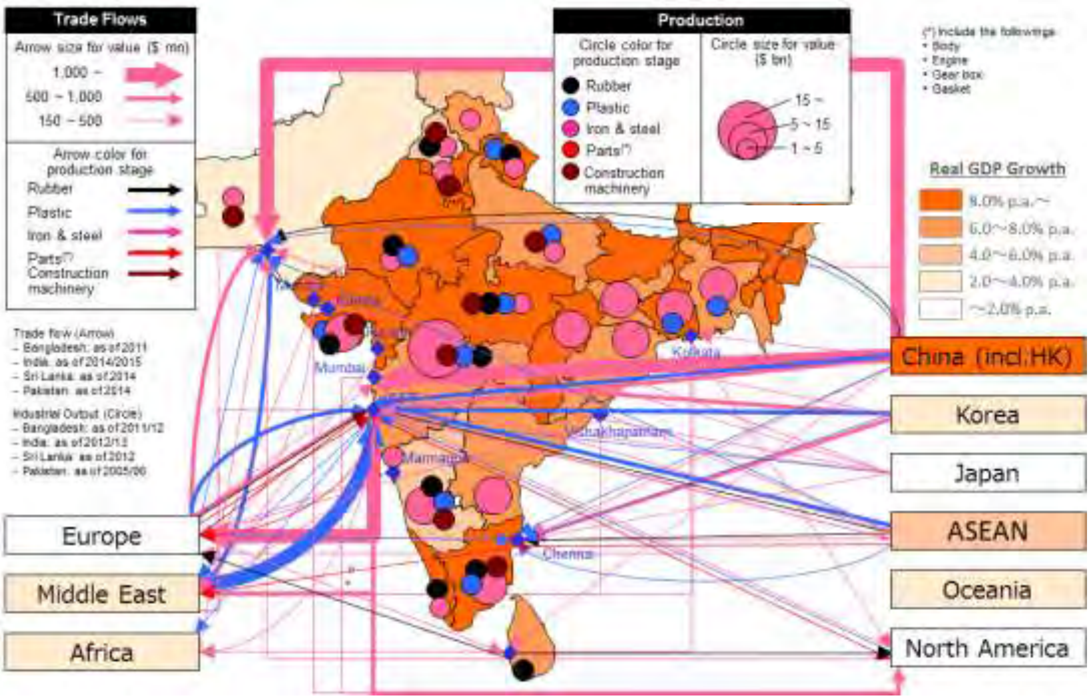
Automobile



Sources: Survey Team, based on the statistics shown in the figure and interviews.

Figure 3.4 Current Status of Supply Chains (2012/13 Price) (3/5)

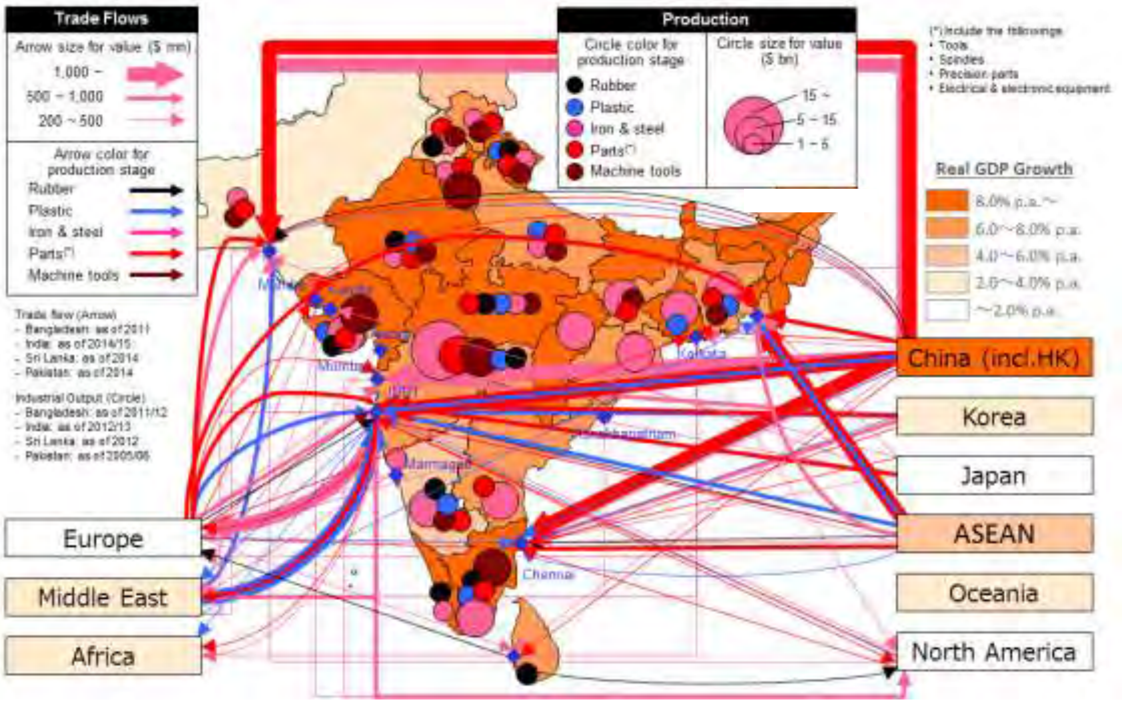
Machinery: Construction Machinery



Sources: Survey Team, based on the statistics shown in the figure and interviews.

Figure 3.5 Current Status of Supply Chains (2012/13 Price) (4/5)

Machinery: Machine Tool



Sources: Survey Team, based on the statistics shown in the figure and interviews.

Figure 3.6 Current Status of Supply Chains (2012/13 Price) (5/5)

Current status of the economy and industries in each country can be summarized as follows.

Table 3.2 Current status of the economy in each country

By country	
Bangladesh	Industry has accumulated around labor-intensive sectors (e.g. textile, apparel) on relatively low cost labor, and Japan, US and EU have been the major export destinations, especially since the preferential tariff was applied. In recent years, sectors such as shoes & leather items, electronics & related parts attracted investments. Going forward, how to add values to the industry (through improving investment climate) should be the key, considering the recent and forthcoming trade agreements, as well as the connectivity of transport infrastructures in the Region.
India	Many foreign companies (including Japanese) have been accelerating Foreign Direct Investments (FDI), with an expectation for the growth of domestic demands. Attention has been growing on the potential of the supply chains involving ASEAN (utilizing India-ASEAN FTA), given that FTAs vis-à-vis US and EU have not been concluded. In addition, potential of India as a production / export center is growing, given the ongoing discussions toward Regional Comprehensive Economic Partnership (RCEP) and India-EU FTA.
Pakistan	Textile export to EU is expected to increase as Pakistan became eligible for GSP Plus (with EU) since January 2014. Also foreign consumer goods manufacturers have been starting the operations in Pakistan, with a view to tapping into the domestic demand with sixth-largest population in the world. And the possibility of a food export center, especially for halal food, has been suggested, leveraging on the high export share of food products to the Middle East.
Sri Lanka	Textile and garments are the top export items, but highly dependent on imports for the raw materials. This high dependency on imports is the result of the absence of the supporting industries, due to the limited FDIs, avoiding the impact of the civil conflict

By country	
	as well as the limited size of the economy. Also Sri Lanka has not been successfully incorporated into the global division of labor, due to relatively higher labor cost compared to Bangladesh, Myanmar and Cambodia, as well as to the absence of practical industry promotion. But there is a possibility of playing a bigger role in the regional supply chains, on the back of the FTA with India and Pakistan, as well as the one being negotiated with China.

Sources: Survey Team

Table 3.3 Current status of the industries in each country

By industry	
Oil refinery	Countries in the Region other than Sri Lanka imports crude oil from the Middle East, refine it and export to other countries and regions. Of these countries, India has the biggest presence, with large-scale relevant facilities developed under the national strategy, whereas Pakistan also exports refined products.
Automobile	Not only final demand is expected to grow in India, but also its importance as the export hub for the emerging market is increasing recently. In Pakistan, Japanese companies almost dominate the market, leveraging on their access to the parts from ASEAN. This is likely to accelerate as the regional demand grows going forward. Size of the relevant industries in Bangladesh and Sri Lanka is not very large, while the shift of the assembly line is taking place, after which the role as the parts supplier is likely to be sought.
Textile & garments	Bangladesh is the only country in the Region with Generalized System of Preferences-Least Developed Countries (GSP-LDC) granted by Japan and EU, which contributes to the increase in export (both in terms of volume and scope) and development of supporting industries. On the other hand, India is the one who supplies wider range of products (e.g. cotton, jute, wool, silk and synthetic fabrics), where the number of apparel companies dealing with all manufacturing processes is increasing. Also Pakistan has the developed upstream businesses (e.g. yarn-making, weaving) on the back of fourth-largest production of cotton in the world. Its role as a supplier of intermediate products to the rest of the Region is focused at the moment, but expansion to the downstream is also expected due to the application of GSP by EU, going forward. Sri Lanka, also on the downstream side, traditionally has a competitive advantage in higher value-added and/or niche products such as brand clothes, lingerie and sportswear.
Chemical	Materials such as plastics and petro chemicals are mainly for domestic demands, and the export potentials are likely to wane against the supply from China. Biomedical, on the other hand, is led by India, who successfully established the status in the global market, especially in the field of generic drugs. Also Bangladesh has a potential as an alternative production site besides China and India, if the Trade-Related Aspects of Intellectual Property Rights (TRIPS) Agreement is extended.

Sources: Survey Team

Going forward, the development of the supply chains will depend on labor intensive sectors leveraging on the low cost labor (as in sewing), as well as on those focusing on huge domestic demand in India, at least for the time being. In the medium-to-long term, further strengthening of supply chains can be expected, assuming that the Region will become a ‘consumption center’ on the back of the expansion of high net worth and middle income classes. Furthermore, if the role of India increases as an export hub for the emerging markets, as already beginning to be seen in automobile and biomedical sectors, it will be critical to obtain inputs (raw materials and intermediate goods) within the region, to be competitive vis-à-vis China and ASEAN. In that sense, it will be increasingly important for India to strengthen the supply chains with Bangladesh and Pakistan, in addition to Sri Lanka already under FTA.

3.4 Needs from the Private Sector

Operational environment and future directions of Japanese companies in the Region are summarized in Table 3.4. As of now, the number of companies operating in the Region has not even reached that of Thailand alone, but is on the rise in recent years. The number for India (1,209) is far greater than others, but some extent of presence can be observed in Bangladesh and Pakistan on the back of their population exceeding 100 million each. Also factors such as 'low barriers to communication' and 'ease to employ workers' contribute to the increasing presence of Japanese companies in the Region. Going forward, this trend is likely to continue, thanks to the expansion of the domestic markets, as well as to the advantageous geographical location of the Region, right in the center of the network with ASEAN, Middle East, Africa and Europe, which can further encourage Japanese companies to operate in the Region.

Table 3.4 Current Operations and Future Directions of Japanese Companies in the Region

Country	Number of Japanese companies	Base salary for the workers (USD/month)	Merit of operation	Future direction of business (expansion)
India	1,209	239	1. Size & growth potential of the market (86.9%) 2. Low barriers to communication (30.6%) 3. Ease to employ workers (15.3%)	78.2%
Bangladesh	183	100	1. Size & growth potential of the market (56.3%) 2. Ease to employ workers (40.6%) 3. Low barriers to communication (21.9%)	71.1%
Sri Lanka	118	161	1. Low barriers to communication (50.0%) 2. Political and social stability (46.7%) 3. Ease to employ workers (26.7%)	60.7%
Pakistan	67	173	1. Size & growth potential of the market (76.9%) 2. Political and social stability (38.5%) 3. Ease to employ workers (38.5%)	52.6%
Thailand	1,552	369	1. Size & growth potential of the market (64.7%) 2. Better living environment for expats (56.3%) 3. Concentration of business clients (45.6%)	60.9%

Source: Survey Team, from the data by JETRO

Hurdles to the entry in the market, however, are still high compared to advanced ASEAN countries such as Thailand. Looking at the forecast operational profits of Japanese companies in the Region in 2014, more than 20% of the respondents are likely to be in red in India, Bangladesh and Sri Lanka, implying that the business environment is still hard while the market itself is regarded as attractive. As for the investment climate, these countries share the challenges in 1) insufficient infrastructure (e.g. power, logistics and distribution), 2) inefficient administrative procedures (taxation and relevant procedures, sudden change in policy, etc.) and 3) increase in labor cost (Table 3.5.).

Table 3.5 Business Conditions and Challenges for Japanese CompaniesOperating in the Region

Country	Operational profit/loss for 2014 (forecast)	Annual increase in salary (manufacturing)	Challenges for the investment climate
India	32.1%	10.8%	1. Insufficient infrastructure (77.7%) 2. Taxation and relevant procedures (76.2%) 3. Administrative procedures (74.4%)
Bangladesh	44.7%	8.7%	1. Insufficient infrastructure (88.2%) 2. Social situation (88.2%) 3. Policy operations (67.6%)
Sri Lanka	25.0%	7.7%	1. Policy operations (51.5%) 2. Rise in labor costs (39.4%) 3. Taxation and relevant procedures (36.4%)
Pakistan	5.3%	13.2%	1. Social situation (96.3%) 2. Insufficient infrastructure (74.1%) 3. Exchange rate instability (70.4%)
Thailand	18.7%	4.6%	1. Rise in labor costs (68.7%) 2. Labor shortage (47.8%) 3. Social situation (42.3%)

Source: Survey Team, from the data by JETRO

Going forward, it will be necessary to solve these problems one by one and encourage further accumulation of industries, with a view to strengthen the supply chains in the Region.

3.5 Supply Chain Structure in 2030

In order to estimate the future structure of the supply chains, the data for industrial production as well as the trade flows shown in Figure 3.2 through 3.6 have been projected to the year 2030, considering the following drivers.

1) **Change in the global demand** (based on the GDP/GRDP growth forecast shown in Table 2.2)
2) **Tariffs**: Forecast method is detailed in Box 3.1 below.
3) **Non-tariff barriers**: Forecast method is detailed in the Box 3. 2.

It has also been deemed necessary to consider the land transport cost (especially within India), but in this version of the estimate, it has not been explicitly reflected on the calculations, due to the technical difficulty in; a) precisely assigning the domestic flow of goods to the downstream sectors and locations, especially when they are scattered across the country, b) limited access to inter-state data for India, and c) estimating the future cost of land transport. Instead, impacts of land transport cost on trade flows and industrial productions are assumed to remain neutral for the simplicity purpose in this estimate.

By reflecting these factors, the future images of the supply chains (as in 2030) for the four sectors have been drawn in Figure 3.7 through 3.21. Detailed assumptions based on the on-site interviews with relevant ministries, industry associations and private sector companies in each country are summarized after Boxes 1 and 2. Also in Figure 3.22, real growth images of the four sectors, in terms of total sum of the import and export for the relevant inputs and outputs, are shown by country and growth scenario.

Box 3.1: Methodology for Forecasting Tariffs

Summary

- Only base level applied ad-valorem tariff is considered. No additional duties is taken into consideration.
- Data from 2010-2014 are taken from public sources such as custom websites/government or commerce ministry websites. Interpolation/extrapolation is used in absence of data during this period.
- For prediction, various tariff agreements and the commitments are taken into account.
- In absence of bilateral trade agreements, regional commitments, if any, are incorporated.
- Average tariffs are calculated at the aggregated level from the disaggregated data.
- Beyond 2022, simple trend lines are used for further projections up to 2030.

Details

Both bilateral and Regional agreements are considered for understanding the tariff cut commitments by any country. Wherever there is a bilateral FTA (Example India-Japan), the tariff considerations given in the agreement is taken. In case of the absence of FTA (Bangladesh and Sri Lanka) the regional treaty (SAPTA/SAFTA) is considered. An implicit assumption is made that for all ASEAN and South East Asian countries, tariffs will fall to 5% level by 2022, unless mentioned in the FTA. Therefore, keeping the tariff at 5% for 2022, a trend line has been developed from 2012 to 2022. However, if there is an FTA binding (India-Sri Lanka), the tariff given in the FTA is taken. For Example, the tariff level for petro-chemicals is expected to fall to 0% by 2022 and therefore the trend line is developed accordingly. However there are some exceptions listed below.

1. For USA, Middle East and Africa, where there is an absence of any treaty. No assumption for tariff is made in this case. The tariff forecast is obtained by simply extrapolating the present data
2. For tariff’s already less than 5% before 2012, it is assumed that the tariff will eventually drop till zero

The FTA’s considered are;

- India-Sri Lanka
- India-Japan
- India-Africa
- India-ASEAN
- Pakistan-China
- Pakistan-Sri Lanka
- Asia Pacific Trade Agreement (APTA)
- SAARC Preferential Trading Arrangement (SAPTA)
- South Asian Free Trade Area (SAFTA)

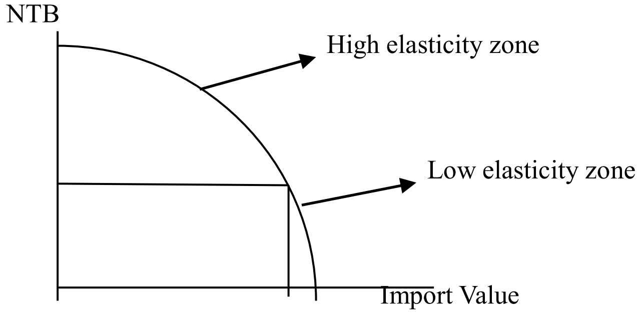
For forecast up to 2030, the data till 2022 are extrapolated. However once the tariff becomes negative during extrapolation, it is set at zero. In some cases a slow rise in tariff is visible such as textile import in Japan and USA from Sri Lanka. This is because during 2010-2014, a rise in tariff is visible.

Box 3.2: Methodology Used for Assessing Non-Tariff Barrier (NTB) Impact

1) World Bank -UNESCAP database of trade cost is used as quantitative proxy of NTBs. This is a tariff equivalent ad valorem rate. Hence, theoretically the same 'tariff elasticity' can be used for assessing NTB impact.

2) However, NTB forecasting is difficult as it is highly influenced by such factors as the global economic progress, country's belief on liberal trading system and institutional arrangements. Hence, direct use of 'tariff elasticity' is avoided.

3) For that purpose, a major assumption using the concept of variable elasticity is applied. It is assumed that there is a negatively sloped concave relation between NTB and trade growth. When NTB is high, a small reduction in NTB induces high trade growth. However, when NTB is already at low level, its reduction has smaller impact on trade growth. Therefore, at least two sets of elasticity are used: 'high' or 'low' depending on the current level of NTBs. Regarding the tariff impact, average elasticity is applied. In this case, highest and lowest elasticities in a specific product group are used.



4) Regarding NTB forecasting, trend and CAGR are used. However, it is also assumed that;

   a) If NTBs are continuously rising, after 2022, it will start to taper off slightly by 5%, assuming that it cannot rise infinitely. Changes are accommodated when ad-valorem equivalent of trade costs go beyond 160%,

   b) If the NTB trend is declining and has gone below after 2022 to a rate less than 100%, there is no further decline. It is assumed that in a tariff free world, NTB will be major instruments to protect the domestic industry from imports, and

   c) If the trend value in 2022 is in between 100-160%, NTBs are allowed to rise till the value 160% and then allow it to decline by 5%.

Also, 2022 is regarded as a benchmark year, since most of the FTAs in South Asia have time line till 2020 for free trade and it is extended it to two more years, due to the slower implementation process in South Asia.

5) Measuring the impact of NTB.

For the impact calculation, the following formula is used.

Average % change in import
= elasticity ('high' or 'low', depending on NTB value) * Average change in NTBs

- There is no requirement of base and inflation adjustment as NTBs are mostly institutional and its impact is assessed on predicted real trade only.
- There is data problem for Oceania and Pakistan for which projection is not done.

3.5.1 General Methodology

Calculation of the future trade flows and industrial production has been done in the following sequence.

Trade Flows

1. Calculate the past CAGR for the nominal USD price, for the period up to ten years (depending on the availability of data) for each combination of item, origin and destination country/port, and convert it into the real growth using the price indices for the same period.
2. Calculate the future CAGR (2014-30) for three cases ('Base', 'Upside' and 'Downside') by applying the simple correlation between the trade flow and the real GDP growth of the destination country.
3. Then, starting from the final goods sector, align the growth rate of the trade flows of an item to the growth of immediately downstream item in the production stage. In doing that, share of the imported components is also taken into account.
4. The results for each of the three cases are capped at a certain level to rule out the outliers. Cap levels are also altered, with 'Moderate', 'Aggressive' and 'Passive' groups, to reflect the future prospect for each flow, based on the interviews with the relevant industries in each country.
5. Apply the tariff and NTB impacts (in terms of the percentage point) to the trade flow growth calculated above. Impact numbers are also capped at certain levels to rule out the outliers.
6. Calculate the annual trade flows as in 2030 by applying the above growth numbers, the results of which are reflected on the size of the arrows in Figure 3.7-11 (Base Case), 3. 12-16(Upside Case) and 3.17-21 (Downside Case).

Industrial Output

1. Calculate the past CAGR for the nominal USD price, for the period up to six years (depending on the availability of data) for each combination of industrial sector and country/state, and convert it into the real growth using the price indices for the same period.
2. Estimate the real growth of the domestic sales by industrial sector for the same period, using the output growth calculated above and the export flows for the items relevant to each one of the sectors. The results are capped at a certain level to rule out the outliers.
3. Estimate the future CAGR (2014-30) for industrial output by sector under three cases ('Base', 'Upside' and 'Downside') through calculating weighted average growth using; a) export growth, b) domestic sales growth calculated above and c) future prospect of the export share to total output.
4. Calculate the annual industrial outputs in 2030 by applying the above growth numbers, the results of which are shown in the size of the bubbles in Figure 3.7 through 3.11 (Base Case), 3.12 through 3.16 (Upside Case) and 3.17 through 3.21 (Downside Case).

Also, the sector-specific assumptions are summarized in the following sections.

3.5.2 Textile / Garment

India

- Export share to the total domestic production will not change much over time as marginal increase in production is likely to be absorbed by the domestic demand, whereas the share of the sector to the overall employment will decline gradually.
- India will be required to shift to the higher value-added products to be competitive in the global market, implying the future change in the composition of export destinations toward the developed economies.
- Supply of accessories (e.g. buttons, zippers) is likely to shift to the domestic production, while it will become necessary to reduce the domestic transport cost.

Bangladesh

- Competitive advantage in labor cost will remain despite the increase over time, as the cost in other regions will also increase.
- Export to China, Russia, Japan and Latin American countries will increase in terms of share, compared to currently dominant destinations such as US and Europe.
- For northeastern states in India, the role of Chittagong Port will increase as an exit to the sea route for export.
- There is a plan to double the export from USD 25 billion (2014) to USD 50 billion by 2021, in which case, further utilization of additional ports (Mongla, etc.) may be required. In that case, import is also likely to double, accordingly.

Pakistan

- Textile accounts for a large portion of the export, but under a tough competition with China, which is likely to constrain the expansion of export.
- Value addition to the existing products will become critical going forward.

Sri Lanka

- There will be greater number of companies covering Middle East market, with some of them regarding Sri Lanka as a 'marketing hub' for Western Asia.
- Accordingly, share of sea route export is likely to increase, in contrast with US and Europe, demanding shorter lead time to meet the changeable taste of the consumers.

3.5.3 Oil / Oil-Related Products

Bangladesh

- Demand for crude oil, currently met by the import from Qatar (60%), Saudi Arabia (25%), UAE (15%), will increase in line with the expansion of the domestic economy, and the composition of import is less likely to change.
- For the production of refined products, 3 million ton /year will be added to the current production capacity of 1.5 million by 2018.
- Once Sonadia Port is ready, 10 million /year will be added by the operation of JV between BPC and Kuwait, from which exports to such destinations as Bhutan and Nepal are also expected. (But this part is not reflected on the forecast.)

- Domestic demand for refined products (currently 5.5 million ton /year) is expected to keep increasing in line with the expansion of the economy.

India

- Generally, if GDP grows by 1%, the demand for crude oil grows by 0.7-0.75%, but this number is likely to decline to 0.65-0.7% by 2030 as the energy efficiency improves.
- For crude oil, domestic demand and import will increase by 3-4% and 4-5%/year respectively, whereas domestic production will decline by 1%/year. As in 2014, 82.5% is imported (i.e. 17.5% is produced domestically), which will increase up to 90% by 2040. As in 2030, it will be around 85%. Out of the domestic production, there is almost no export, which is likely to remain the same going forward.
- In the future, productions at off the coast of Mumbai, between Visakhapatnam and Chennai are expected (although they are not explicitly reflected on the forecast).
- For refined products, 8.3% is imported as in 2014 (i.e. 91.7% is produced domestically), which is likely to remain the same (as the import is rather limited to the spot purchase of those for special purposes), or to decline (if technology improvements allows the domestic production of such special products). Out of the domestic production, 27.9% is exported as in 2014, but the share is likely to come down to 13% as in 2030, as domestic demand grows further. (In terms of the volume, the current level will be maintained.)
- Given the growth of both domestic and external demands, production capacity of refineries is expected to grow by a CAGR of 7-9%.
- The government has a plan to make India a ‘refinery hub’, for which 2 or 3 additional plants accompanied by dedicated ports are required (e.g. in the area between Mumbai and New Mangalore), although such ports are not specifically assumed in the forecast.
- Some of the sites with a prospect of grater production capacity are Mundra and Rajastan (where the 3rd plant is being prepared by Reliance), Hardia and Paradip on the east side (with a potential of export to Bangladesh, Myanmar, Cambodia, who currently buy refined products from Middle East).
- Once the production sites on the east side are ready, there will be a clearer functional division, in which the west side will export to Europe and Africa and the east side export to Southeast Asia. From the west side (e.g. Mumbai, Mundra), export to Africa is expected to grow in terms of share.

Pakistan

- Oil sector has been playing a critical role in Pakistan for the past several decades, and is expected to remain so as a base line.
- The actual trade flow and production data show that a majority of both crude and refined products are primarily for domestic consumption, which is also met by greater amount of imports. As the production capacity increases going forward, this gap could be narrowed down.
- The longer term trend, however, suggests that energy consumption is changing toward substitution by gas as a cheaper source, as well as by alternative energies under a longer-term goal sought by the government.
- Given these structural shifts, relatively slower expansion of trade flows than domestic production is assumed for the forecast period.

Sri Lanka

- Oil supply is 100% dependent on import, which is less likely to change up to 2030.
- However, natural gas reserve of 1 trillion sq ft has been found at Mannar Bay (on the east side) recently, which, if developed successfully, covers one third of the domestic energy demand. As it will take at least 5 years until the actual production starts, and given that the exploration should take some more years, this has not been incorporated into the forecast.

3.5.4 Automobile

Bangladesh

- While there have been plans to bring assembly lines to Bangladesh by automobile manufacturers form East Asia, there is a view that the domestic demand under the current level of motorization can be met just by import. Also, full-line production is regarded as difficult due to the immature peripheral industries.
- On the other hand, agreements reportedly have been reached between the government and Indian manufacturers such as TATA Motors and Ashok Layland with a view to bringing assembly lines to Bangladesh. While the main target seems to be the domestic demand, export to Nepal and Bhutan may also be considered.
- In the longer run (although not reflected on this forecast), export to Africa may be explored.
- As for iron and steel as inputs, current productions are mainly focused on the lower value-added items, but this will gradually shift to higher value-added ones as the domestic demand is expected to double in next 10 years. The production sites are most likely to concentrate in Chittagong area.
- For tires, CIAT (from India) already has an operation to absorb the excess demand from India (i.e. products are exported back to India), taking advantage of lower cost of labor and electricity. This is likely to continue, and can be expanded to other parts industries, as well.

India

- For the next 10-20 years, CAGR at 12-15% is expected for the whole sector on the back of further penetration due to the income growth.
- Local demand for automobile is expected to grow from 23 million units in 2014 to 70-80 million units in 2030.
- Export share to the total domestic production will remain at the level of 5-7% due to the expansion of the local demand, but the destination will be diversified to Middle East and Africa. There seems to be less expectation on Bangladesh and Pakistan. The share of US and Europe is likely to decline, but the small cars should keep their presence in Europe.
- Major clusters, such as North India, Maharashtra, Chennai, are expected to keep expanding.
- Also in Gujarat, large scale consolidation of production capacity is going on for auto parts manufacturers. It is also likely to expand as an export hub for automobile, with full-fledge operations of several auto manufacturers expected to start in next 5 years.
- In the longer run (although not directly reflected on the forecast), southern part of India may come into the picture as new production sites, thanks to the lower labor cost and less active unions compared to North. Also, the east side (e.g. Orissa, Jharkhand, Bihar) are expected as the next location of assembly lines.

- For auto parts, import substitution will accelerate (with import share to the total input declining from the current 17-20% to around 10% in 2030), leaving only higher value-added components (such as electronic parts) dependent on imports from Thailand, Japan, etc. Export of lower value-added parts to Middle East, Africa and (to some extent) ASEAN will likely increase in addition to those to Europe.
- The net effect of the growth of both domestic and external demand for auto parts will be a slight increase in export share to overall production from 22% in 2014 to 25-30% in 2025.
- Some of the auto manufacturers aim at 100% local procurement, while there exists a critical mass for developing and manufacturing complicated parts such as engines.
- For iron and steel on the upper stream, acceleration of import substitution may be expected in the future, although the supply pressure from China is currently quite strong for containing their excess capacity.
- Production sites for the supply chain for automobile sector are typically classified into 2 layers, i.e. ‘materials’ layer and ‘parts & assembly’ layer. In other words, materials come from various sites, but the production sites for parts are pretty much concentrated around major assembly sites. While this structure is less likely to change going forward, there are some temporary cases in which an automobile company operates more than two assembly factories in totally different locations and supply the parts with each other. This kind of flow is likely to decrease as enough suppliers start to operate around the assembly lines.

<u>Pakistan</u>

- Domestic demand for automobile is expected to grow from the current 200 thousand (of which 150 thousand are new and 30-60 thousand are used ones) up to 350 thousand by 2025. New vehicles are basically assembled in the country due to the high import tariff. Critical parts such as engines and transmissions are imported from Japan, Thailand, etc.
- Pakistan has had a cyclical policy change for allowing the imoprt of used cars, especially when the demand expansion surpasses supply capacity increase, by altering the regulation on the age of imported cars. This kind of control is likely to wane as the domestic production is stabilized.
- Critical parts such as engines and transmissions are imported from Japan, Thailand, etc.
- Generally, parts manufacturers from Japan are not as aggressive as to bring operations yet, and provide technical support to the local partners.
- Both vehicles and parts are generally for the domestic sales, which is likely to remain the same for the time being.
- In addition to Japanese manufacturers, China has recently been expanding its presence, not only for penetrating into Pakistan market but also for exporting relevant items through obtaining an access to Arabic Sea.

<u>Sri Lanka</u>

- There have been plans and rumors to invite assembly lines of major brands, with a view to making Sri Lanka a full-fledge production site of automobiles like Thailand, but have not been materialized yet. It is less likely to take place in the near future, but if it does (due to the rising labor cost in India, for example), the target market could be Africa and Middle East (as mentioned many of the interviewees), and to less extent, Bangladesh and Pakistan.
- More realistic strategy for Sri Lanka, on which the forecast is based, should be leveraging on its geographical advantage in playing the role of parts supplier, to be able to serve both

western (Africa, Middle East and Europe) and eastern (Bangladesh and ASEAN) sides of the country.

- In the tire industry, collaboration/integration with Indian manufacturers has been quite successful on the back of the rich production of rubber, which Sri Lanka will likely keep benefitting going forward. For the materials other than rubber, roughly 60% are imported from India (mostly chemicals) and 20% each from China and Russia (carbon black, etc.).
- Although it has not been taken into account for the forecast, Hambantota has been, and will be playing the role of transshipment hub for the used cars to be exported to Africa. In the longer run, synergy with local automobile industry may be explored to add value to its export to Africa and Middle East.

3.5.5 Machinery: Construction Machinery

Bangladesh

- Currently, the role of Bangladesh in construction machinery is quite limited, as the final product is almost 100% dependent on imports. And this position is less likely to change for the forecast period, although production of minor parts could be outsourced from India in the longer run.

India

- 50-70% of the final product is manufactured domestically (e.g. body, engine and gearbox in Maharashtra, Gujarat and Tamil Nadu), while the main components are still dependent on imports. (e.g., Assembly line of Caterpillar still depends on imported components from UK, but the new establishment of local factory is in process, and the share of local components is expected to rise going forward.)
- Among the rubber components, 75% of tires are produced in India (whereas the rest is from US, Korea, etc.), while other components such as gasket are from Europe and US. Glass components are produced 100% in India. These shares are less likely to change drastically.
- Among the most upper stream materials, steel and aluminum are form the northeastern states, Orissa and Chhattisgarh, and 70-80% of the steel used specifically for construction machinery is from Japan and France. For aluminum and plastics, 60-70% and 20-30% are produced in India, respectively. This structure is likely to gradually shift toward greater share in domestic production, as technical progress allows much higher value-added materials. Basically these heavy materials are better to be produced locally in order to save the transport cost.
- For the final products, 75% is for domestic sales and the rest is for exports. For domestic sales, major destinations are Gujarat, Maharashtra and Tamil Nadu, and in recent years, Northern Belt area. Also the sales to eastern area (Orissa, Chhattisgarh and Jharkhand) is expected to increase due to the demand from mining and power sectors. Going forward, both domestic and external demands (e.g. Africa) are likely to expand, on the back of great potential in infrastructure and construction sectors.
- Major ports used for import of inputs and export of final products are; Kolkata, Chennai, Haldia, Mumbai and Mundra, which will keep playing the current role throughout the forecast period.

Pakistan

- Construction machinery sector, with a total market size of USD2.5 billion (FY2012-13), is almost entirely dependent on imports, according to the industry sources. While the majority of imports are from major global brands from US, Germany, UK, Japan and Korea, China is also penetrating into the market either through agent/distributorship arrangements or through their own offices in Pakistan. Going forward, size of the domestic market is likely to expand in line with the construction demand, while this import-dependent structure may not change in short period of time.

Sri Lanka

- Accounts for 60-70% global share in the production of solid tire, on the back of rich production of rubber in southwestern region. Products are mostly for export to Europe (Belgium, Germany, UK, etc.), US and Asia (Japan, China, etc.) to be sold to the global construction machinery brands such as Caterpillar and Deere & Company. This export structure is likely to be maintained throughout the forecast period.

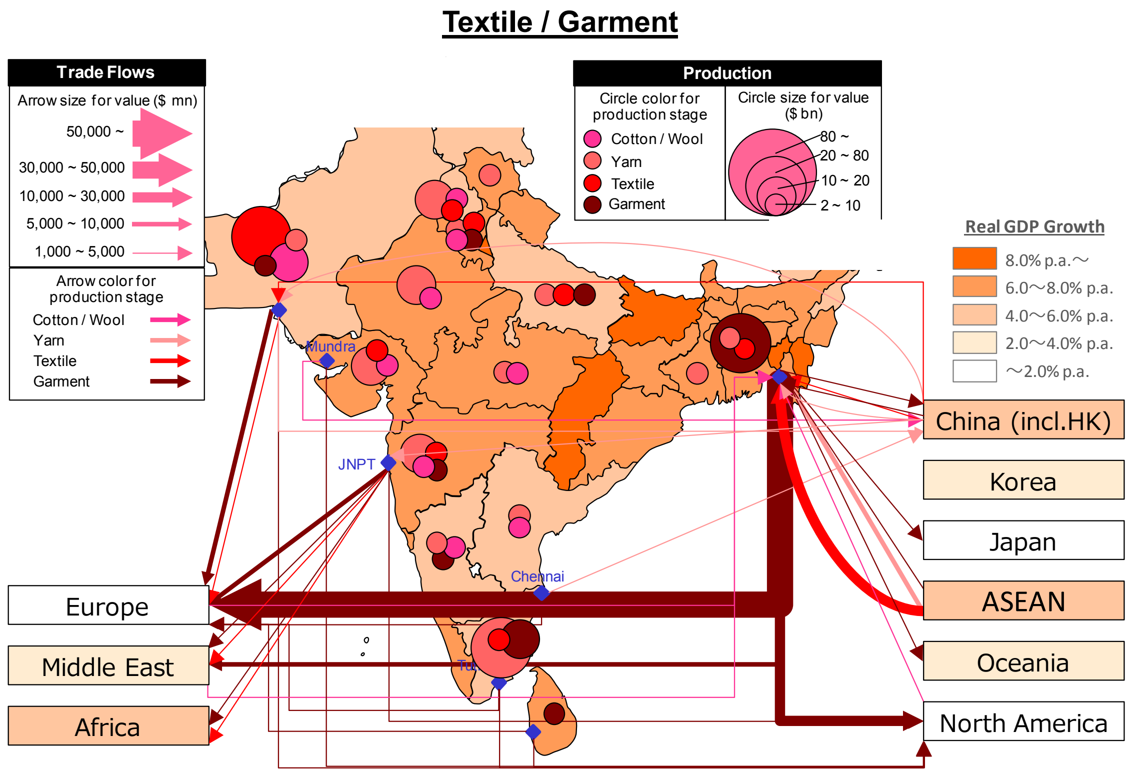
3.5.6 Machinery: Machine Tool

India

- Domestic demand is growing and expected to grow at 15-20%/year.
- Currently, 70-80% of domestic demand is met by imports, of which those from Europe and Japan may decline as import substation goes on. Current composition of domestic production vs. imports is expected to be reversed, for meeting the swelling local demand (to become 5th largest market globally by 2025.)
- At the same time, certain level of import will be always necessary, considering the ‘technology follower’ nature of Indian machinery sector.
- Major clusters are Delhi, Gujarat, Maharashtra (Pune) and Tamil Nadu (Chennai), and further concentration is expected in Delhi-Mumbai area and Gujarat.
- Among the local production, currently 10-15% is exported, which is expected to go up to 30%. Especially, for those with cost advantage, such as turbines, sales to Europe is expected to increase. From the west side, sales to Africa and Middle East are also expected to expand, while the competition with China should become tougher.
- Compared to the automobile sector, India’s role as exporter will be greater, as the spec of the products does not vary by region so much as motor vehicles.
- Heavily used ports will be; Mundra, JNPT, New Mangalore and Chennai. As products are generally heavy, there should be a great potential in coastal shipping, when products from the western side of India are sold to the clients on the eastern side.

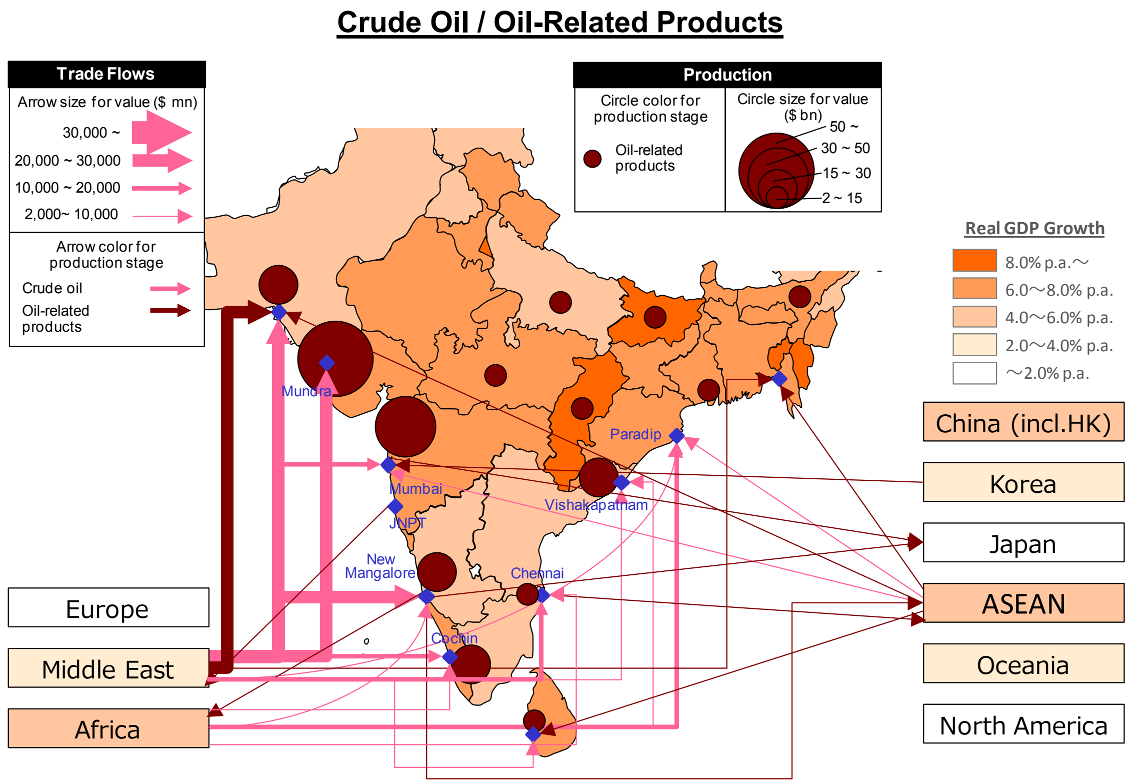
Pakistan

- One of the major categories in Pakistan’s machinery market is the textile machinery, such as those for spinning, weaving and processing. Given the importance of the industry to the economy, the spinning sector is expected to grow steadily.
- For that, Pakistan textile industry has to overcome the problem of low productivity due to its obsolete machineries, which requires high investments. The demand for textile machinery has almost been entirely met by imports, in which China and Taiwan has begun to play a key role.
- While the whole machinery sector has started to explore the expansion domestic production, import substitution to the similar extent to India is less likely within the forecast period.



Source: Survey Team

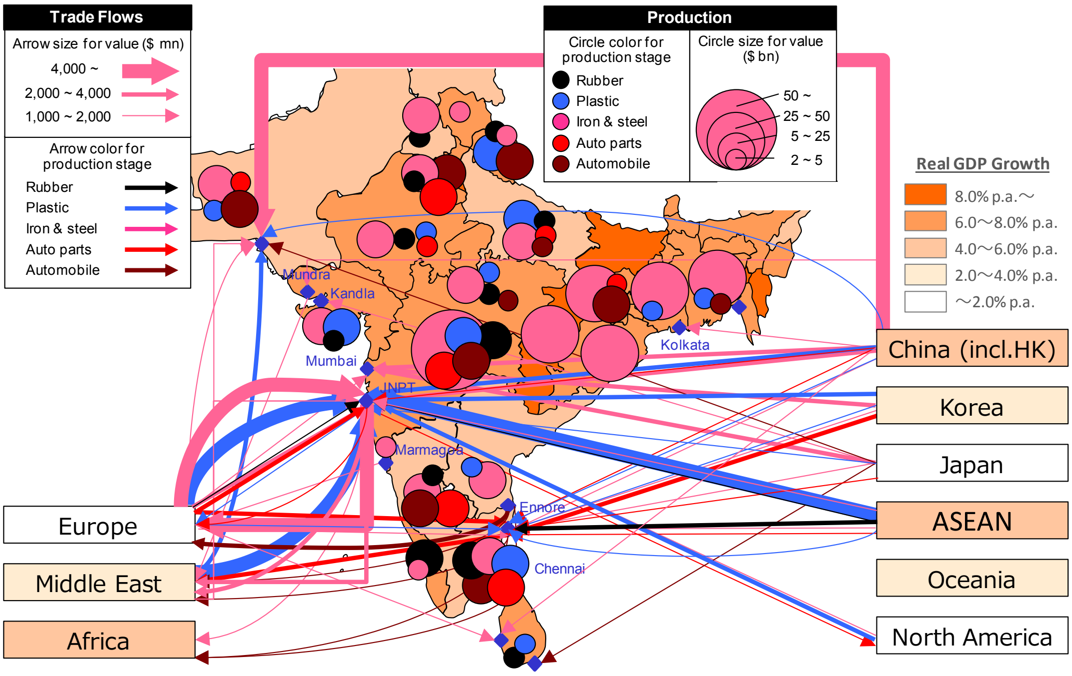
Figure 3.7 Supply Chains in 2030: Base Case (2012/13 Price) (1/5)



Source: Survey Team

Figure 3.8 Supply Chains in 2030: Base Case (2012/13 Price) (2/5)

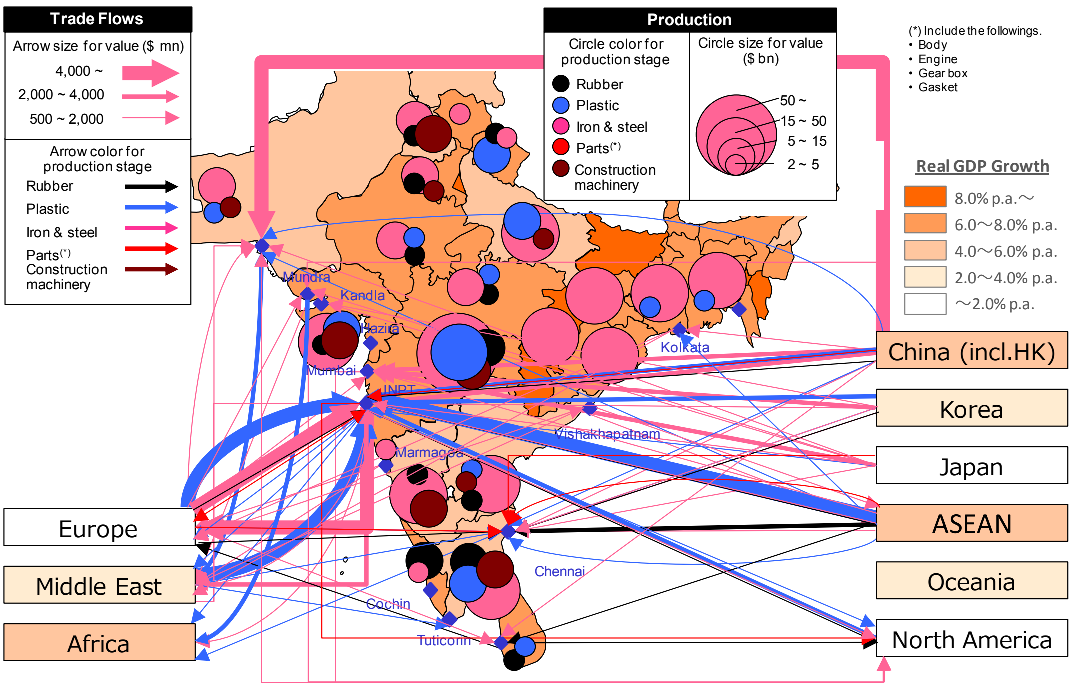
Automobile



Source: Survey Team

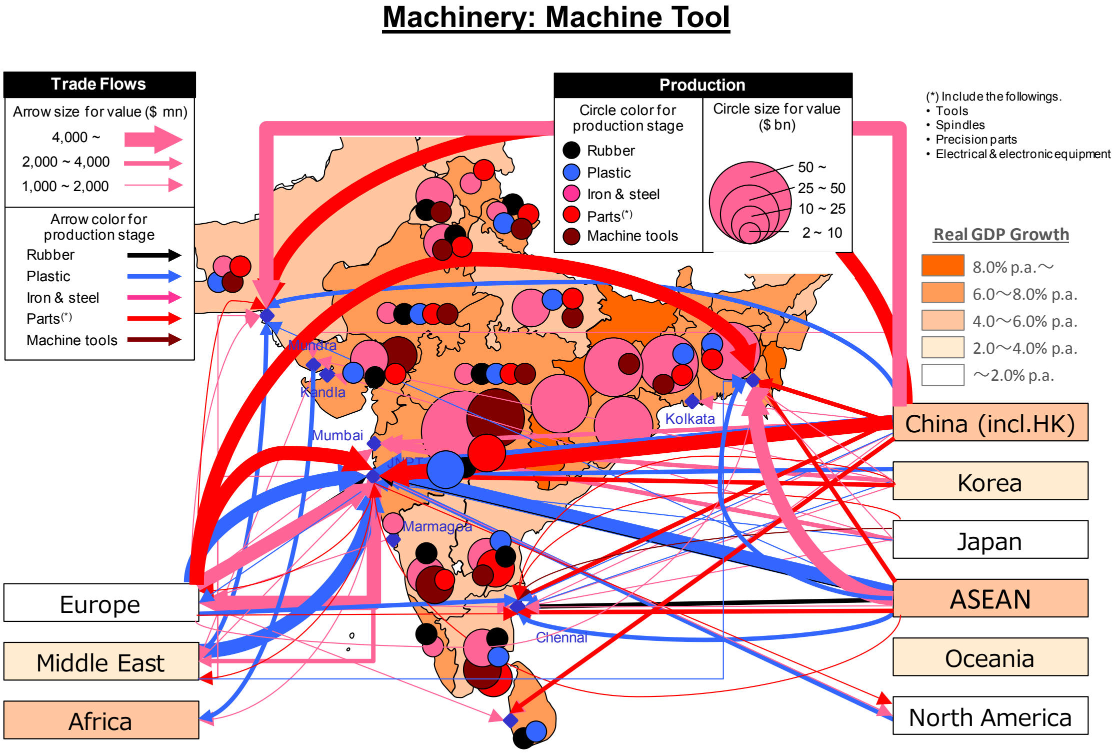
Figure 3.9 Supply Chains in 2030: Base Case (2012/13 Price) (3/5)

Machinery: Construction Machinery



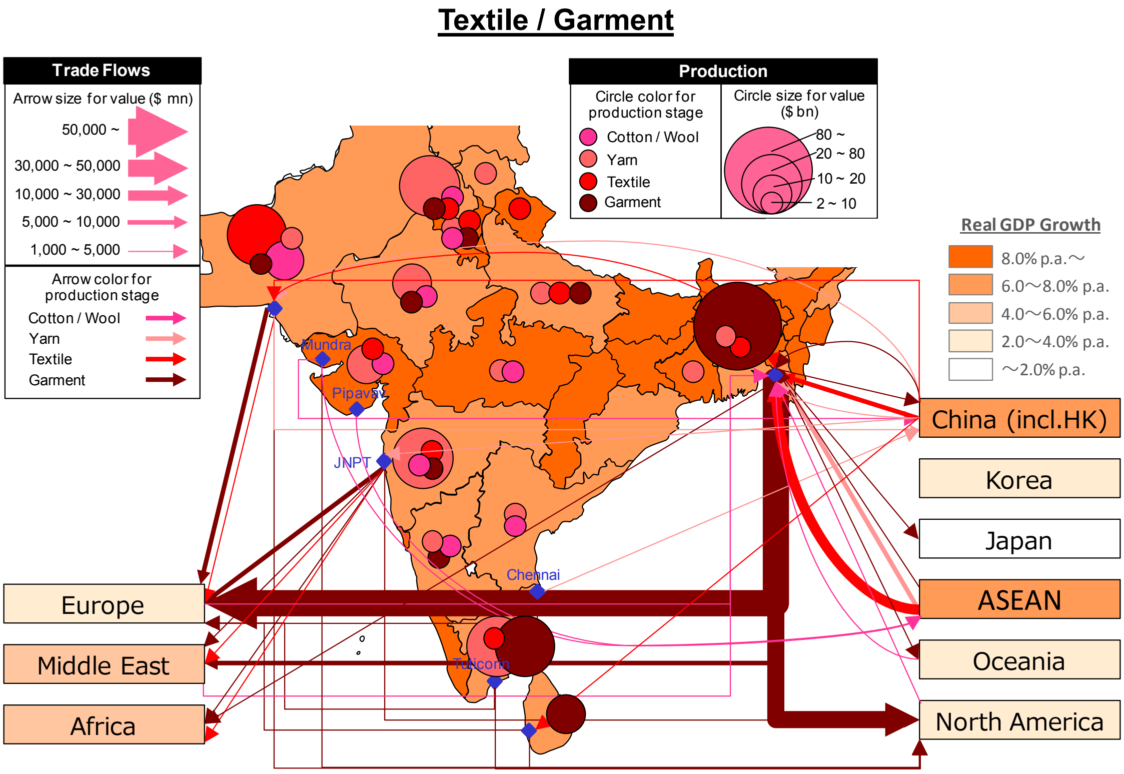
Source: Survey Team

Figure 3.10 Supply Chains in 2030: Base Case (2012/13 Price) (4/5)



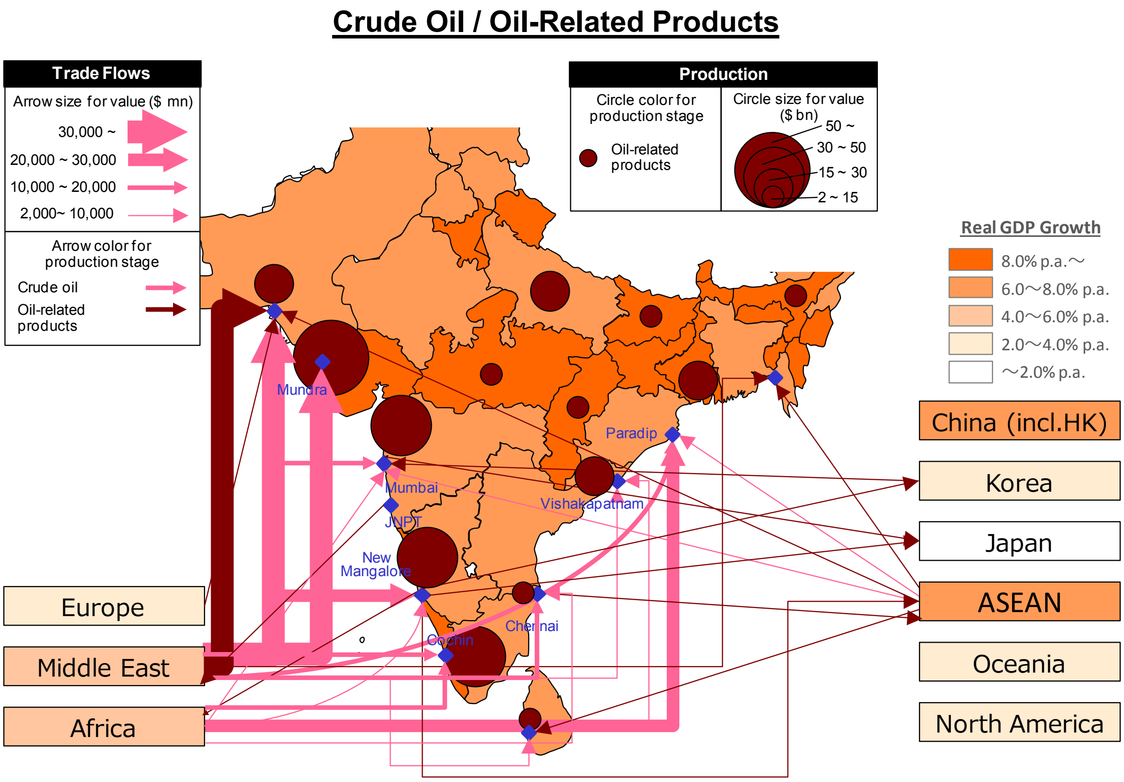
Source: Survey Team

Figure 3.11 Supply Chains in 2030: Base Case (2012/13 Price) (5/5)



Source: Survey Team

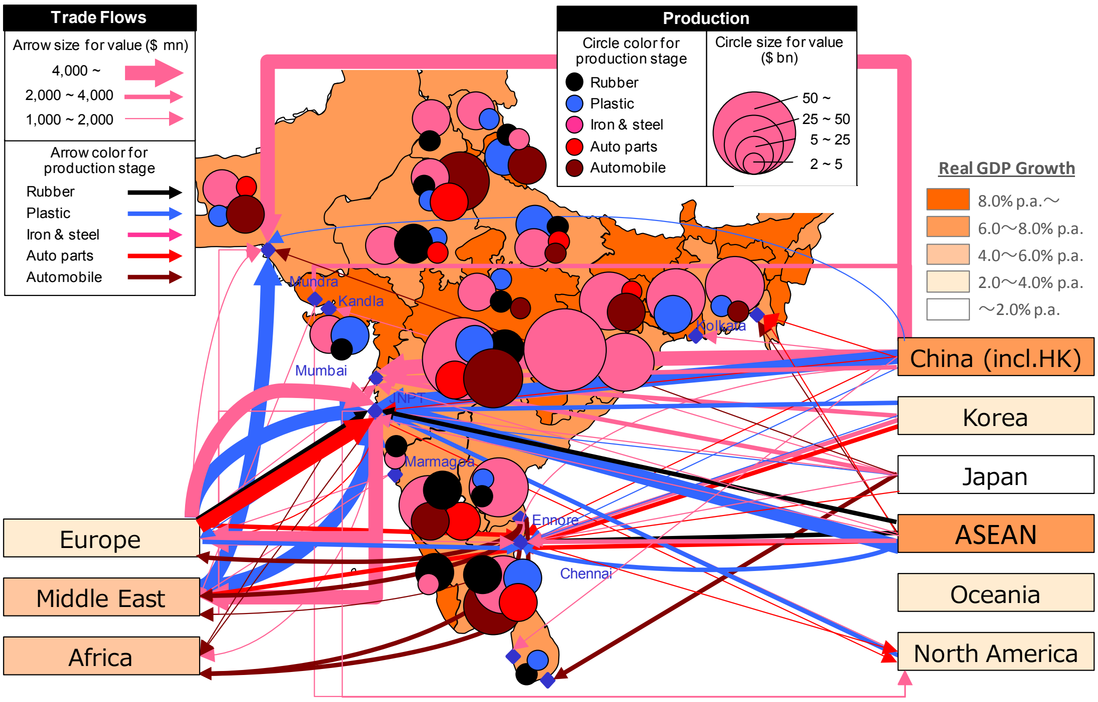
Figure 3.12 Supply Chains in 2030: Upside Case (2012/13 Price) (1/5)



Source: Survey Team

Figure 3.13 Supply Chains in 2030: Upside Case (2012/13 Price) (2/5)

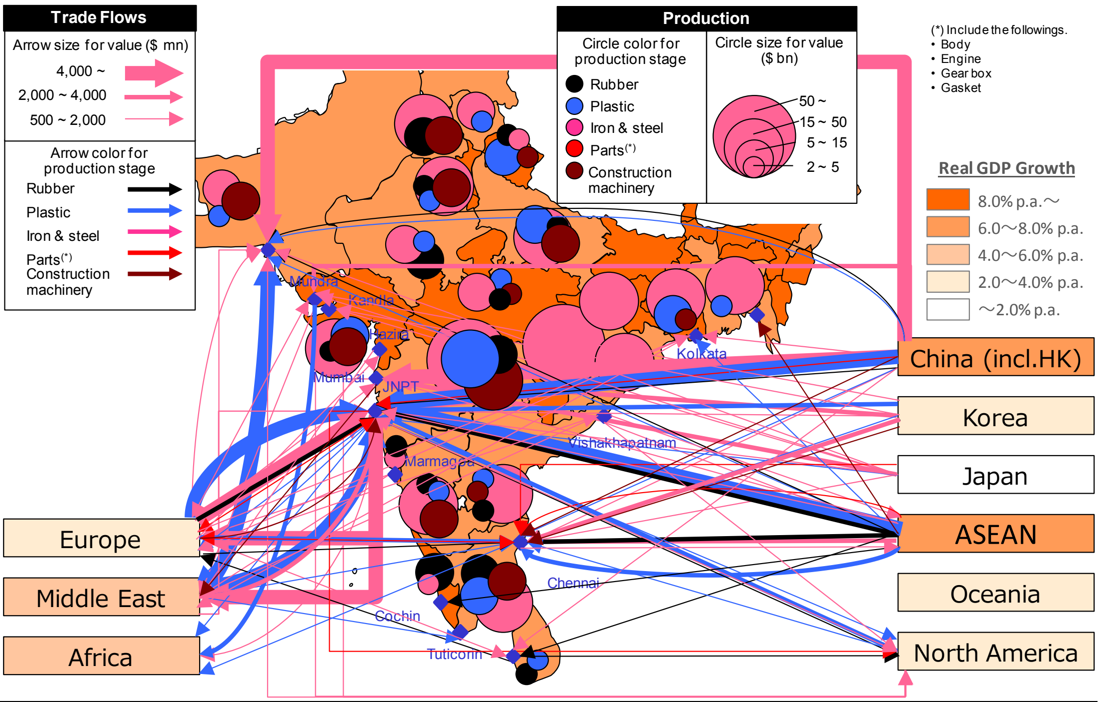
Automobile



Source: Survey Team

Figure 3.14. Supply Chains in 2030: Upside Case (2012/13 Price) (3/5)

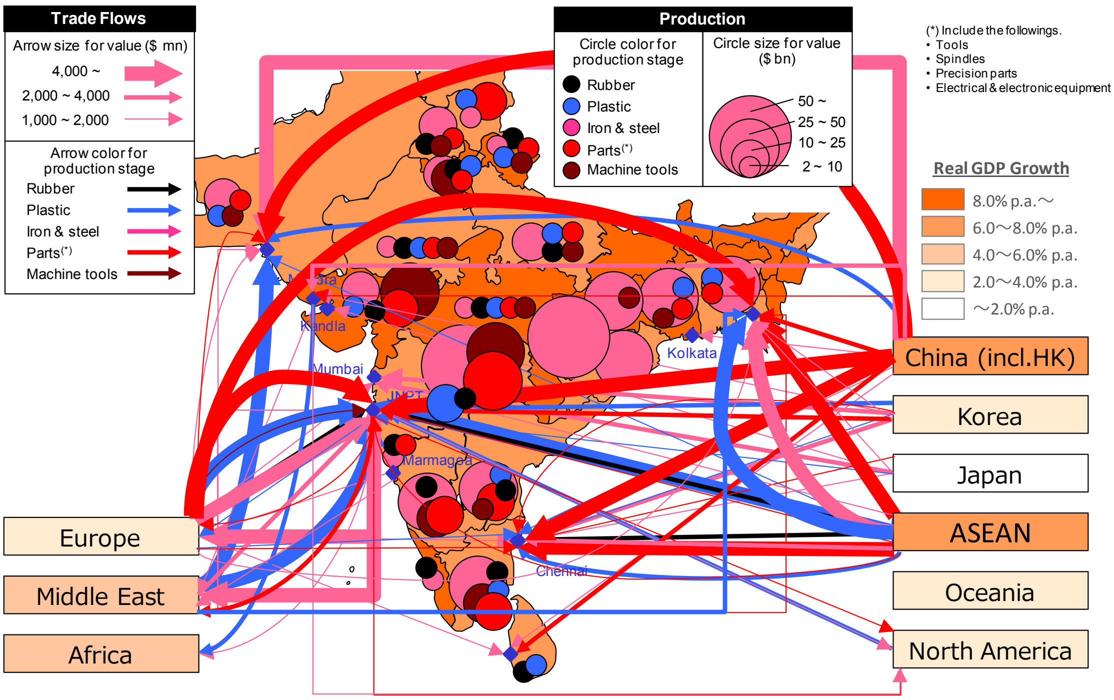
Machinery: Construction Machinery



Source: Survey Team

Figure 3.15 Supply Chains in 2030: Upside Case (2012/13 Price) (4/5)

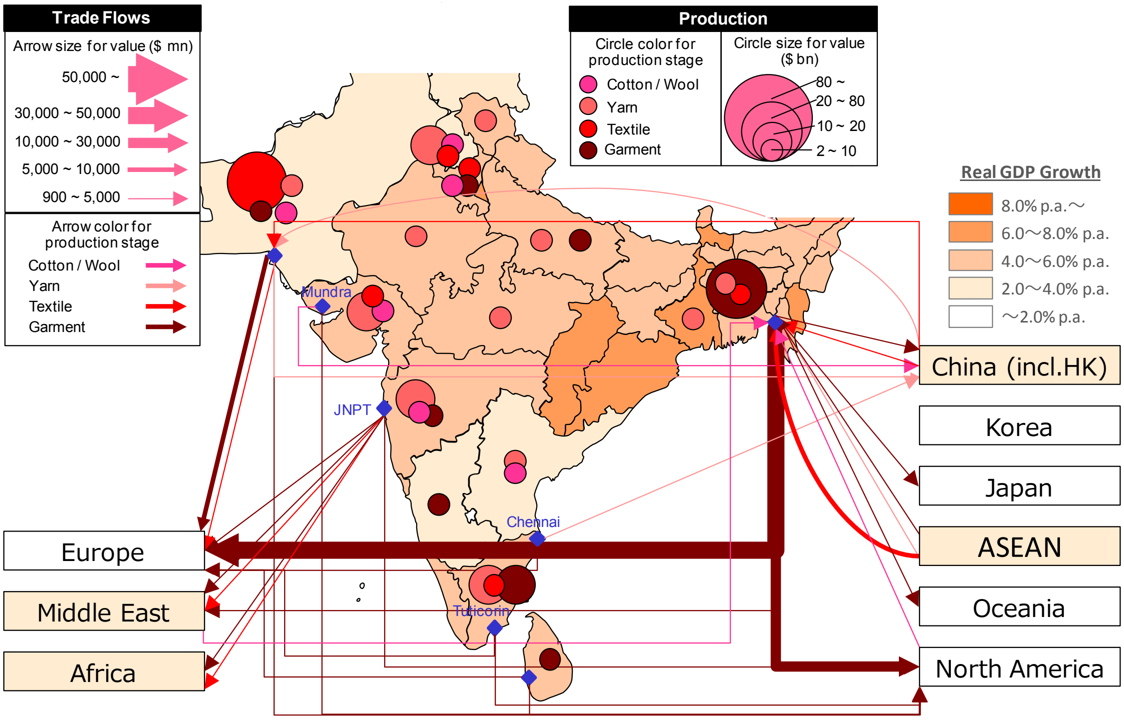
Machinery: Machine Tool



Source: Survey Team

Figure 3.16 Supply Chains in 2030: Upside Case (2012/13 Price) (5/5)

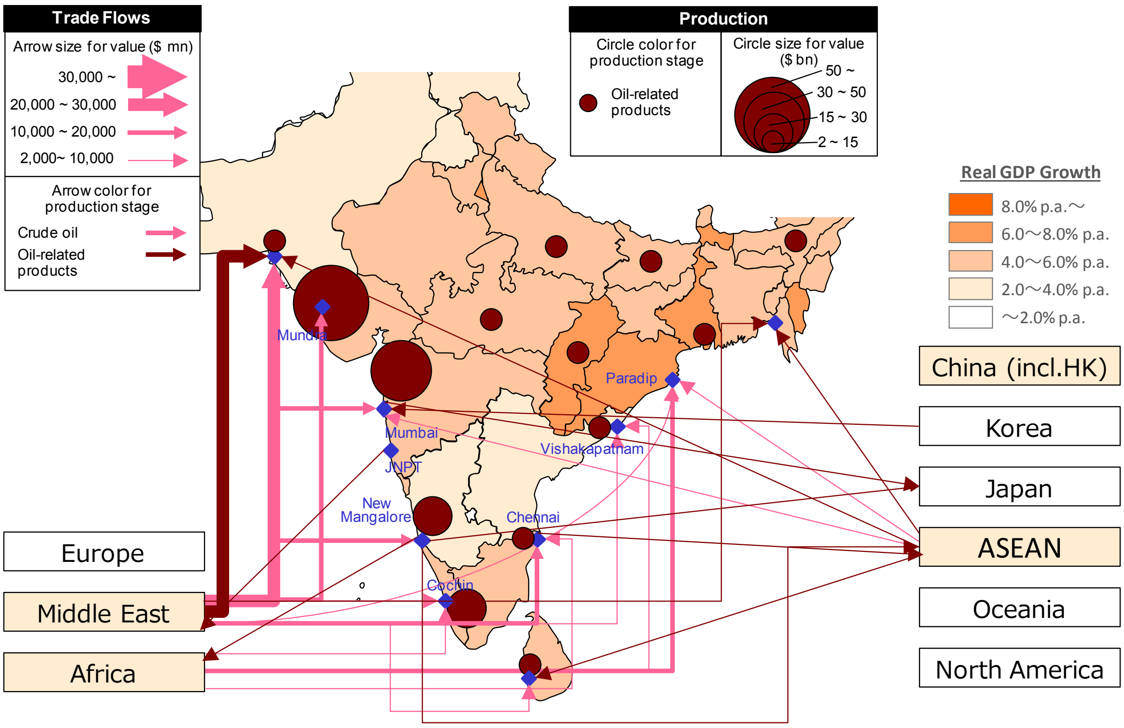
Textile / Garment



Source: Survey Team

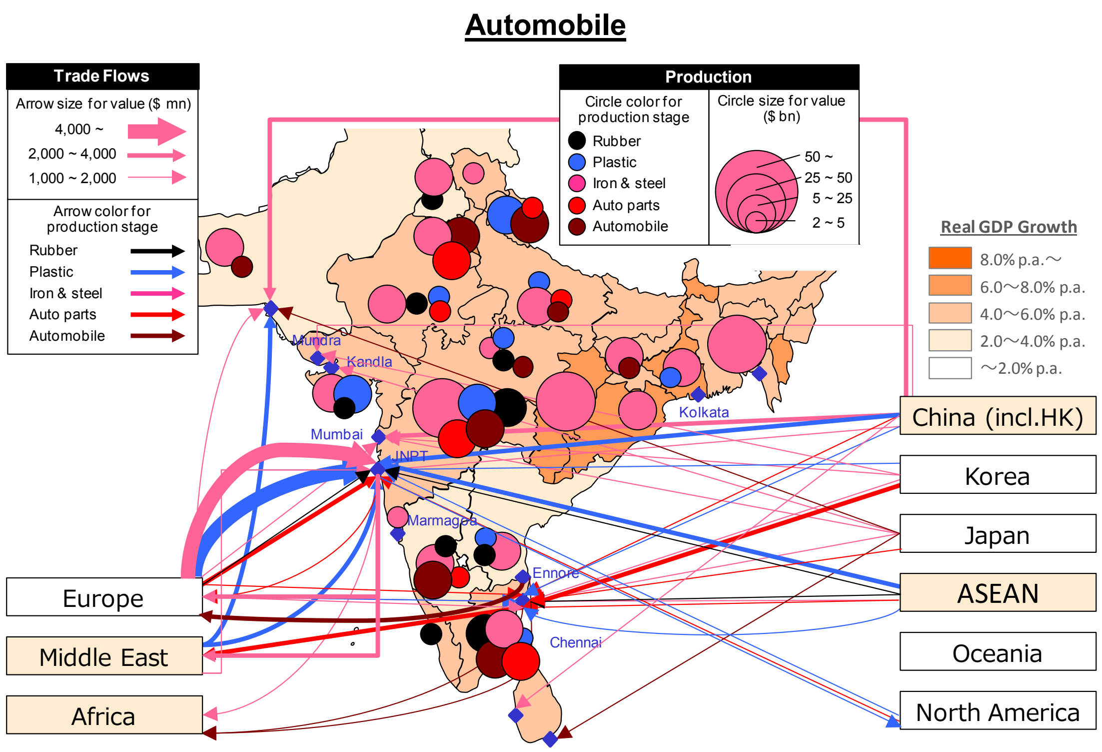
Figure 3.17 Supply Chains in 2030: Downside Case (2012/13 Price) (1/5)

Crude Oil / Oil-Related Products



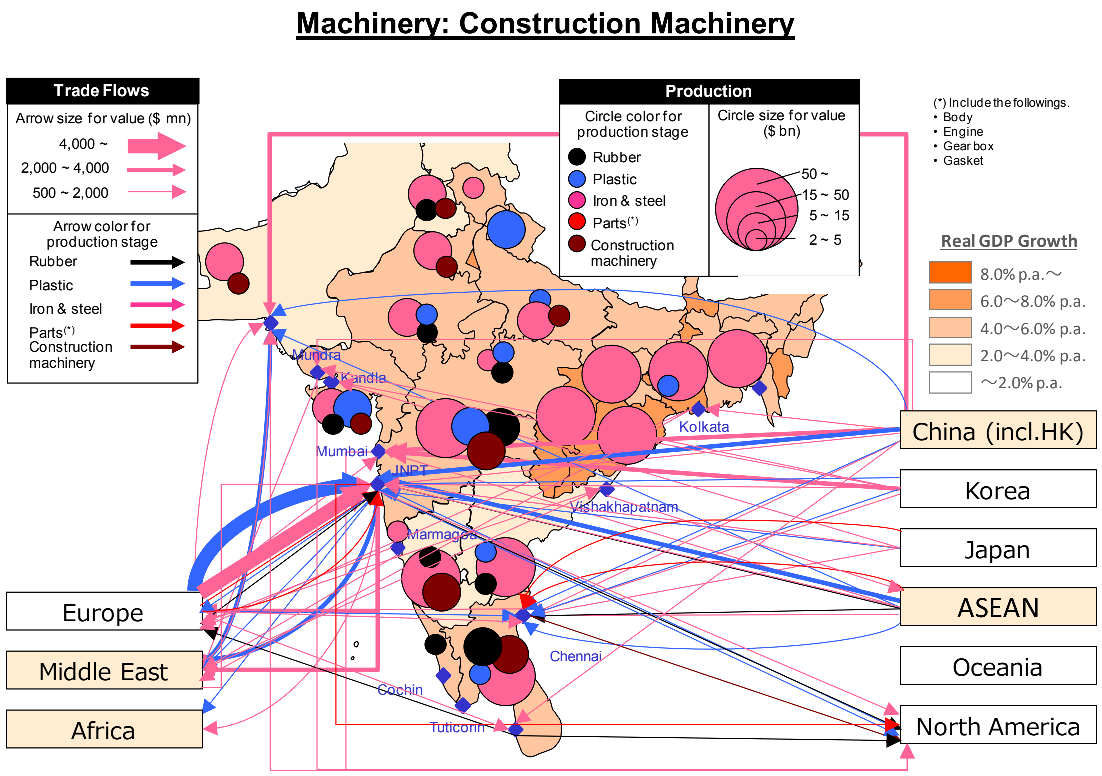
Source: Survey Team

Figure 3.18 Supply Chains in 2030: Downside Case (2012/13 Price) (2/5)



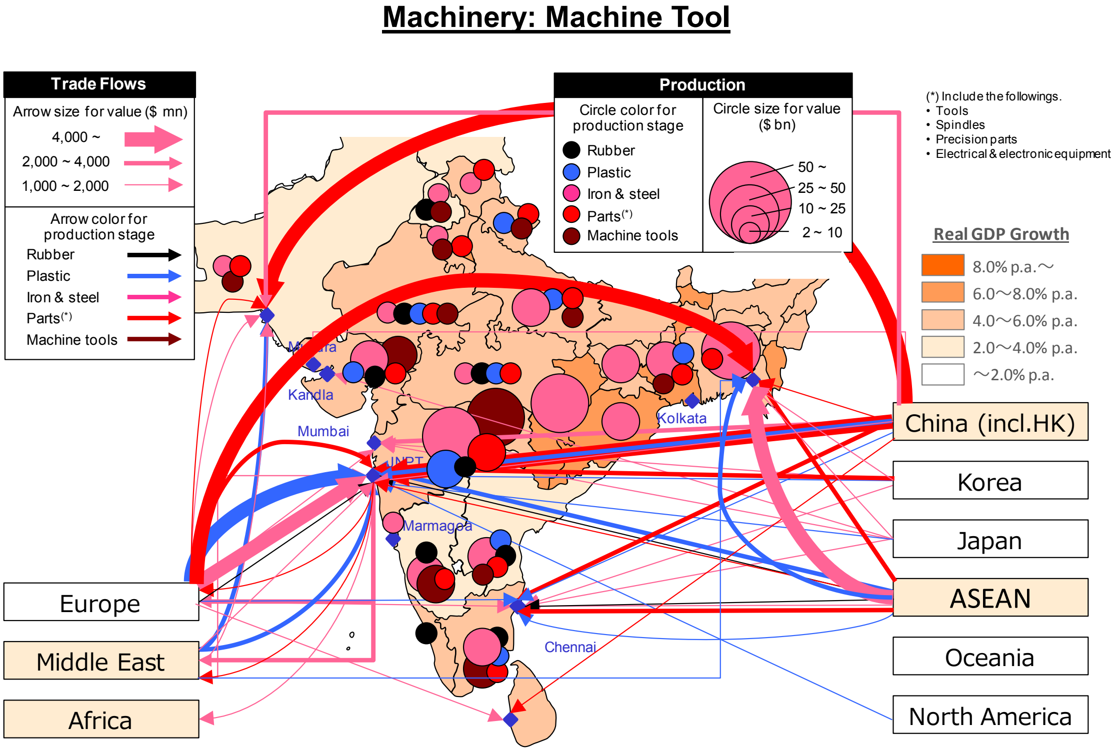
Source: Survey Team

Figure 3.19 Supply Chains in 2030: Downside Case (2012/13 Price) (3/5)



Source: Survey Team

Figure 3.20 Supply Chains in 2030: Downside Case (2012/13 Price) (4/5)



Source: Survey Team

Figure 3.21 Supply Chains in 2030: Downside Case (2012/13 Price) (5/5)

3.5.7 Summary of Analysis

From the future images of regional supply chains, three main conclusions can be drawn.

First, according to the estimation, intra-Regional trade dependency in South Asia is less likely to increase drastically. Instead, the Region will be playing a greater role in the global supply chains. This can be even visually observed in the arrows for the trade flows in the figures show above; i.e., the arrows become bigger for the trade flows vis-à-vis the rest of the world than those within the Region.

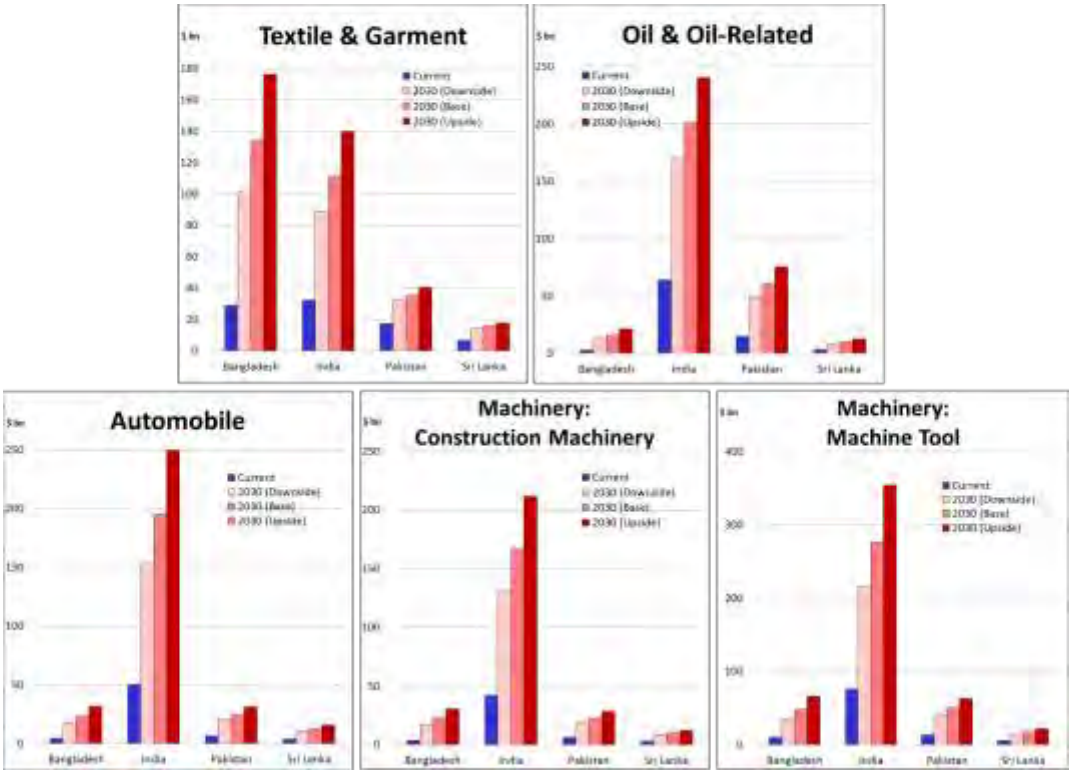
Second, there are likely to be the countries with main focus on meeting domestic demands, such as India and Pakistan, and the countries with greater emphasis on external demands, as in the cases of Bangladesh and Sri Lanka. Formulation of supply chains can be much affected by such demand structure within the Region.

And lastly, it is critical for each industry to be able to add higher values to their products, not only for playing a greater role in the global supply chains, but also for extending the domestic industry structure toward downstream production stages. This has already taken place in textile/garment and oil-related industries, and is expected to accelerate in automobile and machinery sectors.

Here are some of the specific observations, both general and sector-wise.

<u>General</u>

- In the Base Case, trade flows into and out of the region is expected to expand by 3.7 times in the next 15 years. In the Upside and Downside Cases, the numbers will be 4.7 times and 2.9 times, respectively.



Source: Survey Team

Figure 3.22 Sector Growth (Import + Export) by Scenario (2012/13 price)

- Regarding the dependency on intra-Regional trade (i.e. share of the intra-Regional trade to overall trade flows), higher dependency is expected in 2030 for the following flows, as summarized in Table 3.6;
  - Textile & garment: Regional dependency increases for the export flows from India, Pakistan (except for the Downside Case) and Sri Lanka, while those from Bangladesh, mainly for the final products, are likely to remain targeted more to the outside markets.
  - Oil & oil-related product: Greater dependency is expected for the exports from Pakistan and Sri Lanka, whereas for the imports, only India is likely to have a higher dependency on the region (although the increase is just a fractional one).
  - Automobile: Regional dependency increases for the export flows from Bangladesh, India and Sri Lanka, and for the import flows to Sri Lanka.
  - Machinery: Overall increase can be expected for the regional dependency, especially for the export flows, mainly with India as higher-end final products, whereas those from Bangladesh, Pakistan and Sri Lanka are focused more on the lower-end products or the intermediate goods.

Table 3.6 Change in the Dependency on Regional Trade (Current➔2030)

Dependency on Imports from the Region (*)			Sector	Dependency on Exports to the Region (*)		
Downside Case	Base Case	Upside Case		Downside Case	Base Case	Upside Case
			Bangladesh			
			Textile & Garment			
			Oil & Oil-related			
			Automobile	X	X	X
			Machine Tool	X	X	X
			Construction Machinery	X	X	X
			India			
			Textile & Garment	X	X	X
X	X	X	Oil & Oil-related			
			Automobile	X	X	X
			Machine Tool	X	X	X
			Construction Machinery	X	X	X
			Pakistan			
			Textile & Garment		X	X
			Oil & Oil-related	X	X	X
			Automobile			
			Machine Tool	X	X	X
			Construction Machinery			
			Sri Lanka			
X	X	X	Textile & Garment	X	X	X
			Oil & Oil-related	X	X	X
X	X	X	Automobile	X	X	X
		X	Machine Tool	X	X	X
X	X	X	Construction Machinery	X	X	X

(*) 'X' is shown when the dependency on regional trade for the year 2030 is higher than the current level.
Source: Survey Team

Textile / Garment

- The region is likely to go through a gradual change in the existing functional division, in which; 1) Bangladesh and Sri Lanka focus on export-oriented model, with different level of value-added, and 2) India and Pakistan cater more to the domestic demand, and plays a greater role as a supplier of the raw materials and intermediate products to other countries both in and outside the region.

- In India, additional production capacity will be mostly absorbed by expanding domestic demand, and capability to produce higher value-added items will be increased to meet the local demand.
- By the same token, Pakistan will also face the necessity to go upstream of the value chain with a view to expanding exports, but may face tougher competition with China.
- Sri Lanka, exploring the possibility to become a marketing hub for the Middle East, is also likely to expand its export within the region, while those to US and Europe seems almost saturated.
- Having said that, the relative cost advantage/disadvantage of each country is less likely to change drastically, as the input costs should increase rather in parallel across the region.
- As for the export from the region, the destination is likely to be diversified from the currently dominant US and Europe to other regions, including emerging markets such as Middle East and Africa.

Oil / Oil-Related Products

- Except Pakistan, expansion in the production capacity of crude oil cannot be expected in the near future, and the Region is likely to remain as a net importer of crude oil, mainly from the Middle East. India is expected to increase its domestic production, but it will be more than offset by the high growth of the local demand.
- On the other hand, production capacity of refined items is likely to increase, especially in India and Bangladesh, in line with the expansion of their domestic economies. Especially, India is expected to become a ‘refinery hub’, but the share of its export to overall production will not increase, due, once again, to the growing domestic demand.
- Both in India and Bangladesh, current capacity of the refineries will not be enough, which calls for a need to expand the capacity of existing facilities or even establish new ones. As a result of such facilitation, there is likely to be a functional division between the west and the east side of India, in which the former will export to Europe/Africa and the latter to Southeast Asia.

Automobile

- For the next decade or two, India will lead the automobile demand on the back of further penetration due to the income growth, to which a majority of additional production capacity will be dedicated. And only an incremental part will be directed to the export to other emerging markets such as Middle East and Africa. From the viewpoint of India, Bangladesh, Pakistan and Sri Lanka seem less attractive as export destination at this point.
- A full-fledge automobile cluster typically consists of a finished vehicle supplier and parts suppliers surrounding it, as already mentioned. And such structures have been materialized only in India and (to a less extent) Pakistan. Auto manufacturers operating in India and Pakistan are mainly targeting the domestic markets, while exports to other emerging markets, especially from India, are being sought.
- Although there have been discussions to bring major brands’ assembly lines to Bangladesh and Sri Lanka, large-scale production is less likely in the near future, due to the limited market size which can be well met by imports.
- For the time being, Bangladesh and Sri Lanka will focus on supplying the lower value-added parts to India and other markets outside the region, allowing more complicated

parts flow from outside the region (e.g. ASEAN, Japan, Europe). Therefore, development of backward linkage within the region will be observed only gradually.

- Also on the upstream side of the supply chain (e.g. iron and steel), import substitution will proceed gradually, shifting to higher value-added items. This is likely to take place not only in India, but also in Bangladesh and Pakistan, which, for the time being, will be constrained by the supply pressure from China for containing their excess capacity.

Machinery: Construction Machinery

- In general, Indian market, as well as other emerging markets (e.g. Africa), is likely to expand steadily, on the back of the great potential in infrastructure, construction and mining sectors.
- Similar to the automobile sector, India already has assembly lines for the major brands, producing 50-70% of the final products. Going forward, import substitution is expected for more critical and complicated parts (as in the case of Caterpillar).
- Import substitution is also likely to take place for upstream materials, such as rubber, steel and aluminum, which will contribute to saving the transport cost.
- Sri Lanka has a unique position as the top share solid tire supplier in the global market on the back of rich production of rubber, which is likely to be maintained throughout the forecast period.

Machinery: Machine Tool

- Currently, the region supplies the rest of the world with relatively low-end products, and a majority of local demands are met by imports from advanced countries (e.g. Europe and Japan). But considering the high demand growth going forward, further import substitution is expected for upstream items.
- Furthermore, India has a greater potential as a net exporter compared to the automobile sector, since the specification of the products does not reflect the local requirements so much as motor vehicles. Especially, for the product segments with cost advantage, sales increase can be expected not only for the advanced market but also for the emerging markets (e.g. Africa and Middle East), to complete with the products from China.
- However, given the ‘technology follower’ nature of Indian machinery sector, certain share of imports will remain even in the long run.

4. Maritime Network and Development Programs in the Region

4.1 Overview of Regional Maritime Network

4.1.1 Overview of the Ports in South Asia

Ports in the South Asia Region are located in the middle of the busiest East-West maritime trade lane. The access to the east coast of North America is also relatively good by stretching further from Europe. Geopolitical importance of the South Asian ports is increasing; firstly as a gateway in the Indian Ocean Rim Region with the growing trades with the Middle East and East Africa, secondary as a gateway to the Indo-Pacific Region with deepening economic cooperation with the Southeast Asian countries.

(1) Ship Calls

This section gives an overview on the ship calls at the ports in South Asia. The data were extracted from “Seasearcher”; the data base of Lloyd’s List Intelligence. The numbers and deadweights of the ships having called at the ports in South Asia in 2014 are shown by ship type in Tables 4.1 to 4.4 hereunder. It should be noted that, for container ships and general cargo ships, the value of deadweight does not necessarily mean the volume of cargoes actually loaded/ discharged to/from a ship but just denotes the loading capacity of a ship, as those ships are mostly deployed in the liner trades where the ships call at multiple ports and load/discharge partial cargoes at each port. On the other hand, for the dry/liquid bulk carriers, the deadweights can be regarded as nearly equal to the volume of cargoes actually loaded/discharged.

Container and General Cargo Ships

Colombo Port marked the largest in number of ships and total deadweight. The largest ship that called the Port of Colombo had over 186,000 deadweight ton (DWT).

Table 4.1
Numbers and Deadweights of the Container/General Cargo Ships Calling at South Asian Ports (Ships Sailed from the Ports in 2014)

Port	Nos of Ships	Total DWT	Average DWT	Maximum DWT
Colombo	3,204	142,675,711	44,530	186,650
JNPT	1,852	102,744,699	55,478	117,096
Mundra	1,110	51,129,817	46,063	138,377
Karachi	883	35,504,007	40,208	85,250
Pipavav	732	35,113,849	47,970	144,159
Bin Qasim	606	34,317,732	56,630	112,516
Chennai	917	23,851,885	26,011	67,727
Chittagong	1,224	22,979,359	18,774	46,500
Kochi	629	12,445,312	19,786	67,727
Mumbai	892	11,295,803	12,663	117,096
Visakhapatnam	436	10,341,863	23,720	79,278
Tuticorin	609	9,651,499	15,848	48,139
Hazira	440	8,988,716	20,429	85,446
Kolkata	748	7,299,243	9,758	19,404
Krishnapatnam	253	7,184,348	28,397	62,994
Haldia	256	3,559,901	13,906	55,861
Kandla	213	2,813,035	13,207	55,861
New Mangalore	156	2,473,955	15,859	49,755
Mormugao	160	2,103,041	13,144	53,022
Mongla	126	1,528,134	12,128	33,403
Paradip	74	1,066,426	14,411	55,861
Dahej	21	375,688	17,890	56,816
Galle	24	258,848	10,785	14,026
Kattupali	5	141,549	28,310	55,944
Hambantota	10	117,658	11,766	23,075
Trincomalee	3	22,682	7,561	13,060
Kulpi				0
Gwadar				0
Total	15,583	529,984,760	34,010	186,650

Source: Lloyd's List Intelligence "Seasearcher

Dry Bulk Carriers

Mundra Port handled the largest total deadweight of 55.0 million in 2014, due to the coal imports for the power plants. Large Cape-size bulkers over 319,000 DWT were handled at Visakhapatnam and Paradip Ports due to the iron ore exports.

Table 4.2
Numbers and Deadweights of the Dry Bulk Carriers Callingat South Asian Ports (Ships Sailed from the Ports in 2014)

Port	Nos of Ships	Total DWT	Average DWT	Maximum DWT
Mundra	513	54,994,201	107,201	207,529
Visakhapatnam	865	51,955,772	60,064	319,869
Krishnapatnam	500	44,140,803	88,282	206,118
Mumbai	1,079	43,377,697	40,202	207,529
Kandla	759	35,174,948	46,344	95,766
Haldia	493	30,093,025	61,041	180,200
Tuticorin	458	23,063,893	50,358	82,962
Hazira	388	21,606,028	55,686	165,289
Mormugao	303	18,443,020	60,868	174,732
New Mangalore	290	16,791,448	57,902	110,909
Dahej	220	16,302,714	74,103	185,879
Paradip	257	16,038,081	62,405	319,000
Karachi	276	13,803,876	50,014	93,336
Chittagong	330	12,319,740	37,333	180,200
Chennai	246	10,700,959	43,500	71,038
Pipavav	211	7,603,858	36,037	93,263
Bin Qasim	119	6,581,603	55,308	93,039
Mongla	123	4,806,885	39,080	73,498
Colombo	184	4,772,291	25,936	82,282
Kochi	104	3,739,743	35,959	319,869
JNPT	510	2,836,540	5,562	82,580
Kolkata	63	2,803,244	44,496	81,177
Hambantota	16	1,077,740	67,359	179,797
Trincomalee	15	491,871	32,791	77,053
Galle	10	153,374	15,337	43,245
Kattupali	1	84,062	84,062	84,062
Gwadar	2	64,501	32,251	32,701
Kulpi	1	56,837	56,837	56,837
Total	8,336	443,878,754	53,248	319,869

Source: Lloyd's List Intelligence "Seasearcher"

Liquid Bulk Tankers

Mumbai Port handled the largest total deadweight of 57.8 million in 2014, which mainly consists of mid-size crude oil tankers and product/chemical tankers, while larger crude oil tankers over 317,000 DWT were handled at Kochi, Mundra, Paradip, New Mangalore and Visakhapatnam.

Table 4.3
Numbers and Deadweights of the Liquid Bulk Tankers Calling at South Asian Ports (Ships Sailed from the Ports in 2014)

Port	Nos of Ships	Total DWT	Average DWT	Maximum DWT
Mumbai	1,310	57,758,944	44,091	164,787
New Mangalore	639	37,045,227	57,974	318,000
Visakhapatnam	570	27,364,643	48,008	317,441
Paradip	337	26,973,192	80,039	319,063
Karachi	502	25,326,295	50,451	116,038
Kochi	425	24,253,283	57,067	320,412
Chennai	410	21,249,526	51,828	308,492
Dahej	359	18,746,008	52,217	130,171
Kandla	712	18,662,724	26,212	52,650
Haldia	870	18,637,476	21,422	114,783
Bin Qasim	401	17,954,965	44,775	113,976
JNPT	565	17,737,296	31,393	112,723
Mundra	310	14,414,149	46,497	319,819
Hazira	382	13,248,785	34,683	122,006
Chittagong	355	10,469,916	29,493	116,038
Colombo	480	7,177,438	14,953	281,501
Tuticorin	196	3,729,731	19,029	73,711
Krishnapatnam	205	3,577,881	17,453	51,604
Mormugao	136	3,495,836	25,705	299,999
Kolkata	221	2,849,514	12,894	308,930
Pipavav	35	544,443	15,556	45,544
Hambantota	10	459,569	45,957	157,410
Mongla	37	298,675	8,072	50,096
Galle	9	269,755	29,973	114,809
Trincomalee	2	219,842	109,921	147,498
Kattupali	1	54,783	54,783	54,783
Kulpi				
Gwadar				
Total	9,479	372,519,896	39,299	320,412

Source: Lloyd’s List Intelligence “Seasearcher”

RORO and Vehicle Carriers

Mumbai Port handled the largest total deadweight of 3.9 million ton. Most of the ship calls at Hambantota were for transshipment.

Table 4.4
Numbers and Deadweights of the RORO and Vehicle Carriers Calling at South Asian Ports (Ships Sailed from the Ports in 2014)

Port	Nos of Ships	Total DWT	Average DWT	Maximum DWT
Mumbai	214	3,939,689	18,410	30,438
Chennai	124	2,005,343	16,172	31,340
Hambantota	105	1,693,609	16,130	31,340
Mundra	44	882,412	20,055	30,438
Karachi	33	598,069	18,123	30,438
Colombo	32	509,257	15,914	21,199
Chittagong	43	370,256	8,611	11,676
Bin Qasim	16	268,784	16,799	21,500
Kandla	18	254,376	14,132	30,438
Mongla	26	194,809	7,493	9,301
Kolkata	15	117,009	7,801	13,139
Tuticorin	6	81,442	13,574	30,127
Visakhapatnam	5	66,091	13,218	13,238
Hazira	4	35,774	8,944	10,037
Haldia	3	34,792	11,597	19,120
Paradip	3	32,841	10,947	13,139
Krishnapatnam	2	26,661	13,331	13,337
Mormugao	2	19,000	9,500	11,260
Dahej	1	10,037	10,037	10,037
Kochi	1	7,195	7,195	7,195
Pipavav				
JNPT				
New Mangalore				
Kattupali				
Kulpi				
Trincomalee				
Galle				
Gwadar				
Total	697	11,147,446	15,993	31,340

Source: Lloyd's List Intelligence "Seasearcher"

(2) Cargo Handling Volumes

Containers

Table 4.5 shows the numbers of containers handled at the major ports in South Asia in 2014 in descending order. Colombo Port, the hub port in the east-west trade lane, marked the largest throughput of 4.9 million Twenty-Foot Equivalent Units (TEU) including 3.7 million TEU (75%) of transshipment. The second largest number of 4.5 million TEU was handled at Jawaharlal Nehru Port Trust (JNPT) with India's largest industrial agglomerations in its hinterlands. Concurrently there are many ports with throughputs less than a million TEU. In India, it is noteworthy that the gateway ports for the container freight are eccentrically located. In terms of transshipment containers, Colombo alone is playing the role of a regional hub port, while other ports handle mostly local cargoes.

Table 4.5 Container Throughputs at Major Ports in South Asia (2014)

Port	'000 TEUs
Colombo	4,880
JNPT	4,466
Mundra	2,720
Chittagong	1,860
Karachi	1,720
Chennai	1,552
Bin Qasim	971
Pipavav	780
Tuticorin	560
Kolkata	528
Kochi	365
Visakhapatnam	248
Haldia	102
Krishnapatnam	91
New Mangalore	63
Mumbai	45
Mongla	42
Mormugao	25
Paradip	4

Source: Indian Ports Association, port authorities' web sites Intelligence

Non-container Cargoes

The latest statistics of the ports in South Asia are as follows. The periods of statistics vary due to the different fiscal years of the state governments.

1) Bangladesh

The statistics of Chittagong Port and Mongla Port are available on each port authority's web site as below:

a) Chittagong

Table 4.6
Cargo Handling Volumes at Chittagong Port and Dhaka ICD (Jul.2012–Jun. 2013)

		Containers ('000 ton)	Non-Container ('000 ton)	Total ('000 ton)	Major Commodities			Containers (TEU)
Chittagong	import	9,928	28,384	38,312	Import: Food grain, Cement clinker, Sugar, Salt, Fertilizer, General cargo, Iron Materials, Chemicals, Coal and Edible Oil etc. Export: Ready Made Garments, Knitwear, Fertilizer, Jute & Jute Products, Hides & Skins, Tea, Naphtha, Molasses, Frozen Foods etc.	Chittagong	import	743,547
	Export	4,628	432	5,060			Export	725,166
	S.Total	14,556	28,816	43,372			S.Total	1,468,713
Inland ICD		0	6,088	6,088		Dhaka ICD	import	31,053
Dhaka ICD	import	324	0	3			Export	31,585
	Export	134	0	134			S.Total	62,638
	S.Total	458	0	458				
Total		15,014	34,903	49,917		Total		1,531,351

Source: Chittagong Port Authority web site

b) Mongla

Table 4.7 Cargo Handling Volumes at Mongla Port (Jul. 2012–Jun. 2013)

(unit : '000 metric tons)

	Dry Bulk						Liquid Bulk			Vehicles	Containers, General Cargoes	Total
	Fertilizer	Clinker	Grain	Coal	Others	S.Total	Crude Oil, Petro. Products	Gas	S.Total			
Import	1,235	856	160	20	248	2,519	29	61	90	6	325	2,940
Export	0	0	0	0	0	0	0	0	0	0	201	201
Total	1,235	856	160	20	248	2,519	29	61	90	6	526	3,141

	Containers (TEUs)
Discharged	21,994
Shipped	21,879
Total	43,873

Source: Mongla Port Authority web site

2) India

Table 4.8 shows the cargo volumes handled at 13 major ports in India during fiscal year 2014. The ports are sorted in descending order of the total volume of non-container cargoes. Kandla Port handled the largest volume of 92.5 million ton including 55.6 million ton of liquid bulk. Paradip Port marked the second largest of 71.0 million ton including 38.0 million ton of thermal and coking coal. JNPT was ranked the last due to its small volume of non-container cargoes.

Table 4.8
Cargo Handling Volumes at 13 Major Ports in India(Apr. 2014–Mar. 2015)

(unit:'000 tons)

Port	Liquid Bulk	Iron Ore	Fertilizer		Coal		Other Cargo	Non-container total	Container		Total
			Finished	Raw	Thermal	Coking			'000 Tons	'000 TEUs	
Kandla	55,589	1,160	3,847	655	9,725	242	21,279	92,497	-	-	92,497
Paradip	17,976	2,181	51	4,378	30,135	7,876	8,347	70,944	67	4	71,011
Mumbai	36,285	-	172	276	4,779	-	19,667	61,179	481	45	61,660
Visakhapatnam	14,641	8,301	1,838	720	2,779	6,074	19,278	53,631	4,373	248	58,004
New Mangalore	22,973	1,474	649	82	2,726	5,452	2,289	35,645	921	63	36,566
Ennore	3,188	-	-	-	24,023	330	2,710	30,251	-	-	30,251
Haldia	5,500	2,342	329	482	1,185	5,997	13,218	29,053	1,957	102	31,010
Chennai	12,736	146	197	344	-	-	9,173	22,596	29,945	1,552	52,541
Tuticorin	606	46	438	1,053	8,613	-	10,624	21,380	11,034	560	32,414
Kochi	14,017	-	68	378	-	98	1,788	16,349	5,246	365	21,595
Mormugao	571	758	227	-	1,937	6,631	4,275	14,399	312	25	14,711
Kolkata	626	133	98	99	-	124	6,093	7,173	8,109	528	15,282
J.N.P.T.	4,181	-	-	-	-	-	2,687	6,868	56,934	4,466	63,802
Total	188,889	16,541	7,914	8,467	85,902	32,824	121,428	461,965	119,379	7,958	581,344

Source: Indian Ports Association

3) Pakistan

The statistics of Karachi Port and Port Bin Qasim are available on each port authority's web site as below

a) Karachi

Table 4.9 Cargo Handling Volumes at Karachi Port (Jul. 2013–Jul. 2014)

('000 tons)

	Dry Bulk	Liquid Bulk	General Cargoes	Total
Import	5,995	11,707	12,641	17,702
Export	1,015	1,401	8,591	2,416
Total	7,010	13,108	21,232	20,118

	Containers ('000 TEUs)
Import	811
Export	780
Total	1,591

Source: Karachi Port Trust web site

b) Port Bin Qasim

Table 4.10 Cargo Handling Volumes at Port Bin Qasim (Jul. 2013–Jun. 2014)

('000 tons)

	Dry Bulk	Liquid Bulk	Containers	Total
Import	1,708	11,342	5,404	18,454
Export	1,707	30	5,584	7,321
Total	3,415	11,372	10,988	25,775

	Containers ('000 TEUs)
Import	420
Export	434
Total	854

Source: Port Bin Qasim Authority web site

4) Sri Lanka

The latest statistics of the ports of Colombo, Trincomalee and Galle are for the year of 2011, which are available on the web site of Sri Lanka Ports Authority.

Table 4.11 Cargo Handling Volumes at Sri Lankan Ports (2011)

('000 metric tons)

	Dry Bulk, General Cargoes	Liquid Bulk	Containers	Total
Colombo	3,342	4,565	54,109	62,015
Trincomalee	2,460	114		2,574
Galle	464			464
Total	6,265	4,678	54,109	65,053

Source: Sri Lanka Ports Authority "Annual Report 2011"

As for Hambantota Port, a Sri Lankan newspaper "The Island" reported that 79,147 vehicles of transshipment and 36,401 vehicles of imports were handled at the port in the 21 months from June 2012 to March 2014, and 118,570 ton of break bulk were handled in 2013.

4.1.2 Overview of the Maritime Transportations Related to South Asia

(1) Container Trade

<u>Trade Volume</u>

The world container movements are shown in the origin/destination region matrix as Table 4.12 below. The exports from South Asia amount to 5.3 million TEU which represents a 3.4% share of total world exports. The major destinations are Europe, East Asia, North America etc. The imports to South Asia amount to 5.5 million TEU with 3.5% share in the world total imports. Fifty-four percent of South Asia's imports are from East Asia. It is noteworthy that the intra-Regional movements in South Asia are merely 156,000 TEU, which is smaller than any other intra-Regional movements in the world.

Table 4.12 Region-to-Region Container Trades in 2014 (in TEU Carried Onboard)

2014 (unit: '000TEUs carried onboard)

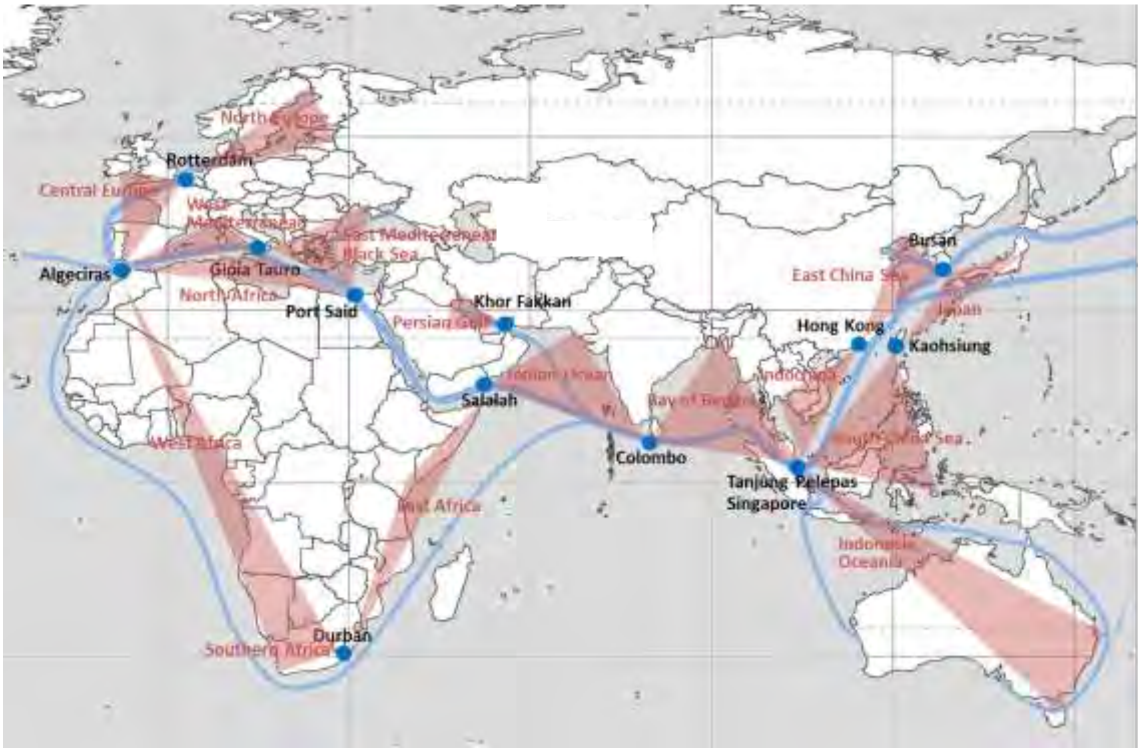
↓from to→	East Asia	Oceania	South Asia	Western Asia	Europe	Africa	North America	South America	Total	Share in the world exports
East Asia	48,100	2,154	2,537	3,390	15,400	2,705	15,165	4,323	93,775	60.0%
Oceania	1,700	281	172	140	189	54	172	32	2,739	1.8%
South Asia	1,223	86	708	596	1,467	274	804	155	5,312	3.4%
Western Asia	1,203	122	418	1,764	1,047	336	378	40	5,308	3.4%
Europe	6,961	399	810	2,571	4,262	1,686	3,829	1,694	22,212	14.2%
Africa	597	28	182	64	962	597	191	60	2,682	1.7%
North America	7,087	243	546	849	2,567	340	96	2,522	14,250	9.1%
South America	1,325	82	93	277	2,271	278	2,699	2,871	9,896	6.3%
Total	68,195	3,397	5,467	9,651	28,165	6,271	23,333	11,696	**156,174**	100.0%
Share in the wrorld imports	43.7%	2.2%	3.5%	6.2%	18.0%	4.0%	14.9%	7.5%	100.0%	

Source: MOL Research Office, calculations based on Drewry, IHS Global Insight, Seabury, CTS, Piers, conference statistics etc.

<u>Hub and Spoke System</u>

As a result of shipping lines' attempts to reduce their slot costs, many large container ships are now deployed in their East–West trade lanes. To optimize the economic effect of that deployment, "hub and spoke system" has been developed by the shipping lines. Figure 4.1 shows the major hub ports on the east-west trade lanes and the waters covered by the hub ports (simply indicated by triangle shapes).

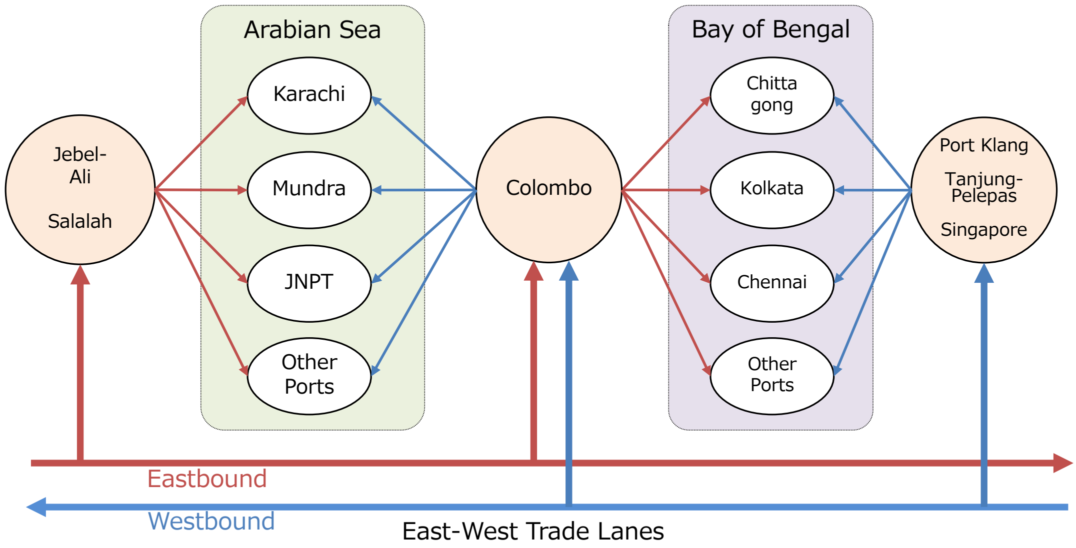
It is generally observed that, each water has 2 hub ports; one for west-bound located at the east end of the water, and the other for east-bound located at the west end of the water. In case of South China Sea, Kaohsiung is functioning as the east hub port, and Tanjung Pelepas or Singapore is functioning as the west hub port. Likewise in the Mediterranean Sea, Port Said is the east hub and Algeciras is the west hub.



Source: Survey Team

Figure 4.1 Major Hub Ports and their Covering Waters

Located in the middle of the East-West trade lanes, the South Asian ports are covered by 3 major hub ports, that is, Singapore (or Tanjung Pelepas, Port Klang), Colombo and Salalah (or Jebel Ali). In consideration of the geographical rotations of the calling ports enroute, the role sharing among those 3 hub ports can be simply illustrated as per Figure 4.2 below.



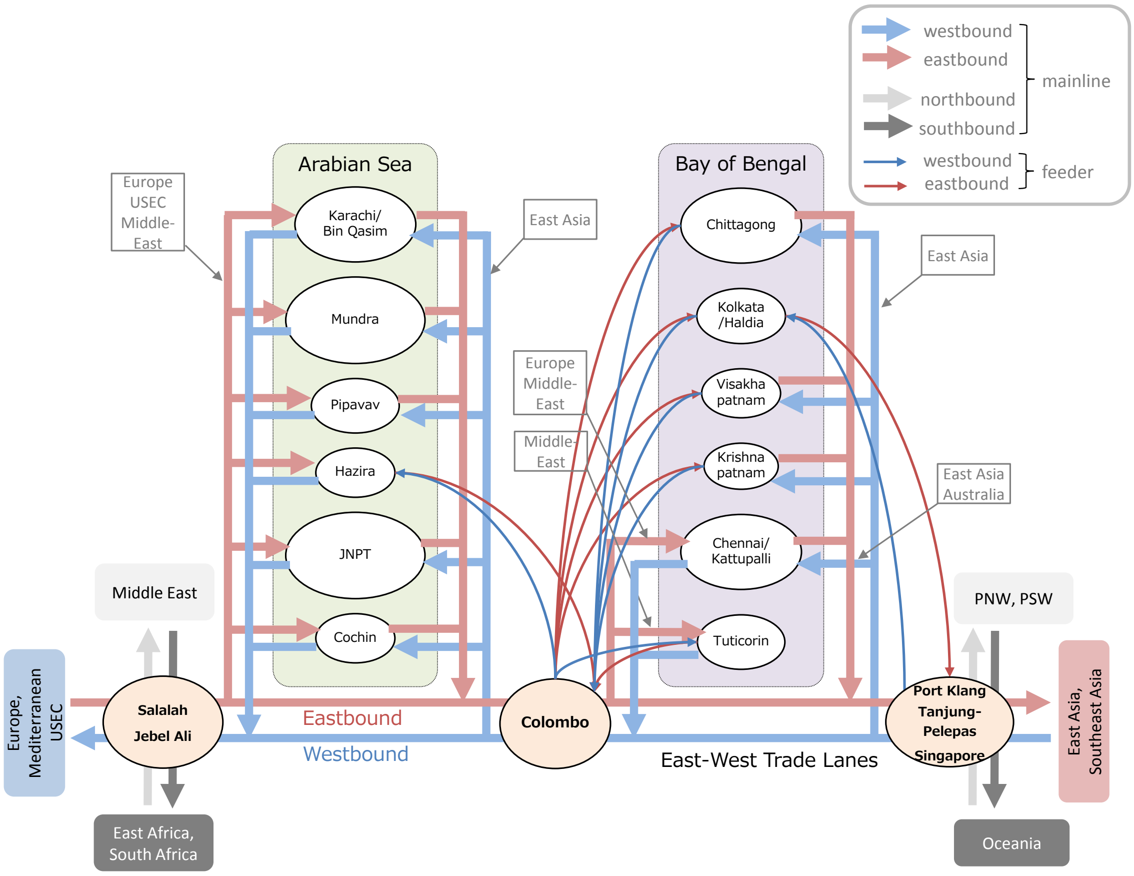
Source: Survey Team

Figure 4.2 Role Sharing among 3 Hub Ports in South Asia

When looking at the containers transshipped at those hub ports, some of them may be moving from mainlines to feeders, while others may be moving between different mainlines. Mainline-to-mainline transshipments are significant at Singapore (or Tanjung Pelepas, Port Klang) and Salalah (or Jebel Ali), while mainline-to-feeder transshipments are dominant at Colombo. An example of the mainline-to-mainline transshipment can be found in the container trade from India to East Africa; the containers are loaded on a South Asia/Middle East mainline vessel directly calling at Indian ports, then transshipped at Salalah to a Middle East/East Africa mainline vessel. Another example may be found in the India/US West Coast container trade; the containers firstly loaded on a South Asia/East Asia mainline vessel will be transshipped at Singapore to an East Asia/US West Coast mainline vessel.

<u>Coverage of the Ports by Mainline Direct Callings or Feeders</u>

Based on the identification of mainline and feeder vessel callings at each port, the current maritime transportation network for the container trade can be illustrated as per Figure 4.3 below:



Note: There may be some containers carried by feeder ships to/from the ports which are indicated as covered by main lines.
Source: Survey Team

Figure 4.3 Current Maritime Transportation Network for Container Trade

The figure shows that the major container ports in the Indian Ocean except Hazira are covered by mainline direct callings for both eastbound and westbound. In comparison, the ports in the Bay of Bengal have less coverage of direct callings for eastbound.

<u>Trade Lanes Covering South Asian Ports and Ships Deployed</u>

The capacities and maximum sizes of container ships deployed in South Asia are shown by calling port in Figure 4.4 and Figure 4.5 respectively, and the detail figures are indicated by trade lane and calling port in Table 4.13.

1) Mainlines

The South Asian ports are covered by multiple trade lanes such as for East Asia, Middle East, Indian Ocean Islands (IOI), Africa, Mediterranean, Europe and East Coast North America (ECNA). The trade lanes for West Coast North America (WCNA) and East Coast South America (ECSA) are available at Colombo Port only. Being a hub port in the region, Colombo Port is attracting the largest capacity of ships with 8.3 million TEU for mainlines and 1.9 million TEU for feeders. Sizes of the ships vary depending on the volume of trade and capacity of the port of call. The largest ship calling at South Asian ports is deployed on the East Asia/ Europe mainline by Maersk Line; it has a capacity of 13,200 TEU and calls only Colombo Port. The second largest ship (9,178 TEU) is deployed in South Asia/Europe mainline by MSC, calling at Mundra Port and JNP.

2) Feeders

The feeders can be categorized into 5 types by connecting hub; i) Singapore (or Tanjung Pelepas, Port Klang), ii) Colombo, iii) Salalah or Dubai (Jebel Ali, Khor Fakkan), vi) both Singapore and Colombo, v) both Colombo and Dubai. Large feeder ships with 4,000 TEU or more are deployed to connect Mundra, JNPT, Chennai, Visakhapatnam and the hub ports of Singapore, Dubai. The ports of Mormugao, New Mangalore, Haldia and Mongla are not covered by mainline ships but feeders only. Small feeder ships ranging from 660 TEU to 1,645 TEU are deployed for those ports due to the limited berth depth and small cargo volumes.

3) Multiple Ports Calling Services

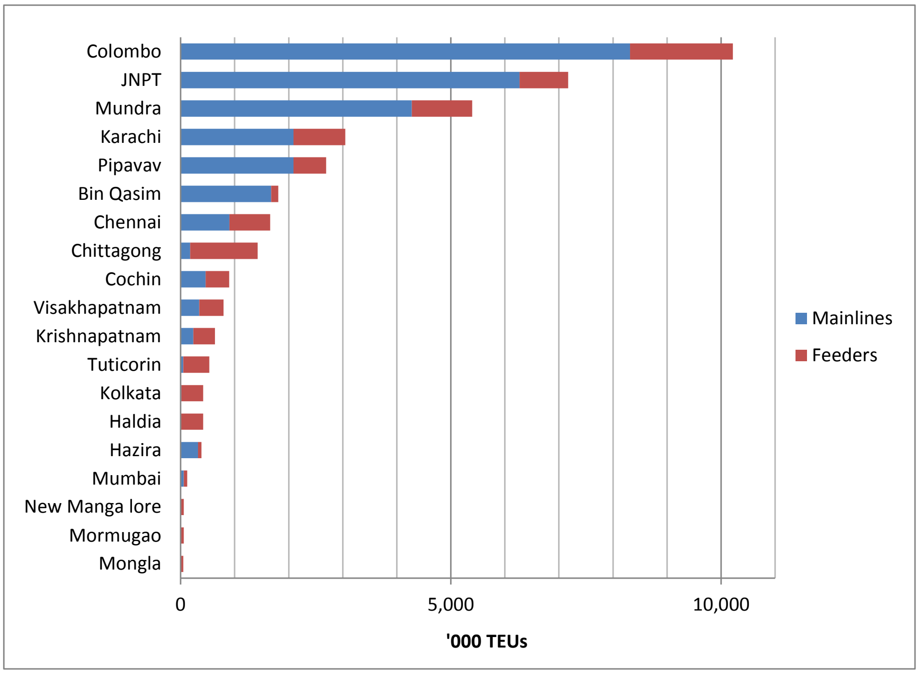
Under the opposite concept of Hub & Spoke System, there are some cases that a single mainline service covers multiple ports in South Asia. For example, the ships deployed in PIL's "AMI" service" from India to West Africa are calling multiple Indian ports such as Tuticorin, Cochin, JNPT, Hazira and Mundra. The concept of multiple calling is to optimize a shipping line's freight revenue by securing different cargo sources from various ports.

The size of ships deployed in such service may be subject to the restriction of the shallowest port enroute. In case of AMI service, the maximum ship size deployed is 1,680 TEU which can enter Tuticorin Port where the permissible draft is 10.8 m, while JNPT and Mundra Port can accept ships with a draft of 14 m or more. This implies that a shallow port may sometimes become a constraint in the network planning by shipping lines.

The ship size may also depend on the frequency of the service. If PIL extended the service interval of AMI from the current 10 days to 15 days, it might be possible for them to take more cargoes at the ports and deploy some bigger ships. In this event On the contrary, when improving service frequency from 10-day interval to weekly, they would have to deploy smaller ships, which might lower the cost-efficiency of the service.

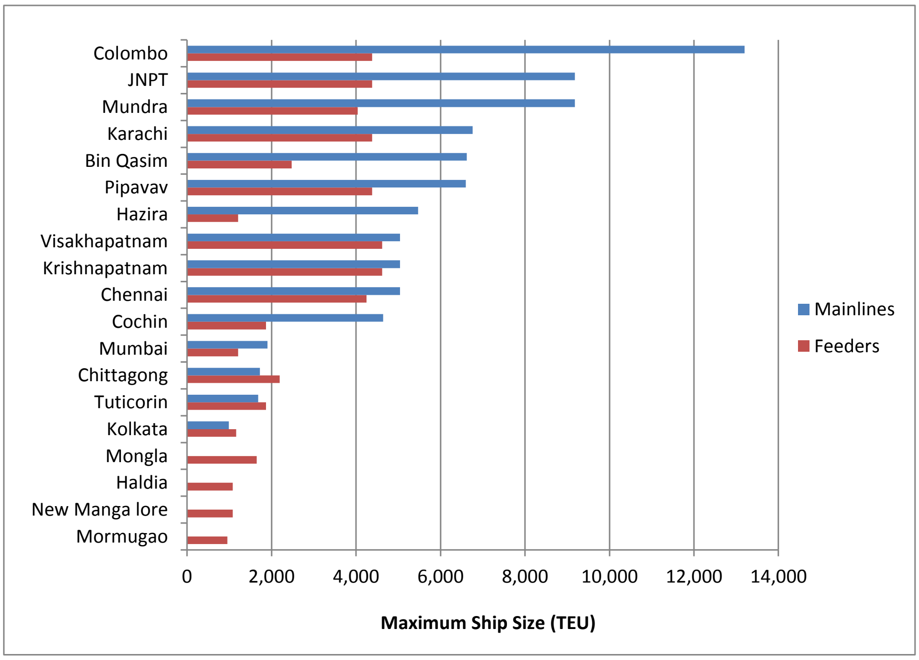
4) Coastal Container Shipping in India

Indian coastal shipping for container freight is undertaken by 2 private companies incorporated in India; Shreyas Shipping & Logistics Ltd. and Caravel Logistics Pvt. Coastal shipping in India is regulated through a policy on cabotage stipulated in the Merchant Shipping Act, 1958. While the cabotage policy has been relaxed for RORO, Ro-Pax, pure car carriers, LNG vessels and plant carriers, the restriction is still applied to container ships.



Source: MDS Transmodal "MDS Containership Database" as of August 2014

Figure 4.4 Capacity of Container Ships Calling at South Asian Ports



Source: MDS Transmodal "MDS Containership Database" as of August 2014

Figure 4.5 Maximum Sizes of Container Ships Calling at South Asian Ports

Table 4.13 Shipping Lines' Services Covering South Asian Ports

	Port		Pakistan		India														Bangladesh		Sri Lanka
					Arabian Sea								Bay of Bengal								
	Trade Lane		Karachi	Bin Qasim	Mundra	Pipavav	Hazira	Mumbai	JNPT	Mormugao	New Mangalore	Cochin	Tuticorin	Chennai	Krishna-patnam	Visakha-patnam	Kolkata	Haldia	Chittagong	Mongla	Colombo
Mainlines	WCNA	Number of Services																			1
		Number of Ships deployed																			14
		Yearly Ship Calls																			52
		Max Ship Capacity (TEU)																			7,024
		Average Ship Capacity (TEU)																			5,993
		Yearly Ship Capacity ('000TEU)																			312
	ECNA	Number of Services		3	3	1		1	4					1							5
		Number of Ships deployed		28	24	8		7	37					7							56
		Yearly Ship Calls		156	116	52		12	208					12							260
		Max Ship Capacity (TEU)		6,200	5,760	6,200		1,904	6,200					1,904							9,178
		Average Ship Capacity (TEU)		4,892	4,075	6,199		1,424	4,718					1,424							6,505
		Yearly Ship Capacity		763	473	322		17	981					17							1,691
	ECSA (west-bound)	Number of Services																			1
		Number of Ships deployed																			13
		Yearly Ship Calls																			52
		Max Ship Capacity (TEU)																			9,000
		Average Ship Capacity (TEU)																			8,152
		Yearly Ship Capacity ('000TEU)																			424
	Mediter-ranean/ Europe	Number of Services	2	1	7	1	2	2	8			3		2			1				6
		Number of Ships deployed	12	8	51	8	12	8	65			25		17			4				65
		Yearly Ship Calls	64	52	324	52	64	29	416			121		69			17				312
		Max Ship Capacity (TEU)	5,900	6,620	9,178	5,468	5,468	1,158	9,178			4,639		4,639			985				13,200
		Average Ship Capacity (TEU)	4,883	6,385	5,980	4,986	4,267	966	5,779			3,434		3,437			835				7,972
		Yearly Ship Capacity	313	332	1,937	259	273	28	2,404			416		237			14				2,487
	Africa/IOI	Number of Services	3	2	6		1		2			1	1								6
		Number of Ships deployed	11	8	35		5		9			5	5								56
		Yearly Ship Calls	102	94	256		36		78			36	36								282
		Max Ship Capacity (TEU)	2,908	3,630	8,110		1,680		3,630			1,680	1,680								4,250
		Average Ship Capacity (TEU)	2,052	2,676	2,880		1,318		2,442			1,318	1,318								2,641
		Yearly Ship Capacity	209	252	737		47		190			47	47								745
	Middle East /Red Sea	Number of Services	3		4			1	2												3
		Number of Ships deployed	16		15			3	6												14
		Yearly Ship Calls	156		208			26	104												156
		Max Ship Capacity (TEU)	6,760		4,616			925	3,534												8,560
		Average Ship Capacity (TEU)	4,669		3,284			553	2,838												4,881
		Yearly Ship Capacity	728		683			14	295												761
	East Asia	Number of Services	4	1	2	6			10					7	1	3			2		8
		Number of Ships deployed	20	7	10	34			54					29	6	15			10		42
		Yearly Ship Calls	199	52	95	312			510					332	52	140			104		406
		Max Ship Capacity (TEU)	5,760	6,570	5,760	6,600			6,620					5,040	5,040	5,040			1,726		6,620
		Average Ship Capacity (TEU)	4,215	6,349	4,715	4,835			4,704					1,950	4,544	2,471			1,683		4,669
		Yearly Ship Capacity	839	330	448	1,508			2,399					647	236	346			175		1,896
Mainlines Sub Total		Number of Services	12	7	22	8	3	4	26			4	1	10	1	3	1		2		30
		Number of Ships deployed	59	51	135	50	17	18	171			30	5	53	6	15	4		10		260
		Yearly Ship Calls	521	354	999	416	100	67	1,316			157	36	413	52	140	17		104		1,520
		Max Ship Capacity (TEU)	6,760	6,620	9,178	6,600	5,468	1,904	9,178			4,639	1,680	5,040	5,040	5,040	985		1,726		13,200
		Average Ship Capacity (TEU)	4,009	4,737	4,283	5,024	3,206	888	4,764			2,949	1,318	2,183	4,544	2,471	835		1,683		5,471
		Yearly Ship Capacity	2,089	1,677	4,278	2,090	321	59	6,270			463	47	902	236	346	14		175		8,316
Feeders & Coastal	Singapore (or Tanjung Pelepas, Port Klang)	Number of Services	1						1					2	1	1	8	6	13	1	
		Number of Ships deployed	3						3					5	2	3	19	16	21	2	
		Yearly Ship Calls	52						52					104	52	52	329	251	563	52	
		Max Ship Capacity (TEU)	3,534						4,380					4,616	4,250	4,616	1,147	1,147	2,190	954	
		Average Ship Capacity (TEU)	3,483						4,380					3,427	3,495	3,359	875	958	1,547	932	
		Yearly Ship Capacity	181						228					356	182	175	288	241	871	48	
	Singapore & Colombo	Number of Services	1			2											1				3
		Number of Ships deployed	3			6											7				13
		Yearly Ship Calls	52			104											52				156
		Max Ship Capacity (TEU)	4,380			4,380											917				4,380
		Average Ship Capacity (TEU)	4,380			3,931											831				2,898
		Yearly Ship Capacity	228			409											43				452
	Colombo	Number of Services	2		2					1	1	2	3	4	2	4	2	2	3		18
		Number of Ships deployed	5		5					1	1	2	4	6	2	9	4	4	10		30
		Yearly Ship Calls	78		78					52	52	104	244	201	104	201	71	104	260		1,069
		Max Ship Capacity (TEU)	1,740		1,740					1,078	1,078	1,092	1,510	2,228	2,228	1,726	660	1,645	1,740		2,228
		Average Ship Capacity (TEU)	1,402		1,402					1,078	1,078	1,061	1,045	1,578	2,078	1,225	609	1,402	1,468		1,247
		Yearly Ship Capacity	109		109					56	56	110	255	317	216	246	43	146	382		1,333
	Colombo & Dubai	Number of Services	1		1	1			1			2	1	1							2
		Number of Ships deployed	2		2	2			2			5	2	3							5
		Yearly Ship Calls	52		26	26			26			78	26	52							78
		Max Ship Capacity (TEU)	2,760		1,869	1,869			1,869			1,869	1,869	1,160							1,869
		Average Ship Capacity (TEU)	2,245		1,869	1,869			1,869			1,481	1,869	1,287							1,481
		Yearly Ship Capacity	117		49	49			49			116	49	67							116
	Dubai (or Salalah)	Number of Services	3	1	4	1			4												
		Number of Ships deployed	3	1	7	2			8												
		Yearly Ship Calls	126	52	208	52			208												
		Max Ship Capacity (TEU)	4,040	2,474	4,040	2,824			3,960												
		Average Ship Capacity (TEU)	2,578	2,474	3,296	2,824			2,992												
		Yearly Ship Capacity	325	129	686	147			622												
	India Coastal	Number of Services			4		1	1				3	2	1		2	2	2			
		Number of Ships deployed			4		1	1				3	2	1		2	2	2			
		Yearly Ship Calls			208		52	52				156	104	12		38	38	38			
		Max Ship Capacity (TEU)			1,720		1,208	1,208				1,720	1,720	1,160		1,160	1,160	1,160			
		Average Ship Capacity (TEU)			1,308		1,208	1,208				1,342	1,720	1,160		756	756	756			
		Yearly Ship Capacity			272		63	63				209	179	14		29	29	29			
Feeders & Coastal Sub Total		Number of Services	8	1	11	4	1	1	6	1	1	7	6	8	3	7	13	10	16	1	23
		Number of Ships deployed	16	1	18	10	1	1	13	1	1	10	8	15	4	14	32	22	31	2	48
		Yearly Ship Calls	360	52	520	182	52	52	286	52	52	338	374	369	156	291	490	393	823	52	1,303
		Max Ship Capacity (TEU)	4,380	2,474	4,040	4,380	1,208	1,208	4,380	1,078	1,078	1,869	1,869	4,616	4,250	4,616	1,160	1,645	2,190	954	4,380
		Average Ship Capacity (TEU)	2,666	2,474	2,145	3,320	1,208	1,208	3,142	1,078	1,078	1,287	1,290	2,044	2,550	1,545	823	1,056	1,522	932	1,459
		Yearly Ship Capacity	960	129	1,116	604	63	63	899	56	56	435	482	754	398	450	403	415	1,252	48	1,901
Total		Number of Services	20	8	33	12	4	5	32	1	1	11	7	18	4	10	14	10	18	1	53
		Number of Ships deployed	75	52	153	60	18	19	184	1	1	40	13	68	10	29	36	22	41	2	308
		Yearly Ship Calls	881	406	1,519	598	152	119	1,602	52	52	495	410	782	208	431	507	393	927	52	2,823
		Max Ship Capacity (TEU)	6,760	6,620	9,178	6,600	5,468	1,904	9,178	1,078	1,078	4,639	1,869	5,040	5,040	5,040	1,160	1,645	2,190	954	13,200
		Average Ship Capacity (TEU)	3,461	4,447	3,551	4,506	2,522	1,028	4,475	1,078	1,078	1,814	1,292	2,118	3,049	1,846	823	1,056	1,540	932	3,619
		Yearly Ship Capacity	3,049	1,806	5,394	2,694	383	122	7,169	56	56	898	530	1,656	634	796	417	415	1,427	48	10,217

Source: MDS Transmodal "MDS Containership Database" as of August 2014

(2) Non-container Trades

This section gives an overview on the world seaborne trades of non-container cargoes, that is, dry bulk, liquid bulk and vehicles. The data for the year 2014 were extracted by commodity category from “World Trade Service”; the data base of IHS Global Insight.

<u>Dry Bulk</u>

a) Coal

The volume of import coal to South Asia amounts to 230 million ton, which represents a 18.7% share of total world coal imports. Substantial volume of coal is moving from East Asia (Indonesia) to India, and some from Oceania (Australia) and Africa (South Africa).

Table 4.14 Region-to-Region Seaborne Trades of Coal in 2014

('000 tons)

↓from to→		East Asia	Oceania	South Asia						Western Asia	Europe		Africa	North America	Central America & the Caribbean	South America	Other Region	Total	Share in the world exports
				India	Bangla-desh	Sri Lanka & islands	Pakistan	Afganistan & landlocked	S.Total		EU	Others							
East Asia		339,013	302	154,706	3	1,177	1,299	8	157,192	533	8,594	184	188	1,412		479	31	507,930	41.3%
Oceania		307,770	612	37,747		0	98		37,845	819	17,645	5	1,184	1,145		4,650		371,674	30.2%
South Asia	India	14	2		186	1	3		190	123	21	0	10	1	0		1	364	0.0%
	Bangaladesh			0					0									0	0.0%
	Sri Lanka & islands	0	1						0	1	2		5	1	0			11	0.0%
	Pakistan			0					0	0								0	0.0%
	Afganistan & landlocked								0									0	0.0%
	S.Total	14	3	0	186	1	3	0	190	125	24	0	15	3	0	0	1	376	0.0%
Western Asia		154		224			8	46	278	391	6	0	3				0	833	0.1%
Europe	EU	360	70	326		0	61	1	388	237			1,458	147	45	513	194	3,412	0.3%
	Others	62,708	6	1,528		40	59		1,627	1,178			685	319	253	1,467	2	68,245	5.6%
Africa		21,159	159	22,688			2,361		25,049	3,875	15,636	112	2,302	28	88	1,032		69,440	5.7%
North America		37,299	5	5,674			0	0	5,674	4,380	42,206	4,589	3,005	10,749	761	11,016		119,684	9.7%
Central America & the Caribbean									0						1			1	0.0%
South America		1,439		264			1		265	4,815	44,879	380	9	10,066	1,376	12,616		75,844	6.2%
Other Region		0		1,319				192	1,512	9,384	480							11,376	0.9%
Total		769,917	1,158	224,477	189	1,219	3,889	247	230,021	25,737	129,469	5,271	8,850	23,869	2,524	31,772	228	1,228,815	100.0%
Share in the world imports		62.7%	0.1%	18.3%	0.0%	0.1%	0.3%	0.0%	18.7%	2.1%	10.5%	0.4%	0.7%	1.9%	0.2%	2.6%	0.0%	100.0%	

Source: IHS Global Insight “World Trade Service”

b) Iron/Manganese Ores

India both imports and exports iron/manganese ore. While a substantial volume of iron ore is exported from India to East Asia (China) in 2014, the export volume has been sharply declining in the recent 5 years, as the Indian government is strengthening its control of the illegal mining of iron ore and has ordered the closing of major mines in India. On the contrary, imports of iron ore (pellet and lump ore) have been increased.

Table 4.15
Region-to-Region Seaborne Trades of Iron and Manganese Ore in 2014

('000 tons)

↓from to→		East Asia	Oceania	South Asia						Western Asia	Europe		Africa	North America	Central America & the Caribbean	South America	Other Region	Total	Share in the world exports
				India	Bangla-desh	Sri Lanka & islands	Pakistan	Afganis-tan etc.	S.Total		EU	Others							
East Asia		42,223	2,789	75	0				75	28	7	0	1	0		10		45,133	3.0%
Oceania		748,139	1,698	652	20				672	107	252	157	17	71		3		751,116	50.5%
South Asia	India	13,342			13	0			13	75	1	0					50	13,481	0.9%
	Bangaladesh								0									0	0.0%
	Sri Lanka & islands								0									0	0.0%
	Pakistan	53							0									53	0.0%
	Afganistan & Landlocked								0									0	0.0%
	S.Total	13,395	0	0	13	0	0	0	13	75	1	0	0	0	0	0	50	13,534	0.9%
Western Asia		29,365		2,354			251		2,605	1,078	159	8	22					33,238	2.2%
Europe	EU	3,223	0	54					54	6,326			1,241	206		4	301	11,355	0.8%
	Others	31,135	43	95					95	655			171	0	18			32,116	2.2%
Africa		135,785	102	2,034	2		63		2,098	205	19,867	1,439	148	414		21		160,079	10.8%
North America		34,891	172			0			0	671	15,602	0	0	9,555	2,090	0		62,982	4.2%
Central America & the Caribbean		1,695							0									1,695	0.1%
South America		277,036	30	9					9	19,819	59,047	138	4,910	2,441	2,823	2,292		368,546	24.8%
Other Region									0	0	8,037		0					8,038	0.5%
Total		1,316,886	4,834	5,273	35	0	313	0	5,622	28,965	102,973	1,743	6,510	12,687	4,931	2,330	351	1,487,832	100.0%
Share in the world imports		88.5%	0.3%	0.4%	0.0%	0.0%	0.0%	0.0%	0.4%	1.9%	6.9%	0.1%	0.4%	0.9%	0.3%	0.2%	0.0%	100.0%	

Source: IHS Global Insight "World Trade Service"

c) Non-ferrous Ores

Major movements of non-ferrous ores are from India to East Asia, and from Western Asia to India.

Table 4.16 Region-to-Region Seaborne Trades of Non-Ferrous Ores in 2014

('000 tons)

↓from to→		East Asia	Oceania	South Asia						Western Asia	Europe		Africa	North America	Central America & the Caribbean	South America	Other Region	Total	Share in the world exports
				India	Bangla-desh	Sri Lanka & islands	Pakistan	Afganistan & landlocked	S.Total		EU	Others							
East Asia		121,653	3,488	2,548	2,178	164	13	1	4,905	3,388	1,403	521	819	4,888	11	476	0	141,551	30.3%
Oceania		44,942	2,535	2,045	2	1	1		2,050	2,378	1,680	1,012	1,922	1,551		244	19,556	77,870	16.7%
South Asia	India	14,826	60		298	187	3		488	3,599	896	234	328	273	23	55	140	20,920	4.5%
	Bangaladesh	239		29					29		0		6					275	0.1%
	Sri Lanka & islands	76		6			0		7	1	4	1	0					89	0.0%
	Pakistan	1,278	5	19	6	2			27	56	216	3	13	124		4		1,725	0.4%
	Afganistan & landlocked	1							0	0	0							1	0.0%
	S.Total	16,420	64	54	304	189	3	0	550	3,656	1,116	237	347	396	23	59	140	23,010	4.9%
Western Asia		17,194	90	12,579	39	20	55	2	12,695	1,630	1,373	485	3,259	203	7	636	2,401	39,975	8.6%
Europe	EU	5,060	29	430	25	15	130	2	602	1,872			4,664	2,776	422	1,713	641	17,778	3.8%
	Others	3,164	2	399	13	19	6		437	784			2,088	172	96	966	55	7,765	1.7%
Africa		12,744	36	292	5	0	0		297	1,213	16,650	4,271	2,000	6,217	16	167	35	43,646	9.4%
North America		10,519	1,203	36	0	0	1		37	375	2,229	1,006	867	30,503	967	3,040		50,747	10.9%
Central America & the Caribbean		611	9	0		0			0	31	1,680	634	37	9,760	179	275		13,217	2.8%
South America		13,795	251	639	1	1	0		641	728	7,310	3,796	667	18,704	299	2,611	104	48,905	10.5%
Other Region		145		135					135	32	1,489	0	149		55	6		2,011	0.4%
Total		246,246	7,708	19,158	2,566	410	211	5	22,350	16,086	34,930	11,964	16,818	75,171	2,075	10,193	22,932	466,474	100.0%
Share in the world imports		52.8%	1.7%	4.1%	0.6%	0.1%	0.0%	0.0%	4.8%	3.4%	7.5%	2.6%	3.6%	16.1%	0.4%	2.2%	4.9%	100.0%	

Source: IHS Global Insight "World Trade Service"

d) Grain

Grain is exported mainly from India to East Asia, Western Asia and Africa. Total export from South Asia amounts to 18 million ton, which represents a 4.8% share of world exports.

Table 4.17 Region-to-Region Seaborne Trades of Grain in 2014

('000 tons)

↓from to→		East Asia	Oceania	South Asia						Western Asia	Europe		Africa	North America	Central America & the Caribbean	South America	Other Region	Total	Share in the world exports
				India	Bangla-desh	Sri Lanka & islands	Pakistan	Afganistan & landlocked	S.Total		EU	Others							
East Asia		3,610	112	1	278	3	6	1	289	945	442	138	3,955	202	5	37	221	9,954	2.6%
Oceania		8,276	677	12	68	1	0		81	6,101	228	0	2,482	120		33	2,715	20,713	5.4%
South Asia	India	6,130	26		205	57	2		263	4,391	261	48	4,207	116	3	4	0	15,448	4.1%
	Bangaladesh	1	0						0	0	1		0	0				3	0.0%
	Sri Lanka & islands	9	1						0	2	0	0	3	0				15	0.0%
	Pakistan	432	14	0	493	223			715	467	64	31	1,023	28	2	2		2,780	0.7%
	Afganistan & landlocked		0						0			0	0					0	0.0%
	S.Total	6,573	40	0	698	279	2	0	978	4,860	327	79	5,233	145	5	6	0	18,246	4.8%
Western Asia		103	0	1	23	18	0	0	42	2,081	20	0	337	3			11	2,598	0.7%
Europe	EU	1,986	4	1	103	0	52	0	157	15,214			18,407	509	575	205	0	37,057	9.7%
	Others	3,406	73		536	33	474		1,044	12,904			11,587	206	792	360	0	30,372	8.0%
Africa		695	0	20		1	2		23	229	162	9	314	315		33	0	1,780	0.5%
North America		79,200	93	1	1,132	470	5	32	1,641	5,407	9,452	404	12,220	8,420	8,037	17,711		142,584	37.4%
Central America & the Caribbean		43							0	875	0		62	0	18	5		1,003	0.3%
South America		65,150	3	14	674	0	2	3	693	10,166	10,864	1,278	12,439	2,302	2,848	8,468	2,387	116,598	30.6%
Other Region		3							0	4	15		18		0	0		40	0.0%
Total		169,045	1,002	50	3,511	805	544	37	4,948	58,787	21,509	1,907	67,052	12,221	12,282	26,858	5,334	380,945	100.0%
Share in the world imports		44.4%	0.3%	0.0%	0.9%	0.2%	0.1%	0.0%	1.3%	15.4%	5.6%	0.5%	17.6%	3.2%	3.2%	7.1%	1.4%	100.0%	

Source: IHS Global Insight "World Trade Service"

Liquid Bulk

a) Crude Oil

Crude oil import of South Asia amounts to 189 million ton which represents a 10.3% share of world imports. South Asia's import is mainly from Western Asia, Africa and South America.

Table 4.18 Region-to-Region Seaborne Trades of Crude Oil in 2014

('000 tons)

↓from to→		East Asia	Oceania	South Asia						Western Asia	Europe		Africa	North America	Central America & the Caribbean	South America	Other Region	Total	Share in the world exports
				India	Bangla-desh	Sri Lanka & islands	Pakistan	Afganistan & landlocked	S.Total		EU	Others							
East Asia		28,271	15,296	5,445		119	96		5,659				0	1,786	0			51,013	2.8%
Oceania		8,161	1,616	219					219					85		41		10,122	0.6%
South Asia	India																	0	0.0%
	Bangaladesh	18																18	0.0%
	Sri Lanka & islands																	0	0.0%
	Pakistan																	0	0.0%
	Afganistan & landlocked																	0	0.0%
	S.Total																	0	0.0%
Western Asia		578,188	8,180	101,791		2,211	3,520		107,522	431	67,201	81,181	35,645	102,764		9,316	54,122	1,044,549	57.3%
Europe	EU	4,177							0	52			23	1,496		656		6,404	0.4%
	Others	54,599	1,910	2,040					2,040	2,241			1,461	7,812	0			70,064	3.8%
Africa		97,343	7,132	40,456					40,456	242	115,567	4,811	14,984	19,566	2,126	14,015	441	316,683	17.4%
North America		2,522		6,362					6,362		12,187	527		64,317	1,128			87,042	4.8%
Central America & the Caribbean		197							0		807			686	625	249		2,564	0.1%
South America		47,188		26,265					26,265		13,191	3,413	596	80,801	9,797	43,729	1,320	226,299	12.4%
Other Region										7,086	58							7,144	0.4%
Total		820,665	34,134	182,578	0	2,330	3,615	0	188,523	10,052	209,009	89,932	52,709	279,313	13,676	68,005	55,882	1,821,901	100.0%
Share in the world imports		45.0%	1.9%	10.0%	0.0%	0.1%	0.2%	0.0%	10.3%	0.6%	11.5%	4.9%	2.9%	15.3%	0.8%	3.7%	3.1%	100.0%	

Source: IHS Global Insight "World Trade Service"

b) Petroleum Products/Chemicals

Exports of petroleum products and chemicals from South Asia amount to 67 million ton with 7.4% share in the world exports. Major movements are from India to Western Asia, East Asia, Africa and other Regions.

Table 4.19
Region-to-Region Seaborne Trades of Petroleum Products/Chemicals in 2014

('000 tons)

↓from to→		East Asia	Oceania	South Asia						Western Asia	Europe		Africa	North America	Central America & the Caribbean	South America	Other Region	Total	Share in the world exports
				India	Bangala desh	Sri Lanka & islands	Pakistan	Afganistan & landlocked	S.Total		EU	Others							
East Asia		168,691	20,974	5,851	2,320	1,895	613	6	10,685	4,652	7,822	533	6,757	6,502	4,848	4,594	426	236,483	26.0%
Oceania		2,190	174	21	1	1	0	0	22	22	30	7	52	3	2	4	1,849	4,357	0.5%
South Asia	India	16,211	35		14	668	33		715	18,708	6,184	730	9,590	5,069	652	3,386	5,473	66,753	7.3%
	Bangaladesh	94		3		0	1		4		0		1		0			99	0.0%
	Sri Lanka & islands	49	0	2	1		0		4	3	0	0	0	0	0		11	67	0.0%
	Pakistan	310	0	12	1	1			14	71	0	0	4	1	0	0		401	0.0%
	Afganistan & landlocked								0				3					3	0.0%
	S.Total	16,663	35	18	16	670	34	0	738	18,782	6,184	730	9,598	5,071	652	3,386	5,484	67,322	7.4%
Western Asia		61,275	441	5,413	12	591	6,304	12	12,332	5,611	17,667	5,134	14,489	2,554	259	2,387	16,709	138,858	15.3%
Europe	EU	13,968	140	829	44	4	113	89	1,078	10,023			34,132	28,923	770	5,117	29,534	123,685	13.6%
	Others	21,286	35	401	8	93	25	41	567	3,580			3,998	21,012	1,016	2,048	320	53,862	5.9%
Africa		4,337	41	2,006	31	0	190	0	2,227	1,275	9,244	953	3,549	8,738	481	2,373	2,648	35,864	3.9%
North America		16,741	443	1,207	0	0	8	0	1,215	2,273	24,938	392	6,628	45,494	20,904	36,758	0	155,785	17.1%
Central America & the Caribbean		772	0	1		28	0		29	2	605	12	324	4,531	1,437	2,730	106	10,550	1.2%
South America		13,882	6	37	1	0	1	0	39	87	2,984	36	321	9,392	8,730	3,289	34,981	73,748	8.1%
Other Region		164	3,955	28		0			29	2,067	1,686	0	209	0	707	1,027		9,844	1.1%
Total		319,969	26,244	15,811	2,433	3,282	7,288	149	28,963	48,373	71,158	7,797	80,058	132,219	39,807	63,712	92,058	910,360	100.0%
Share in the world imports		35.1%	2.9%	1.7%	0.3%	0.4%	0.8%	0.0%	3.2%	5.3%	7.8%	0.9%	8.8%	14.5%	4.4%	7.0%	10.1%	100.0%	

Source: IHS Global Insight "World Trade Service"

c) Liquefied Natural Gas

Natural gas import of South Asia amounts to 21 million ton with 4.3% share in the world imports. Most of the natural gas is imported from Western Asia.

Table 4.20 Region-to-Region Seaborne Trades of Liquefied Natural Gas in 2014

('000 tons)

↓from to→		East Asia	Oceania	South Asia						Western Asia	Europe		Africa	North America	Central America & the Caribbean	South America	Other Region	Total	Share in the world exports
				India	Bangla-desh	Sri Lanka & islands	Pakistan	Afganistan & landlocked	S.Total		EU	Others							
East Asia		61,885	33	5	41	17	0	5	68	90	7	9	20	69	1	1		62,183	13.1%
Oceania		24,674	96						0		4		2	0			25,106	49,882	10.5%
South Asia	India	74			0				0	0			5				0	80	0.0%
	Bangaladesh			0					0									0	0.0%
	Sri Lanka & islands								0									0	0.0%
	Pakistan								0									0	0.0%
	Afganistan & landlocked								0									0	0.0%
	S.Total	74	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	80	0.0%
Western Asia		85,813	654	18,879	0	260	108	1	19,248	1,347	13,941	423	1,421	971	2	1,993	3,009	128,823	27.0%
Europe	EU	1,330	0	0			0		0	278			1,351	224	0	917	108	4,209	0.9%
	Others	12,183	10	87					87	475			252	307	184	422	145,084	159,002	33.4%
Africa		13,696	7	1,114					1,114	5,527	15,346	2,167	1,209	1,041	64	1,967	0	42,139	8.8%
North America		2,133	93						0	0	1,829	119	236	734	2,024	1,704		8,873	1.9%
Central America & the Caribbean		1,236				4			4		1,908		18	2,531	162	6,136		11,995	2.5%
South America		536							0		1,541		53	435	98	648	3	3,315	0.7%
Other Region		0	4,718	2					2	177	496	373	0		0			5,766	1.2%
Total		203,562	5,611	20,087	41	281	109	6	20,524	7,895	35,072	3,090	4,567	6,313	2,534	13,789	173,310	476,266	100.0%
Share in the world imports		42.7%	1.2%	4.2%	0.0%	0.1%	0.0%	0.0%	4.3%	1.7%	7.4%	0.6%	1.0%	1.3%	0.5%	2.9%	36.4%	100.0%	

Source: IHS Global Insight "World Trade Service"

(3) Vehicles

India, the dominant exporter of vehicles in South Asia Region, has 0.6 million ton of vehicle exports with 2.2% share in the world exports. India imports vehicles in far smaller volume than it exports due to the ban on the import of used cars.

Table 4.21 Region-to-Region Seaborne Trades of Vehicles in 2014

('000 tons)

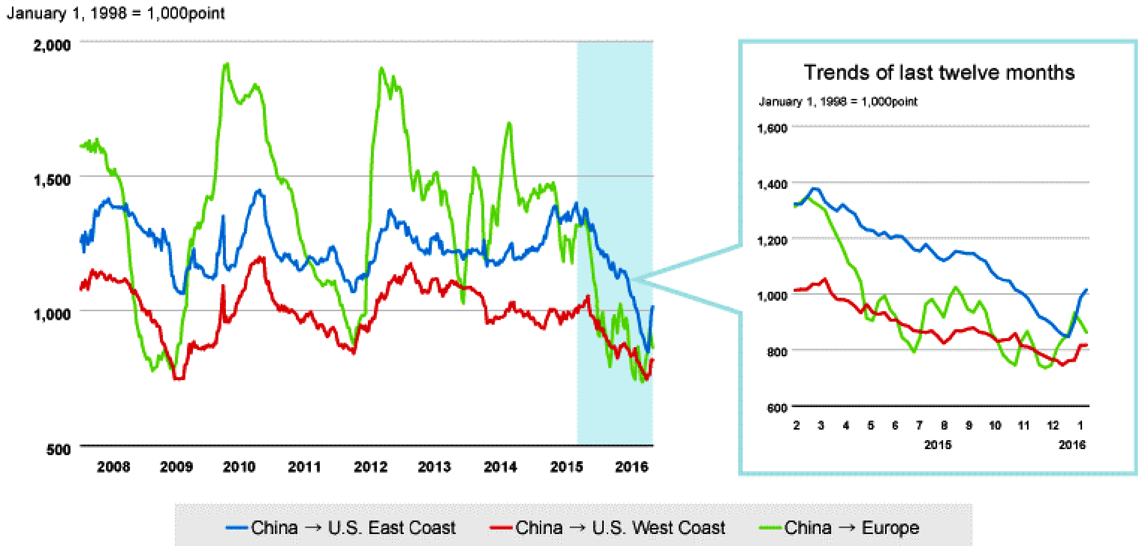
↓from to→		East Asia	Oceania	South Asia						Western Asia	Europe		Africa	North America	Central America & the Caribbean	South America	Other Region	Total	Share in the world exports
				India	Bangla-desh	Sri Lanka & islands	Pakistan	Afganistan & landlocked	S.Total		EU	Others							
East Asia		1,917	1,139	4	26	52	37	12	130	2,406	1,085	906	1,258	4,146	251	571	3	13,814	47.4%
Oceania		9	27	0	0	0	1		1	152	1	1	36	15	0	0	0	242	0.8%
South Asia	India	35	20		2	22	0		24	69	151	8	264	28	11	27		636	2.2%
	Bangaladesh								0		0		0					0	0.0%
	Sri Lanka & islands	0	0	0	0			0	0	0	0		0			0	0	2	0.0%
	Pakistan	0			0	0			0	1	0		2		0			3	0.0%
	Afganistan & landlocked								0				0					0	0.0%
	S.Total	35	20	0	2	22	0	0	24	70	151	8	267	28	11	27	0	640	2.2%
Western Asia		27	3	0	0	0	0	1	2	89	150	16	197	10	0	22	92	609	2.1%
Europe	EU	1,427	296	21	1	3	5	70	101	1,125			2,035	2,477	49	307	0	7,817	26.8%
	Others	6	1	0	0		0	5	5	11			131	13	1	6	0	174	0.6%
Africa		69	12	0		0	0	0	0	41	221	14	175	76	5	1	1	615	2.1%
North America		890	176	1	0	0	0	2	3	927	643	161	398	515	158	580	0	4,452	15.3%
Central America & the Caribbean		0							0	0	0	0	1	0	2	2		5	0.0%
South America		4	20	0					0	3	9	2	154	108	12	417	1	730	2.5%
Other Region		1		0					0	7	13	0	2		1	0		23	0.1%
Total		4,385	1,695	27	29	78	43	90	267	4,832	2,274	1,108	4,654	7,388	490	1,933	98	29,123	100.0%
Share in the world imports		15.1%	5.8%	0.1%	0.1%	0.3%	0.1%	0.3%	0.9%	16.6%	7.8%	3.8%	16.0%	25.4%	1.7%	6.6%	0.3%	100.0%	

Source: IHS Global Insight "World Trade Service"

(4) Current State of the Shipping Market

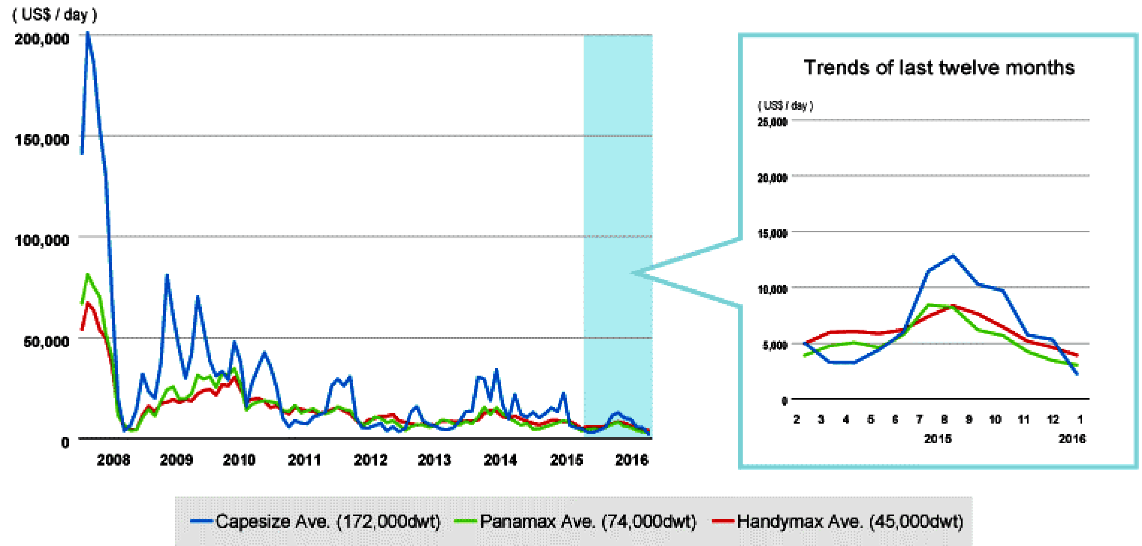
The world shipping market is currently in the worst situation that the industry has ever experienced. Ocean freight rates have declined particularly in the container and dry bulk sectors due to over-supply of ship tonnage by shipping lines, despite weak cargo demand starting with the Lehman Shock and continuing through the Euro Crisis and China's economic downturn.

The recent market trends for the container and dry bulk sectors are shown in Figures 4.6 and 4.7 respectively.



Source: NYK "Shipping Market Information" based on the China (Export) Containerized Freight Index

Figure 4.6 Container Market Trends (Apr. 2008 – Jan. 2016)



Source: NYK "Shipping Market Information" based on the data of Tramp Data Service Co., Ltd.

Figure 4.7 Dry Bulk Market Trends (Apr. 2008 – Jan. 2016)

The following mitigation measures have been adopted by the by the shipping lines to alleviate the over-capacity issue:

- Delaying delivery of ship building orders
- Canceling ship building orders
- Demolishing aged ships
- Slow steaming
- Deviating routes (e.g. taking the Cape of Good Hope route instead of passing Suez Canal)
- Laying-up (when the operational cost of the ship cannot be recovered through ocean freight)

In the container sector, the following additional mitigation measures could be taken to reduce slot-costs and/or enhance economies-of-scale;

- Restructuring/merging maritime networks
- Forming a greater alliance/slot-charter agreement
- M&A

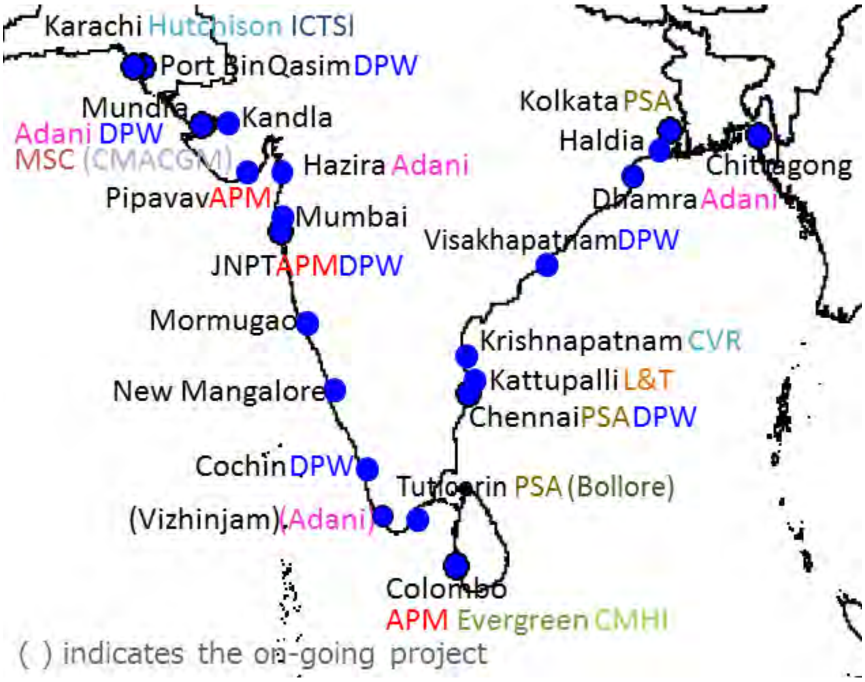
In the course of the restructuring of maritime networks, shipping lines may discard unprofitable services as well as costly port calls, keeping focus on enhancing operational efficiency of the ports en-route.

This downturn in the shipping market will be alleviated sooner or later once cargo demand catches up with the tonnage supply. Current difficulties faced by the shipping industry should not overly impact long-term infrastructure provision as the shortage of infrastructure capacity would constrain the future economic growth. Despite the poor state of the current shipping industry, infrastructure should be provided to accommodate future freight volume, which would increase substantially in South Asia Region along with long-term robust economic growth of the Region.

4.1.3 Issues Facing Ports in South Asia

(1) Privatization

The global terminal operators are participating in the operation of the major ports in South Asia. While the concession policies adopted by individual governments may be effective in reducing their financial burden and in improving the operational efficiency of the ports, privatization is sometimes subject to volatility. For instance, privatization of the 4th terminal at JNPT, Haldia and Kulpi has been delayed despite the government's decision, while the concession in Kattupalli was withdrawn after just 1.5 years of operation due to severe competition with neighboring ports.



Source: Survey Team

Figure 4.8 Private Terminal Operators of South Asian Ports

(2) Development of Deep Sea Ports

Though a considerable growth in demand is expected in future, the ports in South Asia do not seem to have sufficient depth. As shown in the table below, the permissible draft for container ships are all 14.5 m (for 8,800 TEU capacity type) or less except Colombo and Hambantota. Only 4 berths of South Harbor at Colombo can accommodate 18,000 TEU container ships which are the largest currently deployed in the East–West trade. At Chittagong where the garment industry is rising, the permissible draft is just 9.2 m, which allows only small feeder ships with 1,700 TEU capacity to berth. Insufficient depth is also an issue for the bulk berths, too. Only limited ports on the east coast India can accommodate large Cape-size bulkers with 15.5 m draft. Deep sea ports need to be developed in a timely manner, otherwise the permissible drafts will sooner or later be a bottleneck in promoting the trades in South Asia Region.

Table 4.22 Maximum Permissible Drafts of South Asian Ports

Bangladesh			India		
Port	Container /General Cargo	Dry/Liquid Bulk	Port	Container /General Cargo	Dry/Liquid Bulk
Chittagong	9.5	9.5	Mundra	14.3	25.0
Mongla	7.5	7.5	Kandla	9.8	12.5
Pakistan			Pipavav	14.0	12.5
Port	Container /General Cargo	Dry/Liquid Bulk	Dahej/Hazira	-	14.5
Port Bin Qasim	14.0	14.0	Mumbai	10.0	12.0
Karachi	13.0	13.0	JNPT	14.0	12.5
Gwadar	12.5	12.5	Panaji/Mormugao	13.0	14.1
Sri Lanka			New Mangalore	14.0	14.0
Port	Container /General Cargo	Dry/Liquid Bulk	Cochin	12.5	14.5
Colombo	12-15 18.0 (presumption)	11.0 -N.A	Tuticorin	10.8	10.9
Hambantota	17.0	17.0	Chennai	13.4	16.5
Trincomalee	12.5	12.5	Ennore	-	15.0
Galle	8.0-9.0	8.0-9.0	Kattupalli	14.0	-
			Khrishnapatnam	13.0	16.0
			Visakhapatnam	14.5	16.5
			Paradip	14.5	14.0
			Kolkata/Haldia/Kulpi	8.4	8.4

Source: web sites of port authorities, IHS Fairplay Ports & Terminals Guide

(3) Connectivity with the Hinterlands

<u>Bangladesh</u>

i) Pangaon Inland Container Terminal

Pangaon Inland Container Terminal (ICT) was built in June 2013 jointly by Bangladesh Inland Water Transport Authority (BIWTA) and the Chittagong Port Authority (CPA) at a cost of BDT 1.54 billion, and 3 ships with 128 TEU capacity and 3.75 m draft each are deployed by CPA at a cost of BDT 0.5 billion to shuttle between ICT and Chittagong Port. However throughput of the ICT in 2014 was just only 1,805 TEU. Measures need to be taken to promote the use of Pangaon ICT to streamline the container transportations between Chittagong Port and its hinterlands.

Source: Survey Team, CPA

Figure 4.9 Pangaon ICT and a Ship Deployed by CPA

Source: Google Earth, modified by Survey Team

Figure 4.10 Navigation Route from Pangaon ICT to Chittagong Port

Currently import/export containers are mostly carried by trucks between Chittagong Port and its hinterlands. Garments, the major export commodity of Bangladesh, are produced at 3,000 or more factories scattered around Dhaka city. The garment products are carried by van trucks in small lots to the off-dock CFSs located at 16–17 places around Chittagong Port, stuffed into containers and cleared customs there by the consolidators, then brought to the container terminal in Chittagong Port.

If inland waterway transportations became more attractive for the garment exporters, the current hectic situation could be streamlined, that is, garments could be brought to Pangaon ICT (which is located much closer to the factories), stuffed into containers there, clear customs and be carried to Chittagong Port by ships through inland waterways.

There are some issues in the current ICT and ship operations as follows:

- Number of ships is far insufficient to accommodate the needs of garment exporters
- Sailing schedule is irregular since the ships are always waiting for containers to fill up their hulls
- Waterborne freight rate of USD 150/20’ is much higher than the Kamalapur ICD/ Chittagong rail fare of USD 55/20’ which is subsidized by the government

India

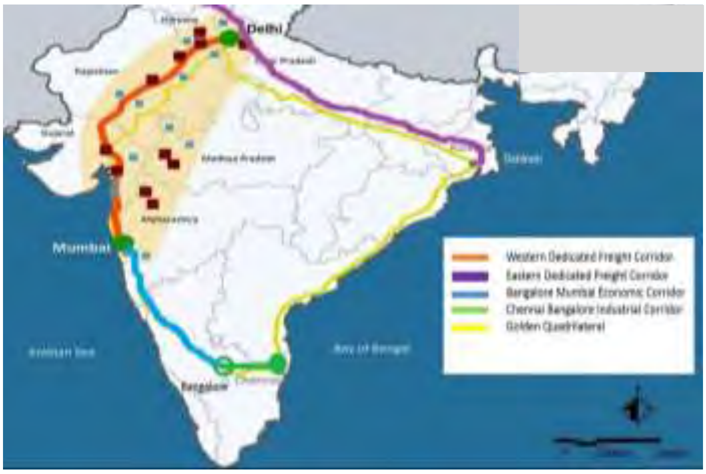
i) Railways

The major ports are connected by railways with the bonded Inland Container Deport (ICD)s scattered across the country. Rail transportation of containers is currently undertaken by Container Corporation of India Ltd. (CONCOR in short, a state enterprise) and 16 private firms.

Source: CONCOR

Figure 4.11 Major Ports and ICDs in India

The government of India has a plan to develop 5 major railway corridors along the "Golden Quadrilateral", that is, i) Western Dedicated Freight Corridor with the support of the Japanese government, ii) Eastern Dedicated Freight Corridor with support of the World Bank, iii) Bangalore Mumbai Economic Corridor, iv) Chennai Bangalore Industrial Corridor, and v) Vizag–Chennai Industrial Corridor with the support of the Asian Development Bank. Priority will be given to those major railway corridors in terms of construction/rehabilitation of tracks and purchase of wagons.



Source: DMICDC

Figure 4.12 Major Industrial Corridors in India

ii) Inland Waterways and Coastal Shipping

Six national waterways are being developed and maintained by Inland Waterway Authority of India ("IWAI" in short). Traffic volume as a total of National Waterway (NW) 1, 2, & 3 is roughly estimated as 5 million ton (for the year 2011–2012), while official statistics have never been compiled by IWAI. The largest volume is moving along NW1 (The Ganges) with major commodities of dry bulk (thermal coal, cement, fertilizer, fly ash) carried by self-propelled barges to/from power plants/factories located along the Ganges, break bulk (steel products, rice, jute), liquid bulk (edible oil) etc., however no marine containers are moving due to the shallow depth of the waterways (the deepest section of NW1 is only 3 m).

Source: IWAI

Figure 4.13 National Waterways in India

There are multiple access routes from Kolkata to the Northeast States; one is NW2 and the other is NW6 through India-Bangladesh Protocol Routes. "Kaladan Multimodal Transport Project" is being implemented to develop a new access route through Myanmar, which is a combination of coastal navigation from Kolkata to Sitwe, inland waterway on Kaladan River, and surface transport across the border to Mizoram State. Those access routes will play positive roles for economic development of the Northeast States.

Source: The Hindu Business Line

Figure 4.14 Kaladan Multimodal Transport Project

IWAI is promoting inland waterway transportations as it both cost-effective and environmentally friendly. A feasibility study of the World Bank on the development of NW1 is supposed to complete in February 2016; this project will be implemented concurrently with the Eastern Dedicated Freight Corridor Project.

<u>Pakistan</u>

Containers are transported between Karachi Port and Lahore mostly by rail. The country has served as a gateway of the landlocked countries such as Afghanistan and Central Asia especially after 2010 when the country became a member of Central Asia Regional Economic Cooperation (CAREC in short).

Inland waterways are not actively used in Pakistan. Punjab Inland Water Transport Development Company launched a pilot project on January 2015, but it has not been commercialized yet.

(4) Particular Issues on Container Trades

<u>Possibility of Developing a New Transshipment Hub</u>

It can be argued that there will be an opportunity to develop a new hub port somewhere in South Asia, on the grounds that the 20.2% transshipment ratio of the South Asia Region is relatively low compared to other Regions. From the shipping lines' viewpoint, assignment of a hub port is determined based on the following criteria:

1) The location is geographically rational
2) Ships can call with minimum deviation from the trunk line
3) Ships can berth without waiting
4) Berthing window is secured on the desired day of the week, time of the day

5) Transshipment can be performed at minimum time length
6) Transshipment can be performed at low cost
7) Diversity of mainline callings (in case of using dedicated feeder services within/without the alliance)
8) Diversity of feeder callings (in case of using common feeder services)

Therefore, when examining the possibility of developing any new hub ports in South Asia, the criteria above should be taken into consideration.

In the current market situation of east-west container trade, medium scale shipping lines including 3 Japanese container carriers are mostly going for the alliances. Such shipping lines tend to minimize their network costs by a joint operation of dedicated feeder services by their own rather than using common feeder services. For such shipping lines, the factor 7) above seems critical.

On the contrary, 7) and 8) above could be ignored by the mega container carriers such as Maersk Line or MSC who have a sufficient volume of cargoes to fill-up feeder ships and even one hub terminal by itself. That is why they have ever been successful in developing brand-new hub terminals for themselves such as Tanjung Pelepas, Salalah, Port Said, Geoia Tauro, and Algeciras.

In this sense, any new hub ports to be developed in South Asia in future should target the mega container carriers for potential users, and it seems rather difficult for such hub ports to count on medium or small scale shipping lines.

<u>Limitation on the Enlargement of Ship Size and Frequent Callings</u>

The trade lanes covering South Asian ports have been diversified in line with the rapid growth in the volume of trade. Number of direct services is increasing especially with Indian ports. In principle, shipping lines cope with the increasing cargo volume by 2 different means; one is to enlarge the size of ships, while the other is to increase the frequency of port callings. However at the ports in South Asia, with the exception of Colombo, enlargement of ship size for Europe and Mediterranean trade lanes is almost reaching the limit due to the restriction of berth depth. Likewise it may also become difficult for the shipping lines to increase the frequency of calls when the berthing windows are saturated.

(5) Particular Issues on Non-container Trades

The shallow port depth may sooner or later become a constraint for the cargo owners who desire to export or import the goods in a greater lot size. Without larger size of dry/liquid bulk carriers, the exporters/importers will have to bear higher unit cost for the transportation of the goods, which may affect the market competitiveness of the cargo owners.

4.2 Regional Programs for Freight Transport Development

4.2.1 Regional Cooperation Organizations or Forums

Regional cooperation organizations or forums play a coordinating role in development of Regional infrastructure in the South Asia Region. This section assesses the approaches of the five main organizations or forums involving most or all of the subject countries of this survey:

(i) the South Asian Association for Regional Cooperation (SAARC);
(ii) Bay of Bengal Multi-Sectoral Technical and Economic Cooperation (BIMSTEC);
(iii) South Asian Subregional Economic Cooperation (SASEC);

(iv) Central Asia Regional Economic Cooperation (CAREC); and
(v) the United Nations Economic and Social Commission for the Pacific (UNESCAP).[1]

Table 4.23 shows which of the subject countries of this survey are members of the respective organizations and forums.

Table 4.23
Membership of Subject Countries
in Regional Cooperation Organizations or Forums

Country	SAARC	BIMSTEC	SASEC	CAREC	UNESCAP
Bangladesh	✓	✓	✓		✓
India	✓	✓	✓		✓
Pakistan	✓			✓	✓
Sri Lanka	✓	✓	✓		✓

Abbreviations: BIMSTEC = Bay of Bengal Multi-Sectoral Technical and Economic Cooperation, CAREC = Central Asia Regional Economic Cooperation, SAARC = South Asian Association for Regional Cooperation, SASEC = South Asian Subregional Economic Cooperation, UNESCAP = United Nations Economic and Social Commission for Asia and the Pacific
Source: Survey Team

(1) South Asian Association for Regional Cooperation (SAARC)

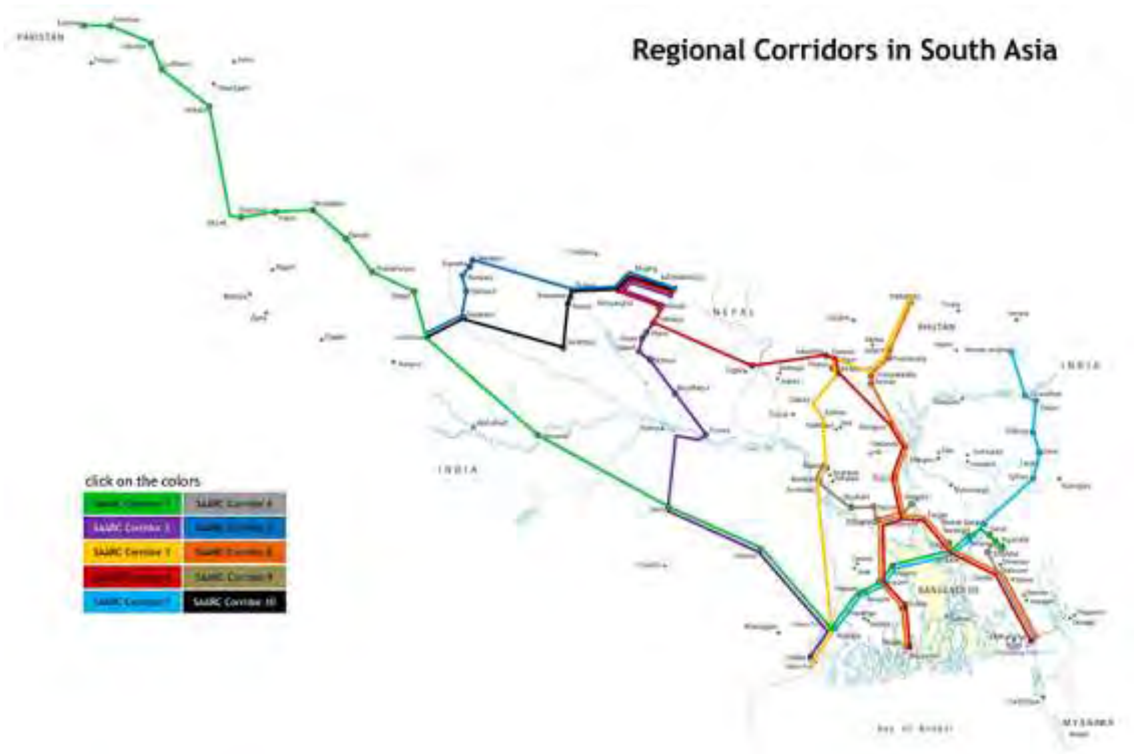
Bangladesh, Bhutan, India, the Maldives, Nepal, Pakistan, and Sri Lanka formally established SAARC on 8 December 2005; Afghanistan joined the association on 4 April 2007. With ADB assistance, SAARC carried out the SAARC Regional Multimodal Transport Study (SRMTS) in 2006, which identified several potential maritime gateways (see Table 4.24) and transport corridors (see Figure 4.15) as well as major physical, non-physical and institutional constraints hindering the efficient movement of freight in the Region. Kolkata/Haldia, Chittagong, and Mongla are identified as gateway ports to provide access for landlocked countries/regions (i.e., Bhutan, Nepal, and the North East states of India), and corridors connecting to these ports by road, rail, and inland waterway are selected in the list of potential corridors.

Table 4.24 Selected Regional Maritime Gateways in the SAARC Region

Principal Ports for SAARC Trade	Basis of Selection
Karachi, Port Bin Qasim, JNPT, Cochin, Tuticorin	Potential to handle future traffic
Kolkata/Haldia, Chittagong, Mongla	Ability to provide access for landlocked countries to seaports
Colombo	Potential to handle international and intra-Regional container traffic as a hub port

Source: SAARC Regional Multimodal Transport Study (2006)

[1] Other regional cooperation organizations or forums include (i) the Bangladesh–China–India–Myanmar (BCIM) Forum for Regional Cooperation, (ii) Mekong–Ganga Cooperation, which includes India, Thailand and Myanmar, as well as Cambodia, the Lao People's Democratic Republic and Viet Nam, and (iii) Economic Cooperation Organization (ECO), which includes Pakistan as well as Afghanistan, Azerbaijan, Iran, Kazakhstan, Kyrgyz Republic, Tajikistan, Turkey, and Turkmenistan, Uzbekistan.



Source: SASEC website (http://sasec.asia)

Figure 4.15 SAARC Road Corridors

Along with expressions of strong determination on the part of the Heads of State of Governments of SAARC to deepen Regional integration, transport ministers of Bangladesh, Bhutan, India, and Nepal signed the Bangladesh, Bhutan, India, and Nepal Motor Vehicle Agreement (BBIN MVA)[1] in Thimphu, Bhutan on 15 June 2015. BBIN MVA essentially draws on the SAARC MVA, which has not come into effect but will be mutually complementing with BBIN MVA. BBIN MVA will enable the exchange of traffic rights on road transport routes and facilitate cross-border movement of cargo, non-regular passenger, and personal vehicular traffic among the four countries.

In the joint mistrial statement of BBIN MVA, it is stated to carry out a six-month work plan from July to December 2015 for the implementation of the BBIN MVA and to commence staged implementation from October 2015.[2,3] In the statement, it is also noted that 30 priority

[1] Any other countries (e.g., Myanmar and China) may join the agreement subject to consensus among the existing contracting parties.

[2] The following issues need to be discussed for validation of the BBIN MVA: standard operating procedures; vehicle weight, axle load and dimensions; road design and construction standards; prescribed routes; commodity classification system; rates of taxes and fees; and conditions on transit.

[3] A cargo trial run was organized on the Kolkata-Dhaka-Agartala route in November, 2015 covering a distance of 640 km. This could substantially reduce journey distance when compared with the conventional routing from Kolkata to Agartala via Siliguri-Guwahati-Silchar, covering a distance of 1,550 km. This trial run tested "online issue and exchange of international vehicle permits" and "electronic tracking of vehicles along with digital lock for cargo/containers" for both passenger and cargo vehicles for international travel. The four countries have also identified 14 routes for passenger services and 7 routes for cargo movement under the BBIN MVA and more trial runs are under consideration. In addition, a BBIN Friendship Motor Rally was organized to highlight the importance of connectivity under the framework from 14th November- 2nd December 2015. The Rally started in Bhubaneswar in India and travelled through the states of Jharkhand, Bihar, West Bengal, Sikkim, Thimphu (Bhutan), Assam, Meghalaya, Tripura, and Dhaka (Bangladesh), before concluding in Kolkata. Total distance of the Rally was over 4,400 km over a 20 day period. Some 72 members from the four countries participated in the Rally.

transport connectivity projects toward 2020 are indicated for BBIN MVA with an estimated total cost of over USD 8 billion. Priority projects include port projects like "development of road connections to Diamond Harbor" in Kolkata/Haldia and "Sagar Island port connectivity to the mainland" as well as rehabilitation and upgrade of the remaining sections of trade and transport corridors in the countries. In addition, several major road transport corridor projects for approximately 2,400 km have been identified in India (particularly in the North Eastern region) at an estimated investment of US$4.6 billion, which are proposed to be taken up with ADB support.[1]

(2) Bay of Bengal Multi-Sectoral Technical and Economic Cooperation (BIMSTEC)

BIMSTEC is a "cross-regional institution" involving Bangladesh, Bhutan, India, Myanmar, Nepal, Sri Lanka, and Thailand).[2] BIMSTEC has 14 priority sectors[3] of cooperation, including transport and communications, which is led by India. BIMSTEC emphasizes connectivity by every mode of transport throughout the Region. Important cross-border linkages include development of the Tri-lateral Highway Project between Thai–Myanmar–India and Thai–Myanmar–Bangladesh. BIMSTEC member countries have established the BIMSTEC Free Trade Framework Agreement, which not only provides for liberalization of merchandise trade, but also of services and investments. The target date is now 2017.

With ADB assistance, BIMSTEC prepared the BIMSTEC Transport Infrastructure and Logistics Study (BTILS) in 2007. The updated version has extended the timeframe forward to 2020 and the draft final report was finalized in July 2014, but it has not been released yet. BIMSTEC recognizes the need for deeper water ports and the importance of container handling performance. BIMSTEC will encourage investments to address these issues, so that the region's ports can handle the anticipated growth in container traffic.

The formation of a BIMSTEC Transport Connectivity Working Group is currently in progress. It will serve as an operation level platform for coordinating, planning, and monitoring all activities related to the implementation of policies, strategies, and action plan agreed in the BIMSTEC transport and logistics sectors.

(3) South Asian Subregional Economic Cooperation (SASEC)

In 1996, four of the then seven SAARC member countries (Bangladesh, Bhutan, India, and Nepal) formed the South Asia Growth Quadrilateral, with the aim of accelerating sustainable economic development in eastern South Asia. Subsequently, they requested ADB's assistance to facilitate their economic cooperation initiative, in response to which ADB launched SASEC in 2001. Since 2014, Sri Lanka and the Maldives have also joined this framework as new member

[1] About 110 km on the Imphal-Moreh National Highway (NH 39) linking Myanmar will be upgraded via loans provided by ADB. MoRTH has also proposed JICA loan assistance projects to develop road infrastructure in North East India to connect to neighboring countries. A total of 10 sub-projects have been included in JICA's rolling plan under the North East Cross Border Connectivity Improvement Project covering about 1,153 km at an approximate investment of US$1.81 billion. Of these projects, 435 km of National Highways in Mizoram (NH 54) and Meghalaya (NH 51 and 64) are expected to commence construction in 2016-17.

[2] The regional grouping was initially known as Bangladesh, India, Sri Lanka, and Thailand Economic Cooperation or BIST-EC). The organization was established on 6 June 1997, initially by Bangladesh, India, Sri Lanka, and Thailand, which were later joined by Myanmar in December 1997, and by Bhutan and Nepal in 2004. The BIMSTEC Secretariat was established in Dhaka in September 2014.

[3] BIMSTEC's 14 priority sectors of cooperation are trade and investment, technology, energy, transport and communication, tourism, fisheries, agriculture, cultural cooperation, environment and natural disaster management, public health, people-to-people contact, poverty alleviation, counterterrorism and transnational crime, and climate change (in the order listed on BIMSTEC's website).

states. SASEC is an informal organization with no permanent secretariat; it has been described as more of a program than an institution.[1]

SASEC is "institution-light and projects-heavy".[2] About USD 5 billion has been invested in projects in the SASEC subregion since 2001, with the focus on transport, trade facilitation, and energy. Most of transport sector projects, including both road and rail, have targeted sections on the SAARC corridors, as SASEC provides technical and financial supports SAARC (and BIMSTEC). In Bangladesh and India, several new land connectivity projects are being prepared. In addition to land transport projects, SASEC has implemented Chittagong Port Trade Facilitation Project and Regional technical assistance projects for trade facilitation.

(4) Central Asia Regional Economic Cooperation (CAREC)

The Central Asia Regional Economic Cooperation (CAREC) Program was established in 1997 to promote development through cooperation, leading to accelerated economic growth and poverty reduction. Pakistan has joined CAREC since 2010, and there are presently 10 member countries in the program (Afghanistan, Azerbaijan, China, Kazakhstan, Kyrgyz Republic, Mongolia, Pakistan, Tajikistan, Turkmenistan, and Uzbekistan). In addition to ADB which serves as the secretariat, 5 multilateral development partners support the program (European Bank for Reconstruction and Development, International Monetary Fund, Islamic Development Bank, United Nations Development Programme, and World Bank).

CAREC facilitates Regional cooperation in the priority areas of transport, trade facilitation, trade policy, and energy. Developing economic corridors is a priority for the CAREC Program, which has funded infrastructure connectivity among member countries for more than a decade. Road and rail corridors of CAREC are shown in Figure 4.16 and Figure 4.17. Since its inception, CAREC has mobilized about USD 24.2 billion for transport, energy, trade policy, and trade facilitation. In 2011, CAREC countries adopted a long-term strategic framework that stressed economic corridor development.

Since participation in the CAREC Program, Pakistan serves a role of the Region's gateway to the Arabic Sea by linking CAREC corridors 5 and 6 to ports of Karachi, Bin Qasim, and Gwadar. Under the program, ADB and the World Bank have assisted Pakistan for road corridor development, trade and transport facilitation, and improvement of border services.

[1] Prabhu Gate, *The Institutions of Regionalism in South Asia – Do Institutions Matter?*", prepared for the Asian Development Bank, June 2011, p. 7

[2] SASEC and ADB, *Transport and Trade Facilitation under SASEC,* presentation at the Workshop in Secure and Efficient Cross-Border Transport for SASEC, 9–11 October 2013, slide 2.

Source: CAREC Transport and Trade Facilitation Strategy 2020 (2013)

Figure 4.16 CAREC Road Corridors

Source: CAREC Transport and Trade Facilitation Strategy 2020 (2013)

Figure 4.17 Designated Rail Corridors in CAREC

(5) United Nations Economic Commission for Asia and the Pacific (UNESCAP)

UNESCAP is the Regional development arm of the United Nations for the Asia-Pacific Region. It was established in 1947 with its headquarters in Bangkok and now has 53 member states and

9 associate members. In December 2011, UNESCAP established a South and South-West Asia Office serving 10 countries, including Afghanistan, Bangladesh, Bhutan, India, the Islamic Republic of Iran, Maldives, Nepal, Pakistan, Sri Lanka, and Turkey.

Its Transport Division includes sections on Transport Infrastructure, Transport Facilitation and Logistics, Transport Policy and Development. Core activities of UNESCAP's Transport Division include: (i) adoption of the Inter-governmental Agreement on the Asian Highway Network; (ii) adoption of the Intergovernmental Agreement on the Trans-Asian Railway Network; (iii) adoption of the Intergovernmental Agreement on Dry Ports through Resolution; (iv) work on improving transport processes; (v) work on freight forwarding, multimodal transport, and logistics; and (vi) preparation and application of transport facilitation tools.

4.2.2 Inter-Regional Connectivity with Southeast and East Asia

(1) Connectivity with ASEAN Countries

In recent years, several studies assess potential of enhancing connectivity between South Asia and Southeast Asia (i.e., ASEAN) and some of these studies focus particularly on India-ASEAN connectivity.[1] Such trend toward inter-Regional connection is motivated by some factors such as political and economic reforms in Myanmar and Look East Policy of the pro-business Indian government, though economic ties between these two Regions have been still limited.

In the studies by ADB and ADBI, specific projects for development of port and supporting infrastructure are proposed as summarized in Table 4.25. It is expected that these projects would lower transport costs in the Bay of Bengal by making a shift from feeder line transshipment of containers to in-line transshipment.

[1] For example: (i) ADB and ADBI, *Connecting South Asia and Southeast Asia*, a joint study of the Asian Development Bank and the Asian Development Bank Institute, 2015; (ii) David Wignall and Mark Wignall, *Seaborne Trade between South Asia and Southeast Asia*, ADBI working paper series no. 508, December 2014; (iii) ASEAN-India Centre at RIS, *ASEAN-India Maritime Connectivity Report*, Research and Information System for Developing Countries (RIS), 2014; (iv) Ted Osius, et al., *Enhancing India-ASEAN Connectivity*, Center for Strategic and International Studies, June 2013; (v) RIS, *ASEAN-India Connectivity Report*, Research and Information System for Developing Countries (RIS), 2012; and (vi) India Country Study Fukunari Kimura and So Umezaki (eds.), *ASEAN-India Connectivity: The Comprehensive Asia Development Plan, Phase II*, ERIA Research Project Report 2010-7, December 2011.

Table 4.25 Proposed Port Development Projects in South Asia

Country	Port	Project	Cost Estimate (Mil. USD)	Priority
Major Ports Development				
Bangladesh	Chittagong	New deepwater port (or floating container transshipment terminal) ***	3,000 (Port) 1,000 (Infra)	1
India	Kolkata/Haldia	Sagar Island deepwater port***	1,500 (port) 1,500 (Infra)	1
Sri Lanka	Colombo	South Harbor expansion*	1,200	N/A
	Hambantota	Deepwater port Phase II expansion*	808	N/A
Container Terminals				
Bangladesh	Karnaphuli (Chittagong)	New container terminal*	100	N/A
India	Chennai or Ennore [a]	Potential further expansion of container handling capacity**	500	3
	Karaikal	Container terminal**	400	4
	Krisnapatnam	Container terminal**	600	4
	Vizag	Additional container berth**	300	4
	Paradip	Container terminal**	400	4
	Kolkata/Haldia	New container port at Diamond Harbor*	250	N/A
		Development of Haldia II Dock complex*	280	N/A
Pakistan	Karachi Port	Karachi Deep Water Container Terminal	650	1
Supporting Infrastructure				
Bangladesh	(Not specified)	Inland waterways**	600	2
India	Chennai	Road connections***	250	3
	Karaikal	Road and rail connections***	100	3
	Kolkata/Haldia	Road connections*	130	N/A
	Krisnapatnam	Road connections**	200	3
	(West Bengal)	Inland waterways**	250 [b]	2
Pakistan	Port Bin Qasim	Development of Approach Channel	200	1
	Karachi Port	Development of Logistic facilities in Port area	200	1
Other Projects				
Sri Lanka	Trincomalee	Oil storage hub**	750	5

Note: [a] noted as "Most likely location for evolution into hub port in mainland India on Bay of Bengal", [b] Inland waterways covers a range of projects including barge fleet development (USD 5–50 million), small terminal development (USD 10–20 million), dredging and other IT/monitoring projects.
Source: * Connecting South Asia and Southeast Asia (2015), ** Seaborne Trade between South Asia and Southeast Asia (2014), *** proposed in the both studies.

Some important corridor development concepts to link each other's markets have been initiated by BIMSTEC, the Government of India, and so forth, as illustrated in Figure 4.18. Some of these are concept of multimodal corridor coupling maritime and land transport, which links with intra-Regional or national corridors at the main nodes. Major inter-Regional corridors or projects include below:

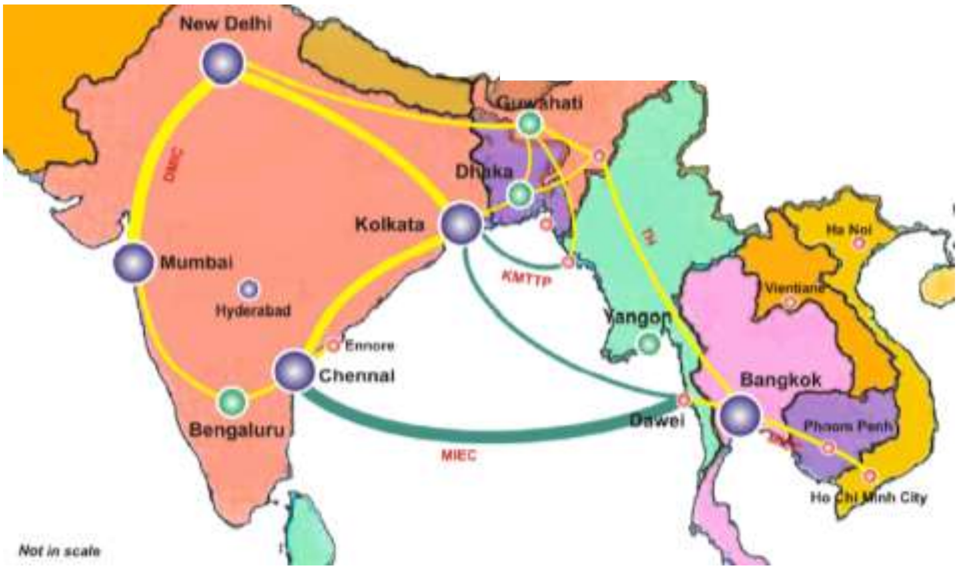
- **India–Myanmar–Thailand Trilateral Highway (IMTTH or TH)**: BIMSTEC conceptualized 1,360 km road project linking Moreh on the Indian side in Manipur with Mae Sot in Thailand via Bagan in central Myanmar, which falls within the Asian Highway 1. The development of the IMTTH has been slow since 2002, particularly in the border regions between Imphal in India and Yagyi in Myanmar.

- **Kaladan Multimodal Transit Transport Project (KMTTP):** The Indian government sponsors this project to provide access to northeast India via Sittwe Port in western Myanmar by combining an inland waterway development and a new highway. This project is based on a bilateral agreement between India and Myanmar.

- **Mekong-India Economic Corridor (MIEC):** This corridor would link Chennai with Ho Chi Minh City and cut travel distances from India to Mekong countries from 700 km to

2,000 km. It would require development of a deepwater port in Dawei, access highway, special economic zones and supporting utilities.

- **Delhi–Hanoi Railway Link (DHRL):** Indian consulting engineering company, RITES, has already completed a preliminary study to establish Delhi–Hanoi railway link in 2006. Harmonization of railway track is essential to realize inter-Regional connection. The Indian government has provided financial assistance for railway upgrade for the Myanmar government.



Abbreviations: DMEC = Delhi Mumbai Industrial Corridor, KMTTP = Kaladan Multimodal Transit Transport Project, MIEC = Mekong-India Economic Corridor, TH = Trilateral Highway
Source: ASEAN-India Connectivity: The Comprehensive Asia Development Plan, Phase II (2011)

Figure 4.18 Conceptual Layout of Major Inter-Regional Connectivity Projects

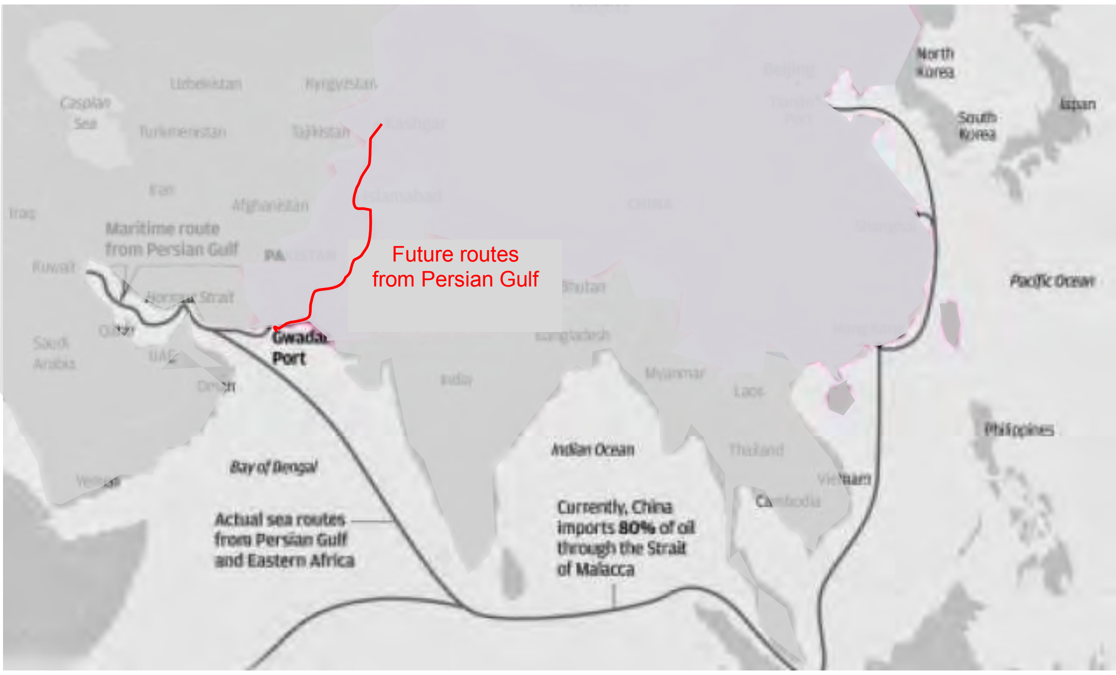
(2) Connectivity with China

China has proposed the One Belt, One Road (OBOR) initiative, which comprises of the Silk Road Economic Belt and 21st Century Maritime Silk Road that are aimed at building across the continent transport network and thereby promoting economic exchanges with countries on the route. The Maritime Silk Road concept first announced at Indonesia in October 2013, and the route stretches from the mainland of China to Europe through the Indian Ocean.[1] Before emergence of the concept, China has invested in port developments in South Asia and strengthened its sea lane network, which has been referred as "string of pearls"[2] surrounding the Indian Subcontinent and forms part of the Maritime Silk Road. Major port projects include Hambantota and Colombo South Harbour[3] in Sri Lanka and Gwadar in Pakistan (see the following section for more detail on each port).

In the bilateral level, China declared assistance amounting to USD 46 billion for the China–Pakistan Economic Corridor (CPEC) initiative and signed 51 minutes of understanding for initiating the associated projects on April 2015. CPEC will connect Gwadar port and Kashgar, the inland city of China, by new roads, railway lines, oil and gas pipelines (see Figure 4.19). This corridor opens a route for China to access the Arabian Sea and the Gulf countries.

[1] There is a variation of the routes (i.e., major accessing ports) by different sources of available information.
[2] This term is not originally used by China itself.
[3] There is a concept of new city development project behind the Harbour, which is called as "Colombo Port City". A state-owned company, China Communications Construction Company (CCCC) has promoted the project.

Gwadar port and the surrounding area will be developed as a gateway of CPEC in 5 years, and development projects include road, railway, airport, power plant, and free zone. Chinese company has been awarded a concessionaire for 40 years ant it is supposed to prepare a detailed development plan, which has not been open to public.



Source: Sindh – the land of endless opportunities, presentation by Sindh Board of Investment

Figure 4.19 China-Pakistan Economic Corridor and Sea Routes of China

4.2.3 Benefits and Barriers on Enhancing Regional Connectivity

Although there are certainly benefits by enhancing connectivity in the Region, realization of specific programs or projects may not be always straightforward, as expected benefits differ by country and barriers exist in each country. The table below summarizes conditions by country.

Table 4.26 Benefits and Barriers by Country

Country	Benefit	Barrier
Bangladesh	• Increase of more transit cargos to landlocked countries and regions • Increase of bilateral trade with India • Evolution of supply chains with India (e.g., shift of labor intensive production process)	• Limited capacity of the existing ports • Underdevelopment of inland transport infrastructure (i.e., road, railway, and inland waterway) • Increase in transport facility maintenance cost for transit cargo
India	• Improved access to the North East region through Bangladesh • Increase of bilateral trade with neighboring countries • Evolution of supply chains with neighboring countries and ASEAN	• Limited capacity and depth of the gateway ports • Lack of connectivity with Pakistan
Pakistan	• Increase of more transit cargos to landlocked countries • Increase of bilateral trade with neighboring countries	• Congestion around the existing ports • Underdevelopment of the new port and corridors • Security conditions around the border (e.g., border with Afghanistan) • Lack of connectivity with India
Sri Lanka	• Increase of bilateral trade with Regional countries • Possible shift of capital intensive production process from India	• Absence of land link with the subcontinent

Source: Survey Team

4.3 National Development Plans

4.3.1 Bangladesh

(1) Vision/Goal

The General Economic Division of Planning Commission issued the *Perspective Plan Report 2010–2021* in April 2012 for a vision/goal of national development by 2021. Thus in 2021, Bangladesh will expectantly take its place amongst middle income nations of the world. With the higher growth rate, the public and private sectors will collaborate effectively and efficiently through public private partnership (PPP) projects.

(2) Strategy/Development Priority

Sound infrastructure is essential to realizing the Vision. The efficient and safe flow of people and goods requires well-built efficiently operated and maintained infrastructure and transportation systems, along with reliable and affordable supplies of water, electricity and power, telecommunications, postal and waste management services. In addition to well-planned urbanization, attention will be given to multi-modal transport, integration of roads and highways, railways, water transport, rural transport and airports. Railways will receive much higher attention as a means of passenger and goods transportation throughout the country.

The main objective of the development priority with respect to the transportation sector is to develop an efficient, sustainable, safe and regionally balanced transportation system in which various modes complement each other, interface appropriately and, if possible, provide healthy competition to each other. The broad policy objectives are summarized as follows:

- The Government plans to put the transport sector as a priority in the next five year plan to achieve 8% economic growth from 2016 to 2020.
- Development of the two sea ports (Container terminal development at Mongla port and

Construction of Laldia Terminal in Chittagong Port) and Construction of Inland Container Terminal at Khanpur are identified as top ten higher priority projects.

- Re-orientation of the development strategy for rural transport in order to achieve efficient external access through optimal integration of road and inland water transportation, and off-road internal accesses.
- Efforts will be made to develop some of the critical inter-modal transport network that allows connectivity of neighboring countries to the two sea ports of Bangladesh.
- Efforts will be made to fully participate in global and regional transport connectivity initiatives that help develop the land route links between South Asia and East Asia through Bangladesh.

Sub-sectoral goals, objectives and strategies of ports and inland waterways are summarized as follows:

Strategies of Ports and Shipping

- Maintain and improve the navigational channel through capital dredging and regular maintenance dredging.
- Develop efficient inland distribution of container traffic by road, rail, and inland water transport to relieve the congestion and long travelling time at Chittagong Port.
- Expansion of the terminal/yard facilities and improvement of operations through the acquisition of modern container handling equipment and procurement of harbor crafts and vessels.
- Urgent establishment of ICDs/CFS at all potential cargo distribution centers across the country.
- PPP in port management and port development infrastructure through a BOO/BOT model using a clear, transparent policy guideline.
- Improve institutional capability for training, planning, safety, and environmental control.

Strategies of Inland Waterways

Development of inland waterways would focus on dredging and resuscitation of dead and dying river routes, developments of inland river ports, providing navigable aids for smooth and safe movement of cargo and passenger vessels, and improvement of waterways in and around Dhaka City for widening surrounding rivers. All these activities will accelerate the infrastructure development and promote economic growth, which in turn will lead to poverty alleviation. Specific strategies in this sector are as follows:

- Establishment of inland container river port on priority basis.
- Upgrading port facilities (both cargo and passenger) as well as storage facilities and introduction of mechanical equipment to handle cargo in order to save waiting time for berthing of vessels.
- Implementation of rural launch landing station development projects by providing pontoon facilities for smooth embarkation/disembarkation of passengers and loading/ unloading of cargo.

(3) Investment Plan

Ministry of Shipping (MOS) forecasts that container traffic demands through Bangladesh in 2030 would be around 6.90 million TEU. MOS plans to share these demands by two existing ports and a new port, in which the following investment are planned. (See Appendix4: Project Profile A4-1 for the detailed information on these ports.)

i) **Chittagong port:** to upgrade 4 existing container terminals and to develop additional two candidate sites at Bay Terminal and Laldia Terminal, to enhance the capacity of 2.50 million TEU.

ii) **Mongla port:** to increase the capacity up to 400,000 TEU through developing container terminals.

iii) **Payra port:** to develop Payra port to accommodate the balance of demands and capacity of Chittagong/Mongla ports in 2020 (planned port capacity of containers nearly 5.0 million TEU).

iv) **New deep sea port at Matarbari area;** to develop to meet the demands after 2025–2030.

After 2023, new terminals will be required for accommodating an exceeding volume of capacity from the existing ports. The suggested terminals site selection survey is under deliberation for location around the Matabari/Makeshkhali island area. It has been considered effective to check the outputs through a study for developing a new commercial port on a long term basis with the collaboration of an industrial port which will import coal for power plants.

MOS has declared the following investment plans regarding the development of sea ports and inland waterway transport (IWT).

- Active promotion of private shipping companies to participate in IWT at the coastal areas.
- Development of secondary waterways for sailing large ferry ships.
- Promotion of the development of IWT along the cross-border coastal areas of India and Myanmar.
- In order to improve the connectivity of hinterland, MOS plans to further develop Mongla Port.

Furthermore, MOS plans to develop Inland Container Terminals (ICTs) at Khanpun through a PPP scheme.

The Protocol of using inland water ways between Bangladesh and India was agreed in 2015 to encourage trade with North-East province of India and Myanmar. Under this protocol both governments agreed to the common use of main water ways from Kolkata to the North-East province of India through Ashuganj river port / Akhaura and crossing the border to Agartala of India

The Inland Waterway Transport Authority/Corporation of both governments were nominated as executing agencies to develop the agreed infrastructure projects to create integrated Regional economic activities between two countries.

4.3.2 India

(1) Vision/Goal

The Government of India launched a new initiative named “Sagar Mala Project” in October 2014, which aims to integrate the development of the ports, the industrial clusters and hinterland and efficient evacuation system through road, rail, inland and coastal waterways resulting in ports becoming the drivers of economic activity in coastal areas. The Sagar Mala initiative is comprised of the following three pillars:

1) Port modernization which refers to upgrading port and port-related infrastructure in order to increase operational efficiency of ports and facilitate trade, industrial activity and tourism in the hinterland. ;

2) Efficient evacuation systems which is to ensure seamless and hassle free cargo movement through efficient rail, road and coastal/inland waterway transport (IWT) networks, and promotion of coastal shipping and IWT; and
3) Coastal economic development, specifically the development of port hinterland through an increase in economic activity at a port and vice versa.

The Sagar Mala initiative seeks various infrastructure and development benefits such as:

- 3–4 modern world class Mega Ports of 200 million ton capacity each;
- Transshipment terminal as a Regional Container Hub;
- Establishing 10 state-specific Coastal Economic Regions (CERs);
- Better integrated connectivity in a CER and hinterland; and
- Fully integrated coastline through inland and mega waterways.

Through the Sagar Mala initiative, the total cargo traffic handled at Indian ports is expected to increase by 5 times over the next 20 years from 934 million ton in the year 2012/2013 to 4,668 million ton in the year 2032/2033.

(2) Strategy/Development Priority

Under the Sagar Mala initiative, comprehensive development will be considered for each CER. A CER is a single state based economic region that will encompass both major and minor ports within the state, which can extend along 300 to 500 km of coastline and 10 to 30 km inland/offshore. The CER will also develop the transport system for land and water-borne evacuation from and to the ports on a regional basis thereby ensuring an optimal modal mix. Currently 10 CERs have been identified.

The Sagar Mala Project would be implemented by a Sagar Mala Company at the national level. To develop each CER, a Special Purpose Vehicle would be formed with equity participation from the concerned State Government and the Sagar Mala Company. The Sagar Mala Company would be expected to follow a comprehensive Vision, Strategy and Perspective Plan prepared for the entire Indian coastline/waterway routes. This would be followed by Detailed Project Reports for the various CERs and identified projects for specific execution. A National Perspective Plan for Sagar Mala is being prepared by an international consulting firm.

Since the Sagar Mala initiative is still at a beginning stage, the Maritime Agenda 2010–2020 prepared by the Ministry of Shipping in January 2011 should be referred to as indicative programs for port development with detailed overview and concrete plans.

The Maritime Agenda states that the top priority is given to the modernization of ports, which is undertaken through:

- Construction of new berths/terminals;
- Various expansion/upgrading projects for berths;
- Installation of new and modern equipment;
- Upgrade/replacement through higher capacity of cargo handling equipment;
- Mechanization of cargo handling operations;
- Various computer aided systems to encourage automation in port operation;
- Installation of Vessel Traffic Management System (VTMS) for smooth movement of vessels; and
- Implementation of Web- based Port community system

In the Maritime Agenda, Mumbai (JNPT), Kochi, Chennai and Visakhapatnam are regarded as hub ports. The Maritime Agenda also articulates that each Major Port will preferably have minimum four lane road connectivity and double line rail connectivity.

(3) Investment Plan

The Maritime Agenda shows a traffic forecast which indicates that the total traffic at all major ports amounting to 561.08 million ton in 2010 would increase up to 1,214.82 million ton in 2019–20 with the average annual growth rate of 8.0% (see Table 4.27). In order to meet the rapid growth of cargo throughput in the country, the Maritime Agenda proposes a number of projects comprising several project types such as deepening of channels, construction and re-construction of berths, procurement/modernization of equipment, rail/road connectivity works and various other developmental works to be taken up in three phases i.e. Phase-I (2010–2012), Phase-II (2012–2017) and Phase-III (2017–2020), in addition to the ongoing projects (see Table 4.28). Those investments amounting to INR 127,942.35 crores are expected to yield additional capacity of 910.85 million ton by the year 2020. The investments for new projects in Phase-I to III amount to INR 109,449.41 crores, of which INR 72,878.16 (66.6%) crores are envisaged to come from private sector participation and the balance of INR 36,571.25 crores (33.4%) would be funded through Internal Resources/EBR and Government Budgetary support etc.

Table 4.27 Summary of Traffic Forecast for All Major Ports (in million ton)

Major Port		2010	2011-12	2016-17	2019-20	Annual growth rate
Kolkata	Kolkata	13.05	13.69	65.97	83.41	20.4%
	Haldia	33.38	34.48	66.71	74.18	8.3%
Paradip		57.01	70.00	100.00	120.00	7.7%
Visakhapatnam		65.50	66.26	83.40	102.96	4.6%
Ennore		10.70	23.95	67.44	71.54	20.9%
Chennai		61.06	62.94	82.66	107.72	5.8%
Tuticorin		23.78	26.77	50.60	58.94	9.5%
Cochin		17.43	25.08	46.43	58.42	12.9%
New Mangalore		35.53	47.59	69.14	81.93	8.7%
Mormugao		48.84	51.99	62.23	68.00	3.4%
Mumbai		54.54	55.30	72.50	77.20	3.5%
JNPT		60.76	64.30	130.20	130.20	7.9%
Kandla		79.50	85.60	132.12	177.90	8.4%
Port Blair		-	1.69	2.12	2.42	-
Total		561.08	629.64	1,031.52	1,214.82	8.0%

Note: In the “Maritime Agenda”, Port Blair is included in the major ports.
Sources: Ministry of Shipping, ‘Maritime Agenda 2010–2020’

Table 4.28 Summary of Capacity Yielding Projects for All Major Ports

Project Head	Ongoing Projects		Phase-I (2010-2012)		Phase-II (2012-2017)		Phase-III (2017-2020)		Total	
	No.of Projects	Estimates Cost (Rs. in Crore)	No.of Projects	Estimates Cost (Rs. in Crore)	No.of Projects	Estimates Cost (Rs. in Crore)	No.of Projects	Estimates Cost (Rs. in Crore)	No.of Projects	Estimates Cost (Rs. in Crore)
Deepening of Channel/Berths, etc.	6	1,551.61	13	3,412.14	17	1,000.40	10	4,184.10	46	10,148.25
Construction/Reconstruction of Berths/Jetties etc.	15	11,146.20	51	17,415.83	48	27,064.32	16	10,240.00	130	65,866.35
Procurement of Equipments etc.	8	1,230.93	35	1,543.39	24	1,675.70	13	1,718.20	80	6,168.22
Rail / Road Connectivity Works	20	2,945.43	7	1,731.09	12	2,511.56	7	725.00	46	7,913.08
Other Works	23	1,618.77	35	6,501.38	45	26,578.30	19	3,148.00	122	37,846.45
Total	72	18,492.94	141	30,603.83	146	58,830.28	65	20,015.30	424	127,942.35

Sources: Ministry of Shipping, 'Maritime Agenda 2010–2020'

The Maritime Agenda provides a list of the major and important capacity yielding projects for the major ports which includes the projects in Table 4.29.

Table 4.29 Examples of Major and Important Capacity Yielding Projects

Major Port	Projects (Amount over Rs. 1,000 crores)
Kolkata	River Regulatory Measures for improvement of draft of Hooghly Estuary
	Construction of four Container Handling Jetties at Diamond harbour Container Terminal
	Development of full-fledged Cargo handling Facilities at Saugor
	Construction of Port Facility at Salukkhali (Haldia Dock II)
	Construction of a rail link (around 35km from Kakddip to the proposed port facility at Saugar)
Paradip	Construction of Offshore Breakwater
Visakhapatnam	Development of Satellite port at Bhimunipatnam including new Fishing Harbour Ph- I Ph-II
	Expansion of Outer harbour Ph- I
	Replacment of existing berths in the inner harbour/ Development of Jetties / Berths.
	Development of Second Entrance channel to Inner Harbour
	Expansion of Outer Harbour -Stage -II
Ennore	
Chennai	Creation of Mega container terminal to the north of the Bharathi Dock
	Development of SEZ along with Port facilities by investing in Kolachel Minor Port
Tuticorin	Development of Outer Hasrbour (Breakwater, Dredging and Reclamation)
Cochin	LNG Re-gassification Terminal - Phase II
	Outer Harbour Project for Construction of a Deep Water Port
New Mangalore	
Mormugao	
Mumbai	Development of offshore container terminal Phase-II
	New Cruise Terminal near Gateway of India
JNPT	Development of 4th Conatiner Terminal: Phase I Phase II
Kandla	Development of dry bulk terminal off veera near Tuna outside Kandla creek
	Construction of T-shaped Jetty at Tuna (Phase-II)
Port Blair	Establishement of Dry Dock

Note: In the "Maritime Agenda", Port Blair is included in the major ports.
Sources: Ministry of Shipping, 'Maritime Agenda 2010–2020'

4.3.3 Pakistan

(1) Vision/Goal

The Pakistan Planning Commissions published the "*21st Centuries Vision 2030"* in August 2007, and "Pakistan Vision 2025" was approved in May 29, 2014. With economic growth at a rate of around 7%–8% per annum, Pakistan expects to join the middle-income countries ranking, with a GDP of around USD 4,000 by 2030. The vision is defined by the below key objectives:

- To establish the rule of law as a bedrock principle impacting on all walks of life.
- To encourage freedom of enterprise and innovation in the market place together with state responsibility for the provision of basic services to all citizens.
- To eliminate absolute poverty and ensure social protection for the weak and the vulnerable.
- To sustain an average growth of 7%–8% in the long term through effective investment and saving strategies while maintaining macroeconomic stability.
- To take advantage of globalization through enhanced competitiveness in a global economy relating to commerce, manufacturing and services; with increased diversity and quality of content.
- To facilitate the emergence of "Brand Pakistan", which will result in several large conglomerates becoming global players and many more regional hubs and centers established in Pakistan.
- To achieve significant breakthroughs in the sectors of education, employment and energy while consolidating and expanding the gathering momentum in infrastructure and service sectors.

(2) Strategy/Development Priority

The vision states that "*we can aspire to become an influential nation of the 21st century. It will be a nation that has achieved competence in technology, and a nation which draws upon its rich history to become modern, developed, just and affluent*".

This is the premise on which the framework for implementing Vision 2030 has been formulated:

- In 2030, Pakistan will emerge as a major economic power, and will be ranked among the top twenty countries on the basis of a 7%–8% sustainable growth.
- GDP is expected to be USD 1,000 billion, with per capita incomes of around USD 13,000 in current PPP terms.
- Pakistan will be an active player in regional and international cooperation, with a competitive enabling environment for innovation and investment.

<u>Infrastructure</u>

A comprehensive program has been launched under the National Trade Corridor Initiative to overhaul the entire logistics chain, physical connectivity and processes (motorways, expressways, railways, ports and shipping and airports) and efficiency to bring it in line with international standards.

<u>Transport and Communications</u>

The following interventions are targeted at improving the logistics and supply chain:

- Construction of major new motorways/corridors through less populated areas to spread urbanization, as well as with other countries in the region
- -Modernization of the trucking fleet by gradually replacing older 2–3 axial rigid trucks with multi-axial, low emission vehicles

<u>Ports & Shipping</u>

All three ports would be made more efficient in service delivery, and are planned to be run on landlord-port concepts through private sector port operators of international repute. The objective of the ports' reforms would be to enhance and facilitate the trade and business at minimum costs:

- Upgrade seaport facilities and infrastructure to meet global efficiency and enhance competitiveness of cargo-handling standards and shipping services through significant additional investments.
- Reduce free cargo dwell time to less than 3 days.
- Reduce ports costs (customs procedures, terminal handling charges, apart from lower vessel charges, increased infrastructure, and deepened berth drafts).
- Pakistan's National flag carrier PNSC owns a fleet of 15 vessels which is projected to increase to 61 vessels by 2030.
- Professional port management through foreign operators if necessary.

All of these programs will need to be regularly updated to cater for increased trade, especially the major North-South trade and energy corridor planned to start from Gwadar to the North of Pakistan and on to China and Central Asia.

(3) Investment Plan

Pakistan joined the Central Asia Regional Economic Cooperation (CAREC) in 2010. Karachi Port and Port Bin Qasim are expected to function as gateway ports to the Central Asian countries and Northwest China. As a result of participation in the CAREC program, the traffic volume on regional corridors through the two ports is assumed to increase. The enhancement of land transportation capacity from Karachi Port/ Port Bin Qasim to neighboring member countries of CAREC will be required.

Karachi Port

- Current traffic volume of containers to Karachi Port reaches the port capacity. Karachi Port Trust (KPT) will develop a deep sea container terminal and expand the terminal facilities to meet the container traffic demands.

The port will function as a metropolitan gateway and developing elevate expressway to connect the deep sea terminal to outside the port area and cargo terminal in Western Backwater area

Port Bin Qasim

- Port Bin Qasim has deep draft capabilities and will be dedicated to private partners in order to develop port facilities and import/export bulk cargo trades. PQA plans to cooperate with a private investor who wishes to develop bulk cargo handling business in Port Bin Qasim area.
- Bulk cargoes from Port Bin Qasim such as wheat, rice, coal, fertilizer, and cement are transported by trucks and railway further upcountry and inland.
- PQA has the development plans of;
- 2nd grain terminal;
- Container terminal expansion; and
- 2nd coal terminal (4.0 million ton)1 for power plants called PQEPC (Port Bin Qasim Electric Power Corporation, 330 MW coal firing power plant).

Gwadar Port

The project for development of port facilities has started to meet the demands and needs in the domestic market of Pakistan and other Central Asian countries. It is the highest priority project of the Government of Pakistan to develop an access road and railway to connect Gwadar city and the Karachi region with Northern parts of the nation.

[1] About 2.0 million ton of imported coal per year is transported by railway from Port Bin Qasim to the inland destination in Punjab Province.

The Gwadar Port Authority (GPA) has committed to implement all planning and appraisal processes for China-Pakistan Economic Corridor programs. The following port facilities have been completed in Phase-I of the development:

- 1 RORO facility, 1-100 meter service berth
- 4.7 km long approach channel dredged to 14.4 m depth in the outer channel, 13.8 m in the inner channel /turning basin and 14.5 m depth alongside the berth.
- Outer channel width of 206 m, inner channel width of 155 m, and turning basin diameter of 595 m

Under Phase 1, the Gwadar Port Authority plans to develop 3 berths (3 x 200 m long), receiving ships of up to 25,000 to 30,000 DWT, container vessels, and bulk carriers up to 50,000 DWT with a draft of 12.5 m maximum depth, respectively. A rail network connection is required, which will be laid by the government. The access road to Gwadar city and the port is required to be developed as a coastal highway that is approximately 600 km long to Karachi. The development of residential houses, water supply, power supply, etc. is also required.

4.3.4 Sri Lanka

(1) Vision/Goal

In Sri Lanka, the macroeconomic situation has improved, thus allowing a renewed focus on long-term strategic and structural development challenges. The long-term strategy / Government Vision describes three macroeconomic goals as follows:

- The first goal is to increase per capita income to USD 4,000 by 2016 with sustained high economic growth (8 percent per year), driven by a high investment rate. Of the targeted investment rate (33%–35% of GDP per year), 6%–7% of GDP per year.
- The second goal is shifting towards a more knowledge-based, globally integrated, competitive, environmentally friendly, internally integrated and increasingly urbanized economy.
- The third goal is ensuring improvement in living standards and social inclusion. As Sri Lanka becomes a middle income country, new challenges are emerging (e.g. a rapidly aging population) and improving the quality of services will be a major issue.

In addition, the support to the development of infrastructure needed for sustainable urban development and better linkages within Sri Lanka will be improved.

Vision in respect to Ports and Shipping

The vision of the Government of Sri Lanka with respect to the ports and shipping sector is self defined as: “developing Sri Lanka as the leading navigational, trading and commercial center in South Asia” by the year 2020. This policy is based on several strategies and guidelines.

The goal is for Sri Lanka to become the most competitive and preferred Maritime and Logistics Centre in the Asian Region. The objectives are to provide excellent services to attract sea-borne traffic and to encourage successful partnerships towards the generation of economic activity, employment and wealth.

The government has given highest priority to accelerate public investment on infrastructure development. Targeted major infrastructure projects includes the “Port of Galle” sea port development at Hambantota in parallel with work on Colombo South Harbor Breakwater and 2 further Terminals; Oluvil Port Development Rehabilitation and improvements to KKS harbor.

(2) Strategy/Development Priority

The Mahinda Chintana long term strategy aims to increase Sri Lanka's integration into the global economy and to make it competitive internationally.

Historically, Sri Lanka has been well connected internationally, making use of its excellent climate and strategic geographic position between the west and the east; it has previously been considered the most open economy in South Asia.

The *Country Partnership Strategy (CPS)* supports the national development plan as laid out in the *"Mahinda Chintana, Vision for the Future"*. The CPS focuses on three areas: (i) facilitating sustained private and public investment; (ii) supporting the structural shifts in the economy; and (iii) improving living standards and social inclusion.

National Policy for Maritime Sector of Sri Lanka (Ports & Shipping)

The Ministry of Ports and Aviation[1] issued the National *Policy for Maritime Sector of Sri Lanka* (Ports & Shipping) in October 2009. The following is an extract from this policy.

- Being an island, Maritime Transport is of critical importance for social and economic development of Sri Lanka. Strategically located globally in the maritime transport network, the country has the potential to benefit by developing ports, shipping and connected activities of the maritime sector.
- The development of maritime activities as a major business enterprise will generate employment and enhance national revenue in addition to providing a service to trade.
- The long term vision is to consolidate and further develop the country's position to become the most competitive and preferred maritime and logistics center in the Asian Region by providing excellent services.
- Transshipment trade and domestic trade involving imports and exports require frequent, fast, reliable and competitive transport services. The policy issues concerning the ports and shipping link of the transport services, both domestic and global, embraces the development and management of ports, their contribution to world maritime transport, national shipping fleets and related shipping issues.
- The ports and shipping sector is a major segment of the economy of the country. Trade is dependent on ports and shipping to a large degree. Additionally, transshipment activities increase the number of ship calls, resulting in spin off benefits to the national economy.
- Investors are attracted to the lower freight rates and the excellent ship schedules for 'just in time' operations with consequent expansion of the import export activities and employment opportunities.
- The Far East, the Middle East, the Indian Sub-Continent and the continents of Africa and Australia and some Pacific Rim countries encircle Sri Lanka. Developing port infrastructure in Sri Lanka would therefore help to attract shipping lines that serve these regions.
- The development of a hub port within the Indian Sub-Continent in close proximity to major centers with potential economic growth and activities, are important factors that will strengthen Sri Lanka's effort to become a Maritime Center in the Region.
- The potential to develop Sri Lanka as a logistics service hub is possible by providing the necessary infrastructure in warehousing, electronic business systems etc.

[1] Presently, this ministry is equivalent to the Ministry of Ports and Shipping.

Main Goals of Maritime Sector

The National Policy for the Maritime Sector of Sri Lanka (Ports and Shipping) aims to advance Sri Lanka as a Maritime Center in the region, as well as a leading navigational, trading and commercial center in South Asia; providing efficient, productive and sustainable ports and shipping services. In achieving these objectives the ports and shipping sectors will be steered towards the following goals:

- The National Policy for Shipping is to develop feeder services to enhance transshipment container traffic through Sri Lanka.
- The National Policy for Ports is to develop the vital logistics of Sri Lanka both domestic and worldwide and to contribute to world maritime transport by making full use of Sri Lanka's

(3) Investment Plan

Development of medium scale ports in identified provinces such as the South, the East and the North to divert increasing volumes of domestic bulk freight transport from road to sea transport will be central to the policy. Decongesting the port of Colombo by constructing the Colombo South Harbor, Galle and Hambantota ports will be given priority.

The main ports of the country will be developed to facilitate the increase of export and import trade associated with rapid economic development in the country. Additionally, regional ports in the northern region will be developed to minimize the gap of economic growth between south and north; this will be achieved through utilization of liberalization and globalization process.

Developing Public-Private Partnerships in the development and expansion of Sri Lanka's ports and in the identification of other locations that can be developed to handle coastal vessels, leisure craft and maritime related activities will also be encouraged.

Colombo

The following development projects for Colombo Port are planned by SLPA. Investment plans are consistent with the recommended project list for the Western Region Megapolis Master Plan published in January 29, 2016 by the Ministry of Megapolis and Western Development. The existing container terminal and related port facilities at the Jaya Container Terminal (JCT) will be renovated and upgraded.

There are plans for: (i) the development of a cruise ship center to receive large passenger cruise ships; (ii) the development of East and West terminals for the South and North harbors of Colombo Port; (iii) the development of an elevated port access road; and (iv) an inland dry port/ container depot in the suburban area of Colombo. These projects are expected not only to increase the capacity of the container terminal and enhance feeder services for containers in this Region, but also to modernize port facilities to receive large ships and provide safe traffic within the port.

Trincomalee

There are large demands for power plants development in Sri Lanka including a 2,500 MGW development funded by a private Indian organization, a 300 MGW of power plant at Norochiyore and 3 other additional plant developments. The power plants require a large volume of coal to produce the required electricity; as such the port office is conducting a study to address the possibility of transporting coal by railway from Trincomalee (Sampur) to respective sites of the Power Plants. Japanese Cement manufacturing company developed the cement factory in the port area. They also require large volume of import coal for cement fabrication for domestic demands. This would likely require additional berth capacity construction by expanding the present berth or new deep draft berth at Sampur.

Galle

Sri Lanka Port Authority (SLPA) has clarified all comments made by UNESCO in last 4 years. Permission has been received by SLPA to proceed with the project from UNESCO. During the UNESCO conference to approve the clarification of the SLPA project, UNESCO requested that care is taken to protect the present view of the "world heritage" status of the sea by ensuring the project has protection facilities.

Hambantota

Stage 1 of the development is to provide a useful multi-purpose port in the total area of 1,500 ha, with a wide range of business options for customers at a relatively small investment cost. The project is now at Phase 2 stage.

5. Analysis of Maritime Freight Transport Scenarios

5.1 Analysis of Container Movement

5.1.1 Introduction

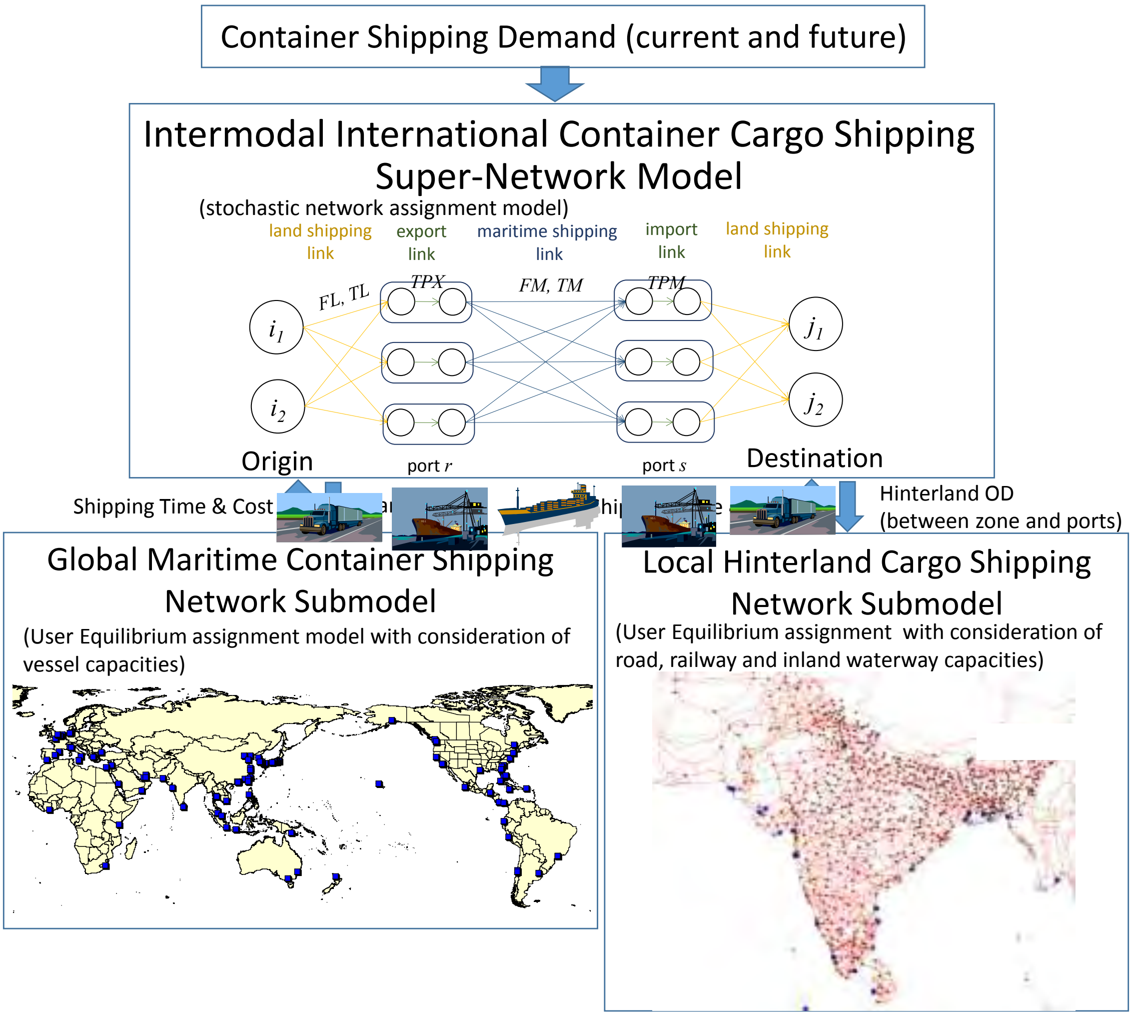
Movement on international maritime containers to and from South Asia are estimated by applying the model for intermodal international container cargo shipping (MICS) into South Asia, which is an application of a network assignment methodology to include both global maritime shipping and local hinterland transport. The model can output the estimated container cargo flow on each link of the network. By utilizing this model, impacts of several different scenarios (e.g. improving the level of service of port, rail, road, etc.) on cargo flow are examined. The MICS was originally developed for analyzing the international maritime container flow to and from Central America (Shibasaki, et al., 2015). The model consists from three kinds of cargo assignment model with two levels as shown in Figure 5.1; two sub-models representing each maritime and hinterland shipping network in the lower level, and one integrated model on the intermodal super-network in the upper level.

In each sub-model representing maritime and hinterland shipping, congestion due to capacity constraint in each transportation mean (i.e. vessels, roads, and railways) is considered; therefore, a user equilibrium (UE) assignment methodology is applied. For the integrated model on an intermodal super-network, a stochastic network assignment methodology is applied, since the cargo owners are considered to select the port for import/export, not only by the generalized cost, but also other unobservable elements from the model developer.

Note that the two models in which the different hinterland shipping network is included are separately developed in this report for the practical reason. One includes the hinterland network (including Bhutan and Nepal) of ports in Bangladesh, India, and Sri Lanka, while another includes the hinterland network of Pakistani ports including not only Afghanistan but Central Asia. This is because Pakistan is expected to function as a gateway port of Central Asia as a member of the Central Asia Regional Economic Cooperation (CAREC) framework thus to have a very broader hinterland.

Major necessary inputs for the calculation of the MICS are container cargo demand (container cargo OD) and network information including maritime, port, and land shipping. Details of the input data are explained below. By inputting the future cargo demand into the model, future container cargo throughput for each South Asian port and other outputs can be estimated for each logistics scenario.

Regarding the logistics scenarios, consideration is given to the improvements in depth, lead-time, etc. of ports, which are determined on the basis of the results of interview surveys by the JICA survey team and other sources. Several large cities (e.g. Delhi, Bangalore) in South Asia are located in inland areas and these geographical characteristics affect port choice behavior. Hence, scenarios for improvement of the hinterland shipping network are included in the model simulation.



Source: Survey Team

Figure 5.1 Overall Structure of Model for International Intermodal Container Cargo Shipping (MICS)

5.1.2 Network Data

(1) Target Ports

In principle, all container ports at which throughput exceeds 500,000 TEU per year as of 2013 (including empty containers) are included all over the world. The estimated quantities of transhipped containers in the world's major hub ports, which handle more than 1 million TEU transhipped containers per year, are available from Drewry Maritime Research (2014). However, acquiring the list of the world container ports which handles more than 500,000 TEU in total per year has become difficult, since such data sources (such as CI-online or Containerisation International Yearbook) are no longer available. As a result, the port list for this study was made mainly from the following sources:

a) Drewry Maritime Research (2014);
b) Lloyd's List: Top 100 Container Ports 2013;
c) China Port Yearbook Publishers (2014) (only for ports in Mainland China);
d) Drewry Maritime Research (2014)b - Estimated throughput is available for each container terminal where worlds' major terminal operators are in operation;
e) Websites for each port or terminal; and
f) Substitution with a past record (e.g. as of 2012, 2011) (in case that data is not available

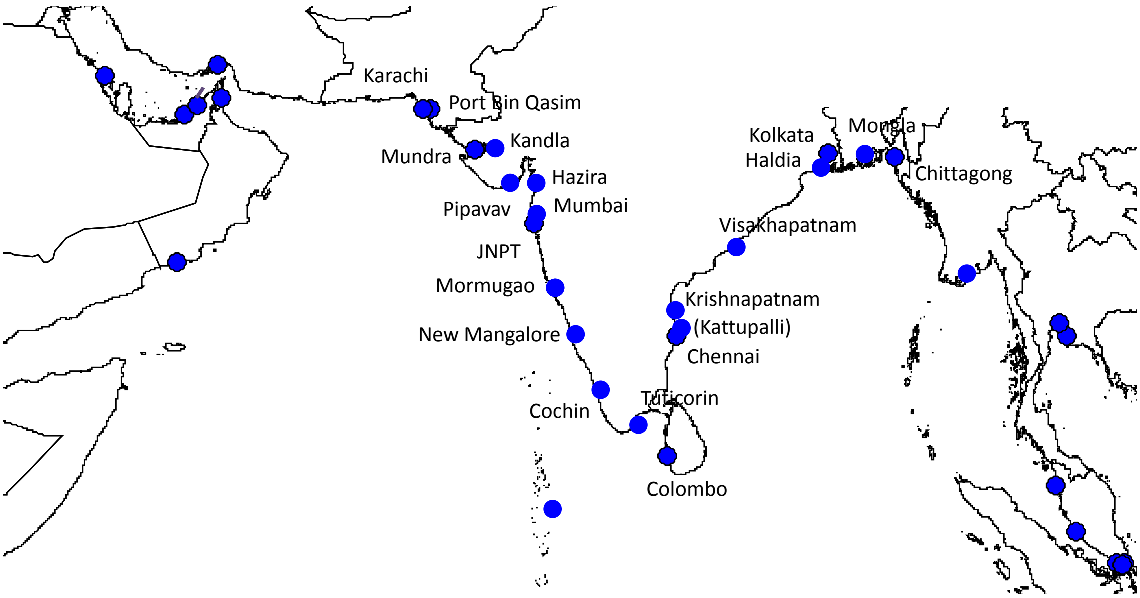
from any of the sources listed above).

From the sources listed above, the total number of ports considered in the model is 173. Note that some ports that are closely located to each other, such as Singapore and Jurong, and Puerto Manzanillo and Cristobal in Panama, are treated as one port. On the other hand, Shenzhen Port (China) is divided into i) Yantian terminal and ii) Shekou and other terminals, due to the fact that they are located on opposite sides of Hong Kong Port.

Another topic is the treatment of domestic containers. Since the container throughput of each port is utilized in estimating the international cargo shipping demand between ports, domestic containers should be subtracted from the total throughput. However, statistics on domestic containers is generally difficult to obtain. An exception is for Chinese ports, where the number of domestic containers (including feeder containers of international shipping) handled is available from the China Port Yearbook Publishers (2014), and in some ports constitutes a large share of throughput. As a consequence, twelve Chinese ports (such as Yingkou, Rizhao and Quanzhou) which handle less than 500,000 TEU of international containers are not included in the list.

In addition, the port list also includes 21 local container ports in South Asia and neighbouring regions. All local ports that include at least one international liner service call in South Asian countries are considered. Also, some local ports in Southeast Asia (Myanmar), Middle East (Oman), East Africa (Mozambique and Tanzania), and the Indian Ocean Islands (Seychelles, Comoros, Madagascar, Reunion, and Mauritius) are included. Furthermore, 5 additional port including Vostochny (Russia), Poti (Georgia), Klaipeda (Lithuania), Riga (Latvia), and Tallinn (Estonia) are also included in the Pakistani model as rivals of gateway ports of Central Asia. The container throughput data for each port is obtained from various sources, including websites of port associations, international organizations such as the World Bank and the United Nations World Food Programme, and interviews of this survey with port trusts and other organizations.

Attributes related to the ports are; loading/unloading time (hour), transhipment time (hour), handling charge for export and import (USD/TEU), and cost for border crossing including custom clearance and document preparation (USD/TEU). Loading/unloading time, handling charge for export and import, and cost for border crossing are derived from a Doing Business database (in "Trading Across Borders") which was provided by World Bank before, while transhipment time is estimated by JICA study team judging from the comprehensive level of service in each port.



Source: Survey Team

Figure 5.2 Target Ports in South Asian Region

(2) Maritime Shipping Network

The Maritime shipping network was developed using the MDS containership databank. The MDS database provides information for each containership such as vessel name, IMO number, name of service, operator name (carrier), partner company(ies) of the service (if any), slot chartered company(ies) (if any), route category defined by MDS, list of port of call and its order, service frequency (yearly basis), TEU Capacity, DWT, vessel speed, etc. By aggregating this vessel-basis data (5,492 vessels as of June 2013) into service-basis data (2,569 services), the maritime shipping network was formed. From the database, the ports which are not included in the model are eliminated.

When a service is provided by multiple companies, the assumption is that the vessel capacity is divided equally by the number of operators. When a service has a slot charted company (ies), the vessel capacity for the slot charted company (ies) is assigned to be half of the capacity of each operator. For the simplicity of model calculations, congestion due to capacity constraint in the model is calculated for each company, even in the same vessel; namely, a capacity assigned to each company as above is not allowed to apply across different companies, even if a space for one company is very crowded but that for another company is less crowded.

Since the model focuses on container flow for the worldwide maritime shipping network and the transshipment of containers in hub ports, some liner services provided by smaller, local companies hardly involved in South Asia are eliminated for simplicity of calculations. Specifically, the model includes the 20 largest container shipping companies in the world as well as fourteen local companies which have a liner service network in South Asia as shown in Table 5.1. 932 services are included in the model, covering 68.9% of the annual vessel capacity in the world.

Several ports, i.e. Weihai (China), Suzhou (China), Nanjing (China), Wuhan (China), Zhongshan (China), Zhuhai (China), Makassar (Indonesia), Mumbai (India), Honolulu (USA) and Duisburg (Germany), are not included in the MDS database or are not sufficiently covered (less than 30% of the total capacity) by the above companies considered in the model, therefore they are eliminated from the port list described before.

The distances between ports (in nautical mile), are obtained from Toriumi's work (2010). The distance is calculated from an assumption that every container ship passes through the shortest route on the sea out of the pre-set navigation routes. The dummy variables for Suez and Panama Canal transit are also obtained from Toriumi's work. Some distances to/from several local ports which were newly added to the model as of 2013 are obtained from several websites such as SeaRates.com and Sea-Distances.org.

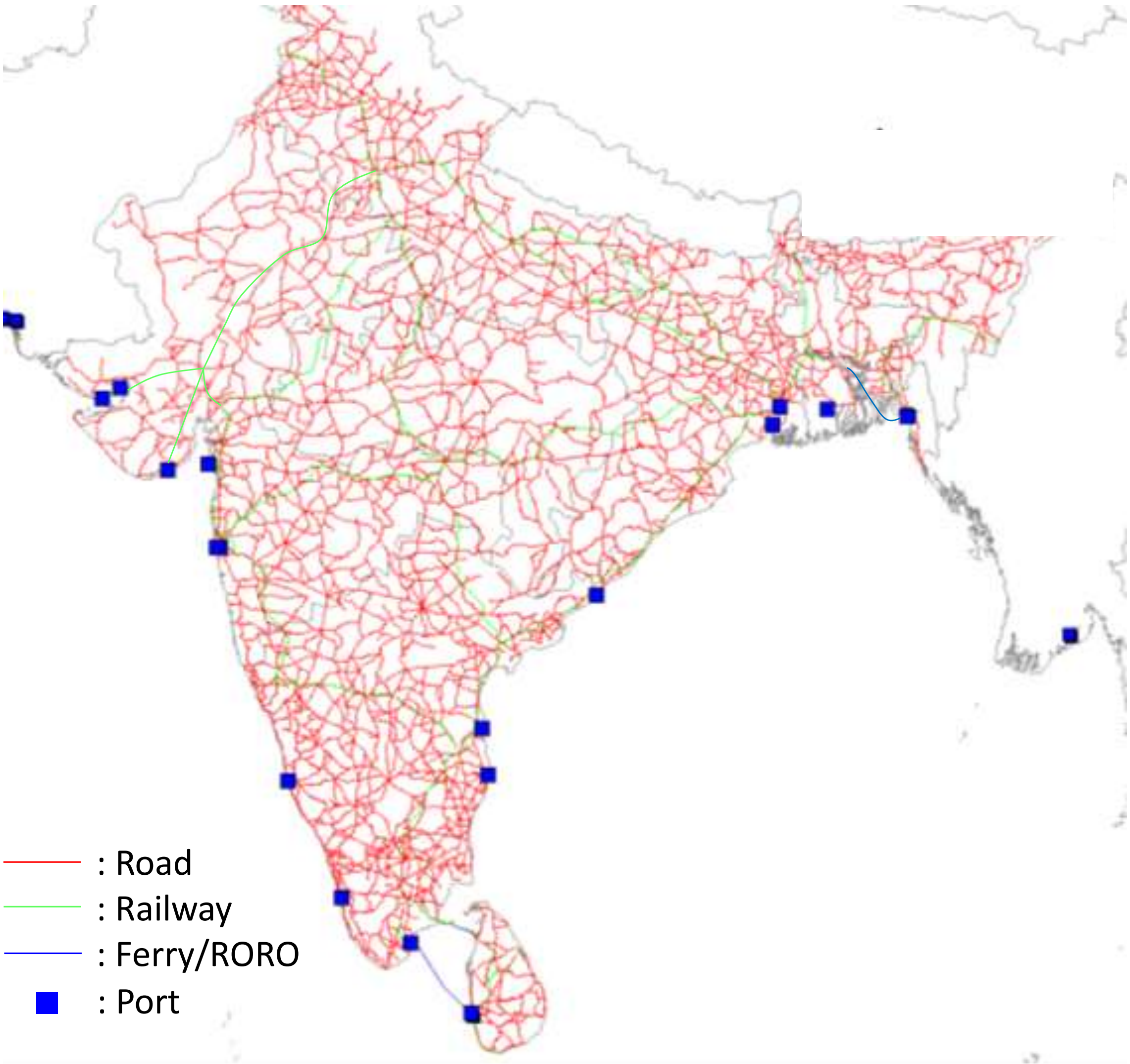
Table 5.1 Target Shipping Lines

No.	Group	Group Name	Alliance	Included Carriers	Annual TEU Capacity*	Share of the world
1	Group A	Maersk	-	Maersk Line, Norfolkline Ferries, Safmarine Container Lines, MCC Transport, Mercosul Line	17,208	9.9%
2	Group B	MSC	-	Mediterranean Shipping Co (MSC)	15,994	9.2%
3	Group C	CMA-CGM	-	CMA-CGM, ANL Container Line, China Navigatrion Co.(CNC Line), Campagrie Marocaine de Navigation (Comanav), Delmas, MacAndrews, Gemartrans, OT Africa Line, US Lines	13,027	7.5%
4	Group D	Evergreen	-	Evergreen Marine, Italia Marittima (LT), Jatsu Marine	7,167	4.1%
5	Group E	Hapag-Lloyd	Grand Alliance	Hapag-Lloyd, CP Ships	4,808	2.8%
6	Group F	APL	New World	APL	4,640	2.7%
7	Group G	CSAV	-	CSAV (Compania Sud Americana de Vapores), CSAV Norasis Liner Services	2,378	1.4%
8	Group H	Cosco	CKYH	Cosco Container Lines, Shanghai Panasia	5,854	3.4%
9	Group I	Hanjin	CKYH	Hanjin Shipping, Senator Lines	4,411	2.5%
10	Group J	CSCL	-	China Shipping Container Lines (CSCL),	4,480	2.6%
11	Group K	MOL	New World	Mitsui-OSK Lines, Meimon Taiyo Ferry, Shosen Mitsui Ferry	3,706	2.1%
12	Group L	NYK	Grand Alliance	Nippon Yusen Kaisha (NYK), Tokyo Senpaku Kaisha (TSK), NYK-Hinode Line, NYKLauritzenCool, Kinkai Yusen	4,599	2.7%
13	Group M	OOCL	Grand Alliance	Orient Overseas Container Line (OOCL)	3,208	1.9%
14	Group N	Hamburg-Sud	-	Hamburg-Sud, Alianca Transportes Maritimos,	3,033	1.8%
15	Group O	K-Line	CKYH	Kawasaki Kisen Kaisha, Kawasaki Kinkai Kisen Kaisha	3,717	2.1%
16	Group P	Yang Ming	CKYH	Yang Ming Marine Transport Corp, Kuang Ming Shipping	2,825	1.6%
17	Group Q	ZIM	-	Zim Integrated Shipping Services, Gold Star Line, Laurel Navigation	3,176	1.8%
18	Group R	HMM	New World	Hyundai Merchant Marine	2,998	1.7%
19	Group S	PIL	-	Pacific International Lines (PIL), Advance	2,025	1.2%
20	Group T	UASC	-	United Arab Shipping Co (UASC)	2,193	1.3%
21	Group U	X-Press	-	X-Press Feeders	426	0.2%
22	Group V	Bengal Tiger	-	Bengal Tiger Line	450	0.3%
23	Group W	OEL	-	Orient Express Lines	477	0.3%
24	Group X	Emirates	-	Emirates Shipping Line	2,267	1.3%
25	Group Y	Wan Hai	-	Wan Hai Lines	186	0.1%
26	Group Z	SCI	-	Shipping Corp of India	165	0.1%
27	Group AA	DAL	-	DAL Deutsche Afrika-Linien	366	0.2%
28	Group AB	Hub	-	Hubline	1,061	0.6%
29	Group AC	RCL	-	Regional Container Lines	780	0.5%
30	Group AD	Samudera	-	Samudera Indonesia	219	0.1%
31	Group AE	Shreyas	-	Shreyas Shipping	766	0.4%
32	Group AF	Simatech	-	Simatech Shipping	611	0.4%
33	Group AG	STX	-	STX Pan Ocean Shipping	57	0.0%
34	Group AH	Far Shipping	-	Far Shipping	84	0.0%
Others					53,831	31.1%
Total					173,192	100.0%

Source: Estimation by the Survey Team from MDS data, '000TEU

(3) Hinterland Transport Network

Hinterland shipping network in South Asia is also considered in the model. Figure 5.3 illustrates the hinterland shipping network in 2030 used in the model. The land shipping network for the South Asian network (including road, rail, and ferry/RORO network) is based on GIS-based information provided by American Digital Cartography (ADC) Inc. The ADC WorldMapTM provides the information such as link distance and road type of the networks in South Asian continent. The land shipping network for three South Asian countries (Bangladesh, India, and Sri Lanka) covers 7,355 road links and 727 railway links, and 3 ferry/RORO links with total lengths of 131,589 km of road, 15,260 km of railway, and 872 km of Ferry/RORO as shown in Figure 5.3, while Pakistani model includes 69,300 road links and 4,033 railway links, with total lengths of 2,909,252 km of road and 128,729 km of railway, which includes Pakistan, Afghanistan, Central Asian countries, Iran, Russia, Belarus, Ukraine, Rumania, Baltic states, Moldova, Azerbaijan, Armenia, and Georgia as shown in Figure 5.4. Nepal and Bhutan is also incorporated in the hinterland shipping network of three South Asian countries with a hypothetical link for each, although they are not shown in the below figure.



Source : Study Team

Figure 5.3 Hinterland Shipping Network of South Asia (Bangladesh, India, and Sri Lanka)

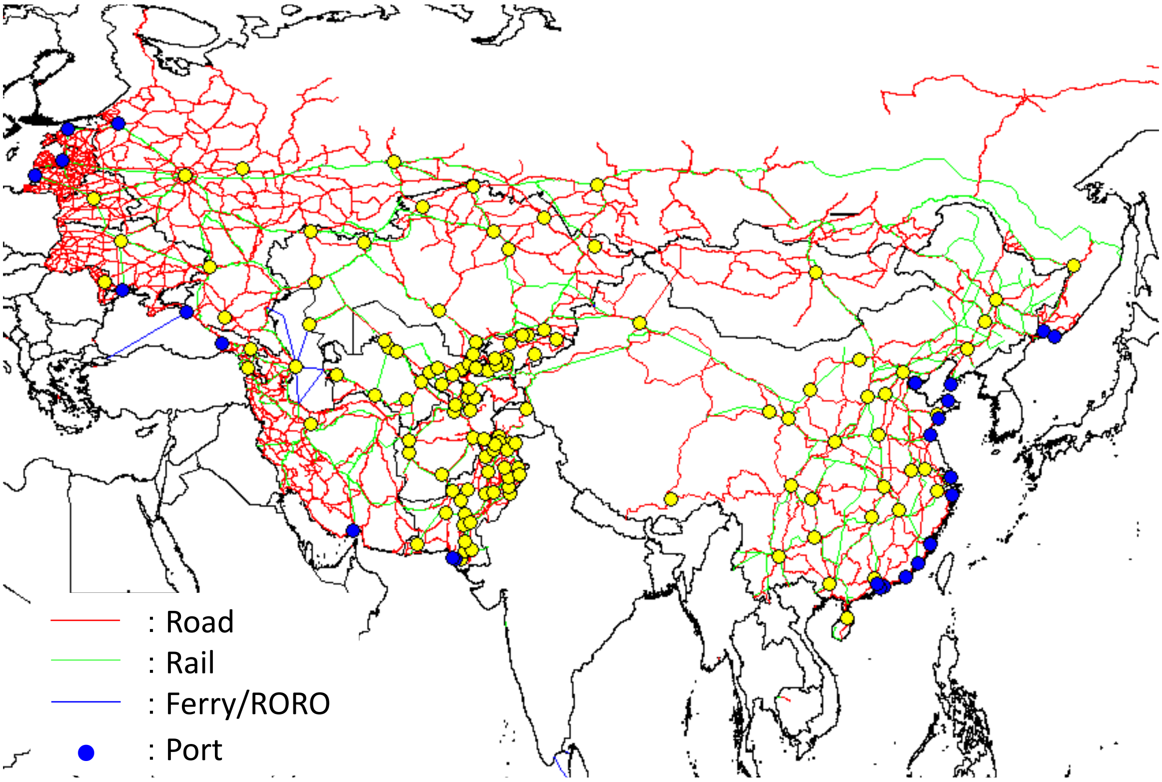


Figure 5.4 Hinterland Shipping Network of Pakistan and Eurasia

5.1.3 Container Shipping Demand (OD Matrix)

(1) Port OD

The demand of container cargo shipping from port r to s is estimated as follows. First, the demand of container cargo shipping (OD matrix) between countries or regions on a TEU-basis is obtained from the World Trade Service (WTS) database provided by IHS, Inc. Note that the empty containers are not included in the matrix. The current version of the WTS data provides a container shipping demand for each year (from 2000 to 2030) among 117 countries/regions of the world. However, some countries/regions in the WTS data are landlocked or do not have any seaports which handle more than 500,000 TEU a year. Also, hinterland transport across national borders can be observed in some regions, such as in Europe and North America. Therefore, the OD matrix is aggregated into 46 countries/regions considering the characteristics of hinterland transport.

The second step for estimating demand for container cargo shipping is dividing the aggregated OD matrix above into a port-basis according to the port's share of the export and import container cargo throughput of the aggregated region. Note that transhipment containers and empty containers, which are available from Drewry Maritime Research (2014a), are eliminated from the cargo throughput utilized above

Then, the third step is to eliminate the containers that will be shipped by the companies which are not included in the model. This is necessary for the balanced calculation of the model between the vessel capacity and the amount of containers shipped in each service. This is obtained by first subtracting the total amount of shipping demand by the share of carriers which are not considered in the model for each port based on the share in vessel capacity arriving at and departing from each port. Then, the Frater method is applied to adjust errors by inputting the total amount of shipping demand for each port for the target carriers as given and the OD matrix estimated in the previous section as initial inputs. This is a procedure for the development of OD matrix between the ports

(2) Regional OD (Bangladesh, India, Sri Lanka)

Since the model considers the hinterland network, OD matrix between the ports (developed in the previous section) are subdivided into detail zones where container cargoes are generated/attracted to/from outside of South Asian counties. Detail zones in three South Asian countries (Bangladesh, India, Sri Lanka) are identified following OD matrix developed by GSM model which is elaborated on the basis of the macro forecasting results described in Chapter 3. GSM OD matrix comprises of 1,883 zones in the world and three South Asian countries are divided into 64 zones for Bangladesh, 575 zones for India, and 9 zones for Sri Lanka as shown in Figure 5.5. The OD matrix calculated by GSM model is value-based transactions between the OD, and the six OD matrices are separated in terms of goods items such as; agriculture, automobile, electricity, textiles, food processing, and other manufacturing.

Source: Survey Team

Figure 5.5 Centroid of Zones in South Asia

The OD matrix estimated by GSM is used for the purpose where the country's export/import container volume is distributed to each of the detailed zones shown in Figure 5.5. Here, regarding three South Asian countries, port OD is aggregated to countries level. The procedure to obtain the OD matrix is as follows. (i)The transaction values transported by containers are extracted and multiplied by container ratio with values in the OD matrix. At this time, the share of container ratios is applied for each of the OD pairs. The container ratios between OD pairs are calculated by using WTS data, which is able to differentiate container and non-container cargo in terms of tonnage base, and, goods items are also able to specify for almost the same items of the GSM OD matrix; agriculture, automobile, electricity, textiles, food processing, and other manufacturing. Finally, total trade volume of the country (Bangladesh, India, and Sri Lanka) in terms of TEU is proportionally distributed to each OD volume on the basis of the container ratio between the OD pairs. However, in the case of India, import/export data provided by Indian Customs Office is used to obtain the container export/import volume for each state. In this case, the model accuracy in terms of reproduction of current cargo flow proves a higher coefficient of variation (mentioned in next section). Proportional to the distributed container cargo for each state, the share of the OD matrix by IDE is used to calculate the share within the state in order to obtain the container amount of the detailed OD pairs.

Regarding the future the OD matrix (year 2030), the growth rate of the OD matrix of GSM is used (which is derived on the basis of the macro forecasting results). The GSM OD matrix is provided for the year of 2010 and 2030, and these two OD matrices are identical in terms of zones and goods items (six types). Here, the growth rate is computed for each of the OD pairs due to the fact that growth rates are different for each OD pair. The average growth rate of all 2030 OD pairs is to be 2.43 times higher, when compared to the year 2010 in terms of value-based amount. As for the average growth rate, it is estimated at 3.51, 4.06, and 3.89 times for Bangladesh, India, and Sri Lanka, respectively. At the same time, future container volumes of Nepal and Bhutan also utilizes the result of GSM model. Consequently, the future OD matrix for the year 2030 base case is also obtained. In this analysis, the future case simulation is considered for three cases; normal (1.0), high (2.04 times changed from 2013 normal case), and low (0.929 times changed from normal case) cases. This growth rate comparing 2030 normal and 2030 high and low cases are derived on the basis of macro forecasting results.

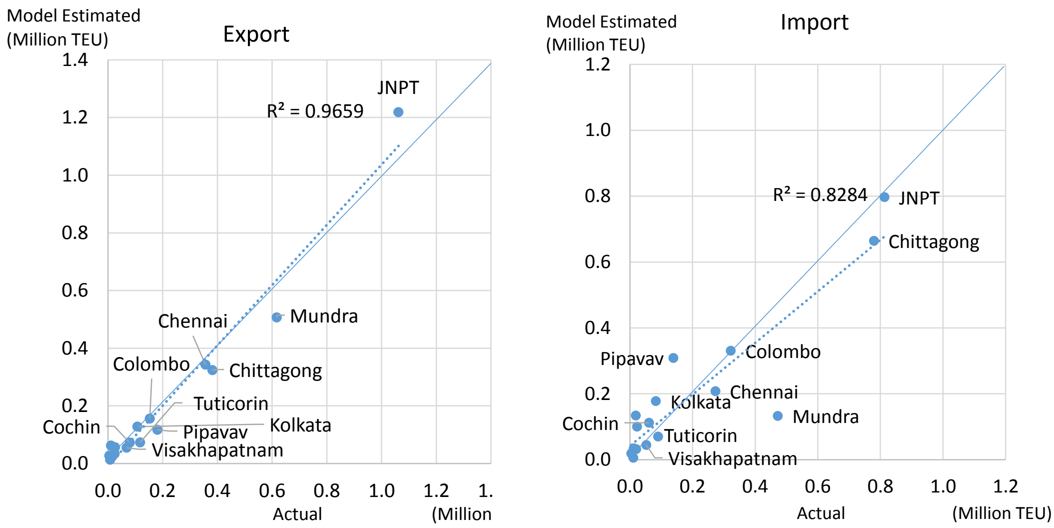
(3) Regional OD (Pakistan and Central Asia)

The regional OD matrix in 2013 for Pakistani (and Central Asian) model is estimated through following steps. Firstly, the OD matrix between countries or regions on a TEU-basis is obtained from WTS database. The WTS-region-level OD matrix is aggregating into 72 countries/regions considering the characteristics of hinterland transport of Pakistani ports. Secondly, the aggregated OD matrix is divided into a port-basis OD matrix according to the port’s share of the export and import container cargo throughput of the aggregated region in consideration of transhipment rate, empty containers rete, and shipping companies. Thirdly, OD matrix between the ports is subdivided into detail zones where container cargoes come from/to the targeted countries. The hinterland transportation networks in targeted countries are incorporated in this model. The hinterland network in Central Asian countries, Afghanistan, and Pakistan are necessary to be included. Furthermore, the connecting transportation network of Central Asian countries with possible gateway ports. The targeted countries in this Pakistani and Central Asian model, therefore, include Kazakhstan, Kyrgyzstan, Turkmenistan, Tajikistan, Uzbekistan, Afghanistan, Pakistan, Russia, China, Armenia, Azerbaijan, Belarus, Estonia, Georgia, Iran, Latvia, Lithuania, Moldova, Mongolia, and Ukraine. The targeted countries are divided into 134 zones. Kazakhstan, Kyrgyzstan, Turkmenistan, Tajikistan, Uzbekistan, Afghanistan, and Pakistan are divided according to the administrative units in each country. China is divided into 31 provinces, and Russia is divided into eight districts. Country-based zones are assumed for the rest of targeted countries. WTS database is utilized to obtain country’s export/import container volume is distributed to each of the Countries-based zones. Since the trade data of Central Asian countries (i.e. Kazakhstan, Kyrgyzstan, Turkmenistan, Tajikistan, and Uzbekistan) are combined as a single region in the original WTS database and the breakdown by Central Asian country is not available as of 2013, the share in international maritime container cargoes of each Central Asian country by trade partner in 2013 is estimated to be proportional to that in 2010 respectively which was also estimated by IHS Inc. Similarly, regarding Afghanistan cargo which is combined with Bhutan and Nepal as a single region in the original WTS data, the container volume to/from Afghanistan as of 2013 is estimated by dividing the original data proportionally to the trade value of each country by trade partner in 2013, which is available from the UN website (COMTRADE database). Since no suitable statistical data other than Gross Regional Product (GRP) is available that is representative indicator for the detail zones, this report estimated the detail-zones-based traffic volumes assuming that the traffic volumes to and from the detail zones are proportional to their GRP, as recommended in Shibasaki et al. (2010a).As the GRPs of the provinces in Turkmenistan are not available, the traffic volumes to and from the detail zones in Turkmenistan are assumed to be proportionally allocated with population. As the both export and import of trade value in each Chinese province is available, The Chinese container volume is proportionally distributed to each Chinese province based on Chinese provincial trade value in 2013.

Regarding the future OD matrix (year 2030), the growth rate of the Pakistani containers are estimated by multiplying growth rate of Pakistani GDP by container demands' growth elasticity of GDP growth in other South Asian countries because GSM model does not include Pakistan. Note that the forecasted GDP growth rate utilizes the values explained in the chapter of 3.2, and that the forecast of containers' demand utilizes the result of GSM model. The growth rates of Pakistani containers volumes from 2013 to 2030 are estimated to be 2.85, 3.29, and 4.50 for the low case, the base case, and the high case.

5.1.4 Reproduction of Current Cargo Flow

In order to check the model accuracy, reproduction of current cargo flow (year 2013) by the MICS is plotted in Figure 5.6, which illustrates the case for container volume in the ports of South Asia for export and import, separately. The horizontal axis and vertical axis indicate actual and estimated (by model) container volume, respectively. The model accuracy seems to be acceptable for both an export and import case, since the coefficients of determination (R2) is relatively high enough, which are received as 0.97 and 0.83. Therefore, several scenarios can be simulated using the developed model. Regarding the land container flow of the year of 2013, it is shown in Figure 5.7.

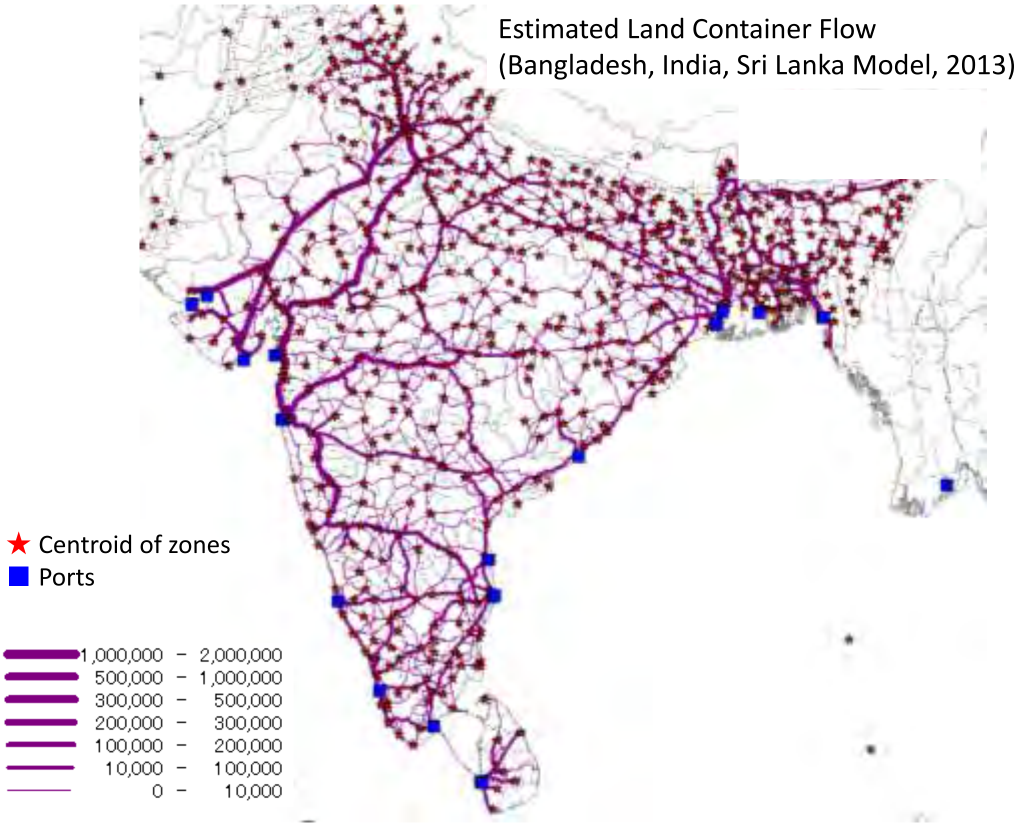


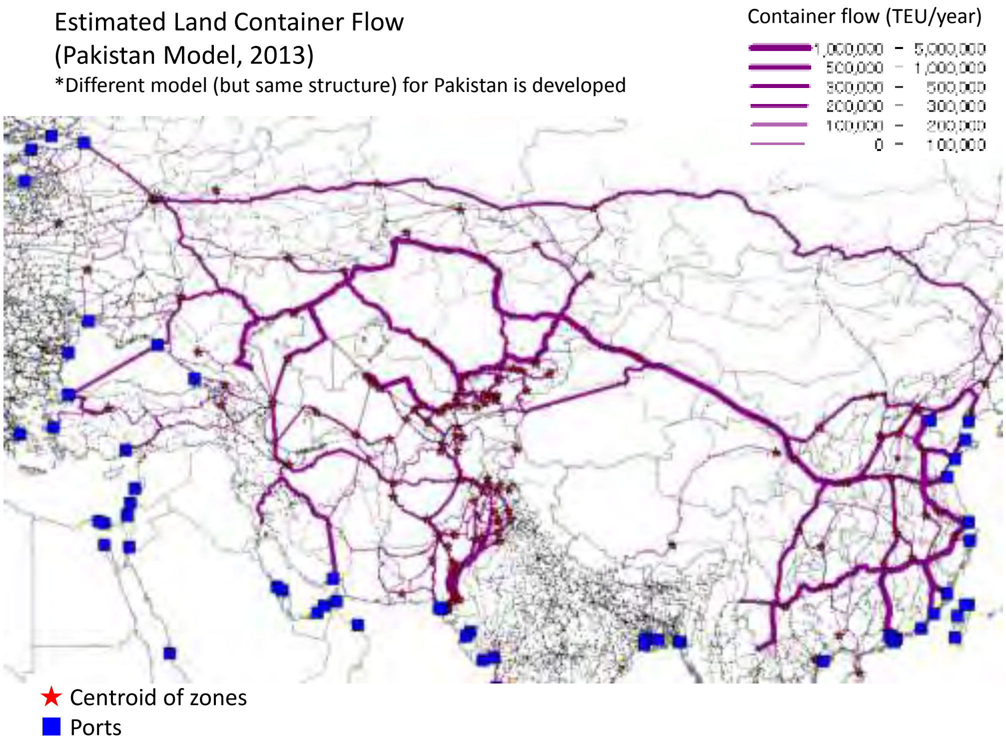
(a) Export (b) Import

(*excluding empty containers)

Source: Survey Team

Figure 5.6 Actual and Estimated Container Volumes at South Asian Ports (2013)





(*excluding empty containers)

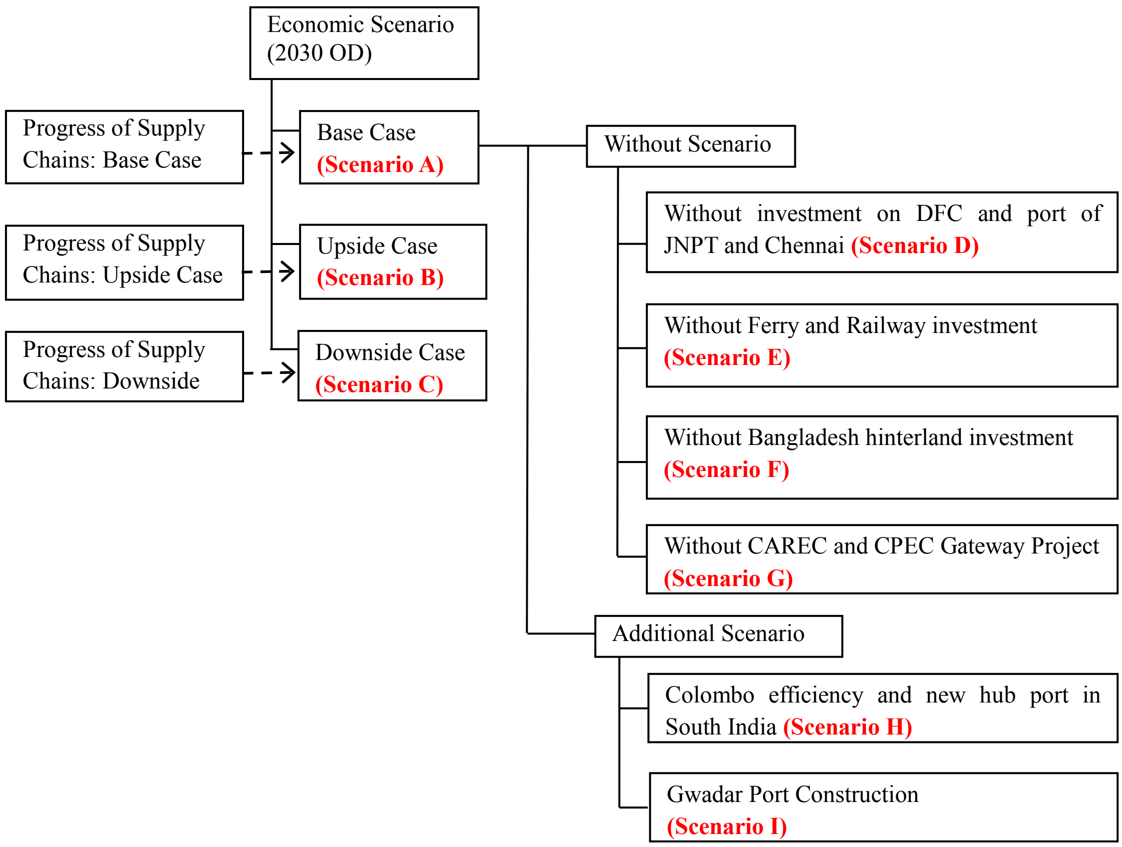
Source: Survey Team

Figure 5.7 Estimated Land Container Flow in 2013

5.1.5 Scenario Analysis

(1) Overview of Scenario Analysis

In this simulation analysis, several scenarios are simulated by the combination of each case. Scenarios for the simulation analysis are summarized in Figure 5.8. Basically, the scenarios can be divided into economic scenarios, without scenarios, and additional scenarios. As for economic scenarios, future OD data (the year 2030) is input, instead of current OD data (the year 2013). Future OD data is estimated by multiplying the growth rate (including low and high demand cases). In this sense, the future cargo flow simulation is estimated based on the macro forecasting result. These are Scenarios A, B, and C. Without scenarios are targeted DFC (Dedicated Freight Corridor), JNPT, Chennai, ferry/railway service between Colombo and Sri Lanka, Bangladesh hinterland, and CAREC and CPEC for Pakistan scenario. On the other hand, additional scenario is construction of new hub port in South India plus further Colombo efficiency. This scenario is regarded as hub port competition in South Indian region. In Pakistani simulation, Gwadar port construction is simulated. Here, simulation for Pakistan is performed by using the same model and OD data, but, the parameters and target hinterland are different.



Source: Survey Team

Figure 5.8 Summary of the Scenarios for the Simulation Analysis

(2) Economic Scenarios (Scenario A, B, C)

First scenario for future cargo flow simulation assumes increase in export/import volume as economic conditions improve. Proposed scenarios are that economic conditions are base case (Scenario A), upside case (Scenario B), downside case (Scenario C) which are assumed and derived on the basis of the forecasting results of progress of supply chains in chapter 3, macroeconomic analysis. The reason to analyze upside and downside cases in addition to base case is due to the uncertainty of future economic conditions.

As economic conditions changed, the future cargo demand (OD matrix) is changed in the model. Accordingly, in the maritime shipping network, it is assumed that a vessel size of each service is proportionally enlarged as the world economy expands (i.e. 2.43 times in the Base Case, 2.92 times in the Upside Case, and 2.04 times in Downside Case comparing to 2013) to meet the shipping demand, unless it reaches the upper limitation (i.e. 24,000 TEU) which is currently estimated due to the technical reason (if the vessel size reaches the upper limit, the frequency of the service in question is increased to maintain the sufficient annual capacity for each service). Similarly, we assume the infrastructure of each port in the world is sufficiently streamlined in terms of both depth and berth capacity to accommodate sufficient number of enlarged vessel with some exceptions (i.e. JNPT and Chennai, see below). Also, the capacity of hinterland network including road, rail and inland waterway in South Asia is proportionally increased as the shipping demand in South Asia increased (i.e. 4.07 times in the Base Case, 5.52 times in the Upside Case, and 2.98 times in Downside Case comparing to 2013). This assumption comes from the idea that fundamental improvement of overall infrastructure service level is to be achieved in the future. In addition, regarding the economic scenarios (Scenarios A, B, and C), remarkable transport infrastructure investment including construction of Dedicated Freight Corridor (DFC) between Delhi and Mumbai/Pipavav/Mundra, improvement of access road around the port of JNPT and Chennai, improvement of railway access between Krishnapatnam and Bangalore, construction and improvement of ferry and railway service between India and Sri Lanka, and several investments on Bangladesh hinterland including road, railways, and inland waterway shipping.Detail settings for these investment into the model are described in each “without” cases later.

As mentioned above, since the planned berth depth in port of JNPT and Chennai in future are not sufficient to accommodate the enlarged vessel estimated in the model calculation, the additional settings are assumed as follows;

1) Future permissible draft of JNPT is still limited to -14m (less than 5,700 TEU capacity vessel is able to call at) as mentioned in chapter 4 (4.1.3). In this case, several services might skip JNPT since vessel size is so enlarged that JNPT cannot accommodate such large vessels. In this simulation, some of the feeder services are assumingly skip JNPT. Currently, the number of liner services to call at JNPT is 32. Among them, we defined the feeder services in case a vessel calls at JNPT between the ports of transshipment hub and other Indian ports. Among these feeder services, 12 services are provided by more than 5,700 TEU sized-vessels. Due to constraint of draft, these services are assumed to skip JNPT. Regarding other services which average capacity is more than 5,700 TEU in 2030, it is assumed that vessel size is enlarged up to 5,700 TEU at maximum.

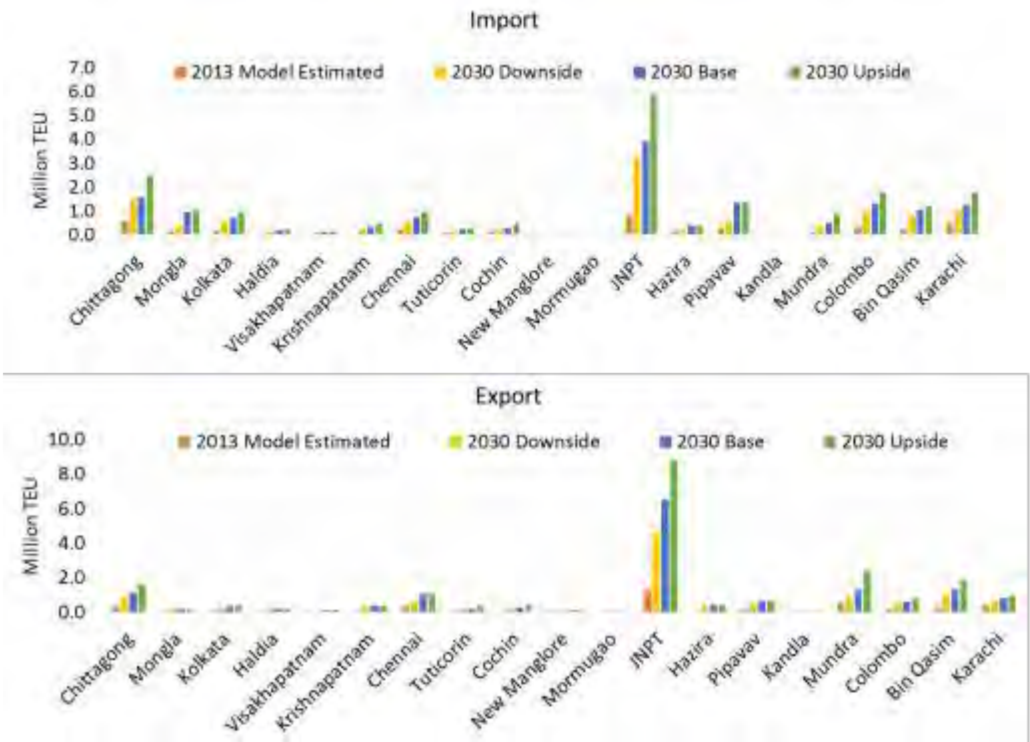
2) Future draft in port of Chennai will is planned to be -15m as mentioned in chapter 4. Even if 15m draft is realized in the future, 7,200 TEU capacity vessel cannot call at Chennai due to the limitation of draft. Therefore, three liner services out of 18 services which calls at Chennai are assumed to shift in future to Krishnapatnam which draft is -18m at the maximum.

Figure 5.9 illustrates the results of container throughput (laden container only, excluding empty containers) for each port in South Asia, for the case of 2013 model estimate, 2030 downside, base, and upside case, which corresponds to Scenario A, B, and C. As seen in Figure 5.9, it is expected that JNPT will be overwhelmingly high volume, compared to other Indian ports (as well as other South Asian ports), which reaches 6.5 (8.8, 4.6) million and 3.9 (5.9, 3.3) million TEU in the 2030 base (upside, downside) case for export and import case, respectively. As mentioned before, in this simulation, port capacity is assumingly accommodate to handle increased demand of container volume except for JNPT and port of Chennai. Mundra and Pipavav ports are also expected to increase the container throughput, especially for export in Mundra and import in Pipavav, both of which are expected to handle 1.3 million TEU, respectively. In case that the container cargo amount handled in JNPT reaches full capacity, these two ports are the potential alternative ports of JNPT due to its mutual proximity.

As for Bangladesh and Sri Lanka, Chittagong and Colombo ports will keep the highest container cargo volume in the country. Chittagong port will treat 2.7 million TEU (in total of export and import) in 2030 for the base case. In this case, it is concerned that capacity of Chittagong port will be exceeded in 2030, thus, increase in port capacity (e.g. expansion of Chittagong port or construction of new deep seaport in the proximity of Chittagong port) is needed. As for Mongla port, 1.2 million TEU will be handled in 2030 whereas container throughput in 2013 is only 37.5 thousand TEU.

Table 5.2 shows the growth rate in the comparison between 2013 and 2030. The red hutched cell indicate growth rate of container throughput exceeds the average growth rate in South Asia. As for the growth rate, JNPT records 5.17 and 4.78 for export and import, respectively. It is high rate compared with average growth rate. The two highest growth rates are Krishnapatnam (12.3 for 2030 base case) and Hazira (12.85) ports for export case.

Regarding Pakistani ports, the estimated container volume in Karachi port for the year 2030 is estimated as 0.8 and 1.3 million TEU, for export and import case, respectively, whereas 2030 upside case is as increased up to 1.0 and 1.8 million TEU, export and import, respectively. Regarding Bin Qasim port, 1.3 and 1.0 million TEU will be treated in base case.



(*excluding empty containers)

Source: Survey Team

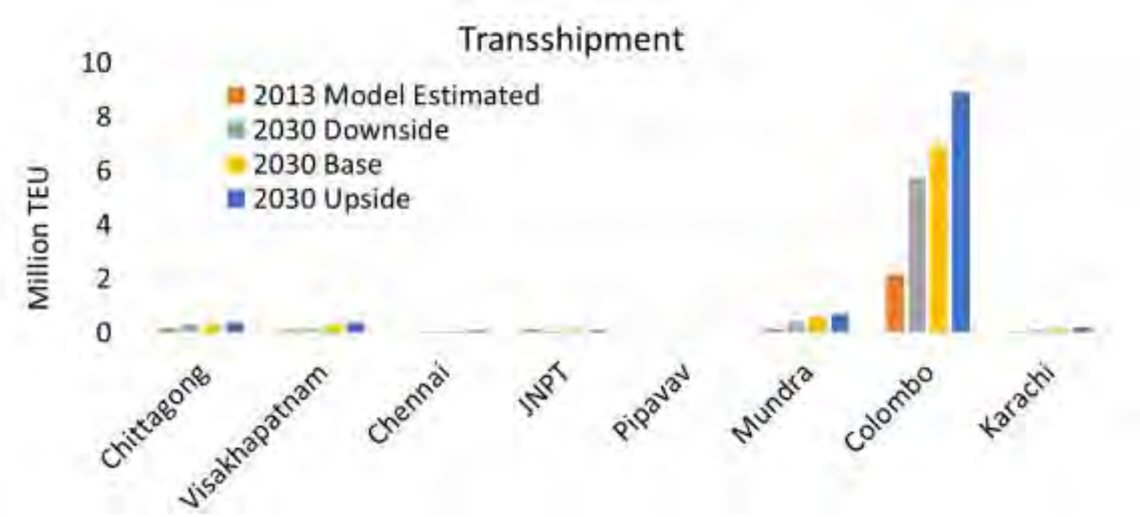
Figure 5.9 Container Volume in Each Port (Scenarios A, B, C)

Table 5.2
Container Growth Ratio Comparing to 2013 at Each Port (Scenario A, B, C)

port	Export			Import		
	2030 Downside	2030 Base	2030 Upside	2030 Downside	2030 Base	2030 Upside
Chittagong	2.53	3.41	4.98	2.49	2.69	4.17
Mongla	3.21	3.19	2.86	2.03	5.43	5.76
Kolkata	2.31	3.53	4.42	3.29	3.97	5.36
Haldia	3.75	5.68	6.58	3.69	5.46	6.44
Visakhapatnam	1.33	2.11	3.91	2.59	2.58	3.29
Krishnapatnam	11.88	12.43	11.63	6.82	10.48	15.02
Chennai	1.70	2.96	3.00	3.10	4.01	5.04
Tuticorin	2.51	2.86	5.20	2.29	2.97	3.65
Cochin	3.46	3.39	6.15	1.73	2.38	3.74
New Manglore	3.76	3.29	6.81	2.55	3.51	5.03
Mormugao	1.87	1.34	1.25	1.36	1.68	2.20
JNPT	3.64	5.17	6.99	3.95	4.78	7.14
Hazira	11.79	12.85	11.09	1.24	2.85	2.77
Pipavav	4.10	5.03	5.33	2.11	4.73	4.80
Kandla	4.44	2.52	1.69	2.04	0.52	0.32
Mundra	1.80	2.53	4.77	2.64	3.68	6.63
Colombo	3.03	3.99	5.33	2.98	4.00	5.41
Bin Qasim	3.77	4.77	6.59	3.70	4.86	5.64
Karachi	1.96	2.52	2.88	2.11	2.59	3.69
Total (Average)	3.02	4.06	5.45	2.85	3.85	5.23

Source: Survey Team

Figure 5.10 illustrates the transshipment container cargo volume (excluding empty containers) in each major port in South Asia. As seen in Figure 5.10, transshipment volume in South Asia is overwhelmingly the highest volume handled in Colombo. As for the base case in 2030, transshipment container volume in Colombo port is 6.8 million TEU, which is 3.13 times larger than that estimated as of 2013. Regarding Indian and Bangladesh ports, the amounts of transshipment containers are much smaller in these scenarios, which the construction of a new hub port in South India is not considered. As for Indian port, Mundra and Visakhapatnam are increased transshipment container throughput by 525,368 TEU (3.63 times higher than that in 2013) and 207,978 TEU (3.96 times), respectively.



(*excluding empty containers)

Source: Survey Team

Figure 5.10 Transshipment Container Volume in Each Port (Scenario A, B, C)

Table 5.3
Transshipment Container Growth Ratio to 2013 at Each Port (Scenario A, B, C)

port	Transshipment		
	2030 Downside	2030 Base	2030 Upside
Chittagong	2.09	2.11	2.61
Visakhapatnam	1.96	3.63	4.54
Chennai	4.69	4.54	7.86
JNPT	0.52	0.66	0.77
Pipavav	1.27	5.69	4.27
Mundra	2.81	3.96	4.74
Colombo	2.65	3.18	4.12
Karachi	1.69	3.01	3.49

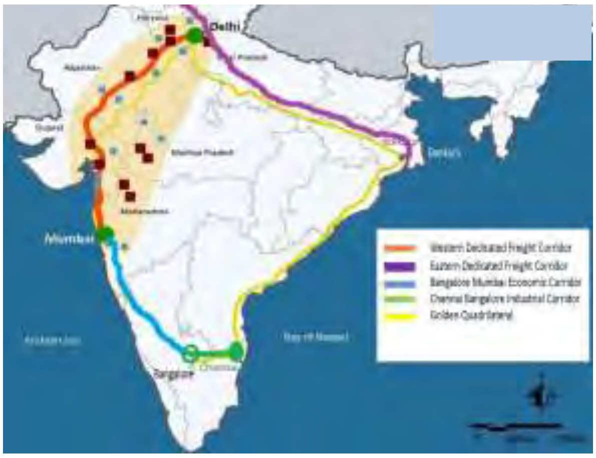
Source: Survey Team

(3) Without Investment on DFC and the Port of JNPT and Chennai (Scenario D)

The scenario examining in this section is the case without any investment on neither DFC nor the access roads of JNPT and port of Chennai.

The DFC project is shown in Figure 5.11. As mentioned in chapter 4 (section 4.1.3), in the current situation, the railway network between Delhi and Mumbai is already electrified. However, passenger transport is prioritized over cargo transport. In addition, there are long waiting times and low service levels due to the full capacity of seaports on the West Coast, such as JNPT. Thus, shippers which treats high value-added goods, such as Japanese companies, tend to use the rising seaports of Mundra and Pipavav. However, since the railway network to Mundra and Pipavav is not electrified, transport times take more than that to Mumbai. Regarding the connection between Delhi and Mumbai, a cargo dedicated railway, DFC, is being developed. In case DFC is completed (scheduled for completion in 2019), a 90-car, double stack train, with non-electrified and double tracks, will be operated and the railway capacity will substantially increase. If the expansion and new terminal development of JNPT is completed as scheduled, Mumbai (JNPT) will likely continue to maintain the role of the main gateway seaport of Delhi and its surrounding states and cities.

In Scenario D, DFC railway is constructed as planned, however, the service level is the same as other freight railways. In the analysis, the following input variables are changed for the container flow simulation as shown in Table 5.4.



Source : Delhi Mumbai Industrial Corridor Development Corporation Ltd.

Figure 5.11 Major Industrial Corridor of India Including DFC

Table 5.4 Input Values for Simulation (Scenario D)

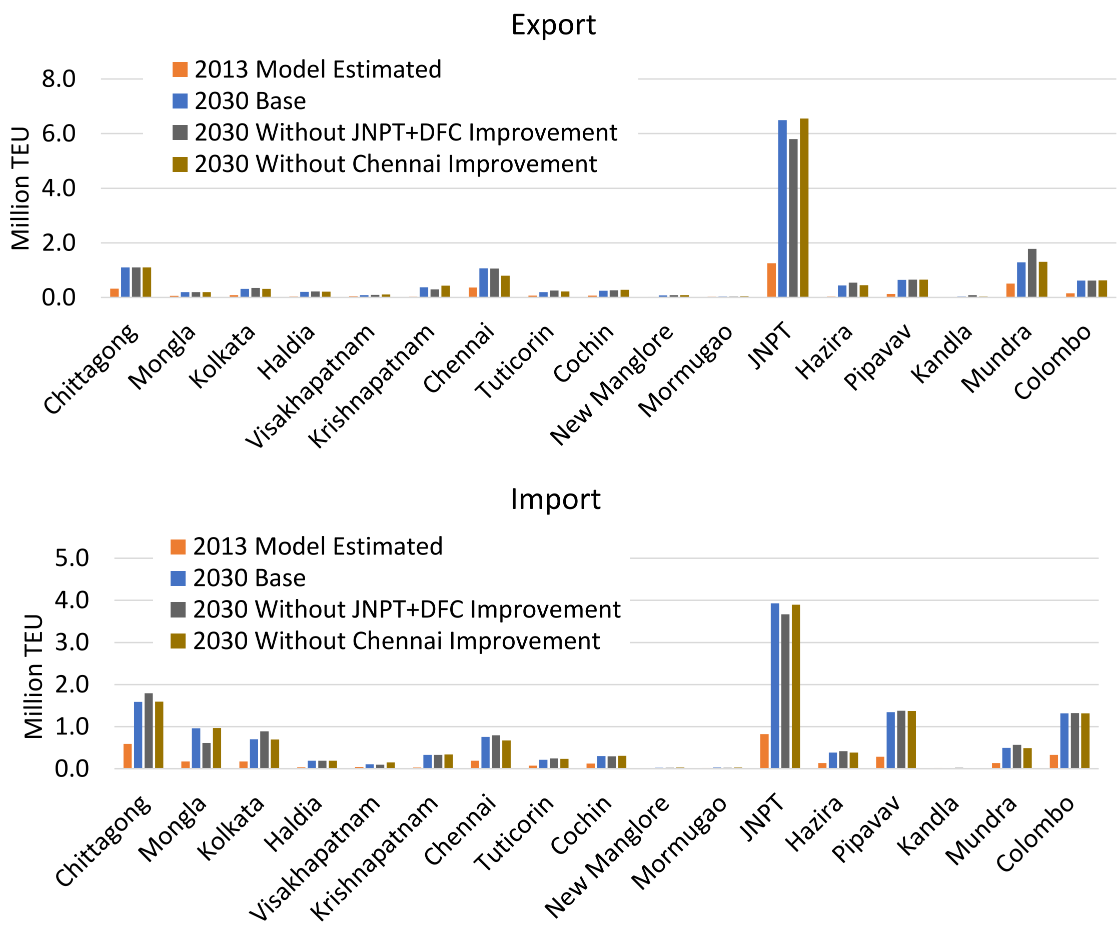
	Current Status (without case)	Future Scenario (with case)
Capacity	90 TEU (45 wagons)/train	360 TEU (90 wagons, double-stacked)/train
Speed	20 km/h	80 km/h
Frequency	7~50 trains/week	28~200 trains/week
Handling time at station	24 hours	4 hours
Operation Cost	0.3 USD/km	0.15 USD/km

Source: Survey Team

In addition, since the access roads around JNPT and port of Chennai are heavily congested, the improvement of port access roads become very critical for both ports. In the simulation, the access roads to JNPT and Chennai are assumed to be not improved since 2013.

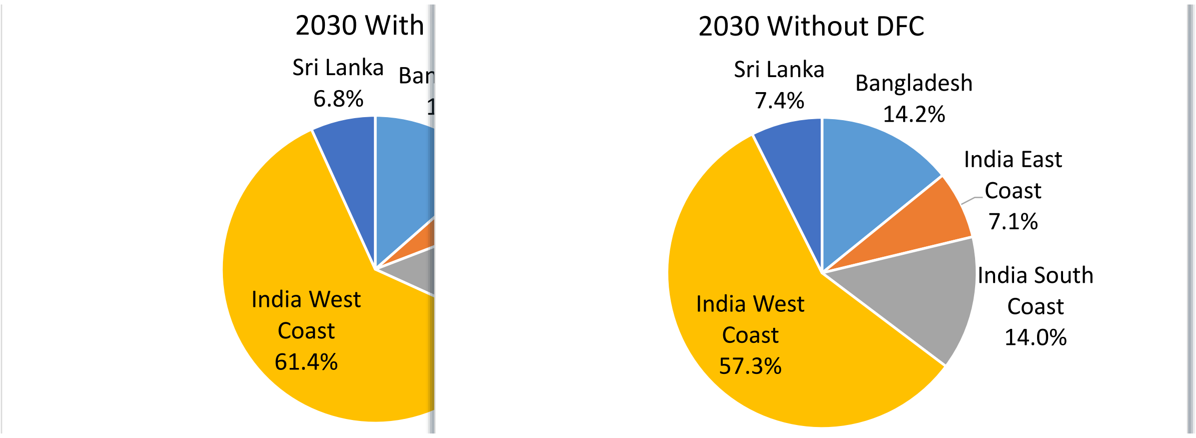
Simulation results of Scenario D which limits access improvement of JNPT (including DFC) and Chennai port are shown in Figure 5.12 and 5.14, respectively. The figure illustrates container cargo volume for each South Asian port for the case of 2013 model estimate, 2030 base case, and 2030 without investment of JNPT+DFC and Chennai port. As seen in Figure 5.12, the container cargo volume in JNPT is decreased by 0.95 million TEU from 10.42 million TEU in case the access road of JNPT and DFC improving projects are not conducted. From the simulation result, it can be concluded that the hinterland improvement project needs to be conducted for JNPT in order to obtain a high volume of containers. Figure 5.14 shows container throughput at the ports of each region in India for the cases of with and without DFC development. The most remarkable change is share in the ports of India West Cost. As DFC improvement is done, total container cargo are imported/exported at the ports of India West Cost increases 4.1 point. It is equivalent to 2.5 million TEU increase (+16.9%) from without DFC investment. On the other hand, share of Indian West Coast (i.e. Kolkata port) decreases 1.5 point, which is equivalent to 24.5 thousand TEU decrease (-13.3%). From this result, as DFC is developed, shippers (particularly from/to Delhi) change their port choice to the ports of Indian West Coast due to the reduction of transport cost.

As seen in Figure 5.12, the container cargo volume in Chennai port is decreased by 0.36 million TEU from 1.83 million TEU (total of export and import) in case that an access road to Chennai port are not improved. From the simulation result, hinterland improvement project is important for Chennai port.



Source: Survey Team

Figure 5.12 Container Volume at Each Port (Scenario D)



(*Excluding empty containers)

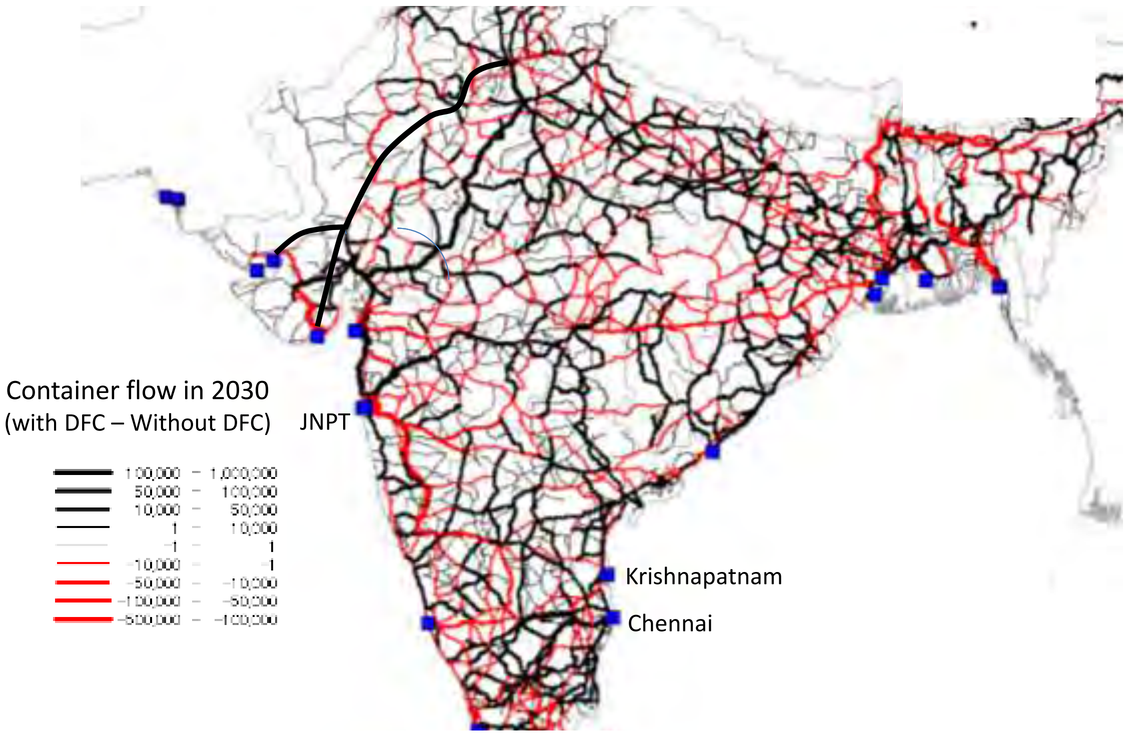
Source: Survey Team

Figure 5.13 Container Throughput at the Ports of Each Region (With and Without DFC Development, Scenario D)

Country and Region	Ports
Bangladesh	Cittagong, Mongla
India East Coast	Kolkata, Haldia, Visakhapatnam
India South Coast	Krishnapatnam, Chennai, Tuticorin, Cochin, New Manglore
India West Coast	Mormugao, JNPT, Hazira, Pipavav, Kandla, Mundra
Sri Lanka	Colombo

Source: Survey Team

Table 5.5 Ports by Country and Region

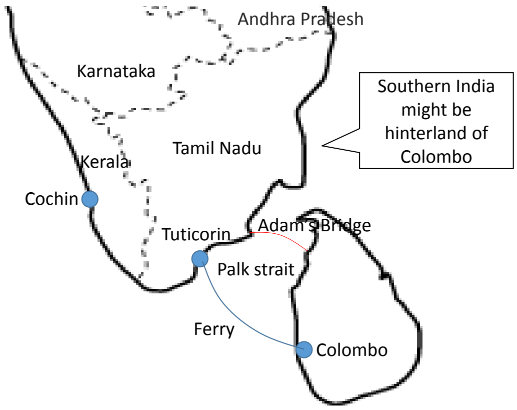


Source: Survey Team

Figure 5.14 Land Container Flow in 2030

(4) Without Ferry and Railway investment between South India and Sri Lanka (Scenario E)

Scenario E is the case assuming any ferry nor rail services between South India and Sri Lanka as well as any improvement of rail access to these services are not implemented. In other words, ferry and railway connections between South India and Sri Lanka are not assumingly reopened. Currently, transport connection between India and Sri Lanka is mainly container transport between Colombo and Tuticorin. The ferry service between these ports has been suspended after the civil war in Sri Lanka. Ferry operation had temporarily re-opened; however, it was subsequently suspended. In addition to the ferry transport, surface transport by bridge in Palk Strait by railway is deemed one of the possible scenarios.

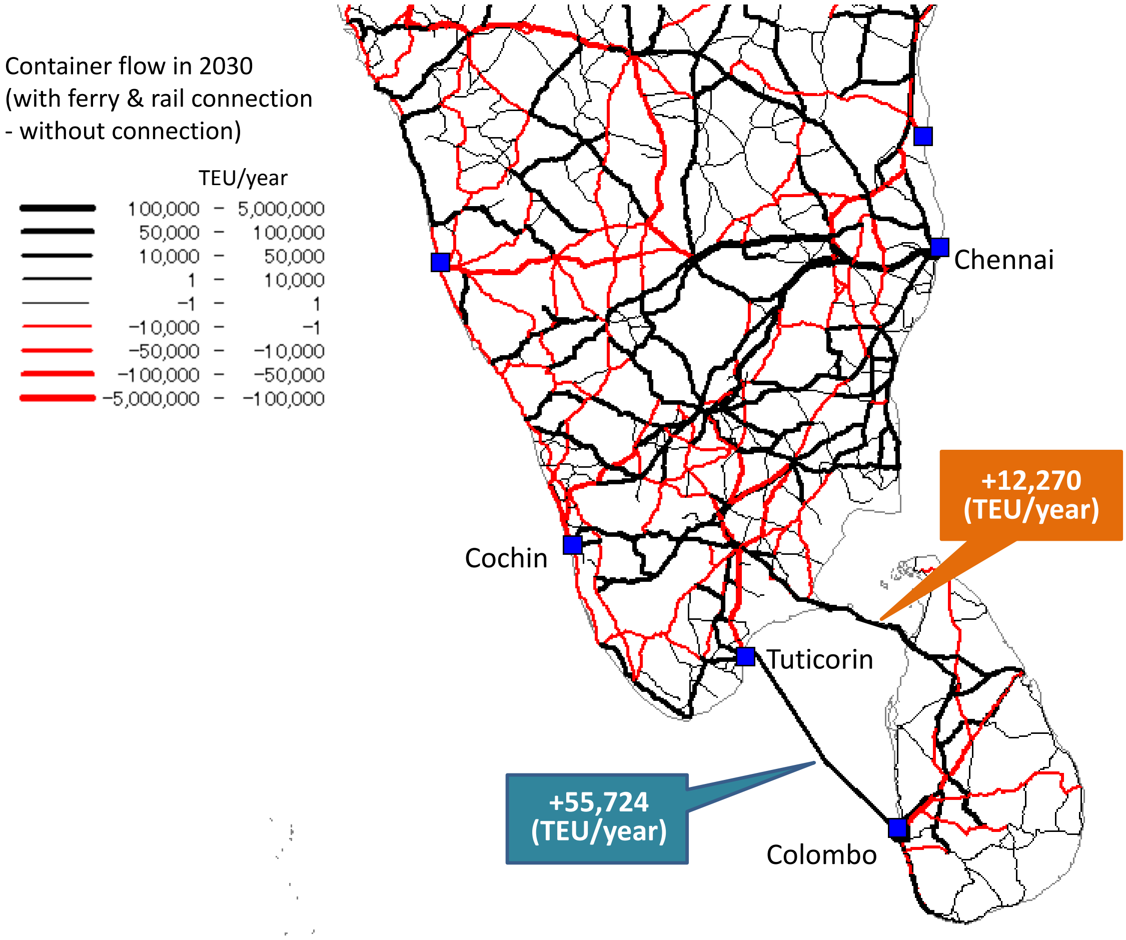


Source: Survey Team

Figure 5.15 Land and Ferry Feeder Transport between India and Sri Lanka

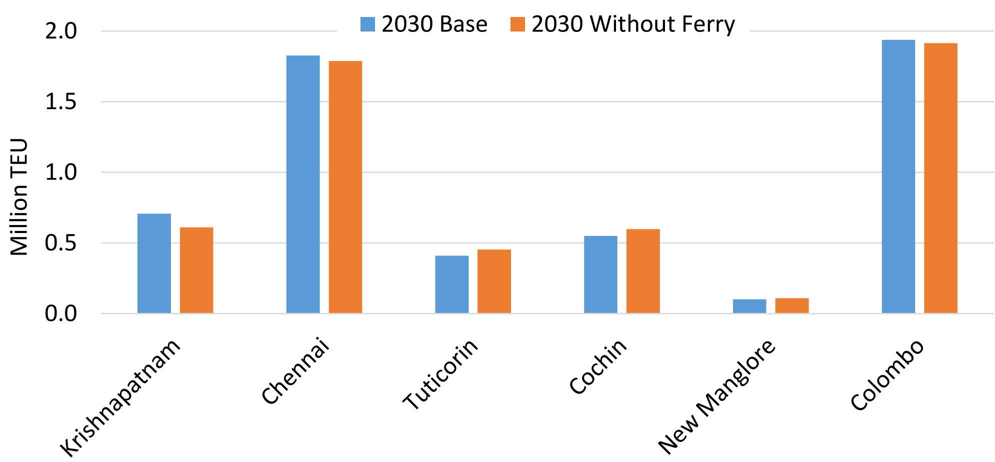
In the analysis, the following conditions are assumed for the simulation in the "with case". First, re-opening of the ferry between Tuticorin and Colombo is assumed. In this case, the frequency of ferry service is tentatively set as 4 times/day for trucks and 1 time/day for railways with a 30km/h speed. Also, regarding Adam's Bridge connection, a new rail bridge is assumed to open with 1 time/day service. In addition, improvement of rail service between South India (near Chennai) and Colombo is assumed. Current operation of rail service is 0.5 times/week and future operation is assumingly set as 7 times/week. Besides, the crossing of the national border between India and Sri Lanka is assumed to take up to half of the current conditions in terms of time and cost.

Figure 5.16 shows change in container flows in scenario E. Ferry service will be used 55,724 TEU (in total of trucks and railways) per year after reopening the service, while a new rail bridge is 11,270 TEU. Here, the simulation results in terms of export/import laden containers at each port are shown in Figure 5.17. As a result, container throughput at each port in south India and Colombo is not significantly changed as shown in Figure 5.17. It may be because shippers of each country (Southern India and Sri Lanka) mutually shift port choices so as to minimize their transport cost.



Source: Survey Team

Figure 5.16 Change in Container Flows of Ferry Connection and Rail Improvement Scenario (Scenario E)



Source: Survey Team

Figure 5.17
Container Throughput for Ferry/ Railway Connection Scenario (Scenario E)

(5) Without Bangladesh Hinterland Investment (Scenario F)

Scenario F is the case assuming any improvement of multimodal hinterland shipping network including road, railways, and inland waterways in Bangladesh is not implemented. Main transport mode between Dhaka and Chittagong is currently road transport which shares approximately 85% of the total amount, followed by rail and inland waterway. Traffic volume of inland waterway via Pangaon ICT in Narayanganj is low at current situation. In this route, modal shift from truck to rail or inland waterway is needed due to high dependent on road transport, which is severely congested. Scenarios for each transport mode are developed as follows, based on the survey results by JICA study team:

(a) Road

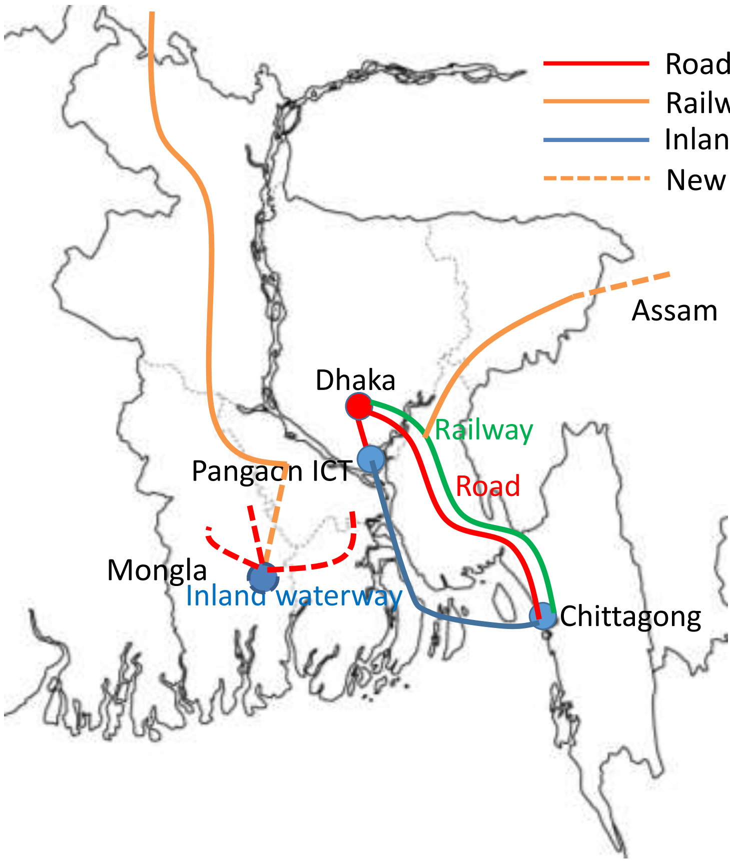
Roads between Dhaka and Chittagong are of only 1 lane for one-direction and pavement condition is relatively poor for several sections. It is assumed that road development for a 4-lane road and rehabilitation of existing roads are to be carried out by an Asian Development Bank loan and consequently, a scenario for improved driving speed (60km/h) is considered. This is the 2030 base case, which seems to be realized with relatively high likelihood. As for the "without case" above improvement is not realized.

(b) Railway

There are several single truck sections between Dhaka and Chittagong for the railway connection. Also, the rail departs only after the train becomes full (its capacity is 62 TEU). Thus, rail transport has the problem on the reliability (or punctuality). As the current situation, development for a double truck railway is being progressed and some of the sections will be double tracked within 2016. The scenario for all the railway sections to be double tracked, by an Asian Development Bank loan, with higher frequency (4 trains/day) and speed (40 km/h). In addition, a new rail construction and significant improvement of existing railways connecting with the northeast states of India are assumed (1 train/day). This is the 2030 base case. As for without case, above improvement is not achieved.

(c) Inland waterway

Container haulage by barge between Pangaon ICT and Chittagong seaport is currently in operation. At present, however, traffic volumes are low at 1,805 TEU in 2014. One of the reasons of this low volume is the insufficient number of vessels (low frequency). Thus, punctual service cannot be provided and consequently, shippers are avoid to use inland waterway. In order to shuttle 157 nautical miles, the currently available three vessels is grossly insufficient. An entrusted company for operating the vessels has not been found so far, since this operation is not beneficial for the operators. An increased level of services can be expected to induce a cargo shift from land transport to water transport. Assuming improvement of competitiveness between Pangaon ICT and Chittagong seaport, frequency and vessel speed will be increased up to 7 services/week and 20km/h, respectively in the 2030 base case.



Source: Survey Team

Figure 5.18 Hinterland Transport Network in Bangladesh to be improved (Scenario F)

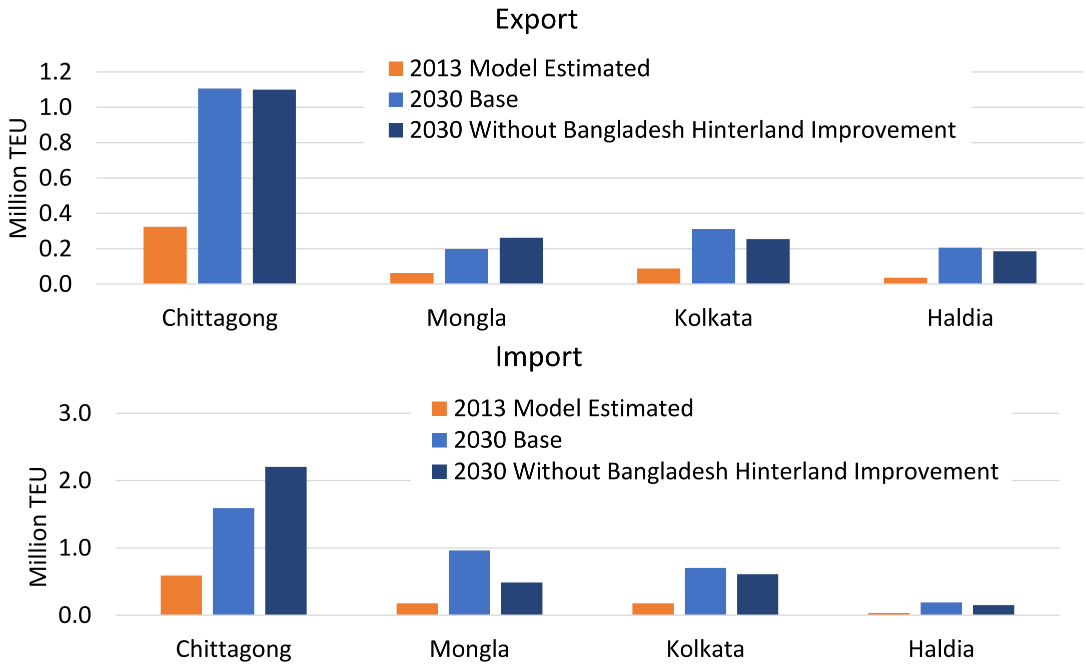
Besides, hinterland improvement of Mongla port is incorporated. Firstly, road improvement is assumed for the access to Mongla port. Specifically, capacity is expanded from current condition. Secondly, railway construction to Mongla port is assumed.

Furthermore, a reduction of the border crossing barrier is also incorporated to be half of the current level. In this case, Indian Northeast container flows will possibly enter Bangladesh and utilize Chittagong port. Container flow from/to Indian Northeast states, such as Assam state, is of much lower volume compared to other states of India. The transport mode to carry containers is mainly railway from Assam ICD and truck haulage through Indian territory. Few cargo passes through Bangladesh territory. The type of goods is mainly tea and coal.

Figure 5.18 illustrates improved or newly constructed links in the Bangladesh hinterland network assumed in the 2030 base case.

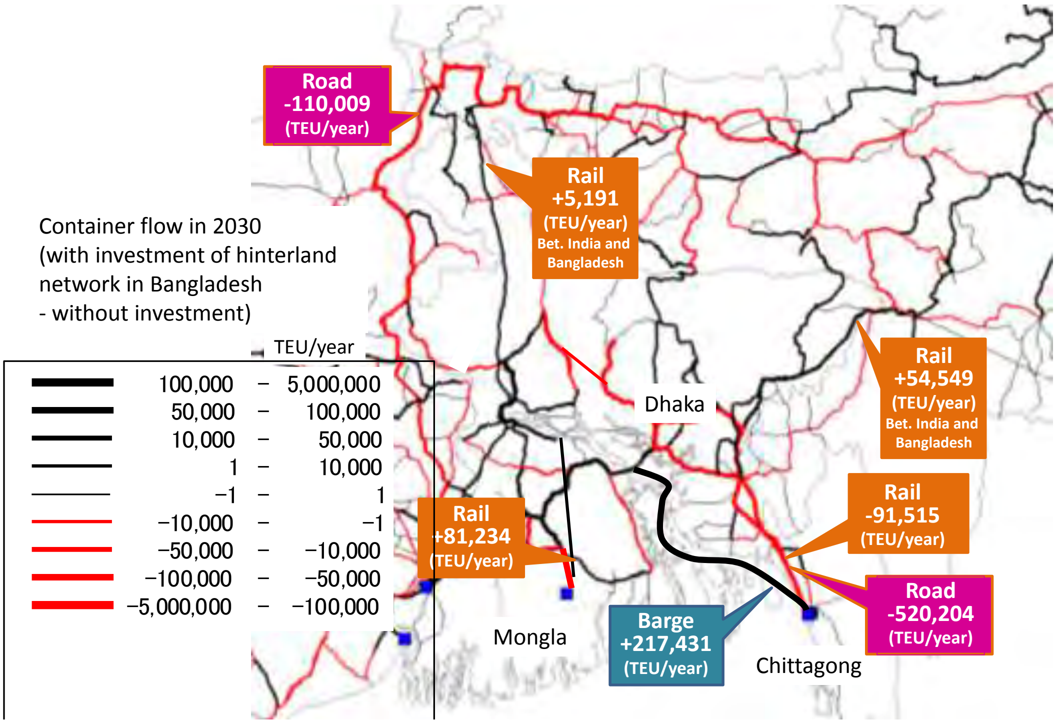
Simulation results in terms of export and import laden container throughputs for each port are shown in Figure 5.19. Unless hinterland improvement is completed, Mongla port decreases export container volume by 63.4 thousand TEU and increases import container volume 476.2 thousand TEU. Regarding Chittagong port, 515.5 thousand TEU decreased for import in case “without investment on hinterland transport network”, however, in export case, container volume is estimated almost same as “with case”. Kolkata and Haldia ports increases their container throughput by 148.4 and 59.2 thousand (export and import total) TEU for base case. This is due to the relaxation of border barriers. Container flows generated in internal

Bangladesh are partially bound for Indian ports. As decreased in border barriers, container cargo from/to Northeastern India to/from Kolkata port for detour is dramatically decreased. Since a number of container cargoes are generated in Northwest Bangladesh (according to the results of GSM model), Mongla and ports of west part of India (i.e. Kolkata and Haldia port) will be utilized as a result of hinterland improvement.



Source: Survey Team (*Excluding empty containers)

Figure 5.19 Container Volume at Each Port (Scenario F)

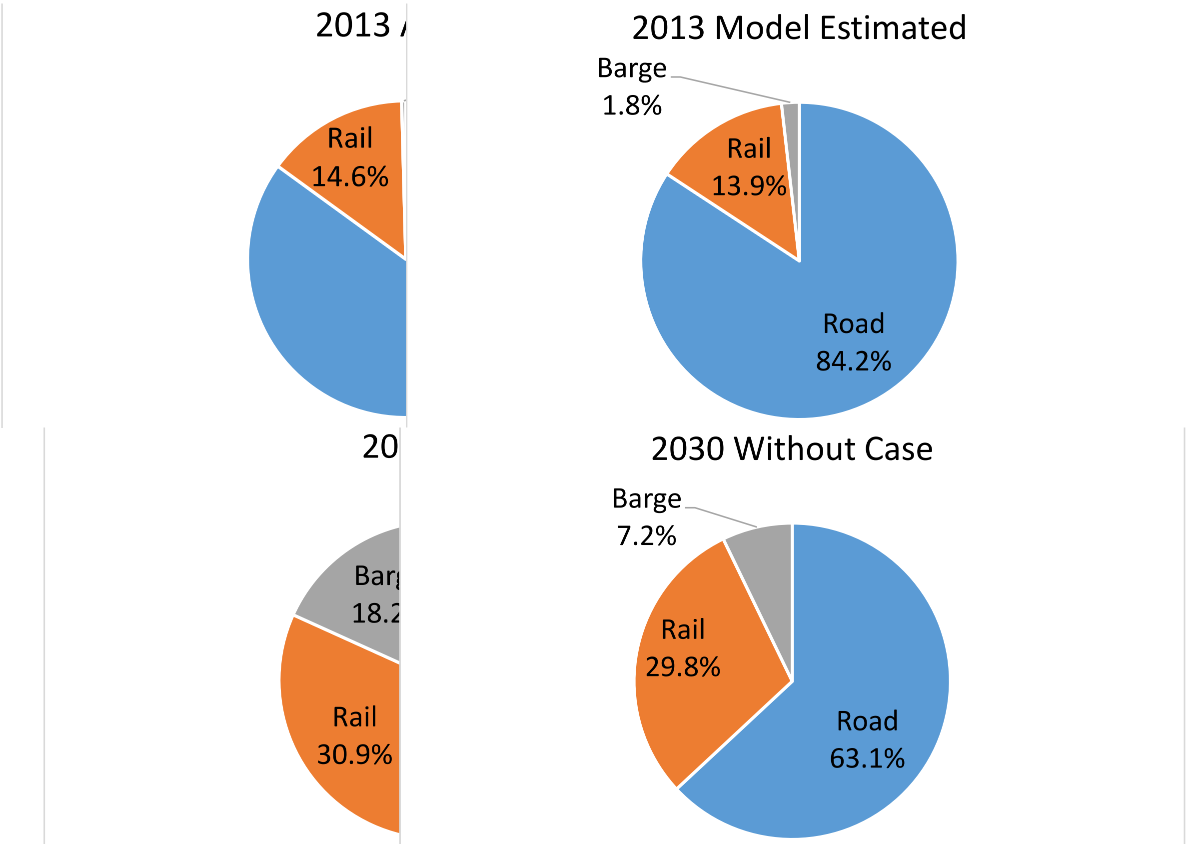


Source: Survey Team

Figure 5.20
Change in Cargo Volume for Bangladesh Hinterland Investment (Scenario G)

The change in Bangladesh hinterland laden container flow between 2030 base and without case is shown in Figure 5.20. As seen in Figure 5.20, barge usage is accelerated (+217 thousand TEU) whereas road (-520 thousand TEU) and rail (-91 thousand TEU) usage is decreased in the comparison of 2030 with and without hinterland investment project. As for the comparison between 2013 base case and 2030 without case, all container flows of road, rail, and inland waterway are increased by 430, 571, and 390 thousand TEU, respectively.

Modal share between Dhaka and Chittagong for four cases (i.e. 2013 actual, 2013 model estimated, 2030 base, 2030 without case) are shown in Figure 5.21. First of all, model is well reproduced since modal share between 2013 actual and model estimated case are almost same. As current (year 2013) situation, road transport dominantly shares 84.2%, followed by rail (13.9%) and inland waterway (1.8%). In the 2030 base case, the share of road transport decreases to 50.8%, while that of rail and inland waterway increase to 30.9% and 18.2% respectively. By comparing the shares in the 2030 base case with the case without hinterland investment in Bangladesh, the road share decreases by 12.3%, while the share of inland waterway increases by 11.0%. These results imply that the progress of hinterland transport environment will encourage the shift from road to inland waterway shipping, since the improvement of level of service in inland waterway is assumed the most significant in this scenario.



Source: Survey Team

Figure 5.21 Modal Share between Dhaka and Chittagong (Scenario F)

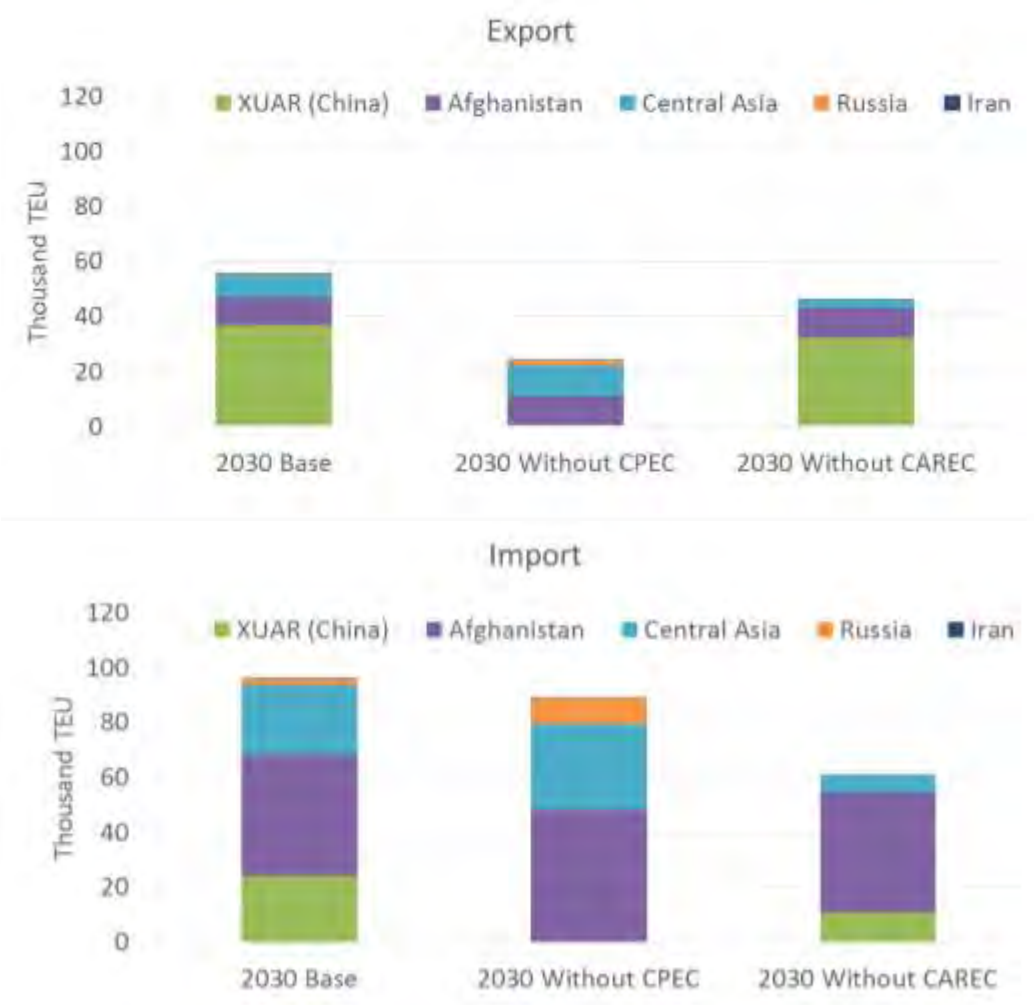
(6) Without CAREC and CPEC Gateway Project (Scenario G)

Pakistan joined CAREC in 2010 and is expected to offer landlocked CAREC partners access to ports on the Arabian Sea, giving them the prospect of greater trade with the Middle East and elsewhere. CAREC corridor 5 and 6 are connected to Pakistan's road and railway networks. Meanwhile, CPEC was designed and the constructions have already started, intending to improve the Pakistani surface infrastructure. CPEC will link Xinjiang Uyghur Autonomous Region (XUAR) directly to Gwadar port on the southwestern coast of Pakistan's Balochistan province. Scenario G assumes the situation where the CAREC corridor and CPEC extensions are not completed, while base case assumes the implementation of the CAREC projects, CPEC project, and relaxation of border barriers. This scenario G aims to analyze how much regional corridor development improves the utilization of Pakistani ports as gateway of container trade by other countries, which are Central Asian countries, Afghanistan, Russia, and XUAR in China. In this scenario analysis, therefore, the container volumes through Pakistani ports from/to other countries are compared between base case and scenario G (Without corridor extensions scenarios).

Figure 5.22 shows estimated export/import containers to/from other countries through Pakistani ports in each scenario. Note that the container demand in the scenario analysis is the same as the demand in the base case. In the 2030 base case, the export containers transported from other countries than Pakistan are estimated to account for 2.6 % of total export containers through Pakistani ports. The estimated volume is 55 thousand TEU, which consists of 37 thousand TEU exported from XUAR of China, 10 thousand TEU from Afghanistan, and 8.2 thousand TEU from Central Asian region. The import containers in the 2030 base case to other countries through Pakistani ports is estimated to be 96 thousand TEU, which consists of 24 thousand TEU imported to XUAR, 44 thousand TEU to Afghanistan, and 25 thousand TEU to Central Asia. The import containers heading to inland foreign regions are estimated to account for 4.2 % of total import containers through Pakistani ports.

Export containers from other countries in the without CPEC corridors scenario are estimated at 24 thousand TEU, which is a 57 % decrease from the base case. Almost all of export containers from XUAR are estimated not to be loaded at Pakistani ports in case the without CPEC corridors scenario. In the without CAREC scenario export containers from other countries are estimated at 46 thousand TEU, which is a 17 % decrease from the base case. In particular, export containers from Central Asian countries are estimated to decrease from .2 thousand to 2.9 thousand TEU.

Next, estimated import container volumes to other countries through Pakistani ports in each scenario are analyzed. In the without CPEC corridor scenario import containers are estimated at 88 thousand TEU, which is a 7.3 % decrease from the base case. Although import containers transported to XUAR are estimated to decrease significantly, those to other countries (i.e. Afghanistan, Central Asia, and Russia) are estimated to increase, mainly due to a relaxation of capacity constraint of Pakistani hinterland shipping network by decreasing of Chinese cargo. In the without CAREC corridors scenario, import containers heading to other countries through the Pakistani ports are estimated at 61 thousand TEU, which is a 32 % decrease from the base case. Import containers heading to inland Central Asian countries are estimated to decrease from 25 thousand TEU to 6.0 thousand TEU. As well, import containers to China (XUAR) through Pakistani ports are estimated to drastically decrease from the base case. This is because that import containers to Central Asian countries through Chinese ports in the base case are estimated to be shifted to the ports of Russian Pacific Sea ports due to the incompletion of CAREC corridor projects, which makes railway congestion in China smaller, and which leads that containers imported to XUAR are handled at Chinese ports. In Central Asian Countries case import containers are estimated to shift to Iranian ports.



Source: Survey Team

Figure 5.22 Container Export/Import through Pakistani Ports to/from Other Countries in Each Case (Scenario G)

(7) Additional Colombo Efficiency and New Transshipment Hub in South India (Scenario H)

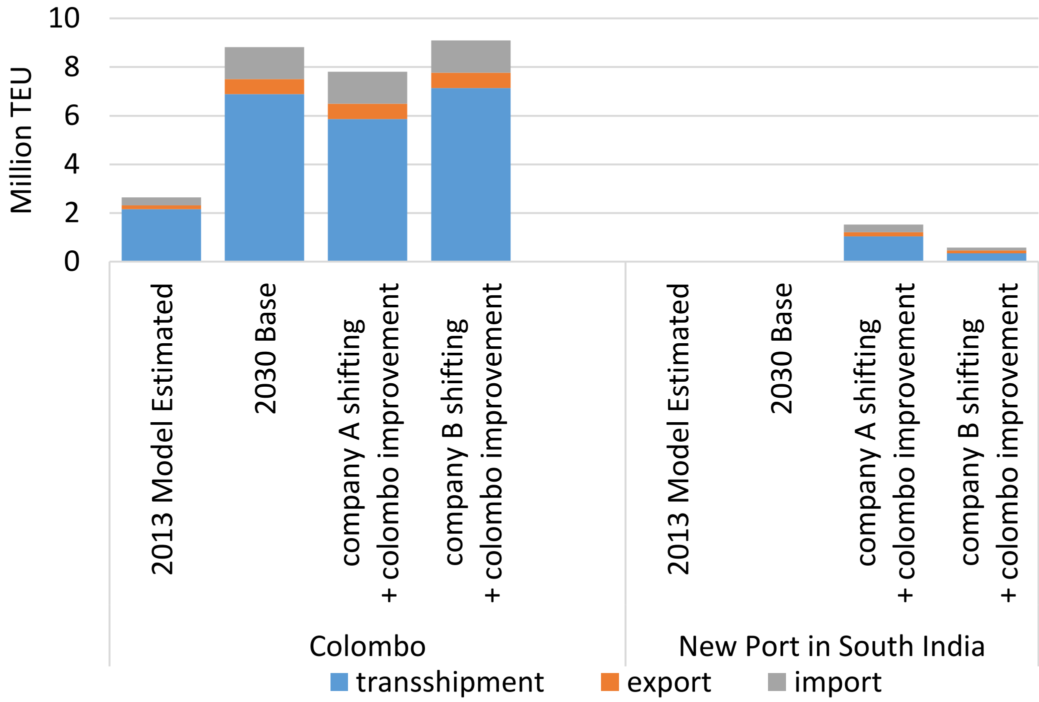
The next scenario is the case for the combination of additional efficiency in Colombo Port and development of new transshipment hub in South India. Supposed a new transshipment hub is constructed in South India, Colombo port, the competitor of hub port in South India, possibly attempts to improve their level of service in order to keep transshipment container cargo.

At the completion of the new terminal construction in the Colombo Port, it would be expected that the transshipment time will be shortened, which will significantly affect the shipper's port choice, due to the reduction of total transport cost. In the simulation analysis, the transshipment handling time is assumed to decrease up to the level of Singapore port.

In addition, new transshipment hub is expected to be developed in South India near the Colombo Port. In this simulation analysis, a new transshipment port or new terminal in the existing port is assumed to be constructed in South India then some of the shipping companies are assumed to shift to the new hub port.

Figure 5.23 shows estimated container throughputs excluding empty containers in case that a new hub port in South India is constructed then a large shipping company (company A) or a middle-class shipping company (company B) is assumed to shit to the port. In the simulation, all liner services to call at Colombo port which are (co-)operated by a company A (or company B) are assumed to be shifted to the new port, while any services which are slot-chartered by the company in question are not assumingly shifted and remained in the Colombo port.

Compared with the 2030 base case, the amount of the estimated transshipped containers in Colombo port will decrease in case that company A (a large shipping company) assumingly shifts to the new hub port, while it will increase in case that company B (a medium-size company) shifts to new hub port in South India and increase in Colombo port efficiency. The container throughput at new hub port in South India is estimated 1.52 and 0.57 million TEU for each case that company A or B shifts, which includes not only the transshipped containers but export and import containers. Some of export and import containers estimated in the new hub port may be shifted from the utilization of feeder services connecting South Indian ports with Colombo port, to the direct hinterland shipping to/from the new hub port from/to South Indian region.



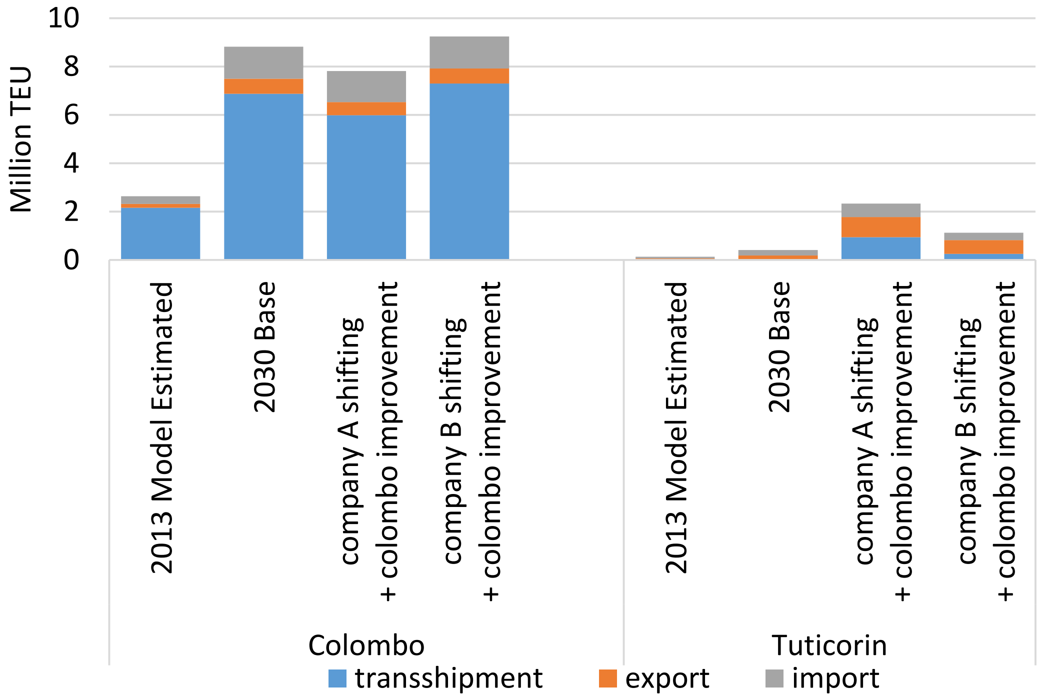
(*excluding empty containers)

Source: Survey Team

Figure 5.23 Container Throughput in Colombo and New Hub Port in South India (Scenario H-1)

Figure 5.24 shows estimated container throughputs excluding empty containers in case that a new deep-water container terminal is assumingly developed in Tuticorin port. In this simulation (scenario H-2), Colombo port is also assumed to achieve further efficiency in terms of handling time, as similar with the previous scenario.

In scenario H-2, the estimated amount of transshipped containers is similar as the result of scenario H-1 which assumes the new hub port in South India; the estimated amount of transshipped containers is smaller than the 2030 base case if company A is assumed to shift, while it is larger if company B is assumed to shift. Meanwhile, compared with the results of Scenario H-1, the increased volumes of export and import containers in the new transshipment hub are estimated larger; some of them are even shifted from Colombo port, not only some South Indian ports. This means the expansion of hinterland would be more expected in case that a new transshipment terminal is constructed in Tuticorin.

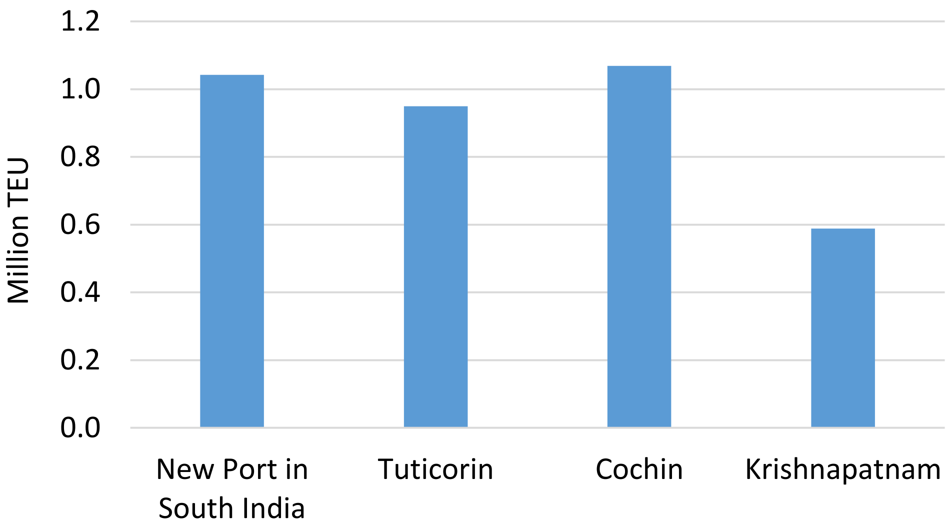


(*excluding empty containers)

Source: Survey Team

Figure 5.24 Container Throughput in Colombo and Tuticorin (Scenario H-2)

Further simulation analyses are conducted for the cases that company A shifts a hub function to Cochin and Krishnapatnam. Estimated container throughput of each scenario on a transshipment hub in South India is shown in Figure 5.25. The figure shows that in case of a Krishnapatnam hub, the estimated amount of transshipped containers will be almost half of those in other hub cases. which is mainly because Krishanapatnam port is located far away from the main sea-lane in Indian Ocean.



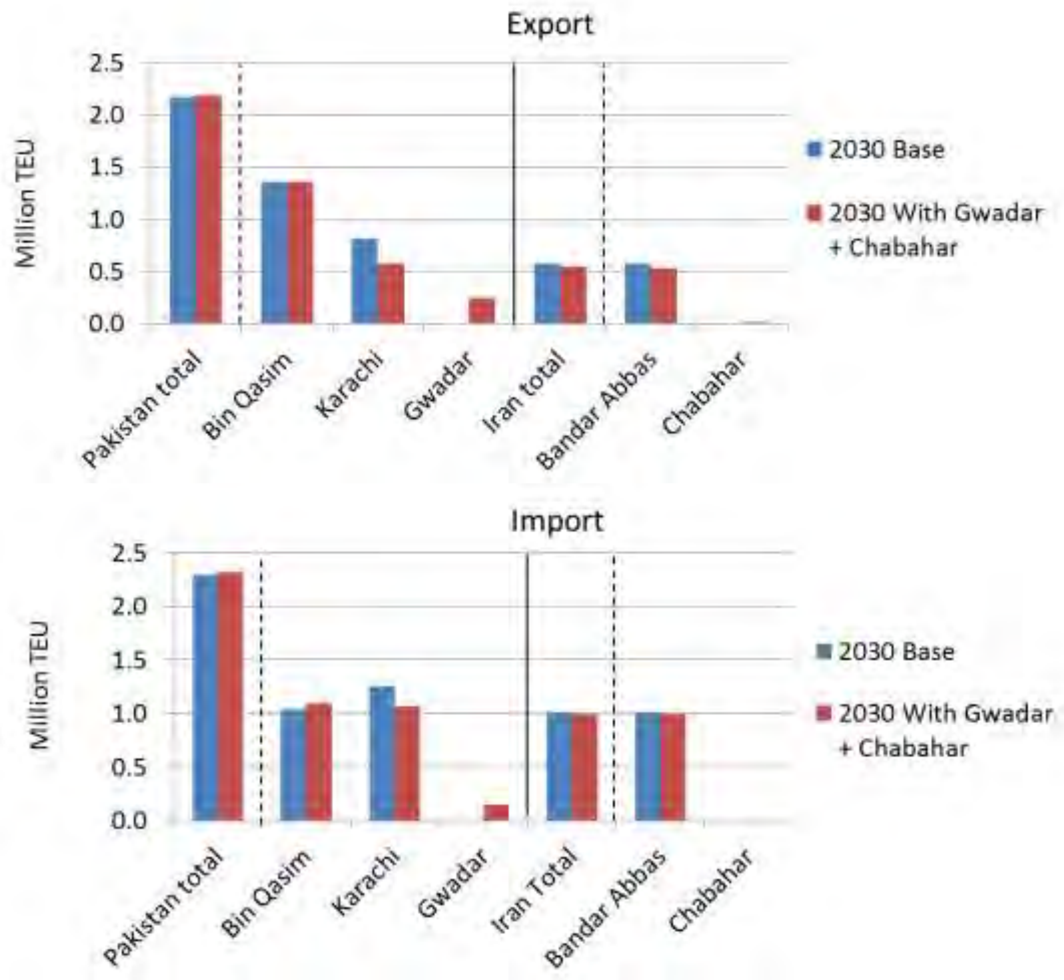
Source: Survey Team

Figure 5.25 Container Throughput of Each Hub (Summary of Scenario H)

(8) Additional Port Construction (Gwadar Port) (Scenario I)

As the last scenario, the development of the Gwadar port in Pakistan and the Chabahar port in Iran are analyzed. In the scenario, any maritime shipping services which call at either of Pakistani ports (i.e. Karachi or Bin Qasim) as well as either of Dubai (United Arab Emirates), Bandar Abbas (Iran), or Sohar (Oman) are assumed to call at the Gwadar ports, considering geographic location of each port. As well, any maritime shipping services which call at Bandar Abbas port as well as either of Pakistani ports or Sohar are assumed to call at Chabahar port. The total number of shipping services to call the Gwadar port is 12 lines, while that to call the Cabahar port is 4 lines.

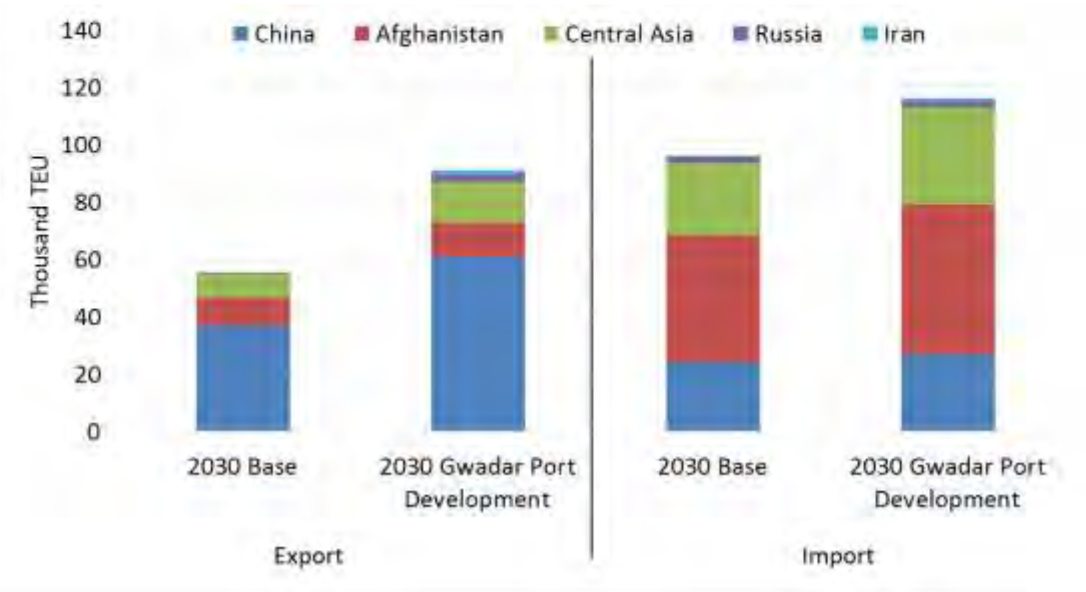
Figure 5.26 shows estimated export and import container volumes at each port in Iran and Pakistan in the base case and in the with port development case in 2030. In the with port development scenario, export container volumes at Pakistani ports are estimated to be 2.19 million TEU, which is a 0.6 % increase from the base case. The export volume at the Gwadar port, which is the newly developed port in the scenario, is estimated to be 248 thousand TEU, accounting for 11 % of total export volume of Pakistan. The export container volumes at Iranian ports in case of port development is estimated to be 576 thousand TEU, which is almost same as the base case. As for import case, container volumes at Pakistani ports are estimated to be 2.3 million TEU, which is a 0.9 % increase from the base case, while the import container volumes at Iranian ports are estimated to be 1.0 million TEU, which is also same as the base case. The volumes of import containers at new two ports are estimated to be 151 thousand TEU in the Gwadar port in Pakistan.



Source: Survey Team

Figure 5.26 Container Volume of Ports in Iran and Pakistan (Scenario I)

Figure 5.27 shows estimated export/import containers from/to other countries through Pakistani ports in base case and in with port development scenario in 2030. In the port development scenario, export containers from other countries are estimated to be 91 thousand TEU, which is consisting of 61 thousand TEU from XUAR, 12 thousand TEU from Afghanistan, 14 thousand TEU from CA, 2 thousand TEU from Russia, and 2 thousand TEU from Iran. The total of export container volume from other countries in the port development scenario is assumed to increase by 64 % over the base case. Here, the share of origin countries are almost same between base and port development case in 2030. Meanwhile, import container heading to other countries in 2030 port development case are estimated to be 116 thousand TEU, which is consisting of 27 thousand TEU to XUAR, 52 thousand TEU to Afghanistan, 34 thousand TEU to CA, 1.8 thousand TEU to Russia. The import container volume heading to other countries in the port development scenario is assumed to increase by 21 % over the base case.



Source: Survey Team

Figure 5.27 Container Exports/ Imports through Pakistani Ports to/from Other Countries (Scenario I)

5.1.6 Summary

- The container volume of the ports of four South Asian countries (Bangladesh, India, Sri Lanka, and Pakistan) will be increased up to 30.6 million TEU (7.7 million TEU in 2013) by 2030. In case of upside and downside cade in terms of economic condition, container volume will be 22.7 million TEU and 41.2 million TEU, respectively.

- Among the ports of South Asia, container volume of JNPT, which is India's busiest port, is overwhelmingly increased up to 10.4 million TEU (export and import total) in the 2030 base case (2.1 million TEU in 2013). From this result, lack of capacity at JNPT is anticipated. However, further expansion to develop more than 14m draft is difficult due to geographical condition at JNPT. Thus, in order to accommodate increased demand in 2030 Mundra and Pipavav ports, which are the neighbor ports of JNPT, are the potential alternative ports of JNPT due to its mutual proximity.

- Unless improvement of JNPT access (congestion alleviation) and DFC project are invested, container volume at JNPT is decreased by 0.95 million TEU from 10.4 million TEU comparing to "with investment case". In Chennai port which suffers from heavy congestion at access road, 0.36 million TEU out of 1.8 million TEU will be decreased in case no investment is conducted for access road.

- Transshipment volume in South Asia is overwhelmingly the highest volume handled in Colombo in 2030. In the base case in 2030, transshipment container volume in Colombo port is 6.8 million TEU, which is 3.13 times more volume compared to the year 2013. In case South new hub port is established in South Indian region, new hub port will treat transshipped containers 0.9 million TEU at most. Transshipment volume in Colombo port in 2030 will be approximately 6.0-7.0 million TEU. This is almost same volume of "without construction of new hub port in South India in 2030" which is to be 6.8 million TEU.

- Regarding the case in Bangladesh, Chittagong port will treat 2.7 million TEU (export and import total) in 2030 and thus it continues to act important role for future trade activities. However, since the lack of capacity at Chittagong port is anticipated, alternative ports or new terminal construction is needed. As for port access between Dhaka and Chittagong port, as current (year 2013) situation, road transport has dominant share as 84.2% (700 thousand TEU), following rail 13.9% (116 thousand TEU), and Barge 1.8% (15 thousand TEU). However, in 2030, road decreases its share up to 50.8% (1.1 million TEU), 30.9% (687 thousand TEU), 18% (405 thousand TEU) in case all transport related infrastructure investment is conducted.

- Regarding Pakistan, container volume from/to Central Asia and Xinjiang Uyghur Autonomous Region will be increased in case CAREC and CPEC corridors development is conducted. As for Gwadar port development, it is expected to occupy 8.9% of total container volume of Pakistani ports, which is equivalent to 400 thousand TEU.

5.2 Analysis of Non-Container Cargo Movement

5.2.1 Introduction

Demand of non-container (hereinafter referred to as bulk cargo) is forecasted based on its typical characteristics that "single bulk cargo is transported by a single shipper".

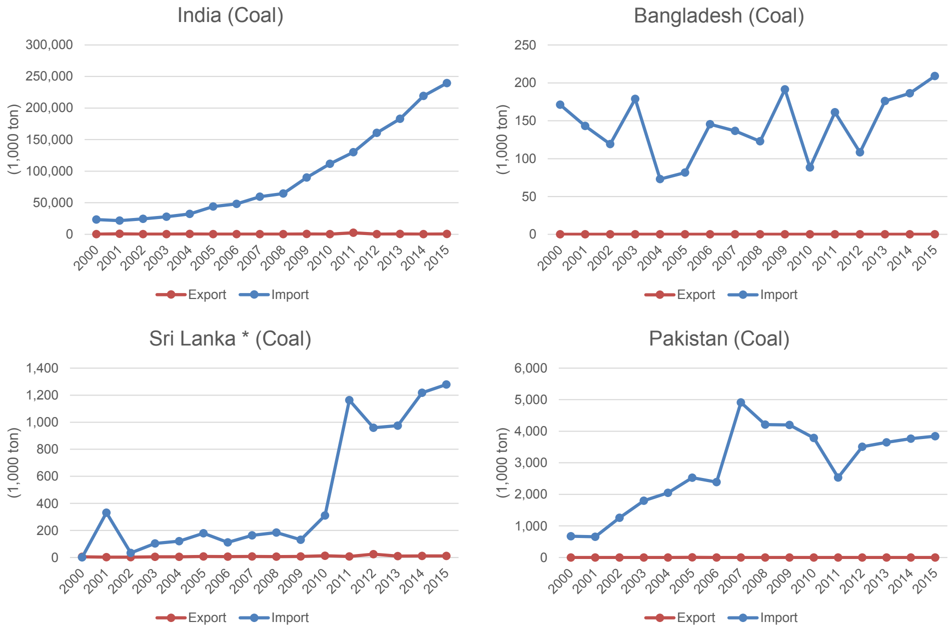
Targeted bulk cargoes are 1) coal, 2) iron ore, 3) non-ferrous materials (hereinafter referred to as non-ferrous), 4) grain crops (hereinafter referred to as grain), 5) crude oil and petroleum products (hereinafter referred to as petroleum), and 6) liquid gas (hereinafter referred to as natural gas). Future cargo volumes are estimated considering "current volumes handled", "scenario of economic trend" and "scenario of industrial trend and supply chain trend", as well as "future plans recognized through interviews by the JICA Survey Team".

5.2.2 Current Situation of Bulk Cargo Handling

Changes in handling volume of targeted bulk cargo in targeted countries are shown in the graphs below.

(1) Coal

Basically, the import volume of coal shows an increasing trend in each country. The increasing trend in India is remarkable.



Coal (unit : 1,000 ton)

Country	Ex / Im	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
India	Export	274	618	122	239	326	295	289	151	214	466	99	2,447	122	351	312	341
	Import	23,326	21,692	24,545	27,718	32,139	43,928	48,133	59,595	64,444	89,830	111,604	129,964	160,488	183,023	219,003	239,558
	Total	23,600	22,310	24,667	27,958	32,465	44,223	48,421	59,746	64,658	90,296	111,703	132,411	160,610	183,373	219,315	239,899
Bangladesh	Export	0			0							0	0	0	0	0	0
	Import	171	143	119	179	73	82	145	137	123	191	88	161	108	176	186	209
	Total	171	143	119	179	73	82	145	137	123	191	88	161	108	176	186	209
Sri Lanka*	Export	5	2	3	5	6	7	7	8	7	8	13	8	25	11	11	12
	Import	1	331	34	104	121	179	112	164	185	131	310	1,164	960	974	1,217	1,278
	Total	6	333	37	110	127	186	119	171	192	139	323	1,172	984	985	1,228	1,290
Pakistan	Export						5			0	0	0	0	0	0	0	0
	Import	672	656	1,261	1,802	2,050	2,526	2,390	4,913	4,212	4,201	3,789	2,537	3,508	3,647	3,764	3,845
	Total	672	656	1,261	1,802	2,050	2,531	2,390	4,913	4,212	4,201	3,789	2,537	3,508	3,647	3,764	3,845
Total	Export	279	620	125	244	332	307	296	159	221	473	112	2,456	147	362	323	353
	Import	24,170	22,823	25,959	29,803	34,383	46,715	50,780	64,808	68,964	94,353	115,791	133,825	165,064	187,820	224,171	244,890
	Total	24,449	23,443	26,084	30,048	34,715	47,022	51,076	64,967	69,185	94,827	115,903	136,281	165,211	188,182	224,494	245,243

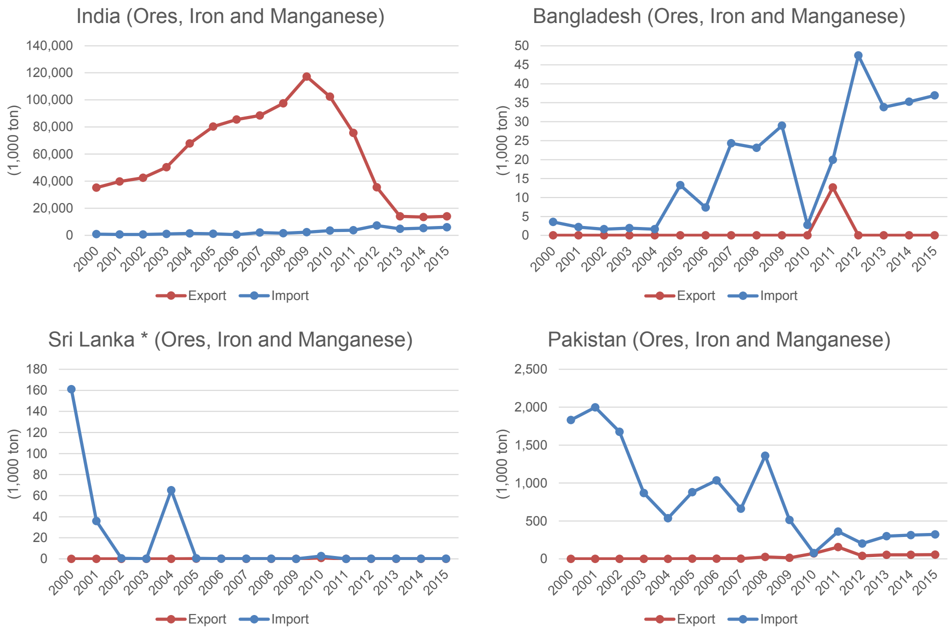
* Sri Lanka: Indian Subcontinent Islands (British Indian Ocean Territory, Maldives, Sri Lanka)

Dry Bulk and Liquid Bulk
Source: World Trade Service (IHS)

Figure 5.28 Changes in Cargo Volume (Coal)

(2) Iron ore

Export volume of iron ore in India shows a dramatic decrease due to the export embargo on iron ore since 2009.



Ores, Iron and Manganese (unit : 1,000 ton)

Country	Ex / Im	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
India	Export	35,127	39,780	42,472	50,264	67,749	80,266	85,434	88,507	97,445	117,174	102,370	75,555	35,423	13,980	13,481	14,044
	Import	898	562	546	1,050	1,357	1,102	507	2,018	1,506	2,321	3,437	3,766	7,242	4,737	5,273	5,892
	Total	36,025	40,341	43,018	51,314	69,106	81,368	85,941	90,524	98,950	119,495	105,807	79,321	42,665	18,717	18,755	19,937
Bangladesh	Export												13				
	Import	4	2	2	2	2	13	7	24	23	29	3	20	47	34	35	37
	Total	4	2	2	2	2	13	7	24	23	29	3	33	47	34	35	37
Sri Lanka*	Export						0	0				1					
	Import	161	36	1	0	65	1	0	0	0	0	3	0	0	0	0	0
	Total	161	36	1	0	65	1	0	0	0	0	3	0	0	0	0	0
Pakistan	Export					0	2	1	2	24	14	71	155	40	52	53	55
	Import	1,832	1,998	1,676	867	535	878	1,034	661	1,359	512	78	359	203	300	313	323
	Total	1,832	1,998	1,676	867	536	881	1,036	662	1,384	526	149	514	242	352	366	379
Total	Export	35,127	39,780	42,472	50,264	67,749	80,268	85,435	88,509	97,469	117,188	102,441	75,723	35,463	14,032	13,534	14,099
	Import	2,895	2,597	2,224	1,920	1,959	1,994	1,549	2,702	2,888	2,861	3,520	4,145	7,492	5,071	5,622	6,253
	Total	38,022	42,377	44,696	52,184	69,709	82,262	86,984	91,211	100,357	120,050	105,961	79,868	42,955	19,103	19,156	20,352

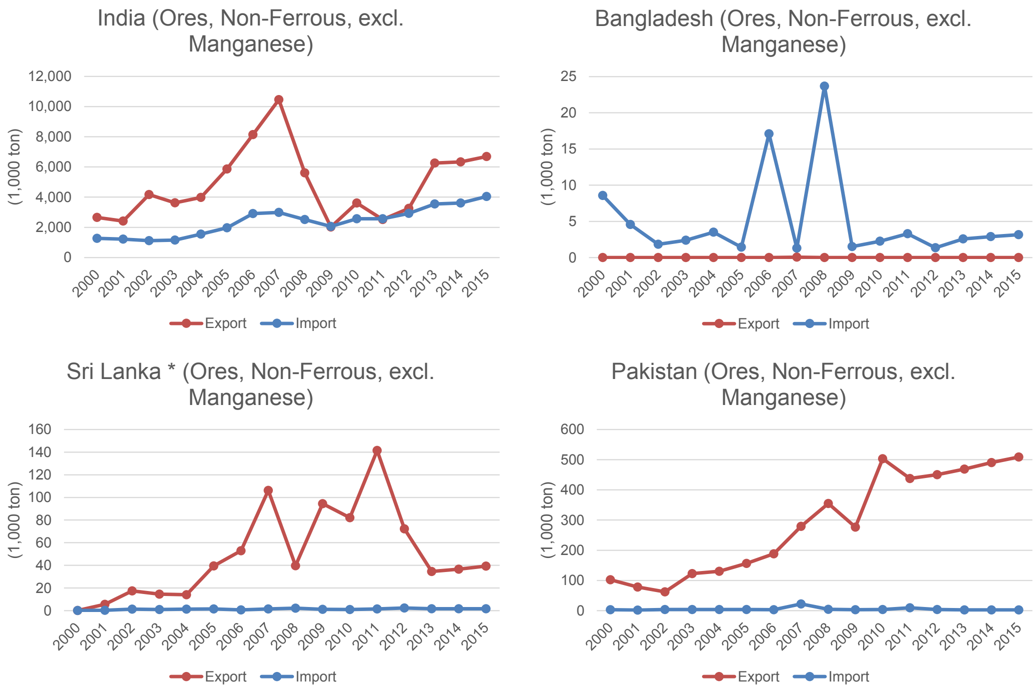
* Sri Lanka: Indian Subcontinent Islands (British Indian Ocean Territory, Maldives, Sri Lanka)

Dry Bulk and Liquid Bulk
* Iron: Ores, Iron and Manganese
Source: World Trade Service (IHS)

Figure 5.29 Changes in Cargo Volume (Iron ore)

(3) Non-Ferrous

Export volume of non-ferrous materials in targeted countries, except Bangladesh, shows an increasing trend in recent years. Import volume in India also shows an increasing trend.



Ores, Non-Ferrous, excl. Manganese (unit : 1,000 ton)

Country	Ex / Im	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
India	Export	2,649	2,409	4,170	3,625	3,981	5,858	8,145	10,453	5,604	2,019	3,605	2,512	3,253	6,252	6,331	6,690
	Import	1,272	1,220	1,120	1,157	1,554	1,963	2,907	2,980	2,520	2,051	2,567	2,567	2,923	3,551	3,606	4,048
	Total	3,922	3,628	5,290	4,782	5,535	7,821	11,052	13,433	8,124	4,070	6,171	5,079	6,175	9,804	9,938	10,738
Bangladesh	Export								0		0		0	0	0	0	0
	Import	9	5	2	2	4	1	17	1	24	2	2	3	1	3	3	3
	Total	9	5	2	2	4	1	17	1	24	2	2	3	1	3	3	3
Sri Lanka*	Export	0	6	17	15	14	39	53	106	40	95	82	141	72	35	37	39
	Import	0	0	1	1	1	2	1	1	2	1	1	1	2	2	2	2
	Total	0	6	19	16	16	41	54	108	42	96	83	143	75	36	38	41
Pakistan	Export	103	78	63	123	130	156	188	279	355	277	503	438	451	469	490	509
	Import	3	2	4	4	4	4	3	22	4	3	4	10	4	2	3	3
	Total	106	80	66	126	134	160	191	301	359	280	507	448	455	472	493	512
Total	Export	2,752	2,493	4,250	3,762	4,125	6,054	8,386	10,839	5,999	2,390	4,190	3,091	3,775	6,756	6,858	7,238
	Import	1,284	1,226	1,127	1,164	1,562	1,970	2,928	3,005	2,550	2,057	2,574	2,582	2,930	3,558	3,614	4,056
	Total	4,036	3,719	5,377	4,927	5,688	8,024	11,314	13,844	8,549	4,447	6,764	5,673	6,706	10,314	10,472	11,294

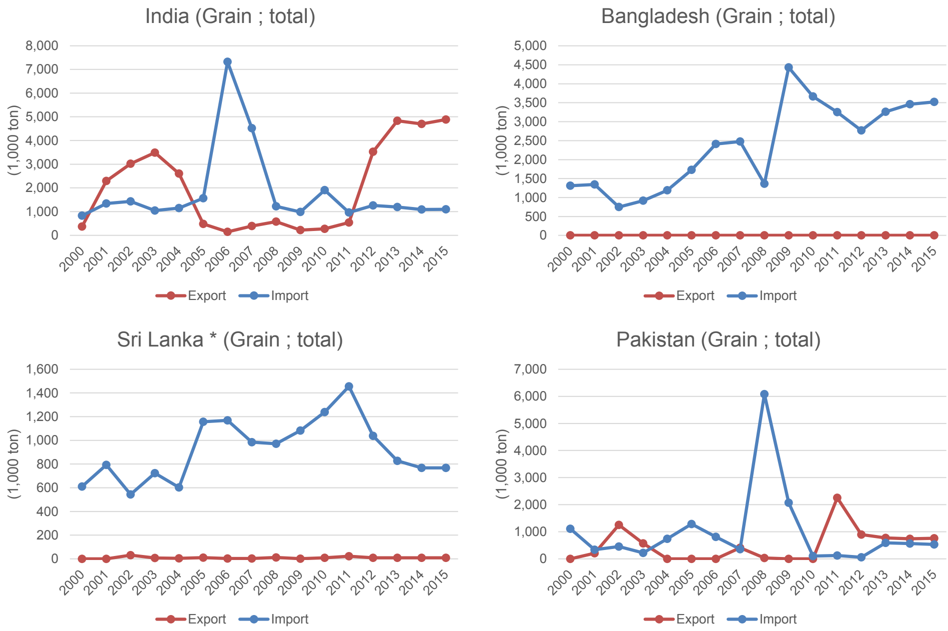
* Sri Lanka: Indian Subcontinent Islands (British Indian Ocean Territory, Maldives, Sri Lanka)

Dry Bulk and Liquid Bulk
*Non-Ferrous: Ores, Non-Ferrous, Excl. Manganese
Source: World Trade Service (IHS)

Figure 5.30 Changes in Cargo Volume (Non-Ferrous)

(4) Grain

Export volume of grain crops shows a remarkable increasing trend in India in recent years. On the other hand, importing volume shows an increasing trend in Bangladesh.



Grain ; total (unit : 1,000 ton)

Country	Ex / Im	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
India	Export	368	2,294	3,022	3,486	2,608	479	146	389	576	221	272	543	3,523	4,830	4,697	4,883
	Import	830	1,340	1,432	1,045	1,146	1,566	7,320	4,518	1,222	984	1,903	960	1,262	1,193	1,092	1,097
	Total	1,198	3,633	4,454	4,531	3,754	2,045	7,466	4,907	1,799	1,205	2,175	1,502	4,785	6,022	5,789	5,980
Bangladesh	Export		0		0	0	2	1	0								
	Import	1,313	1,345	749	915	1,189	1,731	2,413	2,477	1,362	4,429	3,667	3,251	2,767	3,262	3,458	3,522
	Total	1,313	1,345	749	915	1,189	1,732	2,414	2,477	1,362	4,429	3,667	3,251	2,767	3,262	3,458	3,522
Sri Lanka*	Export	0	0	31	7	4	10	3	3	12	1	8	22	9	8	8	8
	Import	610	793	543	724	603	1,157	1,169	985	971	1,083	1,239	1,456	1,039	828	767	768
	Total	610	793	574	731	607	1,167	1,172	988	983	1,084	1,248	1,478	1,048	836	776	776
Pakistan	Export	2	209	1,252	574	1	0	1	409	30	2	1	2,252	894	774	741	757
	Import	1,111	340	454	223	740	1,290	813	359	6,082	2,075	106	122	59	594	564	534
	Total	1,113	549	1,706	797	741	1,290	814	767	6,112	2,076	107	2,374	954	1,368	1,305	1,292
Total	Export	370	2,503	4,305	4,067	2,613	491	150	801	618	223	281	2,817	4,427	5,612	5,446	5,649
	Import	3,864	3,818	3,179	2,907	3,678	5,743	11,715	8,338	9,638	8,571	6,916	5,789	5,127	5,877	5,882	5,922
	Total	4,234	6,321	7,484	6,974	6,291	6,234	11,865	9,140	10,256	8,795	7,197	8,606	9,554	11,489	11,328	11,570

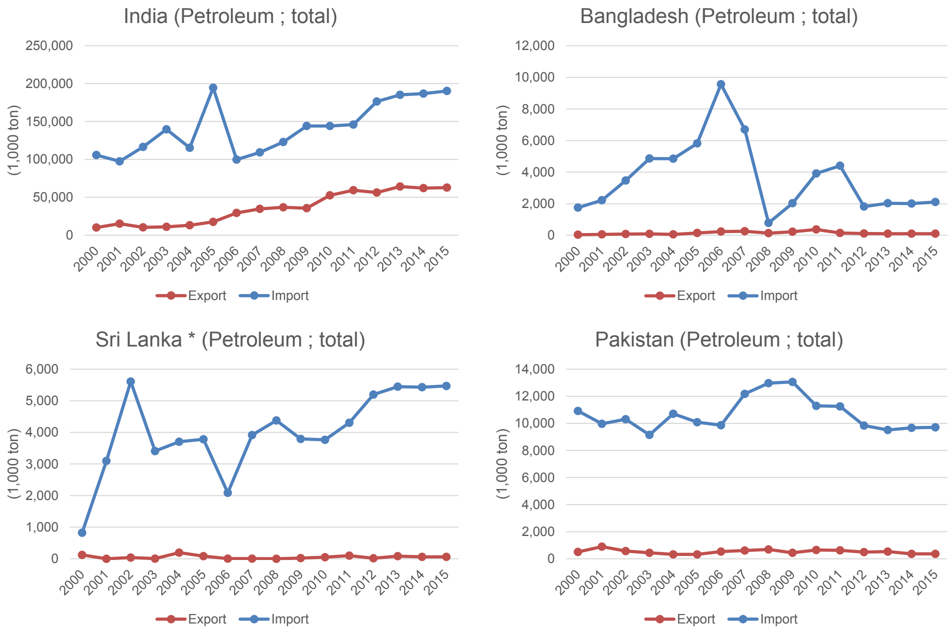
* Sri Lanka: Indian Subcontinent Islands (British Indian Ocean Territory, Maldives, Sri Lanka)

Dry Bulk and Liquid Bulk
* Grain: Wheat, Soybeans, Corn and Soybean Oil, Other Grain
Source: World Trade Service (IHS)

Figure 5.31 Changes in Cargo Volume (Grain)

(5) Petroleum

Import volume of crude oil and petroleum products shows an increasing trend in India and Sri Lanka. On the other hand, import volumes in Bangladesh and Pakistan are stagnant in recent years.



Petroleum ; total (unit : 1,000 ton)

Country	Ex / Im	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
India	Export	10,125	15,259	10,264	10,969	13,157	17,666	29,474	34,635	36,867	35,637	52,548	59,230	56,341	64,264	62,102	62,855
	Import	105,686	97,349	116,422	139,587	115,341	194,479	99,767	109,209	123,013	144,011	144,043	145,951	176,315	185,089	186,819	190,244
	Total	115,811	112,607	126,685	150,556	128,498	212,145	129,241	143,844	159,880	179,648	196,592	205,181	232,656	249,353	248,920	253,099
Bangladesh	Export	39	63	88	97	62	153	235	267	141	224	373	153	122	111	107	108
	Import	1,759	2,222	3,474	4,867	4,856	5,817	9,562	6,697	789	2,028	3,912	4,406	1,827	2,032	2,011	2,113
	Total	1,798	2,285	3,562	4,964	4,918	5,970	9,797	6,963	930	2,253	4,285	4,559	1,948	2,143	2,118	2,221
Sri Lanka*	Export	123	0	37	3	192	84	5	6	1	24	51	98	18	84	61	62
	Import	822	3,095	5,612	3,409	3,704	3,783	2,087	3,916	4,379	3,792	3,764	4,303	5,195	5,449	5,432	5,473
	Total	945	3,095	5,648	3,413	3,896	3,867	2,092	3,922	4,380	3,816	3,815	4,401	5,213	5,534	5,492	5,534
Pakistan	Export	512	897	572	440	327	322	535	605	685	441	656	621	497	533	363	360
	Import	10,918	9,970	10,306	9,151	10,707	10,090	9,870	12,179	12,975	13,065	11,296	11,262	9,840	9,507	9,675	9,715
	Total	11,431	10,866	10,878	9,590	11,034	10,412	10,405	12,784	13,660	13,506	11,951	11,883	10,338	10,040	10,039	10,075
Total	Export	10,799	16,219	10,960	11,509	13,738	18,225	30,249	35,513	37,695	36,326	53,628	60,103	56,978	64,992	62,632	63,384
	Import	119,186	112,635	135,814	157,014	134,608	214,169	121,286	132,001	141,156	162,896	163,016	165,921	193,177	202,078	203,937	207,544
	Total	129,985	128,854	146,774	168,523	148,346	232,394	151,535	167,514	178,850	199,223	216,643	226,024	250,155	267,070	266,570	270,928

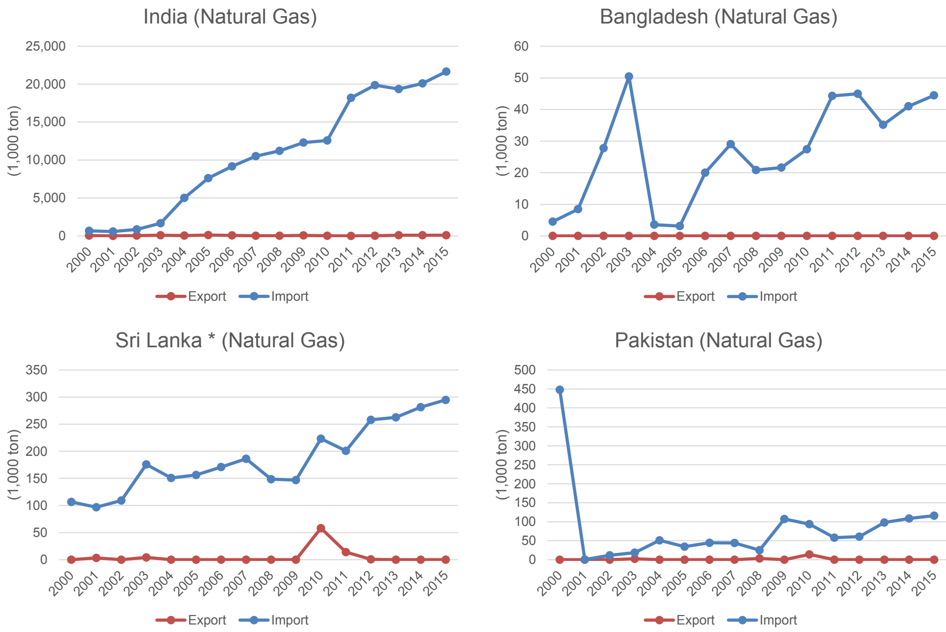
* Sri Lanka: Indian Subcontinent Islands (British Indian Ocean Territory, Maldives, Sri Lanka)

Dry Bulk and Liquid Bulk
*Crude Petroleum: Crude Petroleum, Petroleum Refineries
Source: World Trade Service (IHS)

Figure 5.32 Changes in Cargo Volume (Crude Oil and Petroleum Products)

(6) Natural Gas

Import volume of natural gas shows an increasing trend in all targeted countries.



Natural Gas (unit : 1,000 ton)

Country	Ex / Im	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
India	Export	31	1	42	89	43	118	68	10	23	58	21	3	18	76	80	87
	Import	666	576	841	1,656	4,999	7,601	9,155	10,506	11,197	12,297	12,570	18,177	19,850	19,342	20,087	21,653
	Total	697	577	884	1,745	5,041	7,720	9,224	10,516	11,220	12,355	12,591	18,180	19,867	19,418	20,167	21,741
Bangladesh	Export							0			0		0	0	0	0	0
	Import	5	8	28	50	4	3	20	29	21	22	27	44	45	35	41	44
	Total	5	8	28	50	4	3	20	29	21	22	27	44	45	35	41	44
Sri Lanka*	Export		3		4							58	14	1			
	Import	107	97	109	176	151	156	171	186	148	147	223	201	258	262	281	295
	Total	107	100	109	180	151	156	171	186	148	147	281	215	259	262	281	295
Pakistan	Export				3					3	0	14					
	Import	448	0	12	18	51	34	44	44	25	107	94	58	61	98	109	116
	Total	448	0	12	21	51	34	44	44	29	107	107	58	61	98	109	116
Total	Export	31	4	42	96	43	118	68	10	26	58	93	16	18	76	80	87
	Import	1,225	682	990	1,900	5,204	7,795	9,391	10,766	11,391	12,573	12,915	18,480	20,213	19,738	20,518	22,108
	Total	1,256	686	1,032	1,996	5,247	7,913	9,459	10,775	11,418	12,630	13,007	18,497	20,231	19,813	20,598	22,196

* Sri Lanka: Indian Subcontinent Islands (British Indian Ocean Territory, Maldives, Sri Lanka)

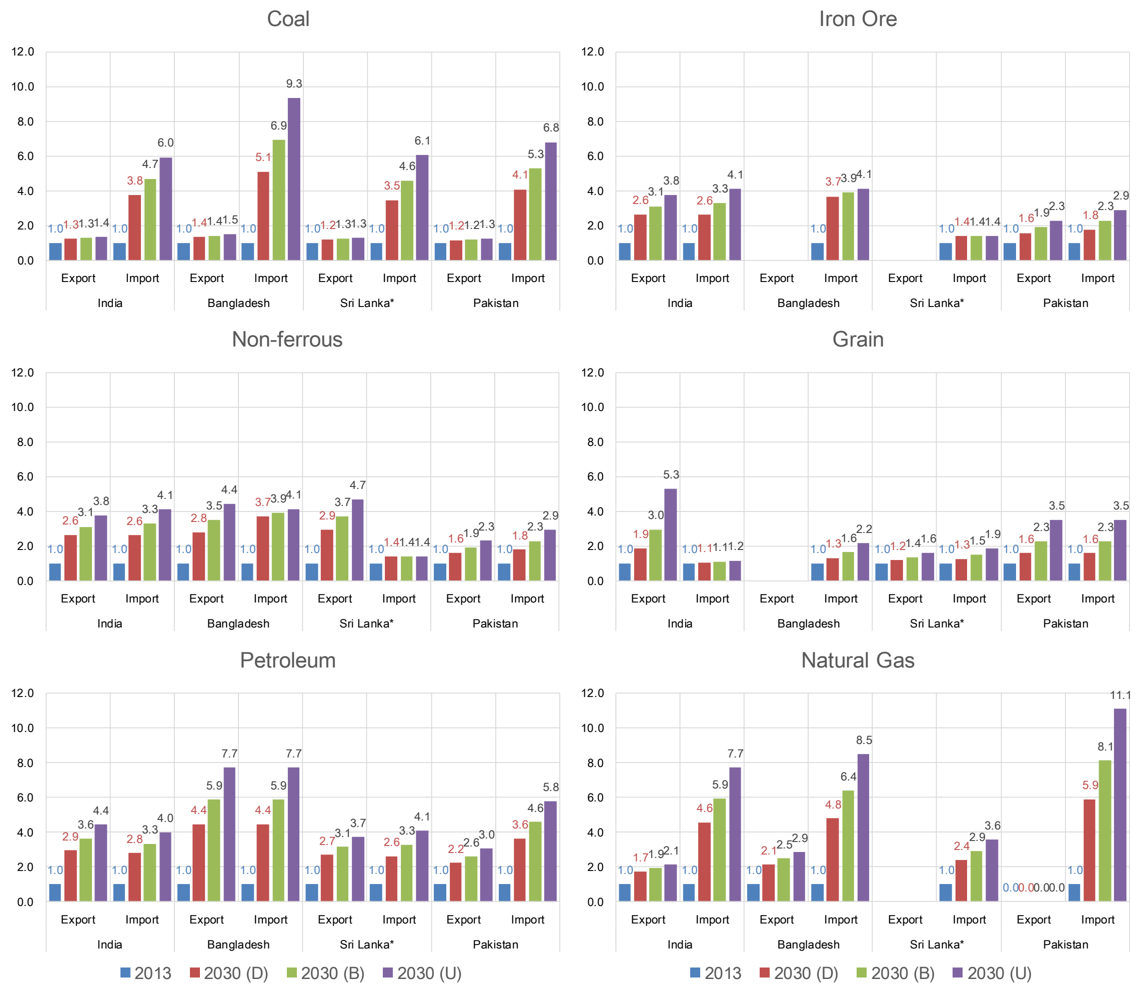
Dry Bulk and Liquid Bulk
Source: World Trade Service (IHS)

Figure 5.33 Changes in Cargo Volume (Natural Gas)

5.2.3 Future Projection of Bulk Cargo Transport

Future volumes of bulk cargo are estimated as shown in the graphs and tables below. In terms of the growth ratio between 2013 and the target year of 2030, cargo volume is estimated to increase approximately 3.69 times in the Base Case, approximately 4.55 times in the Upside Case, and approximately 3.02 times in the Downside Case. These estimates are based on the above-mentioned "scenario of economic trend" and "scenario of industrial trend and supply chain trend".

Methodology of future projection of bulk cargo transport will be mentioned below.



Source: Survey Team

Figure 5.34 Estimation Results of Bulk Cargo (2013 ratio)

Table 5.6 Estimation Results of Bulk Cargo

Base Case (unit: 1,000 ton)

		Coal		Iron Ore		Non- Ferrous		Grain		Petroleum		Natural Gas		Total		
		Export	Import	Export	Import	Export	Import	Export	Import	Export	Import	Export	Import	Export	Import	Total
India	2013	48,350	194,435	40,038	3,938	6,252	3,551	4,092	737	79,614	265,076	76	19,342	178,423	487,079	665,501
	2030	62,854	915,771	125,019	12,988	19,513	11,719	12,129	816	287,980	884,309	146	114,313	507,641	1,939,914	2,447,556
	2030/2013	1.30	4.71	3.12	3.30	3.12	3.30	2.96	1.11	3.62	3.34	1.93	5.91	2.85	3.98	3.68
Bangladesh	2013	0	176		34	0	3		3,262	111	2,032	0	35	111	5,542	5,653
	2030	0	1,220		132	0	10		5,377	652	11,920	0	224	652	18,884	19,536
	2030/2013	1.45	6.93		3.91	3.51	3.91		1.65	5.87	5.87	2.48	6.38	5.87	3.41	3.46
Sri Lanka	2013	11	974		0	35	2	8	828	84	5,449		262	138	7,516	7,654
	2030	14	4,481		0	128	2	11	1,239	265	17,826		766	419	24,316	24,734
	2030/2013	1.27	4.60		1.40	3.70	1.40	1.35	1.50	3.15	3.27		2.92	3.03	3.24	3.23
Pakistan	2013	0	3,647	52	300	469	2	774	594	533	9,507		98	1,828	14,148	15,977
	2030	0	19,292	101	687	901	5	1,745	1,340	1,382	43,505		795	4,128	65,624	69,752
	2030/2013	1.22	5.29	1.92	2.29	1.92	2.29	2.26	2.26	2.59	4.58		8.11	2.26	4.64	4.37
Total	2013	48,361	199,232	40,091	4,271	6,756	3,558	4,874	5,421	80,342	282,065	76	19,738	180,500	514,285	694,785
	2030	62,868	940,764	125,120	13,807	20,543	11,737	13,885	8,771	290,279	957,560	146	116,099	512,840	2,048,738	2,561,578
	2030/2013	1.30	4.72	3.12	3.23	3.04	3.30	2.85	1.62	3.61	3.39	1.93	5.88	2.84	3.98	3.69

Upside Case (unit: 1,000 ton)

		Coal		Iron Ore		Non- Ferrous		Grain		Petroleum		Natural Gas		Total		
		Export	Import	Export	Import	Export	Import	Export	Import	Export	Import	Export	Import	Export	Import	Total
India	2013	48,350	194,435	40,038	3,938	6,252	3,551	4,092	737	79,614	265,076	76	19,342	178,423	487,079	665,501
	2030	65,755	1,156,955	151,041	16,243	23,574	14,630	21,650	863	353,537	1,062,535	162	149,129	615,718	2,400,356	3,016,074
	2030/2013	1.36	5.95	3.77	4.12	3.77	4.12	5.29	1.17	4.44	4.01	2.14	7.71	3.45	4.93	4.53
Bangladesh	2013	0	176		34	0	3		3,262	111	2,032	0	35	111	5,542	5,653
	2030	0	1,644		140	0	11		7,069	857	15,670	0	299	857	24,833	25,690
	2030/2013	1.54	9.34		4.14	4.44	4.14		2.17	7.71	7.71	2.86	8.49	7.71	4.48	4.54
Sri Lanka	2013	11	974		0	35	2	8	828	84	5,449		262	138	7,516	7,654
	2030	14	5,914		0	162	2	14	1,546	314	22,195		934	503	30,592	31,095
	2030/2013	1.31	6.07		1.40	4.68	1.40	1.60	1.87	3.72	4.07		3.56	3.64	4.07	4.06
Pakistan	2013	0	3,647	52	300	469	2	774	594	533	9,507		98	1,828	14,148	15,977
	2030	0	24,835	121	874	1,084	7	2,707	2,078	1,621	54,825		1,087	5,533	83,705	89,238
	2030/2013	1.26	6.81	2.31	2.92	2.31	2.92	3.50	3.50	3.04	5.77		11.08	3.03	5.92	5.59
Total	2013	48,361	199,232	40,091	4,271	6,756	3,558	4,874	5,421	80,342	282,065	76	19,738	180,500	514,285	694,785
	2030	65,769	1,189,348	151,162	17,257	24,820	14,650	24,370	11,557	356,328	1,155,224	162	151,449	622,611	2,539,486	3,162,097
	2030/2013	1.36	5.97	3.77	4.04	3.67	4.12	5.00	2.13	4.44	4.10	2.14	7.67	3.45	4.94	4.55

Downside Case (unit: 1,000 ton)

		Coal		Iron Ore		Non- Ferrous		Grain		Petroleum		Natural Gas		Total		
		Export	Import	Export	Import	Export	Import	Export	Import	Export	Import	Export	Import	Export	Import	Total
India	2013	48,350	194,435	40,038	3,938	6,252	3,551	4,092	737	79,614	265,076	76	19,342	178,423	487,079	665,501
	2030	60,451	731,081	105,900	10,368	16,506	9,339	7,584	780	234,848	740,734	131	88,411	425,420	1,580,714	2,006,133
	2030/2013	1.25	3.76	2.64	2.63	2.64	2.63	1.85	1.06	2.95	2.79	1.73	4.57	2.38	3.25	3.01
Bangladesh	2013	0	176		34	0	3		3,262	111	2,032	0	35	111	5,542	5,653
	2030	0	903		125	0	10		4,324	494	9,036	0	168	494	14,565	15,060
	2030/2013	1.36	5.13		3.70	2.79	3.70		1.33	4.45	4.45	2.14	4.78	4.45	2.63	2.66
Sri Lanka	2013	11	974		0	35	2	8	828	84	5,449		262	138	7,516	7,654
	2030	13	3,380		0	101	2	10	1,039	226	14,302		627	351	19,351	19,702
	2030/2013	1.22	3.47		1.40	2.92	1.40	1.19	1.25	2.69	2.62		2.39	2.54	2.57	2.57
Pakistan	2013	0	3,647	52	300	469	2	774	594	533	9,507		98	1,828	14,148	15,977
	2030	0	14,956	84	538	750	4	1,226	941	1,189	34,412		579	3,250	51,430	54,680
	2030/2013	1.18	4.10	1.60	1.79	1.60	1.79	1.58	1.58	2.23	3.62		5.90	1.78	3.64	3.42
Total	2013	48,361	199,232	40,091	4,271	6,756	3,558	4,874	5,421	80,342	282,065	76	19,738	180,500	514,285	694,785
	2030	60,465	750,319	105,984	11,031	17,358	9,356	8,820	7,084	236,758	798,485	131	89,785	429,515	1,666,060	2,095,574
	2030/2013	1.25	3.77	2.64	2.58	2.57	2.63	1.81	1.31	2.95	2.83	1.73	4.55	2.38	3.24	3.02

Source: Coal, Iron Ore, Grain, Petroleum: [India] Indian Ports Assosiation, Indian Customs Data. Grain except the handling of Indian Minor ports. [Others] World Trade Service (IHS)
Non-Ferrous, Natural Gas: [All Countries] World Trade Service (IHS), [India] Indian Customs Data.

*Based on above source, JICA survey team estimated.

(1) Methodology of Future Projection of Bulk Cargo Transport

Obtaining cargo volume data in the current situation

- Organize the cargo volumes in the current situation (2013), based on the "MAJOR PORTS OF INDIA, A PROFILE: 2014-15 (INDIAN PORTS ASSOCIATION)" and " IHS World Trade Service Data (WTS Data, IHS)"
  1) by country (India, Bangladesh, Sri Lanka, Pakistan)
  2) by direction (export, import)
  3) by commodity item (Coal, Iron ore, Non-ferrous, Grain, Petroleum, Natural gas)

Consideration of cargo handling to/from hinterland in India

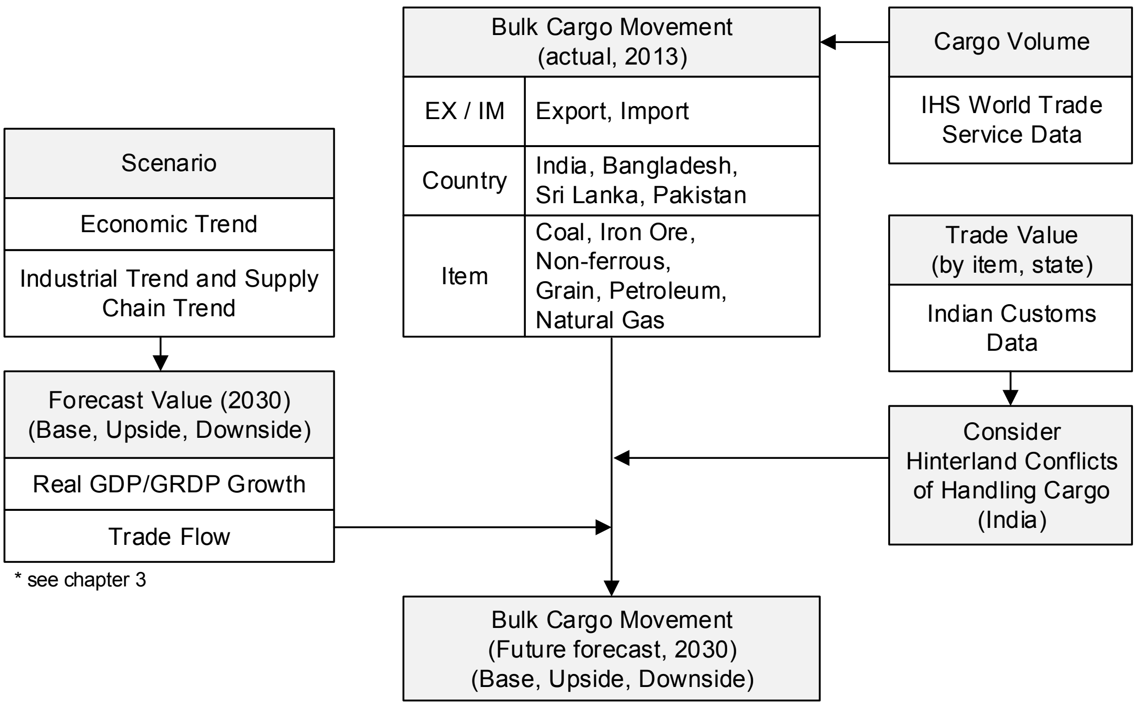
- Organize the cargo trade value in the current situation (2013), based on the "Indian Customs Data"
  1) by custom (sea port, ICD, not including airport)
  2) by item (Coal, Iron ore, Non-ferrous, Grain, Petroleum, Natural gas)
  3) by states and union territories of India

Consideration of scenario of Economic Trend, and Industrial Trend and Supply Chain Trend

- Consideration of Real GDP/GRDP Growth and Trade Flow (based on above 2 scenarios , refer to Chapter 3)
  1) by country (by Indian state)
  2) by commodity item

Future Projection of Bulk Cargo Transport

- Calculation of future bulk cargo volume
  1) Consideration of current cargo volume
  2) Consideration of growth rate of cargo, based on above 2 scenarios

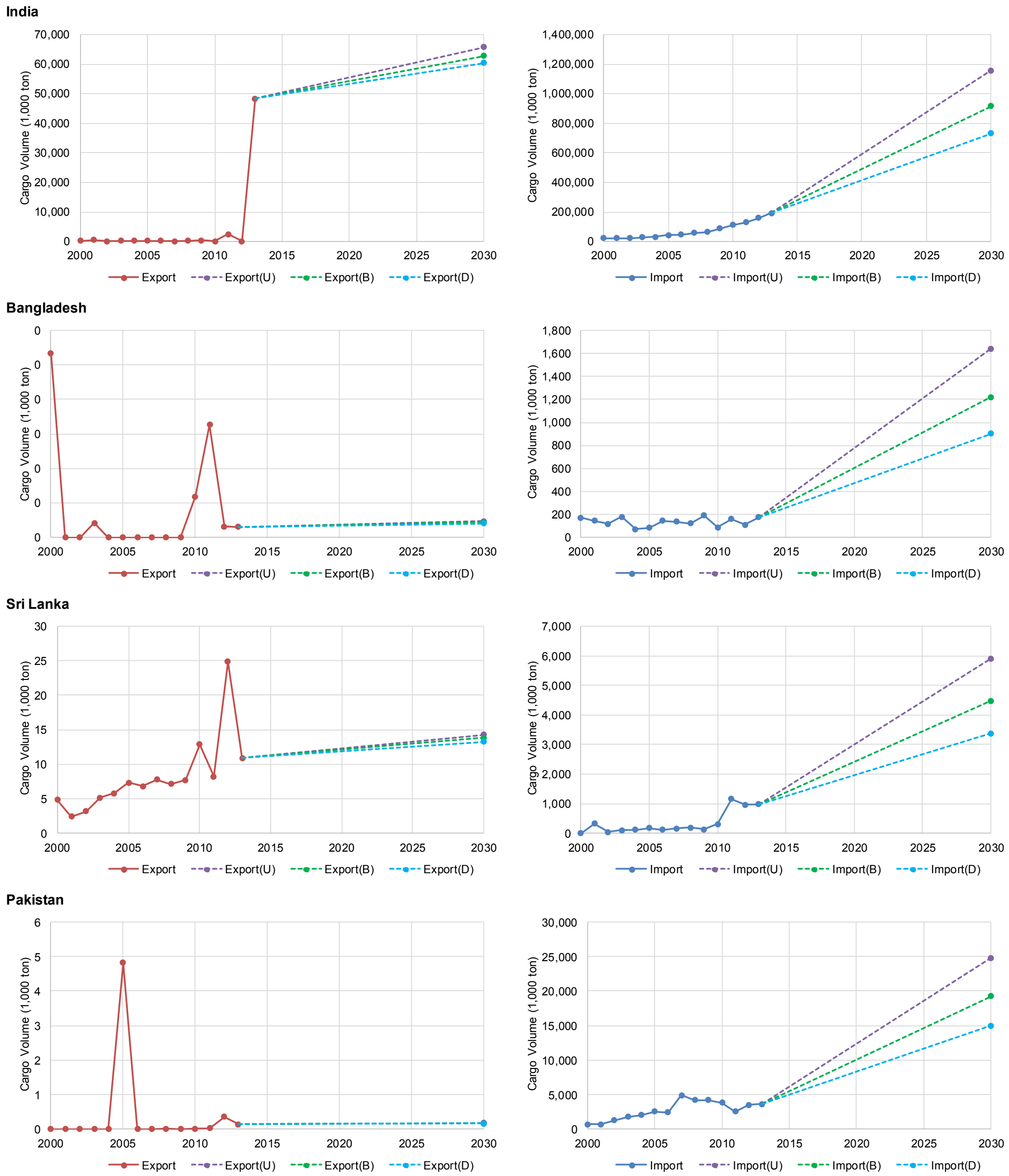


Source: Survey Team

Figure 5.35 Flow of Future Bulk Cargo Estimation

(2) Coal

Import cargo volume is assumed to increase by expanding domestic demand. In 2030, Import cargo volumes are estimated to increase approximately 4~7 times in India and Sri Lanka compared with those in 2013, and approximately 4~5 times in Pakistan, approximately 3~6 times in Bangladesh. Export cargo volume is estimated to increase approximately 1~2 times in all target countries.



* (U) Upside Case, (B) Base Case, (D) Downside Case
* India: [2000~2012] World Trade Service (IHS), [2013] INDIAN PORTS ASSOCIATION
* Bangladesh, Sri Lanka, Pakistan: [2000~2013] World Trade Service (IHS)

Export Import

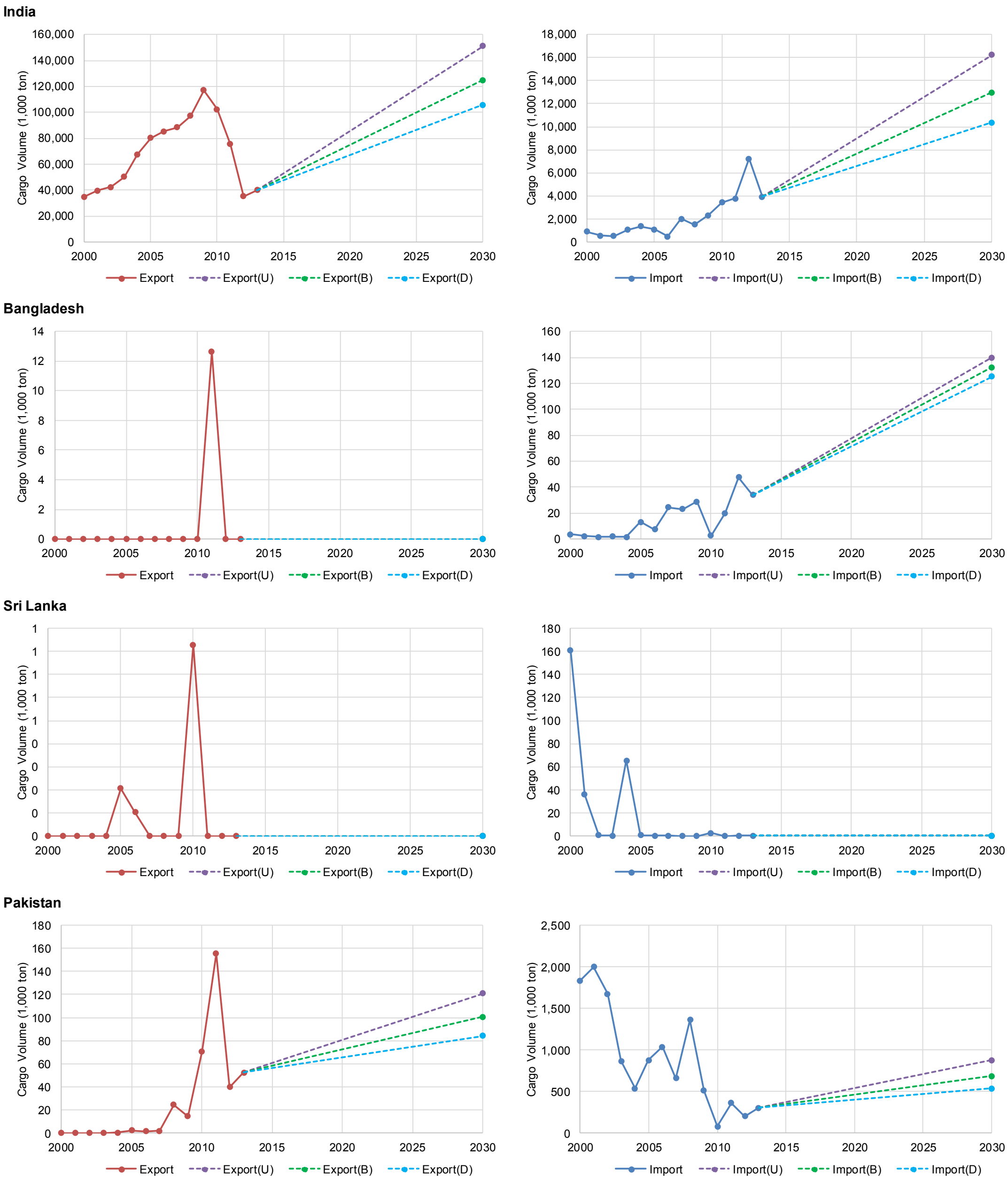
Source: Survey Team

Figure 5.36 Changes in Cargo Volume (Coal: 2000-2030)

(3) Iron Ore

In India, an official measure of banning mining of the mineral in Goa in 2012 was implemented. Export volume has decreased significantly afterwards. In April 2014, resumption of mining is authorized to limit the annual production volume to 20 million ton.

For 2030, export cargo volume is estimated to increase approximately 3~4 times in India, and approximately 2 times in Pakistan. Import cargo volume is estimated to increase approximately 3~4 times in India and Bangladesh, approximately 2 times in Pakistan.



* (U) Upside Case, (B) Base Case, (D) Downside Case
* India: [2000~2012] World Trade Service (IHS), [2013] INDIAN PORTS ASSOCIATION
* Bangladesh, Sri Lanka, Pakistan: [2000~2013] World Trade Service (IHS)

Export Import

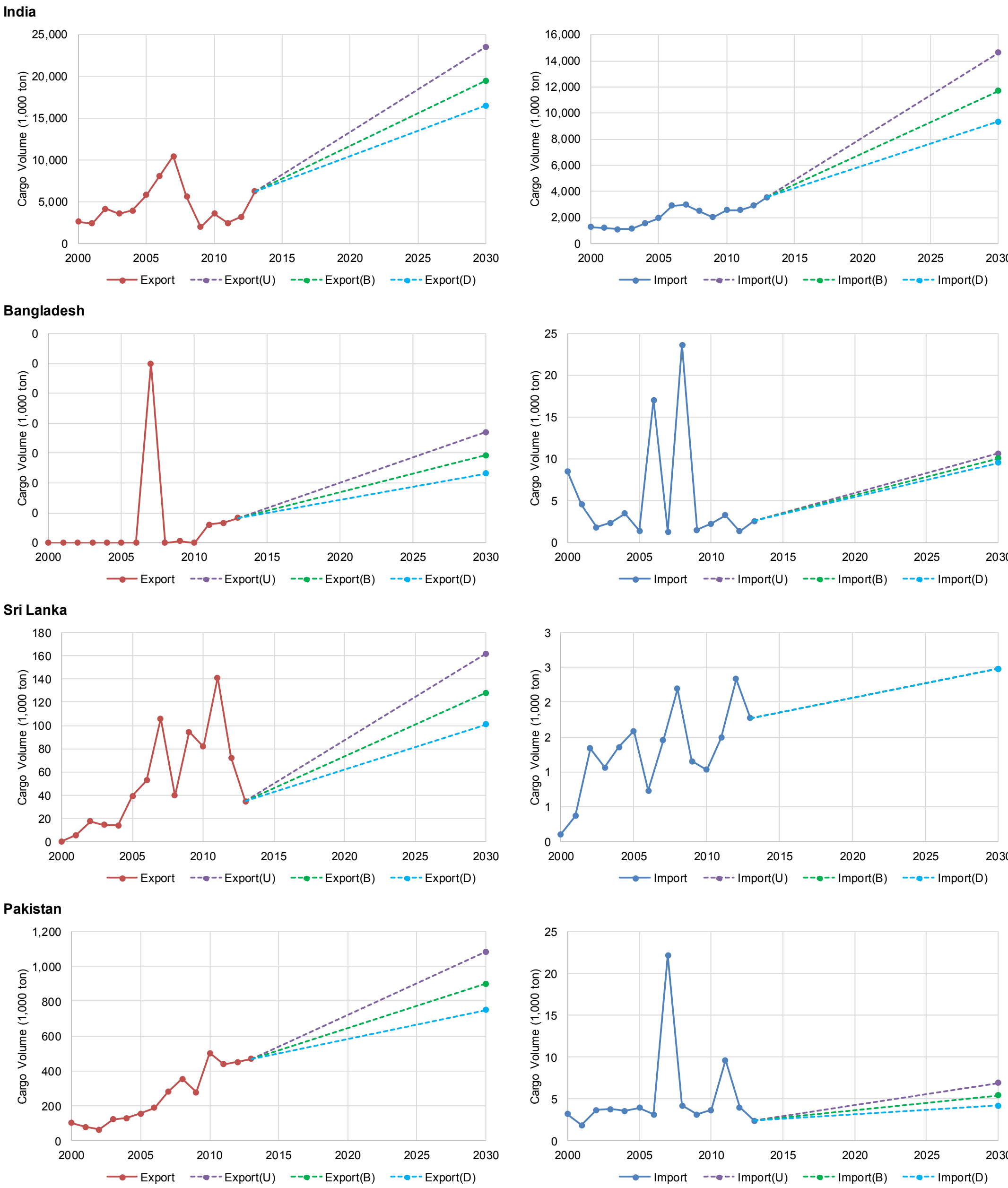
Source: Survey Team

Figure 5.37 Changes in Cargo Volume (Iron Ore: 2000-2030)

(4) Non- Ferrous

Although the fluctuation in cargo volume of non-ferrous metal is large, it is assumed to remain at a generally increasing trend.

In 2030, export cargo volume is estimated to increase approximately 3~5 times in India, Bangladesh and Sri Lanka and approximately 2 times in Pakistan. Import cargo volume is estimated to increase approximately 3~4 times in India and Bangladesh, approximately 1~2 times in Sri Lanka and Pakistan.



* (U) Upside Case, (B) Base Case, (D) Downside Case
* India, Bangladesh, Sri Lanka, Pakistan: [2000~2013] World Trade Service (IHS)

Export Import

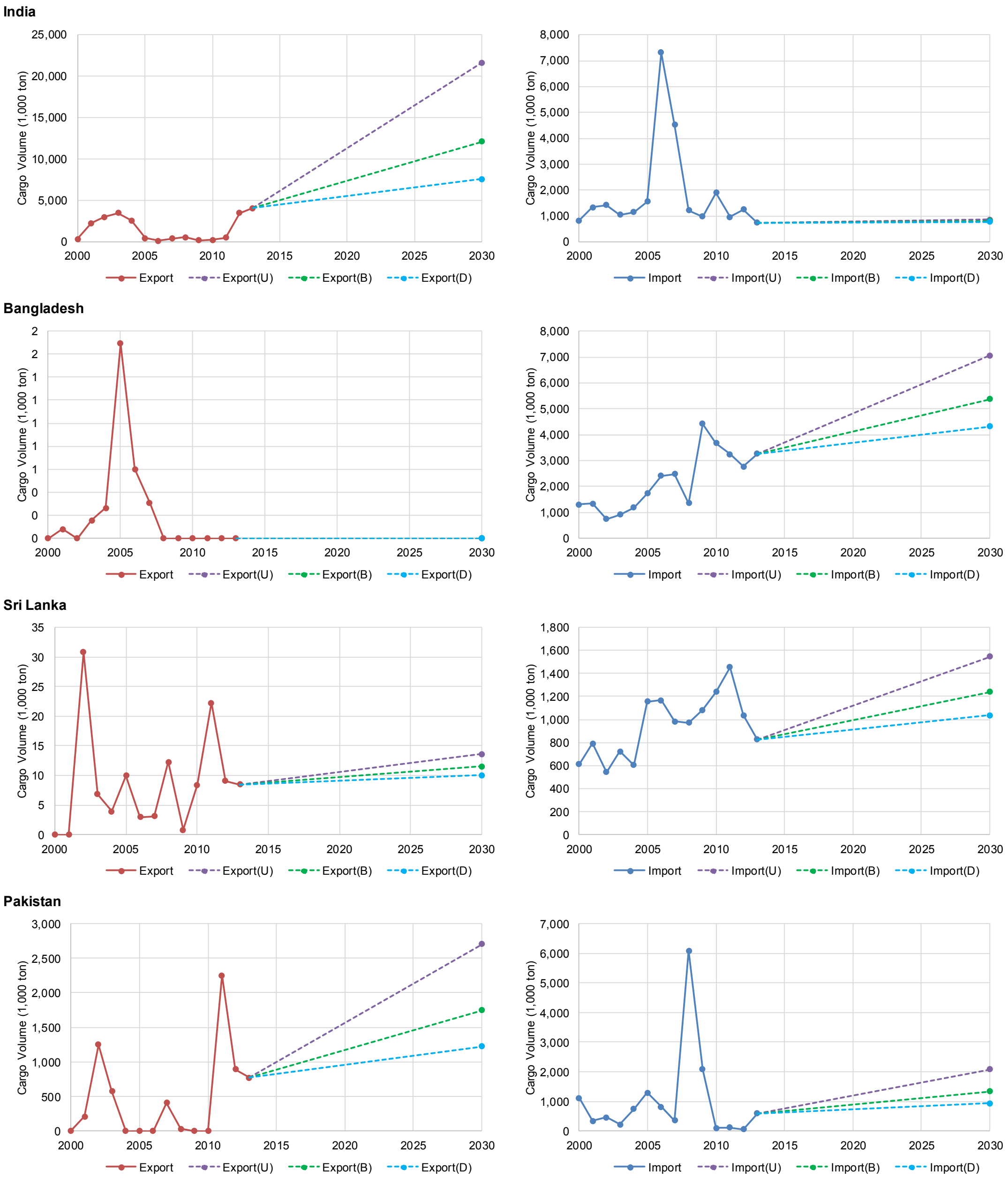
Source: Survey Team

Figure 5.38 Changes in Cargo Volume (Non- Ferrous: 2000-2030)

(5) Grain

The fluctuation in cargo volume of grain crops is also large, but it is assumed to remain at a generally increasing trend.

In 2030, export cargo volume is estimated to increase approximately 2~5 times in India, and approximately 1~2 times in Sri Lanka and Pakistan. Import cargo volume is estimated to almost the same in 2013 in India, approximately 1~2 times in Bangladesh and Sri Lanka, Pakistan.



* (U) Upside Case, (B) Base Case, (D) Downside Case
* India: [2000~2012] World Trade Service (IHS), [2013] INDIAN PORTS ASSOCIATION /except Minor ports
* Bangladesh, Sri Lanka, Pakistan: [2000~2013] World Trade Service (IHS)

Export Import

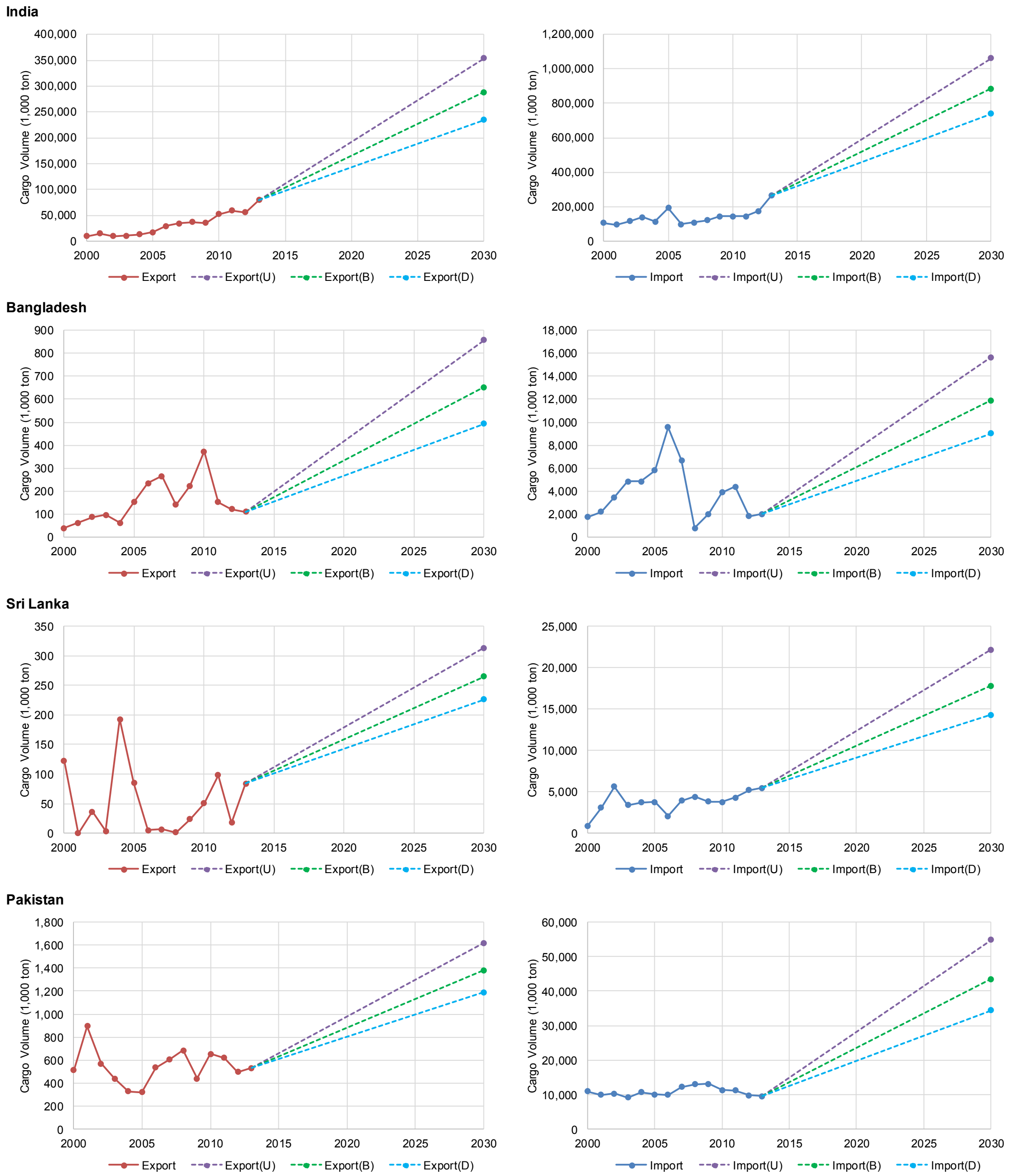
Source: Survey Team

Figure 5.39 Changes in Cargo Volume (Grain: 2000-2030)

(6) Petroleum

For all target countries, in line with assumed high economic growth, a continued expansion of energy demand is also assumed.

In 2030, export cargo volume is estimated to increase approximately 3~4 times in India and Sri Lanka, and approximately 1~2 times in Bangladesh, approximately 2 times in Pakistan. Import cargo volume is estimated to increase approximately 3~4 times in India and Sri Lanka, approximately 4~6 times in Bangladesh, approximately 4~5 times in Pakistan.



* (U) Upside Case, (B) Base Case, (D) Downside Case
* India: [2000~2012] World Trade Service (IHS), [2013] INDIAN PORTS ASSOCIATION
* Bangladesh, Sri Lanka, Pakistan: [2000~2013] World Trade Service (IHS)

Export Import

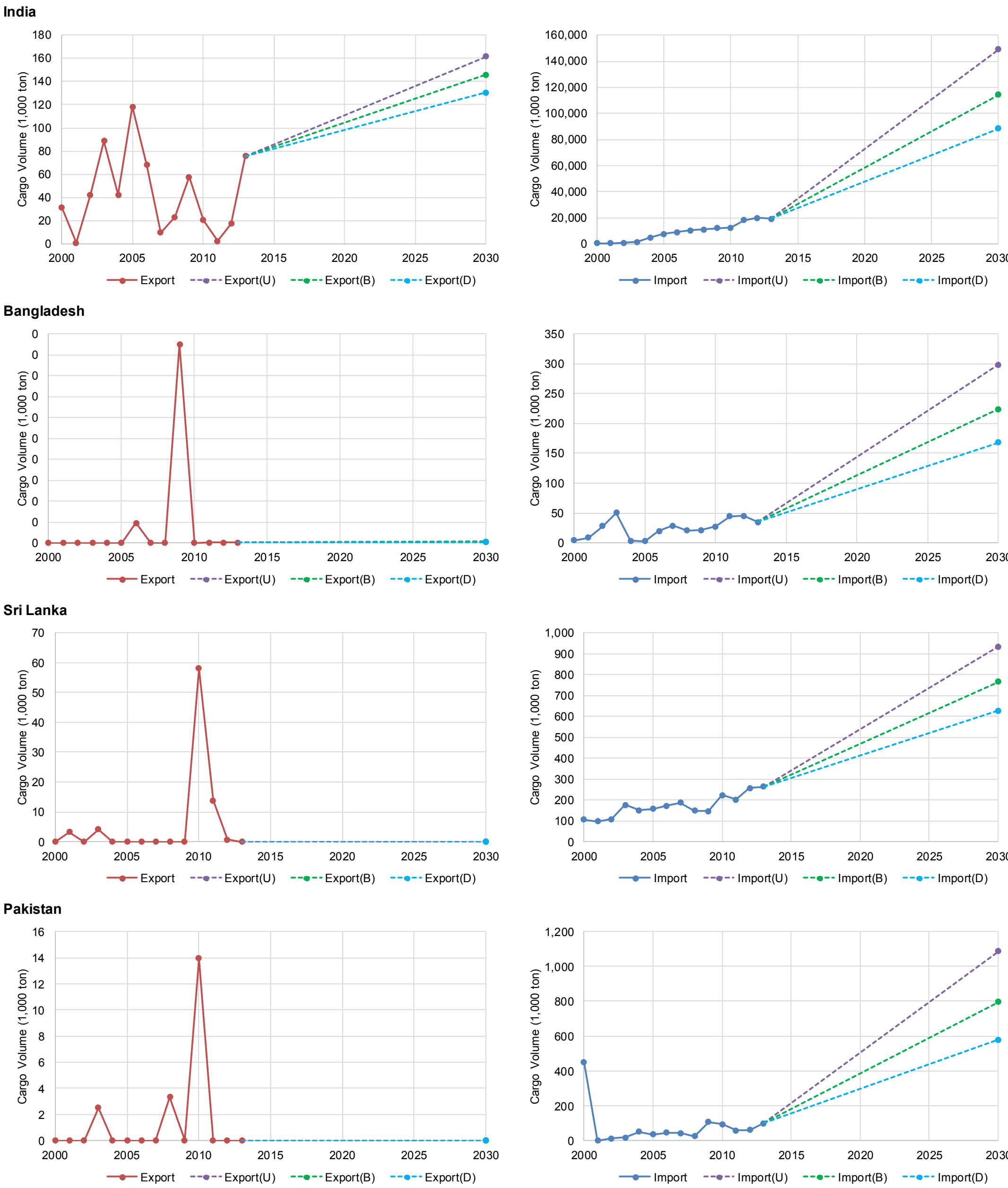
Source: Survey Team

Figure 5.40 Changes in Cargo Volume (Petroleum: 2000-2030)

(7) Natural Gas

For all target countries, in line with the assumed high economic growth, a continued expansion of energy demand is also assumed.

In 2030, export cargo volume is estimated to increase approximately 2 times in India and Bangladesh. Import cargo volume is estimated to increase approximately 5~8 times in India and Sri Lanka, approximately 2~4 times in Bangladesh, approximately 6~8 times in Pakistan.



* (U) Upside Case, (B) Base Case, (D) Downside Case
* India, Bangladesh, Sri Lanka, Pakistan: [2000~2013] World Trade Service (IHS)

Export Import

Source: Survey Team

Figure 5.41 Changes in Cargo Volume (Natural Gas: 2000-2030)

5.2.4 Consideration of Port Handling Capacity

A comparison of projected future cargo volume (import and export) and port handling capacity is made to verify the validity of future plans of each port or the country.

Port handling capacities are set by official statistics and interview surveys done by this Survey. But, for some ports that do not have useful information, capacities are assumed to be in line with the demand. The port handling capacity in India was set based on "Maritime Agenda 2010-2020", if there is no new plan, port handling capacity is assumed to continue at the current level. It should be noted that, cargo volume of each port in India was estimated by considering the GRDP by state based on Indian customs statics data.

(1) Coal

India

In India, except for Kolkata port and Haldia port of downside case, most of the ports have insufficient port handling capacity as a result. Based on this result and high economic growth rate of India, new expansion plans should be examined.

Bangladesh

In Bangladesh, there is no shortage of port handling capacity in the future as a result. In addition, the expansion of the port handling capacity is planned in Matabari and Paira port.

Sri Lanka

In Sri Lanka also, there are no shortage of port handling capacity in the future as a result. In addition, the expansion of the port handling capacity is planned in Hambantota and Torincomalee (Sampur) port.

Pakistan

In Pakistan also, there are no shortage of port handling capacity in the future as a result. In addition, the expansion of the port handling capacity is planned in Port Bin Qasim and Gwadar port.

Table 5.7 Estimation Results of Port Handling Capacity (Coal)

Coal (unit: 1,000 ton)

Country	Port	Cargo Volume (Export & Import)				Capacity		Evaluation			development plan
		2013	2030			2013	2030	2030			
		Actual	Downside Case	Base Case	Upside Case	Actual	Plan	Downside Case	Base Case	Upside Case	
India	Kandla	6,350	31,705	44,294	117,260	*10,000*	*10,000*	NG	NG	NG	
	Mumbai	4,221	15,013	18,320	30,345	*10,000*	*10,000*	NG	NG	NG	
	Mormugao	7,517	29,959	38,272	74,243	11,000	11,000	NG	NG	NG	
	New Mangalore	8,348	26,477	30,840	43,543	11,400	11,400	NG	NG	NG	1 berth (draft -14.0m, L=300m)
	Tuticorin	12,147	41,595	49,989	78,606	28,750	35,750	NG	NG	NG	2 berths (draft -18.2m, L=350m*2)
	Ennore	22,482	76,985	92,522	145,486	34,000	34,000	NG	NG	NG	
	Visakhapatnam	13,292	41,210	49,889	82,541	26,440	33,940	NG	NG	NG	1 berth (per.draft -18.1m, L=356m)
	Paradip	32,069	69,398	80,122	118,209	32,500	32,500	NG	NG	NG	some berths (draft -18m ~)
	Kolkata	68	235	288	489	19,000	21,000	OK	OK	OK	
	Haldia	10,168	33,069	40,315	67,591	33,500	38,000	OK	NG	NG	in Sagar Island, Coal berth (-13.5m)
	Total	242,785	791,532	978,625	1,222,710	-	-	-	-	-	
Bangladesh	Total	176	903	1,220	1,644	*5,000*	*35,000*	OK	OK	OK	in Matabari, 30 mil. Ton capacity in Paira, for coal power plant
Sri Lanka	Total	985	3,393	4,495	5,928	*5,000*	*10,000*	OK	OK	OK	in Hambantota, coal berth in Trincomalee (Sampur), coal berth
Pakistan	Total	3,647	14,956	19,292	24,835	*27,000*	*35,000*	OK	OK	OK	in Port Qasim, 8 mil. Ton capacity in Gwadar, Coal based power plant
Total		247,593	810,784	1,003,633	1,255,118	37,000	80,000	-	-	-	

* source: (yellow hatch) MARITIME AGENDA 2010-2020 (Government of India Ministry of Shipping, January, 2011), 2013=2016-17(plan), 2030=2019-20(plan)

* source: (blue hatch) JICA survey team

(2) Iron Ore

India

Port handling capacity of Visakhapatnam and Paradip port, Kandla port of upside case are insufficient as a result. There is a plan of new deep-sea port development in Sagar Island located at the estuary of Hooghly River. However, if this development plan is implemented, there is a possibility of improving the processing performance.

Bangladesh

Port in Matabari area will be expected to secure the port handling capacity in accordance with the development plan of the steel mill (100ha).

Sri Lanka

For cargo volume (imports and exports) is little, the capacity problems are assumed to not occur for the time being.

Pakistan

For cargo volume (imports and exports) is few, the capacity problems are assumed to not occur for the time being.

Table 5.8 Estimation Results of Port Handling Capacity (Iron Ore)

Iron Ore (unit: 1,000 ton)

Country	Port	Cargo Volume (Export & Import)				Capacity		Evaluation			development plan
		2013	2030			2013	2030	2030			
		Actual	Downside Case	Base Case	Upside Case	Actual	Plan	Downside Case	Base Case	Upside Case	
India	Kandla	586	1,881	2,540	5,337	*5,000*	*5,000*	OK	OK	NG	
	Mormugao	44	113	132	158	38,300	38,300	OK	OK	OK	
	New Mangalore	3,123	7,607	8,935	11,249	14,120	14,120	OK	OK	OK	
	Chennai	71	181	222	335	*20,000*	*20,000*	OK	OK	OK	2 berths (per. draft -16.5m, L=270m*2)
	Visakhapatnam	13,032	33,569	39,168	46,774	26,660	26,660	NG	NG	NG	Extension of Ore Bearth 1,2
	Paradip	7,196	18,539	21,628	25,816	18,500	18,500	NG	NG	NG	some iron ore berths (draft -18m ~)
	Haldia	2,170	5,590	6,522	7,785	9,000	9,500	OK	OK	OK	in Sagar Island, Iron ore berth (-13.5m)
	Major Ports (Subtotal)	26,222	69,328	82,291	99,748	131,580	132,080	OK	OK	OK	
	Minor Ports	17,754	46,940	55,716	67,536	-	-	-	-	-	
	Total	43,976	116,267	138,007	167,285	-	-	-	-	-	
Pakistan	Total	352	622	787	995	*5,000*	*5,000*	OK	OK	OK	
Total		44,362	117,015	138,927	168,420	234,860	240,860	-	-	-	

* source: (yellow hatch) MARITIME AGENDA 2010-2020 (Government of India Ministry of Shipping, January, 2011), 2013=2016-17(plan), 2030=2019-20(plan)

* source: (blue hatch) JICA survey team

(3) Non-Ferrous

India

In Tuticorin port, lack of some port handling capacity is concerned. The capacity problem is assumed to not occur for the time being, for cargo volume is not so much in other ports.

Bangladesh

For cargo volume (imports and exports) is few, the capacity problems are assumed to not occur for the time being.

Sri Lanka

For cargo volume (imports and exports) is few, the capacity problems are assumed to not occur for the time being.

Pakistan

For cargo volume, imports and exports are few, the capacity problems are assumed to not occur for the time being.

Table 5.9 Estimation Results of Port Handling Capacity (Non Ferrous)

Non-Ferrous (unit: 1,000 ton)

Country	Port	Cargo Volume (Export & Import)				Capacity		Evaluation			development plan
		2013	2030			2013	2030	2030			
		Actual	Downside Case	Base Case	Upside Case	Actual	Plan	Downside Case	Base Case	Upside Case	
India	Kandla	29	84	105	132	*5,000*	*5,000*	OK	OK	OK	
	JNPT	316	825	1,002	1,233	*5,000*	*5,000*	OK	OK	OK	
	New Mangalore	1	4	4	5	*5,000*	*5,000*	OK	OK	OK	
	Tuticorin	7,101	18,582	22,400	27,336	*15,000*	*15,000*	NG	NG	NG	
	Chennai	33	86	104	127	*5,000*	*5,000*	OK	OK	OK	
	Visakhapatnam	981	2,605	3,154	3,865	*5,000*	*5,000*	OK	OK	OK	
	Kolkata	1,078	2,903	3,527	4,336	*5,000*	*5,000*	OK	OK	OK	
	Major Ports (Subtotal)	9,538	25,089	30,296	37,034	45,000	45,000	OK	OK	OK	
	Minor Ports	265	757	936	1,170	-	-	-	-	-	
	Total	9,804	25,846	31,232	38,204	-	-	-	-	-	
Bangladesh	Total	3	10	10	11	*5,000*	*5,000*	OK	OK	OK	
Sri Lanka	Total	36	104	131	165	*5,000*	*5,000*	OK	OK	OK	
Pakistan	Total	472	755	906	1,091	*5,000*	*5,000*	OK	OK	OK	
Total		10,314	26,714	32,279	39,470	15,000	15,000	-	-	-	

* source: (yellow hatch) MARITIME AGENDA 2010-2020 (Government of India Ministry of Shipping, January, 2011), 2013=2016-17(plan), 2030=2019-20(plan)

* source: (blue hatch) JICA survey team

(4) Grain

India

In Kandla port, lack of port handling capacity is concerned. The capacity problem is assumed to not occur for the time being, for cargo volume is not so much in other ports.

Bangladesh

Due to the further economic growth, there is a possibility that the shortage occurs in the port handling capability in the case of base and upside case.

Sri Lanka

For cargo volume (imports and exports) is not so many, the capacity problems are assumed to not occur for the time being.

Pakistan

The capacity problems are assumed to not occur for the time being. In addition, there is the development of grain terminal in Port Bin Qasim.

Table 5.10 Estimation Results of Port Handling Capacity (Grain)

Grain (unit: 1,000 ton)

Country	Port	Cargo Volume (Export & Import)				Capacity		Evaluation			development plan
		2013	2030			2013	2030	2030			
		Actual	Downside Case	Base Case	Upside Case	Actual	Plan	Downside Case	Base Case	Upside Case	
India	Kandla	2,731	5,061	8,095	14,449	5,000	5,000	NG	NG	NG	
	Mumbai	720	763	798	846	5,000	5,000	OK	OK	OK	
	Mormugao	44	82	130	233	5,000	5,000	OK	OK	OK	
	New Mangalore	118	219	350	624	5,000	5,000	OK	OK	OK	
	Tuticorin	49	91	145	259	5,000	5,000	OK	OK	OK	
	Chennai	306	567	907	1,619	5,000	5,000	OK	OK	OK	
	Visakhapatnam	834	1,532	2,439	4,340	5,000	5,000	OK	OK	OK	
	Kolkata	27	50	80	143	5,000	5,000	OK	OK	OK	
	Major Ports (Subtotal)	4,829	8,364	12,944	22,513	40,000	40,000	OK	OK	OK	
	Minor Ports					-	-	-	-	-	
	Total	4,829	8,364	12,944	22,513	-	-	-	-	-	
Bangladesh	Total	3,262	4,324	5,377	7,069	5,000	5,000	OK	NG	NG	
Sri Lanka	Total	836	1,049	1,250	1,560	5,000	5,000	OK	OK	OK	
Pakistan	Total	1,368	2,167	3,085	4,785	5,000	10,000	OK	OK	OK	in Port Quasim, 1 berth
Total		10,295	15,904	22,657	35,927	15,000	20,000	-	-	-	

* source: (yellow hatch) MARITIME AGENDA 2010-2020 (Government of India Ministry of Shipping, January, 2011), 2013=2016-17(plan), 2030=2019-20(plan)

* source: (blue hatch) JICA survey team

(5) Petroleum

India

In Mormugao and Tuticorin, Kolkata ports, the capacity problems are assumed to occur for the time being. In the other ports, due to the further economic growth, lack of port handling capability is a concern.

Bangladesh

In Upside Case, although slight lack of port capacity is concerned, it is assumed that generally port handling capacity by construction of port in Matabari area is ensured.

Sri Lanka

Due to the further economic growth, lack of port handling capability a concern.

Pakistan

Due to the further economic growth, lack of port handling capability a concern.

Table 5.11 Estimation Results of Port Handling Capacity (Petroleum)

Petroleum (unit: 1,000 ton)

Country	Port	Cargo Volume (Export & Import)				Capacity		Evaluation			development plan
		2013	2030			2013	2030	2030			
		Actual	Downside Case	Base Case	Upside Case	Actual	Plan	Downside Case	Base Case	Upside Case	
India	Kandla	52,702	127,274	178,193	291,201	91,230	97,230	NG	NG	NG	
	Mumbai	24,599	64,027	89,616	146,590	54,000	54,000	NG	NG	NG	
	JNPT	4,419	11,213	15,824	23,397	5,500	5,500	NG	NG	NG	
	Mormugao	527	1,280	1,740	2,799	7,500	7,500	OK	OK	OK	
	New Mangalore	24,647	59,901	81,475	118,087	47,800	47,800	NG	NG	NG	
	Cochin	14,321	37,361	52,156	87,644	29,800	31,800	NG	NG	NG	1 berth
	Tuticorin	479	1,275	1,794	3,247	2,300	*5,300*	OK	OK	OK	1 berth (L=300m), add cap. 3 mil. Ton
	Chennai	12,878	32,982	45,691	75,748	12,800	*15,800*	NG	NG	NG	Liquid terminal
	Ennore	2,340	6,072	8,447	14,708	8,500	*11,500*	OK	OK	NG	2nd Liquid terminal
	Visakhapatnam	13,206	34,420	48,021	81,210	27,650	*37,650*	OK	NG	NG	2 berths (per.draft -17m, L=408m, per.draft -14m, L=271m,
	Paradip	17,702	45,960	63,958	111,031	55,500	55,500	OK	NG	NG	
	Kolkata	717	1,925	2,720	4,674	29,500	29,500	OK	OK	OK	
	Haldia	6,098	16,369	23,138	39,217	22,000	22,000	OK	NG	NG	
	Major Ports (Subtotal)	174,635	494,272	593,933	717,444	394,080	421,080	NG	NG	NG	
	Minor Ports	170,055	481,309	578,356	698,628	-	-	-	-	-	Vizhinjam: Phase2(~2030) cap. 51.8 mil. Ton
	Total	344,690	975,582	1,172,289	1,416,071	-	-	-	-	-	
Bangladesh	Total	2,143	9,530	12,572	16,527	*5,000*	*14,400*	OK	OK	NG	in Matabari, Oil refinery 4.4mil. Ton (400ha)
Sri Lanka	Total	5,534	14,529	18,092	22,508	*10,000*	*10,000*	NG	NG	NG	
Pakistan	Total	10,040	35,602	44,886	56,445	*20,000*	*20,000*	NG	NG	NG	
Total		362,407	1,035,242	1,247,838	1,511,552	35,000	44,400	-	-	-	

* source: (yellow hatch) MARITIME AGENDA 2010-2020 (Government of India Ministry of Shipping, January, 2011), 2013=2016-17(plan), 2030=2019-20(plan)

* source: (blue hatch) JICA survey team

(6) Natural Gas

India

In New Mangalore port and Visakhapatnam port of base and upside case, lack of port handling capacity is concerned. The capacity problem is assumed to not occur for the time being, for cargo volume is not so much in other ports.

Bangladesh

For cargo volume (imports and exports) is few, the capacity problems are assumed to not occur for the time being.

Sri Lanka

For cargo volume (imports and exports) is few, the capacity problems are assumed to not occur for the time being.

Pakistan

For cargo volume (imports and exports) is few, the capacity problems are assumed to not occur for the time being.

Table 5.12 Estimation Results of Port Handling Capacity (Natural Gas)

Natural Gas (unit: 1,000 ton)

Country	Port	Cargo Volume (Export & Import)				Capacity		Evaluation			development plan
		2013	2030			2013	2030	2030			
		Actual	Downside Case	Base Case	Upside Case	Actual	Plan	Downside Case	Base Case	Upside Case	
India	Mumbai	655	2,043	2,472	3,011	5,000	5,000	OK	OK	OK	
	JNPT	282	888	1,076	1,313	5,000	5,000	OK	OK	OK	
	New Mangalore	2,289	7,207	8,736	10,658	5,000	5,000	NG	NG	NG	
	Tuticorin	306	942	1,138	1,384	5,000	5,000	OK	OK	OK	
	Chennai	1	2	3	3	5,000	5,000	OK	OK	OK	
	Ennore	200	1,086	1,435	1,912	5,000	5,000	OK	OK	OK	LNG terminal
	Visakhapatnam	1,429	4,500	5,455	6,655	5,000	5,000	OK	NG	NG	
	Kolkata	728	2,688	3,361	4,240	5,000	5,000	OK	OK	OK	
	Major Ports (Subtotal)	5,890	19,357	23,677	29,177	40,000	40,000	OK	OK	OK	
	Minor Ports	13,528	69,185	90,781	120,115	-	-	-	-	-	
	Total	19,418	88,542	114,458	149,291	40,000	40,000	-	-	-	
Bangladesh	Total	35	168	224	299	5,000	5,000	OK	OK	OK	in Matabari, LNG (70ha)
Sri Lanka	Total	262	627	766	934	5,000	5,000	OK	OK	OK	
Pakistan	Total	98	579	795	1,087	5,000	5,000	OK	OK	OK	
Total		19,813	89,916	116,245	151,611	135,000	135,000	-	-	-	

* source: (yellow hatch) MARITIME AGENDA 2010-2020 (Government of India Ministry of Shipping, January, 2011), 2013=2016-17(plan), 2030=2019-20(plan)

* source: (blue hatch) JICA survey team

5.2.5 Summary of Bulk Cargo Volume Projection

(1) Bangladesh

Coal, Iron Ore, Petroleum

Ports of Matabari and Payra, etc. have development plans for increasing demand of coal and iron ore, and petroleum. These plans are expected to satisfy the future cargo demand (exclude upside case of petroleum).

Non-Ferrous, Natural Gas

Estimated future cargo volumes of non-ferrous mineral and natural gas are not so much. For this reason, current port handling capacity is assumed to be sufficient in the future (2030).

Grain

Lack of port handling capacity against future cargo volume of grain is a matter of concern. For this reason, it is necessary to further port development plans in Bangladesh.

In addition, because of the necessity of the expansion of port handling capacities in Chittagong, improvement of existing facilities are planned to be done by PPP scheme.

Table 5.13 Estimation Results of Port Handling Capacity (Bangladesh)

Bangladesh (unit: 1,000 ton)

Item	Cargo Volume (Export & Import)				Capacity		Evaluation		
	2013	2030			2013	2030	2030		
	Actual	Downside Case	Base Case	Upside Case	Actual	Plan	Downside Case	Base Case	Upside Case
Coal	176	903	1,220	1,644	*5,000*	*35,000*	OK	OK	OK
Iron Ore	34	125	132	140	*5,000*	*10,000*	OK	OK	OK
Non-Ferrous	3	10	10	11	*5,000*	*5,000*	OK	OK	OK
Grain	3,262	4,324	5,377	7,069	*5,000*	*5,000*	OK	NG	NG
Petroleum	2,143	9,530	12,572	16,527	*5,000*	*14,400*	OK	OK	NG
Natural Gas	35	168	224	299	*5,000*	*5,000*	OK	OK	OK

* source: (blue hatch) JICA survey team

(2) India

Coal

Lack of port handling capacity against the future cargo volume of coal is a matter of concern with the exception of the new port plan of Sagar Island (offshore of Kolkata). For this reason, it is necessary to further port development plans for coal cargo in India.

Iron Ore

Lack of port handling capacity against the future cargo volume of iron ore is a matter of concern in port of Visakhapatnam and Paradip. For this reason, it is necessary to further port development plans for iron ore cargo in these ports.

Non-Ferrous

Estimated future cargo volume of non-ferrous is not so much with the exception of port of Tuticorin. For this reason, current port handling capacity is assumed to be sufficient in the future (2030) with the exception of port of Tuticorin (Port of Tuticorin is necessary to further port development plans).

Grain

Lack of port handling capacity against the future cargo volume of grain is a matter of concern at port of Kandla port (Kandla port is necessary to further port development plans). In addition, current port handling capacity of the other ports is assumed to be sufficient in the future (2030).

Petroleum

Lack of port handling capacity against the future cargo volume of petroleum is a matter of concern with the exception of Mormugao and Tuticorin port, etc. For this reason, it is necessary to further port development plans for petroleum cargo with the exception of these ports.

Natural Gas

Lack of port handling capacity against the future cargo volume of natural gas is a matter of concern with the exception of ports of New Mangalore and Visakhapatnam. These ports are necessary to have further port development plans.

Table 5.14 Estimation Results of Port Handling Capacity (India) (1/2)

India (unit: 1,000 ton)

Item	Port	Cargo Volume (Export & Import)				Capacity		Evaluation		
		2013	2030			2013	2030	2030		
		Actual	Downside Case	Base Case	Upside Case	Actual	Plan	Downside Case	Base Case	Upside Case
Coal	Kandla	6,350	31,705	44,294	117,260	*10,000*	*10,000*	NG	NG	NG
	Mumbai	4,221	15,013	18,320	30,345	*10,000*	*10,000*	NG	NG	NG
	Mormugao	7,517	29,959	38,272	74,243	11,000	11,000	NG	NG	NG
	New Mangalore	8,348	26,477	30,840	43,543	11,400	11,400	NG	NG	NG
	Tuticorin	12,147	41,595	49,989	78,606	28,750	35,750	NG	NG	NG
	Ennore	22,482	76,985	92,522	145,486	34,000	34,000	NG	NG	NG
	Visakhapatnam	13,292	41,210	49,889	82,541	26,440	33,940	NG	NG	NG
	Paradip	32,069	69,398	80,122	118,209	32,500	32,500	NG	NG	NG
	Kolkata	68	235	288	489	19,000	21,000	OK	OK	OK
	Haldia	10,168	33,069	40,315	67,591	33,500	38,000	OK	NG	NG
	Major Ports (Subtotal)	116,662	380,344	470,245	587,531	216,590	237,590	NG	NG	NG
	Minor Ports	126,123	411,189	508,380	635,179	-	-	-	-	-
	Total	242,785	791,532	978,625	1,222,710	-	-	-	-	-
Iron Ore	Kandla	586	1,881	2,540	5,337	*5,000*	*5,000*	OK	OK	NG
	Mormugao	44	113	132	158	38,300	38,300	OK	OK	OK
	New Mangalore	3,123	7,607	8,935	11,249	14,120	14,120	OK	OK	OK
	Chennai	71	181	222	335	*20,000*	*20,000*	OK	OK	OK
	Visakhapatnam	13,032	33,569	39,168	46,774	26,660	26,660	NG	NG	NG
	Paradip	7,196	18,539	21,628	25,816	18,500	18,500	NG	NG	NG
	Haldia	2,170	5,590	6,522	7,785	9,000	9,500	OK	OK	OK
	Major Ports (Subtotal)	26,222	69,328	82,291	99,748	131,580	132,080	OK	OK	OK
	Minor Ports	17,754	46,940	55,716	67,536	-	-	-	-	-
	Total	43,976	116,267	138,007	167,285	-	-	-	-	-
Non-Ferrous	Kandla	29	84	105	132	*5,000*	*5,000*	OK	OK	OK
	JNPT	316	825	1,002	1,233	*5,000*	*5,000*	OK	OK	OK
	New Mangalore	1	4	4	5	*5,000*	*5,000*	OK	OK	OK
	Tuticorin	7,101	18,582	22,400	27,336	*15,000*	*15,000*	NG	NG	NG
	Chennai	33	86	104	127	*5,000*	*5,000*	OK	OK	OK
	Visakhapatnam	981	2,605	3,154	3,865	*5,000*	*5,000*	OK	OK	OK
	Kolkata	1,078	2,903	3,527	4,336	5,000	5,000	OK	OK	OK
	Major Ports (Subtotal)	9,538	25,089	30,296	37,034	45,000	45,000	OK	OK	OK
	Minor Ports	265	757	936	1,170	-	-	-	-	-
	Total	9,804	25,846	31,232	38,204	-	-	-	-	-
Grain	Kandla	2,731	5,061	8,095	14,449	*5,000*	*5,000*	NG	NG	NG
	Mumbai	720	763	798	846	*5,000*	*5,000*	OK	OK	OK
	Mormugao	44	82	130	233	*5,000*	*5,000*	OK	OK	OK
	New Mangalore	118	219	350	624	*5,000*	*5,000*	OK	OK	OK
	Tuticorin	49	91	145	259	*5,000*	*5,000*	OK	OK	OK
	Chennai	306	567	907	1,619	*5,000*	*5,000*	OK	OK	OK
	Visakhapatnam	834	1,532	2,439	4,340	*5,000*	*5,000*	OK	OK	OK
	Kolkata	27	50	80	143	*5,000*	*5,000*	OK	OK	OK
	Major Ports (Subtotal)	4,829	8,364	12,944	22,513	40,000	40,000	OK	OK	OK
	Minor Ports					-	-	-	-	-
	Total	4,829	8,364	12,944	22,513	-	-	-	-	-

* source: (yellow hatch) MARITIME AGENDA 2010-2020 (Government of India Ministry of Shipping, January, 2011), 2013=2016-17(plan), 2030=2019-20(plan)

* source: (blue hatch) JICA survey team

Table 5.15 Estimation Results of Port Handling Capacity (India) (2/2)

India (unit: 1,000 ton)

Item	Port	Cargo Volume (Export & Import)				Capacity		Evaluation		
		2013	2030			2013	2030	2030		
		Actual	Downside Case	Base Case	Upside Case	Actual	Plan	Downside Case	Base Case	Upside Case
Petroleum	Kandla	52,702	127,274	178,193	291,201	91,230	97,230	NG	NG	NG
	Mumbai	24,599	64,027	89,616	146,590	54,000	54,000	NG	NG	NG
	JNPT	4,419	11,213	15,824	23,397	5,500	5,500	NG	NG	NG
	Mormugao	527	1,280	1,740	2,799	*7,500*	*7,500*	OK	OK	OK
	New Mangalore	24,647	59,901	81,475	118,087	47,800	47,800	NG	NG	NG
	Cochin	14,321	37,361	52,156	87,644	29,800	31,800	NG	NG	NG
	Tuticorin	479	1,275	1,794	3,247	2,300	*5,300*	OK	OK	OK
	Chennai	12,878	32,982	45,691	75,748	12,800	*15,800*	NG	NG	NG
	Ennore	2,340	6,072	8,447	14,708	8,500	*11,500*	OK	OK	NG
	Visakhapatnam	13,206	34,420	48,021	81,210	27,650	*37,650*	OK	NG	NG
	Paradip	17,702	45,960	63,958	111,031	55,500	55,500	OK	NG	NG
	Kolkata	717	1,925	2,720	4,674	29,500	29,500	OK	OK	OK
	Haldia	6,098	16,369	23,138	39,217	22,000	22,000	OK	NG	NG
	Major Ports (Subtotal)	174,635	494,272	593,933	717,444	394,080	421,080	NG	NG	NG
	Minor Ports	170,055	481,309	578,356	698,628	-	-	-	-	-
	Total	344,690	975,582	1,172,289	1,416,071	-	-	-	-	-
Natural Gas	Mumbai	655	2,043	2,472	3,011	*5,000*	*5,000*	OK	OK	OK
	JNPT	282	888	1,076	1,313	*5,000*	*5,000*	OK	OK	OK
	New Mangalore	2,289	7,207	8,736	10,658	*5,000*	*5,000*	NG	NG	NG
	Tuticorin	306	942	1,138	1,384	*5,000*	*5,000*	OK	OK	OK
	Chennai	1	2	3	3	*5,000*	*5,000*	OK	OK	OK
	Ennore	200	1,086	1,435	1,912	*5,000*	*5,000*	OK	OK	OK
	Visakhapatnam	1,429	4,500	5,455	6,655	*5,000*	*5,000*	OK	NG	NG
	Kolkata	728	2,688	3,361	4,240	*5,000*	*5,000*	OK	OK	OK
	Major Ports (Subtotal)	5,890	19,357	23,677	29,177	40,000	40,000	OK	OK	OK
	Minor Ports	13,528	69,185	90,781	120,115	-	-	-	-	-
	Total	19,418	88,542	114,458	149,291	40,000	40,000	-	-	-

* source: (yellow hatch) MARITIME AGENDA 2010-2020 (Government of India Ministry of Shipping, January, 2011), 2013=2016-17(plan), 2030=2019-20(plan)

* source: (blue hatch) JICA survey team

(3) Pakistan

Coal

Port of Karachi and Bin Qasim have development plans for dedicated coal terminal. Because of this, port handling capacity is assumed to be sufficient in the future (2030).

Petroleum

Although, the port of Bin Qasim have development plans of new Oil/LNG terminal, lack of port handling capacity against the future cargo volume of petroleum is concerned in Pakistan. For this reason, it is necessary to have further port development plans.

Iron Ore, Non-Ferrous, Grain, Natural Gas

Estimated future cargo volume of iron ore, non-ferrous, grain, natural gas are not so much. For this reason, current port handling capacity is assumed to be sufficient in the future (2030).

Table 5.16 Estimation Results of Port Handling Capacity (Pakistan)

Pakistan (unit: 1,000 ton)

Item	Cargo Volume (Export & Import)				Capacity		Evaluation		
	2013	2030			2013	2030	2030		
	Actual	Downside Case	Base Case	Upside Case	Actual	Plan	Downside Case	Base Case	Upside Case
Coal	3,647	14,956	19,292	24,835	*27,000*	*35,000*	OK	OK	OK
Iron Ore	352	622	787	995	*5,000*	*5,000*	OK	OK	OK
Non-Ferrous	472	755	906	1,091	*5,000*	*5,000*	OK	OK	OK
Grain	1,368	2,167	3,085	4,785	*5,000*	*10,000*	OK	OK	OK
Petroleum	10,040	35,602	44,886	56,445	*20,000*	*20,000*	NG	NG	NG
Natural Gas	98	579	795	1,087	*5,000*	*5,000*	OK	OK	OK

* source: (blue hatch) JICA survey team

(4) Sri Lanka

Coal

Port of Hambantota and Trincomalee have development plans for coal terminal. Because of this, port handling capacity is assumed to be sufficient in the future (2030).

Petroleum

Lack of port handling capacity against the future cargo volume of petroleum is concerned in Sri Lanka. For this reason, it is necessary to have further port development plans in the future.

Iron Ore, Non-Ferrous, Grain, Natural Gas

Estimated future cargo volume of iron ore, non-ferrous, grain, natural gas are not so much. For this reason, current port handling capacity is assumed to be sufficient in the future.

Table 5.17 Estimation Results of Port Handling Capacity (Sri Lanka)

Sri Lanka (unit: 1,000 ton)

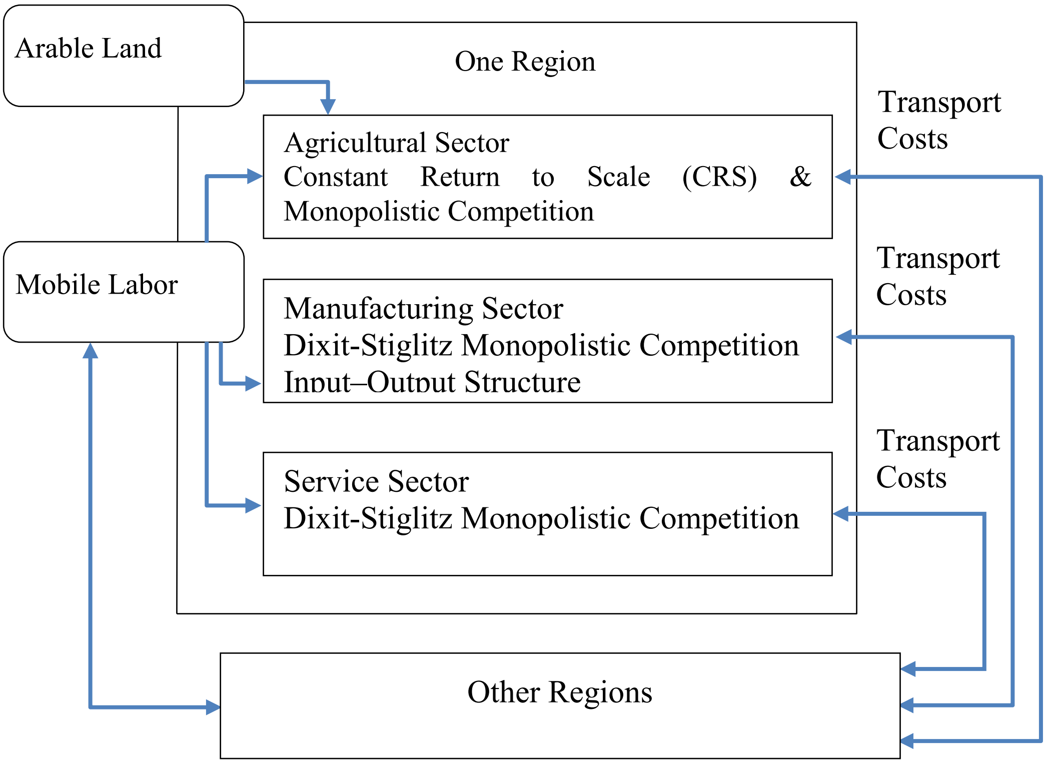
Item	Cargo Volume (Export & Import)				Capacity		Evaluation		
	2013	2030			2013	2030	2030		
	Actual	Downside Case	Base Case	Upside Case	Actual	Plan	Downside Case	Base Case	Upside Case
Coal	985	3,393	4,495	5,928	*5,000*	*10,000*	OK	OK	OK
Iron Ore	0	0	0	0	*5,000*	*5,000*	OK	OK	OK
Non-Ferrous	36	104	131	165	*5,000*	*5,000*	OK	OK	OK
Grain	836	1,049	1,250	1,560	*5,000*	*5,000*	OK	OK	OK
Petroleum	5,534	14,529	18,092	22,508	*10,000*	*10,000*	NG	NG	NG
Natural Gas	262	627	766	934	*5,000*	*5,000*	OK	OK	OK

* source: (blue hatch) JICA survey team

5.3 Economic Impact of Maritime Transport Network Improvement

A simulation analysis by the Institute of Developing Economies–Geographical Simulation Model (IDE–GSM[1]) explains how port improvement contributes to higher economic growth. The IDE–GSM illustrates the dynamics of the location of populations and industries in South and East Asia in the long term, by using province data rather than national data. The theoretical foundation of the IDE–GSM follows New Economic Geography (NEG), in particular, Puga and Venables (1996), which captures the multi-sector and country general equilibrium (Figure 5.42). The model allows workers to move within countries and between sectors. A notable difference of the IDE–GSM from that of Puga and Venables (1996) lies in the specification of the agricultural sector. The IDE–GSM explicitly incorporates land size in its production and keeps its technology as constant returns to scale. For more details on the IDE–GSM, see Kumagai et al (2013).

[1] IDE–GSM has been developed with financial and manual contribution by Economic Research Institute for ASEAN and East Asia (ERIA) through a joint research.



Source: Survey Team

Figure 5.42 Basic Structure of the IDE-GSM Simulation Model

The model covers ASEAN 10 countries, Bangladesh, Bhutan, China, Hong Kong, India, Japan, Korea, Macao, Nepal, Sri Lanka, and Taiwan in South and East Asia. The model also covers other areas of the world, referred as ‘Rest of the World’. The system uses country data for those 65 other economies, while 21 economies are divided into 1,818 regions for South and East Asia, and utilizes country data for the rest of the world. In total, the model has 1,883 regions. Primarily based on official statistics, the model utilizes the data of gross regional domestic product (GRDP) for the agriculture sector, five manufacturing sectors, and the services sector for 2010. The five manufacturing sectors are automotive (Auto), electronics and electric appliances (E&E), garment and textile (Textile), food processing (FoodProc), and other manufacturing (OtherMfg). Population and area of arable land for each region are compiled from multiple statistical sources. The administrative unit adopted in the simulation is one level below the national level for Bhutan, Cambodia, Japan, Korea, Lao PDR, Malaysia, Nepal, the Philippines, Sri Lanka, Taiwan, Thailand, and Viet Nam. For Bangladesh, China, India, Indonesia, and Myanmar, the administrative unit is two levels below the national level. Brunei Darussalam, Hong Kong, Macao, and Singapore are each treated as one unit. The economies in the rest of the world are each included as one unit.

The transport costs in IDE–GSM comprise direct costs such as freight rates and tariffs, and indirect costs such as time costs, social and cultural barriers, and non-tariff barriers (NTBs). The freight rates are a function of distance traveled, travel speed per hour, physical travel cost per kilometer, and holding cost for domestic/international transshipment at border crossings, stations, ports, or airports. Time costs depend on travel distance, travel speed per hour, time cost per hour, holding time for domestic/international transshipment at border crossings, stations, ports, or airports. NTBs comprise some measures distorting international trade and lack of transparency. The transparency issues may include uncertainty in customs operation, red-tape and corruptions. Moreover, NTBs include fixed costs of trade for firms. SMEs are suffering from studying laws and regulations, catching up with changes in those regulations and preparing documents. When SMEs try to export their products to another country, they must study laws, regulations and procedures of the destination country not only on trade, but also on standards, health and safety, intellectual property right and environments. One may think that large portions of invisible trade barriers stem from restrictive and cumbersome measures and operations by the customs and governments, while lack of firms' capacity also plays a lot. In this analysis, the sum of tariffs and NTBs (TNTBs) is estimated by employing the log odds ratio approach initiated by Head and Mayer (2000). Namely, the estimation derives industry-level border barriers for each country. The explanatory variables include the above-calculated sum of physical transport and time costs and the ratio of a country's per capita GDP to its domestic per capita GDP. The ratio of geographical distance with a country to domestic distance is defined as two-third times the radius of the domestic country concerned. To control for the effect of cultural disparity on differences in imports/consumption, border-sharing dummy is introduced, i.e., a linguistic commonality dummy and a colonial relationship dummy. With this methodology, industry-level TNTB for 69 countries is estimated. TNTB for the remaining sampled countries is obtained by prorating their TNTB according to each country's per capita GDP. Then, NTBs are obtained by subtracting tariff rates from TNTB.The simulation model takes the differences of GDPs/regional GDPs (GRDPs) between the baseline scenario and an alternative scenario to calculate the economic impacts. The baseline scenario contains minimal additional infrastructure development by 2015. The alternative scenarios contain specific policy measures. Two scenarios are conducted in addition to the baseline scenario. The scenario "Port" is that the transaction time and costs at all ports in India, Bangladesh and Sri Lanka are halved in 2015. The scenario "PortNTB" is that the NTBs of India, Bangladesh, Sri Lanka, Bhutan and Nepal are lowered by 2% every year from 2015 to 2024 and the transaction time and costs at all ports in India, Bangladesh and Sri Lanka are reduced in 2015.

How the GDPs/GRDPs may change in the model when transaction time at a port is reduced? It is not straightforward as the methodology simulates complex interaction among e.g. the difference in travel time, operating costs, or safety value by the unit cost. First, reduced transaction time can lower the time costs and thus the transport costs. Directly, cheaper transport costs make it possible for the firms in the regions having the port or near the port to sell the products or services at lower price. The consumers in the regions will also benefit. Consumers will become able to buy goods and services at a lower price. At the same time, firms will be able to purchase parts and components at lower prices and thus produce their goods at a lower price. This may even increase the sales and revenues of the firms by allowing more sales in the market. Increased sales and revenues can lead to higher profits, higher employment, and higher salaries for employees. Together with lower prices for the products, workers with higher salary can demand more goods and services. This will attract more firms and households from other regions, and some of the firms and households will move into the regions. The inflow of the firms and households will eventually increase the sales and profits of the firms and the salaries and consumption of the workers more, where it will generate a ripple effect to attract more firms and households. In the end, those direct and indirect effects may raise the regional GDP. On the other hand, there are benefits and drawbacks for the other regions far from the improved infrastructure. First, the firms in remote areas may utilize the better infrastructure and sell more of the products and services even though it is far from the firms and potential sales increase might be small. Firms and consumers in remote regions may also benefit from purchasing products and services at a lower price from the improved regions. However, some firms and households may leave the remote regions, and some firms may face fierce price competition with the firms in the improved regions, which may lead to losing customers. Therefore it may lead to a negative impact on the region.

The economic impacts of "Port" scenario and "PortNTB" scenario are summarized in Table

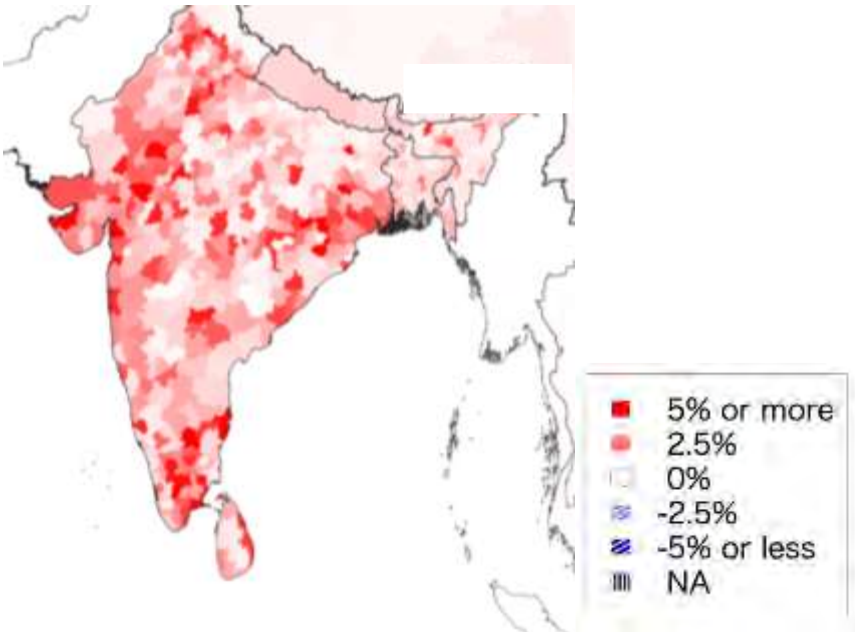
5.18. It benefits relatively smaller areas and overall impacts on the country will be small. If port facilitation and NTB reduction are combined through streamlining trade in goods, enhancing capacity of firms to complete trading procedures and finding trade partners, and reforming domestic regulations to raise efficiency and transparency in trading for both foreign and domestic investors, the economic impacts will be enlarged significantly.

Table 5.18 Economic Impacts of Port Facilitation and NTB Reduction (Compared with the Baseline Scenario, 2030)

Country	Port		PortNTB	
	Billion USD*	%	Billion USD*	%
Bangladesh	0.06	0.02%	2.714	0.99%
India	9.48	0.12%	236.340	2.91%
Sri Lanka	0.13	0.08%	3.307	2.04%

* In real 2010 dollars

Source: IDE–GSM simulation result

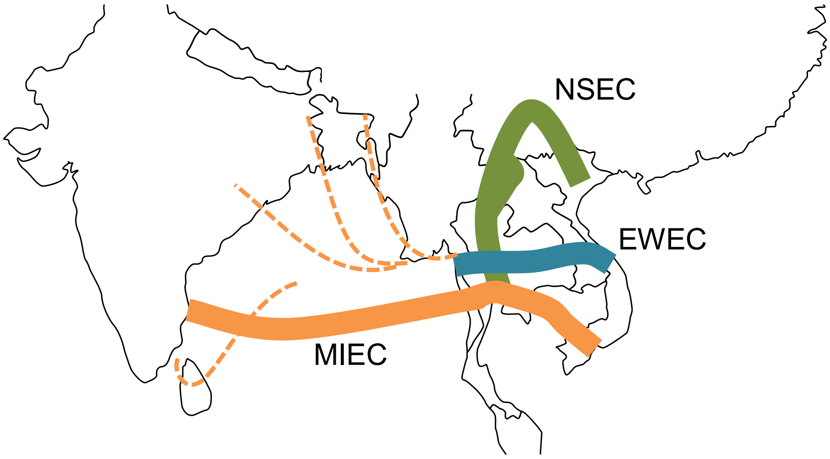


Source: IDE–GSM simulation result.

Note: Not available for Jammu and Kashimir, and Pakistan due to the data availability.

Figure 5.43 Economic Impacts of Port Facilitation and NTB Reduction (Compared with the Baseline Scenario, 2030)

One of the applications of IDE–GSM is an impact analysis of the Mekong–India Economic Corridor (MIEC), an extension of the Asian Development Bank's Greater Mekong Subregion (GMS) Southern Economic Corridor toward South Asia by connecting with sea routes via the proposed Dawei deep-sea port. The simulation analysis reveals that development of the economic corridor had a larger impact on India, Sri Lanka and the Mekong region than the other GMS economic corridors, i.e. the East–West Economic Corridor (EWEC) and the North–South Economic Corridor (NSEC) (Figure 5.44, ERIA 2015). While the MIEC is promising, two missing links still remain in the MIEC: (1) the Dawei deep-sea port and link to South Asia, and (2) a land link between Dawei, Myanmar, and Kanchanaburi (Thailand).



Source: Survey Team.

Figure 5.44 MIEC, EWEC and NSEC

6. Major Ports in the Region

6.1 Bangladesh

6.1.1 Chittagong

(1) Geographic Conditions

Chittagong port is situated in the estuary of the river Karnaphuli, on the right bank of the river, at a distance of approximately 9 nautical miles from the shore line of the Bay of Bengal.

Source: Survey Team

Figure 6.1 Chittagong Port

Source: Survey Team

Figure 6.2 Layout Plan of Chittagong Port

(2) Facilities

Chittagong port has the following facilities to handle containers and other cargo.

Table 6.1 Port Facilities and Cargo Handling Equipment in Chittagong Port

	Facilities	Specification	Quantity
1	Jetty & Moorings for Ocean-Going		
1.1	Berths owned &Operated by CPA		
	General cargo berth	Depth along the berth; 9.5 m HWL	6 berths
	Container Berth	Depth along the berth; 9.5 m HWL	11 berths
1.2	Specialized berths for Bulk Handling	Oil jetty, Cement, clinker jetty, Ammonia jetty, Ureo jetty	9 berths
1.3	Repair berth	Dry dock jetties	2 berths
1.4	Mooring Berths	River moorings	5 berths
1.5	Inland Coastal &Vessels	Jetty berths for POL, grain,	2 berths
	Pontoon berths	For POL, Cement	4 berths
	Single Point Moorings		14 points mooring
2	Container Handling Facilities		
2.1	Holding capacity	GCB+CCT+NCT+NCY	32,017 TEU
	Yards		20 Nos
	Container Freight Station	GCB (5 Nos)	45,064 m^2
	Container Storage Yards	At CCT	150,000 m^2
		At NCT	220,000 m^2
		At NCY	62,532 m^2
	Reefer Points	415 volts	900 points
	Water reservoir		140,000 Gallons
2.2	Container Handling equipment		
	Quay Gantry Crane	40 ton capacity	4 units
	Mobile harbor cranes	84 ton capacity	2 units
	Rubber tyre gantry crane	40 ton	15 units
	Straddle carriers (04 high)	40 ton	36 units
	Reach stacker (RS)	45 ton	12 units
	Forklift	25 to 42 ton	6 units
		7–16 ton	19 units
	Terminal tractor/trailer	50 ton tractor	43 units
		50 ton trailer	55 units

Source: CPA

In Chittagong Port there is no separate domestic terminal. Same terminal as used for international trade berth has been used for Inland seagoing ships and thus unloading/loading can be done.

(3) Cargo Traffic

The port could handle general cargo, bulk cargo and containers (43.37 million ton) in 2013 consisting of 38.31 million ton of import cargo and 5.06 million ton of export cargo. CPA handled the containers 1.73 Mil TEU in 2014 and received 2,410 ship calls; Thus CPA has estimated that the forecast container throughput will be 2.74 Mil TEU in 2019.

Table 6.2 Container Traffic from 2008–2014 through Chittagong and Dhaka ICD

	Chittagong Port				Dhaka Inland Container Depot			
Year	Import (TEU)	Export (TEU)	Total (TEU)		Import (TEU)	Export (TEU)	Total (TEU)	No of Ship call
2008–2009	557,891	550,165	1,108,056		36,427	37,009	73,436	2,088
2009–2010	612,883	599,768	1,212,652		32,781	33,086	65,867	2,203
2010–2011	729,593	739,221	1,468,914		32,238	32,949	65,187	2,308
2011–2012	675,796	667,612	1,343,408		33,123	33,582	66,705	2.079
2012–2013	743,547	725,166	1,468,713		31,053	31,585	62,638	2,136

Source: CPA

(4) Connectivity

An Inland container Depot (ICD) at Dhaka has been in operation since 1987 with an annual handling capacity of 90,000 TEU. At present two Container trains run daily each way between Chittagong port and Dhaka ICD.

Table 6.3 Facilities of Railway Transport from Chittagong Port

Facilities	Capacity
Container handling capacity	4,067 TEU
Yard Area	136,954 m^2
Container Freight Station (CFS)	8,182 m^2
Equipment	Reach stacker;7 unit, Forklift: 10 units, tractor trailers: 8 units
Railway wagons for container transportation	350 units
Railway terminal (Length of tracks)	1,097 m

Source: CPA

The existing road from Chittagong to Dhaka is being widened to 4 lanes. The EPZ (Export Process Zone) has been developed adjacent to the port Chittagong Export Processing Zone, Karnaphuli Export Process Zone and Korean Export Processing Zone, which are fully occupied by foreign industries.

(5) Development Plan

The CPA plans the following on-going and future – as medium term projects to enhance the container handling capacity. The Chittagong Port Master Plan site selection survey, to develop alternative terminals in Chittagong port for expanding container handling capacity, was prepared and submitted in September 2015. The details of development projects are described in the Appendix3 Detailed Information on Major Ports in the Region.A3-1.

On-going Projects

- Feasibility study & Design for Construction of Karnaphuli Container Terminal (KCIT)
- Strategic Master Plan for Chittagong Port by ADB's TA

Up-Coming Project as Short Term Plans

- Construction of Laldia Bulk terminal under Public Private Partnership (PPP)
- Procurement of 2 units of Rail Mounted quay cranes for Pangaon ICT
- Construction of Karnafully Container Terminal (KCT) at jetty 10, 11, 12 & 13

Future Projects as Medium Term Plans

- Procurement of Trailing Suction Hopper Dredger
- Construction of Bay Terminal and Extension of Port services
  - The survey team conducted site reconnaissance of the planned site and found this site is considered technically feasible.
- Construction of Patenga Container Terminal
  - The proposed project site is located close to the airport which could lead to height restrictions for container cranes, the project is not considered recommendable.

By upgrading the existing facilities, in the short and medium term development projects, the CPA estimates that the handling capacity will be increased to 2.70 to 3.00 Mil TEU. The demands will reach such volume in 2025, by that time a new port would be developed to support Chittagong Port and Mongla Port.

Request for JICA Assistants

CPA requested for training of development of human resources in the field of introducing privatized container terminal operation and selection procedures of private investors for terminal development and operation.

6.1.2 Mongla

(1) Geographic Conditions

Mongla Port, the second gateway of Bangladesh, is the most environmentally friendly seaport in the country. It is situated on the south western part of the country, at the confluence of Pussur River and Mongla Nulla, approximately 71 nautical miles upstream from the Bay of Bengal. The port is well protected by one of the largest mangrove forests on earth, known as the Sundarbans, which was awarded with "World Heritage" status in 1997 by the UNESCO.

(2) Facilities

The general cargo berths (180 m length per berth, depth −7.5 m) were constructed in 1980 to handle general cargo, containers and imports such as automobiles. The existing berth has two movable cranes, but no container handling equipment.

Table 6.4 Port Facilities and Access Channel Depth and Length by Port

<table>
<tr><td>Container Berth</td><td colspan="5">At present, Mongla Port has no container berth. Containers are being handled in the existing general cargo Jetty.</td></tr>
<tr><td>Dry Bulk Berth</td><td colspan="5">Mongla Port has 5 nos. Jetty to handle bulk and break bulk cargos but about more than 80% bulk cargo are being handled in anchorage.</td></tr>
<tr><td rowspan="3">General Cargo Berth</td><td colspan="5">Length: 182.92 m each (5 no. Jetty)</td></tr>
<tr><td>2010</td><td>2011</td><td>2012</td><td>2013</td><td>2014</td></tr>
<tr><td>Depth:
6.50 m</td><td>Depth:
6.50 m</td><td>Depth:
6.50 m</td><td>Depth: 6.50 m
(Jetty No. 5–8)
Depth: 7.5 m
(Jetty No. 9)</td><td>Depth: 7.5 m
(all 5 Jetty)</td></tr>
<tr><td>Container Yards</td><td colspan="5">35,752 m^2 (Total-3nos. Container Yard), 9,880 m^2 are under construction</td></tr>
<tr><td>CFS</td><td colspan="5">At present, Mongla Port has no CFS facilities</td></tr>
<tr><td>Terminal Operator</td><td colspan="5">Cargo handling operation by Mongla Port Authority</td></tr>
<tr><td></td><td>Length (m)</td><td>Width (m)</td><td>Draft (m)</td><td></td><td></td></tr>
<tr><td>Access Channel</td><td>131,100</td><td>1,000</td><td>7.5</td><td></td><td></td></tr>
<tr><td>Maintenance Dredging</td><td colspan="5">Regular dredging volume has been carried out. Volume was 2.79 mil cum in 2000–2004; 0.107 mil cum in 2007–2008; 2.50 mil cum in 2013–2014; 0.906 mil in 2014–2015.</td></tr>
</table>

Source: MPA

(3) Cargo Traffic

Cargo handling volume and ship calls at Mongla Port are summarized in the table below.

Table 6.5 Cargo Handling Volume and Ships Calls from 2009–2015

	2010	2011	2012	2013	2014
Container (TEUS)	19,604	31,204	34,451	44,773	43,724
Dry Bulk Cargo (ton)	1,055,269	1,274,039	1,699,261	2,095,018	2,537,393
General Cargo (ton)	1,010,887	1,663,689	1,028,694	1,219,269	1,544,198
Cars (number)	7,331	10,378	7,085	5,344	9,337
Number of Ship calls	156	272	234	282	345

Source: MPA

(4) Connectivity

The port facilities and hinterland connectivity have not been developed. This is needed to improve the port capacity.

(5) Development Plan

The government MOS issued the following development policy to support Mongla port:

- Improvement of connectivity from Dhaka by development of highway, railway link from Mongla to Khulna,
- Mongla to Dhaka via Padma Bridge is developed, and
- Airport development at Khanjahan Ali about 21 km from Mongla.

Table 6.6 List of Projects under the Process of Preparation

	Name of Project	Estimate budget	Implementing Period	Main Items of the Project
i)	Construction of Container Terminal	7440.00 Mil TK	2015–2016 to 2017–2018	1 no. Container terminal with modern equipment will be established.
ii)	Construction of Container Terminal	3190.00	2015–2016 to 2017–2018	1 no. Container Delivery Yard will be established.
iii)	Construction of Multi-storied Car Parking Yard	7280.00	2015–2016 to 2017–2018	1 no. Multi storied car parking yard with a minimum 15,000 car parking capacity will be constructed.
iv)	Installation of VTMIS		2015–2016 to 2017–2018	To accelerate the activities of Mongla Port VTMIS will be installed.
v)	Procurement of Tug for Mongla Port		2015–2016 to 2017–2018	1 no. Tug will be procured for Mongla Port
vi)	Procurement of high powered 1 no. speed boat for Mongla Port	95.00	2015–2016 to 2016–2017	1 no. high powered speed boat will be procured for Mongla Port
vii)	Expansion of Existing Main Road & Bypass Road up to Four Lane and construction of gate at Digraj and Port Restricted Area.	147.00	2015–2016 to 2016–2017	Existing Main Road & Bypass Road up to Four Lane will be expanded and attractive gate will be constructed

Source: MPA

Request for JICA Assistants

MPA intends to request for JICA to assist in development of a new container terminal with two berths (180 m each × 2 berths at depth of 8.5 m) on the extension of the existing cargo berths. Container stock yard areas are targeting a container handling capacity of 400,000 TEU with 2 container berths and 5 existing cargo berths. The present water depth along the cargo berth is 7.5 m. MPA proposes the depth along the new container berth is deepened to 8.5 m to receive the designed container ships.

6.1.3 Matarbari

(1) Geographic Conditions

The foundations of the planned sites are salt farm ground with soft subsoil layer. This requires large-scale soil improvement.

(2) Facilities

The Port will be developed as deep sea with the depth of the approach channel −15.0 to −18.0 m. The port plans to handle containers and general cargo with 30 berths of containers and general cargo toward 2041. Land use for the development plan has been prepared tentatively by order and size of commodities as follows;

- For coal terminal: 150 ha for handling 30 million ton
- For Cement factory: 10 ha
- For Fertilizer Factory: 50 ha
- For Ash Pond: 680 ha
- For Steel Mill: 100 ha
- For Oil Refinery: 400 ha
- For LNG: 70 ha
- For CTT: 150 ha.

This is the information used for the allocation plan; it will be changed following a further study.

(3) Cargo Traffic

Demands of containers beyond the capacity assumed of the existing ports, such as Chittagong port and Mongla port, are estimated at 5.5 mil TEU in 2041 and general cargoes 9.8 million ton in 2041. The industrial port plans to handle coal, cement, clinker, fertilizer, Crude oil, petroleum, petroleum products, steel products, and industry entrants such as LNG.

Bangladesh maritime needs the deep sea port to be able to accept large container ships of more than 13,000 TEU, depth −16 m. The role of this port will function to handle demands of containers and general cargo exceeding the capacity of the existing ports including their expanded capacity after 2030.

(4) Connectivity

The new deep sea port is planned to be connected to railway lanes and roadways to transport containers and general cargo to the hinterlands.

(5) Development Plan

The project for development of container terminal and cargo berth, as part of the integrated Matabari deep sea port, is planned to be developed by phases. The phase 1 project is planned to open 3 berths of containers and 1 berth of cargo berth in 2026. Ultimately planned facilities will be developed by Phase 3 in 2041. The development plans are prepared to meet the target traffic demands after 2041.

Table 6.7 Development Plan of Deep Sea Port

Commodities	Phase 1(by 2026)		Phase 2 (by 2031)		Phase 3 (by 2041)		Planned land area (ha)	Planned ship size
	Demands	No of Berths	Demands	No of Berths	Demands	No of Berths		
Coal (Mil ton)					30		150	
CTT (Million ton)	9.1	5	14	8	40.8	16	150	80000DWT
Ash Pond (mil ton)							600	
Fertilizer (mil ton)	2.3	1	3.3	0	5.6	0	50	
Cement Factory (mil ton)	14	1	25	0	42	0	10	
Steel Mill Products (mil ton)	0.4	1	0.5	0	0.6	0	100	
Oil refinary products	2.2	6	4.4	0	0.1	0	400	
LNG (mmcfd)	0	1	1,000	1	2,000	0	72	Q-Flex
Containers (mil TEU)	0.76	3	2.01	6	5.49	15	150	20000-40000DWT
General Cargo (mil ton)	0.47	1	2.8	3	9.78	8		15000-30000DWT

Source: Survey team summarized from interview with the Survey team of “Data Collection Survey on Integrated Development for Southern Chittagong Region”

The Ministry of Power, Energy and Mineral Resources (MOPEMR) is involved in the development of a bulk terminal accepting 80,000 DWT draft −16.0 m of bulk carrier for the Industrial port for power plants development, which is open to private investors. MOS is not involved in the development plan, but will check and scrutinize the details of the application for construction permits that are submitted to the MOPEMR.

According to the progress report of the “Data Collection Survey on Integrated Development for Southern Chittagong Region”, there is a necessity for a deep sea port in Bangladesh. This is not only for the demands of container traffic, but also of potential bulk cargoes. Further, it is recommended to conduct a feasibility study of deep sea port development project.

The following message was stated by one of delegate representatives from Bangladesh in the seminar in November 14, 2015.

Government of Bangladesh has attached highest importance for the development of Deep Sea Port in Bangladesh (southern Chittagong area – Matarbazin) as well as for attracting investments to increase the berthing capacity of higher drafts.

6.1.4 Payra

(1) Geographic Conditions

This port is planned in the Meghna Estuary which enters the Rabnabad Channel in the Kalapara Upazila, Patuakhali District, Bavisal Division. It is about 154 nautical miles away from the Chittagong Port and 125 nautical miles away from the Mongla Port. The total port area is 504 m^2. Sedimentary conditions around the planned port area are observed as a mixed silt clay profile.

The anchorage area is selected at the following location: Area 30 nautical miles × 7 nautical miles, Depth −10 to −20 m, and distance from the fairway buoy 30 nautical miles.

(2) Facilities

The jetty alignment is selected at the depth of −12 m to 25 m, which can accommodate deep draught. Bigger size vessels can also be berthed.

The Payra port plan aims to develop the following terminals:

- Container terminal of 2 km berth length at −14.0 m draft,
- Dry bulk terminal for coal fired power plants,
- Multipurpose terminal with 1 km length of berth,
- Liquid bulk cargo,
- LNG terminal,
- Ferry terminal for inland waterway,
- Ship yard and repair facilities,
- Economic zone,
- Airport, and
- Railway connection between Payra and Dhaka.

The practical development plan covering all planned facilities is under preparation.

(3) Cargo Traffic

Forecast demand for the planned port is as shown in the table below.

Table 6.8 Traffic Demands Forecast (1,000 TEU)

Year	Bangladesh	Chittagong	Mongla	Payra
2015	1,940	1,900	33	0
2020	2,930	2,790	40	100
2030	3,785	2,870	400	515

Source: Payra Port Authority

(4) Connectivity

Current Connectivity is presented below:

- Existing road – 2 lanes, to be widened to 4 lanes in the future.
- Planned construction of the Padma Bridge, which will reduce the distance to Dhaka.
- Ferry service available to cross Payra River

By development of the Padma Bridge for crossing Padma River in South-Western part of the country, the transportation time between Dhaka and Mongla will reduce more than 3–4 hours, especially during the traffic congestion. At present small air craft is operated for transporting passengers, the transport time to Payra from Dhaka will be reduced by 4–5 hours. The development of this bridge will contribute to improve logistic of transporting large volume of cargo.

The distances from Payra to main destinations are as follows:

- Chittagong to Dhaka: 250 km.
- Mongla to Dhaka: 218 km
- Payra to Dhaka: 242 km.

Development of connecting points from the planned port site; too North, 4 lanes Reinforced concrete road for 6 km, to connecting bridge for 800 m; and to South, 4 lanes road in 12 km away, Marine drive available in approximate 4 km away.

River communication has minimum depth of 0.5 m. There is no bay crossing and no possibility to wait for high tide. However, there are navigational markings along the river and ships are able sail during the day and night. The water route distance from Chittagong to Dhaka is 232 km. Furthermore, from Mongla to Dhaka it is 354 km and from Payra to Dhaka it is 267 km.

(5) Development Plan

HR Wallingford, a UK consulting firm, currently provides the techno-economic study for an approach-channel design, river bank protection, capital and maintenance dredging, breakwater, potential cargo handling terminals of general cargo, bulk cargo, RORO traffic, containers etc. and checking economic viability and preparation of a conceptual master plan.

Below is the Planned Implementation Schedule;

- Stage 1: Commence limited implementation of port operation by December 2015; lighter vessels to bring merchant ships at outer anchorage.
- Stage 2: Complete major components of port infrastructure with 2.5 km terminal facilities; including river bank protection, capital dredging and breakwater by 2018.
- Stage 3: Complete remaining port facilities by 2023.

(6) Comparison of Payra and Matarbari/Moheshkhali New Port

The table below summarizes key characteristics of the two ports including natural conditions, geography, dredging and project cost.

Item\Port				Payra Port	Matarbari/Moheshkhali New Port				
Natutal Conditions	Littoral Drift/Siltation			Largly affected especially to outer channel	Modelately affected				
	Subsoil			Soft clay layer up to 20-30m from GL	More or less same as Payra port				
Geography	Access	Waterway		**240 km** (dredging required to be navigable)	**320 km**				
		Roadway	Highway	**250 km** from Payra Port to Dhaka **95km out of 250km** to be upgraded to 4lanes	**350 km** from M/M New Port to Dhaka **All 350 km** to be upgraded to 4lanes				
			Bridge	**Padma bridge** under construction to 4lanes	**Kanchpur 2nd bridge** under rehabilitation to 8 lanes **Meghna 2nd bridge** under rehabilitation to 6 lanes **Gumti 2nd bridge** under rehabilitation to 6 lanes				
			Expressway	**N/A**	**250 km** between Dhaka-Chtg. under study in PPP **100 km** between Chtg.-Cox Bazar proposed				
		Railway		**N/A** (under planning)	**320 km** between Dhaka-Chtg.				
	Hinterland		Topograhy & Land Use	Flat, floodplain & swamp (delta) Flat, rice field (near Dhaka)	Flat, rice field along land transport infrustrcuture				
			Expadability	**Less anticipated** due to land nature	**Highly anticipated** along land transport infrastructure				
Dedging	Alternative Plan			Recommended plan	Option 1	Option 2	Option 3	Option 4	Option 5
	Capital Dredging		(Mil. m3)	**400**	198	172	206	**209**	197
			(Mil.USD)	**10,000**	3,960	3,440	4,120	**4,180**	3,940
	Maintenance Dredging		(Mil. m3/yr)	**100**	5.3	5.3	5.2	**5.3**	5.3
			(Mil.USD/yr)	**2,500**	106	106	104	**106**	106
Project Cost	Initial Cost		(Bil.USD)	N/A	8.9	11	12.6	12.2	11.6
	Total Cost		(Bil.USD)	N/A	23.4	25.4	24.8	24.3	23.6

The natural conditions of the both port sites, Payra and Matarbari/Moheshkhali, are similar, both have subsoils consisting of soft clayey materials. The approach channel to Payra will be more greatly impacted by littoral drift, as the channel is about 80km long and is to be constructed by excavating the shallow seabed less than -5m depth along a considerable length.

From a geographic perspective, the distance from Payra to Dhaka, the major destination for import cargo, is 250km, while the distance from Matarbari to Dhaka is 350km. The road between Matarbari and Dhaka is currently being upgraded, while an expressway between

Chittagong and Dhaka is under investigation. Upgrading of 95km of the road between Payra and Dhaka is still to be studied. The railway between Chittagong and Dhaka currently exists and it is being extended to Cox's Bazaar (near Matarbari). At the same time, no railway link is planned from Payra to Dhaka. With respect to land transport, Matarbari Port is considered to be superior due to the existing or planned upgrade of the railway links to Chittagong and the planned upgrade of the road from Chittagong to Matarbari.

As an 80km approach channel must be built in shallow seas, capital and annual maintenance dredging for Payra Port are estimated to account for 400 million m^3 and 100 million m^3, respectively. When compared with dredging for Matarbari Port, the volume of capital dredging for Payra Port would be double and maintenance dredging would be nearly 20 times. It should be noted that the cost of maintenance dredging of Payra Port is estimated to be about US$2.5 billion per year, while that for Matarbari is estimated at about US$100.0 million per year. Therefore from an economic perspective, Matarbari Port is considered to be more advantageous than Payra Port.

If Payra Port is built at a scale without too much financial burden, i.e. with limited allowable draft, its market will be different from that of Matarbari Port as it can attract only vessels of limited draft whereas the Matarbari deep sea port with its deep draft would attract vessels of large size from afar.

6.1.5 Inland Waterway River Ports

(1) Geographic Conditions

Modal option for regional connectivity will go in favor of IWT. Since the capacity of road and railway have limitation, while IWT has got immense potentials and underutilized. Further IWT would be cost and time effective and environmentally friendly as well.

Bangladesh is a riverine country. The rivers of Bangladesh are linked with the regional countries like India, Nepal, Bhutan and China. So the geographical location of Bangladesh for Inland Waterways Transportation has got a unique strategic advantage.

The distance of the inland waterway was 24,000 km in 1974 (reduced to 6,000 km during monsoon season and only 3,800 km during dry season), however this distance was reduced to 4,800 km in 1989, even during the dry season. The distance today is likely to be shorter than 3,800 km. Conversely, the traffic of passengers, cargo transport and the number of inland river ports has increased; however the ship size has not got larger. BIWTA developed 24 river ports in Bangladesh to provide passenger transport services and load/unload cargo transport services.

(2) Facilities

BITWA is responsible for maintaining the depth of the waterway at a classified level. The inland waterways are classified in four hierarchical classes as below:

Table 6.9 Hierarchical Classes of BIWTA

Class	Indicated Depth (m)	Length (km)	Share (%)	Classification Criteria
I	3.6–3.9	683	11	These are major transport corridors where limited depth of 3.6 m is required to be maintained around the year
II	2.1–2.4	1,000	17	These links are major inland ports or places of economic importance to Class-I routes
III	1.5–1.8	1,885	32	Being seasonal in nature, it is not feasible to maintain higher limited depth throughout the year.
IV	<1.5	2,400	40	These are seasonal routes where maintenance of limited depth of 1.5 m or more in dry season is not feasible
Total		5,968	100	

Source: Bangladesh Inland waterway Transport Master Plan 1989.

Terminal facilities of inland ports at Ashuganj, Bhairab, and Chandpur are as summarized in the tables below.

Table 6.10
Terminal Facilities of Ashuganj and Bhairab Inland Ports, Existing and Proposed

	Existing Facilities	Ashuganj Cargo Terminal	Bhairab Bazar Terminal
1	Existing port area, ha	4.50 km	4.50 km
2	Details of existing facilities related to passenger terminals such as office, passenger facilities, Jetties, Pontoon, Gangway etc.	a) Office = 250.00 m^2	a) Office = 250.00 m^2
		b) Rcc Jetty =1 no = 425.00 m^2	b) Rcc Jetty =1 no = 425.00 m^2
		c) Steel Jetty = 2×45 m = 90.00 m^2	c) Steel Jetty = 2×45 m = 90.00 m^2
		d) Pontoon = 2 nos	d) Pontoon = 2 nos
		e) Gangway = 1no = 93.00 m^2	e) Gangway = 1no = 93.00 m^2
3	Details of existing cargo facilities such as warehouse area, parking area, access road.	a) warehouse area = 1 no =225 m^2	a)warehouse area = -
		b) parking area = 1000.00 m^2	b) parking area = -
		c) access road = 3990.00 m^2	c) access road = -
	Proposed Facilities		
1	Proposed area, ha	2.00 kilometer Both way	2.00 Kilometer Both way
2	Details of existing facilities relater to passenger terminals such as office, passenger facilities, Jetties, Pontoon, Gangway etc.	a) Office = N/A	a) Office = N/A
		b) Rcc Jetty =1 no = 425.00 m^2	b) Rcc Jetty =1 no = 425.00 m^2
		c) Steel Jetty = 2×45 m = 90.00 m^2	c) Steel Jetty = 2×45 m = 90.00 m^2
		d) Pontoon = 2 nos	d) Pontoon = 2 nos
		e) Gangway = 1no = 93.00 m^2	e) Gangway = 1 no =225 m^2
		f) Bank Protection	f) Bank Protection
3	Details of existing cargo facilities such as warehouse area, parking area, access road	a) warehouse area = 1 no =225 m^2	a)warehouse area = 1 no = 400 m^2
		b) parking area = N/A	b) parking area = 2000.00 m^2
		c) access road = 1500.00 m^2	c) access road = 20000.00 m^2

Source: BIWTC

Table 6.11 Passenger and Cargo Terminal at Chandpur Inland Port

	Existing Facilities	
1	Existing port area, ha	1 (one) Hectare
2	Details of existing facilities related to passenger terminals such as office, passenger facilities, jetties, pontoons, gangways, etc.	Walk way: 167.29 m² Ticket Counter: 37.00 m² Steel Jetty: 2 nos, 118.96 m² Steel Spud: 6 nos Pontoon: 4 nos Police barrack: 185.87 m² Passenger Waiting Shed: 74.00 m² Parking Yard: 8010.00 m²
	Proposed Facilities	**-**
1	Proposed area, ha	Appx. **0.57 Hectare**
2	Details of Proposed facilities related to passenger terminals such as office, passenger facilities, jetties, pontoons, gangways, etc.	Land development: 21,669.00 m³ 3stored terminal Building: 4061.00 m² Bank protection: 253.00 m Boundary wall: 231.00 m Steel gangway: (Length 100'): 3.00 nos Spud and spud ring: 22 nos Shaded Walkway: 270.00 m² Terminal pontoon (100' x 30' x 7'-0"): 4 nos Deeptubell with water supply system & sewerage facilities: L.S Electrification: L.S Construction of steel jetty at port area: 267.65 m² Fire Fighting System: L.S Parking yard : 7014 m² Internal / External road: 3326.00 m²

Source: BIWTA

It is requested from BIWTA to find out the causes of deterioration and technology and measures to restore navigability.

It is observed that many industrial factories inland waterway transport facilities had been developed along the coast of the main waterway by land reclamation and berthing facilities. It is considered that these developed facilities have caused the impacts of changes of water flow through the channel/water way, subsequently the banks of water way were deteriorated gradually. The reinforcement of the soft soil condition of the bank along the water way shall be carried out by installing protection material or driving cemented material to make soft soil harder of deteriorated area.

(3) Cargo Traffic

The table below summarizes passenger and cargo traffic of inland and coastal services in Bangladesh.

Table 6.12 Traffic Volume of Inland and Coastal Service

Year	Inland			Coastal			Total	
	Passenger	Cargo (M. ton)		Passenger	Cargo (M. ton)		Passenger	Cargo
2010–11	430,185	9.0		570,082	7.0		1,000,267	16.0
2011–12	463,956	5.0		366,844	2.0		830,800	7.0
2012–13	465,637	5.0		279,854	3.0		745,491	8.0
2013–14	329,086	6.0		265,751	3.0		594,837	9.0
2014–15	339,831	6.0		218,406	2.0		558,237	8.0

Source: BIWTC

The number of vehicles and passengers carried by BIWTC ferry services in different routes from 2010–11 to 2014–15

Table 6.13 Traffic Volume of Vehicle and Passengers by Main Route

Routes	Paturia-Daulatdia		Mawa-Charjanajat		Chandpur-Shariatpur		Laharhat-Veduria		Bhola-Laxmipur		Total	
Commodity	Vehicle	Passenger	Vehicle	Passenger	Vehicle	Passenger	Vehicle	Passenger	Vehicle	Passenger	Vehicle	Passenger
Year												
2010-2011	1,245,611	13,433,738	470,946	4,325,109	41,883	141,994	40,456		30,920		1,829,816	17,900,841
2011-2012	1,244,843	12,725,266	578,060	4,169,965	48,957	196,881	44,126	1,758	37,694		1,953,680	17,093,870
2012-2013	1,264,099	12,669,324	609,141	3,797,632	51,847	274,797	46,348	5,537	37,949		2,009,384	16,747,290
2013-2014	1,227,464	12,001,478	676,029	3,937,735	48,602	210,769	52,858	8,631	38,547	10	2,043,500	16,158,623
2014-2015	1,404,169	14,024,905	726,526	4,139,409	62,518	284,589	66,388	16,551	47,665	5	2,307,642	18,465,459

Source: BIWTC

(4) Connectivity

Connectivity from the river port to the city by road and railway is poor; it is therefore necessary to develop or expand the existing facilities. BIWTA plans to develop the roads and commuter public service facilities around the main river port to improve connectivity.

(5) Development Plan

<u>Development of prioritized river ports</u>

BIWTA nominated 24 river port developments this year (2015) with the status of ‘important’ and selected further 10 ‘top-priority’ developments. BIWTA plan to develop these in the 7th edition of the five-year plan. In 2016 a project engineering study will be implemented. The prioritized developments are listed below:

Table 6.14 Prioritized River Port Development

For Service	Name of River ports concerned
For Passenger transport	1) Patuakhali River Port (improve by extension)
For Cargo & Passenger	2) Bhola River Port, (Improve existing) 3) Chandpur River Port, (Improve existing) 4) Narayanganj river port (Improve existing)
For Cargo transport	5) Meghna Ghat River Port (New near Dhaka river port), 6) Ghorashal River Port (New Lakya river), 7) Chhatak River Port (North Suna river) 8) Ashuganj-Bhairab river port (New terminal adjacent to planned ICT by India) 9) Nowapara river port (near Khulna inland river port) 10) Baghabari river port (New at Baral River)

Source: BIWTA

Target facilities to be developed in prioritized river ports

- Introducing cargo handling equipment for loading/unloading cargo between ships and on-land storage area.
- Improved road connectivity by construction of an access road from the terminal to main roads.
- Development of a public transport service area in front of the terminal building by, created through land reclamation at Khulna inland river port, Narayaganj river port and Dhaka inland waterway river port.
- Three river ports (Dhaka River Port, Khulna River Port and Narayangnj River Port) are to receive upgrades for existing terminal facilities and development of new port facilities for supporting the expansion of special economic zones in the hinterland.
- BIWTA plans to develop ICT facilities through a PPP scheme. They have already issued a development license to private companies and investors who are interested in developing the following sites:

Table 6.15 List of Inland Container Terminals

Implementing Agency	Name of ICT site	River name
By BIWTA	Khanpur ICT	Lakhya river
By Private companies	Rupaya ICT	Lakhya river
	Kumudini ICT	Lakhya river
	Ananda ICT	Meghna river
	Akkhan ICT	
	Summit ICT	

Source: BIWTA

Protocol Inland waterway development by Bangladesh and India governments

The government of Bangladesh has already signed a protocol to jointly develop inland water transport with India for cargo/passenger transport; from Kolkata in India to the north-East provinces of India and through the Inland waterway of Bangladesh. A Line of Credit (LOC) has been signed for this development.

The protocol signed between India and Bangladesh includes three routes of rivers. Route 1 is located from the east-west direction to the border of the north-east India provinces (Tripura, Assam, Mizoram, Aran, and Meghalaya provinces). Route 2 is from north to south and Route 3 is planned along river adjacent to the national border on west side of Bangladesh. The Indian government conducted a feasibility study in 2014 to develop the best out of these three routes with consideration to the existing level of urgency, economic effects, and remote support. The study found that the route 1 is best required with strong demands and best cost performance.

Accordingly, the Indian government proposed to develop a water way from India's Kolkata area to Ashuganj; ICT through the inland waterway and transit to railway and trucks to Akhaura in Bangladesh and cross the border of India to Agartala in Tripura of north east province of India.

The Bangladesh government MOS received the proposal from India and, upon review, consented to implement the joint development operation. The Engineering study is scheduled to begin in 2016 at the earliest.

6.1.6 Dhaka River

(1) Geographic Conditions

Port facilities are located along Buriganga River, where water depth along the berth is 3.5 to 4.0 m, but the center part of the river is 10.0–12.0 m.

Source: Survey Team

Figure 6.3 Dhaka River Port Terminal Facilities

Source: Survey Team

Figure 6.4 Dhaka River Port Berthing Facilities

(2) Facilities

The table below shows information on facilities at Dhaka river port.

Table 6.16 Passenger and Cargo Terminal at Sadar Ghat, Dhaka Inland Port

Existing Facilities		**Sadar Ghat Dhaka Inland Port**
1.	Existing port limit	2 × 40.50 km= 81.00 km
2.	Details of Proposed facilities related to passenger terminals such as office, passenger facilities, jetties, pontoon, Gangway etc.	a) Office: 1358.00 m^2
		b) RCC Jetty: 2 Nos.
		c) Steel Jetty :14 Nos.
		d) Pontoon: 28 Nos.
		e) Gangway: 25 Nos.
3.	Details of existing cargo facilities such as warehouse area, parking area, access road.	a) Warehouse : N/A
		b) Parking area: 7900.00 m^2
		c) Access road : N/A
Proposed Facilities		
1.	Proposed area, he	2 × 40.50 km = 81.00 km
2.	Details of existing facilities relater to passenger terminals such as office, passenger facilities, jetties, pontoon, Gangway etc.	a) Office: 1000.00 m^2
		b) RCC Jetty: N/A
		c) Steel Jetty: 10 Nos.
		d) Pontoon: 15 Nos.
		e) Gangway: 5 Nos.
		f) Spud: 30 Nos.
3.	Details of existing cargo facilities such as warehouse area, parking area, access road.	a) Warehouse : N/A
		b) Parking area: 1162.00 m^2
		c) Access road : N/A

Source: BIWTC

(3) Cargo Traffic

Refer to Table 6.12.

(4) Connectivity

There is no railway access. A main road is connected with the terminal, however the width of the road is narrow causing heavy congestion; widening is urgently required. A bus and public transportation terminal, with an adequate parking area, shall be developed in front of the river port gate area; providing safe and smooth loading and unloading of passengers.

(5) Development Plan

<u>Development plans of Narayanganj River Port area</u>

BIWTA indicated the following long term development plans of Narayanganj River Port area by 2030.

- Development of ICT at Khanpur area by PPP scheme
- Development of Eco Park at Kanpur area by PPNB (Project Proposal National Budget)
- Development of DEPTC area by PPNB (opposite side of Narayanganj Terminal building)
- Modernized terminal building and berthing facilities
- Construction of bank protection with waterway along the Shitalakha river both sides at Kanchpur to Kumudini
- The Link road from Khanpur to Chasara needs to be developed & expanded before the project at Khanpur is completed
- Expanding the inland waterway transportation capacity through the border crossing between India and Bangladesh by widening and deepening the existing navigational channel; this will enable the sailing of large ferry ships. A feasibility study for this is being conducted.

Feature Projects also need to focus on improvement of efficiency of port handing facilities and introducing modern technology in cargo handling equipment from the boats to stock yards on land.

Plan of container transport by BIWTC

- BIWTC plan to allocate space for 4 container ships/barges (158 TEU) to transport containers between Chittagong ICT and Pangaon ICT. BIWTC plans to build additional container barges to meet the future increasing traffic demands.
- BIWTC plans to develop ICT around the Naranganj river port area beside the Pangaon ICT.
- BIWTA had already issued the ICT development permit license to 22 private companies, the following ICT developments were implemented by three private investors at the cost of the investors. Rupaya ICT (Lakhya River), Kumudini ICT (Lakhya River), Anande ICT (Meghne River), Akkhan ICT and Summit ICT. BIWTA also intends to develop Khanpur ICT itself.
- BIWTC conducted a feasibility study for inland waterway container transport at freight cost of 10,000 BDT–8,000 BDT of imported containers and 5,000 BDT–4,000 BDT of export containers between Chittagong and Pangaon ICT.

Subsidy to operation and management of Coastal Service

BIWTC operates a coastal service connection between islands in remote areas of the Bengal Bay (from Chittagong-Sawndip-Hatiya. The average traffic volume per ship is around 700 passengers and cargo such as dry food etc.

The ship engaged in this route is a large size ship able for safely crossing the ocean in open sea and through high waves. The operation cost of this service is 40 Mil BDT per year, while the number of users is small. Thus the traffic volume and income from users is limited.

The revenue by users is not enough to cover the expenses of coastal service operation. Central government provides a limited annual budget of 0.5 mil BDT in lump sum. The shortage caused through operation costs is covered by an internal subsidy from the BIWTC. This coastal service is the only accessible means for the coastal region/remote areas and BIWTC continues to provide the public transportation due to the humanitarian supports.

Circular Waterway Transport Service around Dhaka Waterway

BIWTA started the development of waterway transport facilities through the “Project of Circular Waterway” in 1994.

The development of waterway transport facilities was implemented and completed in two phases. The 1st phase from Sardaghat to Ashulia(29.50 km) which was completed in 2005 and the 2nd phase from Ashulia to Kachpur (40.50 km) which was completed in 2013.

Table 6.17 Route and Dimension of Circular Waterway around Dhaka

	Route From	To	Length of Route (km)	Width of Channel (m)	Depth of Channel (m)
1	Sadarghat	Gabtol	16.00	60	4.28
2	Gabtol	Asholia	29.00	37	2.44
3	Tongi area	Kanchpur	40.50	37	2.44

Source: BIWTA

Potential of Bangladesh IWT in Sub-regional Connectivity

In 2010 Bangladesh and India signed a Joint Communiqué laying down a provision for using Chittagong and Mongla sea-ports by Bhutan, India and Nepal in order to promote transit trade between the countries. Most freight to neighbor countries is transported by railways and inland waterways.

- Bhutan: The inland waterway route exists from both Chittagong and Mongla seaports up to the Bangladesh border (Daikhawa, Chilmari) and extends to Dhubri (India). A 150 km long road, in good condition, exists from Dhubri to Thimpu, which is a commercial center of Bhutan. This inland route falls within the Bangladesh – India "protocol" waterway and is also favorable for inter-country trade. Is it is used as a transit route from India (Kolkata) to Bhutan.
- Nepal: Banglabandha, a land port within the Bangladesh boundary line, is currently in use as a crossing point for traffic and trade with Nepal. A 42 km long road runs from the border to Kakravita, a prominent and busy business hub in Nepal.
- There is an opportunity to extend a friendly hand to neighboring land-locked Nepal throough allowing them use of Bangladesh's sea-ports. Cargo destined for Nepal can be transported through Bangladesh by availing facilities in the advantageously located Mongla sea-port. Mongla Port has previously handled about 60,300 ton of Nepalese transit cargo. The following preliminary multi-modal routes using the country's waterways network have been identified:

Table 6.18 Inland Multimodal Routes

Using IWT and Railway	Mongla-Noapara (by waterways); and Noapara-Rohanpur / Singbad-Raxual-Birgunj (by Railway)	Connectivity to Kathmandu region in Nepal
	Mongla-Noapara (by waters); and Noapara-Birol/Radhikapur-Jugobani-Biratnagar (by Railway)	Connectivity to Biratnagar region in Nepal. (Particularly to Birol existing Meter Gauge train tract requires to be replaced by Board Gauge)
Using IWT and Road	Mongla-Noapara (by waters); Banglabandha/Phulbari-Naxualbhita-Kakravita (by Road)	Connectivity to Kathmandu region in Nepal

Source: BIWTA

The following two plans are suggested for future JICA Technical Assistants.

Nationwide Hydrographic survey by BIWTA

BIWTA intends to request JICA's technical assistance for the implementation of a hydrographic survey that will cover nationwide inland waterways. A Nationwide hydrographic survey of all national waterways has not been conducted since an original implementation by the Netherlands in the 18th century.

The objective of this survey will be as follows:

i) To discover the correct position and current state of nationwide inland waterways, their extension and water depth.
ii) To review the standard high water level and low water level.
iii) To review the current classification of criteria for current waterways.

BIWTA proposes to conduct a nationwide traffic counting survey to collect basic data of the users and volume by origin and destination. This will be used for establishing data for the inland waterways, which can be used to determine what equipment will need to be procured for project implementation. The executing agency is the Hydrography Dep. of BIWTA.

Installation of VTS at heavy traffic routes by BIWTC

BIWTC has requested JICA Technical assistant for providing a VTS (Vessel Tracking System) for the following routes, which have heavy traffic volume, to monitoring the safe operation of inland waterways. Proposed 2 routes and its traffic volume are as follows;

Table 6.19 Location of Proposed Sites to Install the VTS

Name Route	Distance	Traffic volume
Paturia-Daulatdia, Paturia-Kazirhat,	19 km	Daily 5,000 units of vehicles transported to cross river by 17 ferry
Mawa-Charjanajat, Mawa-Kathalbari	10–15 km	Daily 3,000 units of vehicles transported to cross river by 16 ferry

Source: BIWTC

BIWTC's request includes the following contents.

- Equipment supply ; Install radar tower of VTS above two routes on both sides of the river respectively.
- Equipment of communications, receiving equipment (such as VHF, AIS and GYRO) required to install on each ferry and communicate with each other for avoiding the collision among ships and ferry.
- Provision of training for transferring, engineering and operation of such equipment.
- Technologic transfer of equipment, operation, and maintenance of supplied equipment as development of human resources program;

6.1.7 Pangaon Inland Container Terminal

(1) Geographic Conditions

The Inland Container Terminal (ICT) has already been constructed by Bangladesh Inland Water Transport Authority (BIWTA) at Pangaon on the bank of Buriganga River. The geographic condition around the river port area is observed as a soft silt-clay sediment profile.

(2) Facilities

Chittagong Port Authority is responsible for operation and equipment of the Pangaon ICT. CPA plans to carry containers by vessel of 125 TEU loading from Chittagong port.

This terminal was developed with a project loan from CPA. The construction works started from 2009 and finished in 2013. The terminal was opened in 2013 and is operated by CPA.

Table 6.20 Terminal Facilities and Cargo Handling Equipment

Terminal Facilities	
Jetty Length	180 m
Jetty Breath;	26 m
water depth along the berth	4 m LWL
Yard Area	55,000 m^2
Container Handling Capacity	3,500 TEU
CFS Area	5,815 m^2
Refer Plug Point	48 Nos
Equipment	**Quantity**
Mobile Harbour Crane	1 No
Straddle carrier	2 Nos
FLTs	4 Nos
Crane	Weigh bridge 1 No

Source: Pangaon ICT

(3) Cargo Traffic

The ICT is envisaged to handle 30,000 TEU initially; but targeted to handle 116,000 TEU in the first phase and 160,000 TEU after full completion of the second phase.

Container Traffic volume import was 634 boxes (987 TEU) and export was 480 boxes (818 TEU).

Table 6.21 Traffic Volume in 2013–2014

	Import			**Export**	
	Box	**TEU**		**Box**	**TEU**
Total 20'container	281	281		142	142
Total 40'container	353	706		338	676
Total	634	987		480	818

Source: Pangaon ICT

(4) Connectivity

An access road is constructed to connect to Dhaka city through the Bangladesh and Chinese Friendship Bridge. Railway lines are not connected. From this terminal containers are transported by trucks to more than 300 industrial parks located around the Dhaka metropolitan area.

Logistic through this terminal
Usually 12 hours before sailing (departure) but right now we are only loading empty containers as we didn't get export loaded boxes in PICT yet.

Meanwhile lots of buyers are looking for opportunities to start export activities in Pangaon ICT. PICT plans to establish a guaranteed sailing (every Saturday) schedule initially from Pangaon to Chittagong for export.

In case of cut-off time in PICT i.e. will be accepted even 02 hours before (subject to prior intimations) sailing.

There is no cut-off time applicable in Chittagong port for export load containers from Pangaon ICT. Chittagong Port will take every step to load export containers in respective nominated feeder vessel. Similarly treats with the containers from ICD, Kamalapur, and Dhaka.

(5) Development Plan

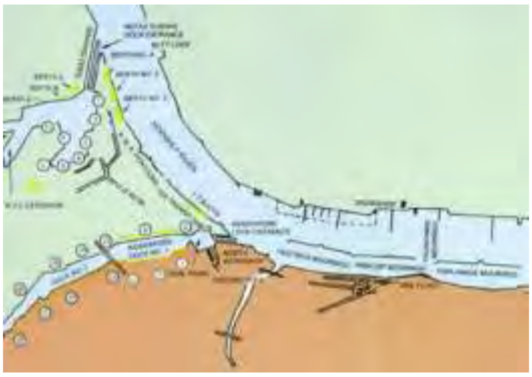
The Port authority plans to purchase container handling cranes and yard cranes.

6.2 India

6.2.1 Kolkata/Haldia

(1) Geographic Conditions

The Port of Kolkata is a riverine port in the city of Kolkata, located around 200 kilometers from the sea. It is the oldest operating port in India. Kolkata Port has two distinct dock systems – Kolkata Docks System (KDS) at Kolkata and a deep water dock at Haldia Dock Complex (HDC). It has a vast hinterland comprising the whole of Eastern India and two neighboring countries, Nepal and Bhutan.



Source: Kolkata Port Tust

Figure 6.5 Kolkata Dock System

(2) Facilities

KDS has 2 docks (Kidderpore Docks and Netaji Subha Docks) and 6 petroleum jetties. Kidderpore Docks consists of 18 berths whose total length is 2814 m with 8.0–8.7 draft. Netaji Subha Docks consists of 10 berths whose total length is 1,850 m with the same draft. HDC has 12 berths which can accept vessels of 90,000–150,000 DWT and 3 oil jetties and 3 barge jetties.

Source: Kolkata Port Tust

Figure 6.6 Kolkata Port

(3) Cargo Traffic

Kolkata Port handled a total of 46.29 million ton of cargo in 2014–15, around, 12% higher than the volume handled during the last fiscal year; it also compares favorably with the 4.65% growth registered by the major ports of India. In container traffic too, Kolkata Port handled a record high of 6,30,095 TEU in 2014–15, clocking a 12.11% growth vis-à-vis last year, while retaining its 3rd rank amongst major container handling ports, besides handling the highest number of vessels in the major port circuit. Interestingly, KDS, one of the port's twin docks which had almost been written off a few years ago for its traffic stagnation, handled an all-time high volume of 15.282 million ton in 2014–15, a 18.7% increase over the previous year.

Table 6.22 Evolution of Cargo Handling (Kolkata)

Year	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013	2013-2014	2014-2015
Total cargo (million. ton)	12.43	13.05	12.54	12.23	11.84	12.87	15.28
Container (thousand.TEU)	302	378	377	412	463	449	528

Source: Indian Ports Association

Table 6.23 Evolution of Cargo Handling (Haldia)

Year	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013	2013-2014	2014-2015
Total cargo (million. ton)	41.79	33.38	35.01	31.02	28.08	28.51	31.01
Container (thousand.TEU)	127	124	149	140	137	113	102

Source: Indian Ports Association

(4) Connectivity

Kolkata port is well connected by road and railways with the rest of India. City roads connect the port to National Highway 2 and 6 and to the Airport. Haldia is connected to National Highway 41, which is connected to National Highway 6. It is also connected to the railway and on the National Waterway 1.

(5) Development Plan

The following major development projects have been planned in the Port of Kolkata.

Diamond Harbour Container Terminal Project

Development of a dedicated Container Terminal at Diamond Harbour, on the east bank of the river Hooghly, was recommended by a high-powered committee set up by the Ministry of Shipping. The project site, around 50 km south of Kolkata Port Trust by road, is envisaged at an indicative cost of around Rs. 14,330 million. The first phase of the project will comprise a contiguous quay length of 900 m (design capacity: 1.2 million TEU). The bidding procedure as a PPP project was undertaken and a new developer was expected to be announced around 2014. However, no one eventually participated in the bidding. Currently the Diamond Harbour Project is being revised to include the handling of non-container cargo. The new Feasibility Study is planned to be conducted soon.

Development of deep draft berths for handling Dry Bulk Cargo and Containers at Sagar Island

For establishing port facilities at Sagar Island including rail-road connectivity and construction of a rail-cum-road bridge over Muriganga, a feasibility study was conducted and submitted by RITES Ltd. This new port is planned to handle bulk commodities (Coal, Iron ore etc.) besides breakbulk and container traffic and have a maximum draft of up to 13.5m. Currently two more studies have been conducted. One is the revalidation study for traffic demand forecasting and required facilities by McKinsey Ltd. and has been completed. The other is the technical study for the proposed rail-road connectivity by AECOM Ltd. which is expected to be completed in early 2016.

6.2.2 Paradip

(1) Geographic Conditions

Paradip Port is an artificial, deep-water port on the East coast of India in Jagatsinghpur district of Odisha. It is situated at a confluence of the Mahanadi River and the Bay of Bengal. It is situated 210 nautical miles south of Kolkata and 260 nautical miles north of Visakhapatnam.

(2) Facilities

Paradip port has the following berths which mainly handle bulk cargo.

- Iron ore berth: Jetty length 210 m, draft 13.5 m
- Coal berth: Jetty length 520 m, draft 14.5 m
- General cargo berth: 8 berths, total length 1941 m, draft 11–14.5 m
- Oil Jetty: Dolphin length 360 m
- Fertilizer berth: 2 berths, total length 500 m, draft 14.5 m

The approach channel was being dredged to increase depth to at least 18.7 meters to enable the port to handle cape-size vessels. The fully automated coal handling plant can handle up to 20 million ton of coal imports per annum.

Source: Survey Team

Figure 6.7 Paradip Port

(3) Cargo Traffic

Paradip port mainly deals with bulk cargo apart from other clean cargoes and handled its highest traffic of 36.06 MT (million ton) in first six months of fiscal 2015, up from 34.35 million ton of cargo handled during the same period of the previous year.

During the April-September period in the current fiscal year, thermal coal traffic in the port has increased by 8.7% from the corresponding period of the previous year. POL (petroleum, oil and lubricants) traffic also saw growth of 6.4%.

Table 6.24 Evolution of Cargo Handling (Paradip)

Year	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013	2013-2014	2014-2015
Total cargo (million. ton)	46.42	57.01	56.03	54.25	56.55	68.00	70.94
Container (thousand.TEU)	2	4	4	8	13	9	4

Source: Indian Ports Association

(4) Connectivity

The Port is connected with the broad-gauge electric railway system of the East-Coast Railway and is also served by National Highway 5 and State Highway 12.

(5) Development Plan

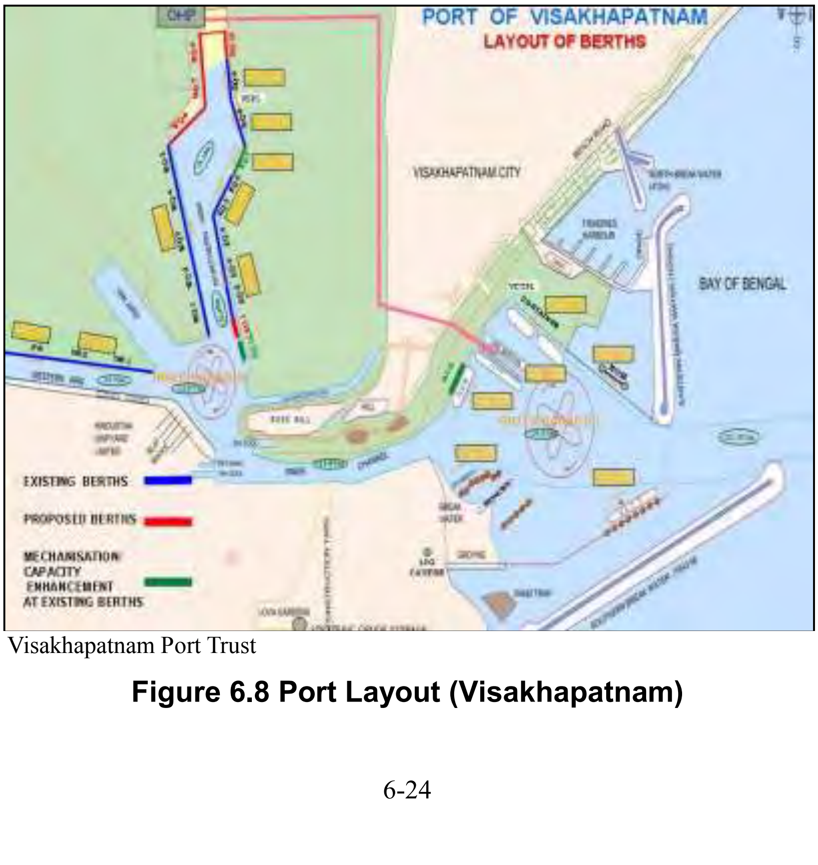
Paradip Port cannot accept vessels beyond Panamax-size. Deeper berths are required for handling larger vessels. The Port Authority intends to expand the port including the construction of berths with a draft of more than 22 m for handling Cape-sized coal and iron loaded vessels.

Mckinsey-AECOM are carrying out a Techno-Economic Feasibility Study, which is expected to be completed soon.

6.2.3 Visakhapatnam

(1) Geographic Conditions

Visakhapatnam Port is located in the State of Andhra Pradesh on the east coast of India. Its cargo traffic had been the second largest among 12 major ports in India after Kandla, until the year 2013–2014 when Paradip Port became the second ranked. The port is a major bulk handling port with POL, iron ore and coal.



Source: Visakhapatnam Port Trust

Figure 6.8 Port Layout (Visakhapatnam)

(2) Facilities

Berthing facilities of the port are shown in Table 6.25. Some berths, including the container terminal in the outer harbor, have been concessioned to private firms.

Table 6.25 Berthing Facilities (Visakhapatnam)

	Name of Berth	Type of cargo	Permissible draft (m)	Length (m)
Inner Harbour				
	EQ-1	Steam coal	14.0	280.00
	EQ-2	Multi-purpose	10.06	55.28
	EQ-3	Multi-purpose	11.0	167.64
	EQ-4	Multi-purpose	11.0	231.00
	EQ-5	Multi-purpose	11.0	167.64
	EQ-6	Multi-purpose	11.0	182.90
	EQ-7	Multi-purpose	11.0	255.00
	EQ-8	Multi-purpose	11.0	255.00
	EQ-9	Multi-purpose	11.0	255.00
	WQ-1	Multi-purpose	11.0	212.00
	WQ-2	Multi-purpose	11.0	226.70
	WQ-3	Multi-purpose	11.0	201.12
	WQ-4	Multi-purpose	11.0	243.00
	WQ-5	Multi-purpose	11.0	241.70
	WQ-1 Return-end	Multi-purpose	8.0	170.00
	Fertilizer berth	Fertilizer	10.06	183.00
	OR-1	Oil Refinaery Berth	9.75	183.00
	OR-2	Oil Refinaery Berth	10.06	173.13
Outer Harbour				
	Ore Berth - I	Iron ore and pellets	16.5	270
	Ore Berth - II	Iron ore and pellets	16.5	270
	Vizag General Cargo Berth	Coking coal	18.1	356
	Off-shore Tanker Terminal	Crude oil and petroleum products	17.0	408
	LPG	LPG, propane, butane, petroleum products	14.0	370.92
	Visakha Container Terminal	Container	15.0	451

Source: Survey Team

(3) Cargo Traffic

Cargo traffic at the port since the year 2008–2009 has been fairly stable (see Table 6.26). The majority of the cargo is composed of iron ore/pellets (13.032 million ton in 2013–2014), POL (12.96 million ton), and coal (9.672 million ton). Typically, the iron ore and thermal coal from the State of Orissa are transported by rail, while thermal coal from the State of Assam is transported by coastal shipping via Haldia Port Steam coal is imported from Indonesia and South Africa, while coking coal is from Australia and the United States.

Table 6.26 Evolution of Cargo Handling (Visakhapatnam)

Year	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013	2013-2014	2014-2015
Total cargo (million. ton)	63.91	65.50	68.04	67.42	59.04	58.50	58.00
Container (thousand.TEU)	86	98	145	234	247	262	248

Source: Indian Ports Association

(4) Connectivity

The port is well connected to double line electrified Howra-Chennai Trunk Line of East Coast Railway through two exchange yard. The Port is also well connected by a 12.47 km four lane road to the National Highway 16 (Chennai-Jharpokharia). Out of the inland container movement at the port which amounted to 201,845 TEU in 2013–2014, transportation by road is dominant (98.8%).

(5) Development Plan

Extension of Ore Berth 1, 2 is under consideration by the current concessionaire, namely, Essar. The project for extension of existing container terminal in the outer harbor was awarded to the current operator Visakha Container Terminal (VCT). A project to replace EQ-1 – EQ-5 in the inner harbor and convert the existing bended alignment to straight one is in the pipeline.

6.2.4 Krishnapatnam

(1) Geographic Conditions

Krishnapatnam Port is located in the State of Andhra Pradesh on the east coast of India, and lies 180 km north of Chennai. The port was developed by Krishnapatnam Port Company Ltd. (KPCL) on a BOST (Build-Operate-Share-Transfer) basis for 50 years. The operation of the port commenced in July 2008.

(2) Facilities

The port currently has 10 multipurpose berths whose total length is 2,950 m with 18.5 m draft. The current capacity of the port is of 77.4 million ton per annum including 2.1 million TEU of containers.

(3) Cargo Traffic

Cargo traffic at the port has grown at an average annual rate of 20% in the last six years (see Table 6.27). The majority of the cargo is coal (25.25 million ton were handled in 2014–2015) followed by iron ore (9.52 million ton) and others such as edible oil, fertilizer, and containers.

Source: KPCL

Figure 6.9 Krishnapatnam Port

Table 6.27 Evolution of Cargo Handling (Krishnapatnam)

Year	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013	2013-2014	2014-2015
Total cargo (mil. tons)	8.21	16.14	15.92	15.42	21.12	24.37	40.74
Container (TEU)	0	0	0	16,236	21,165	58,577	91,572

Sources: KPCL

(4) Connectivity

The port is connected to National Highway 5 (Chennai-Kolkata) with a dedicated 26 km four-lane road. The port is also connected to the Chennai-Kolkata main railway line with a dedicated 19 km railway line owned by a Special Purpose Vehicle named Krishnapatnam Rail Company Limited (KRCL). In the year 2014–2015, almost a half of the total cargo (22 million ton out of 40.74 million ton) was transported by rail.

Source: KPCL

Figure 6.10 Access Road/Railway

(5) Development Plan

A master plan for Krishanapatnam Port includes the development of over 13km of wharf for handling bulk, container, RORO and ferry for international and coastal movement of cargo. The ultimate cargo handling capacity of the port envisaged at the master plan stage is about 200 million ton.

Several types of industries are established near the port in line with the port development. So far, 6 thermal power plants have been constructed behind the port, and coal is transported from the port to the power plants by conveyer belt. Steel plants are also located near the port, which are supplied coking coal through the port. Imported edible oil is processed at the factories nearby the port, and eventually transported to the domestic market by land. In addition, fertilizer plants will soon be constructed.

6.2.5 Kattupalli

(1) Geographic Conditions

Kattupalli Port is located in Tamil Nadu State on the east coast of India, around 10 km north from Ennore Port (currently called as Kamarajar Port), which is also located around 15 km north from Chennai Port. It was developed by L&T Shipbuilding Limited (LTSB), a joint venture of Larsen & Toubro (L&T) and Tamil Nadu Industrial Development Corporation (TIDCO). Operation of the Kattupalli International Container Terminal (KICT) started in January 2013.

(2) Facilities

The port has two berths, namely CB1 (length: 350 m, depth: 14 m) and CB2 (length: 360 m, depth: 14 m). The initial annual capacity of the berths is collectively 1.2 million TEU.

Source: The Survey Team

Figure 6.11 Kattupalli Port

(3) Cargo Traffic

KICT handles containers, RORO, and break bulk. Currently, the containers throughput is monthly 16,000 TEU which is still increasing with the worsening congestion at Channai Port, according to KICT.

(4) Connectivity

The port is connected to National Highway 5 (Chennai-Kolkata) with State Highway 56. No rail access is available.

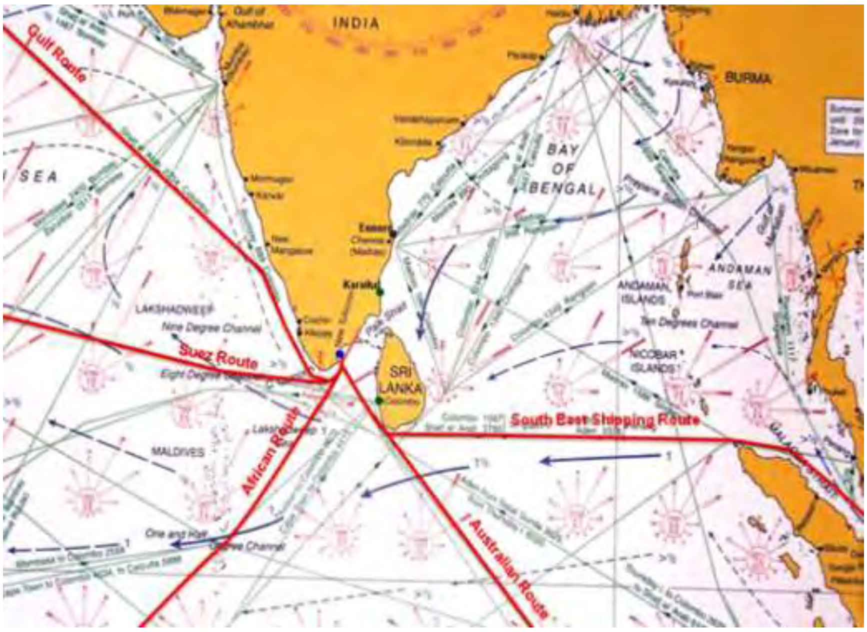
(5) Development Plan

The port has space for further development within the port, but no concrete plan has been established.

6.2.6 Tuticorin (V.O.Chidambaranar)

(1) Geographic Conditions

V.O. Chidambaranar Port (usually known as Tuticorin Port) is located strategically close to east-west international sea routes off the southeastern coast of India. Located in the Gulf of Mannar, with Sri Lanka to the southeast and the large landmass of India to the west, Tuticorin Port is well sheltered from storms and cyclonic winds. Due to its strategic location in the southern peninsula and assured round-the-clock operations, the port has served as the nerve center of economic activity in south Tamil Nadu.



Source: V.O. Chidambaranar Port Trust

Figure 6.12 V.O.ChidambaranarC Port Location

(2) Facilities

Tuticorin Port is an artificial port. The current Inner Harbour consists of 14 berths including 2 Container berths, 3 Coal berths and an Oil jetty (maximum permissible draft 12.8 m for bulk and 10.9 m for container). The container terminal is currently managed by PSA. The container terminal has 3 quay cranes with 44 m reach and four RTG cranes for stacking the containers. The port also has a vast area for storage facilities.

(3) Cargo Traffic

The Port which began with the mono commodity of coal for the Tuticorin Thermal Power Station has diversified and the cargo profile of the Port consists of import cargo, viz. Thermal Coal, Timber Logs, Petroleum Products, LPG and various other bulk, break bulk and containerized cargoes and export cargoes viz. Granite, Salt, Sugar (Raw) Cement in bags, containerized cargo and construction materials. The Port's hinterland comprises southern parts of the state of Tamil Nadu, Kerala and also some regions in the state of Karnataka.

The Port handled a record volume of 32.41 million ton in 2014–15, an increase of 13.17 per cent over the last year. This was 1.28 % higher than the 32 million target set by the Ministry of Shipping.

Table 6.28 Evolution of Cargo Handling (Tuticorin)

Year	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013	2013-2014	2014-2015
Total cargo (million. ton)	22.01	23.79	25.73	28.11	28.26	28.64	32.41
Container (thousand.TEU)	439	440	468	477	476	508	560

Source: Indian Ports Association

(4) Connectivity

Tuticorin Port has connections with the hinterland via road and railway networks. The road connection is via three 2-lane national highways (NH45 to Madurai, NH7 to Salem & Bangalore and NH7 to Tirunelveli.)

The Port is connected by rail link with major cities like Tirunelveli in the west, Trivandrum in the South, and Madurai, Chennai and Bangalore in the north.

(5) Development Plan

Tuticorin Port Outer Harbour Project

The Outer Harbour Project has been undertaken due to limitations of the current entrance channel width, which can only accommodate Panamax size vessels. The enhancement will increase capacity and lead to improved socioeconomic conditions and industrialization in the hinterland of the Port from the increased demand for export/import trade and resulting accelerated economic development. The Draft Plan proposes construction of 18 berths with depths of 16 m. The Port Trust has requested assistance from JICA, especially for construction of the breakwater and dredging. The project cost is estimated at US$1.79 billion. A project preparatory study by JICA commenced in February 2016.

The proposed Port Project Layout and features are as below.

Source: V.O. Chidambaranar Port Trust

Figure 6.13 Layout of Tuticorin Port Outer Harbour Project

Table 6.29 Development Plan of Tuticorin Port Outer Harbour Project

Phase	Duration	Terminals / Berths	Capacity addition (MTPA)		Project Cost (Port's Investment) (Rs. In crores)			Sub-Total	Private Investment (Rs. In crores)	Total (Rs. In crores)
			Cargo-wise	Total	Breakwater	Dredging	Others			
Construction	2015 - 20	Construction of Breakwaters, Dredging etc (Ports investment)								
Phase - I	(Stage-1) 2020– 25	Containers (CT 1) Quay – 750m (2 berths)	1.50 MTEUS (22.50 MTPA)	42.50	920	5,800	900	7,620	2,530	10,150
		Coal berths - 2 350m x 30m each	20 MTPA							
	(Stage-2) 2025 - 30	Containers (CT 2) Quay – 1000m (3 berths)	2.00 MTEUS (30 MTPA)	40.00	-	1,390	-	1,390	2,235	3,625
		Coal berth - 1 350m x 30m	10 MTPA							
Sub Total				82.50	920	7,190	900	9,010	4,765	13,775
Phase - II	2031 – 36	CT 3 (3 berths) Quay – 1200m	2.40 MTEUS (36 MTPA)	46.00					2,550	2,550
		Coal berth – 1 350m x 30m	10 MTPA							
Phase - III	2037 – 43	CT 4 (3 berths) Quay – 1200m	2.40 MTEUS (36 MTPA)	59.00		1,155		1,155	3,390	4,545
		Coal berths - 2 350m x 30m each	20 MTPA							
		POL berth – 1 (300m x 24m)	3 MTPA							
Total	2020 - 43	Containers (4150m) 11 berths Coal (2100m) 6 berths POL (300m) 1 berth		187.50	920	8,345	900	10,165	10,705	20,870
Note: The harbour layout has a space of 1200m for multi-purpose berths (Capacity 30 MTPA) Total - 217.50 MTPA										

Source: V.O. Chidambaranar Port Trust

6.2.7 Chennai/ Ennore

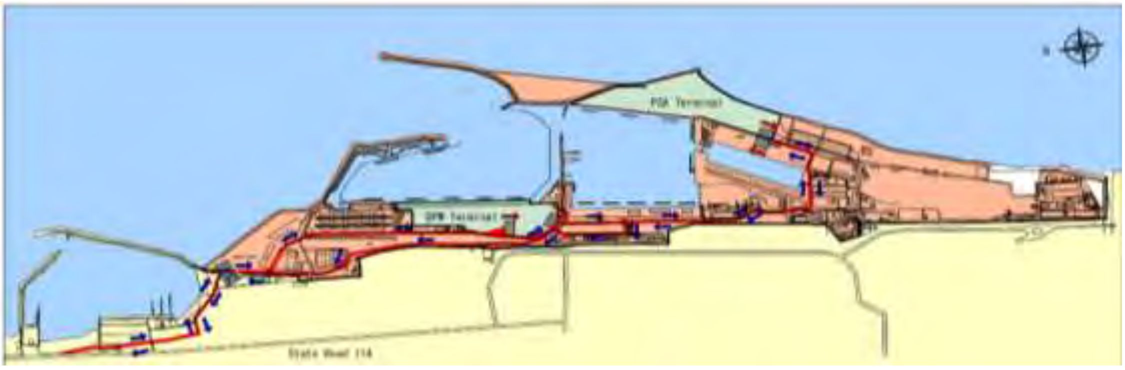
(1) Geographic Conditions

Chennai Port lies on a flat coastal plain known as the Eastern Coastal Plains on the east coast of the Indian peninsula known as the Coromandel Coast in the Bay of Bengal. The bed slope is fairly flat. The port is situated on the thermal equator and is also coastal, which prevents extreme variation in seasonal temperatures. Kamarajar Port (usually known as Ennore Port) is located about 24 km north of Chennai Port. Kamarajar Port is the only major private port and is registered as a company. It is also expected to act as a satellite port that can help alleviate congestion at Chennai Port.

(2) Facilities

Chennai port is the second smallest in the country measured by surface area, encompassing only 274 hectares. Chennai port with three docks, 24 berths and draft ranging from 8.5 m to 16.5 m, has become a hub port for Containers, Cars and Project Cargo on the east coast.

Ennore port has more than 800 hectares of land and features all-weather, round-the-clock operations. Five berths with drafts ranging from 10 m to 13.5 m are available.



Source: Chennai Port Trust

Figure 6.14 Layout of Chennai Port

(3) Cargo Traffic

Chennai Port, which is the third largest port for containers in India and the largest port on the east coast of the country, handles containers as well as liquid and dry bulk and breakbulk cargoes.

Ennore Port was originally conceived primarily to handle thermal coal to meet the requirement of Tamil Nadu Electricity Board (TNEB) and is now handling a variety of bulk, liquid, automobile and container cargo.

Table 6.30 Evolution of Cargo Handling (Chennai)

Year	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013	2013-2014	2014-2015
Total cargo (million. ton)	57.49	61.06	61.46	55.71	53.40	51.11	52.54
Container (thousand.TEU)	1143	1216	1524	1558	1540	1468	1552

Source: Indian Ports Association

Table 6.31 Evolution of Cargo Handling (Ennore)

Year	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013	2013-2014	2014-2015
Total cargo (million. ton)	11.50	10.70	11.01	14.96	17.89	27.34	30.25
Container (thousand.TEU)	—	—	—	—	—	—	—

Source: Indian Ports Association

(4) Connectivity

Chennai port is well connected by National Highway to Kolkata, NH 4 to the West and NH45 to Dindugal and run its own railway operations inside the harbour. Ennore port has access to these National Highways as well as the Thermal Power Station. Chennai - Ennore road connectivity project has been implemented by National Highways Authority of India. Port related road and rail links are expected to emerge as part of the Chennai–Bengaluru Industrial Corridor (CBIC).

Source: Kamarajar Port Ltd.

Figure 6.15 Ennore Port

(5) Development Plan

Chennai port and Ennore port have the following development projects.

Elevated Four lane Link road from Chennai Port to Maduravoyal

- Estimated Cost: Rs. 18.15 billion
- Project Starts from War Memorial gate of Chennai Port and runs up to Maduravoyal for a length of 19.01 km, which runs along the Cooum river bank up to Koyambedu and along NH 4 thereafter.
- Work is not progressing in alignment due to issues raised by State Govt. of Tanil Nadu etc.
- Legal arguments concerning the project are now being heard by the Supreme Court.

Development of Chennai Mega Terminal at Chennai Port has been re-structured as Development of the New Outer Harbour to the north of the Bharathi Dock

- Estimated Cost: Rs. 51 billion (to be developed under PPP mode)
- Capacity: 35 MTPA
- Development of Outer Harbour Terminal includes 6 berths along the 1.5 km long quay and an ultimate alongside depth of 15 m sheltered by a breakwater system of about 4.75 km in length.

Procurement stage on a BOT basis. Bidding was not successful in 2014 and redoing the procurement is under consideration.

Development of Ennore Container Terminal of 1.40 million TEU on DBFOT basis

- Kamarajar Port has decided to undertake the proposed development of the Container Terminal
- The length of the proposed terminal is 730 m with an estimated capacity is 1.40 million TEU
- Awarded to Adani Port & Special Economic Zone Pvt. Ltd.
- The construction work is under progress.

Great Kamarajar Port Project

Kamarajar Port Ltd. also has an ambitious plan to construct an outer harbor, called the Greater Kamarajar Port Project. It is expected to be build north of breakwaters already established for the existing Ennorte Port. It will have a capacity to handle 100 million ton of cargo per annum.

6.2.8 Colachel

(1) Geographic Conditions

V.O. Chidambaranar Port Trust is planning to develop a container transshipment port at Colachel (specifically in a town called Enayam, 7 km north-west to Colachel) in the State of Tamil Nadu, because of its proximity to main container liner routes and availability of natural deep water.

Source: The Survey Team

Figure 6.16 Project Site

(2) Facilities

Table 6.32 shows the berths which are planned for the new port at Colachel. All the berths would have depths of 20 m.

Table 6.32 Berth Length and Capacity

Target period	Phase 1	Phase 2	Phase 3
	2018–2020	2021–2025	2026–2030
Total berth length [container terminal]	1,400 m [800 m]	3,800 m [2,800 m]	5,400 m [4,000 m]
Container terminal capacity	1,606,590 TEU	5,623,064 TEU	8,032,949 TEU

Source: Rapid Techno-Economic Feasibility Report for Development of Colachel Port in Tamilnadu

(3) Cargo Traffic

Summary of cargo traffic forecast is given in Table 6.33. The majority of container traffic is transshipment cargo.

Table 6.33 Traffic Forecast Summary

Target period	Phase 1	Phase 2	Phase 3
	2018-2020	2021-2025	2026-2030
Container (gateway)	0.9–1.1 mil. TEU	1.6–2.4 mil. TEU	2.1–3.4 mil. TEU
Container (transshipment)	0.5–0.9 mil. TEU	2.0–3.5 mil. TEU	2.6–5.2 mil. TEU
Container (total)	1.4–2.0 mil. TEU	3.5–5.9 mil. TEU	4.7–8.6 mil. TEU
Bulk cargo – coal	0–6.6 mil. ton	3.3–23.1 mil. ton	6.6–26.4 mil. ton

Source: Rapid Techno-Economic Feasibility Report for Development of Colachel Port in Tamilnadu

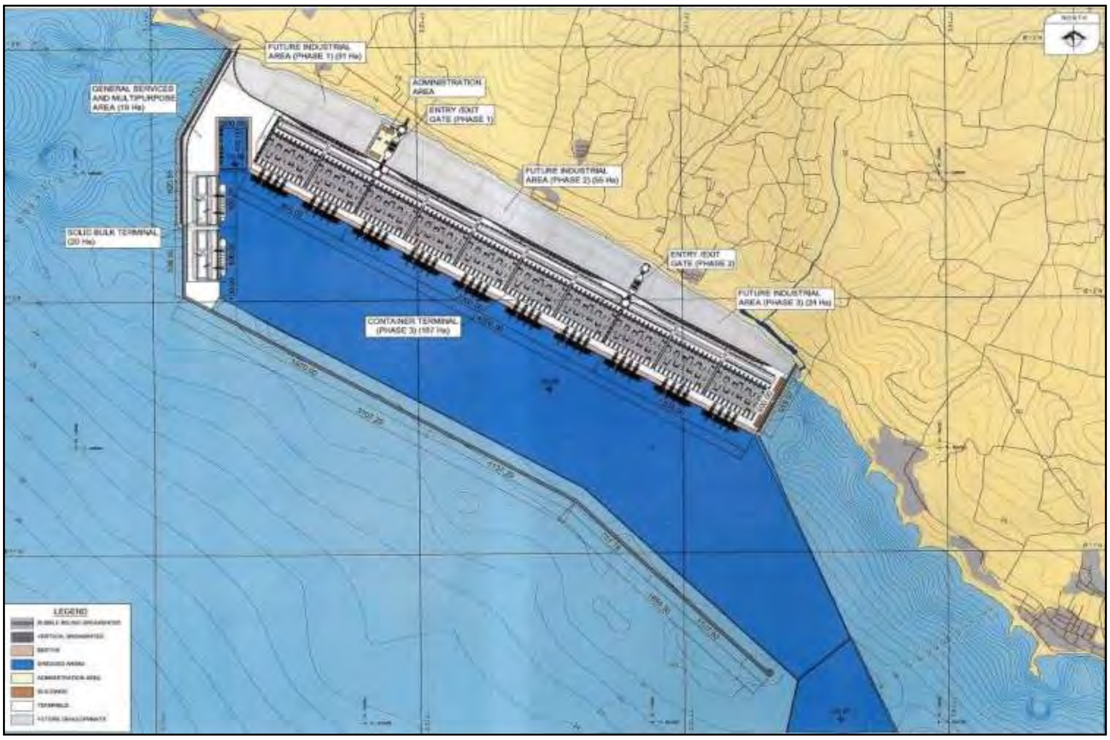
(4) Connectivity

The following connectivity is recommended in a preliminary study:

- Railway: a new double-track railway (almost 10 km) which connects the port to the existing railway
- Road: a four lane road (11.8 km) which connects the port to the National Highway 47.

(5) Development Plan

A preliminary study called the "Rapid Techno-Economic Feasibility Report for Development of Colachel Port in Tamil Nadu" was finalized in August 2015. Phase I of the Project calls for construction of a 4,639 m breakwater and dredging of 6.8 million m^3. Estimated cost is Rs. 5,492 crores. Project structure and a financing plan have yet to be finalized. A Detailed Project Report (DPR) is being prepared.



Source: V.O.Chidambaranar Port Trust

Figure 6.17 Proposed Layout

6.2.9 Vizhinjam

(1) Geographic Conditions

The State Government of Kerala, as part of its various programs for development of the state, has opted to establish a deep water international container transshipment port at Vizhinjam, at 16 km south of the State Capital, Thiruvananthapuram, because of its close proximity to the international East-West shipping route, as well as availability of naturally deep water. It has therefore formed a separate company, namely Vizhinjam International Seaport Limited (VISL) as a special purpose Government company (fully owned by the State Government of Kerala) that would act as the implementing agency for development of the green field port, being responsible for the land acquisition, development of external infrastructure and selection of concessionaire.

Source:Survey Team

Figure 6.18 Project Site

(2) Facilities

The port is planned to be equipped with container berths, a cruise cum multi-purpose berth, a navy berth, fishery berths etc. According to the "Integrated Master Plan for Vizhinjam Port (November 2012)", the container berths with a total length of 2,000 m would be developed in three phases as shown in Table 6.34. The design ship capacity and loaded draft is 18,000 TEU and 16.0 m respectively.

Table 6.34 Container Terminal Length and Capacity

Target period	Phase 1 2014–2020	Phase 2 2021–2030	Phase 3 2031–2044
Total No. of berths	2	3	5
Total length	800 m	1,200 m	2,000 m
Total capacity	900,000 TEU	1,800,000 TEU	3,350,000 TEU

Source: Integrated Master Plan for Vizhinjam Port (November 2012)

(3) Cargo Traffic

Summary of cargo traffic forecast is given in Table 6.35. Container traffic constitutes the primary cargo, of which transshipment containers are expected to be dominant.

Table 6.35 Traffic Forecast Summary

Target period	Phase 1 2014–2020	Phase 2 2021–2030	Phase 3 2031–2044
Container (gateway)	138,495 TEU	392,371 TEU	768,904 TEU
Container (transshipment)	683,798 TEU	1,292,842TEU	2,054,545 TEU
Container (total)	822,256 TEU	1,685,212 TEU	2,823,449 TEU
Multi-purpose	107,000 ton	359,000 ton	777,000 ton
Petro-products	159,000 ton	518,000 ton	1,051,000 ton

Source: Integrated Master Plan for Vizhinjam Port (November 2012)

(4) Connectivity

It is envisaged that the public sector will develop a 4-lanes road connecting the port to the nearest National Highway, as well as a railway line connecting the port to the nearest railway station on the regional railway network.

(5) Development Plan

The State Government of Kerala and Adani Vizhinjam Port Private Limited signed a Concession Agreement on the development and operation of Vizhinjam International Deepwater Multipurpose Seaport in August 2015, with a 40-year concession period. The port with a 800-m wharf shall be completed within 4 years from the Appointed Date, according to the concession agreement. The estimated cost for the Phase I project is USD 674 million, according to the Integrated Master Plan.

Source: VISL

Figure 6.19 Vizhinjam Port (Image)

6.2.10 Cochin

(1) Geographic Conditions

Cochin Port is a port on the Arabian Sea – Indian Ocean sea-route. The port lies on two islands in the Lake of Kochi: Willingdon Island andVallarpadam, towards the Fort Kochi river mouth opening into the Arabian Sea.

(2) Facilities

The International Container Transshipment Terminal (ICTT), part of Cochin Port, is the largest container transshipment facility in India. The Port has 16 berths with drafts ranging from 9 m to 14.5 m. Two container berths with draft of 14.5 m and length of 600 m are currently available.

(3) Cargo Traffic

Cochin Port handles crude oil, dry cargo, fertilizer, liquid bulk, LNG and containers. The traffic volume of container increased by 5.5% from 2014 to 2015.

Table 6.36 Evolution of Cargo Handling (Cochin)

Year	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013	2013-2014	2014-2015
Total cargo (million. ton)	15.23	17.43	17.87	20.09	19.85	20.89	21.60
Container (thousand.TEU)	261	290	290	336	335	347	366

Source: Indian Ports Association

(4) Connectivity

The present road connectivity of the Port is through two bridges, one each on Mattanchery channel and Ernakulam Chennel linking the Port to the main island. There is also a link road between Wellingdon Island and National Highway 47 bypass.

(5) Development Plan

Cochin Port Outer Harbour Project

Outer Harbour Project entails the construction of 2 breakwaters on both sides of the approach channel; it is planned to reclaim 2,600 acres of land inside the northern breakwater and 650 acres inside the southern breakwater. Cochin Port Trust explained that the project is an essential requirement for addressing the immediate need on the prevention of the adjacent shoreline erosion, minimizing maintenance dredging requirements and improving vessel navigation through entrance channel.

Source: Cochin Port Trust

Figure 6.20 Layout of Cochin Port Outer Harbor Project

The said project is proposed to avail JICA ODA loan assistance and Port Trust submitted the letter for the assistance to the Ministry of Shipping in May 2015.

Outline of the project is as follows:

- Port Facility: Reclamation of 2,600 acres inside the northern breakwater and 650 acres inside the southern breakwater (12 Container berths, 2 LNG berth and 1 Oil berth are planned to be built).
- Implementation period: 3 years
- Project Cost: Rs. 6,875 crores. (two Breakwaters, Rs. 3,618 crores.; 3,250 acres of reclamation, Rs. 2,732 crores; and other projects, Rs. 525 crores)
- Current maintenance dredging cost: Approximately Rs.150 crores (a 30%–40% of savings in maintenance dredging cost of the Outer Harbour is expected to be realized)

6.2.11 New Mangalore

(1) Geographic Conditions

New Mangalore Port is located in Mangalore, the State of Karnataka, on the west coast of India. The Mangalore SEZ focusing on oil refinery and petro-chemistry is located at 8 km away from New Mangalore Port.

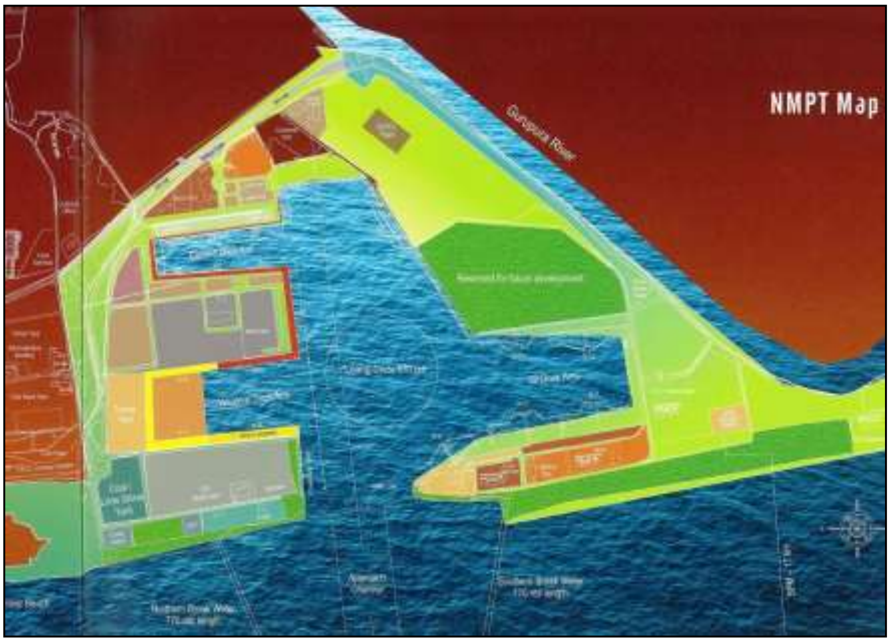
(2) Facilities

Berthing facilities of the port are shown in Table 6.37. The present total capacity is 77.77 million ton per annum.

Table 6.37 Berthing Facilities (New Mangalore)

	Name of Berth	Type of cargo	Draught (m)	Length (m)
1	Berth No. 1	General Cargo	7.0	125
2	Berth No. 2	General Cargo	10.5	198
3	Berth No. 3	General Cargo	10.3	198
4	Berth No. 4	General Cargo / Liquid Ammonia	9.5	198
5	Berth No. 5	General Cargo / Cement / Edible Oil	9.5	198
6	Berth No. 6	Coal / Bulk Cargo	9.5	198
7	Berth No. 7	Coal / Bulk Cargo	9.5	198
16	Berth No. 8	Coal / Iron Ore (KIOCL)	12.5	300
11	Berth No. 9	LPG	10.5	330
12	Berth No. 10	Crude / POL product	14.0	320
13	Berth No. 11	Crude / POL product	14.0	320
14	Berth No. 12	POL product / LPG / Chemicals	12.5	320
15	Berth No. 13	POL Products	14.0	350
8	Berth No. 14	Coal / Bulk Cargo	14.0	350
9	Berth No. 15	Coal (UPCL)	14.0	300
10	Berth No. 18	Coal / Bulk Cargo *Under Construction	14.0	300
17	Single Poinrt Mooring	Crude	18.0	-

Source: New Mangalore Port Trust



Source: New Mangalore Port Trust

Figure 6.21 Port Layout (New Mangalore)

(3) Cargo Traffic

Cargo traffic at the port since the year 2008–2009 has been stable (see Table 6.38). More than half of the cargo is POL (22.944 million ton in 2013–2014), followed by coal (8.348 million ton) and iron ore (3.012 million ton). Volume of containers is still limited. Mangalore Refinery and Petrochemicals Ltd. (MRPL) connected to the port through pipelines imports crude oil and produces petroleum products which are also exported through the port. KIOCL (Kudremukh Iron Ore Co.,Ltd.), a state-owned company to produce iron pellets handles iron ore and coal at its dedicated berth (Berth No. 8). Udupi Power Corporate Ltd. (UPCL) imports coal through the port for thermal power generation.

Table 6.38 Evolution of Cargo Handling (New Mangalore)

Year	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013	2013-2014	2014-2015
Total cargo (million. ton)	36.69	35.53	31.55	32.94	37.04	39.37	36.57
Container (thousand.TEU)	29	31	40	45	48	50	63

Source: Basic Port Statistics of India 2013–2014, New Mangalore Port Trust

(4) Connectivity

The port is located along National Highway 17 connecting Cochin and Mumbai. The port is also connected to the railway network with a railway spur. The rail is used for transportation of bulk cargo, while inland containers are transported by road.

(5) Development Plan

On-going development project is construction of berth B-18 only. The port is deemed to be able to handle substantially more cargo, since the recent cargo handling volume is still only half of its total capacity (77.77 million ton per annum). Development of the Western Dock Arm is in the pipeline.

MRPL is carrying out a study for development of LNG terminal in the port. Because of a regulation which stipulates that an LNG terminal be located at minimum 500 m away from adjacent facilities, it would require development of an outer harbor to accommodate the LNG terminal.

Cargo produced/consumed in Bengaluru, a potentially large market for New Mangalore Port is currently handled at Chennai Port, although Chennai is farther from the market than New Mangalore. It may be because of cheaper transportation cost between Bengaluru and Chennai, compared with the cost between Bengaluru and New Mangalore. One of the major reasons for the relatively expensive transportation cost between Bengaluru and New Mangalore is the mountain ranges named Western Ghats for which a project to improve the road access between Mangalore and Hassan is allegedly on-going.

6.2.12 Mormugao

(1) Geographic Conditions

Mormugao Port is one of the oldest ports on the west coast of India, located in the State of Goa which is abundant in iron ore.

(2) Facilities

Berthing facilities of the port are as shown in Table 6.39.

Table 6.39 Berthing Facilities (Mormugao)

	Name of Berth	Type of cargo	Depth (m)	Length (m)
1	Berth No. 5	General Cargo	14.1	210
2	Berth No. 6	Coal / Coke	14.1	240
3	Berth No. 7	Coal / Coke	14.1	300
4	Berth No. 8	Liquid Bulk	13.1	50
5	Berth No. 9	Iron Ore (MOHP)	14.1	220
6	Berth No. 10	General Cargo	13.1	250
7	Berth No. 11	General Cargo	13.1	270

Source: Mormugao Port Trust

Source: Mormugao Port Trust

Figure 6.22 Port Layout (Mormugao)

(3) Cargo Traffic

Cargo traffic at the port since the year 2008–2009 has drastically fallen since a ban on exports of iron ore came into effect in October 2012 (see Table 6.40). The port used to be highly dependent on the iron ore trade; for example, in the year 2009–2010 when the port recorded the highest throughput of 65 million ton, export of iron ore amounted to 54 million ton. Currently, the majority of the cargo is imported coal (7.518 million ton in 2013–2014), whereas only 44,000 ton iron ore was exported. The coal is used at steel plants and thermal power plants in the State of Karnataka.

Although the ban had been lifted, extraction of iron ore in the State of Goa is limited to 20 million ton per annum. In this regard, the port intends to diversify the type of cargo, by trying to increase export of uranium chips, bauxite and fertilizer.

Table 6.40 Evolution of Cargo Handling (Mormugao)

Year	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013	2013-2014	2014-2015
Total cargo (mil. tons)	41.68	48.85	50.06	39.05	17.74	11.74	14.71
Container (TEU)	10,933	11,688	11,858	14,203	13,114	12,748	16,055

Source: Basic Port Statistics of India 2013–2014, Mormugao Port Trust

(4) Connectivity

National Highway 17 runs close and parallel to the sea coast. The connection between the port and the National Highway 17 is being upgraded. A railway reaches the port at berths 5 and 6. The rail is used for transportation of coal, while inland containers movement is by road. Inland waterway transport is used for the transport of the bulk of the iron ore from the mines to the port of Mormugao through Zuari Rive and Mandovi River. The use of inland waterway reduced the transportation cost and made the iron ore from Goa competitive in the international market.

(5) Development Plan

Mormugao Port Trust (MPT) is implementing a project to convert Berth No. 8 and 9 to a multi-purpose terminal. MPT is also proceeding with a dredging project to deepen the approach channel from 14 m deep to 19.5 m to enable cape size vessels to enter the port.

The rail access to the port is currently single track which is not sufficient to transport the coal currently handled at the port. In the light of potentially increasing imported coal at the port, the project to double the rail access is awaited by port users.

Mormugao Port has planned to develop the area west of the breakwater for creating additional cargo handling facilities. This terminal will have 2 berths (total length 600 m) which will handle multi-commodity cargo i.e. bulk, break bulk and containers. The project is deemed to involve construction of 825 m breakwater and reclamation of about 75 acres of land for storage area. Project cost is estimated as Rs. 950 crores, which would yield additional capacity of 5.74 million ton per annum. Part of the project is likely to be implemented through PPP scheme.

Source: Mormugao Port Trust

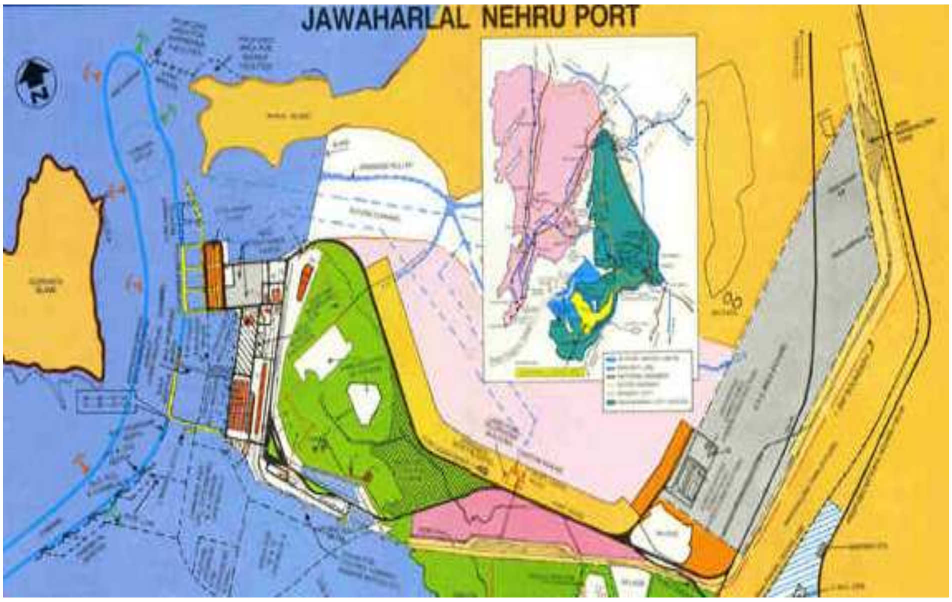
Figure 6.23 Multi-purpose Cargo Terminal (Plan)

6.2.13 Mumbai/JNPT

(1) Geographic Conditions

The Port of Mumbai is situated almost midway on the West coast of India and is gifted with a natural deep water harbour of about 400 km^2 protected by the mainland of Konkan on its east and Island of Mumbai on its west. JNPT (Jawaharlal Nehru Port) was created to relieve pressure on Mumbai Port. It also enabled importers to avoid the tax levied on goods entering Mumbai city by the Brihanmumbai Municipal Corporation. JMPT is located east of Mumbai in

Maharashtra. Its common name derives from the names of Nhava and Sheva villages that were situated here.



Source: JNPT

Figure 6.24 Layout of JNPT

(2) Facilities

JNPT has 3 Container Terminals (JNPCT: JNPT Container Terminal, NSICT: The Nhava Sheva International Container Terminal, GTICT: Gateway Terminals India Container Terminal), Liquid Cargo Terminal and Shawwow Draught Terminal. 3 Container Terminals are as below.

- JNPCT: quay length 680 m, draft 14 m, capacity 1.35 million TEU/year
- NSICT: quay length 600 m, draft 14 m, capacity 1.2 million TEU/year
- GTICT: quay length 712 m, draft 14 m, capacity 1.8 million TEU/year

Mumbai Port has three enclosed wet docks. There are a total of 43 berths with drafts ranging from 6.4 m to 7.0 m. The Port also has 4 jetties with draft of 12.2 m. Mumbai offshore container terminal was partially completed in 2015.

(3) Cargo Traffic

JMPT (Jawaharlal Nehru Port) is the largest container port in India, located east of Mumbai in Maharashtra. JNPT alone handled 4.467 million TEU, accounting for all of India’s container traffic volume.

Source: Mumbai Port Trust

Figure 6.25 Mumbai Port

Table 6.41 Evolution of Cargo Handling (Mumbai)

Year	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013	2013-2014	2014-2015
Total cargo (million. ton)	51.88	54.54	54.59	56.19	58.04	59.19	61.66
Container (thousand.TEU)	92	58	72	58	48	40	45

Source: Indian Ports Association

Table 6.42 Evolution of Cargo Handling (JNPT)

Year	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013	2013-2014	2014-2015
Total cargo (million. ton)	57.29	60.76	64.31	65.73	64.49	62.33	63.80
Container (thousand.TEU)	3952	4062	4270	4321	4259	4162	4467

Source: Indian Ports Association

(4) Connectivity

Mumbai Port is well connected to other parts of the country through National Highway 8 (Ahmedabad), NH3 (Delhi/Kolkata), NH4 (Bangalore) and NH17 (Doa/Mangalore). JNPT acts as a hub port in the region and is connected through NH4 to Mumbai, NH17 to Goa, and NH54 to western India. The port is also well connected to the rail network in India.

Source: Survey Team

Figure 6.26 JNPT

(5) Development Plan

JNPT and Mumbai Port have the following development plans.

Stand-alone container handling facility

- Project consists of the construction of a 330 m container berth, reclamation for a 27 ha yard etc.
- Concession agreement signed with GTICT.
- Capacity will be increased by 0.8 million TEU
- Expected to be completed in July 2016.

Development of 4th Container Terminal

- Phase-I: Construction of 1 km berth, expected to be completed by November 2017.
- Phase-II: Construction of 1 km berth, expected to be completed by November 2022. (Each phase will increase capacity by 2.4 million TEU)

In addition, development of the Port of Wadhavan (Dahanu), a satellite port of JNPT, to cope with the congestion at JNPT is a priority green field project. A DPR is under preparation.

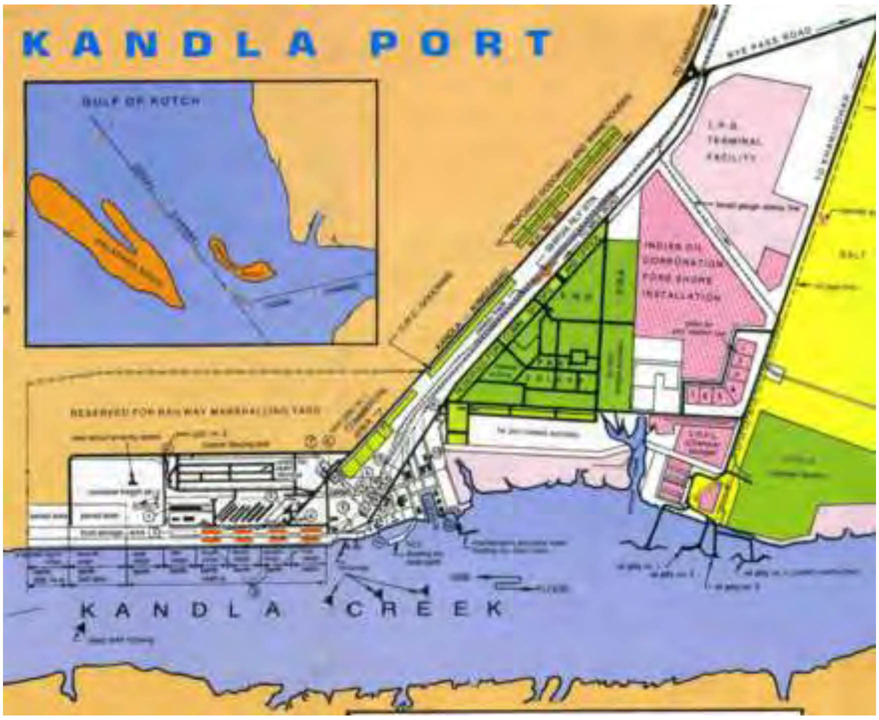
6.2.14 Mundra/Kandla

(1) Geographic Conditions

Mundra port and Kandla port are located in the Gulf of Kutch, in the north of Gujarat State, near the Pakistan border. The Gulf acts as a natural shelter for the port, facilitating 24 × 7 safe berthing, un-berthing and vessel operations. Kandla port was constructed in the 1950s as the chief seaport. Mundra port was newly developed by private Adani Ports and SEZ Ltd (APSEZ) and has become the largest non-major port of India, handling more cargo than Kandla Port in 2015.

(2) Facilities

Mundra Port is India's first multi-product port - based special economic zone (SEZ). Mundra has 22 berths with drafts ranging from 12 m to 17.5 m. Kandla and Mundra both have railway systems in operation. It is connected to Delhi and Mumbai via Ahmedabad etc.



Source: Kandla Port Trust

Figure 6.27 Layout of Kandla Port

(3) Cargo Traffic

Kandla port was the busiest port of all Indian ports until 2012–2013. However, Mundra Port, the flagship port of APSEZ, has achieved a new landmark of handling 100 million ton in 2013–2014. A concession agreement for Mundra Port was signed in 2001–2002. In just 12 years Mundra Port has become the biggest port.

Source: Kandla Port Trust

Figure 6.28Kandla Port

Table 6.43 Evolution of Cargo Handling (Mundra)

Year	2013-2014	2014-2015	Apr.2015-Sep.2015
Total (mil.tons)	101	111	57
Container (thous.TEUs)	2390	2720	1480

Source: Adani Ports and Special Economic Zone Ltd.

Table 6.44 Evolution of Cargo Handling (Kandla)

Year	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013	2013-2014	2014-2015
Total cargo (mil. ton)	72.23	79.50	81.88	82.50	93.62	87.00	92.50
Container (thousand.TEU)	138	147	160	168	118	30	—

Source: Indian Ports Association

(4) Connectivity

Kandka Port is well connected to National Highway 8 from the Port Gate.

Mundra Port is also well connected to the hinterland in the northern and western parts of India. Double stack container trains are available.

Source: APSEZM

Figure 6.29 Mundra Port

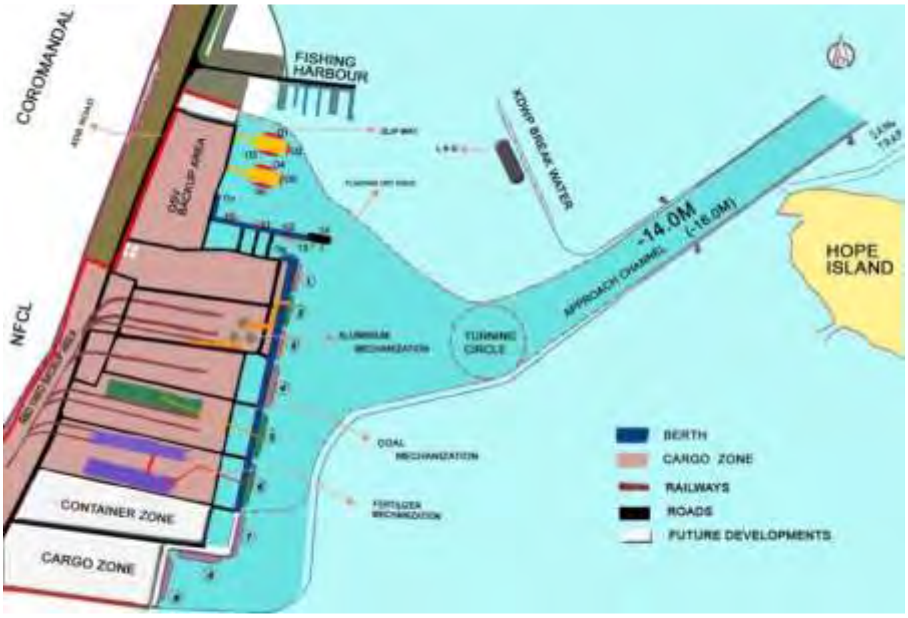
(5) Development Plan

The Kandla Port Trust reached an agreement with APSEZ for construction of a new, mechanized terminal with direct unloading facilities for coal, iron ore, and other bulk goods. Current maximum draft in Kandla port is only around 12 m. The new Adani Kandla Bulk Terminal, known as the Tuna Tekra terminal with dredged draft around 16 m, will be located at Kara Creek, 20 km southeast of Kandla port. The port was commissioned in 2015 with an annual handling capacity of over 20 million ton. The 4th container terminal will be completed at Mundra port by 2016, adding 1.2 million TEU to the present capacity of 6 million TEU.

6.2.15 Kakinada

(1) Geographic Conditions

Kakinada Port is located in the State of Andhra Pradesh on the east coast of India, between major Ports of Vishakhapatnam and Chennai. The Kakinada Seaports Ltd. took over operations when the port was privatized in 1999. The port is surrounded by the districts of Krishna, East and West Godavari, Guntur and the entire Telangana region where agricultural products, minerals, coal and fertilizers are produced in abundance and major highways and railway lines connect to Kakinada.



Sources: Kakinada Seaports Ltd.

Figure 6.30 Port Layout (Kakinada)

(2) Facilities

According to the website of the Kakinada Seaports Ltd., the port is comprised of the following facilities:

- Main jetty: 6 berths (length 1,510 m) and 1 OSV berth (length 58 m), permissible draught 13 m (on high tide);
- OSV jetty: 2 finger jetties (4 × 90 m), berthing faces (2 × 40 m), permissible draught 8.5 m; and
- NRW extension: Multi-purpose berth: 635 m (North)/150 m (South), permissible draught 10 m

At present, the port is fully geared up to handle 20 million ton per annum with complete infrastructure in place.

(3) Cargo Traffic

Cargo handling volume from April 2014 to March 2015 is 17.961 million ton (Import: 13.723 million ton, Exports: 4.237 million ton).

(4) Connectivity

National Highway 216 passes through Kakinada Port. The port is connected to National Highway 6 (formerly 5) by a 60 km road. The port is also connected to Howrah – Chennai trunk railway line with a 20 km railway.

(5) Development Plan

The port still has three berths to be developed south to the existing berths.

6.2.16 Dahej/Hazira

(1) Geographic Conditions

Dahej Port and Hezira Port, which are both private ports in the State of Gujarat, handle LNG, crude oil and dry bulk. Containers have also been recently handled in Hazira Port.

(2) Facilities

Dahej

The major terminals in Dahej port are shown in Table 6.45. Adani Petronet (Dahej) Port Private Ltd. (APDPPL) handles bulk and break-bulk cargo. A gas pipeline network (HBJ Pipeline) is connected to Petronet LNG Terminal, which is operated by Gail, the largest governmental company which produces and supplies natural gas in India.

Table 6.45 Major Terminals of Dahej Port

Terminal	Cargo Type	Depth (draft)	Handling Capacity	Max vessel size
Dahej Harbour Infrastructure Limited. (Birla Copper)	Dry Bulk (coal, copper)	13m	4.5 Million MT	70,000 DWT
Gujarat Chemical Port Terminal Company Limited. (GCPTCL)	oil, petroleum products & chemicals	20m	300,000 m3	60,000 DWT
Petronet LNG	LNG		10 Million MT	155,000 m3
Reliance Industries Limited (IPCL)	Liquid hydrocarbon	8m		8,000 DWT
Adani Petronet	Bulk/Break Bulk	14m		90,000 DWT
ABG Shipyard Limited				
Ro-Ro Terminal and Port Development				

Source: Survey team

Hazira

There are two operators in Hazira port; Hazira LNG & Port capitalized by Shell and Total to handle LNG, and Adani Hazira Port Pvt. Ltd. (AHPPL) to handle other cargo. 5 Berths with 13 m depth have been developed and operated by AHPPL as part of the first phase. Out of the 5 berths, 2 cater for containers, 1 for coal and 2 berths are used as a multi-purpose terminal for handling vessels of sizes varying from 80,000 DWT to 150,000 DWT. The operation of Hazira LNG & Port, which is currently equipped with a jetty of 12 m depth, LNG tank, and re-gasification terminal, was started in April 2005 with an investment cost of USD 700 million.

The AHPPL, which currently has three multiple berths with a 900 m quay of 13 m depth and two container berths with a 600 m quay as phase 1, handles coal, steel, liquid cargo, and containers. The container handling capacity is planned to be expanded to 2.2 million TEU per annum by developing four berths with a 1400 m quay. Other development plans are one berth for coal terminal and four berths for multi-purpose use, in addition to the liquid terminal, RORO/vehicle terminal, general cargo terminal and dock.

(3) Cargo Traffic

AHPPL handles approximately 30,000 TEU of containers and 1 million ton of bulk per month.

(4) Connectivity

Dahej Port: Dahej is the nearest railway station for APDPPL connectivity, which is a part of the Western Railway Network. APDPPL has bridged the gap between the port and Dahej Rail Yard through a private railway network. A 42 km long four lane highway connects Dahej with the district headquarter Bharuch which lies on the National Highway 8 from Mumbai to Ahmedabad.

Hazira Port: Private siding operated by KRIBHCO joins the Mumbai-Delhi line and extends for about 20 km. Hazira Port is about 21 km away from the KRIBHCO siding. Efforts are currently underway to develop rail connectivity to the port. National Highway 6 originates from Hazira Port and connects it to all other important roads in the vicinity.

(5) Development Plan

Major investment plans in connection with Dahej Port are shown in Table 6.46.

Table 6.46 Major Investment Plans at Dahej Port

1. A facility for operating RO-PAX ferry services at Dahej on the mouth of the Narmada River is under development by Gujarat Maritime Board.
2. Development of an SEZ linked with the port is underway
3. Undertaking the expansion of LNG handling facilities at Dahej
4. Development of Solid cargo terminal at Dahej is in progress

Source: Gujarat Maritime Boardwebsitehttp://www.gmbports.org/showpage.aspx?contentid=1492

6.2.17 Pipavav

(1) Geographic Conditions

Pipavav Port, located in the State of Gujarat on the west coast of India, is a private port operated by APM Terminals Pipavav. In addition to containers, Pipavav Port handles a variety of bulk cargo such as coal, cement, clinker, fertilizers, steel, iron ore, agri-products, salt and soda ash.

Source: APM Terminals Pipavav

Figure 6.31 Port Layout (Pipavav)

(2) Facilities

The port has the following facilities:

- Container: quay length 725 m, 14.5 m draught, handling capacity 850,000 TEU per annum;
- Bulk cargo: quay length 690 m including a 350-m multipurpose berth, 13 m draught; and
- Liquid cargo: 1 berth, 10.5 m draught

(3) Cargo Traffic

Recent cargo traffic at the port is shown in Table 6.47.

Table 6.47 Evolution of Cargo Handling (Pipavav)

Year	2012	2013	Jan 2014 - Mar 2015 (15 months)
Bulk (mil. tons)	3.12	3.17	4.64
Container (TEU)	570,480	661,865	980,689

Sources: APM Terminals Pipavav Annual Report

(4) Connectivity

The port is connected to the national railway grid at Surendranagar through a 269 km broad gauge rail built by Pipavav Rail Corporation Limited (PRCL). The port was the first port in India to receive double stacked container trains in March 2006, which currently runs between ICD Kanakpura (Jaipur) and the port. APM Terminals Pipavav has developed an 11 km, a four-lane expressway which connects the port to National Highway 8E.

(5) Development Plan

Apart from the already developed port infrastructure, there is adequate land available for future expansions which include, according to APM Terminals Pipavav, development of additional berths, cargo storage facilities, rail and road infrastructure, installation of rail mounted gantry cranes to handle increased rail volumes etc.

6.2.18 Summary

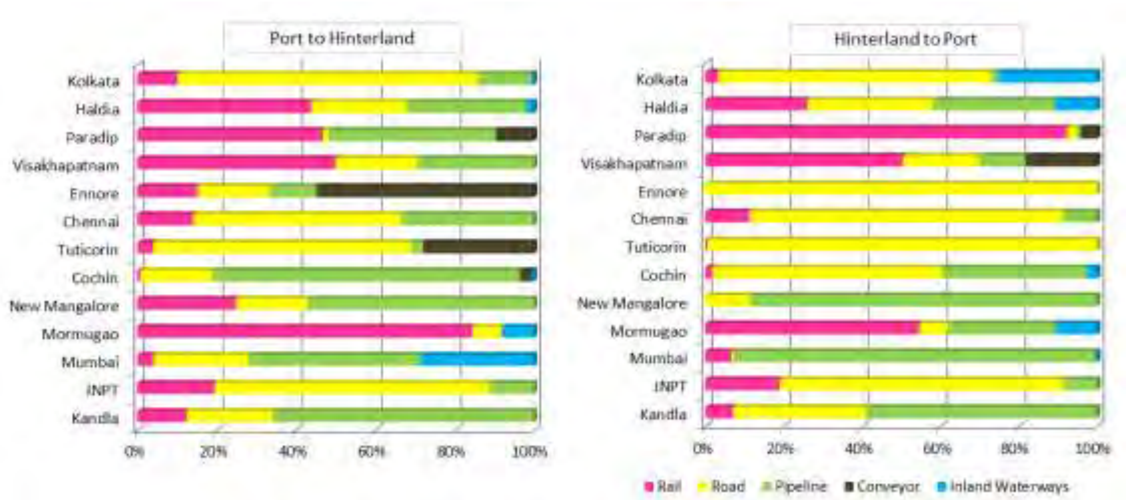
Through the assessments of major ports and some private ports, including the planned ports of Colachel and Vizhinjam, the following issues have been identified:

(1) Port Capacity

It is required to expand the port capacity, in light of rapidly increasing container and bulk cargo traffic and economic growth of the country and the region.

(2) Hinterland Connectivity

In case of Kolkata, Ennore, Tuticorin, Cochin, and Mumbai, the share of railway transport is significantly less than that of road which could exacerbate traffic congestion in the major port cities. In the light of the expected economic growth and substantial growth of cargo throughput at Indian ports, it is imperative to enhance the rail connectivity and capacity, such as the Dedicated Freight Corridor Projects. The rapidly increasing cargo throughput will also require improvement of road connectivity. In addition, inland waterways are generally underutilized. It is therefore recommended that the port sector and other transport sectors collaborate for development and improvement of evacuation systems through roads, rails and inland waterways, in line with the Sagar Mala Concept.

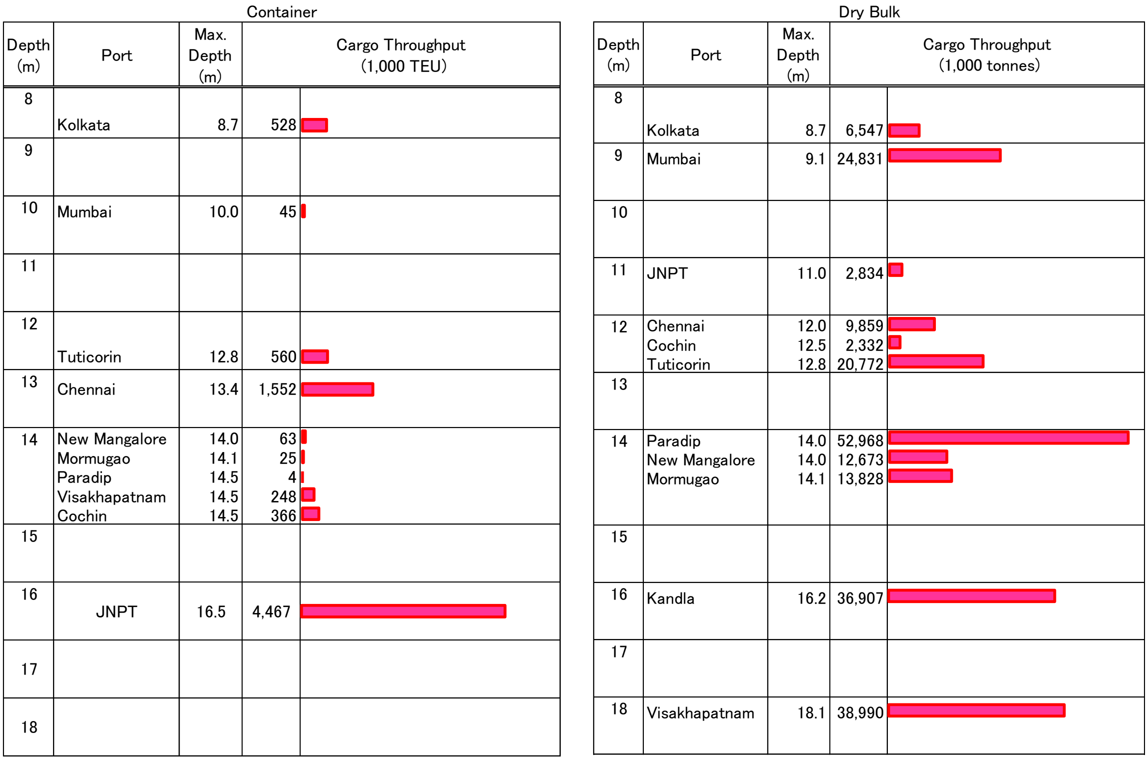


Sources: Survey Team based on "Major Ports of India, A Profile: 2014–2015" (Indian Ports Association)

Figure 6.32 Modal Split of Traffic at Major Ports during 2014–2015

(3) Maximum Allowable Draft

Figure 6.33 (left) shows the maximum draft of container berths and container throughput of the respective ports, whereas Figure 6.33 (right) shows the maximum draft of dry bulk handling berths and cargo throughput (dry bulk) of the respective ports. The maximum allowable drafts at Kolkata and Mumbai are substantially limited, compared with other major ports, which means those ports are not able to accommodate larger vessels. Chennai and Tuticorin, where the depth of berths is 14 m or less, may also need deeper berths to handle container and bulk cargo.



Sources: Survey Team based on "Major Ports of India, A Profile: 2014–2015" (Indian Ports Association)

Figure 6.33 Max Depth of Berths and Cargo Throughput

(4) Capacity Building

Capacity building is required for several reasons:

- In India, project preparation is undertaken by port trusts through feasibility studies, followed by preparation of Detailed Project Reports (DPRs). These exercises are conducted without a long-term vision for concerned ports such as port development master plans.
- Although India has experience in port development under a PPP scheme, the implementation of projects has not always been smooth; it is not unusual for there to be delays in the PPP transaction process, as well as pauses in in the initial stage of project implementation.
- While more and more port facilities are being developed, it is imperative to ensure that port facilities are properly operated and that the entire port is operated effectively.

Thus, enhancing the technical capability of the public sector in areas such as port planning, implementation of port projects under PPP scheme, and port efficiency is required.

6.3 Pakistan

6.3.1 Karachi

(1) Geographic Conditions

Karachi port was developed in 1867, at the gateway of the metropolitan city of Karachi, with a total area of 140,265 acre; This consist of 10,292 acre of port facilities, water area of 121,329 acres and 8,644 acres of other categories. The port facilities were developed on shallow swampy foundations and an access channel was formed by dredging sand with soft silt material.

Source: Survey Team

Figure 6.34 Karachi Port Oil Terminal & PICT

Source: Survey Team

Figure 6.35
Karachi Port Pakistan Deep Sea Water Container Port Reclamation Works & Breakwater Construction

(2) Facilities

Dimensions of the access channel are summarized in the table below. The maintenance dredging required at berth alongside /Berthing basin is responsible of KPT.

Table 6.48 Access Channel Used for the Terminal

	Length (m)	Depth(m)	Width (m)
Turning Basin	420	13	420
Access Channel	11,500	13	300

Source: KPT

KPT has two container terminals managed by private operators and one terminal operated by KPT within the port.

- KICT (Karachi International Container Terminal, terminal area of 26 ha) operates at the west wharf Berth No. 26 to 30 with 3 berths in total length of berth 963 m by Hutchison Port Holding (HPH) group.
- PICT has handled containers, by developing existing berths number of 6 to 9 at the East wharf from 1998.

Berth no 13-14-15-16-17 on East wharf are used for handling bulk cargo (mainly coal) approx. 3.0 million ton in 2014.

(3) Cargo Traffic

PICT and KICT both had congested by traffic volume as summarized in the tables below. The growth of traffic volume of container had been 8% between 2010 and 2014, in average annual growth rate is 2 %.

Table 6.49 Container Traffic Volume from 2010 to 2014 at KICT

Year	Container traffic (TEU)
2010	854,122
2011	865,170
2012	869,450
2013	892,862
2014	921,750

Source: KICT

Table 6.50 Container Traffic Volume through PICT

Year	Container Traffic (TEU)
2010	622,425
2011	659,256
2012	586,731
2013	675,321
2014	699,582

Source: PICT

As shown in the table below on origin/destination of container through the port, the share of trade with ASEAN region occupies about 29% to 32% of the total volume. KPT handle transit cargo by railway and trucks to upcountry.

Table 6.51 Origin/Destination of Container through Karachi Port

Region	2010	2011	2012	2013	2014
ASEAN	186,116	220,472	248,084	251,663	258,825
Middle East	11,567	22,617	13,275	5,764	4,135
Africa	92,144	64,250	101,626	99,685	83,100

Source: KICT

(4) Connectivity

Connectivity to the upcountry of Pakistan and into Afghanistan was developed by constructing a national highway and railway networks from the Port. Railway transport of container volume is very small, with a share of about 1%–2% of total volume, since the railway transport in Pakistan is not reliable, safe or punctual in delivery.

The shares of imported containers for domestic use and transported cargo to the other countries average 40% and 60 % respectively. Volume share of cargo transported to Afghanistan is about 5%–7% of all total imported cargo.

(5) Development Plan

- **Dedicated Coal Terminal East at Berth 13 to 17** (Quay Length 759 m, Terminal area 25 ha, Depth along the berth −14.0 m capacity of 8.8. million ton,) was developed to import coal which is then transported by railway to power plants in the Punjab province and to a cement factory in Sindh Province.
- **Existing Oil Piers 3** to be reinforced as Multipurpose Liquid Bulk Piers by deepening the existing depth of −10.5 m to −13.0 m around constructions.
- **Cargo village Industrial Park / Off Dock Facility** (320 ha) to be developed in the Western Back waters area and served by an elevated motor way corridor, which connects the Karachi Deep Water Port to Karachi city for direct cargo delivery.
- **Pakistan Deep water Container Port** to be placed East of Keamari Groyne for a new container terminal. The project will be implemented through a PPP scheme. KPT will develop basic infrastructure. A private terminal operator called “SAPT (South Asia Pakistan Terminal)” was contracted by KPT in 2010 to develop a quay wall, on land facilities and procurement for installing cargo handling equipment.

6.3.2 Bin Qasim

(1) Geographic Conditions

The Port is situated in the Indus delta region on Sindh Coast and is accessible from Arabian Sea through 45 km long navigation channel and located at a distance of 28 nautical miles from the south-east of Karachi. PQA is an eco-friendly port, geographically located on a trade route of in the Arabian Gulf.

Figure 6.36 Bin Qasim International Container Terminal

Figure 6.37 Gate of Bin Qasim International Container Terminal

(2) Facilities

The following industrial parks have been developed around the port operation area. In the South area 9,000 acres have been developed for the textile city, in the Central parts 11,000 acres has been developed for an industrial estate and in the North West parts 3,000 acres have been developed. In the East parts there have been no significant infrastructure developments.

Table 6.52 Terminals Users and Detailed Facilities at PQA

Terminals	Operation Start	Design Capacity	Quay Length	Loading Capacity
LCT	2009	35000 DWT, 4 million ton/year	185 m	1000 ton/hr
MW 1	1985		200 m	
MW 2	1985		200 m	
MW 3	1985		200 m	
MW 4	1985		200 m	
QICT 1	1997	75,000 DWT 0.60 Mil TEU/year	600 m	22 TEU/crane/hr 9 cranes are operate
QICT 2	2011	75,000 DWT 1,175 Mil TEU/year	735 m	
Grain & Fertilizer by FAP	2010	75,000 DWT 4 million ton/year	300 m	1600 ton/hr
Liquid Chemical Terminal by EVTL	1998	75000 DWT 0.4 million ton/year	325 m	1200 ton/hr
Steel Mil Jetty IOCB	1980	Max 75,000 DWT	250 m	
FOTCO	1995	75,000 DWT 0.9 Mil ton/yea	280 m	
Sui South Gas Co (SSGC)	2012	50000 DWT 2 million ton/year	230 m	
LNG	2015	6 vessels in 2015		
PIBT under construction	2016	Coal, cement, clinker		

Source: PQA

(3) Cargo Traffic

Bulk Cargo

The traffic volume of bulk cargo and number of ships passing through PQA has steadily increased but not substantially increased. PQA has a limited capacity for handling containers and general cargo with 6 berths.

Table 6.53 Traffic Volume and Number of Ships

Period	Handling Volume (Million Ton)	No's of Ships
2008-2009	25.0	1,230
2009-2010	25.6	1,187
2010-2011	26.2	1,229
2011-2012	24.0	1,089
2012-2013	24.7	1.057
2013-2014	25.7	1.072

Source: PQA

PQA has 14 m depth of the channel (−15.0 m HWL) and 45 km distance of access channel. The private operators using the Port Bin Qasim area is listed as follows;

Table 6.54 Major Industries Operating in Bin Qasim Port Area

Industries	Activities in Port Bin Qasim
KESC Thermal Power Plant	The plant is spread over 223 acres of land with a 1260 MW power generation capacity. It has been developed at a cost of Rs. 1.4 billion and been in operation since 1984.
Indus Motors Automobile Plant	Developed through a joint venture between Toyota Company of Japan and House Habibis of Pakistan at a cost of USD 100 million over an area of 105 acres of land, the plant has been operational since 1993.
Engro Asahi Poymer Plant	The plant was developed over an area of 30 acres of land at a cost of Rs. 560 million to produce various types of Petrochemicals/Fertilizer and has been operational since 2002.
PPTA Plant	Operational since 1998 with a designed capacity of 0.43 million ton of annual production. The plant is spread over an area of 150 acres and has been completed at a cost of USD 500 million.
Bin Qasim Fertilizer Plant	Developed by the Fauji Foundation of Pakistan over an area of 350 acres of land at a cost of USD 370 million, the plant has been operational since 1998.
IFFCO Pakistan	The refinery was developed over an area of 15 acres at a cost of USD 34 million and integrated with a bulk oil terminal. It has been operational since 1993 and possesses the manufacturing capacity of 0.4 million ton per annum.
BOC Gases, UK	Established over an area of 10 acres, the plant has been developed at a cost of Rs. 1.25 billion. The main production is hydrogen gas, nitrogen gas etc. The plant has been operational since 1998.
Engro Chemicals (NPK Plant)	The facility has been developed over an area of 30 acres of land at a cost of USD 81 million to produce fertilizers of various types and has been operational since 1999.
Mapak Edible Oil Refinery	The refinery has been developed at Port Bin Qasim through a joint venture of Malaysia and Pakistan with a refining capacity of around 0.4 million ton per annum at a cost of USD 20 million. The plant was commissioned in 2006.

Source: PQA

Container Traffic by QICT

DP World developed a second terminal on the marshalling wharf adjacent to the grain/fertilizer terminal. QICT transport some of the container cargo by railway transport up to the regions which border other countries.

The QICT terminal has a holding capacity of 1.0 Mil TEU and plans to increase this to 1.2 mil TEU in the future. The terminal capacity can be increased by shortening the dwelling time of import containers in the yard from 10 days to 5 days; the terminal capacity can potentially be improved to 2 mil TEU.

Table 6.55 Trends of Container Traffic from 2009–2014 (1,000 TEU)

Year	2009–2010	2010–2011	2011–2012	2012–2013	2013–2014
Import (TEU)	374	382	355	356	420
Export (TEU)	382	397	377	366	434
Total (TEU)	756	779	732	722	854

Source: QICT

QICT has suggested to parties that the container volume handled in 2013–2014 was 942, 800 TEU and that they are expecting to handle 1.0 mil TEU in 2015. QICT receive an average of 56 container ship calls per month.

(4) Connectivity

PQA had acquired the land, access channel, roads and railway for dedicated private partners to develop and operate water front facilities required by their businesses.

The new railway station was developed at Bin Qasim Railway from Karachi to Lahore through Bin Qasim station with double tracks. The single track railway line was extended up to the port operation area via the container terminal area and through the Bin Qasim industrial area. PQA and National Railway made an MOU (Memorandum of Understanding) for cargo transport by railway to sites further up country which will start operation from 2017.

Containers from this terminal are transported by trucks to Afghanistan. The volume transported is 15% of the total; the railway carries 60 TEU by one train. The PQA terminal is located away from city center of Karachi and good road networks are developed for direct access upcountry.

(5) Development Plan

- The coal & clinker/cement terminal, will develop by PIBT (developing railway connectivity, truck yards and increasing handling volume from 8 million ton to 16 million ton) by BOT at cost of USD 250 mil. This project is scheduled to complete in Dec 2016.
- 1320 MW Coal Fired Power Plant with self use jetty to handle 4 million ton of coat at jetty at cost of USD 2 Billion. The project is scheduled to complete by Dec 2017. Coal is the most important commodity imported for Sahiwal Power Plant, followed by other plants by 2017.
- Development of 2nd oil terminal (Pipe line installation for transport LNG 3 lines × 6000 m) to be developed by BOT to handle 9 million ton/year at cost of USD 100 mil.
- LNG terminal development (Engro Energy Terminal); with storage tanks that possess 120,000 and 151,000 m3 capacity by SSGC for 2nd LNG terminal development on BOT basis to handle 3 million ton/year at cost of USD 130 mil.
- Reinforcement of importing iron/ore coal volume to increase steel products developed by steel mills as 2nd Iron Ore & Coal Terminal to be developed by BOT to handle 6–9 million ton /year at cost of USD 200 mil.

- Development of 1st QICT and 2nd QICT (Bin Qasim International Container Terminal) together with the Marginal Wharf development will be achieved by deepening the depth along the waterfront area and widening the on land area. The present handling volume in 2014 is more than 75% over capacity and expansion of terminal facilities are essential; including the basin planning.
- Developing a dedicated oil terminal for importing furnace oil.
- PQA plan to develop a 2nd grain terminal, container terminal and 2nd coal terminal for coal fired power plants to be developed by BOT basis to handle 12–16 million ton /year at cost of USD 250 mil.
- Requests of JICA technical assistant of feasibility study and Capital Dredging of Access Chanel and Development of second Inner Channel

Regarding the last item, PQA intends to request JICA for Technical Assistance to conduct a feasibility study of capital dredging of access channels and development of secondary inner channels; which include analyzing the mechanism of in- fill deposits in the outer channel and establishing a maintenance dredging strategy for the outer access channel. Furthermore it is envisioned the loan will cover development of a second inner channel and if possible the actual capital dredging cost.

Proposed scope of the study includes below:

- Minimum depth & width required along with realignment of the channel bends in the existing channel to accommodate vessels of 14.0 m draught, 355 m LOA and 55 m Beam, whereas, ships handling parameters and Nav-Aids for alternate navigation channel need to be ascertained on the basis of the feasibility study.
- Site investigations, such as soil investigation (Geotech), Tidal flow regime, winds, waves, and current effects.
- Determine the channel alignment, bends alignment and requirement of turning basin and its location and area, waiting area, inshore anchorage along the channel.
- Risk assessment of Marine Traffic and risk analysis and operational limits.
- Accessibility of vessels at all stages of tide including tidal benefit.
- Environmental impact assessment.
- Review the existing duping area and selection of suitable sites in creek area and offshore.
- Assessment of requirement of installation of VTMS.

There is a comment in the seminar to study the fishing industry to be included.

There is fishing port called “Kolangi Fishing port” within the Port Bin Qasim water area. The fishing boats use the main inner channel called “Phittee Creek as inner channel” for crossing and sailing between the fishing area and fishing port. It is very dangerous navigational situation. In order to avoid the clash/collision of fishing boats with large container/bulk ships, PQA propose to develop second inner channel for safe navigation of main large ships to Port Bin Qasim

Under the proposed study of PQA the relocation of fishing port and related facilities with berthing should be studied to provide safe navigation.

6.3.3 Gwadar

(1) Geographic Conditions

Gwadar Port is located at the mouth of Persian Gulf, outside the Straits of the Hormuz on Arabian Sea, and lies in the dry desert area of the Baluchistan Province. It is near the key shipping routes used by the mainline vessels in the region, with further connections to Africa, Asia and Europe.

(2) Facilities

Presently the depth is 14.5 m but ultimately it will be increased. Gwadar port plans to develop a deep sea terminal to receive the original larger ships directly at the port. Gwadar Port Authority intends to become an international hub port by implementing planned development projects by 2030 with support of the Pakistan Government and Chinese Government.

Facilities in Phase-I development have been completed. The port is planned to develop 3 berths (3 × 200 m long), receiving ship size up to 25,000 to 30,000 DWT containers vessels and bulk carriers 50,000 DWT bulk carriers draft of 12.5 meter maximum depth respectively.

- 1 RORO facility, 1–100 meter service berth
  km long approach channel dredged to 14.4 m depth at outer channel, 13.8 m at inner channel /turning basin and 14.5 m depth alongside berth.
- Outer channel is -206 m and inner channel width in 155 m
- Turning Basin 595 m diameter

Table 6.56 Planned Area of the Facilities in Port

Port area	64,000 m^2
Container stacking area	48,300 m^2
Empty Container Stacking Area	6,875 m^2
Storage area	28,700 m^2
Transit shed	3,750 m^2
Maintenance workshop	1,440 m^2
Vehicles servicing garage	450 m^2
Common offices for GPA, customs	4 ,144 m^2
Future development area	118,575 m^2

Source: GPA

Phase-II is planned to have nine additional berths.

- Four container berths.
- One bulk cargo terminal (to handle 100,000 DWT ships).
- One grain terminal.
- One RORO terminal.
- Two oil terminals (to handle 200,000 DWT ships).

(3) Cargo Traffic

The traffic data is not published.

(4) Connectivity

The movement of containers/cargo to and from upcountry will either be done through railway or heavy transport.

The rail network is required to be laid by the government. There is a dire need for a modern railway network.

Gwadar is required to develop a coastal highway, approximately 600 km long, to Karachi. The current travelling time is 7–10 hours depending on mode of transportation.

The master plan of the city has been prepared. Necessary road networks within the port area have been completed, but the main roads from neighbor countries, northern parts of China and Kariachi, Pakistan are not yet developed. 46,000 acres of land has been earmarked on the eastern side for an EPZ.

(5) Development Plan

Gwadar Port Authority (GPA) has been party to all planning and appraisal processes for China-Pakistan Economic Corridor programs. The following projects related to Gwadar Port & Port City of Gwadar have been agreed with USD 46 billion for all modes.

- Construction of Breakwaters, Gwadar Port
- Dredging of Berthing Areas & Channels, Gwadar Port
- Pak-China Technical & Vocational Institute
- Infrastructure Development for Free Zone & EPZs, Gwadar
- EPZA & GIEDA
- Necessary Facilities of Fresh Water Treatment, Water Supply GDA
- China-Pakistan Friendship Hospital (Up-gradation of existing 50 bedded hospital GDA
- A desalination plant has been set-up at Gwadar Port to supply 100,000 gallons/day of drinking water to ships calling Gwadar Port
- Coal-based Power Plant at Gwadar Min of Water & Power
- Construction of Gwadar International Airport CAA
- Completion of construction of planned main roads and railway networks from neighbor countries, northern parts of China and Big city of Pakistan Karachi.
- Presently Gwadar has no building or accommodation to accommodate the human influx and store the bulk supplies of any kind.
- The development of facilities planned for Phase II will be implemented.

In Pakistan Vision 2025, the future development plans of Gwadar Port and its regional linkages are described as follows:

- The Port will be built as a leading port in the region to serve as a gateway to the China-Pakistan Economic Corridor (CPEC).

- Two important road and highway projects include the development of linkages between the Port of Gwadar and the National Trade Corridor, and upgrading the Karakoram Highway to cater for increased traffic with China.

- The CPEC project is aimed at enhancing economic regional integration in investment, energy, trade, and communication and creating linkages between the western China and Pakistan by establishing communication links and developing economic and trade corridors.

- The CPEC offers a unique opportunity to Pakistan to integrate with regional developments and become a hub for trade and manufacturing with Gwadar Port developed as an international free port.

- Pakistan will take advantages of CAREC to help Central Asia and its neighbors realize their vast potential by promoting regional cooperation in four priority areas: (i) transport; (ii) trade facilitation; (iii) energy; and (iv) trade policy. Pakistan will benefit from its strategic location and serve as gateway to Central Asia and attain energy security by connecting to Central Asia.

6.4 Sri Lanka

6.4.1 Colombo

(1) Geographic Conditions

The Port of Colombo lies on Sri Lanka's southwestern shores on the Kelani River. With one of the world's biggest artificial harbors, the Port of Colombo handles most of the country's foreign trade and is a major Indian Ocean seaport. The Port of Colombo, located in the South-West corner of the island is rated amongst the Top Container ports in the world.

The port's natural geographic location is strategically positioned on the main East-West shipping route, linking the Far East with Africa, Europe, and the East Coast of the US, providing ideal connections to the trade in the Indian sub-continent. This makes the Port of Colombo a superb strategic hub.

Source: Survey Team

Figure 6.38 JCT Terminal in Colombo Port

Figure 6.39 South Asia Gateway Terminal in Colombo Port

(2) Facilities

The facilities available at the Port of Colombo are as follows:

- Harbour Area at low water; 195 ha, Length of South-West Breakwater 1,570 m, North-West Breakwater 810 m, North-East breakwater 330 m,
- Total number of berths is 27, Dimensions of the main terminals are provided below;

Table 6.57 Port Facilities of Main Terminal in Colombo Port

Jaya Container Terminal (JCT)	i) 4 container berths and 2 feeder berths, 1,292 m Main berth and 350 m feeder berth ii) Depth alongside berth 12.0–15.0 m iii) 45.5 ha of container terminal Area iv) 1,548 TEU reefer stacking capacity
Unity Container Terminal (UCT)	i) 2 container berths + 1 multipurpose berth ii) Depth alongside berth 7.5 m to 11.0 m iii) 1.53 ha of container terminal area iv) 8,000 TEU stacking capacity
South Asia Gateway Terminals (SAGT), The hub of Tomorrow's World	i) 940 m long of main quay wall container berth ii) Depth alongside berth 15.0 m iii) 5,544 TEU stacking capacity
Bandaranaike Quay	920 m long of berth, Depth 7.0 to 9. 5 m
Passenger Terminal	180 m long of berth, Depth 9.5 m

Source: SLPA

(3) Cargo Traffic

The container traffic volume through Colombo port has been growing as follows;

Table 6.58 Container Traffic and Ship Calls

Year	Container traffic total (Mil TEU)	SLPA	SAGT	CICT	Number of ship calls
2012	4.187	2.317	1.870	No	3,870
2013	4.306	2.502	1.747	0.058	3,667
2014	4.908	2.559	1.662	0.687	3,742
2015 (up to Aug)	3,438	1.520	0.924	0.995	2,792

Source: MOL Colombo Office/Ceylon Association of Ships Agents

About 60% of the transshipment containers handled originates from the Indian Subcontinent. About 75% of total container traffic volume in 2014 (Approx. 3.6 mil TEU) were transshipment through the Terminal.

Table 6.59 Traffic Volume of Non-Containerized Cargo through the Port 2012–2015

Year	International Trade					Domestic Traffic volume	
	Cargo Discharge (× 1000 ton)	Cargo Loaded (× 1000 ton)	Vehicle by RORO (unit)	Number of Ship calls		Cargo Discharge	Cargo Loaded
2012	8,151	13	39,069	643			
2013	7,095	191.5	n/a,	268		14,814	4,220
2014	7,394	71.4	n/a	251		16,027	4,397
2015	4,914	210	n/a	293		5,103	207

Source: Ceylon Association of Ships Agent

(4) Connectivity

The port access road is not good. Under the Metro Colombo Master Plan, it is proposed to develop a port access road and to widen it from 4 lanes to 6 lanes providing connection with the existing highway network.

There is an intake railway line inside the port area. The cargo is mainly transported by trucks to the hinterland.

(5) Development Plan

To renovate the existing passenger berths to handle general cargo, Berth No 1, 2B, 11 and 12 of SJT and provide the berthing facilities to feeder ship lines of Mega Carriers.

SLPA plans to develop a concept for a tourist attraction area combined to with the port facilities and a number of colonial design buildings located around the port area. In order to realize this concept, a long distance cruiser ship terminal is planned.

The following port related infrastructures are required immediately:

- Port Access road development to increase 6 lanes from existing 4 lanes, which is already planned and some parts already constructed.
- SLPA plans to develop custom inspection area by X ray monitoring system.
- Constructing residence for SLPA's employees along the planned port access road.
- The connection point with highway and port which is planned to be located at the entrance of the Port.
- Alignment of Port Access shall be planned such as city traffic does not come into the Port area. Modification of road and cargo handling yards including warehouses and improvement of safety measures are needed, including the elevated port access road to be constructed for easy access to the port, while improving mobility and increasing connectivity with an expressway network.

The following projects are planned to be implemented at the Port of Colombo:

- Construction of a modern Port City inclusive of all facilities in the area of 575 acres
- Modernization of Road Network within the Port Premises
- Expansion of facilities of JCT for handling inland containers
- Introduction of a suitable Automated Cargo Management System after identifying the present deficiencies and areas for improvement
- Development of a new cargo village as inland container depots at four candidate sites including Peliyagoda
- Development of Passenger Terminal Facilities for world cruise passenger vessel and ferry service. Development of the North Harbor of the Port of Colombo

The noted development projects for the Port of Colombo are planned by SLPA. These investment plans are consistent with the recommended project list for the Western Region Megapolis Master Plan published in January 29, 2016 by Ministry of Megapolis and Western Development, except for the development of the North Harbor of Colombo Port.

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SLPA planned to develop the North Harbor of Colombo Port, located at the north of JCT,, although an investment plan has yet to be finalized. SLPA has placed priority on development of the South Harbor. SLPA is scheduled to start development of the western terminal of the South Harbor after 2020 after observing traffic growth trends. SLPA has not set specific investment plan for development of the North Harbor project.

6.4.2 Colombo South Harbor

(1) Geographic Conditions

The South Harbor has developed three terminals (East, South and West terminals). The 'Colombo South Harbor' is located west of the present south west breakwater (Queen Elizabeth Quay) with a water area of approximately 600 hectares.

Figure 6.40 Colombo Port/South Habor

Figure 6.41 CICT in South Harbor

(2) Facilities

The harbor will be served by a new two-way channel with a depth of 20 m and a width of 570 m. The new breakwaters in the initial phase will enclose a basin area of 285 ha which will support three new terminals each with a quay length of 1200 m and a land area of 58 ha. The basin will be dredged to –18 m with provision to deepen it to −21 m for receiving a new generation of deep drafted vessels. There is also provision to extend the breakwater under a second phase to provide area for a fourth Terminal. The length of breakwater is 6.4 km. Further outlines of the South Harbor are as follows:

- Three Terminals – Each terminal three berths with 1,200 m quay length, and designed yard area of 58 ha each terminal, Design Capacity of 2.4 mil TEU
- Water depth alongside the berth; 18.0 m
- Water depth of access channel −20 m
- Yard area 58 ha per each terminal (Yard width 470 m)
- 1stdevelopment is South Terminal, 2nd is East terminal, then the West Terminals
- Commence Break water construction of 6,830 m longas Phase 1 in 2008 & completion of 1st Terminal by 2013
- SLPA developed East Terminal 470 m long of the berth at −18.0 m depth by 2015.
- SLPA owned 49% of the shares of developing this terminal.
- SLPA made the concession agreement with China investor to develop the south terminal named as "CICT (Colombo International Container Terminals Limited" with following berthing facilities.

Table 6.60 Port Facilities of CICT

Alongside depth	18.0 m
Number of berths	4 berths
Berth length	1,200 m
Quay cranes Post-Panamax	12 units
Rubber Typed Gantry Cranes	40 units
Yard area Yard width	35 ha 470 m
Designed annual throughput Capacity	2.4 mil TEU

Source: SLPA

(3) Cargo Traffic

The target volume of handling container volume per terminal is set at 3.5 to 4.0 Mil TEU/Terminal, practical level of handling volume will be 2.4 to 3.0 Mil TEU.

(4) Connectivity

Refer to information on connectivity of the Colombo Port.

(5) Development Plan

When the demands saturate the present capacity of container handling in the port, West terminal is planned to be redevelop in 2018 or 2020.

- The tender for procurement of container handling equipment at East Terminal is called in the beginning of 2016
- Tender of terminal operator with SLPA for developing the remaining parts of East Terminal (length of 470 m)

6.4.3 Hambantota

(1) Geographic Conditions

The Port of Hambantota is located at 6°07 north and 8l°06' east facing the southern ocean, and will have direct access to the main international shipping route linking the Asia Pacific Region with Europe and North America.

(2) Facilities

- In Phase 1; RORO terminal with 600 m long of 2 berths and 17.0 m depth to accommodate car carriers for transshipment,
- Oil terminal with 2 jetties with 1 berth of 300 m and dolphin type jetty of 150 m and oil storage tanks for bunkering service, which is planned to expand to develop LNG supply facilities in Phase 2 and 3
- Dredging works consist of the approach channel at a length of 1 km from a depth of −20 m offshore and basin at depth of −17 m.
- General cargo, bunker services to ships calling the port and development of new roads.
- In Phase 2; provide further expansion for coal handling and RORO terminals, together with the establishment of new container terminals and commercial operations. Commencement by 2015.

The Project of Stage 2 is ongoing and includes construction of the following facilities (it is scheduled to complete 90 % by the end of this year):
Key Project Features:

- Depth of Basin - 17 m
- Depth of Channel - 16 m
- Circle of Turning basin - 600 m
- General Cargo Quay Length - 600 m at 17 m depth
- OIL & GAS Quay length - 310 m
- Service Terminal - 105 m
- Break water length - 1,450 m
- Dredging volume - 12 Mil Cu m

For bulk terminal handling of sugar, fertilizer and petrochemical products there are demands of containers; the container yards will be provided from the bulk terminal area.

The total berth length of the bulk terminal is 2,400 m with a depth of −17.0 m for accepting 100 to 120,000 DWT bulk carriers.

(3) Cargo Traffic

Cargo traffic through the Hambantota port is as summarized in the table below.

Table 6.61 Cargo Traffic through Hambantota 2012-2015

Year	Discharge (Tones)	Cargo Loaded (Tones)	Number of ship calls	Vehicles
2012	17,081	2,635	34	10,849
2013	89,870	28,709	139	n/a
2014	315,563	158,449	335	160,000
2015 (Up to Aug)	129,998	78,838	203	n/a

Source: Ceylon Association of Ships' Agents

(4) Connectivity

The following development projects of road and railway are required and planned.

Road Development

- Extension of Highway to Mattala
- 6 Lane Roads in & outside Port

- Service/Utility Corridor
- Flyovers at Major Junctions in & outside Port

Rail Connection

- Extension of Rail Line and Air Port development
- Port internal Railways

(5) Development Plan

Stage 3 will introduce a major container transshipment terminal which is expected to begin operation by 2025. SLPA plans to see the traffic demands up to Stage 2 and to take intermitted time for proceeding with the next stage of Phase 3 and 4 to review the present development plan.

NPD suggests to develop RORO terminal development and operations at Hambantota Port due to limited space in Colombo instead of the Colombo Port, as all RORO operations are to be operated at Hambantota Port as it requires a massive yard area and Colombo Port cannot accommodate such terminal development.Apart from that, it is proposed to study the rehabilitation of the harbor rail line under an ADB Transport Preparatory Facility to provide rail connectivity to handle container cargo, thereby facilitating connectivity to proposed cargo village/dry ports.

6.4.4 Trincomalee

(1) Geographic Conditions

The Port of Trincomalee has the potential to develop a variety of industries including, tourism and agriculture besides obvious port related industries. Trincomalee port is surrounded by good natural conditions and a deep draft, 14 to 20 m depth of access channel, protected by a bay, which can be used as a natural harbor. The Port is located closer to India, far away from the main shipping line. SLPA developed general cargo berth for handling bulk general cargo. There is also a navy base and air force base.

Figure 6.42 Trincomalee cargo berth behind the Tokyo Cement Factory

(2) Facilities

The Outer Harbor contains the Trincomalee Bay. The Inner harbor has a water area of about 1,630 hectares and a land area of nearly 5,260 ha. The Sri Lankan naval base is located in the Inner Harbour. The area of land vested in SLPA is about 2,065 ha.

The existing jetty is called Ashraf Jetty and was constructed in 2007 for the public service of SLPA. It is only 270 m long and 12.5 m depth. The maximum bulk carriers can berth is up to 30,000 DWT. When the large mother ship comes to the port, coal is transferred to 8,000 ton barges directly offshore. It is then transported to the terminal, which is equipped with railway facilities, at Samper located in Koddyar Bay; located within the Trincomalee water area.

(3) Cargo Traffic

Cargo traffic through the Trincomalee port is as summarized in the table below.

Table 6.62 Traffic Volume through the Port in 2013–2015 (Aug)

Commodities		2012	2013	2014	2015 (Aug)
Ship Arrival		161	113	120	95
Cargo Discharged (x 1000 ton)	Break Bulk	0	1.3	0.1	0
	Dry Bulk	2,468	2,108	2,447	1,518
	Liquid Bulk	179	166	173	112
Total Discharged		2,808	2,275	2,620	630
Cargo Loaded (x 1000 ton)	Break Bulk	161	141	127	114
	Dry Bulk	53	18	0	25
	Liquid Bulk	0	0.8	0	0
Total Loaded		214	160	127	139
Total Port Cargo Handled		2,859	2,435	2,747	1,769

Source: Ceylon Association of Ships' Agents

The port management office estimates the traffic volume of Urea raw material for fabrication of fertilizer. The port unloaded 259,000 ton in 2014 and expects 417,000 ton in 2015. These raw materials are delivered to 23 fertilizer companies in Sri Lanka.

(4) Connectivity

There is intake railway inside the port area, which is extended up to Colombo city.

(5) Development Plan

The plan is for development of a new coal terminal to transport large volumes of coal by railway from the Trincomalee (candidate site of development of coal receiving terminal is at Sampur) to respective sites of the Power Plants and also to construct additional berth by expanding the present berth or a new deep draft berth at Sampur.

At present, coal is transported by road from Trincomalee to the Norocholai power plant on the west coast of Sri Lanka. SLPA studied how best to utilize the existing railway line from Trincomalee to Maho. From Maho to the respective power plant sites, coal will be transported either by highways or by the new railway line to be developed later.

The above study suggested that any transportation originated from Trincomalee will contribute to deliver coal to power plants even during monsoon season and to continue to supply electricity throughout of the year.

6.4.5 Galle

(1) Geographic Conditions

The Port of Galle is located 120 km south of Colombo city. The Galle Port will be developed as a regional port as well as a centre for tourist attraction.

Figure 6.43 Galle Port View from the Fort

The Port of Galle will develop multipurpose berths focusing on attracting world cruise ships and yacht based tourist arrivals and catalyzed by the trend in tourism based on world heritage sites, in addition to multipurpose cargo handling.

(2) Facilities

There are 3 berths with water depths of 8.0–9.0 m together with warehouse accommodation. The length of ship that can enter the port is restricted to 130 m due to the geometry of the channel at the entrance to the port.

(3) Cargo Traffic

The main commodity handled at present is cement, clinker, gypsum, rice, sugar and flour have not passed through this port for several years.

Table 6.63 Traffic Volume through the Port in 2013 and 2014

Commodities	Tonnage Handled	
	2013	2014
No of vessels	36	60
Clinker in Bulk	153,193	355,542
Cement in bulk	10,413	8,201
Bag Cement	829	n/a
Gipsum in bulk	35,954	29,450
Fish	n/a	403
Transshipment		
Unload	344	11
Load	6,722	370
Total Tonnage		
Unload	200,733	393,607
Load	6,722	370

Source: SLPA Galle Port Office

Beside the bulk cargo, the port received approx. 10cruise ships during December to April (non monsoon season) last year. Because there are no proper passenger terminal facilities in the port, the number of cruise ships and passengers were limited.

(4) Connectivity

The national highway from Colombo to Hambantota was developed, which provides better access from Colombo to Galle. The road from this national highway to the gate of the port is narrow and congested with residents. The port office has requested permission to develop this access road by widening it with a concrete pavement.

(5) Development Plan

Galle Port will be developed as a Regional port for handling general cargo in this region, handling bulk cargo for cement factories in the port hinterland and serving tourist attractions and facilities. Considering its close proximity to world heritage sites including the Galle Fort, the port could complement these tourism sector activities. Therefore, development of Galle Port will provide port facilities to handle general cargo, and bulk cargo, as well as cruise ship and yacht leisure based tourist.

The proposed development of the Galle Port is being undertaken in two phases - commercial and tourism. In the commercial phase a new breakwater will be constructed outwards from the south breakwater of the existing port. The proposed new port will consist of one multi-purpose berth of 300 m length and -12 m depth. It will be sheltered by a 1,400 m long breakwater extended from the multipurpose berth. This development will be undertaken with assistance from the Government of Japan.

SLPA expects that in the existing port, facilities available to yachts will be enhanced during the tourism phase of development. The proposed development will provide a fully fledged yacht marina. SLPA plans for berthing facilities for 80 yachts of up to 15 m length and -3 m draft along with basic amenities including service and repair facilities for yachts (including a workshop), club house, duty free shop, information centre, dry berthing facility for yachts, launderette and shower, and toilet facilities.

The survey team considers that demand for a new exclusive passenger cruise ship berth, serving as a tourist terminal, would likely be unable to generate a reasonable profit. The proposed expansion project should develop multi-purpose berths for shared use by cargo and passenger ships. Behind the new berth, a temporary cargo storage area should be developed. When passenger ships call at the port, the area will also be able to be used as a bus parking lot for passengers.

Considering future cargo demand, the proposed new berth shall handle general cargo and occasional passenger ship visits as a multipurpose berth. Existing berths shall be used for handling bulk cargo of cement and related cargo.

SLPA informs the latest position of the project as follows:

- SLPA has submitted the report of Heritage Impact Assessment (HIA) to UNESCO.
- They expect the approval soon from UNESCO. They are aware that the loan agreement will expire in next year and wait the diplomatic decision by Sri Lankan government.
- SLPA considers that the project is viable for providing safe shelters from tsunami to fishery operations. Additionally it will provide protection to the fishery facilities and the rampart of Galle Fort from monsoon waves.
- The scope of the project was substantially reduced to develop only passenger terminals and construction of a long breakwater off shore. The project now focuses on tourism support facilities.

6.4.6 Other Ports

The regional ports along the north coast should be reinforced to enhance handling capacity and to improve trade between southern states of India and northern parts of Sri Lanka.

SLPA acknowledges the necessity of rehabilitation/reinforcement of the existing port facilities at Manner, Point Pedro and Kankesanturai (near Jaffna) and to develop a multipurpose terminal for handling general cargo, containers and bagged cargo. RORO service will also be provided as regional port to prepare for increasing trade with India Ports in the near future.

6.5 Direction of Port Development

Results of demand forecast of container traffic mentioned in Chapter 5 are summarized in Table 6.64.The current capacity in TEU for Indian major ports was calculated, based on the capacity in ton indicated in the "Major Ports of India 2014-2015" published by the Indian Ports Association, whereas the current capacity for other ports are based on interviews during the survey or existing data. The container traffic for 2030 (Estimates) is given by the simulation as explained in Chapter 5, whereas the container traffic for 2020 (Estimates) was calculated by using linear interpolation between 2013 (Actual) and 2030 (Estimates). The saturation rate for 2013 and 2020 are calculated by dividing the actual traffic volume in 2013 and the projection for 2020 respectively by the current container handling capacity. It should be noted that the figures of current container handling capacity are merely indicative, since they are based on various assumptions; that is why the current traffic volume can sometimes by far exceed the current capacity. In this regard, the saturation rate is not necessarily precise, but it serves to illustrate the urgency of capacity augmentation.

Table 6.64 suggests that the container handling capacity at Visakapatnam and Tuticorin in India, as well as Karachi in Pakistan should be urgently increased. In case of Kolkata and Haldia in India and Mongla in Bangladesh, high growth rate is expected to continue toward 2030. Many ports in South Asia including the said ports require an increase in container handling capacity by 2020.

Table 6.64 Results of Demand Forecast (Container)

Country	Port	Current Capacity (million TEU)	Throughput (million TEU)			Saturation Rate		AAGR** (2013-2030)
			2013 Actual	2020* Estimate	2030 Estimate	2013	2020	
Bangladesh	Chittagong	1.54	1.47	2.57	4.14	95.3%	166.7%	6.3%
	Mongla		0.05	0.12	0.22			9.8%
India	Kolkata	0.64	0.45	0.98	1.75	69.9%	153.3%	8.3%
	Haldia	0.21	0.11	0.32	0.63	54.9%	157.3%	10.6%
	Visakhapatnam	0.15	0.26	0.47	0.76	172.4%	306.7%	6.4%
	Chennai	2.20	1.47	2.88	4.90	66.7%	131.0%	7.4%
	Tuticorin	0.25	0.51	0.91	1.49	200.0%	359.2%	6.5%
	Cochin	0.93	0.35	0.59	0.95	37.2%	63.9%	6.1%
	New Manglore		0.05	0.10	0.17			7.4%
	Mormugao		0.02	0.02	0.03			7.4%
	JNPT	5.72	4.16	10.61	19.81	72.8%	185.6%	6.0%
	Kandla	0.48	0.03	0.03	0.04	6.3%	7.0%	1.5%
	Krishnapatnam	2.10	0.06	0.31	0.67	2.8%	14.7%	15.7%
	Hazira		0.36	0.90	1.68			9.5%
	Pipavav	0.85	0.66	1.72	3.24	77.9%	202.6%	6.9%
	Mundra	6.00	2.39	4.35	7.15	39.8%	72.5%	6.7%
Pakistan	Karachi	1.15	1.57	2.29	3.32	136.3%	199.2%	4.5%
	Bin Qasim	1.78	0.85	1.94	3.49	48.0%	108.9%	8.6%
Sri Lanka	Colombo	5.90	4.31	8.44	14.36	73.0%	143.1%	7.3%

* 2020(Estimate) was calculated by using linear interpolation between 2013 (Actual) and 2030 (Estimate)
** AAGR: Average Annual Growth Rate
Source: Survey Team

The same exercise has been conducted for principal commodities, namely, coal, iron ore and petroleum which is shown in Table 6.65 - 6.67. The current capacity of Indian major ports to handle iron ore and petroleum was calculated based on the data from the "Major Ports of India 2014-2015", but such figures are not available for other ports because of an absence of relevant data and information. In terms of coal, Kandla and Mormugao in India, as well as Bangladesh, Pakistan and Sri Lanka, are expected to show a high increase rate toward 2030. With respect to iron ore, demand for Kandla and Chennai in India and Bangladesh is deemed to substantially grow. In addition, Visakhapatnam and Paradip in India are possibly facing capacity shortages. In case of petroleum, Tuticorin, Kolkata and Haldia in India, as well as Bangladesh and Pakistan are likely to show steady growth. In addition, many Indian ports will require capacity augmentation by 2020.

Table 6.65 Results of Demand Forecast (Coal)

Country	Port	Current Capacity (1,000 tonnes)	Cargo Volume (1,000 tonnes)			Saturation Rate		AAGR** (2013–2030)
			2013 Actual	2020* Estimates	2030 Estimates	2013	2020	
India	Kandla		6,350	21,974	44,294			12.1%
	Mumbai		4,221	10,027	18,320			9.0%
	JNPT							
	Mormugao		7,517	20,181	38,272			10.0%
	New Mangalore		8,348	17,609	30,840			8.0%
	Cochin							
	Tuticorin		12,147	27,729	49,989			8.7%
	Chennai							
	Ennore		22,482	51,322	92,522			8.7%
	Visakhapatnam		13,292	28,361	49,889			8.1%
	Paradip		32,069	51,855	80,122			5.5%
	Kolkata		68	159	288			8.9%
	Haldia		10,168	22,581	40,315			8.4%
Bangladesh			176	606	1,220			12.1%
Sri Lanka			985	2,430	4,495			9.3%
Pakistan			3,647	10,089	19,292			10.3%

＊2020(Estimate) was calculated by using linear interpolation between 2013 (Actual) and 2030 (Estimate)
＊＊ AAGR: Average Annual Growth Rate

Note: pink – exceeds the capacity, light blue – high growth rate, grey – no information on capacity available and therefore not possible to calculate saturation rate

Source: Survey Team

Table 6.66 Results of Demand Forecast (Iron Ore)

Country	Port	Current Capacity (1,000 tonnes)	Cargo Volume (1,000 tonnes)			Saturation Rate		AAGR** (2013–2030)
			2013 Actual	2020* Estimates	2030 Estimates	2013	2020	
India	Kandla		586	1,391	2,540			9.0%
	Mumbai							
	JNPT							
	Mormugao	27,500	44	80	132	0.2%	0.3%	6.7%
	New Mangalore	7,500	3,123	5,516	8,935	41.6%	73.5%	6.4%
	Cochin							
	Tuticorin							
	Chennai	8,000	71	133	222	0.9%	1.7%	6.9%
	Ennore	6,000						
	Visakhapatnam	12,500	13,032	23,794	39,168	104.3%	190.4%	6.7%
	Paradip	4,500	7,196	13,139	21,628	159.9%	292.0%	6.7%
	Kolkata							
	Haldia	6,000	2,170	3,962	6,522	36.2%	66.0%	6.7%
Bangladesh			34	74	132			8.4%
Sri Lanka			0	0	0			2.0%
Pakistan			352	531	787			4.8%

＊2020(Estimate) was calculated by using linear interpolation between 2013 (Actual) and 2030 (Estimate)
＊＊ AAGR: Average Annual Growth Rate

Note: pink – exceeds the capacity, light blue – high growth rate, grey – no information on capacity available and therefore not possible to calculate saturation rate

Source: Survey Team

Table 6.67 Results of Demand Forecast (Petroleum)

Country	Port	Current Capacity (1,000 tonnes)	Cargo Volume (1,000 tonnes)			Saturation Rate		AAGR** (2013–2030)
			2013 Actual	2020* Estimates	2030 Estimates	2013	2020	
India	Kandla	67,400	52,702	104,375	178,193	78.2%	154.9%	7.4%
	Mumbai	32,000	24,599	51,371	89,616	76.9%	160.5%	7.9%
	JNPT	6,500	4,419	9,115	15,824	68.0%	140.2%	7.8%
	Mormugao	1,500	527	1,027	1,740	35.1%	68.4%	7.3%
	New Mangalore	49,170	24,647	48,047	81,475	50.1%	97.7%	7.3%
	Cochin	24,010	14,321	29,900	52,156	59.6%	124.5%	7.9%
	Tuticorin	2,300	479	1,020	1,794	20.8%	44.4%	8.1%
	Chennai	17,670	12,878	26,389	45,691	72.9%	149.3%	7.7%
	Ennore	4,000	2,340	4,855	8,447	58.5%	121.4%	7.8%
	Visakhapatnam	27,490	13,206	27,542	48,021	48.0%	100.2%	7.9%
	Paradip	53,000	17,702	36,749	63,958	33.4%	69.3%	7.8%
	Kolkata	8,500	717	1,542	2,720	8.4%	18.1%	8.2%
	Haldia	17,000	6,098	13,115	23,138	35.9%	77.1%	8.2%
Bangladesh			2,143	6,437	12,572			11.0%
Sri Lanka			5,534	10,705	18,092			7.2%
Pakistan			10,040	24,389	44,886			9.2%

＊2020(Estimate) was calculated by using linear interpolation between 2013 (Actual) and 2030 (Estimate)
＊＊ AAGR: Average Annual Growth Rate
Note: pink – exceeds the capacity, light blue – high growth rate, grey – no information on capacity available and therefore not possible to calculate saturation rate
Source: Survey Team

Results of Table 6.64 to 6.67 are summarized as Table 6.68. Direction of port development in South Asia is proposed as follows based on Table 6.68 and the summaries in the end of Section 6.1 to 6.4 respectively.

i) Bangladesh: In the light of the rapid growth of container and several kinds of bulk cargo, it is necessary to augment the cargo handling capacity at Chittagong and Mongla, and consider the development of new port(s). The development of a deep sea port at Matabari area merits special attention since the absence of deep sea ports has been an issue for the country. With respect to the development of Payra Port which is of great interest to the Government, division of roles with other ports in the country, as well as technical and economic viability of the project should be analyzed.

ii) India: It is urgent to boost the container handling capacity at Visakhapatnam and Tuticorin. It is also necessary to increase the container handling capacity at Kolkata and Haldia, as well as Chennai and JNPT toward 2020. In terms of bulk cargo, Visakhapatnam and Paradip seem to need additional capacity to handle iron ore, and Mumbai, Ennore, Cochin and some other ports will need more capacity to handle petroleum around 2020. Measures are being taken at Visakhapatnam where expansion of container and iron ore terminals are being prepared by respective concessionaires, as well as at Mumbai which is expecting development of the 5^{th} Oil Terminal. In this regard, other ports need implementation of substantial capacity expansion, such as outer harbor projects at Tuticorin, Paradip, Chennai, Ennore and Cochin, development of a satellite port called Wadhavan in Dahanu, to the north of Mumbai, since land for port expansion is limited for JNPT. The State of West Bengal expects a rapid increase in container and bulk cargo traffic, but both Kolkata and Haldia have limited water depth. Thus, the project to develop a deeper port in Sagar Island is essential.

iii) Pakistan: Karachi needs to increase its container handling capacity, since it seems to be reaching the capacity limit. It is also necessary to generally expand the major ports, namely Karachi, Bin Qasim and Gwadar, as a rapid increase of cargo traffic of coal and petroleum for the country is expected.

iv) Sri Lanka: The needs of expansion of container handling capacity at Colombo for the year 2020 could be addressed by continuous development of container terminals at Colombo International Container Terminal (CICT) in the South Harbor, which is partially operational. On the other hand, a plan for gradual conversion of the old port area such as Jaya Container Terminal should be developed, since the container handling in the old port area is likely to be more and more shifted to CICT and South Asia Gateway Terminal (SAGT). In addition, development of a coal terminal at Trincomalee should be sought, since the demand of coal in the country is expected to grow fast.

A project long list will be presented in Chapter 7, which is comprised of projects that are in line with the above direction of port development, taking account of views and information shared by stakeholders during the survey.

Table 6.68 Summary of Demand Forecast and Direction of Port Development

Country	Port	Container	Bulk			Projects (ongoing or under preparation)	Direction of Port Development
			Coal	Iron Ore	Petroleum		
Bangladesh	Chittagong	●	–	–	–		Development of container and bulk terminals at ports of Chittagong, Mongla, Matabari and Payra
	Mongla	–					
India	Kolkata	●	–				Sagar Island Project
	Haldia	●	–				
	Paradip		–	●			Outer Harbor Project
	Visakhapatnam	●	–	●	●	Extension of the existing container terminal and iron ore berth	
	Chennai	●			●		New Outer Harbor Project
	Ennore		–		●		Greater Kamarajar Port Project
	Tuticorin	●	–				Outer Harbor Project
	Cochin				●		Outer Harbor Project
	New Manglore	–	–				
	Mormugao	–	–				
	Mumbai		–		●	Construction of 5th Oil Terminal	
	JNPT	●			●		New Port at Wadhavan
	Kandla		–	–	●		
	Krishnapatnam		–				
	Hazira	–	–				
	Pipavav	●	–				
	Mundra		–				
Pakistan	Karachi	●	–	–	–		Development of container and bulk terminals at ports of Karachi, Bin Qasim and Gwadar
	Bin Qasim						
Sri Lanka	Colombo	●	–	–	–	Development of South Harbor	Renovation of old terminals at Colombo Port, development of a new coal terminal at Trincomalee Port

Note: In case of Bangladesh, Pakistan and Sri Lanka, descriptions on bulk cargo are country-wise.
● the current cargo volume exceeds the assumed current capacity, ● cargo volume in 2020 will exceed the assumed current capacity
Light blue – high growth rate for the period 2013-2030
'-': saturation rate is not available because of absence of assumed current capacity
Italic: private ports in India

7. Identification and Evaluation of Potential Projects

7.1 Approach

7.1.1 Objectives and Subject Projects

The preceding chapters presented conclusions of the Survey in how industries of South Asian countries would change by strengthening interrelationships with each other, what the situation of the maritime transport sector in the Region would be in terms of current conditions and prepared plans for the future, what would be the range of future cargo demand for the maritime transport sector, and what issues and problems of each port in the Region would be faced due to changes in the subject economies. This chapter examines each of the projects identified in the preceding chapter and comes up with a list of projects that have high potential to be undertaken in the future. A long list of projects in the Region is prepared here including almost all projects identified. In the subsequent process, however, projects are narrowed to those that are unlikely to be implemented by any development partners or without foreign assistance.

7.1.2 Project Evaluation Based on the Scenario Analysis

In extracting high potential projects, conclusions from the preceding chapters are explicitly taken into account. A series of analyses in this Survey identified areas of high economic growth as the hinterland of ports, areas of crucial nodes in the supply chain (presented in Section 3.5), ports of high growth potential in container/non-container traffic (presented in Sections 5.1 and 5.2), and ports with limitations in capacity and infrastructure that constrain further growth (presented in Section 6.5). In particular, results of the preceding scenario analysis as well as the assessment of individual ports are incorporated in the project evaluation in the following ways. By applying these criteria, shortlist projects are those highly aligned with the scenarios and have potential to contribute to realize the scenarios.

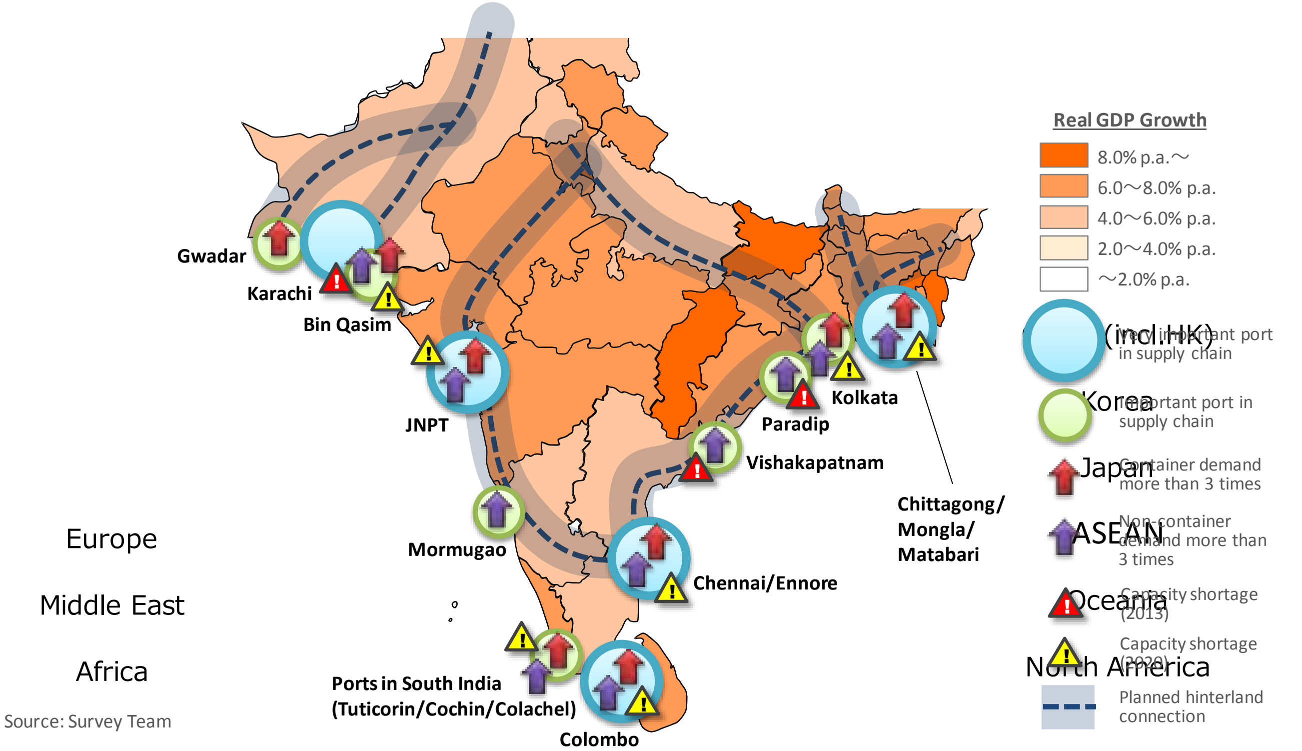
1) **Macroeconomic Scenario:** Growth potential in the hinterland area inferred from the macroeconomic analysis is reflected in the criterion on "**growth potential of hinterland area**". Projects serving high growth area are rated higher.

2) **Industry and Supply Chain Scenario:** "**The importance of ports in the regional supply chain**" is a criterion referring to the results of supply chain analysis. A project is graded higher if it can be heavily utilized as a key node in the supply chain of the Region.

3) **Freight Transport Scenario:** Demand forecast data is used to assess whether the project would be able to deal with a substantial increase in the volume of cargo, which would stagnate without implementation of the project. A project is graded higher if the demand increase is comparatively high in absolute terms (as a criterion of "**freight volume increase**") and in terms of the ratio divided by the estimated investment amount (as "**investment efficiency**").

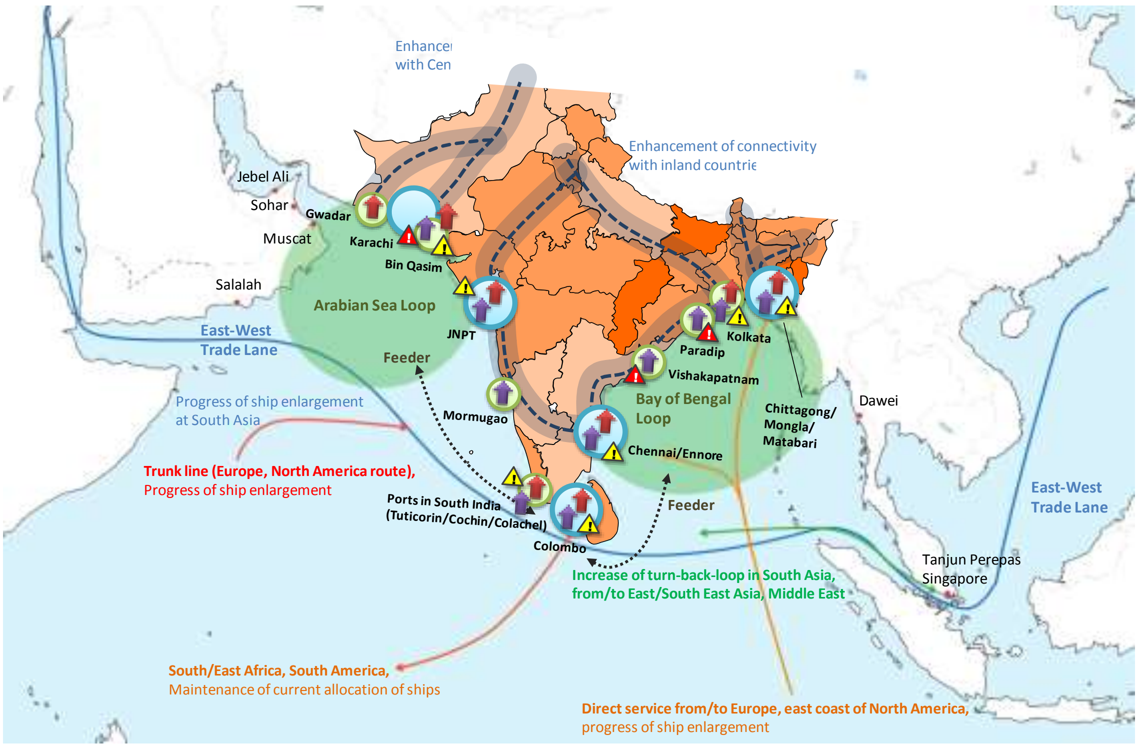
4) **Assessment of Individual Ports:** Assessment of the existing port infrastructure vis-à-vis current/future volume of cargo is also incorporated in the evaluation criteria (as "**Improvement of efficiency by elimination of bottlenecks"**). A project is graded higher if it can address current/future limitation of port capacity.

The aforementioned information is summarized in Figure 7.1 below and interpreted as categorical indicators to screen the long listed projects. Details of the evaluation indicators are outlined in the following section. By applying these indicators, projects in line with the scenarios in this Survey are identified as recommended ones to contribute to higher growth and efficiency in freight transport in the Region.



Note: Red and purple arrows represent an increase in freight demand in 2030 that is larger than 3 times of that in 2013. "Physical bottleneck" represents critical lack of capacity and/or draft of ports. This figure is based on results of the "base case" in the macroeconomic, supply chain, and freight transport scenarios.
Source: Survey Team

Figure 7.1 Summary of Results of Scenario Analysis



Note: "East-West Trade Line" in this figure is illustrated as an approximate route and not connected to calling ports.

Source: Survey Team

Figure 7.2 Overview of the Maritime Network

As drawn in the figure above, the following areas are identified as cores of evolution in the industrial and transport network.

1) Ports in Bangladesh (Chittagong/Mongla/New deep sea port)
Chittagong and Mongla ports are the gateway for Bangladesh and inland countries/states and play an essential role in the supply chain for these areas. However, due to limitation of expandability of Chittagong, development of a new deep sea port is essential to respond to expanding traffic. Improvement of multimodal connectivity is also needed to maximize potential of the area.

2) Kolkata area
This area is the gateway for growth states and inland countries/states. Port capacity and accessibility of large vessels are limited, but these issues have to be overcome in order to accommodate expanding demand for container and non-container cargo of the hinterland.

3) Paradip/Vishakapatnam/Mormugao
These ports are located in important areas on the supply chain and freight corridor. Non-container demand is growing fast, and in particular, Paradip faces problems of limited capacity and draft.

4) Chennai/Ennore area
This area is a gateway to serve the hinterland that has a high potential for industrial growth. This will be accelerated by the expected improvement of rail connectivity. That will result in dramatic growth of both container and non-container cargo. In the meantime, limitations in capacity and draft are issues.

5) Ports in South India (Tuticorin/Cochin/Colachel)
High increases in demand in South India are expected. However, especially at Tuticorin, increases in capacity and draft are necessary. There is potential for a new transshipment port, though it may be subject to various factors including development of another port in this area, decisions of the shipping lines, and improvement of efficiency of the Colombo Port.

6) JNPT and Neighboring Ports
JNPT is the largest gateway in India and serves good potential areas for industry. Freight demand will be further stimulated by the expected improvement of rail connectivity. However, capacity and expandability of the port are limited, hence it is necessity to distribute demand among ports nearby.

7) Karachi and Bin Qasim
This area is a gateway for Pakistan and Central Asia. Development of a deep sea terminal at Karachi has been underway to accommodate demand. On the other hand, restricting traffic due to channel conditions is a concern at Bin Qasim, where coal demand for power generation will grow significantly. In both areas, industrial development around the port will enhance industrial supply chain.

8) Gwadar Area
Although it is an isolated area at present, development of the entire corridor will contribute to increase trade among inland countries. The majority of container traffic will stay in Karachi.

9) Colombo

Colombo will maintain a dominant role as the regional hub. Port infrastructure has been developed, and further improvement of efficiency is expected.

Evaluation of economic impact when all these issues would be resolved has been conducted in Section 5.3 of this report. The following sections elaborate specific measures to be taken for achieving the future vision.

7.2 Project Long List

The Survey Team identified potential projects that would address development issues, as set out in the following pages. The lists contain projects not only for port infrastructure, but also related components to maximize the impact of port development. Project types in the lists include:

1) **Sea Ports:** Sea port and maritime infrastructure (including infrastructure, dredging, and equipment);
2) **Other Infrastructure:** Access and supporting infrastructure including inland water transport; and
3) **Soft Components:** Soft components for improved efficiency and connectivity.

7.2.1 Sea Ports

ID	Country	Location	Project	Outline	Current Issues	Remarks
SP-B-1	Bangladesh	Chittagong	Feasibility Study and Design for Construction of Karnaphuli Container Terminal	KCT plans to renovate the existing container terminal facilities. F/S and D/D are required followed by construction of renovation works for the container terminal.	The port needs expanded container handling capacity.	CPA will develop this terminal facility through a PPP scheme.
SP-B-2	Bangladesh	Chittagong	Construction of Laldia Bulk Terminal under a PPP	Construction works to renovate the existing facilities in the bulk terminal	The port needs expanded bulk cargo handling capacity.	PPP scheme
SP-B-3	Bangladesh	Chittagong	Construction of Bay Terminal and Extension of Port Services	Construction of new container terminal at a new site	The port needs expanded container handling capacity.	The development study is in process.
SP-B-4	Bangladesh	Mongla	Development of New Container Terminal	Construction of container berths by extension of existing cargo berths and procurement of cargo handling equipment	Enhancement of container handling capacity is required.	MPA requested to Japanese ODA, and a F/S has been conducted.
SP-B-5	Bangladesh	Matabari Area	Development of Deep Sea Port	Construction of deep sea port at the same location as an industrial port, resulting in a combined deep sea port	A new deep sea port is required for handling containers and general cargo to meet demand after 2026.	A data collection survey is currently in progress.
SP-B-6	Bangladesh	Payra	New Deep Sea Port Development Project	Complete major components of port infrastructure with 2.5 km of terminal facilities including river bank protection and capital dredging and a breakwater by 2018	A 3rd international trade port is required to handle containers and bulk cargo	The project was commenced in 2015. A major port facilities development plan has not yet been finalized.
SP-I-1	India	Kolkata	Sagar Island Project	A Phase I project targeting the year 2019–2020 comprises 9 berths (with a quay length of 2,470 m, permissible draft of 13.5 m) to handle 54 million ton including 300,000 TEU of containers. The project cost is expected to be INR 4,806 crores for port construction and INR 3,014 crores for rail and road connectivity including a rail/road bridge.	Limited capacity and permissible draft at the Port of Kolkata	An F/S has been completed. A study to revalidate the previously prepared demand forecast and project proposal has been completed. Another study to assess the two options for access to the mainland (i.e., bridge vs. tunnel) will be completed in early 2016.

ID	Country	Location	Project	Outline	Current Issues	Remarks
SP-I-2	India	Kolkata	Diamond Harbour Container Terminal Project	Original Plan: Construction of 4 container handling jetties, INR 1,200 crore, capacity of 1.65 million TEU.	A need to increase the cargo handling capacity	The container terminal project will be modified in such a way that the terminal will be able to handle other types of cargo. An F/S is under preparation.
SP-I-3	India	Paradip	Outer Harbour Project	Project to handle 22 m draft vessels. Construction of 6 berths will create 100 MT capacity. Estimated project cost – USD 769 million.		A technical F/S has been completed and a DPR is under preparation.
SP-I-4	India	Ennore (Kamarajar)	Greater Kamarajar Port Project	Project to increase the capacity by 100 mtpa. Estimated project cost – USD 1,153 million.		A DPR is under preparation.
SP-I-5	India	Chennai	Development of New Outer Harbour to the North of the Bharathi Dock	Development includes 6 berths (with a quay length of 1.5 km, 15 m draft, and sheltered by a 4.75 km breakwater); estimated cost – INR 5,100 crores.	A need to increase containers and multi-purpose cargo (clean cargo)	The procurement stage proceeded on a BOT basis. The bidding was unsuccessful in 2014 and another round of procurement is under consideration. ChPT will approach the government for financial assistance for reclamation of the proposed site.
SP-I-6	India	Tuticorin	Development of Outer Harbour	Development of container terminals to a total quay length of 4,150 m (11 berths) and 6 coal berths (each 350 m in length), in three phases stretching from the year 2015 to 2043. The planned draft of the outer harbour is 16 m, capable of handling ultra large container vessels up to 18,000 TEU capacity, and cape size coal vessels. Total capacity of outer harbour on completion will be 187.5 MTPA.	Limited capacity and permissible draft at the Port of Tuticorin	A DPR has been prepared. The GOI has officially requested the GOJ to provide a Japanese ODA loan for the project. A project preparatory study by JICA commenced in February 2016.

ID	Country	Location	Project	Outline	Current Issues	Remarks
SP-I-7	India	Colachel	Development of Colachel Port at Tamilnadu	The project is to develop a new port with a quay length of 5,400 m in three phases. The new port would mainly handle container cargo including transshipment cargo. The 1st phase would include construction of berths (1,400 m), a breakwater (4,639 m), dredging (6.8 million m^3), and road/rail connectivity at a cost of INR 5,492 crores. The Phase I project will provide container terminal capacity of 1,606,590 TEU.	Absence of transshipment hub port in India	1. Pre-F/S completed. 2. A DPR is under preparation. 3. Potential competition with Vizhinjam Port, which is only 20 km away from the Port of Kolachel. The private sector may also shortly commence civil works at the Vizhinjam Port.
SP-I-8	India	Cochin	Cochin Outer Harbour Project	Construction of two breakwaters and possible reclamation of 2,600 acres (1.052 ha) of land inside the northern breakwater and about 650 acres (263 ha) inside the southern breakwater. There are also plans to connect this area with the Fort Kochi area through a 1.7 km long bridge.	Absence of transshipment hub port in India as well as prevention of coastal erosion	Environmental clearance of the project is underway.
SP-I-9	India	Mormugao	Multi-purpose Cargo Terminal	Construction of two general cargo berths with a capacity of 5.70 mtpa at a cost of INR 950 crores. The project also entails construction of a breakwater (825 m) and reclamation.	Over-dependence on a single commodity	A tender process to select a concessionaire for development of the multi-purpose cargo terminal under a BOT scheme has been completed.
SP-I-10	India	Wadhavan (Dahanu)	New Port (Multi Cargo) at Wadhavan	Development of a Satellite Port (Multi Cargo) by the JNPT. Estimated project cost – USD 923 million. Managed by the state and central government.	Congestion at JNPT	A DPR is under preparation. There is opposition from an environmental conservation group and the locals. ADB financing in under consideration.
SP-P-1	Pakistan	Karachi	Development of Dedicated Coal Terminal at Berths 13 to 17	The project site (Berths 13 to 17) on the East Wharf has been provided by KPT for coal terminal development.	KPT is providing the development area for a coal storage terminal.	This project is being implemented under a PPP scheme.

ID	Country	Location	Project	Outline	Current Issues	Remarks
SP-P-2	Pakistan	Karachi	Reinforcement and Rehabilitation of Existing Oil Piers 3	The existing oil piers were constructed with a shallow draft. Shipping companies and users requested KPT to deepen the depth around the piers and access channel.	The size of oil tankers is becoming larger. KPT needs deep draft berthing facilities and larger storage tanks behind the piers.	These rehabilitation works are being carried out by KPT
SP-P-3	Pakistan	Karachi	Development of Pakistan Deepwater Container Port East of Keamari Groyne	Upon completion of Phase 1, this terminal will have four berths with a quay length of 1,500 m, a yard area of 85 ha, and a depth of 18 m to accommodate deep draft containerships (with a loading capacity of 15,000 TEU, a draft of −16 m to −18 m), to function as a transshipment hub.	The project is being implemented under a PPP scheme. KPT made a contract agreement with SAPT for development of quay wall, terminal on land facilities, and procurement of equipment and terminal operation.	The project started in 2010 with a private partner.
SP-P-4	Pakistan	Bin Qasim	Coal Terminal Development	A private investor plans to develop a coal terminal in the port area to transport coal to power plants by railway. It is estimated that a coal volume of 8- 25 million ton will be transported.	The private investor has prepared a number of alternative proposals to transport coal by railway and awaits the final decision of PQA.	Private investor made joint agreement with GOP to transport coal by railway.
SP-P-5	Pakistan	Bin Qasim	Development of Oil Terminal/LNG Terminal	Private investors plan to develop 3 pipelines x 6,000 m to transport LNG and develop storage tanks of 120,000 m^3 and 150,000 m^3 capacity for a 2nd terminal.	The development plan had already submitted to PQA for approval of implementation.	
SP-P-6	Pakistan	Bin Qasim	Feasibility Study of Capital Dredging of Access Channel and Development of Second Inner Channel	Analyze the mechanism of infill deposit in the outer channel, establish a maintenance dredging strategy for the outer access channel, and develop a second inner channel (with the capital dredging cost to be financed by the ODA project loan, if possible)	PQA needs an appropriate maintenance dredging strategy to manage the port with a sound financial balance.	PQA intends to request JICA technical assistance to conduct an F/S of capital dredging of the access channel and development of a secondary inner channel.
SP-P-7	Pakistan	Gwadar	Development of Port Facilities, Phase 2	GPA had developed the basic port infrastructure of 3 berths (200 m each, with a depth of 14.4 m) and channel/basin dredging of -14.4 m to receive containerships of 25-30,000 dwt and bulk cargo ships 50,000 dwt, as Phase 1 projects.	GPA plans to implement the Phase 2 development projects, including 9 berths, (4 container berths, 1 RORO terminal, 1 bulk terminal, 2 oil terminals, and 1 grain terminal). The target year to start the project has not yet been set.	GPA needs road and railway connectivity from Karachi city by developing a coastal highway, about 600 km long from Karachi and city.

ID	Country	Location	Project	Outline	Current Issues	Remarks
SP-S-1	Sri Lanka	Colombo	Expansion of Facilities of JCT for Handling of Inland Containers	JCT will function as a container feeder terminal, which requires renovation of old facilities.	The draft of JCT is shallow and cannot receive larger container ships. The existing facilities were built in 1985.	SLPA will develop the facilities with its own funds.
SP-S-2	Sri Lanka	Hambantota	Development of RORO Terminal for Specialized Large RORO Ships	NPD plans to develop a RORO terminal in Hambantota port to receive large RORO vehicle carriers and pure car carriers.	NPD expects increased cargo volume by trucks and by pure car carriers. The new RORO terminal facilities are required.	The development plan is under preparation.
SP-S-3	Sri Lanka	Colombo	Development of Passenger Terminal Facilities for World Cruise Passenger Vessel and Ferry service	The government stated that Colombo Port should develop a terminal for world class cruise ships to promote (upscale) tourism.	SLPA started to prepare a passenger terminal development plan using colonial era buildings around the port area as tourism attraction spots.	The development plan is under preparation
SP-S-4	Sri Lanka	Colombo (South Harbour)	Procurement of Container Cranes at the East Terminal of South Harbour	SLPA developed the East Terminal in South Harbor. Container handling equipment is required for terminal operation.	SLPA is financing the procurement of equipment.	The tender will be called in the beginning of 2016.
SP-S-5	Sri Lanka	Colombo (South Harbour)	Procurement of Terminal Operator for Joint Operation with SLPA of the East Terminal in the South Harbour	SLPA needs a private partner for operation of East Terminal. SLPA will call the tender for selection of the terminal operator.	SLPA developed 470 m of the East Terminal, but SLPA needs a private partner to operate the container terminal	The tender will be called in 2016.
SP-S-6	Sri Lanka	Hambantota	Implementation of Third Stage Project	The project entails development of a transshipment container terminal in the port area by 2025.	SLPA plans to observe the growth of traffic demand up to Stage 2.	The project will be continued with financing from a Chinese investor.
SP-S-7	Sri Lanka	Trincomalee	Development of a New Coal Terminal by Expanding the Existing Jetty or Building a New Terminal at Sampur	There is a large demand for coal for power plants. SLPA and the Railway plan to transport coal from this port to the Colombo area by developing a railway and roadway.	The scope of railway transport is not clearly specified.	The development plan is in a preliminary stage.
SP-S-8	Sri Lanka	Galle	Development of Multipurpose Berth and Breakwater Construction	The Project consists of construction of a 300 m long multipurpose berth with −12 m depth, and construction of 1,400 m breakwater to shelter the port area from high waves during the monsoon season.	SLPA has submitted a Heritage Impact Assessment report to UNESCO. SLPA expects the approval from UNESCO.	The project loan will expire next year and SLPA is awaiting the decision on resuming the project.

ID	Country	Location	Project	Outline	Current Issues	Remarks
SP-S-9	Sri Lanka	Ports in Northern Provinces	Development of Regional Ports in the North to Prepare for Developing Trade with Ports of Southern India	The regional ports of Kankasanthurai, Myliddy, Point Pedro, and Karainagar, located along the north coast, are required to enhance port capacity and to increase trade between the southern states of India and northern parts of Sri Lanka.	By providing a direct highway between these northern parts and Colombo city, there will be potential to develop the northern region by increasing trade with India.	The project is under preparation by SLPA.

Abbreviations: ADB = Asian Development Bank, BOT = Build, Operate, and Transfer, ChPT = Chennai Port Trust, CPA = Chittagong Port Authority, D/D = detailed design, DPR = detailed project report, F/S = feasibility study, GOJ = Government of Japan, GOI = Government of India, GOP = Government of Pakistan, GPA = Gwadar Port Authority, HIA = heritage impact assessment, INR = Indian rupee, JCT = Jaya Container Terminal, JICA = Japan International Cooperation Agency, JNPT = Jawaharlal Nehru Port Trust, KCT = Karnaphuli Container Terminal, KPT = Karachi Port Trust, MOS = Ministry of Shipping, MPA = Mongla Port Authority, MT = Million Tons, MTPA = million ton per annum, NPD = Department of National Planning (Sri Lanka), ODA = official development assistance, PPP = public private partnership, PQA = Port Bin Qasim Authority, SAPT = South Asia Pakistan Terminal, SLPA = Sri Lanka Port Authority, T/A = technical assistance, TEU = twenty-foot equivalent unit, UNESCO = United Nations Educational, Scientific and Cultural Organization

7.2.2 Other Infrastructure

ID	Country	Location	Project	Outline	Current Issues	Remarks
OI-B-1	Bangladesh	Mongla	Improvement of Connectivity from Dhaka by Development of Highway and Railway Linkd from Mongla to Khulna	Construction of access roadway and railway between the Port and Khulna	Connectivity to the Port is required.	The central government approved this project and it is scheduled to start in 2016.
OI-B-2	Bangladesh	Khanpur Area	Inland Waterway ICT Development in the Khanpur Area	BIWTA planned to develop ICTs by inland waterways at six sites.	Need to meet the demands of container transport from Chittagong Port to the Dhaka area.	BIWTA has already approved development of ICTs by five private developers.
OI-B-3	Bangladesh	Kolkata (India) to Ashuganj (Bangladesh)	Inland Waterway Development by Widening/Deepening the Existing Channel by Bangladesh and Potential India-Bangladesh IWT Sub-regional Connectivity.	1) In 2010, Bangladesh and India signed a Joint Communiqué for use of Chittagong and Mongla ports by Bhutan, India, and Nepal through development of inland multimodal routes that promote transit trade between the two countries. 2) To develop a transport way from India's Kolkata area to Ashuganj ICT through IWT and transit to railway and truck transport to Akhaura in Bangladesh, which then crosses the border to Agartala in Tripura State of North East India	The project will be financed with GOI funds. A FS was conducted by the GOI and the BIWTA agreed with its results. BIWTA awaits a reply from India to start the project	The project will be implemented under the protocol (agreement) between the two governments. The engineering study will begin in early 2016. India will provide the funds and Bangladesh will provide the waterway and land transport facilities.
OI-B-4	Bangladesh	Dhaka	Installation of VTS along Heavy Traffic Routes	BIWTC proposes to install VTS at two sites with traffic of various types of ships sailing through the channel. BIWTC proposes that this equipment be supplied with JICA assistance.	The project will facilitate the safe sailing of ships at two channel sites. Equipment will be supplied to operating ships VTS equipment at the monitoring tower.	BIWTC has prepared a TOR for the equipment supply and requests JICA T/A through BIWTA.
OI-B-5	Bangladesh	Dhaka	Circular Waterway Transport Service around Dhaka Waterway	BIWTC plans to develop three routes in a Phase 3. BIWTC already developed two routes up through 2013, and development of a third route development is expected	Inland water transport facilities were completed in two phases: a 1st phase from Sardaghat to Ashulia (29.50 km) in 2005 and a 2nd phase from Ashulia to Kachpur (40.50 km) in 2013.	The remaining parts of the project will be implemented with BIWTC's annual budget.

ID	Country	Location	Project	Outline	Current Issues	Remarks
OI-P-1	Pakistan	Karachi	Development of Cargo Village Industrial Park / Off Dock Facility	KPT plans to develop a cargo village in the Western Backwater area with an elevated motorway corridor, by connecting the Karachi Deep Water Port to northwest Karachi city, for direct cargo transport without through the port area.	KPT conducted a feasibility study under a World Bank T/A. KPT plans to implement this project under a PPP scheme.	KPT is looking for project loans to develop basic infrastructure for the project.
OI-P-2	Pakistan	Bin Qasim	Development of Japan Special Economic Zone, Dhabeji, Thatta	1,000 acres (405 ha) of land have been allocated for the establishment of a Special Economic Zone dedicated to Japanese industries, by the Sindh Board of Investment.	The planned zone will have easy access to Port Bin Qasim and enable raw material imports and finished goods exports without incurring major inland transportation costs and saving time.	A study needs to be conducted to assess whether the new Special Economic Zone can attract sufficient investment.
OI-S-1	Sri Lanka	Colombo	Construction of a Modern Port City Inclusive of All Facilities in an Area of 575 ha	The Project is to develop a coastal municipal city adjacent to the South Harbor through reclamation.	The reclamation works were started in 2014 financed by Chinese investors.	The Phase 1 terminal is schedule to be completed in March 2016, after which it will commence operation.
OI-S-2	Sri Lanka	Colombo	Modernization of Road Network within the Port Premises	Developing the existing inner Colombo port roads to create good connections to the planned port access road network (to be developed in 2016)	ADB conducted a feasibility study. ADB started discussions with RDA of the possibility for an ADB loan for this project	Traffic outside and within the Colombo port area is heavily congested. The project is required immediately.
OI-S-3	Sri Lanka	Colombo	Establishment of Dry Ports in Sri Lanka	There is insufficient land for cargo storage inside and nearby Colombo Port. SLPA/NPD planned to develop an off-dock cargo village outside the port area by connecting the Colombo port and proposed cargo village with railway.	The facilities for a cargo village and railway are required to enhance port capacity, particularly transit containers, and to mitigate city traffic congestion by railway transport.	The development plan is completed and identifies 4 candidate sites for development of dry ports. F/S study is required for selection of optimum site of the project.

Abbreviations: BIWTA = Bangladesh Inland Water Transport Authority, BIWTC = Bangladesh Inland Water Transport Corporation, F/S = feasibility study, GOJ = Government of Japan, ICT = Inland Container Terminal, IWT = Inland Water Transport, KCT = Karnaphuli Container Terminal, KPT = Karachi Port Trust, NPD = Department of National Planning (Sri Lanka), SLPA = Sri Lanka Port Authority, T/A = technical assistance, TOR = terms of reference, VTS = Vessel Tracking System

7.2.3 Soft Components

ID	Country	Location	Project	Outline	Current Issues	Remarks
SO-B-1	Bangladesh	Inland Waterway (Nationwide)	Nationwide Hydrographic Survey of All National Inland Waterway Channels	To grasp the correct position of the current state of nationwide inland waterway channels and to review the current classification of criteria of the waterways	Since the 18th century, no hydrographic survey covering the national inland waterway channels has been carried out. BIWTA needs such a survey to obtain the basic data	BIWTA is preparing a TOR for the survey and requests JICA T/A.
SO-I-1	India	Nationwide	Technical Cooperation Project – Port Management and Administration	Provision of training and the dispatch of experts for enhancement of technical capabilities of central and state government officers in port planning and operation.	Absence of master plan for each major port; congestion in and around the ports	
SO-S-1	Sri Lanka	All Ports in Sri Lanka	Study of a Long-Term Nationwide Ports Development project	This study will prepare a long-term development plan (i.e., a master plan for each port) of all ports of Sri Lanka. SLPA needs a long-term development plan for Colombo harbor and other regional ports in the country.	A long-term nationwide port development plan for 2040-2050 is required.	SLPA recognizes the necessity to conduct a long-term national ports development plan. The TOR for such a study has not yet been prepared.
SO-R-1	Regional	Regional	Technical Cooperation Project – Capacity Development for Implementation of Port Projects under PPP Schemes	Provision of training and the dispatch of experts for enhancement of technical capabilities of the staff from the four countries on preparation and implementation of port PPP projects	Challenges in preparation and implementation of port PPP projects	

Abbreviations: BIWTA = Bangladesh Inland Water Transport Authority, PPP = Public Private Partnership, SLPA = Sri Lanka Port Authority, T/A = Technical Assistance, TOR = terms of reference

7.3 Evaluation of Projects

The Survey Team has screened potential projects from the project long list. For the evaluation, a multi-criteria approach has been applied, which includes five categories of criteria described below. Since criteria have been based on analysis of the regional macro-economy, supply chains, and freight transport demand forecasts transport, the evaluation is in line with future scenarios for the Region. Each criterion has been graded A (= 2 point), B (= 1 point), or C (= 0 point), based on objective information. Projects for which funding have been committed by the national government(s), any development partners, or the private sector have been excluded from the selection process for the shortlist of project.

Strategic Importance

Strategic importance includes consistency with the development/assistance strategies of the governments of the four countries, the Government of Japan (including JICA), and other development partners and regional cooperation organizations or forums, measured on the following scales. Strategic importance for the Government of Japan (including JICA) and applicability of Japan's competitive advantage are both examined in the second criteria below.

Consistency with national development plan(s):	A (identified as a potential project in the plan(s)) B (consistent with development direction) C (not consistent)
Expected synergies with other programs/ projects:	A (existence of project plans facilitating synergistic effects) B (existence of project plans adding moderate synergistic effects) C (no project plans adding synergistic effects)

Economy/Industry

Economy/industry includes the growth potential for the macro-economy and supply chain evolution in the hinterland area, which can be inferred from the macroeconomic forecast and supply chain analysis. These factors have been measured through the following scales. The importance of ports in the regional supply chain has also been graded; a project is graded higher if it can be heavily utilized as a key node in the supply chain of the Region, referring to the analysis in Section 3.5 of this report.

Growth potential of hinterland area*:	A (high growth (more than 6% p.a.) of the economic size of the hinterland area) B (moderate growth (more than 4% p.a.) of the economic size of the hinterland area) C (limited growth (less than 4% p.a.) of the economic size of the hinterland area)
Importance of port in regional supply chain*:	A (used for multiple trade flows in the supply chain) B (used for several trade flows in the supply chain) C (scarcely related to supply chains)

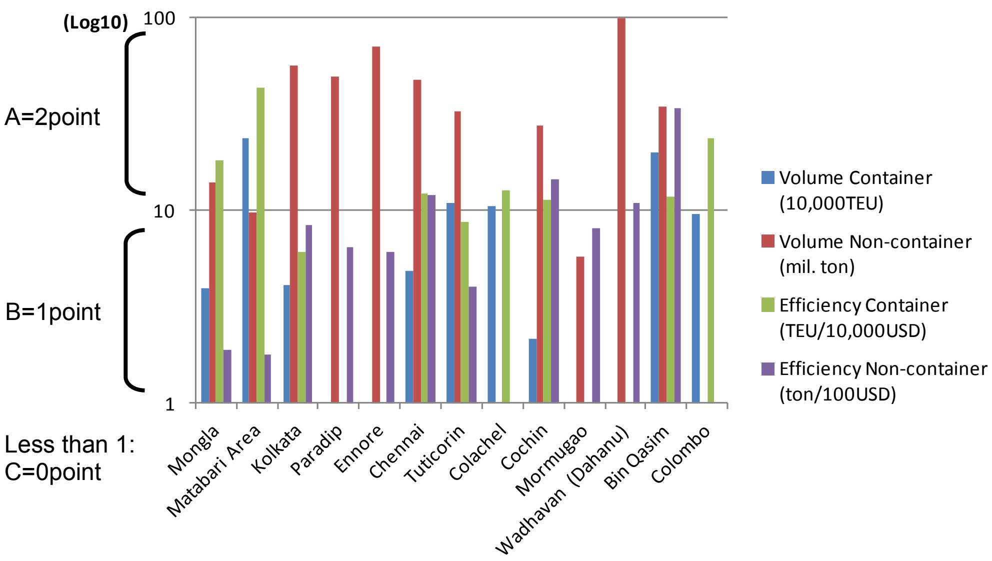
* Reference to analysis in Section 3.5

Freight Demand and Investment Efficiency

This criterion assesses both the absolute volume of the increase in demand for cargo and the investment efficiency in achieving it. Demand forecast data is used to assess whether the project will be able to deal with a substantial increase in the volume of cargo, which would stagnate without implementation of the project. A project is graded higher if the demand increase is comparatively high in absolute terms and in terms of the ratio divided by the estimated investment amount. A three-level rating (A/B/C) has been given as shown in the figure below based on the results of model analysis in the Sections 5.1 and 5.2. Although there are indicators for both container and non-container cargo, grading on the dominant type of cargo has been summed in the final evaluation.

Freight Volume Increase*:	A (large demand to be handled: more than 1 million TEU or 10 million ton) B (medium demand to be handled: more than 0.1 million TEU or 1 million ton) C (small demand to be handled)
Investment Efficiency*:	A (large demand to be handled per investment: more than 10 TEU/10,000 USD or 10 ton/100 USD) B (medium demand to be handled per investment: more than 1 TEU/10,000 USD or 1 ton/100 USD) C (small demand to be handled per investment)

* Reference to analysis in the sections 5.1 and 5.2



Source: Survey Team

Figure 7.3 Evaluation of Freight Demand and Investment Efficiency

<u>Efficiency Improvement</u>

Efficiency improvement refers to the degree of improvements in the capacity of infrastructure, as well as in connectivity with other modes, such as railway, road, and inland water transport for access to and exit from the port area. If intermodal connectivity with the hinterland is not improved even in the future, projects are graded lower. Grading is based on the following scales below. Also, this assessment can be applied to soft infrastructure, by looking into possible impacts of these measures on the performance of the relevant infrastructure.

Improvement of efficiency by elimination of bottlenecks*:	A (resolution of existing capacity shortage) B (resolution of capacity shortage expected in near future) C (no substantial change)
Connection with other modes for access and exit:	A (improvement of connection) B (sufficient connection) C (limited connection)

* Reference to analysis in the Section 6.5

Ease of Implementation

Ease of implementation refers to the "maturity" of the project (i.e., the extent to which the plan has been examined), and existence of obstacles in project implementation. For the latter, the possibility of negative impacts on the natural/social environment has been graded, as a higher impact could be an obstacle to project implementation.

Maturity of the project:	A (examined in detailed design) B (examined in feasibility study) C (no preparatory studies)
Negative impact on natural/social environment:	A (no negative impact) B (possibility of negative impact/not enough information) C (significant negative impact)

7.4 Short-listed Projects

The Survey Team has rated the potential projects, based on results of analysis in this Survey (particularly in Sections 3.5, 5.1., 5.2., and 6.5) and information summarized in the project profiles. Projects listed in the following tables are candidates in terms of the criteria specified above.

Table 7.1 Evaluation of Sea Port Projects

ID	Country	Location	Project Name	Scheme	Estimated Cost (Mil USD)	Strategic importance		Economy/industry		Freight Demand/Efficiency		Improvements of efficiency		Ease of implementation		Total (0-20)	Evaluation
						Consistency with national development plan(s)	Expected synergies with other projects	Growth potential of hinterland area	Importance of port in regional supply chain	Freight Volume Increase	Investment Efficiency	Improvement of efficiency by elimination of bottleneck	Connection with other modes for access and exit	Maturity of the project	Negative impact on natural/social environment		
						Ch. 4.3	Ch. 4.2	Ch. 3.5	Ch. 3.5	Ch. 5.1-2	Ch. 5.1-2	Ch. 6.5	Profile	Profile	Profile		
SP-B-4	Bangladesh	Mongla	Development of New Container Terminal	Finance	135	2	1	2	1	2	2	1	1	1	2	**15**	**High**
SP-B-5	Bangladesh	Matabari Area	Development of Deep Sea Port	Finance	1,000-1,200	2	2	2	1	2	2	1	1	1	1	**15**	**High**
SP-I-1	India	Kolkata	Sagar Island Project	Finance	1,179	2	2	2	1	2	1	1	2	1	1	**15**	**High**
SP-I-2	India	Kolkata	Diamond Harbour Container Terminal Project	Finance	181	2	2	2	1	2	1	1	0	1	1	**13**	**Medium**
SP-I-3	India	Paradip	Outer Harbour Project	Finance	769	2	1	2	1	2	1	2	1	1	1	**14**	**High**
SP-I-4	India	Ennore	Greater Kamarajar Port Project	Finance	1,153	2	2	2	2	2	1	1	1	1	1	**15**	**High**
SP-I-5	India	Chennai	Development of New Outer Harbour to the North of the Bharathi Dock	Finance	784	2	2	1	2	2	2	1	0	2	1	**15**	**High**
SP-I-6	India	Tuticorin	Development of Outer Harbour	Finance	2,078	2	2	1	1	2	1	2	2	2	1	**16**	**High**
SP-I-7	India	Colachel	Development of Colachel Port at Tamilnadu	Finance	828	1	0	2	1	2	2	0	2	1	1	**12**	**Medium**
SP-I-8	India	Cochin	Cochin Outer Harbour Project	Finance	377	2	2	2	1	2	2	1	1	1	1	**15**	**High**
SP-I-9	India	Mormugao	Multi-purpose Cargo Terminal	Finance	143	2	1	2	0	1	1	0	1	2	1	**11**	**Medium**
SP-I-10	India	Wadhavan (Dahanu)	New Port (Multi Cargo) at Wadhavan	Finance	923	2	2	2	2	2	2	1	1	1	0	**15**	**High**
SP-P-6	Pakistan	Bin Qasim	Feasibility Study of capital dredging of access channel and development of second inner channel	Development Survey and Finance	202	2	2	1	1	2	2	1	2	1	1	**15**	**High**
SP-S-1	Sri Lanka	Colombo	Expansion of facilities of JCT for handling of Inland Containers	Finance	300	2	2	2	2	1	2	1	2	0	1	**15**	**High**
SP-S-2	Sri Lanka	Hambantota	Development of Ro-Ro Terminal for Specialized Large Ro-Ro Ships	Finance	150	1	1	1	1	1	1	0	1	1	1	**9**	**Low**
SP-S-3	Sri Lanka	Colombo	Development of Passenger Terminal Facilities for World Cruise Passenger vessel and ferry service	Finance	50	1	0	2	2	0	0	0	2	1	1	**9**	**Low**
SP-S-7	Sri Lanka	Trincomalee	Development of a new coal terminal by expanding the existing jetty or building a new terminal at Sampur	Development Survey and Finance	300-500	2	1	1	0	1	1	1	1	1	1	**10**	**Medium**
SP-S-8	Sri Lanka	Galle	Development of multipurpose berth and breakwater construction	Finance	70-100	1	1	1	0	0	1	0	1	1	1	**7**	**Low**
SP-S-9	Sri Lanka	Ports in North Provinces	Development of regional ports in the north to prepare the developing trade with ports of southern India	Development Survey and Finance	150	1	1	1	0	0	1	0	1	1	2	**8**	**Low**

Note: "High" projects are rated higher than 13 points, and "Medium" projects are rated higher than 9 points.
Source: Survey Team

Table 7.2 Evaluation of Other Infrastructure Projects

ID	Country	Location	Project Name	Scheme	Estimated Cost (Mil USD)	Strategic importance		Economy/industry		Freight Demand/Efficiency		Improvements of efficiency		Ease of implementation		Total (0-20)	Evaluation
						Consistency with national development plan(s)	Expected synergies with other projects	Growth potential of hinterland area	Importance of port in regional supply chain	Freight Volume Increase	Investment Efficiency	Improvement of efficiency by elimination of bottleneck	Connection with other modes for access and exit	Maturity of the project	Negative impact on natural/social environment		
						Ch. 4.3	Ch. 4.2	Ch. 3.5	Ch. 3.5	Ch. 5.1-2	Ch. 5.1-2	Ch. 6.5	Profile	Profile	Profile		
OI-B-4	Bangladesh	Dhaka	Installation of VTS at Heavy Traffic routes	Finance	50	1	1	2	0	1	1	1	1	1	1	**10**	**Medium**
OI-B-5	Bangladesh	Dhaka	Circular Waterway Transport Service around Dhaka Waterway	Finance	35	1	1	2	0	1	1	1	0	0	1	**8**	**Low**
OI-P-1	Pakistan	Karachi	Development of Cargo village Industrial Park / Off Dock Facility	Finance	200	1	2	1	2	1	1	1	2	1	2	**14**	**High**
OI-P-2	Pakistan	Bin Qasim	Development of Japan Special Economic Zone, Dhabeji, Thatta	Development Survey and Finance	100	1	2	1	1	1	1	1	2	0	1	**11**	**Medium**
OI-S-2	Sri Lanka	Colombo	Modernization of Road Network within the Port Premises	Finance	300	2	1	2	2	2	2	1	2	1	1	**16**	**High**
OI-S-3	Sri Lanka	Colombo	Establishment of dry ports in Sri Lanka	Finance	100	1	1	2	2	1	2	1	2	1	1	**14**	**High**

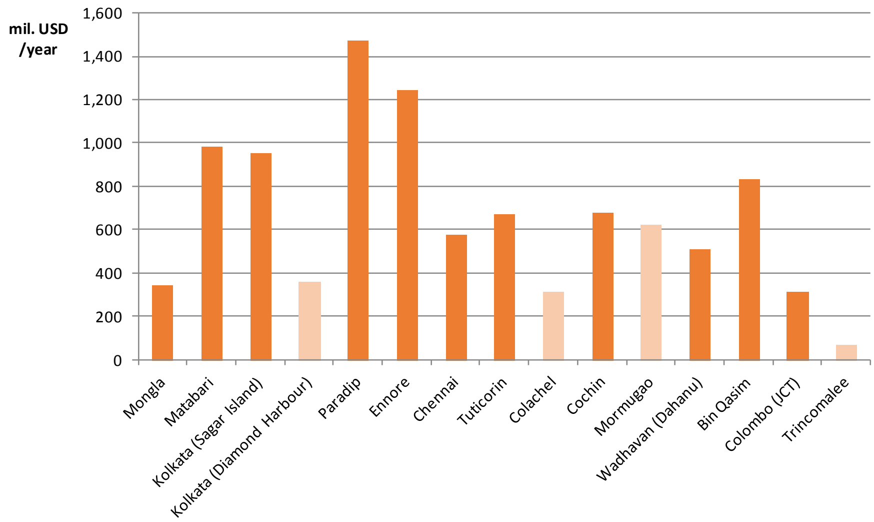
Note: “High” projects are rated higher than 13 points, and “Medium” projects are rated higher than 9 points.
Source: Survey Team

Table 7.3 Evaluation of Soft Component Projects

ID	Country	Location	Project Name	Scheme	Estimated Cost (Mil USD)	Strategic importance		Economy/industry		Freight Demand/Efficiency		Improvements of efficiency		Ease of implementation		Total (0-16)	Evaluation
						Consistency with national development plan(s)	Expected synergies with other projects	Growth potential of hinterland area	Importance of port in regional supply chain	Freight Volume Increase	Investment Efficiency	Improvement of efficiency by elimination of bottleneck	Connection with other modes for access and exit	Maturity of the project	Negative impact on natural/social environment		
						Ch. 4.3	Ch. 4.2	Ch. 3.5	Ch. 3.5	Ch. 5.1-2	Ch. 5.1-2	Ch. 6.5	Profile	Profile	Profile		
SO-B-1	Bangladesh	Inland Waterways (Nationwide)	Nationwide hydrographic survey of all national inland water way channel	Development Survey/ Technical Cooperation	30-50	2	1	2	1			1	2	0	1	**10**	**Medium**
SO-I-1	India	Nationwide	Technical Cooperation Project – capacity development concerning port planning and operation	Technical Cooperation	1.5	2	2	2	2			1	1	1	2	**13**	**High**
SO-S-1	Sri Lanka	All Ports in Sri Lanka	Study of a long term nationwide ports development project	Development Survey/ Technical Cooperation	2	2	2	1	2			1	2	1	2	**13**	**High**
SO-R-1	Regional	Regional	Technical Cooperation Project – capacity development concerning implementation of port projects under PPP scheme	Technical Cooperation	1	1	2	2	2			2	1	1	2	**13**	**High**

Note: “High” projects are rated higher than 11 points, and “Medium” projects are rated higher than 7 points.
Source: Survey Team

For the shortlisted sea port projects, the Survey Team analyzed the magnitude of expected impacts on time and costs for import, export, and transshipment of both container and non-container cargo. Time and other cost items included in the calculation of overall cost for each port are time for customs clearance, time for unloading, time for loading, time for transshipment, fee for export handling, and fee for import handling. As summarized in the figure below, substantial cost reduction for trade is expected by implementing these projects, although this is a preliminary assessment and further analysis is necessary by project for its respective preparation surveys.



Note: 1) Darker bars represent "high" priority projects and others represent "medium" priority projects.
2) Estimated values are the amounts in year 2030.
Source: Survey Team

Figure 7.4 Impact of Selected Sea Port Projects on Reducing Trade Costs

In Bangladesh, projects to develop new container terminals have been given the highest priority to address the critical shortage of capacity that would constrain high growth potential of this country. Projects for improvement of inland waterways follow, which are expected to relieve the high concentration of port access traffic on roads and facilitate cross-border freight movement in the SASEC region.

In India, large port projects have been given high priority. These ports could resolve bottlenecks on regional supply chains, and thereby boost growth of the hinterland and activities of enterprises including Japanese. The impact of these hard investments can be further enhanced with technical cooperation to develop capacity concerning port planning and operation.

In Pakistan, the study of capital dredging of the access channel and development of second inner channel of Port Bin Qasim is a high-priority project. This project is expected to overcome an issue of capacity limitation of the channels of the port, which is important to handle coal for power plants. Industrial development projects in Karachi and Bin Qasim could be consideration as the second priority.

In Sri Lanka, the long-term development plan of ports in the country may be the entry point, in which specific development projects of both port and supporting infrastructure for Colombo and other ports in the country will be further elaborated.

In the whole region, one of the key common issues is improvement of efficiency through adoption of PPP schemes. Each country has challenges in making these schemes work.

Technical cooperation to develop capacity for realizing successful PPP port projects would benefit the whole region.

Appendix Content

Appendix1:
Seminar Outline

Seminar Outline[1]

1. Objective

This Regional Seminar will be held to discuss interim results of the "Data Collection Survey on Cross-border Maritime Traffic in South Asia" among stakeholders of the subject countries. The objective of the Seminar is to review the Survey findings in their interim form and obtain comments and inputs from diverse stakeholders with a view to enhancing and improving the Survey results, and for the participants to exchange views. Specific aspects include: (i) background, (ii) regional macroeconomic and industrial/ supply chain scenarios, (iii) freight transport scenarios (maritime network and inland connectivity), and (iv) future infrastructure development (port, inland transport, and soft) in the region. The Survey Team will prepare Final Report by reflecting comments in the seminar and discussions with JICA.

2. Schedule

14th and 15th of December, 2015

3. Location

The Blue at Hilton Colombo Hotel, Colombo, SRI LANKA

4. Participants

The number of participants was 86. Invitees included senior officers/ staff from the organizations listed in the table below.
In addition, other organizations such as chambers of commerce, business associations, private companies, research institutions, and development partners participated in the seminar.

Country	Official Organizations to be Invited
BANGLADESH	Ministry of Shipping, General Economics Division (Planning Commission), BANGLADESH Inland Waterway Transport Authority (BIWTA), BANGLADESH Inland Waterway Transport Corporation (BITWC), Chittagong Port Authority, Mongla Port Authority, Pangaon ICT
INDIA	Ministry of Shipping, Planning Commission, Department of Industrial Policy & Promotion, Inland Waterways Authority of INDIA (IWAI), Container Corporation of INDIA Ltd. (CONCOR), Ministry of Transport & Highways, INDIAn Institute of Foreign Trade
PAKISTAN	Ministry of Ports and Shipping, Ministry of Planning, Ministry of Commerce, Ministry of Communication, National Transport Research Centre (NTRC), National Highway Authority, Ministry of Railway, Karachi Port Trust, Qasim Port authority, Economic Affairs Division, Board of Investment
SRI LANKA	SRI LANKA Port Authority, Department of National Planning , Ministry of Highways, Ports and Shipping, National Physical Planning Department (NPPD), Urban Development Authority, Board of Investment, Department of External Resources,

[1]:This Appendix shows outline and program distributed to participants to the Regional Seminar, as well as list of attendees and comments on the Interim Report from them.

Seminar Program

Day 1: 14 December 2015

Time	Subject	Speakers
9:00-9:30	**Registration**	
9:30-10:10	**Session 1: Opening**	
	Opening Remarks	**Mr. Kenichi Suganuma** Ambassador of Japan to SRI LANKA
	Address by	**Mr. DE ZOYSA UPALI** SRI LANKA Port Authority Government of SRI LANKA
	Address by	**Mr. M. I. M. Rafeek** Secretary Ministry of National Policies & Economic Affairs Government of SRI LANKA
	Address by	**Mr. Toru ARAI** Director General, South Asia Department, Japan International Cooperation Agency
10:10-11:25	**Session 2: Findings on Future Scenarios in the Region**	
10:10-10:20	**Presentation on JICA Survey Outline and Findings on Cross-Border Maritime Traffic in South Asia**	**Mr.Yuichiro Motomura** Head of JICA Survey Team
10:20-10:35	**Presentation on Macro Economy and Industry/ Supply Chain Scenarios of South Asia**	**Mr. Takayuki Urade** Macroeconomic and Supply-chain Analysis/ Demand Forecast Specialist, JICA Survey Team
10:35-10:50	**Presentation on Freight Transport Scenarios of South Asia and Findings from Model Analysis**	**Dr. Ryuichi Shibasaki** Head of International Cooperation Division, National Institute for Land and Infrastructure Management, Ministry of Land, Infrastructure, Transport and Tourism
11:05-11:20	**Development Prospects and Issues of the Ports in the Region**	**Mr. Tatsuo Harada** Port Policy and Institution Specialist, JICA Survey Team
11:20-11:25	**Comments on Future Development Scenarios**	**Mr. Ali Haider Altaf, Director** Energy, Transport, Science & Technology ivision South Asian Association for Regional Cooperation

11:25-11:40	=== ***Coffee Break*** ===	
11:40-12:40	**Session 3: Analysis on Development Issues and Open Discussions**	
11:25-12:25	**Open Discussions on Future Scenarios on Regional Economy, Industry, and Maritime Transport**	Facilitated by **Mr.Yuichiro Motomura** Head of JICA Survey Team
12:25-13:30	=== ***Lunch*** === **Spices Restaurant** (Lobby area)	
13:30-15:00	**Session 4: Technical Consultation Sessions by Theme**	
13:30-14:30	**Group Session by Theme** **Group 1) Facilitation of Regional Connectivity and Development of Supply Chains** **Group 2) Regional Maritime Network, Present and Future** **Group3) Port Development in the Region**	Facilitated by **Mr. Yuichiro Motomura** **Mr. Takayuki Urade** **Mr. Ryuichi Shibasaki** **Mr. Hitoshi Onodera** **Mr. Tatsuo Harada**
14:30-14:45	=== ***Break*** ===	
14:45-15:00	**Plenary Session and Wrap Up**	Facilitated by **Mr.Yuichiro Motomura** Head of JICA Survey Team
15:00-15:05	**Closing Remarks**	**Mr. Kiyoshi Amada,** Chief Representative,Sri Lanaka office Japan International Cooperation Agency

Day 2: 15 December 2015

	Session 5: Colombo Port Tour	
9:00-9:30	**Registration** @Hilton Colombo	
9:30-11:30	**Colombo Port Tour**	

Seminar Attendees

No	Organization	COUNTRY		Surname	Given Name	Position
Government of BANGLADESH						
1	Ministru of Shipping	BANGLADESH	Mr.	TALUKDER	AHSAN HABIB	National River Conservation Communication Secretary
2	Ministry of Shipping	BANGLADESH	Mr.	BARAL	MANOJ KANTI	Joint Secretary
3	Ministry of Shipping	BANGLADESH	Ms.	AKHTAR	FAHMIDA	Deputy Secretary
4	Ministry of Shipping	BANGLADESH	Ms.	MAHMUDA	SIRAT	Senior Assistant Chief
5	BANGLADESH Inland Waterway Transport Authority	BANGLADESH	Mr.	HAQUE	MD SHAFIQUL	Director Marine Safety & Traffic Management
6	BANGLADESH Inland Waterway Transport Authority	BANGLADESH	Mr.	SALIM	MAHMUD HASAN	Director(Planning)
7	BANGLADESH Inland Waterway Transport Corporation	BANGLADESH	Mr.	HAQUE	MD FAZLUL	Deputy General Manager (Marine)
8	BANGLADESH Inland Waterway Transport Corporation	BANGLADESH	Mr.	ALI	MOHAMMAD ATAHAR	DIRECTOR(ADMINISTRATION) (JOINT SECRETARY)
9	Mongla Port Authority	BANGLADESH	Mr.	HUQ	MUHAMMAD ZAHIRUL	Dupty Chief Planning
10	Mongla Port Authority	BANGLADESH	Mr.	ALI	SK SOWKAT	Dupty Chief Engineer (Civil)
11	Chittagong Port Authority	BANGLADESH	Ms.	BEGUM	HALIMA	Manager Training
12	Chittagong Port Authority	BANGLADESH	Mr.	CHOWDHURY	MOHAMMAD MAHBUB MORSHED	Chief Planning
13	Pangaon ICT	BANGLADESH	Mr.	CHOWDHURY	AHAMEDUL KARIM	Terminal Manager

No	Organization	COUNTRY		Surname	Given Name	Position
14	General Economics Division, Planning Commission	BANGLAD ESH	Mr.	ISLAM	MD FAIZUL	Deputy Chief (Transport & Communication)
15	General Economics Division, Planning Commission	BANGLAD ESH	Ms.	AKTER	KOHINOOR	Assistant Chief
Government of INDIA						
16	Ministry of Shipping	INDIA	Mr.	HASIJA	MADAN MOHAN	Advisor (Shipping)
17	NITI Aayog (Erstwhile Planning Commission)	INDIA	Mr.	SINGH	MANOJ	Adviser (Transport, Infrastructure & Tourism)
18	Ministry of Road, Transport and Highways	INDIA	Mr.	JAMES	ANCHENATT DAS	Deputy Secretary
19	Inland Waterways Authority of INDIA	INDIA	Mr.	GEORGE	MATHEW	Assistant Hydrographic Supervisor
20	Department of Industrial Policy & Promotion (DIPP)	INDIA	Mr.	PANDELLAP ALLI	LAKSHMI NARASIMHA MURTHY	Under Secretary
21	Container Corporation of INDIA Ltd. (CONCOR)	INDIA	Mr.	BHATNAGA R	SANJAY SWARUP	Group General Manager (International Marketing)
22	INDIAn Ports Association	INDIA	Mr	RAO	AMBATI JANARDHAN A	Manging Director
23	SHIPPING CORPORATION OF INDIA	INDIA	Mr.	AKHLAQUE	MAZAHIR	Deputy Manager
Government of PAKISTAN						
24	Ministry of Planning	PAKISTAN	Mr.	KHAN	MALIK MUHAMMAD AHMAD	Member (Infrastructure & Regional Connectivity)
25	Ministry of Planning	PAKISTAN	Mr.	FAZIL	ZOHAIR	Deputy Chief (Transport & Communication)

No	Organization	COUNTRY		Surname	Given Name	Position
26	Economic Affairs Division	PAKISTAN	Mr.	HUSSAIN	SYED MUJTABA	Joint Secretary
27	Ministry of Communications	PAKISTAN	Mr.	AHMAD	NAZIR	Joint Secretary
28	Ministry of Communications National Transport Research Centre	PAKISTAN	Mr.	MIRZA	SHAHBAZ LATIF	Research Officer/Assistant Chief (NTRC)
29	Ministry of Communication	PAKISTAN	Dr.	RAUF	REHAN	Section Officer
30	Qasim Port Authority	PAKISTAN	Mr.	KAZI	SHABIR ANWAR	Director General (Technical)
31	Qasim Port Authority	PAKISTAN	Mr.	HASSAN	NOUMAN	Director General Operations
32	Ministry of Railways	PAKISTAN	Mr.	HASAN	MAHMOOD	Chief Operating Superintendent
33	National Highway Authority	PAKISTAN	Mr.	RAJA	NOWSHERWA N	Member(Planning)
Government of SRI LANKA						
34	Department of National Planning, Ministry of National Policies & Economic Affairs	SRI LANKA	Mr.	M.I.M	Rafeek	Secretary
35	Ministry of National Policies and Economic Affairs	SRI LANKA	Mr.	DHARMAW ARDANA BANDARA TENNAKOO N	UPALI	Secretary
36	SRI LANKA Export DevelopmentBoard Ministry of Development Strategies & International Trade	SRI LANKA	Mr.	MALDENI	SAMAN	Director Export Services

No	Organization	COUNTRY		Surname	Given Name	Position
37	Board of Investment of SRI LANKA Minister of Development Strategies & International Trade	SRI LANKA	Ms.	WEERAKON E	RENUKA MANGALA	Executive Director
38	Board of Investment of SRI LANKA Minister of Development Strategies & International Trade	SRI LANKA	Mr.	Tsuchiya	Keizo	Investment Promotion Advisor (JICA Expert)
39	Department of National Planning	SRI LANKA	Mr.	U.N.	Mallawaarachk	Director Infrastructure
40	SRI LANKA Port Authority	SRI LANKA	Mr.	DE ZOYSA	UPALI	Director(Logistics)
41	SRI LANKA Port Authority	SRI LANKA	Mr.	GUNASEKA RA	DATTA	Director(Technical)
42	SRI LANKA Port Authority	SRI LANKA	Mr.	PERERA	JAYANTHA	Director(Operations)
Government of Japan						
43	Embassy of Japan	SRI LANKA	Mr.	SUGANUMA	KENICHI	Ambassador of Japan to SRI LANKA
44	Embassy of Japan	SRI LANKA	Ms.	OKAI	ASAKO	Minister
45	Embassy of Japan	SRI LANKA	Mr.	IWASE	KIICHIRO	First Secretary Head of the Economic Cooperation Section
46	Embassy of Japan	SRI LANKA	Ms.	GUNAWARD ANA	MONIKA	Economic Cooperation Officer
47	Japan International Cooperation Agency	Japan	Mr.	ARAI	TORU	Director General South Asia Department
48	Japan International Cooperation Agency	Japan	Ms.	TANAKA	TOMOKO	Deputy Director South Asia Department Planning Division

No	Organization	COUNTRY		Surname	Given Name	Position
49	Japan International Cooperation Agency	Japan	Mr.	AMADA	KIYOSHI	Chief Representative SRI LANKA Office
50	Japan International Cooperation Agency	Japan	Mr.	TAIRA	YASUHIRO	Senior Representative SRI LANKA Office
51	Japan International Cooperation Agency	Japan	Mr.	IWASAKI	TATSUYA	Representative SRI LANKA Office
52	Japan International Cooperation Agency	BANGLAD ESH	Mr.	GUPTA	SUMAN	Senior Program Manager BANGLADESH office
53	Japan International Cooperation Agency	PAKISTAN	Ms.	ALMAS	NALIA	Senior Program Officer PAKISTANoffice
54	Japan International Cooperation Agency	Japan	Mr.	Kobayakawa	Toru	Director South Asia Department Division 3
55	Japan International Cooperation Agency	SRI LANKA	Mr.	M.G	Hemachandra	SRI LANKA Office
56	Ministry of Land, Infrastructure, Transport and Tourism	Japan	Mr.	SHIBASAKI	RYUICHI	Head of International Coordination Division National Institute for Land and Infrastructure Management (NILIM)
Regional organization						
57	South Asian Association for Regional Cooperation Secretariat	Nepal	Mr.	ALTAF	ALI HAIDER	Director
58	Asian Development Bank Headquarters	SRI LANKA	Mr.	HERIAWAN	ANDRI	Transport Specialist
59	Asian Development Bank SRI LANKA Resident Mission	SRI LANKA	Mr.	NANAYAKK ARA	DELGAHAWA TTAGE ARUNA	Transport Specialist
Private Sector						
60	DevConsultants Linited	BANGLAD ESH	Mr.	MOHAMMA D	Moniruzzaman	Executive Director

No	Organization	COUNTRY		Surname	Given Name	Position
61	Alar Infrastructues Pvt. Ltd	INDIA	Mr.	SINHA	ASHWIN	Business Development Manager
62	Fauji Oil Terminal &Distribution Co.Ltd	PAKISTAN	Mr.	SOBUCTAGE EN	HASSAN	Chief Operating Officer
63	National Engineering Corporation	PAKISTAN	Mr.	SHAH	SYED FEROZ ALAM	President Director
64	JETRO Colombo	SRI LANKA	Mr.	OBAMA	KAZUHIKO	Resident Representative
65	NYK Line Lanka	SRI LANKA	Mr.	DALUWATT E	VISHVANAT H	Director
66	NYK Line Lanka	SRI LANKA	Mr.	DE SILVA	KUSHAN	Head of Corporate Business Development
67	NYK Line Lanka	SRI LANKA	Mr.	MARZOOK	MOHAMED MAAZUD MOHIDEEN	Head of Strategic Investment
68	NYK Line Lanka	SRI LANKA	Mr.	PEIRIS	TANTRIGE SAGARA DAYA	General Manager
69	Mitsubishi Corporation Colombo	SRI LANKA	Mr.	HONDA	NAOTO	General Manager
70	Itochu Corporation Colombo	SRI LANKA	Mr.	NAKA	HIROKAZU	General Manager
71	Taisei Construction	SRI LANKA	Mr.	HORIKAWA	HIROKI	Chief Representitve Officer
72	Taisei Construction	SRI LANKA	Mr.	WIRUTUNG A	ISHAN	Business Development Manager
73	Wakachiku Construction	SRI LANKA	Mr.	TATSUMI	MASAHIRO	Manager International Division
74	Colombo Dockyard PLC	SRI LANKA	Mr.	TAKEHARA	TORU	Chairman

No	Organization	COUNTRY		Surname	Given Name	Position
75	Penta-Ocean Construction Co.,Ltd.	SRI LANKA	Mr.	IMASAKA	KIYOSHI	Senior Advisor
76	Katahira & Engineers International	Japan	Mr.	Kosei	FUJIKAWA	Managing Director / Regional Manager Oversea Department
77	Nihon University College of Science and Technology	Japan	Mr.	KAWASAKI	TOMOYA	Assistant Professor Depertment of Transportation Systems Engineering
78	PADECO Co., Ltd.	Japan	Mr.	KABIR	TARIQUL	Resident Representative, BANGLADESH Office
79	Oriental Consultants	Japan	Mr.	KITAZAWA	NOBORU	Manager Colombo Office
JICA Survey Team						
80	PADECO Co., Ltd.	Japan	Mr.	MOTOMURA	YUICHIRO	President and CEO
81	PADECO Co., Ltd.	Japan	Ms.	ISHIKAWA	MIEKO	Road Engineer/ Project Consultant Transport Infrastructure Development Division
82	The Overseas Coastal Area Development Institute of Japan	Japan	Mr.	HARADA	TATSUO	Director 2nd Research Division
83	Japan Economic Research Institute Inc.	Japan	Mr.	URADE	TAKAYUKI	Chief Consultant International Division
84	PACIFIC CONSULTANTS	Japan	Mr.	ONODERA	HITOSHI	Professional Engineer Port and Harber Development

Comments to ITR from Officials of the Four Countries And Responses by the Team

The Comments of each country are shown as summarized.

- **B: BANGLADESH**
- **INDIA**
- **P.PASKISTAN**
- **S.SRI LANKA**

Chapter1

Comment by	Comment	Response in DFR	Remark
N/A	N/A	N/A	N/A

Chapter2

Comment by	Comment	Response in DFR	Remark
B.2 Pangaon ICD CEO	B.2.5 Pharmaceuticals are also promising.	Selection of the subject sectors is discussed in 2.3.	Out of scope
P.3 Port Qasim Authority	P.3.4 Supply chain scenarios to add mining sector	Selection of the subject sectors is discussed in 2.3.	Out of scope

Chapter3

Comment by	Comment	Response in DFR	Remark
P.3 Port Qasim Authority	P.3.3 Macroeconomic data of PAKISTAN to be corrected.	Checked again in Chapter 3.	

Chapter4

Comment by	Comment	Response in DFR	Remark
B.3 PADECO Dhaka	B.3.1 WB projects for water development	Added in section 4.2.4	

Comment by	Comment	Response in DFR	Remark
	authority on regional waterways Connectivity		
B.4 Chittagong Port Authority	B.4.1 Chittagong draft is 9.5 m, not 9.2. Vessel limit to be changed.	Added in section 6.1	
B.4 Chittagong Port Authority	B.4.2 Chittagong growth rate is 10% p.a. for the last 20 years and 12% for the last 10 Years	Added in section 6.1	
I.3 Mini. Of Shipping	I.3.1 12 major ports in INDIA, not 13 Port Blair is not a major port.	Footnote that the port was in the Maritime Agenda (Jan. 2011) is added for Table 4.26 and 4.28 in 4.3.2.	Port Blair was included as Major port In Maritime Agenda(2011.01) So the Table which is sourced from Maritime Agenda added note.
P.5 Economic Affairs Division	P.5.1 Means to enhance regional connectivity?	Efforts toward enhanced regional connectivity are summarized in 4.2.	
P.6 Planning Commission	P.6.1 Biggest barrier to regional integration in trade?	In supply side, land connection is still limited and there is a room to undertake trade facilitation measures. In demand side, supply chains have scarcely extended over neighboring countries. (mention in 4.2)	

Chapter5

Comment by	Comment	Response in DFR	Remark
B.1 Development Consultants Ltd.	B1.1Matabari the highest priority	Included in the model as a port without specific location.	
B.1 Development Consultants Ltd.	B.1.2Demand forecasting takes note on this?		
B.2 Pangaon ICD CEO	B.2.1 Why Mongla grows faster than Chittagong	The description stands	Mongla is placed near BANGLADESH which is the largest export and import cit. So Mongla has high potential. And Mongla handle few cargoes. If in the future, the infrastructure will improve, the growth rate becomes higher.
B.4 Chittagong Port Authority	B.4.3 Last year 15%. 2030 projections are too small.	The description stands	We revised OD demand after the seminar. It becomes acceptable growth rate. n addition, it seems that the growth rate of the Chittagong Port becomes small than the growth rate of the BANGLADESHi whole as spoke by comment to port of Mongla.
B.6 Ministry of shipping	B.6.2 Applied sensitivity analysis to each of the scenarios?	Sensitivity analyses done as economic scenario analysis	The sensitivity analysis performs various enforcement and carries it out about Low and High case based on a GDP prediction about the future freight volumes. We analysis various scenario.
I.1 Shipping Corporation of INDIA	I.1.1 Some zones show zero economic impact. Why? Slide No. 11	Depends on connectivity of particular zone.	In With case, I assume I assume infrastructure supply to be able to handle future freight for the increase. In Without case, Other supply won't be satisfied. It cannot deal at insufficiency (the present infrastructure) with the Without case
I.1 Shipping Corporation of INDIA	I.1.2 Growth of trade flows of 3.7 times can be handled? Slide 10.	No. that is why major projects are needed.	
I.1 Shipping Corporation of	I.1.3 Chances of South INDIAn port to act like	Yes as described in	Colombo Port is more likely to remain in the position of the hub basically..

Comment by	Comment	Response in DFR	Remark
INDIA	Colombo?	the text.	The new terminal construction is completed partially, too, and Colombo has room enough capacity. But, as for the appearance of the port of new hub, it is thought that the freight volume of the area increases enough.
I.2 INDIA Port Association	I.2.2 How many transshipment hubs in South Asia by 2030 and where?	Basically two as described.	（It is similar to comment I.1.3.）
I.3 Mini. Of Shipping	I.3.2 Impact of fiscal stress of EU and Latin America will impact container traffic. Lower growth of 1 to 2 years.	Out of scope although covered by economic scenarios	The Demand forecast group calculate the growth of the value based on the result of the economic group in the future basically. The short-term impact does not include this survey.
I.2 INDIA Port Association	I.2.1 Methodology adopted for forecasting?	Details of the methodology are explained in 5.1.	
I.4 NITI AOYOG	I.4.3 How will improvement in NTB increase the growth?	This is shown in 5.3.	
P.1 Min. of Railways	P.1.1 Traffic forecast much higher when considering the following:	These are included in the hinterland scenario (5.1.6 (3)).	
P.1 Min. of Railways	P.1.2 Gwadar port development with Chinese intentions	Added in Section 5.1	
P.1 Min. of Railways	P.1.4 ML-1 and ML-2 FS completed	Added in section5.1	
P.1 Min. of Railways	P.1.5 By 2025 maritime traffic to be manifold	Added in section 5.1	

Comment by	Comment	Response in DFR	Remark
P.3 Port Qasim Authority	P.3.2 Optimum efficiency vis a vis supply chain demand be added	Added in section 5.3	
P.6 Planning Commission	P.6.2 Greater details on tariff reduction effect on economy. No data for PAKISTAN?	Added in section 5.1	
P.4 Min. of Planning	P.4.1 No analysis of CPEC	These are included in the hinterland scenario (5.1.6 (3)) and additional section	
I.4 NITI AOYOG	I.4.1 No major improvement in inter SAARC trade?	All countries of SAAC are included in the model	Out of scope inland freight in Intra SAARC.（includes maritime freight but the effect is restrictive） The comment may say that the model should include all SAARC area, but the model has included all country. Scope of this survey areas are 4countries.
I.4 NITI AOYOG	I.4.2 Dr. Shibasaki showed Colombo containers in 2030 at 2 million toms, . Incorrect.	Verified	Three probable causes. 1: the future demand is insufficient. I review it and finish this. 2: It is different from a sense that an empty container is not included in a model estimation level. 3: Model input data (WTS data) Harbor statistics do not accord with trade statistics base) a little. It is hard to say in experience of the model construction in the area other than to this unconditionally in this connection if which has worse precision.
I.4 NITI AOYOG	I.4.4 Upside growth:	Depends on future situations which are	The Upside case and the Downside case of the freight volumes are decided

Comment by	Comment	Response in DFR	Remark
	How realistic is this?	uncertain	based on the GDP growth rate of the JERI prediction.
P.6 Planning Commission	P.6.4 No mention of CPEC	Add in section 5.1	
P.6 Planning Commission	P.6.5 Very cursory treatment of PAKISTAN ports.	Add in section5.1	
O.1 SAARC	O.1.1 Land locked countries to be separately indicated	All countries are included	
O.2 Embassy of Japan	O.2.1 Effect of Dawei port in Myamar?	Added in Section 5.3	
S.1 NYK Line Lanka	S.1.1 Current oversupply of VLCC	Described in the text	Load factor turns out considerably small on many routes even if we calculate a model in a street of the indication. Because we will assume quantity of loading capacity to a base in this oversupply state in the future, it may be with oversupply in a model in the future. But it is thought that it is one hard to please to assume an appropriate loading capacity supply, and the model calculation top is unavoidable.
S.1 NYK Line Lanka	S.1.2 INDIA cabotage rules and development of deep terminals	Understood	The Cabotage regulation does not consider it in the model. But, in the port of flathead, Cabotage regulation is relaxed as of 2013, and, as for the transhipment quantity that other INDIAn harbors were estimated in a model, it is thought that it is big and does not influence it because there is not many it too much (I noticed that transhipment was estimated slightly in Visakhapatnam, in fact, having possibilities to be this result). Even if

Comment by	Comment	Response in DFR	Remark
			relaxed regulation to see the example of Coch through the interview, someone said that there might not cause big influence.

Chapter6

Comment by	Comment	Response in DFR	Remark
B.2 Pangaon ICD CEO	B.2.2 Chittagong draft 9.5 at high tide. Mongla 8.5 m, really?	Added in section 6.1.(2)	
B.2 Pangaon ICD CEO	B.2.3 Nothing on Payra and Container Terminal at Chittagong	Added about Payra port in section 6.1 (4) Described about CNT of ChittagongPort in section 6.1 （1）	
B.2 Pangaon ICD CEO	B.2.4 Matabari’s role? Draft?	Added in 6.1(3)	
B.2 Pangaon ICD CEO	B.2.6 After Padma bridge, south west will be developed. Payra will be important. Nothing on this.	Added an effect of shortening at time from Pyra port to Mongla port by Padma bridge in section 6.1 （4）	
B.4 Chittagong Port Authority	B.4.4 Projects related to human resource should be included.	Added in section 6.1 (8)	
B.4 Chittagong Port Authority	B.4.5 Max vessel size at Matabari?	Added in 6.1 ［3］	
B.5 Inland water Transport	B.5.1 Find out the causes of deterioration and technology and	Added in 6.1 (5)	

Comment by	Comment	Response in DFR	Remark
Authority	measures to restore navigability		
I.1 Shipping Corporatio of INDIA	I.1.4 Suggestions for JNPT/MON/Chennai to accommodate large vessels?	Consideration on these points is added in 6.2.18.	
I.1 Shipping Corporatio of INDIA	I.1.5 Suggestion on increasing the connectivity between major ports and hinterland to decongest.	Consideration on these points is added in 6.2.18.	
P.1 Min. of Railways	P.1.3 CPEC programs with US$46 billion for all modes	Added comment with US$46 billion for all modes in 6.3 （3）	
P.1 Min. of Railways	P.1.6 For PAKISTAN coal is the most important commodity imported - Sahiwal Power Plant, followed by other plants by 2017	Added in 6.3 (2)	
P.2 Board of Investment – Technical Advisor	P.2.1 Suggestions for PQA and KPA infrastructure	Added in 6.3 （1）、（2）	
P.3 Port Qasim Authority	P.3.1 Data of port Qasim to be corrected	Add the project cost of Port Qasim in section 6.3(2)	
P.3 Port Qasim Authority	P.3.5 Import of coal and LNG to be added	Consideration on these points is added in 6.3（2）	
P.3 Port Qasim Authority	P.3.6 Port development plan details (See the original)	Consideration on these points is added in 6.3（2）	

Comment by	Comment	Response in DFR	Remark
P.4 Min. of Planning	P.4.2 Gwadar port to become international hub port by 2030 not included	Consideration on International hub port is added in 6.3 (3)	(MOPS didn't say the design to make International Hub Port for port of Gwadar.) MOPS selects harbor maintenance of the large depth port as the Karachi Port and carry it out. The development policy is judged with a proper policy as PAKISTAN in Southern Asia sea area.) not to revise in DFR
P.6 Planning Commission	P.6.6 Why not Gwadar as new hub port?	Added about IHP in 5.3 & 6.3 (3)	
P.7 Port Qasim	P.7.2 Fishing industry to be included.	Consideration on these points is added in 6.3 (2)	
S.1 NYK Line Lanka	S.1.3 Colombo can keep its position？	Added in 6.4 (1)	
S.1 NYK Line Lanka	S.1.4 2013 transshipment figure of 1.5 m TEU is much less than figures published by SLPA of 3.6 m TEU.	Revised transshipment figure 3.6MilTEU in section 6.4 (1)	Similar to comment I.4.2
S.1 NYK Line Lanka	S.1.5 Sri Lank has enacted adverse manifesting regulation for sea cargo. Will affect transshipment volume?	Added in section 6.4 (1)	

Chapter7

Comment by	Comment	Response in DFR	Remark
P.5 Economic Affairs Division	P.5.2 Environmental and social impact mitigating capacities to be handled?	This is not in the main scope of the survey. There are preliminary	

Comment by	Comment	Response in DFR	Remark
		information on this matter in the project profiles.	
P.7 Port Qasim	P.7.1 Keep in view on Japan's investment in Auto industry and industrial zone allocated to Japan	Japan SEZ near Qasim is in the project long list.	

Others

Comment by	Comment	Response in DFR	Remark
B.6 Ministry of shipping	B.6.1 Agree with findings		
B.7 Mongla Port Authority	B.7.1 No questions. Only thanks. Send the final report.	The file will be distributed.	
I.3 Mini. Of Shipping	I.3.3 Impact of unstable political conditions of West Asia?	This is difficult to include such factor explicitly, but the scenario of downside demand could infer possible case of a worse political situation.	
P.6 Planning Commission	P.6.3 All supply chain projection for PAKISTAN are conservative.	Difference in opinion	
P.7 Port Qasim	P.7.3 Investment related to earthquake to be included	Out of scope	
S.2 Board of	S.2.1 How JICA can contribute to regional	For example, by lowering NTB (port	

Comment by	Comment	Response in DFR	Remark
Investment	connectivity? How can this be initiated?	efficiency improvement, etc.) and development of hinterland transport	

Appendix2:
Visit Organization

1st Visit Organizations

BANGLADESH

＜JICA/JETRO/Embassy＞
- JICA BANGLADESH
- Embassy of Japan
- JETRO

＜Regional Organization＞
- Asian Development Bank

＜Officials＞
- Ministry of Planning
- General Economic Division
- BANGLADESH Economic Zone Authority
- BANGLADESH Inland Water Transport Authority
- BANGLADESH Inland Water Transport Corporation
- BANGLADESH Freight Forwarders Association
- Ministry of Ports and Shipping especially of the Planning Cell.

＜Ports＞
- Kamalpur ICD (Dhaka)
- Narayanganj Area
- Summit Inland container and Amin Bazar are
- Narsingal at palosh Inland Depot developing site.
- Chittagong Port Authority
- Mongla Port Authority

＜Private＞
- Novo Cargo
- Metropolitan Chamber of Commerce & Industry
- BANGLADESH Garment Manufacturers and Exporters Association
- Maruhisa Pacific
- INDIA-BANGLADESH Chamber of Commerce and Industry
- Dhaka Chamber of Commerce & Industry
- Navana Group
- Mitsubishi Motors BANGLADESH
- Nippon Express
- Kojima Lyric Garments
- TM Textiles & Garments
- NYK Line (BANGLADESH) Chittagong Office
- Yusen Logistics (BANGLADESH) Chittagong Office
- The Chittagong Chamber of Commerce & Industry
-

INDIA

＜JICA/JETRO/ Embassy of Japan＞

- JICA INDIA Office
- Embassy of Japan
- JETRO New Delhi、Mumbai、 Bangalore

＜Regional Organization＞

- Asian Development Bank
- World Bank

＜Officials＞

- Ministry of Shipping
- Planning Commission
- Ministry of Road Transport and Highways
- Directorate General of Commercial Intelligence & Statistics
- Directorate General of Foreign Trade
- Inland Waterways Authority of INDIA
- Department of Industrial Policy & Promotion, Ministry of Commerce & Industry

＜Ports＞

New Delhi

- Dadri ICD
- Container Corporation of INDIA Ltd. (CONCOR)

Kandla

- Kandla Port Trust

Mundra

- Adani Port and Special Economic Zone Ltd

Paradip

- Paradip Port Trust

Mumbai

- Mumbai Port Trust
- Jawaharlal Nehru Port
- Nhava Sheva International Container Terminal
- Shipping Corporation of INDIA, Headquarters

Kochi

- DP World Cochin
- Cochin Port Trust

Bangarole

- ICD Bangalore (CONCOR)

Tuticorin

- V.O. Chidambaranar Port Trust
- J.M Baxi and Co.

Kolkata

- Kolkata Port Trust
- ICD Durgapur (Kolkata)
- Haldia Dock Complex

＜Private＞

- Japan Chamber of Commerce and Industry in INDIA
- Automotive Component Manufacturers Association of INDIA
- Federation of INDIAn Chambers of Commerce and Industry
- Federation of INDIAn Export Organization
- INDIAn Machine Tool Manufacturers' Association
- INDIAn Institute of Foreign Trade
- Larsen & Toubro Limited.
- Essar Oil
- MOL
- Honda

Chennai

- FLYJAC LOGISTICS PVT LTD
- Komatsu
- Renault Nissan Automotive INDIA / Nissan INDIA
- Madras Chamber of Commerce
- MRF
- TT Assembly INDIA Private Limited

Kolkata

- Engineering Export Promotion Council
- Bengal Chamber of Commerce
- Federation of INDIAn Export Organisations, Kolkata
- S Pandey & Company
- Flyjac Logistics Pvt. Ltd.
- Nippon Express (INDIA) Pvt. Ltd.
- Central Inland Water Transport Corporation Ltd.
- Yusen Logistics INDIA Ltd.

Mumbai

- Mitsui O.S.K. Lines, Mumbai
- DHL Logistics Pvt Ltd
- Bombay Custom House Agents Association-

Bangalore

- Japan Chamber of Commerce in Bangalore
- Bangalore customs
- ECL PuyVast (INDIA) Pvt Ltd.
- DHL Global Forwarding

Tuticorin

- St.Judes Freight Pvt. Ltd.
- MACSONS SHIPPING AGENCIES (P) LTD
- JN Freight Forwarders

PAKISTAN

Islamabad

＜JICA/JETRO/Embassy＞

- JICA PAKISTAN Office
- Embassy of Japan

＜Regional Organization＞

- Asian Development Bank
- World Bank

＜Officials＞

- Ministry of Communication
- Ministry of Planning, Development and Reform
- National Highway Authority
- Federal Board of Revenue
- Ministry of Railway
- Ministry of Ports and Shipping

Karachi

＜JICA/JETRO/ Embassy＞

- Japanese Consulate
- JETRO Karachi

＜Officials＞

- Ministry of Port and Shipping

＜Ports＞

- Karachi International Container Terminal
- Karachi Port Trust
- PAKISTAN International Container Terminal
- Quasim Port Authority
- DP World (Quasim International Container Terminal)

＜Private＞

- PAKISTAN National Shipping Corp. for trade Facilitation
- The Japan Chamber of Commerce and Industry
- Paklink Shipping Lines /PSSLINES
- P.S.S. Container Lines (PVT) Ltd.
- National Industrial Park (NIP), Bin Quasim Town
- PAKISTAN Textile City
- PAKISTAN International Bulk Terminal Limited (PIBT)
- FTC Building, Shahrah-e-Faisal, Karachi
- Fauji Oil Terminal 6 Distribution Company Limited (FOTCO)

SRI LANKA

＜JICA/JETRO/ Embassy of Japan＞

- JICA SRI LANKA Office
- Embassy of Japan
- JETRO

＜Regional Organization＞

- Asian Development Bank
- World Bank

＜Officials＞

- Ministry of Shipping, Maritime Department
- SRI LANKA Port Authority
- National Physical Planning

＜Ports＞

- Colombo Port
- Trincomalee Port
- Galle Port
- Hambantota Port/Hambantota Port Authority

＜Private＞

- SRI LANKA Logistics & Freight Forwarders Association (SLFFA)
- The National Chamber of Commerce of SRI LANKA
- Industrial Association of SRI LANKA (Ceylon Chamber of Commerce)
- Export Development Board
- Maersk
- MOL
- Tokyo Cement
- Yusen Logistics & Kusuhara Lanka
- N.Y.K Line Lanka
- YKK Lanka
- Mitsubishi Corp
- MRF Lanka
- Lanka Harness
- Expolanka
- Lanka Ashok Leyland
- Chevron Lubricant Lanka
- Nippon Paint Lanka

Hong Kong

- MOL Liner

Thailand

- JETRO
- Thai Automotive Industry Association (TAIA)
- The Federation of Thai Industries (FTI)
- Nissan

2nd Visit Organizations

BANGLADESH

＜JICA/JETRO/ Embassy of Japan＞

- JICA BANGLADESH Office

＜Officials＞

- Ministry of Shipping (Planning Department)
- BANGLADESH Inland Water Transport Authority (BIWTA)
- Road and Highway Department
- BANGLADESH Railway
- General Economics Division (Planning Commission)
- National Board of Revenue (Customs)
- Bay of Bengal Initiative for Multi -Sectoral Technical and Economic Cooperation (BIMSTEC)

＜Ports＞

- BANGLADESH Land Port Authority
- Mongla Port Authority (MPA)
- SRI LANKA Port Authority (SLPA)

＜Private＞

- BANGLADESH Inland Water Transport Corporation (BIWTC)

INDIA

＜JICA/JETRO/ Embassy of Japan＞

- JICA INDIA Office

＜Regional Organization＞

- ESCAP

＜Officials＞

- Ministry of Shipping (MOS)
- Ministry of Statistics & Programme Implementation
- Research and Information System for Developing Countries
- INDIAn Council for Research on International Economic Relations
- Department of Industrial Policy &Promotion
- Ministry of Transport & Highways
- Container Corporation of INDIA Ltd
- Planning Commission

＜Ports＞

Mormugao

- Mormugao Port Trust (MPT)

Mangalore
- New Mangalore Port Trust (NMPT)

New Delhi
- Container Corporation of INDIA Ltd (CONCOR)

Tuticorin
- V. O. Chidambaranar Port Trust

Hazira
- Adani Hazira Port Pvt.Ltd.

Kolkata
- Kolkata Port Trust
- Haldia Dock Complex

Visakhapatnam
- Visakhapatnam Port Trust

＜Private＞
- Adani Hazira Port Pvt.Ltd.
- DHL Logistics Pvt.Ltd. Hayderabad

Goa
- Hiralal & CO

Mumbai
- Standard Chartered Bank
- Nomura Financial Advisory & Securities (INDIA)
- Kotak Securities
- Axis Capital

Mangalore
- Hiralal & CO

New Delhi
- INDIAn Ports Association (IPA)
- INDIAn Institute of Foreign Trade
- Petroleum Federation of INDIA
- SWS INDIA
- Maruti Suzuki INDIA

Kolkata
- Krishnapatnam Port Company Ltd (KPCL)
- Haldia Dock Complex

Chennai
- Tamil Chamber of Commerce

Visakhapatnam
- Glory Faith Shipping Agencies

PAKISTAN

Islamabad

＜JICA/JETRO/ Embassy of Japan＞
- JICA PAKISTAN Office

＜Officials＞
- Bureau of Statistics

- Ministry of Ports and Shipping
- Ministry of Commerce
- Board of Investment (BOI)
- Ministry of Communication
- Ministry of Planning
- Ministry of Railways
- National Transport Research Center (NTRC)
- The United Nations Development Programme (UNDP)

＜Private＞
- Federation of Chambers of Commerce and Industry
- Inland Water Transport Development Company

Karachi

＜Officials＞
- Sindh Board of Investment

＜Ports＞
- Karachi Port Trust
- South Asia PAKISTAN Terminal

＜Private＞
- Fauji Oil Terminal & Distribution Company Ltd (FOTCO)
- Mitsui O.S.K. Lines, Ltd (MOL)
- YAMAHA

SRI LANKA

＜JICA/JETRO/ Embassy of Japan＞
- JICA SRI LANKA Office
- Asian Development Bank
- SRI LANKA Resident Mission
-

＜Officials＞
- Ministry of Ports and Shipping
- Urban Development Authority
- Ministry of Megapolis & Western Development
- Department of National Planning
- Ministry of National Policies & Economic Affairs
- SRI LANKA Port Authority (SLPA)

3rd Visit Organization

INDIA

＜Officials＞

- Ministry of Shipping (MOS)
- INDIAn Ports Association (IPA)

SRI LANKA

＜Officials＞

- Board of Investment (BOI)
- Dept of National Planning
- Ministry of National Policies & Economic Affairs

4th Visit Organization

BANGLADESH

＜JICA/JETRO/Embassy＞

- JICA BANGLADESH

＜Officials＞

- Ministry of Planning
- Planning Commission
- BANGLADESH Inland Water Transport Authority
- BANGLADESH Inland Water Transport Corporation
- Ministry of Ports and Shipping
- Chittagong Port Authority (CPA),
- Mongla Port Authority(MPA),
- National River Conservation Commision (NRCC)
- National Board of Revenue (NBOR)

INDIA

＜JICA/JETRO/ Embassy of Japan＞

- JICA INDIA Office

＜Officials＞

- Ministry of Shipping
- Planning Commission
- Ministry of Road Transport and Highways
- Inland Waterways Authority of INDIA
- INDIAn Ports Association
- Container Corporation of INDIA Ltd

PAKISTAN

Islamabad

＜JICA/JETRO/Embassy＞

- JICA PAKISTAN Office

＜Officials＞

- Ministry of Communication
- Ministry of Planning, Development and Reform
- National Transport Research Centre
- National Highway Authority
- Economic Affairs Division
- Ministry of Ports and Shipping

SRI LANKA

＜JICA/JETRO/ Embassy of Japan＞

- JICA SRI LANKA Office

＜Officials＞

- Ministry of Ports and Shipping
- SRI LANKA Port Authority
- Board of Investment (BOI)

- Urban Development Authority,
- Ministry of Megapolis & Western Development
- Ministry of National Policies & Economic Affairs

Appendix3:
Detailed Information on Major Ports in the Region

1.1 Bangladesh

1.2 Chittagong Port

Chittagong port is the major seaport of Bangladesh. The port had provided gateway for the country's international trade. During 2012-2013 Chittagong port handled over 43.37 mil ton of cargo including 1.47 mil TEU containers, which is around 92 % of total maritime trade of Bangladesh. The GDP growth of Bangladesh had been 6-7% while the growth of containers through Chittagong port had been around 14%. To meet the future demands and challenge by globalization of maritime trade the port has undertaken many projects to enhance its capacity, improve efficiency to turn itself a world class port services.

Chittagong port is situated in the estuary of the river Karnaphuli being around is situated on the right bank of the river Karnaphuli at a distance of about 9 nautical miles from the shore line of the Bay of Bengal.

1.2.1 Port Facilities and Cargo handling equipment

Chittagong port has the following facilities and handle container and others cargo. The Chittagong port is only port which has unloading and storage facilities of import oil. After unloading import oil it is transported by railway and small barges to Dhaka and up country. The railway transports containers, cement, beside oil to Dhaka and up country, which is about 8% of total cargo volume. In case transport of container by railway is 50 wagons per one lane and carrying about 50,000 TEU.

The Chittagong port having 3 km long of the berth length, but comparatively shallow water depth along the river as the river port causing limited handling capacity,

Table 2.1 Port Facilities and Cargo Handling Equipment in Chittagong Port

	Facilities	Specification	Quantity
1	Jetty & Moorings for Ocean-Going		
1.1	Berths owned &Operated by CPA		
	General cargo berth		6 units
	Container Berth		11 unit
1.2	Specialized berths for Bulk Handling	Oil jetty, Cement, clinker jetty, Ammonia jetty, Ureo jetty	9 berths
1.3	Repair berth	Dry dock jetties	2
1.4	Mooring Berths	River moorings	5
1.5	Inland Coastal &Vessels	Jetty berths for POL, grain,	2
	Pontoon berths	For POL, Cement	4
	Single Point Moorings		14
2	Container Handling Facilities		
2.1	Holding capacity	GCB+CCT+NCT+NCY	32,017 TEUs
	Yards		20 Nos
	Container Freight Station	GCB (5 Nos)	45,064 sq. m
	Container Storage Yards	At CCT	150,000 sq. m
		At NCT	220,000 sq. m
		At NCY	62,532 sq.m
	Railway Container Sliding		550 m
	Standby Generators	8 MW (2 x 4 MW)	
	Reefer Points	415 volts	900 points

	Facilities	Specification	Quantity
	Water reservoir		140,000 Gallons
2.2	Container Handling equipment		
	Quay Gantry Crane	40 ton capacity	4 units
	Mobile harbor cranes	84 ton capacity	2 units
	Rubber tyre gantry crane	40 ton	15 units
	Straddle carriers (04 high)	40 ton	36 units
	Reach stacker (RS)	45 ton	12 units
	Forklift	25 to 42 ton	6 units
		7-16 ton	19 units
	Terminal tractor/trailer	50 ton tractor	43 units
		50 ton trailer	55 units

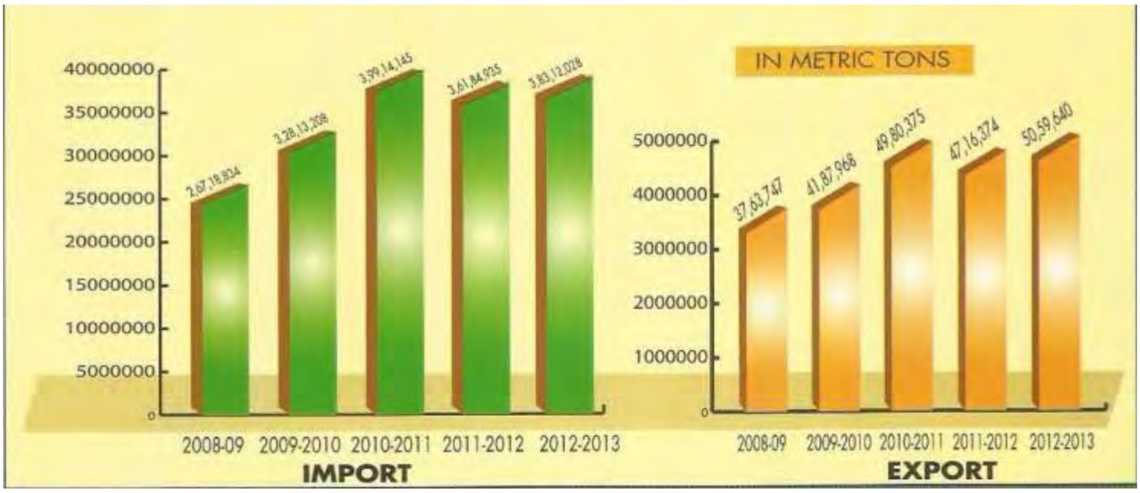
1.2.2 Traffic Volume

Major Import and Export commodities are as follows:

Import:	Food grain, Cement clinker, Sugar, fertilizer, General cargo, Iron Materials, Cotton, Chemicals, Coal, Edible oil, POL etc.
Export:	Ready-made Garments, Knitwear, Fertilizer, Jute & jute products, Hides & Skins, Tea, Light Engineering products, Pharmaceutical Products, Naphtha, Molasses, Frozen goods etc.

The port had handle general cargo, bulk cargo and containers 43.37 mil ton in 2013 consisting of 38.31 mil ton of import cargo and 5.06 mil ton of export cargo.

The trends of import and export cargo traffic volume are shown in the Figure below.



Source: CPA

Figure 2.1 Trends of Cargo Traffic from 2008-2013

CPA handled the containers 1.73 Mil TEU in 2014 and received 2,410 ship calls and estimated the forecast container throughput at 2.74 Mil TEU in 2019. It is planned to develop terminal facilities to handle nearly 1 mil TEU in next 5 years.

Table 2.2 Container Traffic from 2008-2014 through Chittagong and Dhaka ICD

Year	Chittagong Port			Dhaka Inland Container Depot			No of Ship call
	IMPORT (TEU)	EXPORT (TEU)	Total (TEU)	IMPORT (TEU)	EXPORT (TEU)	Total (TEU)	
2008-2009	557,891	550,165	1,108,056	36,427	37,009	73,436	2,088
2009-2010	612,883	599,768	1,212,652	32,781	33,086	65,867	2,203
2010-2011	729,593	739,221	1,468,914	32,238	32,949	65,187	2,308
2011-2012	675,796	667,612	1,343,408	33,123	33,582	66,705	2.079
2012-2013	743,547	725,166	1,468,713	31,053	31,585	62,638	2,136

Source: CPA

Figure 2.2 Trends of Container Traffic volume from 2008-2013

1.2.3 Inland Container Depot (ICD)

An Inland container Depot (ICD) at Dhaka is in operation since 1987 with annual handling capacity of 90,000 TEUs. At present two Container trains run daily each way between Chittagong port and Dhaka ICD.

Table 2.3 Facilities of Railway Transport from Chittagong Port

Facilities	Capacity
Container handling capacity	4,067 TEUs
Yard Area	136,954 sq. m
Container Freight Station (CFS)	8,182 sq. m
Equipment	Reach stacker;7 unit, Forklift; 10 units, tractor trailers; 8 units
Railway wagons for container transportation	350 units
Railway terminal (Length of tracks)	1,097 m

1.2.4 Export Process Zone behind the Port

The following EPZ (Export Process Zone) had developed in adjacent to the port Chittagong Export Processing Zone, Karnaphuli Export Process Zone, Korean Export Processing Zone, which are fully occupied by industries from Korean and Japan

Table 2.4 Export Process Zone behind the Port

Name of Export Process Zones	Approx. Location
1. Chittagong Export Process Zone	Located about 3 km from the port
2. Korean Export Process Zone	It is located opposite bank of the River Karnaphuli. It is under construction
3. Karnaphuli Export Processing Zone	Located 4 km away from the port
4. Hinterland Transportation	Port is connected with the hinterland by road, railway and River
5. Car Storage facilities	Available space for 5,200 unit vehicles

1.2.5 Future Development Projects

The CPA plans the following projects to enhance the container handling capacity. HPC (Hamburg Port Consulting Gmbh) had been conducting the Chittagong Port Master Plan and submitted Interim Report 2 describing site selection survey to develop alternative terminals in Chittagong port for expanding container handling capacity. The Final report will be submitted in September 2015.

(1) On-going projects

- Construction of Back up Facilities behind berth No. 4 & 5 of new –mooring container terminal
- Capital dredging and bank protection with jetty facilities in the Karnaphuli river from Sadarghat jetty to 3rd Karnaphuli Bridge
- Procurement of 29 units of container and cargo handling equipment
- Procurement of one hydrographic Survey boat with multi-beam Echo-sounder
- Procurement of three reconditioned container vessels to ply Chittagong –Pangaon ICT Route
- Procurement of equipment for new mooring container terminal
- Feasibility study & Design for Construction of Karnaphuli Container Terminal (KCIT)
- Strategic Master Plan for Chittagong Port (Under ADB's TA)

(2) Up Coming Projects

- Shifting &reconstruction of the service jetty located near Dock Office to the Up-stream of jetty No.1
- Construction of Laldia Bulk terminal under Public Private Partnership (PPP)
- Procurement of 2 units of Rail Mounted quay cranes for Pangaon ICT
- Construction of Karnafully Container Terminal (KCT) at jetty 10,11,12,&13

(3) Future Projects

- Procurement of Trailing Suction Hopper Dredger
- Construction of Bay Terminal and Extension of Port services

The member of survey team conducted site reconnaissance survey of the planned site and found this site is considered technically feasible for developing deep sea port.

The Bay Container Terminal will be located along the coastal area next to the Port Link Road, connecting the N1 highway to Dhaka with the existing port. The railway line Chittagong –

Dhaka is within close vicinity of the project site. The draft restrictions would be only slightly better than at the existing port. The Bay Container Terminal could handle larger vessels of the panamax and post-panamax type, i.e. fourth generation with up to 5,000 TEU.

Due to its location the Bay Container Terminal (BCT) would technically be more feasible than the other sites and thus could be seen as the favorite alternative to KCT.

Construction of Patenga Container Terminal

The proposed project site is located close to the airport which could lead to height restrictions for container cranes, thus not being viable.
The site for the opposite of Patenga area completely lacks of infrastructure, without any road or rail connectivity to Chittagong and Dhaka. The project is therefore not considered feasible and not recommended.

By this upgrading the existing facilities in short and medium term development projects the CPA estimates the handling capacity will be increased to 2.70 to 3.00 Mil TEU. The demands will reach such volume in 2025, by that time a new port would be developed to support Chittagong Port and Mongla Port.

The potential and candidate site are as follows:

i) Bay Container Terminal (BCT) berth length of 2.5km and back up length of 1.0 km (250 ha area) facing to the open sea and located next to the Port Link Road, connecting the N1highway to Dhaka with the exiting port. This site would be technically more feasible than other sites. The post panama size container ships can be called. CPA process of procurement of consulting for detailed design

ii) Laldia Terminal having 1.0 km length of berth located on the right bank of the river Karnaphuli near the Airport. This project is under study

iii) Renovate the existing wharfs and introducing container handling equipment such as NCT (New Container Terminal) introducing gantry cranes, RTG yard cranes, and old wharfs are renovated and the depth along the berth is deepened to -12.0m. The study was completed.

- KCT (Karnaphuli Container Terminal), Berth No 8 to 13B are planned to transfer to container terminal
- CCT (Chittagong Container Terminal) 4 units cranes are operating which are changed to movable cranes

iv) Some of warehouses will be demolished to open stock yard for contain storage yard with yard cranes. Presently, using Straddle carriers should be replaced by RTG so as to increase stockyard capacity.

v) The existing road 4 lanes from Chittagong to Dhaka will be widened.

Figure 2.3 General Plan of Present Chittagong Port

1.2.6 Shipping Company Observation on Chittagong port

- NYK operate feeder service by 4 container ships (1,200 and 1,000TEU size ship) weekly visits from Chittagong-Colombo-Karachi- Mundra - Colombo- Karachi-Chittagong. NYK provides feeder services from Chittagong – Mongla – Singapore. The volume between Mongla and Chittagong is small. This is not regular service but depending on the requirement NYK provide these transporting services.

- In case deep sea port is developed in Bangladesh and mother ships can come to a new deep sea port, NYK will redesign the present feeder service network and sailing routes depending on the volume availability. NYK may look for transshipment harbors in this region. Two transshipment terminals (Colombo and Singapore Ports) in this region will not be changed.

- NYK carry many different types of commodities of import from China, and Inter Asian countries. Import cargo are machinery, its volume is 5 times of export volume (mainly garments).

- NYK send reefer containers to the Mongla port to export frozen fish, which are cultivated in the hinterland of the port, and jute for export. These containers are directly transported from Mongla to Singapore port. The volume of import cargo is very small.

- The Mongla port had draft restriction caused by heavy siltation at the entrance of the river.

- It is observed that Pangaon ICT is just opened its operation and not efficient yet. At present 200 TEU loading ships are operating from Chitagong port. Big ships cannot sail to this terminal due to limited depth through the waterway. The depth along the berth is 4m. In case this ICT start service of transshipment of containers between India, small ships will face danger to sail through out sea under high waves.

- NYK use railway to transport containers. The transport cost is 50-60,000 TK /TEU by truck, 9,000 TK by railway, which is cheaper than trucks. NYK use public ICD located in Dhaka managed by CPA, where the custom clearance can be made.

- The waiting time at port for berthing was 10-11 days which is improved to 5 -6 days.

- NYK send containers for export to customer factories, but most cases send containers to inland container depots.

- This shipping company made the following suggestions to improve the capacity and handling efficiency i) CPA handles the over capacity of container traffic to meet the demands, ii) due to old fashioned cargo handling equipment the handling capacity at port can not be increased. iii) CPA shall introduce more number of Gantry cranes, iv) expansion of yard area and v) more RTG should be introduced in stock yard, vi) BY renovation of NCT the handling capacity will increase to more than 2.0Mil TEU, not 3.0 Mil TEU.

- 80 % of containers are LLC containers, which are unloaded in the warehouses and transported by small size cargo by trucks. Some of the existing warehouses are required, which shall not be demolished for open storage area.

- Private ICD are planned to develop, but NYK use 24 ICD located in 20km distance from Chittagong port. Empty containers are stocked in off-dock area.

- Import cargo is mainly from Asian countries and export to USA /North Europe.

- Share of shipping line in this region. 25% of cargo is transported by Maersk Line +APL, then MSC, CMA CGA. NYK is ranked around 6 or 7 from the top. The export volume to Japan has been increased recently about 42%. There is no auto manufacturers in Bangladesh, high tech industries have not come to Bangladesh.

Ships coming to Chittagong port are almost all through Port Klang in Malaysia to transship. The container transport cost from the west coast of USA to Port Klang is now 750US$/TEU, then from Port Klang to Chittagong port is 250 US$/TEU, while transport between Chittagong and Dhaka by barges is 200 to 250 US$/TEU. In case deep sea port is developed in Bangladesh and mother ship can call the deep sea port, the transport cost between Port Klang to Chittagong can be saved, even the transport cost from USA to Port Klang is got higher to 800US$.

1.3 Mongla Port Authority (MPA)

Mongla Port – the second gateway of Bangladesh is the most eco-friendly seaport of the country. It is situated on the south western part of the country, at the confluence of Pussur River and Mongla Nulla, approximately 71 nautical miles upstream from the Bay of Bengal.

The activities of the port are extended to Mongla Permanent Jetty, Old Mongla, Hironpoint & Roosevelt Jetty. The port is well protected by the largest mangrove forest known as the Sundarbans, part of which has been declared as “World Heritage” in 1997 by the UNESCO.

Since 1950, Chalna Port continued functioning as a Government Directorate and in May 1977, the Directorate was converted to an autonomous organization named "Port of Chalna Authority" which is again renamed "Mongla Port Authority" on 8th March, 1987.

The validity of deepening the navigational channel and the necessity of such deep draft sea port at Mongla Port will be analyzed. In the meaning, the government has planned to develop a port of a similar scale south of Chittagong Port.

1.3.1 Location and Area

Mongla port is located about 131 km away from the sea and about 150km from Dhaka. The government MOS issued the following development policy:

i) Improvement of connectivity from Dhaka by development of highway, railway link from Mongla to Khulna,
ii) Mongla to Dhaka via Padma Bridge, and
iii) Airport development at Khanjahan Ali about 21 km from Mongla.

1.3.2 Hinterland Development

Port should provide excellent transit service as gate way for international trade of Nepal, Bhutan, and neighboring border area of India. The port has 35,472 sq m of land area. The port has following cargo handling areas; 10 anchorage, 3 mooring buoys, 5 general cargo berths.

Export process zone of 460 acres of the land are procured to develop Mongla EPZ, 190.7 acres were already handed over to 18 industries who had already started construction of factories

The port facilities and hinter land connectivity had not been developed, which are needed to improve to enhance port capacity. There is no container terminal in the Port. MPA has 5 general cargo berths but large volume of cargo is loaded/ unloaded at anchorage area directly between large ships to small inland ships. Since 2009 the import cargo volume had been increased more than capacity.

1.3.3 Navigation

- Vessels of 7.0 m to 8.5 m. draught can take berth in anchorage, mooring buoys and jetties. Maximum LOA of vessels, 225 meter
- Tidal Range between 1.2 and 3.5 meter
- Pilotage-Compulsory
- Radio Communication-Port control, New Port, Harbour Control and Hiron Point Pilot Station maintains VHF channel 16 and 11 for 24 hours.
- Three tugs and one fire fighting tug available
- Night navigation is permissible for outward and inward movement of ships up to 140 m. LOA and 7.0 m. draught.

1.3.4 Exiting Port Facilities

The general cargo berths (180m length per berth, depth -7.5 m) were constructed in 1980 to handle general cargo, containers and importing cars. Imported Cars are stored in the warehouses (storage capacity is 4000 units of cars). The existing berth has two movable cranes, but no container handling equipment.

Table 2.5 Port Facilities and Access Channel Depth and Length by Port

Container Berth	At present, Mongla Port has no container berth. Containers are being handled in the existing general cargo Jetty.				
Dry Bulk Berth	Mongla Port has 5 nos. Jetty to handle bulk and break bulk cargos but about more than 80% bulk cargo are being handled in anchorage.				
General Cargo Berth	Length: 182.92 m each (5 no. Jetty)				
	2010	**2011**	**2012**	**2013**	**2014**
	Depth: 6.50 m	Depth: 6.50 m	Depth: 6.50 m	Depth:6.50m (Jetty No. 5-8) Depth: 7.5m (Jetty No.9)	Depth: 7.5m (all 5 Jetty)
Container Yards	35,752 m2 (Total-3nos. Container Yard), 9,880m2 are under construction				
CFS	At present, Mongla Port has no.CFS facilities				
Terminal Operator	Cargo handling operation by Mongla Port Authority				
	Length (m)	**Width (m)**	**Draft (m)**		
Access Channel	131,100	1,000	7.5		
Maintenance Dredging	Regular dredging volume has been carried out. Volume was in2000-2004, 2.79 mil cum, In 2007-2008, 0.107 mil cum, In 2013-2014, 2.50 mil cum in 2014-2015 0.906 mil				

1.3.5 Traffic Data

Table 2.6 Cargo Handling Volume and Ships Calls from 2010-2014

	2010	**2011**	**2012**	**2013**	**2014**
Container (TEUS)	19,604	31,204	34,451	44,773	43,724
Dry Bulk Cargo (Ton)	1,055,269	1,274,039	1,699,261	2,095,018	2,537,393
General Cargo (Ton)	1,010,887	1,663,689	1,028,694	1,219,269	1,544,198
Cars (Number)	7,331	10,378	7,085	5,344	9,337
Number of Ship calls	156	272	234	282	345

1.3.6 Future Development Projects

Present government has decided to develop the supporting infrastructures to function Mongla port to be second national gate port for enhance import/export trade capacity, such as construction of Padma Bridge at Mawa point, establishment of Khulna-Mongla railway link, supply of gas through pipe line, construction of Khan Jahan Ali airport, establishment of 1320 MW coal based power plant at Rampal, Special Economic Zone at Mongla Port area etc.

Those supporting infrastructure projects are scheduled to complete by 2018-2020. After completion of the Padma Bridge, it will create an efficient connectivity and trade opportunities of increasing import /export volume for industrial estate in Dhaka region and neighbor countries especially for ready-made garments.

After establishment of coal based power plant at Rampal minimum 4.5 Mil m. ton coal will be imported through Mongla Port annually. Special Economic Zone will create new horizon for imports and exports. Consequently, the function of Mongla port will share large parts of national maritime transport service tremendously.

MPA submitted the proposal to Government (MOS) requesting to provide the necessary budget for the following projects to improve port business. i) Removal of wrecks from Pussur Channel, ii) Procurement of hopper suction dredgers for removal of siltation in the channel, iii) installation of navigation aids to the port, procurement of harbor crafts for efficient port operation, iv) expansion of stock yards area, v) development of container terminal by two berths (180 m each at depth 8.5m) on the extension of the exiting general cargo berths, (container handling capacity targeted to 400,000 TEU).

(1) Development Project

For developing port facilities up to international standard 30 development projects have been implemented with a cost of Tk. 556.83 crore including foreign exchange of Tk. 96.41 crore and to uphold its development following projects have been taken for implementation.

(2) On-going Development Project

Dredging at the Harbour Area in the Pussur Channel:

To maintain adequate depth in the Harbour area of Pussur Channel of Mongla Port to facilitate berthing of 7.5 m. draft ships at Port jetty and mooring buoy the project has been undertaken at a cost of Tk. 112.00 crore. Under the project 35.11 lac cum. Dredging has been completed. The project is scheduled to be completed by June 2015.

Dredging at the outer Bar in the Pussur Channel:

The project has been undertaken to increase navigability at the Outer bar area of the Pussur channel to facilitate entrance of more than 9 meter draft ships into Mongla Port area easily. The project (revised) at an estimated cost of Tk. 3000.00 million was prepared to dredge about 5.00 million cubic meter silt in the Outer Bar area. The project is expected to be completed by June 2017.

Procurement of 6nos. Dredgers and Ancillary Crafts & Accessories for Ministry of Water Resources & Ministry of Shipping (Mongla Port-1no., BIWTA-3nos. BWDB 2nos.):

To procure 1no. Dredger with ancillary facilities contract has been signed on 20.07.2013. The project is expected to be completed by June, 2015.

(3) Recent Approved Projects:

Procurement of Container and Cargo Handling Equipment:

For procuring container cargo handling equipment. Under this project, 1 no. 100 ton capacity Tyre Mounted Mobile Crane, 1 no. 50 ton capacity of Mobile Crane, 2 nos. Rail mounted Dock Site Crane, 1 no. Heavy Duty Forklift Truck, 2 nos. Reach Stacker, 2 nos. Forklift with side shifter, 4 nos. Forklift, 6 nos. Low Mast Forklift truck, 3 nos. 3 ton capacity Straddle Carrier will be procured.

Table 2.7 List of Projects under the Process of Preparation

	Name of Project	Estimate budget	Implementing Period	Main Items of the Project
i).	Construction of Container Terminal	7440.00 Mil TK	2015 – 2016 To 2017 – 2018	1 no. Container terminal with modern equipment will be established.
ii).	Construction of Container Terminal	3190.00	2015 – 2016 To 2017 – 2018	1 no. Container Delivery Yard will be established.
iii)	Construction of Multi-storied Car Parking Yard	7280.00	2015 – 2016 To 2017 – 2018	1 no. Multi storied car parking yard with mininum 15000 car parking capacity will be constructed.
iv)	Installation of VTMIS		2015 – 2016 To 2017 – 2018	To accelerate the activities of Mongla Port VTMIS will be installed.
v)	Procurement of Tug for Mongla Port		2015 – 2016 To 2017 – 2018	1 no. Tug will be procured for Mongla Port
vi)	Procurement of high powered 1 no. speed boat for Mongla Port	95.00	2015 – 2016 To 2016 – 2017	1 no. high powered speed boat will be procured for Mongla Port
vii)	Expansion of Existing Main Road & Bypass Road upto Four Lane and construction of gate at Digraj and Port Restricted Area.	147.00	2015 – 2016 To 2016 – 2017	Existing Main Road & Bypass Road up to Four Lane will be expanded and attractive gate will be constructed
viii)	Expansion of Existing Administration Building of MPA up to 5th Floor		2015 – 2016 To 2017 – 2018	Administration Building of MPA will be expanded up to 5th Floor
ix)	Expansion and Modernization of Two Schools of Mongla Port Authority	100.00	2015 – 2016 To 2017 – 2018	Two schools of Mongla Port Authority will be expanded and modernized
x)	Procurement Vessels for Mongla Port	4100.00	2015 – 2016 To 2019 – 2020	1 no. Berthing Tug, 1 no. Buoy Laying Vessel, 1 no. Fire Fighting Tug, 1 no. Dispatch Boat, 1 no. Pilot Boat, 1 no. Mother Survey Vessel, 2 nos. Survey Work Boat, 2 nos. Mooring Boat and 1 no. Self Propelled Water barge
xi)	Construction of ICD at Khulna	500.00	2018 – 2019 To 2019 – 2020	ICD at Khulna will be constructed.
xii)	Establishment of Surface Water Treatment Plant	250.00	2015 – 2016 To 2018 – 2019	1 no. Surface Water Treatment Plant will be established.

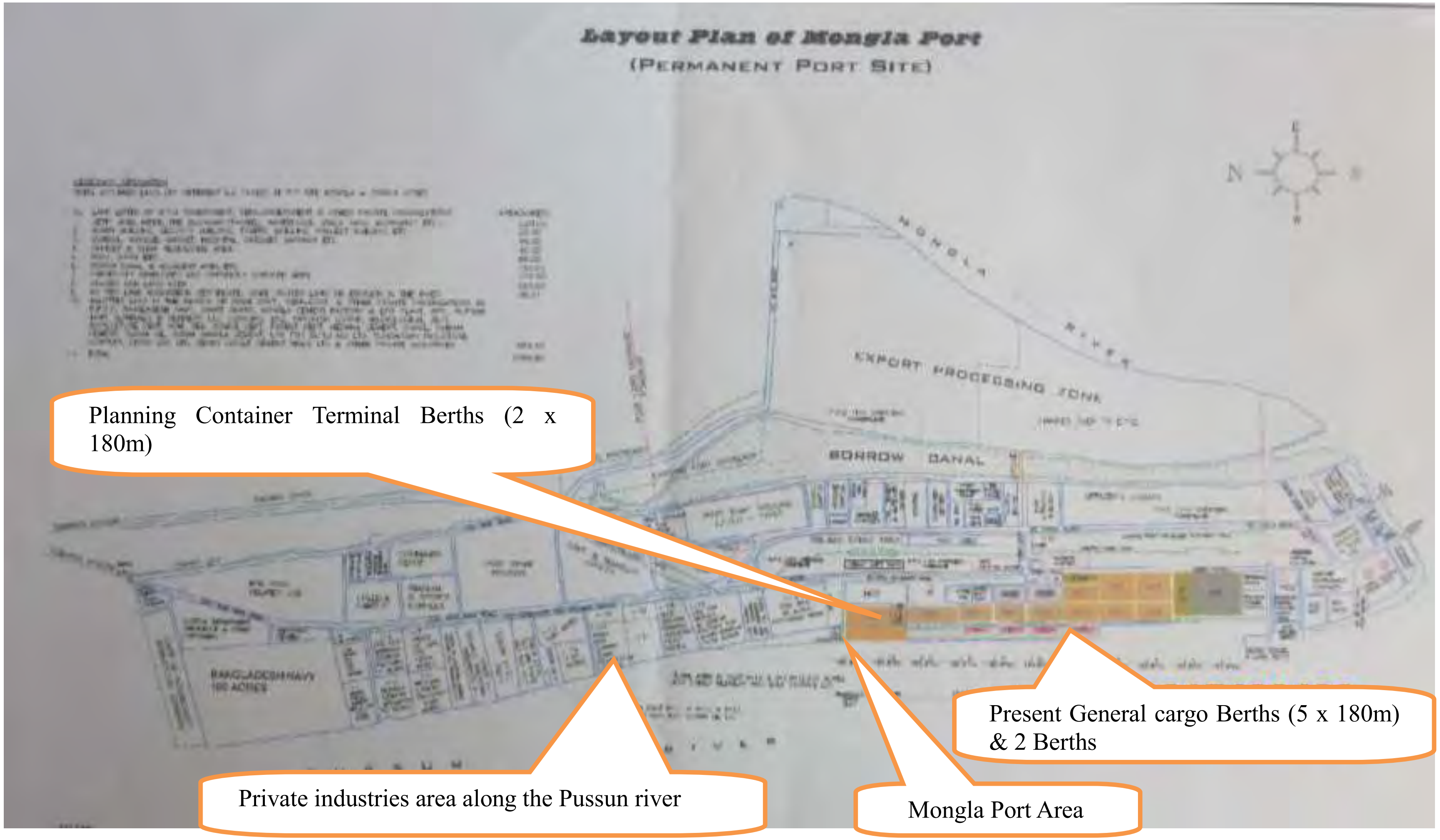


Figure 2.4 Location of Development Plan of Container Terminal Berth in Mongla Port

1.4 Matarbari New Deep water Port Development

1.4.1 Present Site Conditions of Industry Port Development

The deep sea industrial port is planned to develop for receiving import coal to thermal power plant in the Matabari Island. Ground soil conditions in the region is very soft and weak, which is worse than expected as compared with the soil survey results of the FS survey, require extensive soil improvement for Power Plant and deep water port foundation.

In addition there are no sand sources for land reclamation to develop a proposed industry port around the project area, there is no place where procurement of the sandy soil of the land reclamation can be secured from the seabed sand, mountain sand in the vicinity.

The breakwater construction is required in order to protect the approach channel from the high wave during monsoon.

Some parts of the project area are nominated as the environment protected areas. It is informed that some specified rare birds shall be protected for reproductive.

1.4.2 Plan of Deep Water Commercial Port Development

(1) Site Selection of New Deep water Commercial Port

Under the Study of "Data Collection Survey on Integrated Development for Southern Chittagong Region" the development plan of new deep water (depth -16.0m) commercial port is prepared and select Southern Moheshkali district in adjacent to the planned deep water industrial port in Matarbari Island.

It can be seen that in alternative others candidate sites there is a district that has been specified as parts of an environmental protection district, in which large-scale infrastructure development are difficult to develop, it has been decided to develop a new deep water commercial port in Matarbari district, which is considered reasonable judgment.

(2) Target Traffic Demands and Implementing schedule

The deep water commercial port plans to handle demands of containers (8 mil TEU) and general cargoes by developing 30 berths. The project is developed by phases, the port of phase 1 is planned to open in 2026 and ultimately planned facilities will be developed as phase 3 by 2041. The development plans is prepared to meet the target traffic demands after 2030

(3) Preparation of Development Plan of New Commercial Port

Adjacent to the thermal power plants planned in the Matabari district, the deep water commercial port is planned in Makeshkhali island. The study team prepare number of layout plans in a combination of commercial and industrial ports to be developed as an integral with industrial port (new commercial port share the access channel to be developed by industrial port) and the alternative plan to separate industrial port and commercial port by developing the access channel separately.

The new port development project includes the following infrastructures facilities.

Table 2.8 Infrastructures facilities.

Water Supply	Need to discover new water resources (no water resources exist around Matarbari)
Transport	Need to develop a comprehensive logistics plan to include railway, road and ship. Need to construct transport infrastructure, in relation to local logistics transport plan, as mentioned above.

The new deep water commercial port is planned to intake railway lanes and roads to transport containers and general cargo to the hinterlands.

(4) Land Use Plan for Bulk Cargo Handling

The land use plan in the development study include the allocation of land for handling and stocking the bulk cargo of oil, cement, cinders of coal along the access channel and the industrial port area so as to encourage private investors.
The industrial port plans to handle in addition to coal, cement, clinker, fertilizer, petroleum, petroleum products, steel manufacturing, industry entrants such as LNG, near thermal power plant so that it can be allocated, so as to encourage private investors to advance their business in this deep water port area. The study team also prepare land development plan along the access channel.

Table 2.9 Land Development Plan by Commodities in Phases

Commodities	Phase 1(by 2026) Demands	Phase 1(by 2026) No of Berths	Phase 2 (by 2031) Demands	Phase 2 (by 2031) No of Berths	Phase 3 (by 2041) Demands	Phase 3 (by 2041) No of Berths	Planned land area (ha)	Planned ship size
Coal (Mil ton)					30		150	
CTT (Million ton)	9.1	5	14	8	40.8	16	150	80000DWT
Ash Pond (mil ton)							600	
Fertilizer (mil ton)	2.3	1	3.3	0	5.6	0	50	
Cement Factory (mil ton)	14	1	25	0	42	0	10	
Steel Mill Products (mil ton)	0.4	1	0.5	0	0.6	0	100	
Oil refinary products	2.2	6	4.4	0	0.1	0	400	
LNG (mmcfd)	0	1	1,000	1	2,000	0	72	Q-Flex
Containers (mil TEU)	0.76	3	2.01	6	5.49	15	150	20000-40000DWT
General Cargo (mil ton)	0.47	1	2.8	3	9.78	8		15000-30000DWT

Source; The Survey team summarized from interview with the study team of “Data Collection Survey on Integrated Development for Southern Chittagong Region”

(5) Site Conditions Affected the Construction Works

The project is required large volume of dredging works, but the dredging material is soft mixed with silt and cannot be used for the reclamation. As a result the construction cost is getting expensive. It is necessary to conduct detailed site survey of sand source around the planned project area. The special economic zone (SEZ) is planned to develop around the new deep water port.

The foundation of Thermal power plant, and the port planned site are salt farm ground with weak soft ground, requires large-scale soil improvement. The development plan of industry port does not indicate the breakwater along the access channel, which is required to be protected from high waves by breakwater.

Although planning of industrial park has been developed to take advantage of a deep water port, however considering the soil conditions around the port area, SEZ is planned separately from Makeshkheli district and select suitable sites in the main island with firm ground soil area from a technical point of view. In case SEZ is developed in this Island, the further construction of the seawall surrounding the industrial park is required as storm surge measures.

(6) Necessity of Long Term National Port Development Plan

At present the strategic master plan of Chittagong port is under study by ADB Technical Assistant、Each Port Authority in Bangladesh had reviewed their Master Plan and updated to meet the latest demands by economic growths. The long term nation-wide ports development plans is prepared to identify the functions of Chittagong port, Payra port and Mongla port whether these three ports shall be developed to meet the demands after 2030 or develop a new deep water port development.

The out puts by the "Data Collection Survey on Integrated Development for Southern Chittagong Region" describe the necessity of 4th deep sea commercial port in Bangladesh by demands not only of container traffic, but of potential bulk cargo and development plans of combining commercial and industry deep sea ports as integrated port development. The development plan and demands forecast will be worthy to study for establish the long term strategic port development plan by Government MOS and .for selection of the appropriate site of 4th deep sea port to meet the traffic demands to be generated by national and regional economic growth after 2030. It is suggested to proceed the feasibility study of exclusive deep sea port development project.

1.5 Payra Port Development Plan

- Government of Bangladesh planned to develop Payra Port.
- Payran Port Authority Act was passed in the National Parliament on 5 November 2013 for developing 3rd Sea Port in Bangladesh and inaugurated as 3rd Sea port in the nation on 19 Novewmber 2013 by the Prime Minister.
- The port is located in the Meghna Estuary at Rabnabad Channel in the Kalapara Upazila, Patuakhali District, Bavisal Division. It is about 154 NM away from Chittagong Port and 125 NM away from Mongla Port. The total port area is 504 sq m.
- The anchorage area is selected at the following location: Area 30 NM x 7 NM, Depth -10 to -20 m, and distance from the fairway buoy 30 NM.
- The jetty alignment is selected at the depth of -12m to 25m, which can accommodate deep draught and bigger size vessels.

Table 2.10 Nationwide Container Traffic Movement through Bangladesh from 2006 to 2015

F/Year	Throughput (TEUs)	Growth in (TEUs)	% of growth
2006-07	913,704	Base year	Base year
2007-08	1,027,745	114,041	12.5
2008-09	1,108,056	80,311	7.81

F/Year	Throughput (TEUs)	Growth in (TEUs)	% of growth
2009-10	1,212,652	104,596	9.44
2010-11	1,468,914	256,262	21.1
2011-12	1,343,408	-125,506	-8.5
2012-13	1,468,713	125,305	9.33
2013-14	1,625,509	156,756	10.7
2014-15	1,866,942	241,433	14.9

Source; Payra Port Authority

- Road Communication are available with the following lanes; existing road – 2 lanes and future to be widen to 4 lanes, It is planned to construct the Padma bridge, which will reduce the distance to Dhaka. Ferry service is available to cross Payra River.: Road distance Chittagong to Dhaka; 250 km. Mongla to Dhaka; 218 km Payra to Dhaka; 242 km. Connecting points from the Planned port site; To North; 4 lanes Reinforced concrete road for 6 km, to connecting bridge for 800m and to South 4 lanes road in 12 km away, Marine drive available in approximate 4 km away.

- River Communication; minimum depth is 0.5m, No bay crossing and no waiting for high tide, There are navigational marking along the river and ships can sail in day and night times. Water route Distance is from Chittagong to Dhaka; 232 km, From Mongla to Dhaka 354 km and from Payra to Dhaka 267 km.

- It is said that there would be benefits by development of Payra Port including; i) Faster and easier for export agriculture products, ii) Enhanced fish processing and export together with increase employment opportunity, iii) Boost generation of garment industries & accelerated exports, iv) Boost generation of other industrial development in the exclusive Economic Zone v) Enhanced economic networks in the country, vi) Enhanced international trade facilities, vii) Development of Eco-Tourism, and viii) Enhanced waterway communication, ix) Development of exclusive economic zone.

- Planned Implementation Schedule;

- Stage1; Commence limited scale of port operation by December 2015 through lighter vessel bringing merchant ships at outer anchorage

- Stage 2; Complete major components of port infrastructure with 2.5km terminal facilities including river bank protection and capital dredging and breakwater by 2018.

- Stage 3; Complete remaining port facilities by 2023.

- HR Wallingford, UK consultant, provides the techno-Economic study on Approach channel design, River bank protection, capital and maintenance dredging, breakwater, potential cargo handling terminals of general cargo, bulk cargo, Ro-Ro traffic, containers etc. and checking economic viability and preparation of a conceptual master plan.

Table 2.11 Traffic demands forecast (1,000 TEU)

Year	Bangladesh	Chittagong	Mongla	Payra
2015	1,940	1,900	33	0
2020	2,930	2,790	40	100
2030	3,785	2,870	400	515

Source: Payra Port Authority

- The Payra port plan to develop the following terminals:

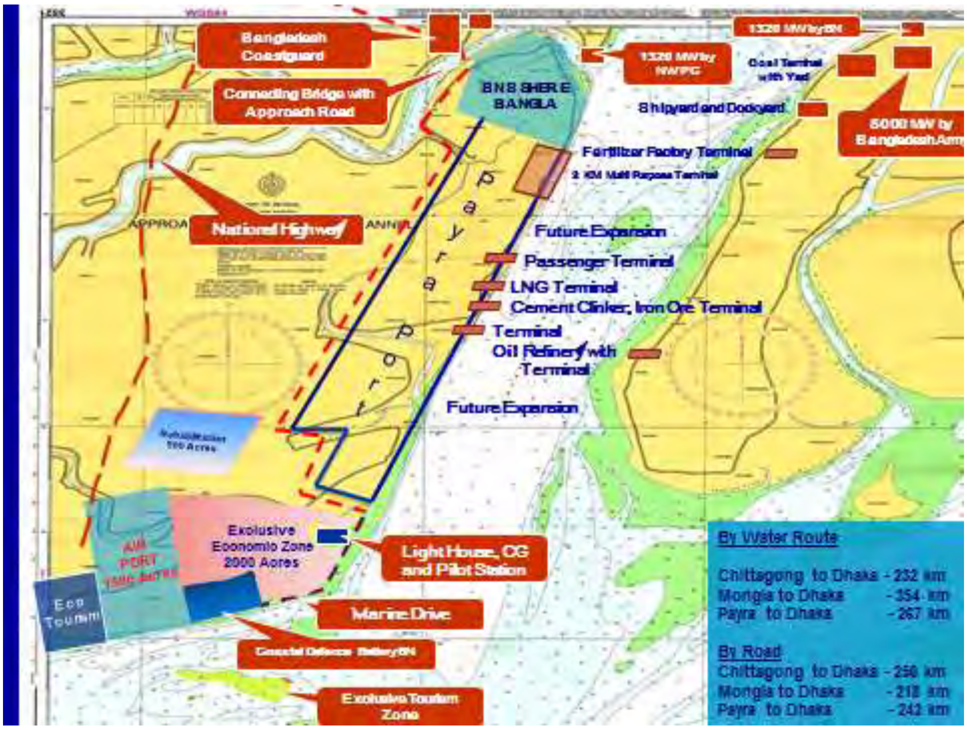
  a) Container terminal of 2 km berth length at -14,0m draft,
  b) Dry bulk terminal for coal fired power plants,
  c) Multipurpose terminal with 1 km length of berth,
  d) Liquid bulk cargo,
  e) LNG terminal,
  f) Ferry terminal for inland waterway,
  g) Ship yard and repair facilities,
  h) Economic zone,
  i) Airport, and
  j) Railway connection between Payra and Dhaka.

The practical development plan covering all planned facilities is not prepared yet.

Figure 2.5 Location of Payra Port

Table 2.12 Distance to Payra by Road and Waterway

By Water Route		Distance	By Road		Distance
Chittagong to	Dhaka	232 km	Chittagong to	Dhaka	250 km
Mongla to	Dhaka	354 km	Mongla to	Dhaka	218 km
Payra to	Dhaka	267 km	Payra to	Dhaka	242 km



Source: Payra Port Authority

Figure 2.6 General allocation of Planned Terminals in Payra Port

Technical Issues of Payra Port and Matarbari port

Comparing the sea charts of the two project sites, it is observed the following technical issues of the Payra port development and operation;

- The distance of access channel of Payra port from the anchorage area at depth of -10m to 20m off shore to port area is around 75.5km. The capital dredging volume and maintenance dredging volume of Payra port is estimated very large based on the sea chart. The capital dredging of Payra port is estimated roughly around 100 Mil cum and maintenance dredging volume will be about 10.0 Mil cum per year.
- The distance of maintenance of dredged channel is from the anchorage area to the Payra port site about 75.5 km (30 NM) distace, which will be physically very difficult works.

This maintenance dredging requirement will cause heavy financial burden for Payra port operation.

In the case of Matarbari port area it is observed the sufficient depth in the offshore access channel area for designed ships, but the port is planned to develop artificially by dredging the inland area for channel and berthing facilities, which may require around 35-40 mil cum of capital dredging for access channel development and maintenance dredging volume will be around 3-4 mil cum/year as estimated roughly by the survey study team.
The geographic condition of the planned project sites of two ports is observed soft silt mud by sediment material from the river. Both ports will require large scale of land reclamation with soil improvement for port development.

1.6 Bangladesh Inland Waterway Transport Authority (BIWTA)

It is expected that traffic volume through the international and inland waterways will increase along with activation of the regional economy of India, Bangladesh and Myanmar. The Survey Team assessed necessity of enhancement of IWT.

Development history of inland waterway in Bangladesh Started in 1958, when 5 inland river ports were operated in Bangladesh. During the period from 1973 to 1975, 3 new river ports were constructed, and in 2014, total 21 inland river ports were operating.
However, during the last 10 years, 80 to 85% of the national budget had been allocated to development of road/highway/big bridge/remote roads, 10 to 12 % had been allocated to railway development and 5 to 10 % had been allocated to inland waterway.

As a result of such infrastructure development policy, the distance of inland waterway was 24,000 km in 1974 (which was reduced to 6,000 km during monsoon season and only 3,800 km during dry season), but the distance became 4,800 km in 1989 even during dry season. This distance today would be further shorter to 3,800 km, while traffic of passengers and cargo transport had been increased and number of inland river ports had increased. The ship size has not got larger since beginning of the transport service. BIWTA developed 24 river ports in Bangladesh to provide for passengers transport service and load/unload cargos transport service.

Bulk cargo are transported and loaded/unloaded by private company at their factories located along the waterway, such as cement, bricks, fertilizer, sand by dredging and transporting to reclamation sites. Public inland waterway service transport passengers and cargo, while private company transport only cargo and not allow transporting passengers.

1.6.1 Hierarchical classes of BIWTA

BITWA is responsible of maintain the depth of waterway by classified level. The inland waterways are classified in four hierarchical classes as follow:

Table 2.13 Hierarchical Classes of BIWTA

Class	Indicated Depth (m)	Length (km)	Share (%)	Classification Criteria
I	3.6 - 3.9	683	11	These are major transport corridors where limited depth of 3.6 m is required to be maintained round the year
II	2.1 - 2.4	1,000	17	These link are major inland ports or places of economic important to Class-I routes
III	1.5 – 1.8	1,885	32	Being seasonal in nature, it is not feasible to maintain higher limited depth throughout the year.
IV	<1.5	2,400	40	These are seasonal routes where maintenance of limited depth of 1.5 m or more in dry season is not feasible
Total		5,968	100	

Source; Bangladesh Inland waterway Transport Master Plan 1989.

1.6.2 Traffic Volume by BIWTC

The number of passengers and cargo carried by BIWTC in Inland waterway and Coastal service from 2010-11 to 2014-2015 (cargo in1000 M.ton)

Table 2.14 Traffic Volume of Inland and Coastal service

Year	Inland		Coastal		Total	
	Passenger	Cargo (M. ton)	Passenger	Cargo (M ton)	Passenger	Cargo
2010-11	430,185	9.0	570,082	7.0	1,000,267	16.0
2011-12	463,956	5.0	366,844	2.0	830,800	7.0
2012-13	465,637	5.0	279,854	3.0	745,491	8.0
2013-14	329,086	6.0	265,751	3.0	594,837	9.0
2014-15	339,831	6.0	218,406	2.0	558,237	8.0

Source; BIWTC

The number of vehicles and passengers carried by BIWTC ferry services in different routes from 2010-11 to 2014-15

Table 2.15 Traffic Volume of Vehicle and Passengers by Main Route

Routes	Paturia-Daulatdia		Mawa-Charjanajat		Chandpur-Shariatpur		Laharhat-Veduria		Bhola-Laxmipur		Total	
Commodity	Vehicle	Passenger	Vehicle	Passenger	Vehicle	Passenger	Vehicle	Passenger	Vehicle	Passenger	Vehicle	Passenger
Year												
2010-2011	1,245,611	13,433,738	470,946	4,325,109	41,883	141,994	40,456		30,920		1,829,816	17,900,841
2011-2012	1,244,843	12,725,266	578,060	4,169,965	48,957	196,881	44,126	1,758	37,694		1,953,680	17,093,870
2012-2013	1,264,099	12,669,324	609,141	3,797,632	51,847	274,797	46,348	5,537	37,949		2,009,384	16,747,290
2013-2014	1,227,464	12,001,478	676,029	3,937,735	48,602	210,769	52,858	8,631	38,547	10	2,043,500	16,158,623
2014-2015	1,404,169	14,024,905	726,526	4,139,409	62,518	284,589	66,388	16,551	47,665	5	2,307,642	18,465,459

Source; BIWTC

1.6.3 BIWTC Facilities

Table 2.16
Terminal Facilities of Ashuganj-Bhairab Inland Port Existing and proposed

	Existing Facilities	Ashuganj Cargo Terminal	Bhairab Bazar Terminal
1	Existing port area, ha	4.50 Kilometer	4.50 Kilometer
2	Details of existing facilities relater to passenger terminals such as office, passenger facilities, Jetties, Pontoon, Gangway etc.	a) Office = 250.00m2	a) Office = 250.00m2
		b) Rcc Jetty =1no = 425.00m2	b) Rcc Jetty =1no = 425.00m2
		c) Steel Jetty = 2x45m = 90.00m2	c) Steel Jetty = 2x45m = 90.00m2
		d) Pontoon = 2 nos	d) Pontoon = 2 nos
		e) Gangway = 1no = 93.00m2	e) Gangway = 1no = 93.00m2
3	Details of existing cargo facilities such as warehouse area, parking area, access road.	a) warehouse area = 1 no =225m2	a)warehouse area = -
		b) parking area = 1000.00m2	b) parking area = -
		c) access road = 3990.00m2	c) access road = -
	Proposed Facilities		
1	Proposed area, ha	2.00 Kilometer Both way	2.00 Kilometer Both way
2	Details of existing facilities relater to passenger terminals such as office, passenger facilities, Jetties, Pontoon, Gangway etc.	a) Office = N/A	a) Office = N/A
		b) Rcc Jetty =1no = 425.00m2	b) Rcc Jetty =1no = 425.00m2
		c) Steel Jetty = 2x45m = 90.00m2	c) Steel Jetty = 2x45m = 90.00m2
		d) Pontoon = 2 nos	d) Pontoon = 2 nos
		e) Gangway = 1no = 93.00m2	e) Gangway = 1 no =225m2
		f) Bank Protection	f) Bank Protection
3	Details of existing cargo facilities such as warehouse area, parking area, access road	a) warehouse area = 1 no =225m2	a)warehouse area = 1no = 400m2
		b) parking area = N/A	b) parking area = 2000.00m2
		c) access road = 1500.00 m2	c) access road = 20000.00m2

Source; BIWTC

Table 2.17 Passenger and Cargo terminal at Chandpur Inland Port

	Existing Facilities	
1	Existing port area, ha	1 (one) Hectare
2	Details of existing facilities related to passenger terminals such as office, passenger facilities, jetties, pontoons, gangways, etc.	Walk way -167.29m² Ticket Counter:-37.00m² Steel Jetty –2Nos:- 118.96m² Steel Spud-6nos Pontoon- 4Nos Police barrack-185.87m² Passenger Waiting Shed:- 74.00m² Parking Yard:- 8010.00m²
	Proposed Facilities	-
1	Proposed area, ha	Appx.0.57 Hectare
2	Details of Proposed facilities related to passenger terminals such as office, passenger facilities, jetties, pontoons, gangways, etc.	Land development -21669.00m³ 3stored terminal Building. -4061.00 m² Bank protection : 253.00m Boundary wall: 231.00m Steel gangway: (Length 100')-3.00Nos Spud and spud ring: -22Nos Shaded Walkway: 270.00m² Terminal pontoon (100' x 30' x 7'-0"):-4Nos Deeptubell with water supply system & sewerage facilities:-L.S Electrification:-L.S Construction of steel jetty at port area: -267.65m² Fire Fighting System:- L.S Parking yard : 7014m² Internal / External road: -3326.00 m²

Table 2.18 Passenger and Cargo Terminal at Sadar Ghat, Dhaka Inland Port :

	Existing Facilities	Sadar Ghat Dhaka Inland Port
1.	Existing port limit	2 x 40.50 KM= 81.00 KM
2.	Details of Proposed facilities relater to passenger terminals such as office, passenger facilities, jetties, pontoon, Gangway etc.	a) Office : 1358.00 M2
		b)RCC Jetty: 2 Nos.
		c)Steel Jetty :14 Nos.
		d)Pontoon: 28 Nos.
		e)Gangway: 25 Nos.
3.	Details of existing cargo facilities such as warehouse area, parking area, access road.	a)Warehouse : N/A
		b)Parking area:7900.00 M2
		c) Access road : N/A
	Proposed Facilities	
1.	Proposed area, he	2 x 40.50 KM = 81.00 KM
2.	Details of existing facilities relater to passenger terminals such as office, passenger facilities, jetties, pontoon, Gangway etc.	a) Office : 1000.00 M2
		b)RCC Jetty: N/A
		c)Steel Jetty : 10 Nos.
		d)Pontoon: 15 Nos.
		e)Gangway: 5 Nos.
		f) Spud : 30 Nos.
3.	Details of existing cargo facilities such as warehouse area, parking area, access road.	a)Warehouse : N/A
		b)Parking area: 1162.00 M2
		c) Access road : N/A

1.6.4 Development of 10 River Ports prioritized out of 24 River Ports.

BIWTA nominated 24 river ports this year (2015) as important ports and select 10 top-priority river ports, and plan to develop in the 7th five-year plan. In 2016 the project engineering study will be started. BIWTA prepare the implementation plan of the project and submit to MOS for approval of a business plan and requesting the budget of the project in 2017.

Table 2.19 Prioritized River Port Development

For Service	Name of River ports concerned
For Passenger transport	1) Patuakhali River Port (improve by extension)
For Cargo & Passenger	2) Bhola River Port, (Improve existing) 3) Chandpur River Port, (Improve existing) 4) Narayanganj river port (Improve existing)
For Cargo transport	5) Meghna Ghat River Port (New near Dhaka river port), 6) Ghorashal River Port (New Lakya river), 7) Chhatak River Port (North Suna river) 8) Ashuganj-Bhairab river port (New terminal adjacent to planned ICT by India) 9) Nowapara river port (near Khulna inland river port) 10) Baghabari river port (New at Baral River)

1.6.5 IWTA plans to develop the following facilities of prioritized river ports.

i) Introducing cargo handling equipment for loading /unloading cargo between ships and on-land storage area and
ii) To improve road connectivity by construction of access road from the terminal to main roads and
iii) Develop public transport service area in front of the terminal building area by land reclamation at Khulna Inland river port, Narayaganj River port and Dhaka inland waterway river port
iv) Three river ports (Dhaka River Port, Khulna River Port and Narayangj River port) are required for upgrading the existing terminal facilities and developing new port facilities for supporting development of special economic zone in the hinterland, since these ports were constructed in 1958 and their structures of facilities were built by reinforced concrete, which were aged and worn out.
v) BIWTA planned to develop ICT by PPP scheme and issued the development license to those private companies/investor interested to develop at the following sites.

1.6.6 Development of ICT Around Dhaka City area by BIWTA

i) BIWTA planned to demolish the existing jetty at Khanpur site and reconstruct the facilities of ICT. The existing jetty in length of 255 ft and width of 40ft and access trestle 230 ft x 30 ft is used for unloading clinkers and stock yard of 9.36 acre. The existing jetty is used for unloading clinkers (2000 ton/trip) for cement factories. BIWTA is not set exact schedule of implementing the construction of ICT at this site.

Implementing Agency	Name of ICT site	River name
By BIWTA	Khanpur ICT	Lakhya river
By Private companies	Rupaya ICT	Lakhya river
	Kumudini ICT	Lakhya river
	Ananda ICT	Meghna river
	Akkhan ICT	
	Summit ICT	

ii) One private company namely "Rupayan Group, Real Estate Developer" had started the development of ICT at Rupaya site located near the Haipur power plant in Bandar along the Shita Rakhwa River. The containers will be transported from Chittagong port to this terminal by container ship/barge (L= 82 m, Depth 3.5 to 4.0m W= 15m, loading capacity of 180-160TEU) and deliver to industrial estates in the northern suburbs of Dhaka city. When they constructed the jetty structure (Length; 180m, Width; 35 m) foundation and dredging along the jetty at -4.0 m, they have to suspend the project due to shortage of budget about 2 years ago. The remaining works of slab construction, installation of cargo handling equipment, stock yard pavement, utilities supply works are required to be completed.

iii) Other private company called " Kumudini Welfare Trust of Bengal (BD) Ltd" with financial assist from India private company called "CONCORD" planned to develop ICT (as KICT) at Kumudini site located along the Meghna river in southern from the Rupayan site. They had carried out the feasibility study in 2014 and plans to start the construction works in 2017. The feasibility study was carried out of transporting containers from

Chittagong Port by container ship/barge of 180-200 TEU loadinShita Riverg capacity and estimating to handle ultimate volume of 250,000TEU per year.

The issues of this project is the land clearance of the planned site by relocating number of existing warehouses of garment manufacturing companies and number factories to the alternative site provided by this company, who had already obtainer required land area.

1.6.7 Protocol Inland waterway development by Bangladesh and India governments

Bangladesh and India governments exchanged the protocol to improve trade of goods between both countries by using the inland waterway.
BIWTA is responsible of maintain the depth of agreed routes (Kolkata – Narayangonj inland river port) of Bangladesh parts. BIWTA plans to develop ICT at Khampun port, , which are located near the Narayangonj river port and Ashugangj port located near the India border. (Refer to Figure 1.7 and 1.8).

Table 2.20 Information in respect of Protocol on Inland Water Transit &Trade between Bangladesh & India

1	Number of Protocol Routes	8 routes
2	Total Number of Cargo Vessel engage under Protocol	300 (Approx.)
3	Highest Capacity of a running vessel under Protocol	2,000 M.T (Average)
4	Lowest Capacity of a running Vessel under Protocol	300 M.T (Average)
5	Average capacity of a running vessel under Protocol	700-1,000 M.T
6	Nature of cargo carried	Mainly Fly ash, Moreover Gypsum, Clinker, Steel Iron, Coal etc
7	Mode of Transportation	1) Inter country, 2) Transit, 3) Transshipment
8	Quantity of Goods carried	1) Inter country; 1,931,576 (Metric.Ton) 2) Transit, 14,840 Metric.T 3) Transshipment 10,000 Metric.T (Food grain)
9	Total trips under Protocol Average monthly trips	2,009 trips in 2013-2014 185-190 trips/month
10	Number of trips by Bangladesh vessels	2,033 trips in 2013-2014
11	Number of trips by India vessels	32 trips in 2013-2014
12	Quantity of cargo carried by Bangladesh vessels	1,912,622 M. ton
13	Quantity of cargo carried by India vessels	21,327 M. Ton
14	Ratio of Bangladesh & India vessels used	99;01 in 2013-2014
15	Maintenance charges earned by GOB from the Govt. India	100 Mil for 2014-2015

Source: BIWTA

i) BIWTA plans to setting custom and immigration service at 3-4 sites to check security of passengers and cargo crossing the border through the inland waterway from India, Nepal, and Bhutan. These services were already installed at Dhaka river port and Chittagong port. The custom clearance procedures for the border crossing traffic cargo will be improved based on the agreed protocol of common use inland waterway.

ii) For joint development of inland water transport with India, Bangladesh government has already signed a protocol to jointly develop the inland waterway for cargo/passenger transport from Kolkata in India to the north-East provinces of India through the Inland waterway of Bangladesh. A Line of Credit (LOC) was signed.

The protocol signed between India and Bangladesh include three routes of rivers Route 1 is located from the east-west route to the border of north-east province (Tripura, Assam, Mizoram. Aran, Meghalaya provinces), Route 2 is from north to south and Route 3 is a river along the national border on west side of Bangladesh. The India government conducted feasibility study in 2014 to develop the optimum routes out of three routes considering the urgency, economic effects, and remote support. The study found that the route 1 is the urgently required by strong demands and best cost performance. LOC financed route.

Accordingly India government propose to develop water way from India's Kolkata area to Ashuganj ICT through the inland waterway and transit to railway and trucks to Akhaura in Bangladesh and cross the border of India to Agartala in Tripura of north east province of India.

MOS, Bangladesh government received the proposal from India, BIWTA studied it and commented on consent to implement, the business of joint development and operation manners. MOS replied the comments to India Government. The Engineering study begins in early 2016 at the earliest.

The project is developed by using the loan from the Indian government. Project cost is estimated about 200Bil US $ in the LOC. It is assumed to 50,000 TEU container traffic volume in the early stages.

1.6.8 Long Term Development Plan of Narayangangj River Port Area

BIWTA indicated the following long term development plans of Narayangonj River Port area by 2030

i) Development of ICT at Khanpur area by PPP scheme
ii) Development of Eco Park at Kanpur area by PPNB(Project Proposal National Budget)
iii) Development of DEPTC area by PPNB (opposite side of Narayangonj Terminal building)
iv) Modernized terminal building and berthing facilities
v) Construction of bank protection with waterway along the Shitalakha river both sides at Kanchpur to Kumudini
vi) The Link road from Khanpur to Chasara needs to develop & Expand before completes the project at Khanpur

vii) In order to enhance the inland waterway transportation capacity through the border crossing between India and Bangladesh by widening and deepening the existing navigational channel, so as to enable the sailing of large ferry ships, a feasibility study of such project is being conducted.

1.7 Bangladesh Inland Waterway Transport Corporation (BIWTC)

1.7.1 Overview

In Bangladesh, transport by inland water way plays an important role, particularly for people from the southern district who uses different types of water transports like launch, ferry, steamer etc. to come to Dhaka.

All the long distance water vessels coming towards Dhaka arrives at the main water terminal called “Sadarghat”. At present, there are 48 different long distance routes from Sadarghat to other districts in Bangladesh. Out of these 48 routes, 3 routes are used by both private and government operated water vessels, 7 routes are used by only government operated vessels and 38 routes are used by private operated water vessels.

Bangladesh Island Water Transport Authority (BIWTA) is responsible of issuing the route permit and fare regulation while Bangladesh Island Water Transport Corporation (BIWTC) is responsible of operating government owned water vessels.

The inland water way facilities had been developed since 1958. Now BIWTA considers to develop facilities at the coastal service in the remote isolated area. Since in 2018 the port of Payra plans to commence the port service. The inland water way should contribute the development of Payra port as an logistic service by inland water way. For the coast area the coastal shipping services for transport passengers and cargo will become efficient road connection.

Table 2.21 Description of different routes where services provided by BIWTC

Ferry Service	Passenger Service	Cargo Service
Paturia-Daulatdia- Paturia	Inland Route	Chittagong-Dhaka
Paturia-Kazirhat- Paturia	1. Dhaka-Morrelgonj Rocket Service	Chittagong- Narayanganj
Shimulia-Charjanajat-Shimulia	2. Water bus service	Chittagong-Mongla/Khulna
Shimulia-Kathalbari- Shimulia	i) Dhaka-Sadarghat-Gabtali	Dhaka- Mongla
Chandpur-Shariatpur-Chandpur	ii) Narayangonj-Tongi	Narayanganj - Mongla
Bhola-Laxmipur-Bhola	Coastal Route	Narayanganj- Ashuganj
Laharhat-Veduria-Laharhat	Chittagong-Sandiwp-Hatiya-Barisal Service	Narayanganj-Kolkata (India)
Matlab-Gazariya-Matlab	Chittagong-Hatiya Service	Khulna- Kolkata (India
	Chittagong -Guptachara (Sandiwp) Service	
	Kumira- Guptachara LCT Sea-truck Service	
	Hatiya-Boyarchar Sea-truck Service	
	Char Changa-Boyarchar Sea-truck Service	
	Manpura-Shashiganj Sea-truck Service.	
	Barisal-Mozuchowdhuryhat Sea-truck Service	
	Hilsha-Maju Chowdhury Hat Sea-truck Service	
	Teknaf-St. Martin Tourist Sea-truck Service (Winter Season)	

Source: BIWTC

1.7.2 Plan of container transport by BIWTC

i) Between Chittagong ICT and Pangaon ICT BIWTC allocate 4 container ships/barges (158TEU) to transport containers. BIWTC plans to build additional container barges to meet the future increasing traffic demands.

ii) BIWTC plans to develop ICT around Naranganj river port area beside the Pangaon ICT.

iii) BIWTA had already issued the ICT development permit license to 22 private companies, the following ICT development were implemented by three private investors at cost of investor. Rupaya ICT (Lakhya River), Kumudini ICT (Lakhya River), Anande ICT(Meghne River), Akkhan ICT, Summit ICT. BIWTA intends to develop Khanpur ICT.

iv) BIWTC conducted the feasibility study of container transport by inland waterway at freight cost of 10,000 TK-8,000 TK of imported containers and 5,000 TK – 4,000 TK of export containers between Chittagong and Pangaon ICT.

1.7.3 Subsidy to operation and management of Coastal Service

i) BIWTC operates coastal service connecting between islands in remote area in Bengal Bay (present operation route as Coastal Service is from Chittagong-Sawndip-Hatiya） At present 3 ships are engaged in operation to make 1 trip per day and it take 16 hours from Chittagong to Hatiya. The average traffic volume per ship is around 700 passengers and cargo (dry food, food stuff etc)

ii) The ship engaged in this route is a large size ship for safe crossing the ocean sailing in open sea and high waves. The operation cost of large ship for this service is 40 Mil TK per year, while the number of population in this region is little and rare regional industries. Thus the traffic volume and income from users is limited.

iii) The revenue by users is not enough to cover the expenses of such large ship. Central government provide limited annual budget of 0.5 mil TK as lump sum in addition to the national budget. The shortage of operation cost of the coastal service is covered by internal subsidy of BIWTC from earnings of profitable routes to the expenses by coastal service to make financial balance of BIWTC management. Since this coastal service is only accessible means of transport in the coastal region/remote areas and BIWTC continues to provide the public transportation due to the humanitarian supports.

1.7.4 Circular Waterway Transport Service around Dhaka Waterway

As Dhaka is surrounded by the Buriganga, Dhaleswari, Turag, Balu and Shitalakhya waterways, introducing water transport service is highly potential. BIWTA started the development of waterway transport facilities called “Project of Circular Waterway in 1994-1995

The development of waterway transport facilities was implemented and completed in two phases. 1st phase from Sardaghat to Ashulia (29.50 Km) in 2005 and 2nd phase from Ashulia to Kachpur(40.50 Km) was completed in 2013.

Currently, BIWTC is operating water buses using this circular waterway around Dhaka. The planned route for the service was Sadarghat to Kachpur via Gabtoli, Tongi and Kanchpur. Description of the route is described in Table below. (Refer to Figure 1.9)

Table 2.22 Description of Circular Waterway around Dhaka

	Route From	To	Length of Route (km)	Width of Channel (m)	Depth of Channel (m)
1	Sadarghat	Gabtol	16.00	60	4.28
2	Gabtol	Asholia	29.00	37	2.44
3	Tongi area	Kanchpur	40.50	37	2.44

Source: BIWTA

BIWTC arranged 4 new waterbuses (81 seats) and BIWTA started to dredge the river to ensure continuous flow of water. Finally, BIWTA resumed the service from July 2013 between Sadarghat and Gabtoli with 6 water buses.

At this stage, the service is having financial loss as still the number of passengers is quite low. Nevertheless, BIWTC is planning to increase the number of waterbuses to12 (twelve) by this year.

With the failure to attract the passengers to use the circular waterway, many commercial water vessels are using the route to carry soil or sand as construction materials. According to BIWTA, the number of trips of water vessels carrying sand or soil is decreasing 2,000 daily truck trips which are supposed to enter the city.

Some of the issues related to passenger service of Circular Waterway in Dhaka are:

- Inconvenient waiting facilities
- Lack of intermodal facilities from the stations
- Lack of publicity is one of the reasons for less passengers
- Quality of river is very bad and smelly
- Insufficient approach roads to the stations
- Low height of bridges at some locations cause difficulty to have access of big water buses
- River is too narrow and shallow in some point

BIWTC intends to develop water buses and improve circular water way transport service with loading/unloading facilities around Dhaka metropolitan area. For this BIWTC plan to purchase 24 ships, cruiser ship, 2 ordinal vessels, 4 floating house boat, and maintenance dredger for maintenance of depth and cleaning the waterway.

- BIWTC started the circular water way around the Dhaka city to relief the traffic congestions in 2014 July with 12 water bus ships (40 passengers per ship). These water bus ships were built by the owned budget of BIWTC and plan to extend to routes of waterway and service area.
- BIWTC plans to build 2 water bus ships (35 passengers per ship), 6 water bus ships (46 passengers per ship) and 4 water bus ships (82 passengers per ship) at owned budget of BIWTC,
- Present operating routes; i) Sadargrat (Dhaka Port) –Gabtoli in the distance of 16 km, which is the most profitable route among the other routes. During July 2014 to Feb 2015 for 8 months, more than 50,000 passengers used this route.
- BIWTC plan to extend the presently operating route up to Asholia in the length of 29 km and new route from Tongi area to Kanchpur Area in the distance of 40.5 km
- BIWTC have already submitted the application to MOS in April 2015 requesting to utilize

JDCF (Japan Deft Cancellation Fund) for procurement of 24 water bus ships in 2016-2017 at the cost of 2,555.1MilTK,

- BIWTA shall carry out the channel dredging, construction of jetty /terminal facilities and fabrication /installation of pontoon for station.

1.7.5 Prospect of Bangladesh – India IWT "Protocol" Routes

Bangladesh with its unique geographical location is strategically located in South Asia and is in a position to serve the region by providing transit facilities to its neighbors.

Under a bilateral "protocol" signed between Bangladesh and India, inter-country and transit trade using inland waterways routes in Bangladesh is already under way.

Potential of Bangladesh IWT in Sub-regional Connectivity

In 2010 Bangladesh and India signed a Joint Communiqué laying down a provision for using Chittagong and Mongla sea-ports by Bhutan, India and Nepal in order to promote transit trade between the countries. The most freight to neighbor countries is required to be carried by railways and inland waterways.

i) Bhutan: There exists an inland waterway route from both Chittagong and Mongla seaports upto Bangladesh border (Daikhawa, Chilmari). The waterway extends to Dhubri (India) where an important and busy river station exists. A 150 km long road in good conditions exists from here to Thimpu, which is a very thriving commercial center of Bhutan. This inland route falls within Bangladesh – India "protocol" waterway and is also favorable for inter-country trade and for using as a transit route between India (Kolkata) to Bhutan.

ii) Nepal: Banglabandha, a land port situated at Bangladesh boundary line, is currently in use as a crossing point for traffic and trade with Nepal. A 42 km long road runs from the border to Kakravita, a prominent and busy business hub in Nepal. However in accordance with an Agreement between India and Nepal, trucks from Nepal can come up to "zero point" of Bangladesh border, but cannot enter into Bangladesh territory. In a similar manner, Bangladeshi trucks with export cargo are not allowed to go to Kakravita in Nepal across Indian territory. Therefore back-to-back transshipment has to be made into Indian or Nepali trucks at "zero point". The time wasting and costly transshipment operation are frustrating the operators; and recent port activities declined.

iii) There is an opportunity to extend a friendly hand to neighboring land-locked Nepal by allowing use of Bangladesh's sea-ports. Cargo destined for Nepal can be transported through Bangladesh by availing facilities in advantageously located Mongla sea-port. Incidentally, Mongla Port handled about 60,300 tons of Nepalese transit cargo in1997 – 98, which fact provides a positive indication of future possibilities. The following multi-modal routes using the country's waterways network have been identified preliminarily:

Table 2.23 Inland Multimodal Routes

Using IWT and Railway	Mongla-Noapara (by waterways); and Noapara-Rohanpur / Singbad-Raxual-Birgunj (by Railway)	Connectivity to Kathmandu region in Nepal
	Mongla-Noapara (by waters); and Noapara-Birol/Radhikapur-Jugobani-Biratnagar (by Railway)	Connectivity to Biratnagar region in Nepal. (Particularly to Birol existing Meter Gauge train tract requires to be replaced by Board Gauge)
Using IWT and Road	Mongla-Noapara (by waters); Banglabandha/Phulbari-Naxualbhita-Kakravita (by Road)	Connectivity to Kathmandu region in Nepal

iv) Ashuganj, Baghabari and Noapara are very prospective inland river ports that can be used as transit and transshipment points for trade with Bhutan, India and Nepal. All the three river ports are presently very active and have waterways connectivity with Chittagong and Mongla seaports and Road connectivity with numerous Land Ports situated on Bangladesh-India border. Not much investment is required to make them suitable for inter-modal transport service.

Table 2.24 Statistic of Movement of Vessels & Cargo under PIWTT

Year	Quantity of goods		Quantity of Goods carried in total (M. Ton)	Number of trip By Bangladesh vessels	Number of trip by Indian vessels	Total trips Under protocol	Ratio of goods Carried by Bangladesh & India
	Carried By Bangladeshi vessel (M. Ton)	Carried By India Vessel (M. Ton)					
2001-2002	47,858	58,170	106,028	170	258	428	44:55
2010-2011	1,424,767	12,697	1,437,464	2,063	21	2,084	99:01
2011 -2012	1,429,444	55,558	1,485,002	2,033	36	2,069	96:04
2012-2013	1,507,357	46,661	1,554,018	1,977	32	2,009	97:03
2013-2014	1,912,622	21,327	1,933,949	2,332	31	2,363	99:01
2014-20 15	1,936,564	12,890	1,949,454	2,332	23	2,355	99.3:07

Note: Protocol on inland water transit & trade between Bangladesh & India from 2001-2002 to 2014-2015
Source: BIWTC

1.7.6 Development Project by BIWTC

(1) Annual Development Plans

The following projects are now under Implementation under Annual Development Programme (ADP) 2015-2016 by BIWTC

Table 2.25 Annual Development Plan of BIWTC

Sl No	Name of the Project (Implementation Period)	Estimated cost (TK in lakh) a) GoB b) BIWTC	Cumulative progress up to June 2015
A	**ADP Project**		
1	Procurement/Construction of 4 Nos, 108 TEU's (Revised 158 TEU's) Self Propelled Multi-Purpose Inland Container Vessels	a) 15151.00	43%
2	Construction of Passenger Vessels for providing efficient passenger services In Chittagong-Sandwip- Hatiya-Barisal Coastal route	a) 3890.25 (75%) b) 1296.75 (25%) c) 5187.00	
3	Procurement of 2 Nos. New Passenger Vessel for operation in Dhaka-Barisal-Khulna River Route	a) 5779.20 (80%) b) 1444.80 (20%) c) 7224.00	
	Sub total	a) 9669.45 b) 2741.55 c) 27562.00	
B	**Project's From BIWTC Own Fund**		
1	Construction of 2 Nos. Passenger Vessels for BIWTC for operation in the Inland River Routes	5436.52	100%
2	Construction of High-Rise Head Office Building Complex of BIWTC at 5, Dilkusha *CIA,* Dhaka.	3077.0	0.03%
3	Rehabilitation of 2 Nos. Medium Ferry ' Jessore' & 'Comilla' of BIWTC.	895.80	
	Sub total	9409.32	

Source: BIWTC

(2) Future project of BIWTC

Short Term Project

i) E-ticketing system in passenger sector in Paturia-Daulatdia-Kazirhat route.
ii) Development of infrastructure facilities and establish a Marine Workshop at Dock-3 of BIWTC
iii) Construction of 2nos. improved K-type ferry as replacement of existing dumb ferry.
iv) Re-engineering of 2 nos. Ro-Ro ferry Hamidur Rahman & Motiur Rahman.
v) Construction of a go-down at Chittagong terminal.

Mid Term Project

Procurement of 35 Nos. Commercial Vessels and Construction of 2 New Slipway (Project has been submitted to the Ministry of Shipping and included in the ADP 2015-2016 under the list of new and unapproved project without allocation. Under the project construction of 3 river cruiser, 2 dedicated ferry, with 2 pontoon, 6 improved k-type ferry as replacement of dumb ferry, 6 improved utility ferry, 8 sea-truck, 2 coastal passenger vessel, 4 inland passenger vessel, 2 salvage tug, 2 oil tanker &construction of 2 slipway program has been taken)

i) Procurement/Installation of modern equipment facilities for increasing the efficiency of BIWTC's Dockyard (1 & 2)
ii) Development of Chittagong passenger terminal of BIWTC (Procurement of I Pontoon, 1 bailey bridge, 4 spud, earth work and concrete jetty, passenger sheds etc.)
iii) Construction of 2 dedicated ferry & 2 dedicated pontoon for carrying container trailer and heavy weight vehicle.
iv) Rehabilitation of 2 Ro-Ro ferry berths, Jahangir & Basha Sahid Barkat.
v) Procurement and establishment of Weigh Bridge & new wrecker 4 Nos.
vi) Introduce E-ticketing system at Mawa (Shimulia) sector and gradually it will be introduced in Chandpur, Bhola & Barisal ferry sector then coastal passenger service.
vii) Construction of 2 mobile crane of 50 tons capacity.
viii) Procurement and installation of Hi-Tech Navigation system at Paturia and Mawa ferry route and 4 ferry ships for uninterrupted operation during the period of fog and rain.
ix) Procurement and Establishment of a Floating Dock including workshop of 1500 MT capacity in the river Padma in between Paturia and Mawa ferry sector.

Long Term Project

i) Construction/ Acquisition of 4 Nos. container vessels for BIWTC (JDCF)
ii) Procurement/ Construction of 4 Nos. shallow draft oil Tanker for BIWTC.
iii) Gradually Weigh Bridge Scale will be introduced at newly open ferry route.
iv) Construction/ Procurement of 2 Nos. coastal passenger vessel-cum-Ferry.
v) Construction of commercial complex at Khulna & Barisal.
vi) Construction of Commercial & Residential complex at Farely House.
vii) Construction of Commercial-cum-Residential building at 85 Shirajdoulla Road, Narayanganj.
viii) Construction of Office building, Dormitory & other infrastructure at the adjacent of Chandpur Shariatpur ferry ghat.
ix) Construction of Office building, Dormitory & other infrastructure at Bhola-Laxmipur, Laharhat Veduria ferry ghat.
x) Construction of I No. Cyclone Shelter cum passenger at terminal No. I & 2 in Chittagong.DI

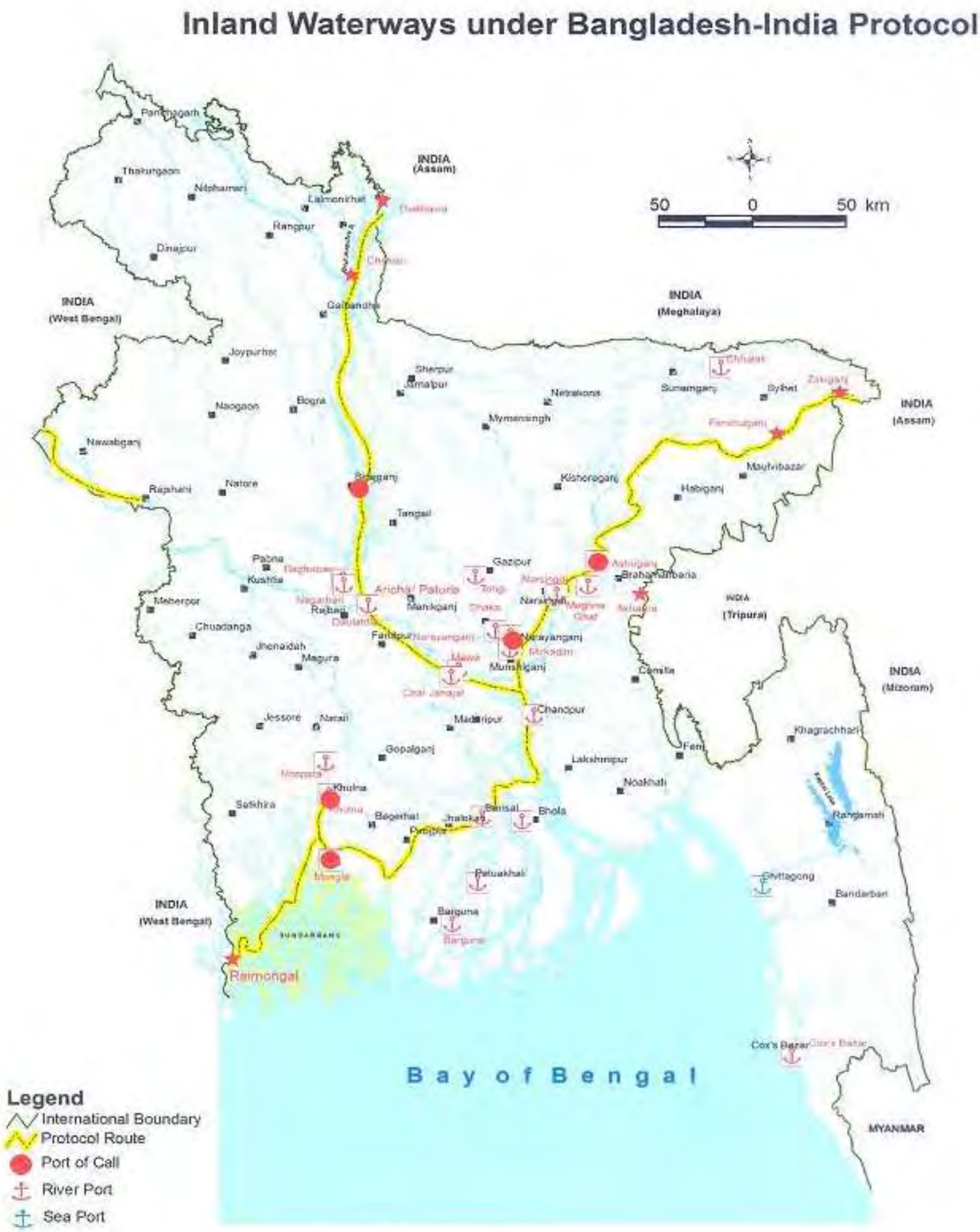


Figure 2.7 Inland Waterways under Bangladesh-India Protocol

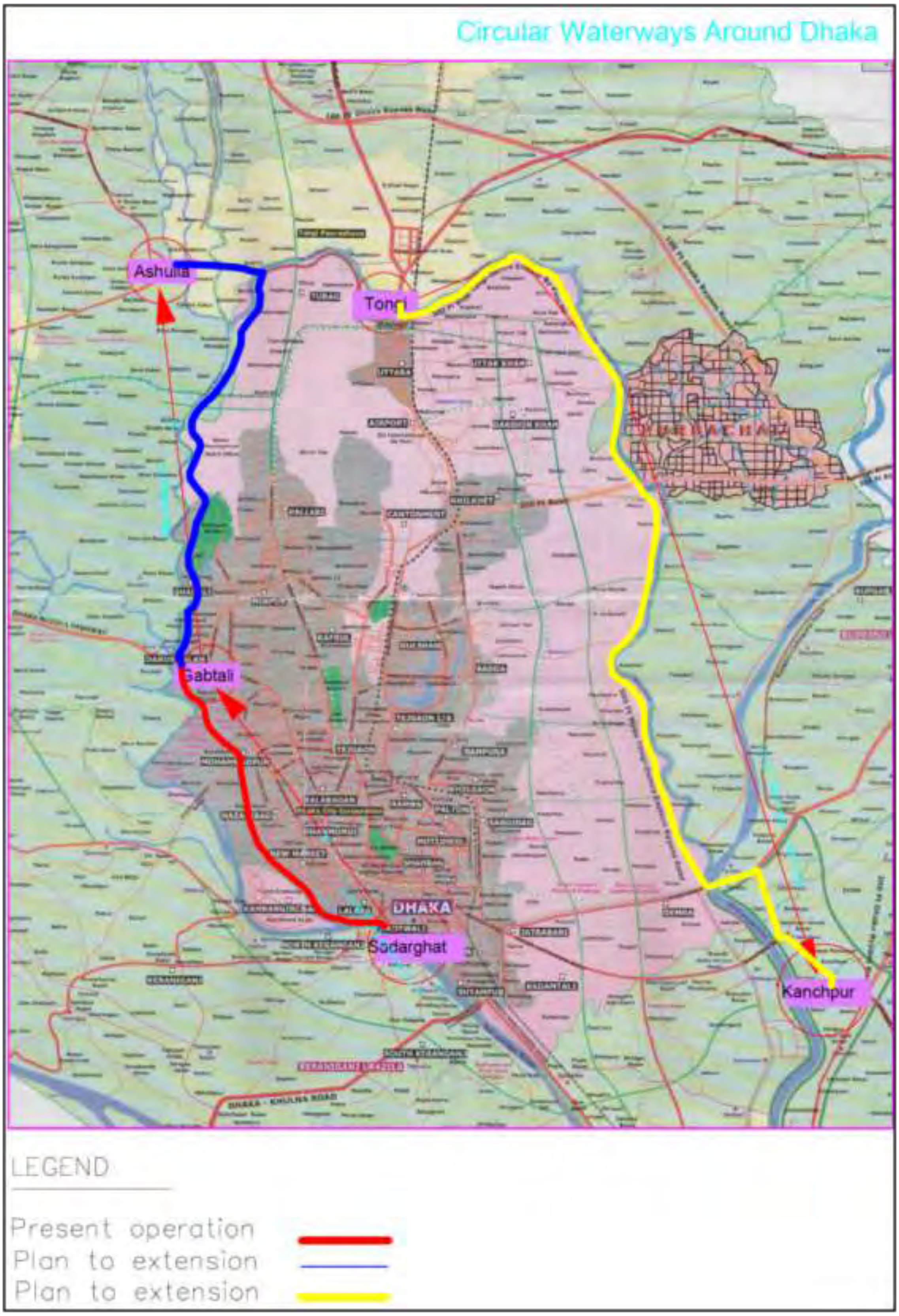
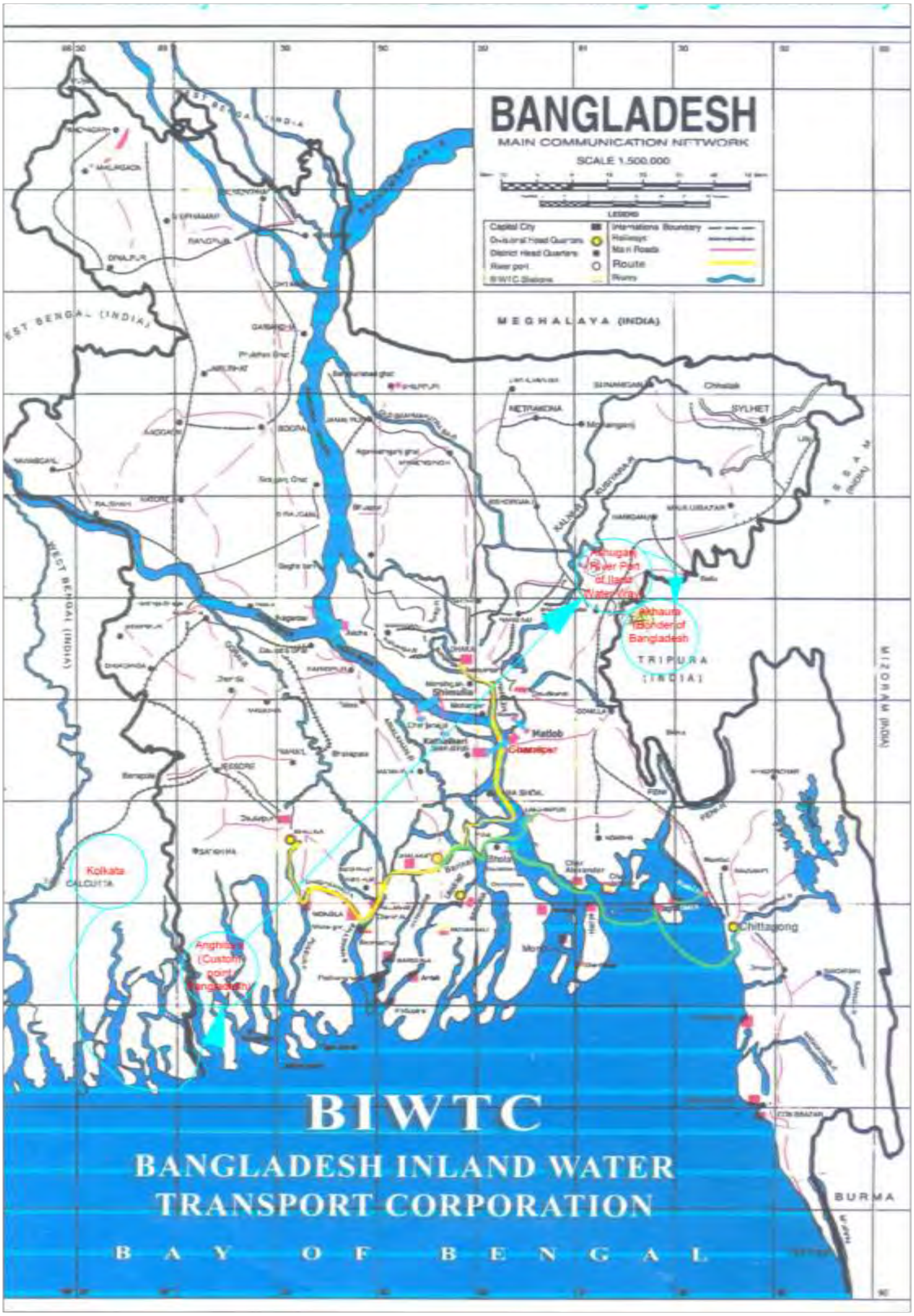


Figure 2.8 Route Map of Circular Waterways Around Dhaka City



Source: BIWTC

Figure 2.9 BIWTC Operation Rout Map and Inland Waterway from India to North East Province through Bangladesh Water way

1.8 Pangaon Inland Container Terminal

1.8.1 Prospect of Container Movement by Inland Waterway

According to the National Monthly magazine in October 2013 which reported the cover story on BIWTA, describing the target of development of Inland waterway transport and potential of cargo & Passenger transport, the following are subtracted from this publicity of the concerned article.

With increasing trend of containerization all over the world, Bangladesh would not be left behind and containers began to arrive in Bangladesh in the seventies. The trend as shown table below has steadily grown and today both Chittagong and Mongla ports handle containers:

Table 2.26 Container Handling at Chittagong and Mongla Ports from 2007-2011

Year	Chittagong (TEU)	Mongla (TEU)	Total
2007 – 2008	1,027,745	20,885	1,048,630
2008 – 2009	1,108,056	21,201	1,129,257
2009 – 2010	1,212,652	20,651	1,233,303
2010 – 2011	1,468,914	27,123	1,496,037

Source: Chittagong Port Authority, Mongla Port Authority

Due to increased economic activity particularly in the garments sector, the overall growth scenario is encouraging.

i) Chittagong Port handles major share of containers in Bangladesh, of which 70% are known to originate from or are destined to Dhaka, Narayanganj region. Of this, major volume is transported by Roads; and less than 10% by Railways. The Dhaka – Chittagong and Dhaka – Mongla highways are already congested with traffic. Their current capacity and even by developing Dhaka – Chittagong Highway into a four-lane one.

ii) Railways do not carry any containers from Mongla Port as there is no tract of railway linking the port with rest of the country. Besides, present carrying and handling capacity of the Railways is getting saturated. Railways, already aware of the situation, A number of development projects are planned to be implemented including procurement of new Container Wagons and new Locomotives as well as the construction of a new Inland Container Depot (ICD) at Dhirasram., It is expected that container transport capacity will increase by 15% of the present volume by such projects of highway and ICT from Chittagong and Mongla ports, which is not sufficient to meet the traffic demands.

iii) Inland waterways therefore hold great potential for container transport. A good waterway system by itself is not enough at present for movement of containers; proper berthing and handling facilities are required. Towards this policy, an Inland Container Terminal (ICT) has already been constructed by Bangladesh Inland Water Transport Authority (BIWTA) at Pangaon on the bank of Buriganga River. Chittagong Port Authority, vested with the responsibility of initiating its operation, and provided the handling equipment. The plan is to sail the containers carrying by vessel of 125 TEU loading from Chittagong port, contents of container area de-stuffed at Pangaon, and transport those to their destined industrial estates and factories. The ICT is envisaged to handle 30,000 TEUS initially; but targeted to handle 116,000 TEUS in first phase and 160,000 TEUS after full completion of second phase.

iv) In order to further encourage transport of containers by river routes, BIWTA plans to open a small-scale ICT at Khanpur on the bank of Sitalakhya River on BOT basis.

v) It has a more ambitious plan to develop another one of a larger dimension at Ashuganj on the bank of the Meghna River, which is expected to serve Bangladesh-India protocol traffic as well. Besides, the Government extended permission to private entrepreneurs to construct and operate a few more container terminals in the country.

vi) Present growth trend shows that there shall be no dearth of containers to be transported from the two sea-ports by IWT. The Pangaon terminal is also expected to be able to handle the same.

vii) There is therefore an urgent need for container vessels. 22 private parties got license to build container ships. It is reported that 12 number of ships are under construction by private companies and 4 container ships are constructed by BIWTC. Private parties should be encouraged to enter this prospective business area and the Government should provide patronage by extending soft bank loans, tax holidays/ rebate, etc. in the contract ports transport sector.

1.8.2 Information from the Terminal Operator at Pangaon ICT

This terminal was developed by the project loan from CPA. The construction works started from 2009 to 2013. The terminal was opened in 2013 and is operated by CPA.

Table 2.27 Equipment in operation at terminal

Equipment	Quantity
Mobile Harbour Crane	01 Nos
Straddle carrier-	02 No
FLTs	04 Nos.
Crane	Weigh bridge-01 Nos

Table 2.28 Terminal Facilities

Terminal Facilities	
Jetty Length	180 m
Jetty Breath;	26 m
water depth along the berth	4 m LWL
Yard Area	55,000 sq.m
Container Handling Capacity	3,500 TEUs
CFS Area	5,815 sq.m
Refer Plug Point	48 Nos

The containers are transported from Chittagong port by 125 TEU loading barge to this terminal in order to minimize traffic congestion of road transport. From this terminal containers are transported by trucks to more than 300 industrial parks located around the Dhaka metropolitan area. The container traffic volume from 2013 is not much yet.

The handling commodities beside the containers are hard coil, Coil sheet, Fabrics items, Stationary items, Raw Cotton, Garments accessories, Lift escalator, Ceramic items, Glass ware items, Furniture items, Food of Beverage, Industrial items, Chemical, Fruits items and other commodity

Container Traffic volume; import was 634 boxes (987 TEU) and export was 480 boxes (818 TEU)

Table 2.29 Traffic Volume in 2013-2014

	Import		Export	
	Box	**TEUs**	**Box**	**TEUs**
Total 20'container	281	281	142	142
Total 40'container	353	706	338	676
Total	634	987	480	818

Source: Pangaon ICT Terminal

- Domestic Cargo is transported in and Out by Mode of Truck.
- Access road is constructed to connect to Dhaka city through the Bangladesh and Chinese Friendship Bridge. Railway lines are not connected.
- Cargo come from China, Japan, USA, India, Korea, Meddle east & Europe countries

2. INDIA

(1) Indian Port Sector – Overview

Cargo Traffic Target and Actual Traffic

In 2014-15, cargo traffic at major ports stood at 581.4 million tons (mt), 4.6% higher than 2013-14, but, 4% lower than target set for the year by the Ministry of Shipping. However the gap between the target and actual traffic handled has narrowed from 53.5 mt in 2013-14 to 23 mt in 2014-15.

Table 2.1 Traffic Target vis-à-vis Actual Traffic at Major Ports in India

	2013-2014		2014-2015		2015-2016
PORT	Target	Actual traffic	Target	Actual traffic	Target
Kandla	95	87.0	100	92.5	115
Paradip	63	68.0	68	71.0	78.2
JNPT	68	62.3	65	63.8	74.8
Mundra	63	59.2	63	61.7	72.5
Visakhapatnam	70	58.5	67	58.0	77.1
Chennai	60	51.1	55	52.5	63.3
Kolkata	52	41.4	47.5	46.3	54.6
V.O.C.(Tuticorin)	30	28.6	32	32.4	36.8
Kamarajar(Ennore)	24	27.3	28	30.3	32.2
New Mangalore	39	39.4	42	36.6	48.3
Cochin	26	20.9	23.6	21.6	27.1
Mormugao	19	11.7	13.4	14.7	15.4
TOTAL	609	555.5	604.5	581.4	695.1

Source:Unit: million tons

Containerization at Indian Ports

Presently the containerization level in India is still low, around 50% whereas the international level exceeds 80%. This level needs to be raised to reduce logistics costs.

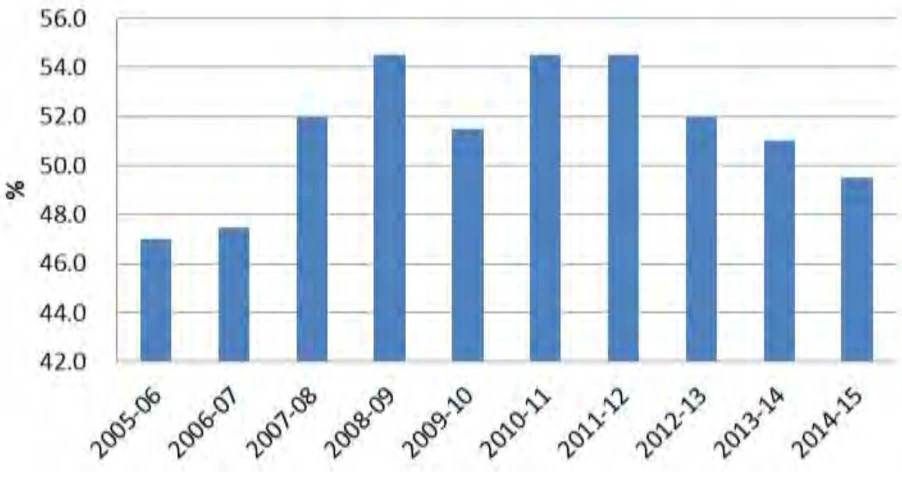


Figure 2.1 Containerization at Indian Ports

Cargo Traffic Growth

In 2014-15 all Indian Ports handled 1052 million tons, which represents annual growth of 8.2% (as compared to the previous year's growth of 4.7%). Of this total, Major Ports handled 581 million tons, an increase of 4.6% over the previous year while Non Major Ports handled 471 million tons, an increase of 13.1%.

Regarding container cargo, total volume handled at Indian ports reached 11.96 million TEUs in FY 2014-15. Major Ports handled 7.96 million TEUs (66.5% share), an increase of 6.6% over the previous year and Non Major Ports handled 4.01 million TEUs (33.5% share), an increase of 29.8%.

Table 2.2 Port Cargo Performance

All cargo (million tonnes)	2013-14	2014-15	Growth(%)
Major Ports	555	581	4.6
Non Major Ports	416	471	13.1
Total	972	1052	8.2
Container (million TEU)	2013-14	2014-15	Growth(%)
Major Ports	7.46	7.95	6.6
Non Major Ports	3.09	4.01	29.8
Total	10.55	11.96	8.2

Port Landscape – Key Players

The number of efficient port terminals by key private operators is increasing.

Table 2.3 Private Terminal Operator in Indian Ports

Terminal Operator	Ports
Adani	Mundra, Kandla, Daheji, Hazira,Mormugao,Ennore,,Dhamra
Essar	Hazira, Paradip, Vizag, Vadinar
DP World	Mundra, Cochin, Vizag, JNPT
PSA	Tuticorin, Chennai, Kolkata, JNPT
APM	Pipavav, JNPT
DVS Raju	Gangavaram
JSW	Jaigard, Mormugao
Navayuga	Krishnapatnam

Source: Survey Team

(2) Container Traffic

Total container volume handled in 2014-15 is 12.0 Million TEU (MTEU) which includes all Major Ports and Non Major Ports.

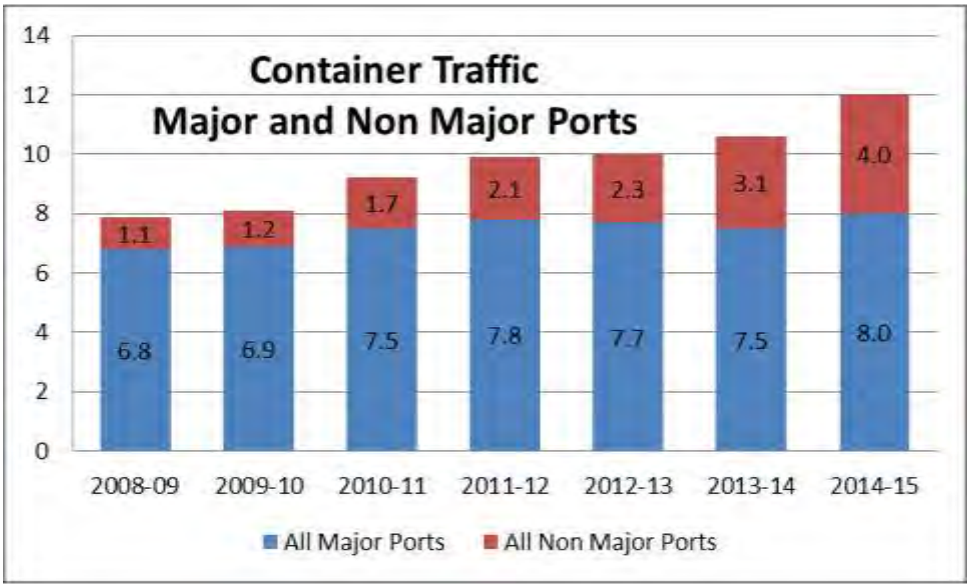
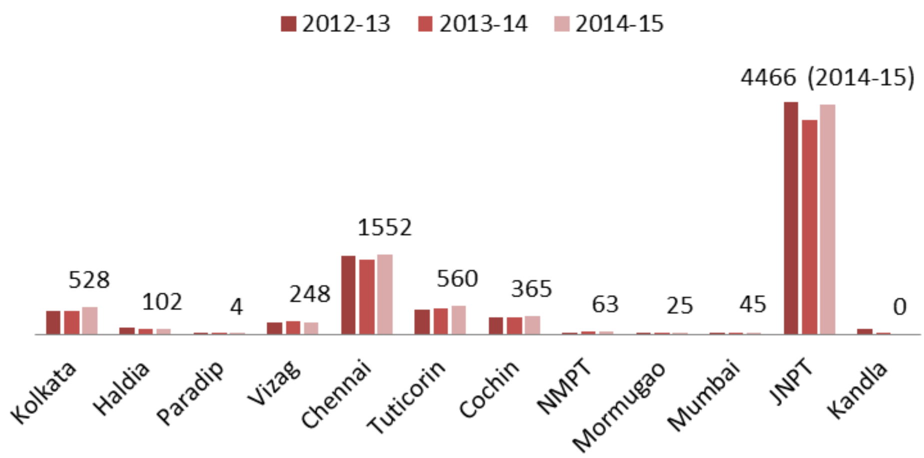


Figure 2.2 Container Traffic at Major and Non Major Ports

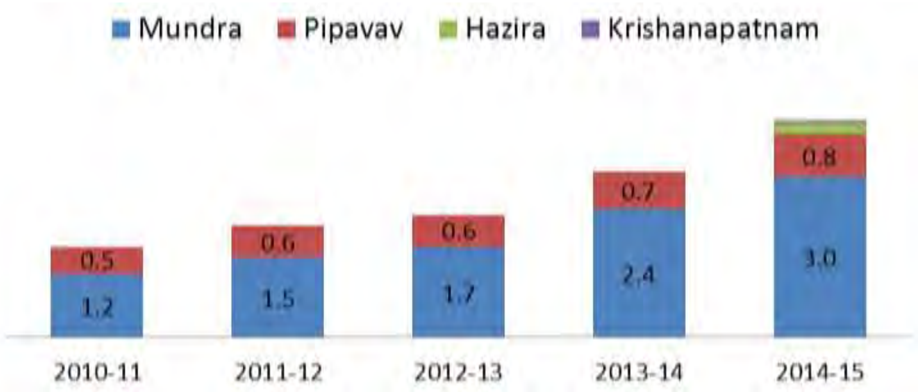
Most of the container traffic is handled by 6 Major ports (JNPT, Chennai, Tuticorin, Cochin, Kolkata and Vizag) and 3 Non Major Ports (Mundra , Pipavav and Hazira)

JNPT handled 4.47 MTEUs in 2014-15, an increase of 7.5% over that in 2013-14. Chennai port handled 1.54 MTEUs in 2014-15, up 5.5% from 2013-14. Kolkata Port, which includes Haldia Dock, moved 0.63 MTEUs in 2014-15, an increase of 13.2% over 2013-14.



Source:Unit: thousand TEU

Figure 2.3 Container Traffic at Major Port



Source:Unit: million TEU

Figure 2.4 Container Traffic at Non Major Port

(3) Container Handling Capacity and Upcoming Container Terminal Projects

Total present container handling capacity (all Major ports and Non Major ports) is 17.83 as of 2015.

Table 2.4 Container Handling Capacity - 2015

	West Coast		East Coast	
Major Ports	JNPT	4.2	Kolkata	0.6
	Mumbai	0.06	Haldia	0.2
	Kandla	0.06	Paradip	0
	Mormugao	0.02	Vizag	0.5
	Mangalore	0.08	Chennai	2
	Cochin	1.0	Turticorin	0.6
Non Major Ports	Mundra	4.2	Krishnapatnam	1.2
	Pipavav	0.85	Karaikal	0.06
	Hazira	1.0	Kattapalli	1.2
Total	(Major)	5.42	(Major)	3.9
	(Non Major)	6.05	(Non Major)	2.46
	Total	11.47(64%)	Total	6.36(36%)

Source Unit: million TEU

Additional Container handling capacity is expected through the following projects.

Table 2.5 Upcoming Container Project - Capacity Addition by 2020

	West Coast		East Coast	
Major Ports	JNPT - 330M	0.8(2016)	Kolkata/Haldia	-
	JNPT FCT Ph1	2.4(2018)		
	JNPT FCT Ph2	2.4(2024)	Paradip	0.4(2018)
	Mumbai - OCT	1.2	Vizag-PICT	0.6(2018)
	Kandla	4.2 (3Ph)	Chennai	-
	Mormugao	-	Ennore-Adani	0.8(2016)
	Mangalore	-		0.6(2020)
	Cochin	0.6(Ph II)	Tuticorin	0.6
		2.5(Ph III)		
Non Major Ports	Mundra	1.3(2016)	Krishnapatnam	4.8(Ph II)
	Pipavav	-	Karaikal	—
	Jamnagar	-	Dhamra	On hold
	Rewas	0.8(2020)	Gangavaram	On hold
		1.6(2024)		
	Dighi	-	Kulpi	-
	Vizhinjam	1.0(2019)		

Source Unit: million TEU

Status of upcoming container terminal projects is as follows:

<u>Mundra Container Terminal (CT)</u>

- Present traffic handling: 3.5 million TEU (CT1, CT2, CT3)
- CT4 terminal to be operational by 2016 (1.3 million TEU)
- CT5 (under different stages of development)

<u>Container Terminal at Hazira Port</u>

Five berths have been constructed by Adani Hazira Port Pvt. Ltd., out of which tow berths are operated as container berths.

<u>Offshore Container Terminal (OCT) at Mumbai Port</u>

Trial run for RoRo operations have commenced.

<u>JNPT Standalone Berth and Fourth Container Terminal</u>

- DP World is awarded 330 m berth – to be operational in 2015
- PSA is awarded 4th CT – 2.4 million TEU commissioning by 2018

<u>Vallapadam (Cochin) container Terminal</u>

First phase is operational (1 million TEU).

<u>Vizhinjam Container Terminal</u>

Awarded to Adani Ports & SEZ (APSEZ)

Chennai Mega Container Terminal

On hold

Ennore Container Terminal

Awarded to APSEZ

Paradip Container Terminal

Awarded to United Liner (JM Baxi) – 5 MTPA multi cargo terminal including containers by 2018

Vizag Container Terminal

- Present capacity is 0.5 million TEU.
- 1.1 million TEU by 2018 after extension
- JM Baxi has won the concession.

Dhamra Port

- Phase I is operational.
- Phase II expansion is in progress.
- Container berth is on hold.

(4) Detailed Break-up of Traffic in Major Ports

Table 2.6 Kolkata Port

(In 000 TONNES)

PORT		KOLKATA					
COMMODITY		**2014－2015**			**2013－2014**		
		Unloaded	Loaded	Total	Unloaded	Loaded	Total
POL	CRUDE						
	PRODUCT	526	100	626	538	179	717
	LPG						
EDIBLE OIL		670		670	568		568
OTHER LIQUID		138		138	126		126
IRON ORE	RAW	43		43			
	PELLETS						
OTHER ORE							
FERTILIZER		49		49	4		4
FERT.RAW MAT	DRY	5					
	LIQUID						
FOOD GRAINS	RICE		5	5		27	27
	WHEAT						
	OTHERS						
COAL	THERMAL						
	COKING	195		195	28		28
	OTHERS	633		633	35	5	40
IRON/STEEL		39	20	59	40	45	85
SALT		46		46			
SUGAR							
CEMENT							
NEWSPRINT							
OTHERCARGO	DRY BULK	50	424	474	22	606	628
	BREAK BULK	946	1227	2173	961	1447	2408
CONTAINER	TEUs(In '000s)	269	259	528	230	219	449
	TONNAGE	4454	3656	8110	3361	3702	7063
TOTAL		7794	5432	13226	5683	6011	11694
TRANSSHIPMENT	CONTAINER						
	POL CRUDE						
	PRODUCT						
	OTHERS	2022	35		1028	152	1180
GRAND TOTAL		9816	5467	13226	6711	6163	12874

Source : Indian Ports Association

Table 2.7 Haldia Port

(In 000 TONNES)

PORT		HALDIA					
COMMODITY		2014－2015			2013－2014		
		Unloaded	Loaded	Total	Unloaded	Loaded	Total
POL	CRUDE	501		501	793		793
	PRODUCT	1810	1307	3117	1934	1845	3779
	LPG	1908		1908	1526		1526
EDIBLE OIL		1942		1942	1549		1549
OTHER LIQUID		1325	162	1487	1179	245	1424
IRON ORE	RAW	1904	434	2338		2170	2170
	PELLETS						
OTHER ORE		1581		1581	1105		1105
FERTILIZER		315		315	194		194
FERT.RAW MAT	DRY	482		482	366		366
	LIQUID	467		467	408		408
FOOD GRAINS	RICE						
	WHEAT						
	OTHERS						
COAL	THERMAL	53	1185	1238		1598	1598
	COKING	6005		6005	5350		5350
	OTHERS	4486		4486	3220		3220
IRON/STEEL		420	31	451	130	140	270
SALT							
SUGAR		52		52	302		302
CEMENT					45		45
NEWSPRINT							
OTHERCARGO	DRY BULK	1617	31	1648	1356	115	1471
	BREAK BULK	33		33	76	1	77
CONTAINER	TEUs(In '000s)	51		51	53	60	113
	TONNAGE	1017	941	1958	983	1247	2230
TOTAL		25918	4091	30009	20516	7361	27877
TRANSSHIPMENT	CONTAINER						
	POL CRUDE						
	PRODUCT						
	OTHERS	514	*487	1001	197	*437	634
GRAND TOTAL		26432	4578	31010	20713	7798	28511

Source : Indian Ports Association

* IWAI Traffic

Table 2.8 Paradip Port

(In 000 TONNES)

PORT		PARADIP					
COMMODITY		**2014－2015**			**2013－2014**		
		Unloaded	Loaded	Total	Unloaded	Loaded	Total
POL	CRUDE	16140		16140	15869		15869
	PRODUCT	1619	217	1836	1574	259	1833
	LPG						
EDIBLE OIL		19		19	64		64
OTHER LIQUID						54	54
IRON ORE	RAW	1032	1149	2181		5593	5593
	PELLETS	133	1184	1317		1603	1603
OTHER ORE		73	102	175	186	304	490
FERTILIZER		51		51	122		122
FERT.RAW MAT	DRY	4378		4378	3932		3932
	LIQUID	1604		1604	1489	37	1526
FOOD GRAINS	RICE						
	WHEAT						
	OTHERS						
COAL	THERMAL	8596	21335	29931	6191	18836	25027
	COKING	7304	257	7561	6833	50	6883
	OTHERS	314	131	445	159		159
IRON/STEEL							
SALT							
SUGAR							
CEMENT							
NEWSPRINT							
OTHERCARGO	DRY BULK	4871	313	5184	4193	508	4701
	BREAK BULK	43	6	49	47	1	48
CONTAINER	TEUs(In '000s)	2	2	4	5	4	9
	TONNAGE	15	52	67	13	86	99
TOTAL		46192	24746	70938	40672	27331	68003
TRANSSHIPMENT	CONTAINER						
	POL CRUDE						
	PRODUCT						
	OTHERS	73		73			
GRAND TOTAL		46265	24746	71011	40672	27331	68003

Source : Indian Ports Association

Table 2.9 Visakhapatnam Port

							(In 000 TONNES)
PORT		VISAKHAPATNAM					
COMMODITY		2014－20155			2013－2014		
		Unloaded	Loaded	Total	Unloaded	Loaded	Total
POL	CRUDE	8668		8668	7900		7900
	PRODUCT	2260	1999	4259	2460	1797	4257
	LPG	1193		1193	1049		1049
EDIBLE OIL					14		14
OTHER LIQUID		1008	130	1138	854	160	1014
IRON ORE	RAW	64	4788	4852	33	8519	8552
	PELLETS		3513	3513		4480	4480
OTHER ORE		2136	25	2161	1596	80	1676
FERTILIZER		1838		1838	1791		1791
FERT.RAW MAT	DRY	720		720	795		795
	LIQUID	590		590	543		543
FOOD GRAINS	RICE		35	35		23	23
	WHEAT		40	40		144	144
	OTHERS	16	189	205	17	650	667
COAL	THERMAL		2779	2779		2744	2744
	COKING	6074		6074	6928		6928
	OTHERS	9668	6	9674	3620		3620
IRON/STEEL		98	1057	1155	5	1073	1078
SALT							
SUGAR			1	1		2	2
CEMENT							
NEWSPRINT							
OTHERCARGO	DRY BULK	1851	1973	3824	3009	1988	4997
	BREAK BULK	220	171	391	372	138	510
CONTAINER	TEUs(In '000s)	124	124	248	131	131	262
	TONNAGE	2096	2277	4373	2296	2620	4916
TOTAL		38500	18983	57483	33282	24418	57700
TRANSSHIPMENT	CONTAINER						
	POL CRUDE	250		250	389		389
	PRODUCT	135	136	271	207	207	414
	OTHERS						
GRAND TOTAL							

Source : Indian Ports Association

Table 2.10 Ennore (Kamarajar) Port

							(In 000 TONNES)
PORT		ENNORE (KAMARAJAR)					
COMMODITY		2014－20155			2013－2014		
		Unloaded	Loaded	Total	Unloaded	Loaded	Total
POL	CRUDE						
	PRODUCT	1894		1894	1275		1275
	LPG	1294		1294	1065		1065
EDIBLE OIL							
OTHER LIQUID		120	9	129	91		91
IRON ORE	RAW						
	PELLETS						
OTHER ORE							
FERTILIZER							
FERT.RAW MAT	DRY						
	LIQUID						
FOOD GRAINS	RICE						
	WHEAT						
	OTHERS						
COAL	THERMAL	24023		24023	22127		22127
	COKING	330		330	335		335
	OTHERS						
IRON/STEEL							
SALT							
SUGAR							
CEMENT							
NEWSPRINT							
OTHERCARGO	DRY BULK						
	BREAK BULK	3	2578	2581	1	2415	2416
CONTAINER	TEUs(In '000s)						
	TONNAGE						
TOTAL		27664	2587	30251	24914	2415	27329
TRANSSHIPMENT	CONTAINER						
	POL CRUDE						
	PRODUCT						
	OTHERS				8		8
GRAND TOTAL		27664	2587	30251	24922	2415	27337

Source : Indian Ports Association

Table 2.11 Chennai Port

(In 000 TONNES)

PORT		CHENNAI					
COMMODITY		2014－20155			2013－2014		
		Unloaded	Loaded	Total	Unloaded	Loaded	Total
POL	CRUDE	10205		10205	10152	38	10190
	PRODUCT	889	1643	2532	1230	1458	2688
	LPG						
EDIBLE OIL		1071	7	1078	1033		1033
OTHER LIQUID		165		165	160	77	237
IRON ORE	RAW						
	PELLETS	126	20	146	71		71
OTHER ORE			251	251		532	532
FERTILIZER		197		197	160		160
FERT.RAW MAT	DRY	344		344	255		255
	LIQUID	22		22			
FOOD GRAINS	RICE						
	WHEAT					272	272
	OTHERS		37	37		34	34
COAL	THERMAL						
	COKING						
	OTHERS						
IRON/STEEL		921	504	1425	637	770	1407
SALT							
SUGAR							
CEMENT						18	18
NEWSPRINT							
OTHERCARGO	DRY BULK	3954	1205	5159	4123	518	4641
	BREAK BULK	203	832	1035	277	960	1237
CONTAINER	TEUs(In '000s)	808	744	1552	748	720	1468
	TONNAGE	15591	14354	29945	14435	13895	28330
TOTAL		33688	18853	52541	32533	18572	51105
TRANSSHIPMENT	CONTAINER						
	POL CRUDE						
	PRODUCT						
	OTHERS						
GRAND TOTAL		33688	18853	52541	32533	18572	51105

Source : Indian Ports Association

Table 2.12 Tuticorin (V.O.Chidambaranar) Port

(In 000 TONNES)

PORT		TUTICORIN (V.O.CHIDAMBARANAR)					
COMMODITY		2014－20155			2013－2014		
		Unloaded	Loaded	Total	Unloaded	Loaded	Total
POL	CRUDE						
	PRODUCT	367		367	299		299
	LPG	241		241	180		180
EDIBLE OIL		284		284	273		273
OTHER LIQUID		84	216	300	87	360	447
IRON ORE	RAW	46		46			
	PELLETS						
OTHER ORE		1229	221	1450	966	321	1287
FERTILIZER		417	21	438	388		388
FERT.RAW MAT	DRY	1052	1	1053	790		790
	LIQUID	131	184	315	101	189	290
FOOD GRAINS	RICE		2	2		5	5
	WHEAT		1	1		8	8
	OTHERS		57	57		36	36
COAL	THERMAL	8613		8613	6916		6916
	COKING						
	OTHERS	5191		5191	5231		5231
IRON/STEEL		6	3	9	128	1	129
SALT			36	36		61	61
SUGAR			49	49	10	14	24
CEMENT			27	27		10	10
NEWSPRINT							
OTHERCARGO	DRY BULK	1212	137	1349	1010	249	1259
	BREAK BULK	596	821	1417	587	170	757
CONTAINER	TEUs(In '000s)	289	271	560	251	257	508
	TONNAGE	4389	6645	11034	3888	6241	10129
TOTAL		23858	8421	32279	20854	7665	28519
TRANSSHIPMENT	CONTAINER						
	POL CRUDE						
	PRODUCT						
	OTHERS	135		135	123		123
GRAND TOTAL		23993	8421	32414	20977	7665	28642

Source : Indian Ports Association

Table 2.13 Cochin Port

(In 000 TONNES)

PORT		COCHIN					
COMMODITY		**2014－20155**			**2013－2014**		
		Unloaded	Loaded	Total	Unloaded	Loaded	Total
POL	CRUDE	10654	92	10746	10160	68	10228
	PRODUCT	1242	2029	3271	1793	2300	4093
	LPG						
EDIBLE OIL		4		4	4		4
OTHER LIQUID		389	150	539	238	12	250
IRON ORE	RAW						
	PELLETS						
OTHER ORE							
FERTILIZER		68		68	36		36
FERT.RAW MAT	DRY	378		378	271		271
	LIQUID	255		255	257		257
FOOD GRAINS	RICE						
	WHEAT						
	OTHERS						
COAL	THERMAL						
	COKING	98		98			
	OTHERS						
IRON/STEEL		16		16	32		32
SALT		38		38	37		37
SUGAR							
CEMENT		703		703	617		617
NEWSPRINT							
OTHERCARGO	DRY BULK	203		203	118		118
	BREAK BULK	30		30	158	1	159
CONTAINER	TEUs(In '000s)	187	179	366	174	173	347
	TONNAGE	3295	1623	4918	2695	1653	4348
TOTAL		17373	3894	21267	16416	4034	20450
TRANSSHIPMENT	CONTAINER	164	164	328	221	216	437
	POL CRUDE						
	PRODUCT						
	OTHERS						
GRAND TOTAL		17537	4058	21595	16637	4250	20887

Source : Indian Ports Association

Table 2.14 New Mangalore Port

							(In 000 TONNES)
PORT		NEW MANGALORE					
COMMODITY		2014－20155			2013－2014		
		Unloaded	Loaded	Total	Unloaded	Loaded	Total
POL	CRUDE	14402		14402	14941		14941
	PRODUCT	249	6758	7007	367	7851	8218
	LPG	1563		1563	543	7	550
EDIBLE OIL		664	19	683	543	7	550
OTHER LIQUID		62	330	392	51	174	225
IRON ORE	RAW	1042	15	1057	1658		1658
	PELLETS		498	498		1465	1465
OTHER ORE							
FERTILIZER		649		649	454		454
FERT.RAW MAT	DRY	55		55	50		50
	LIQUID	182		182	188		188
FOOD GRAINS	RICE						
	WHEAT					33	33
	OTHERS		7	7		84	84
COAL	THERMAL	2726		2726	2928		2928
	COKING	5417	35	5452	5420		5420
	OTHERS						
IRON/STEEL							
SALT							
SUGAR							
CEMENT		336		336	213		213
NEWSPRINT							
OTHERCARGO	DRY BULK	413	112	525	345		345
	BREAK BULK	79	32	111	318	40	358
CONTAINER	TEUs(In '000s)	32	31	63	25	25	50
	TONNAGE	498	423	921	353	394	747
TOTAL		28337	8229	36566	29317	10048	39365
TRANSSHIPMENT	CONTAINER						
	POL CRUDE						
	PRODUCT						
	OTHERS						
GRAND TOTAL		28337	8229	36566	29317	10048	39365
							Source : Indian Ports Association

Table 2.15 Mormugao Port

							(In 000 TONNES)
PORT		MORMUGAO					
COMMODITY		**2014－20155**			**2013－2014**		
		Unloaded	Loaded	Total	Unloaded	Loaded	Total
POL	CRUDE						
	PRODUCT	571		571	522	5	527
	LPG						
EDIBLE OIL		3		3			
OTHER LIQUID		133		133	102		102
IRON ORE	RAW	105	604	709		44	44
	PELLETS	49		49			
OTHER ORE							
FERTILIZER		649		649	454		454
FERT.RAW MAT	DRY	55		55	50		50
	LIQUID	182		182	188		188
FOOD GRAINS	RICE						
	WHEAT					44	44
	OTHERS						
COAL	THERMAL	2000		2000			
	COKING	6568		6568	7517		7517
	OTHERS						
IRON/STEEL			63	63		60	60
SALT							
SUGAR			11	11		61	61
CEMENT							
NEWSPRINT							
OTHERCARGO	DRY BULK	1224	552	1776	734	425	1159
	BREAK BULK	2	1928	1930	1	1573	1574
CONTAINER	TEUs(In '000s)	13	12	25	10	9	19
	TONNAGE	140	172	312	114	122	236
TOTAL		111381	3330	14711	9405	2334	11739
TRANSSHIPMENT	CONTAINER						
	POL CRUDE						
	PRODUCT						
	OTHERS						
GRAND TOTAL		11381	3330	14711	9405	2334	11739

Source : Indian Ports Association

Table 2.16 Mumbai Port

(In 000 TONNES)

PORT		MUMBAI					
COMMODITY		**2014－20155**			**2013－2014**		
		Unloaded	Loaded	Total	Unloaded	Loaded	Total
POL	CRUDE	13385	3069	16454	14009	3462	17471
	PRODUCT	2685	4072	6757	3033	3607	6640
	LPG	549		549	488		488
EDIBLE OIL		210	3	213	268		268
OTHER LIQUID		1928	90	2018	1641	121	1762
IRON ORE	RAW						
	PELLETS						
OTHER ORE							
FERTILIZER		172		172	151		151
FERT.RAW MAT	DRY	275		275	151		151
	LIQUID						
FOOD GRAINS	RICE						
	WHEAT						
	OTHERS	683		683	720		720
COAL	THERMAL	4304		4304	4221		4221
	COKING						
	OTHERS						
IRON/STEEL		4102	610	4712	1886	1040	2926
SALT							
SUGAR			97	97		153	153
CEMENT		1449		1449			1431
NEWSPRINT							
OTHERCARGO	DRY BULK						
	BREAK BULK	824	495	1319	1016	353	1369
CONTAINER	TEUs(In '000s)	41	4	45	36	4	40
	TONNAGE	455	4	459	403	4	407
TOTAL		31021	8440	39461	29418	8740	38158
TRANSSHIPMENT	CONTAINER	79	6	85	37	6	43
	POL CRUDE		9211	9211		8721	8721
	PRODUCT		3314	3314		2660	2660
	OTHERS	9516	73	9589	9495	107	9602
GRAND TOTAL		40616	21044	61660	38950	20234	59184

Source : Indian Ports Association

Table 2.17 J.N.P.T.

(In 000 TONNES)

PORT		J.N.P.T.					
COMMODITY		**2014－20155**			**2013－2014**		
		Unloaded	Loaded	Total	Unloaded	Loaded	Total
POL	CRUDE		1568	1568		1735	1735
	PRODUCT	931	836	1767	1045	1327	2372
	LPG	699		699	312		312
EDIBLE OIL		1277		1277	988		988
OTHER LIQUID		860	19	879	839	36	875
IRON ORE	RAW						
	PELLETS						
OTHER ORE							
FERTILIZER							
FERT.RAW MAT	DRY						
	LIQUID						
FOOD GRAINS	RICE						
	WHEAT						
	OTHERS						
COAL	THERMAL						
	COKING						
	OTHERS						
IRON/STEEL							
SALT							
SUGAR							
CEMENT		653		653	689		689
NEWSPRINT							
OTHERCARGO	DRY BULK				12		12
	BREAK BULK	12	13	25	33	83	116
CONTAINER	TEUs(In '000s)	2287	2180	4467	2098	2064	4162
	TONNAGE	29795	26457	56252	27103	27565	54668
TOTAL		34227	28893	63120	31021	30746	61767
TRANSSHIPMENT	CONTAINER	342	339	681	288	278	566
	POL CRUDE						
	PRODUCT						
	OTHERS						
GRAND TOTAL		34569	29232	63801	31309	31024	62333

Source : Indian Ports Association

Table 2.18 Kandla Port

(In 000 TONNES)

PORT		KANDLA					
COMMODITY		**2014－20155**			**2013－2014**		
		Unloaded	Loaded	Total	Unloaded	Loaded	Total
POL	CRUDE	40399		40399	37595		37595
	PRODUCT	867	14142	15009	698	14405	15103
	LPG				4		4
EDIBLE OIL		3458	210	3668	2490	166	2656
OTHER LIQUID		2059	49	2108	2456	155	2611
IRON ORE	RAW	1160		1160	586		586
	PELLETS						
OTHER ORE		35	463	498	12	44	56
FERTILIZER		3847		3847	2644		2644
FERT.RAW MAT	DRY	655		655	991		991
	LIQUID	1289		1289	1230		1230
FOOD GRAINS	RICE		324	324		670	670
	WHEAT	2	1511	1513		1682	1682
	OTHERS	5	382	387		379	379
COAL	THERMAL	9725		9725	6080		6080
	COKING	242		242	270		270
	OTHERS						
IRON/STEEL		1182	48	1230	842	12	854
SALT			2711	2711		3683	3683
SUGAR		1267	204	1471	611	403	1014
CEMENT							
NEWSPRINT							
OTHERCARGO	DRY BULK	478	2401	2879	267	4678	4945
	BREAK BULK	2886	314	3200	2663	401	3064
CONTAINER	TEUs(In '000s)				14	16	30
	TONNAGE				53	399	452
TOTAL		69556	22759	92315	59492	27077	86569
TRANSSHIPMENT	CONTAINER						
	POL CRUDE	182		182	435		435
	PRODUCT						
	OTHERS						
GRAND TOTAL		69738	22759	92497	59927	27077	87004

Source : Indian Ports Association

3. Pakistan

3.1 Karachi Port Trust

3.1.1 Overview

Karachi port has the total area of 140,265 acre consisting of 10,292 acre of port facilities area and water area of 121,329 acres and others of 8,644 acres.

- KPT has two container terminals by private operators and one terminal operated by KPT within the port, one in West wharf operated by KICT (Karachi International Container Terminal, terminal area of 26 ha) and other in EAST wharf by PICT (Pakistan International Container Terminal, terminal area of 20 ha).

- Berth no 13-14-15-16-17 on East wharf are used for handling bulk cargo mainly coal about 3.0 mil ton in 2014 and the forecast demands is estimated 8.4 mil ton. This terminal is getting congested and the yard areas are required for expansion. In order to cope with such demands KPT planned to develop western back water area and conducted a master plan of cargo village terminal development.

- Railway transport of container volume is very small which about 1-2% of total volume, since the railway transport in Pakistan is not reliable, safe and punctual delivery.

- The shares of imported containers for domestic and transported to up countries are average 40% and 60 % respectively.

- The cargo volume to Afghanistan is about 5-7% of total imported cargo. The cargo volume to Afghanistan, Iran and cross border region had got small. There is no export container from them but there are many empty containers coming back to the port

- KPT purchased large hopper suction dredgers and conducting maintenance dredging by this dredger.

- KPT invested development of KICT and PICT with about 7 Bill Rs. KPT had developed container terminal on East (called “PICT”) and West (called “KICT”) wharf respectively and contracted with private operators for terminal operation by PICT and KICT respectively by BOT basis, which was better than PPP scheme. Both terminals had got congested by traffic volume of around 750,000 to 955,000 TEU respectively in 2014.

- KPT have listed the following projects in KPT Business Plan and Strategic Development Plan.

- Dedicated Coal Terminal at Berth 13 to 17 (Quay Length 759 m, Terminal area 25 ha, Depth along the berth -14.0m to accept target volume of 8.8. mil ton,) is developed to import coal and transported by railway to power plants in Panjab province and cement factory in Sindh Province

- Berth 13 to 17 will be reconstructed into a modern coal terminal, with specialized coal unloading equipment, including cranes and transport conveyor belts.

- This option optimally uses KPT’s existing infrastructure at the East Wharf.
- The depth alongside the berth is 14m, allowing ship size with a draft of 12.7m to be received at the terminal. The terminal area of 25 ha will be sufficient to handle 8.5 mil ton

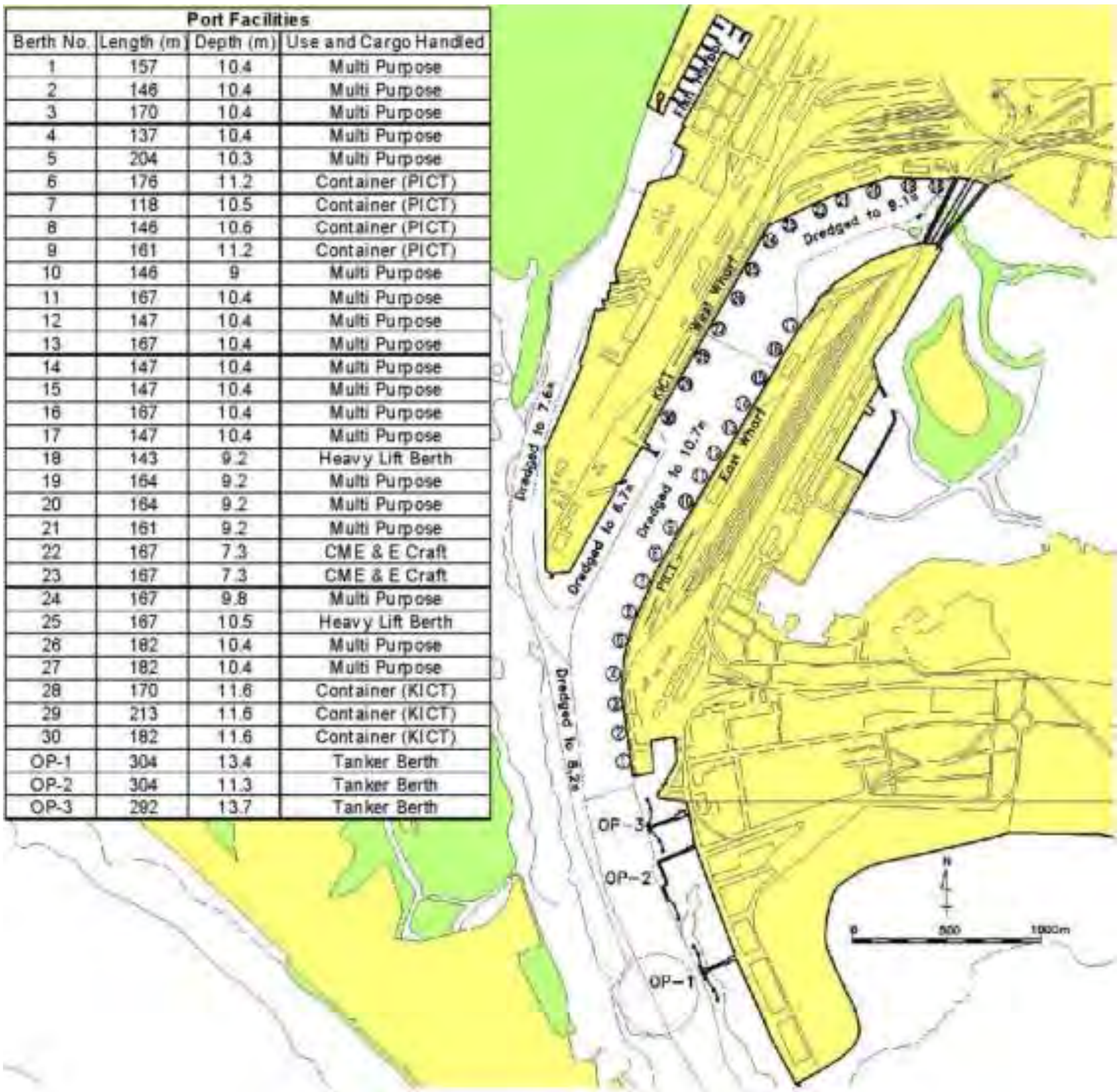
of coal in 2025/26.

- This coal terminal is not planned directly adjacent to PICT container terminal and further away from the Clifton residential area.

- Oil Piers 3 development as Multipurpose Liquid Bulk Pier
- There are three oil piers in Karachi Port located along the access channel near the entrance of the channel, and there are storage tanks in the back up area connecting between Jetty and Tanks by pipe lines. The depth of access channel and port basin channel area should be deepened especially in front of the oil jetty for receiving 105,000 Oil carriers. KPT have rehabilitated old oil jetties as follows;

i) Oil Pier 1 is converted into a multipurpose liquid bulk pier, similar to the current Oil Pier 2 and 3 for multipurpose liquid bulk. By converting Oil Pier 1 into a multipurpose liquid bulk pier, Oil Pier 1 can be able to handle multiple liquid bulk commodities, increasing the chances of 3 vessels being unloading simultaneously. KPT create extra flexibility for the liquid bulk piers. At the same time, the conversion of Oil Pier should also incorporate general rehabilitation works in order for the pier to be functioning property. The depth around the Oil Pier is deepened to -13.0 m to receive 75,000 DWT tankers
ii) Creates a better quay capacity; The total capacity of the oil piers will be getting higher in the case of a converted Oil Pier 1 when using three quays equally flexible berths, the berth occupancy can increase.

iii) With regards to the storage capacity of 15.3 mil ton with three piers on the 118 ha of tanks storage area, a Liquid Bulk Survey is required. The liquid bulk survey should be carried separately. In this survey, the actual storage capacities should be studied, as well as their utilization. Furthermore, the liquid bulk survey should study the effects of connecting oil pipeline between the KPT storage area and the refineries in proximity to Karachi.



Port Facilities			
Berth No.	Length (m)	Depth (m)	Use and Cargo Handled
1	157	10.4	Multi Purpose
2	146	10.4	Multi Purpose
3	170	10.4	Multi Purpose
4	137	10.4	Multi Purpose
5	204	10.3	Multi Purpose
6	176	11.2	Container (PICT)
7	118	10.5	Container (PICT)
8	146	10.6	Container (PICT)
9	161	11.2	Container (PICT)
10	146	9	Multi Purpose
11	167	10.4	Multi Purpose
12	147	10.4	Multi Purpose
13	167	10.4	Multi Purpose
14	147	10.4	Multi Purpose
15	147	10.4	Multi Purpose
16	167	10.4	Multi Purpose
17	147	10.4	Multi Purpose
18	143	9.2	Heavy Lift Berth
19	164	9.2	Multi Purpose
20	164	9.2	Multi Purpose
21	161	9.2	Multi Purpose
22	167	7.3	CME & E Craft
23	167	7.3	CME & E Craft
24	167	9.8	Multi Purpose
25	167	10.5	Heavy Lift Berth
26	182	10.4	Multi Purpose
27	182	10.4	Multi Purpose
28	170	11.6	Container (KICT)
29	213	11.6	Container (KICT)
30	182	11.6	Container (KICT)
OP-1	304	13.4	Tanker Berth
OP-2	304	11.3	Tanker Berth
OP-3	292	13.7	Tanker Berth

Figure 3.1 General Plan of Karachi Port

3.1.2 KICT (Karachi International Container Terminal)

Hutchison Group transported about 82.9 mil TEU containers in the world in 2014.

- This terminal (KICT) is operated at the west wharf Berth No. 26 to 30 of Karachi port with 3 berths with total length of berth 963m by Hutchison Port Holding (HPH) group.
- At present the container ship length in the terminal is more than 260m which is not allowed to enter the port due to limited width of the channel for turning ships. The depth alongside is 12.5m and the depth of the channel area is 11.5m. The handling capacity is 850,000 TEU/year.
- Cargo handling equipment is 7 units of quay crane, 2 units of mobile cranes, 23 units of RTG and 528 reefer plug installed in the yard. Container stock yard of 26.3 ha.

- The import & export volume through KICT are high. The yard facilities lack space for container storage. Procedure and formality are performed manually.

Table 3.1 Access Channel Used for This Terminal

	Length (m)	Depth(m)	Width (m)
Turning Basin	420	13	420
Access Channel	11,500	13	300

The maintenance dredging required at berth alongside /Berthing basin is responsible of KPT.

Table 3.2 Container Traffic Volume from 2010 to 2014

Year	Container traffic (TEU)
2010	854,122
2011	865,170
2012	869,450
2013	892,862
2014	921,750

The growth of traffic volume of container had been 8 % between 2010 and 2014, in average annual growth rate is 2 %.

Table 3.3 Origin/Destination of Container through Karachi Port

Region	2010	2011	2012	2013	2014
ASEAN	186,116	220,472	248,084	251,663	258.825
Middle East	11,567	22,617	13,275	5,764	4,135
Africa	92,144	64,250	101,626	99,685	83,100

The share of trade with ASEAN region occupies about 29 to 32 % of the total volume.

KICT expect the container ship size will be getting larger near future. Today the ship length of 340m or more are coming to the port. These ships are not allowed to enter during night time.

Since 2008, the Pakistan Market share of container traffic by KICT, DPW (PQA), PICT had been increased. The shares of these terminals in 2014 were as follows.

Table 3.4 Traffic Volume by Terminals in Pakistan

CNT	KICT	DPW(PQA)	PICT	Karachi Port
Traffic Volume (TEU)	921,750	910,000	699,582	200,000

KICT is expecting the growth rate of 6-7 % per year of container growth for next few years based on the changes of traffic volume in the last three years. The present depth in the access channel of Karachi port is -13.0m, thus KICT cannot accommodate the post panama size container ships.

3.1.3 Pakistan Deep Water Container Port Development Project

- KPT planned to develop a Pakistan Deep Water Container Port at East of Keamari Groyne for a new container terminal. The project is implemented by PPP scheme. KPT develop basic infrastructure and private terminal operator called "SAPT (South Asia Pakistan Terminal)" had contracted with KPT in 2010 and developing quay wall, on land facilities and procurement and installing cargo handling equipment. Upon completion of Phase 1, Karachi Deep Water Container Port will have four berths with a total quay length of 1,500 meters, a yard area of 85 hectares and depths alongside up to 18 meters to accommodate deep draft container ships (loading capacity 15,000 TEU, Draft -16m to -18m) and function as transshipment hub.

- This terminal is developed a new deep water container terminal for meeting demands of container after 10 years. This site is located on the east side of the access channel at the entrance of the port.

- The container port is operated and managed by one of Hutchison Port Holding (HPH) group who made a concession agreement with KPT for the operation of these terminals of Phase 1A and 1B (Berth length of 750m, depth -17m) and Phase 1 C and D (berth length 800m, depth -17m).

- HPH manage to collaborate, not competition, between two terminals in Karachi port as follows; KICT is to function for regional feeder service terminal and SAPT is for Transshipment and transit of containers to North Africa countries and Central Asian countries. HPH observed the regional deep water terminal as follows;

- Since Salalah Container terminal in Oman has not introduced large quay cranes to receive larger container ships. Colombo and Singapore ports as mega transshipment port are located too far from this region. This region (South Asian Region in India Ocean) should have deep water container transshipment terminal additionally. The targeted market should be North, Central Asian countries which does not have any sea ports and transport cargo by trucks and rails for long distance.

- This terminal 1A and 1B was developed by PPP Scheme. KPT had started this project in 2009 with the following share of responsibility.

a) KPT developed basic infrastructures with public fund for construction of dredging works, breakwater construction, reclamation works for storage yard area as Phase 1.

b) KPT developed the channel/turning basin and berthing area by dredging to depth -16m as phase 1 project and in future depth is planned to be -18m. The existing access channel is deepened from -14m to -16m. Navigational aid facilities are procured from the private manufacturer

c) This dredged material of 24 mil cum from basin and 5 mil cum from access channel is used for reclamation works of the terminal yards for 300 acre. 3 Breakwaters of total 4,050m length called Manole, Kemali, and Clifton were constructed and will be completed by the end of this year (2015). The terminal of phase 1 is planned to start operation in March 2016. It is schedule to call first ship in March 2016.

d) The quay wall and backup land area about 30-45 acre were already completed 85%. For Phase 1 two berths are constructed to handling 3.5 Mil TEU/year. SAPT will accommodate larger container ships more than 15m depth of mega ship size and KICT will accept small container ships depth of less than 10m and operate at the regional feeder service station.

e) SAPT developed on land facilities, oil storage facilities for generating own electric power supply to the new terminal and install all necessary cargo handling equipment operational system by full automated system and operate & manage the container terminal.

f) The construction works is scheduled to complete by middle of 2016 and to start operation in 2016. Phase 1 C and 1 D will be started to construction of facilities in 2019. The capacity of the phase 1 facilities is estimated about 3.2 Mil TEU, while the demands traffic volume is estimated about 3.5 Mil TEU under Phase 1.

- The project includes the railway connection and improvement of the handling efficiency of the present railway connectivity service for transport containers to upper country and central Asian countries including Afghanistan. At present the railway transport cargo about 5% of the total cargo volume, Government of Pakistan urges DoR (Department of National Railway) to improve the rail way network service efficiency and support KPT. DoR will start to transport containers at first, then liquid bulk cargo, bulk cargo like coal.

- The elevated motor way corridor was planned to connect this port to north-west Karachi city for direct cargo delivery from the port by detour around the existing Karachi port area. The World Bank had financed to conduct the feasibility study of development of elevated express way.

- There is a coal stock yard 210 acre of storage capacity of 70 Mil ton, at present 45 million ton in 2015 are used in this storage area located behind the on land side of Pakistan Deep Water Container Port area. The imported coal is transported to cement factories and power plants sites in Punjab province and up country by railway. It is forecast that the volume of multi dry bulk cargo will increase, the development of multi dry bulk cargo terminal on East wharf is started and its operation will be from 2017.

- Next major action required is freight transport of coal for power plants in upper country. The connectivity of railway line from the port to the main railway leading to the up country is big issues, which required improvement of its efficiency of railway operation and procure additional locomotives with strong pulling capacity and wagons to enhance transport capacity. Railway transport within the port is operating well.

(1) Comments by Mega carriers on Deep Water Container Port Development

- In case ship of 8,000-10,000TEU can be allowed to enter the port, it is advantageous. For entering to KICT and PICT ship enter the port during high water level, but SAPT is able to enter any time to the berth without tidal conditions.
- The container transshipment through the ports in Pakistan is not feasible. Greater problems for transshipment service will be institutional problems, due to reasons of the security checking and declaration miss, all of the containers have to be checked. Considering such procedures the transshipment business through ports of Pakistan it will not be feasible. The new deep water container terminal will function to receive the direct service of large mother ship as regional hub port.
- The transit containers from the port to ICD (Inland Container Depot) are required by security checking. About 10-15% of cargoes from Karachi port have used to transport to ICD, which takes more than 3 days to transport from Qasim Port to NLC near the Karachi port due to poor and inefficient procedures.
- It is observed that existing terminal KICT has some allowance to handle containers, SAPT

does not disclose the market plan of collecting targeted demands. It is unclear how they make full operation of terminals

- The tariff at Qasim port (QICT) is comparatively lower, but the deep water is developed at Karachi port, some of shipping companies will shift from Qasim port.
- MOL does not provide Feeder service based on the Karachi port. Depending on the ship size to use SAPT at present MOL does not plan to use SAPT. It is not necessary to introduce or change the ship size.

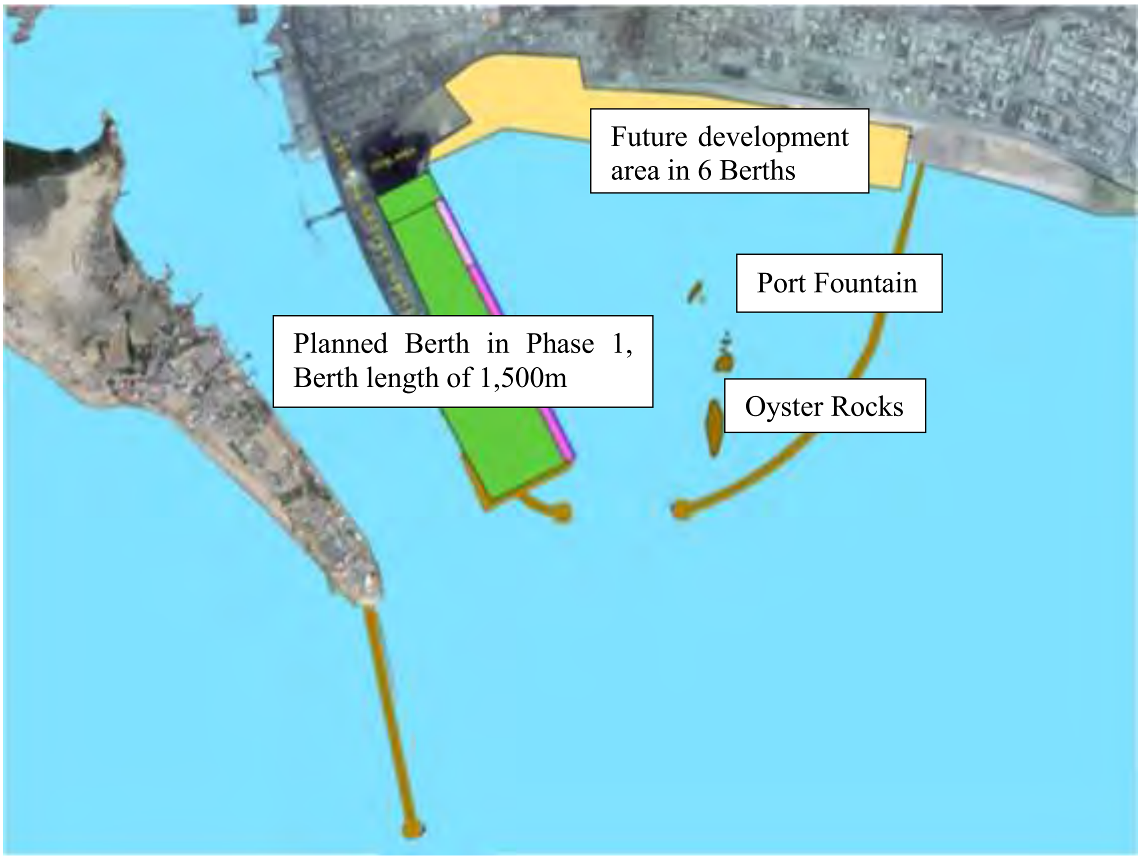


Figure 3.2 Development Plan of Karachi Deep Water Container Port

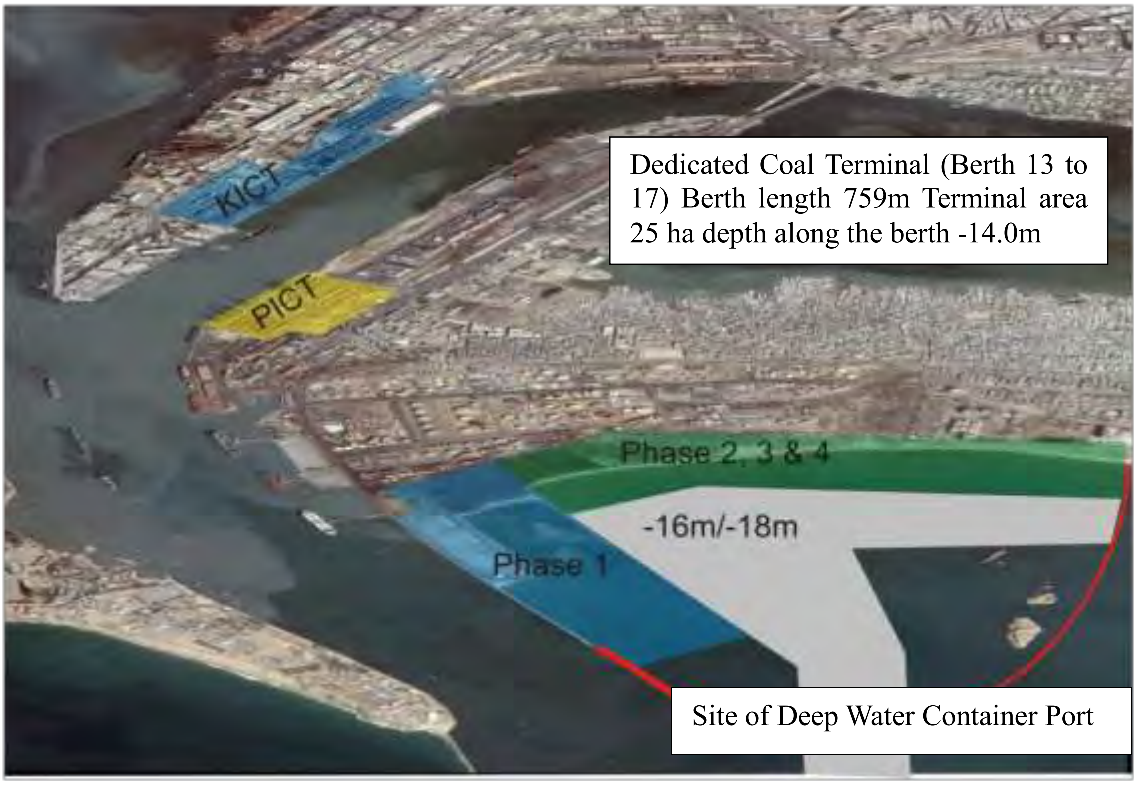


Figure 3.3 Site Relation of KICT, PICT and New Deep Water Container Port

3.1.4 PICT (Pakistan International Container Terminal)

PICT has handled only containers, no bulk cargo /general cargo and developed existing berths by BOT scheme at the East wharf Berth number of 6 to 9 of the Karachi port in 1998, 18 years ago. PICT has 220,000 m2 ground slots, 3,222 TEU and 600m berth length (4berths x 150m each), with 6 gantry crane, 21 units of RTG, 11 reach stackers and 60 units of trailers. PICT can operate night service. X ray monitor system was established for checking the content of containers. PICT requested KPT to develop the additional berth of berth number 10 and 11 for expansion of container terminal, since the handling capacity of the existing terminal is designed up to 750,000 TEU and planned to increase to 950,000 TEU/year.

PICT requested KPT to deepen the access channel and berthing area to -13.5m to receiving 6 000 TEU loading container ships (draft of this size ship 13m) to enhance the handling capacity up to 750,000TEU. The latest traffic volume was as follows.

Table 3.5 Container Traffic Volume through PICT

Year	Container Traffic (TEU)
2010	622,425
2011	659,256
2012	586,731
2013	675,321
2014	699,582

- PICT offer comparatively lower charges than the KICT and KPT container terminal. The import & export volume are high. The yard facilities lack space for container storage. Procedure and formality are performed manually.
- The PICT has no interest to participate the developing and operation of Pakistan Deep Water Container Port. Since Philippine Company (MICT) holds 60% of PICT share in 2013.
- There are large industrial zone in the port hinterland such as Korangi Industrial Zone, and Sindhi Industrial zone The company planned to process custom clearance in these industrial zones by establishing bonded area inside the industrial zones and develop an access road, land acquired for bonded area for transporting all imported containers to these area so that custom office can check the content of container boxes and process custom clearance , however the custom office refuse the proposal
- Empty depot was planned and constructed by developing the bonded area within the industrial zones.
- Dry port was developed near Lahore city by the company and transport empty containers to this yard by using railway.
- Railway is mainly transport passengers and not cargo transport business。 The railway transport cost is cheaper than truck transport. One train carries 30-40 containers from PICT. The contain volume to Afghanistan by trucks is average 10 to 15 % of total volume.

Table 3.6 Access Channel Used for the Terminal

	Length (m)	Depth(m)
Turning Basin	425	13.5
Access Channel	2.7 N.mile	15.0

The maintenance dredging is responsible of KPT

3.1.5 Cargo Village Industrial Park/Off Dock Facility Development Project

KPT planned to develop cargo village-Industrial Park/Off Dock Facility in the Northern part of the Western Backwaters area, west of Karachi Fish harbor. KPT conducted master plan study in 2005, which is required for review and up dated based on the latest development of the port and national economy and situation of regional trade activities. This cargo village is connected to Layari Expressway to the future Karachi Port crossing from Karachi Deep Water Port. The proposed facilities to be developed in this Cargo village are as follows;

- Providing the required area for a Coal Power Plant in the range of 500 to 1000 Megawatts.
- Providing for refrigerated cargo facilities of capable handling volume of 5 million ton/year, including two respective berths with a total length of 600m, to be developed by private investors
- The area of 320 ha (790 acre) is planned to be developed by land reclamation within the first phase of development and the additional 210 ha (520 acres) of the land area for future development.
- Construction of multipurpose berths of 360 m in length to the southern tip and land development for container and bulk terminal.
- Two access roads connecting the Cargo village with Lyari expressway /Maripur Road in the north and ICI-Bridge in the east, and railway access corridor is developed.

- The Master Plan of this cargo village were prepared to handle coal and multi dry bulk cargo with 5 berths named as the” West Back Yard Development Plan” consisting of bulk terminal area, container terminal area and storage yards and railway and roads connection as on-dock yard for containers.
- This village will function of transshipment of cargo between the terminals within the KPT and delivery of cargo from these villages to up country through the access road and rails directly by the elevated express way to outside the port area.
- KPT requested the technical assistance to conduct feasibility study of industrial complex with port facilities as bonded area of the port and detailed design of the basic infrastructure and for providing the project loan. The outputs by the FS study shall be made attractive to private investors.
- The project will be implemented by PPP scheme and completion period will be 4-5 years and estimated project cost is US$ 200 Million.
- Chinese government will not come to Karachi, but develop Gwadar port and aces road connection between Karachi

with total length of berth 963m

Fogure 3.4 Development Concept Plan of Cargo Village and Industrial Park

Note; Feasibility study was completed by M/s Louis Berger, USA under IBRD assistance
1500 acres of land to be developed for Industrial Park / Off Dock Facilities to support existing port traffic capacity

3.2 PIBT (Pakistan International Bulk Terminal)

PIBT (Pakistan International Bulk Terminal) is handling dry bulk cargo imported and transshipment to up country for power plants. This group was started business from 1964 as stevedoring business in Karachi port.

The company transport imported coal to up country by railway to the destinations of Power plants sites and export cement are transported by return railway collecting to cement factories nearby.

- The railway infrastructure has great potential for bulk cargo transport, but the railway is one of the Departments of government organization. They do not have business concept in cost and balance of revenue /loss by cargo/passenger transport, which caused nearly 40 Mil USD loss annually. Railway operates in the sense of annual budget consumption agent, not public service to tax payers without cost and revenue sense. The Pakistan railway should be independent public cooperation like KPT or PQA, which have been checked by third party the balance sheet of management and operation of the companies.
- The Company cannot rely on the railway transport of imported coal to the power plants sites; they established a railway freight company jointly with Pakistan Railway by using

existing infrastructures of railway lines for coal transport to the 350MGW coal power plant site in Punjab province which is built and operated by Chinese Investment Company. For this business the PIBT purchased 55 locomotives to pulling 60 wagons per train and to start its operation from 2018. They plan to start the transportation of 12 mil ton of coal and finally 18.Mil ton and constructing additional jetty at cost of 10 mil US$.

- The company plans to start the transportation of containers by railway from ports to northern country area. They planned to operate 4 trains per day from ports in south to destination in upper country area.
- It is planned by PQA to develop LNG terminals in PQA area. PQA had already developed LNG Terminal along the inner channel to the Port Bin Qasim area, in which there is the land area to develop 2 additional LNG terminals.
- It is planned to develop Power Plants in Gwadar area. There will be large potential demands of bulk cargoes like coal, LNG and oil in this region by development of Chinese –Pakistan corridors.

3.3 Port Bin Qasim

Port Qasim Authority was established through an act of parliament on June 29, 1973. PQA is the 2nd deep sea industrial-cum-commercial port operating under landlord concept. The Port is situated in Indus delta region at a distance of 28 nautical miles in the south-east of Karachi. PQA is the most eco-friendly port and is geographically located on the trade route of Arabian Gulf. The port currently caters for more than 40% of seaborne trade requirements of the country.

The Port is under the administrative control of Ministry of Ports and Shipping, Government of Pakistan. Chairman is the chief executive of the port.

All policy decisions are vested in PQA Board comprising seven members headed by Chairman, PQA. The Board is blend of public and private sector participation.

In 1980 PQA introduced the new Port development policy to invite private partners for port service cargo handling terminal developments. First FOTCO private oil importing company started oil import business in Port Bin Qasim.

PQA has singular attraction both in port facilities and port-based industrial development. These advantages include:

- Close proximity to hinterland thus saving transport cost.
- Availability of basic utilities like portable water, power, gas, telecommunications, banking and other facilities.
- Immense possibility for expansion of port facilities to meet dynamic requirements of international shipping.
- Transshipment and transit trade facilities with Afghanistan and Central Asian Republics.
- Full range of port facilities to handle general, bagged, bulk, break-bulk, liquid and containerized cargo with back-up facilities.

3.3.1 Major Private Industries Operating in Qasim Port

The following industrial parks had been developed around the port operation area such as
In the South area of 9,000 acre for the textile city development and in the Central parts of 11,000 acre for industrial estate were developed and in the North west parts; 3,000 acre and in the East parts available but without infrastructure.
The private operators using the Port Qasim area is listed as follows;

Table 3.7 Major Industries Operating in Qasim Port Area

Industries	Activities in Port Qasim
KESC Thermal Power Plant	The plant spread over an area 223 acres of land with 1260 MW power generation capacity has been developed at a cost of Rs.1.4 billion and is operational since 1984
Indus Motors Automobile Plant	Developed through joint venture between Toyota Company of Japan and House Habibis of Pakistan at a cost of US$100 million over an area of 105 acres of land, the plant is operational since 1993.
Engro Asahi Poymer Plant	The plant developed over an area of 30 acres of land at a cost of Rs.560 million to produce various types of Petrochemicals/Fertilizer is operational since 2002.
PPTA Plant	Operational since 1998 with designed capacity of 0.43 million tons of annual productions, the plant is spread over an area of 150 acres and has been completed at a cost of US$ 500 million
Bin Qasim Fertilizer Plant	Developed by Fauji Foundation of Pakistan over an area of 350 acres of land at a cost of US$ 370 million, the plant is operational since 1998.
IFFCO Pakistan	The refinery is developed over an area of 15 acres at a cost of US$ 34 million, integrated with its bulk oil terminal. It is operational since 1993 and has manufacturing capacity of 0.4 million tons per annum
BOC Gases, UK	Established over an area of 10 acres of land, the plant has been developed at a cost of Rs.1.25 billion production hydrogen gas, nitrogen gas etc. The plant is operational since 1998.
Engro Chemicals (NPK |Plant)	The facility has been developed over an area of 30 acres of land at a cost of US$ 81 million to produce fertilizers of various types and has been operational since 1999.
Mapak Edible Oil Refinery	The refinery has been developed at Port Qasim through joint venture of Malaysia and |Pakistan with a refining capacity of around 0.4 million tons per annum at a cost of US$ 20 million. The plant was commissioned in 2006.

Source: PQA

3.3.2 Traffic Volume and Ship Size Calling to Port

The traffic volume through PQA has been steadily volume, not substantially increased nor decreased. PQA has limited capacity of handling containers and general cargo with 6 berths.

Table 3.8 Traffic Volume and Number of Ships

Period	Handling Volume (Million Ton)	No's of Ships
2008-2009	25.0	1,230
2009-2010	25.6	1,187
2010-2011	26.2	1,229
2011-2012	24.0	1,089
2012-2013	24.7	1.057
2013-2014	25.7	1.072

PQA has 14 m depth of the channel (-15.0m at HWL) and 45km distance of access channel, Railway station at Bing Qasim 30,000 acre, Inner channel area 75,000ha including the additional inner channel area.

(1) The details of each terminal in the Port

Table 3.9 Terminals Users and detailed facilities at PQA

Terminals	Operation Start	Design Capacity	Quay Length	Loading Capacity
LCT	2009	35000DWT, 4 mil ton/year	185 m	1000 ton/hr
MW 1	1985		200 m	
MW 2	1985		200 m	
MW 3	1985		200 m	
MW 4	1985		200 m	
QICT 1	1997	75,000DWT 0.60 Mil TEU/year	600 m	22 TEU/crane/hr 9 cranes are operate
QICT 2	2011	75,000DWT 1,175 Mil TEU/year	735 m	
Grain & Fertilizer by FAP	2010	75,000DWT 4 mil ton/year	300 m	1600 ton/hr
Liquid Chemical Terminal by EVTL	1998	75000DWT 0.4 mil ton/year	325 m	1200 ton/hr
Steel Mil Jetty IOCB	1980	Max 75,000 DWT	250 m	
FOTCO	1995	75,000DWT 0.9 Mil ton/yea	280 m	
Sui South Gas Co (SSGC)	2012	50000 DWT 2 mil ton/year	230 m	
LNG	2015	6 vessels in 2015		
PIBT under construction	2016	Coal, cement, clinker		

Source; PQA

(2) Ship size accommodating at Terminal

Table 3.10 Ship Size Calling to Terminal-wise in Port Qasim

Berth/Terminals	Draught (m)	Beam (m)	Loa(m)
LCT	10.0	33.0	210.0
Marginal Wharf 1	10.0	33.0	225.0
MW 2	10.0	33.0	225.0
MW 3	10.0	33.0	225.0
MW 4	10.5	33.0	225.0
QICT 1	12.0	46.5	Up to 310.0
QICT 1	12.0	45.0	More than 310to 330
QICT 2	13.0	46.5	Up to 310.0
QICT 2	13.0	45.0	More than 310 to 330
FAP Grain. Terminal	13.0 75,000 DWT	43.5	250.0
EVTL-13	11.0	40.0	225.0
IOCB Steel mill	12.0 75,000DWT	40.0	230.0
FOTCO	13.0	41.5	245.0

Berth/Terminals	Draught (m)	Beam (m)	Loa(m)
Oil Terminal	75,000DWT		
SSGC/LPG	10.0	33.0	163.0
LNG-1	12.0	43.40	295.0

Source; PQA

PQA had developed the land, access channel, roads and railway for dedicated private partner to develop and operate water front facilities required according to their business.

(3) Coal Import Capacity and Demands of Pakistan Ports

According to JICA Survey of the coal handling capacity and expected coal demand in Pakistan it is reported that the estimated coal volume is 2 mil tons for the Lakhra Coal Fired Thermal Power Plant. It is judged only Port Qasim will be able to handle the required coal volume.

Table 3.11 Comparative Table of KPT and PQA in Coal Handling Capacity and Demand

Port/Terminal	Coal Handling Capacity (mtpa)	Consumer	Coal Demand (mtpa)
Karachi Port	4.0	Cement Companies	4.0
Port Qasim (Marginal Wharf)	8.0		As draft is 10.5m, only 40,000 DWT can dock.
Port Qasim (Pakistan Steel Mills)	3.0	Pakistan Steel Mills (dedicated)	3.0
Port Qasim (PIBT)	12.0 (Future 20.0)	K-Electric 220MW x 2	Not coal, but by Gas
		Jamshoro 660MW x 2	4.0
		Sahiwar 660MW x 2	4.0
		Lucky Cement Factory; (IPP) 660MW x1	2.0
		Lakhra 660 MW x1	2.0
		KAPCO (IPP); 660 MW x 1	2.0
		Sub total	(14.0)
Total	27.0 (Future 35.0)	Total	21.0

Note; Bin Qasim (IPP 1320 MW) will construct their own jetty at Qasim canal

*1 It is said that Karachi Port has coal handling capacity of 8 mtpa, however actual handling capacity is limited at 4mtpa.

*2 Port Qasim (Marginal Wharves) has only berth, not has unloading facilities, As draft is 10.5m at present, only 40,000DWT vessel can berth, that is economically inefficient.

*3 K-Electric (220MW x2) was converted its source by gas, instead of coal fired power plants

Source; JICA Survey Team summarized based on the collected data by interview.

3.3.3 Dry Bulk Demands for Power Plants in Up Country

- The large coal fired power plants are planned at Bin Qasim site, one is with 13.2 MGW new plants by Chinese proposed and 330 MGW by UAE based company in Punjab province. The demands of coal for this power plants will be 4 mil ton. The large volume of coal is required at these sites.

- The Pakistan Railway plans to transport coal by railway at 2.0 mil ton/year to power plants in Punjab province. There are additional power plants in up country in Sindhi, 840 MGW and Punjab provinces 1,330 MGW. The private investor developed dry port at Prenaga in Lahore area to store the cargo/coals transported by railway. The land was provided by the National Railway. ADB conducted the study of coal handling and transport to meet the demands of coal fired power plants in Pakistan.

3.3.4 TRANSPORTATION OF IMPORTED COAL FROM PORT QASIM

<u>The transport of dry bulk cargo (Coal/cement) by railway</u>

- The efficiency of the railway from Karachi port is very bad due to disorganized connectivity of cargo transport from the port and in the railway loading area. Chinese private company proposed to develop a dedicated freight train line between Port Qasim and Karachi container terminals and developing railway marshalling yard at Port Qasim railway station area.

- Import coal demands for power plants in Pakistan are growing, since the present government intends to develop coal firing power plants. National Railway established a new company of dedicated coal transport jointly with PIBT (Pakistan International Bulk Terminal). This terminal will handle import coal by conveyor belt installed along the coast to transport from ships to railway station/coal marshalling yard for delivery to the power plants site in upper country.

- FOTCO planned to extend the present berth length (300m) of the existing grain/fertilizer terminal for 175 m to receive panamax size ships. The present jetty handling capacity is 4 mil ton, while the demands is estimated 22 mil ton of coal. The present capacity must be enhanced 8 to 12 mil ton. The required number of 75,000 DWT class ships to transport such volume of coal will be around 106 to 110 ship calls per year.

- In order to manage the economical railroad transportation of large volumes of imported coal from Port Qasim to various proposed coal fired power plants up country, it is critical to provide an efficient and economical railroad loading system integrated with the PIBT marine coal terminal under development at Port Qasim.

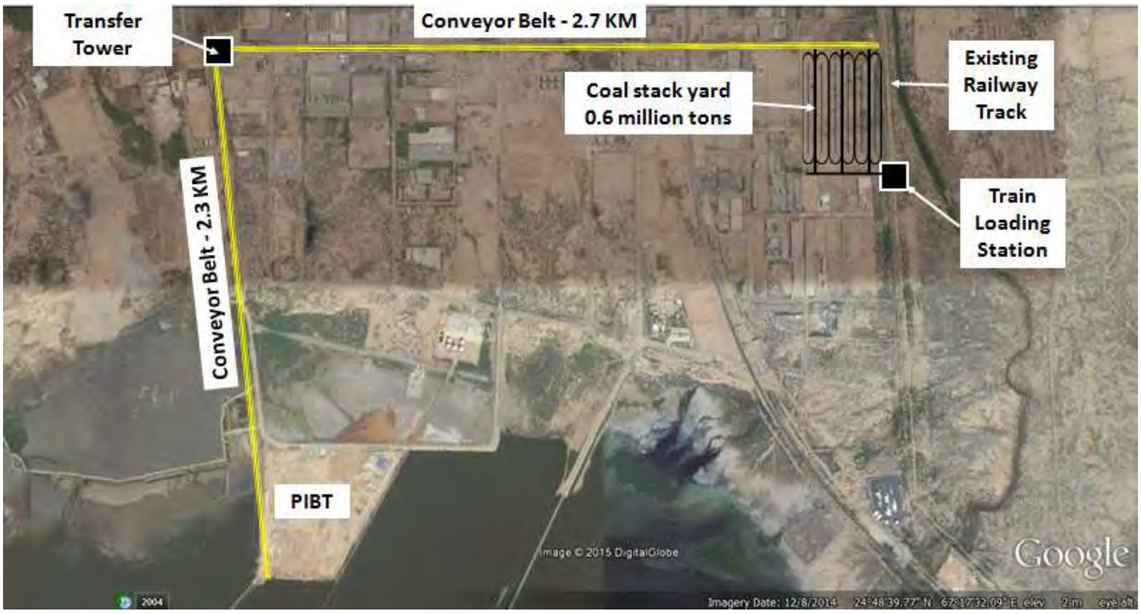
a) Under the prevailing topographic conditions the transporting coal by railway is not feasible technically to connect between coal jetty and stock yard (50 acres, stocking capacity of 8 mil ton) on the land near the Qasim railway station due to higher deference of the ground level and cannot obtain the feasible gradient within the limited distance of railway running.

b) It is considered the alternative proposal of using belt conveyer for transporting coal from jetty to railroad loading facility is definitely the most cost effective and time efficient solution as compared to any other option available to mitigate the constraint of coal transportation. According to the Private investor the project cost of this system is estimated 50-60 Mil US$ and 18 to 20 months of construction work period.

c) In terms of technical feasibility, environmental soundness and implementation time involved, the proposed alternative option is considered the most efficient configuration of connectivity between the PIBT marine coal terminal and the existing railroad tracks for loading coal trains at the Qasim station. However PQA is looking for other optimum options.

The concept development plan of transporting coal by belt conveyors from the PIBT jetty terminal to Rail Road Loading Facility in the Qasim railway station is shown in Figure 3.5

Figure 3.5 Concept Development Routes Plan of Coal Transport by Belt Conveyors



Source; FOTCO

- Inland railway connectivity; the new railway station was developed at Bin Qasim Railway from Karachi to Lahore through Bin Qasim station in double tracks. The railway line of single track was extended up to the port operation area, container terminal area through the Bin Qasim industrial area. PQA and National Railway made MOU (Memorandum of Understanding) for cargo transport by railway to sites in up country and start operation from 2017.

- Environmental points of view KPT is not allowed to handle coal. National railway does not transport coal from KPT, but from PQA imported coal are transported by railway to up country. It is planned to develop 2nd coal terminal off shore site and to transport coal by belt conveyor of 2.5 km long to PIBT (Pakistan International Bulk Terminal) to handle 15. Mil ton per year. Originally it was planned to transport coal by rail, but it was found the large difference of height in 150 ft. between the seaside site and stock yard level, and found difficult to obtain the required gradient slop for railway transport. Alternatively private company proposed to transport coal by belt conveyor.

- Cargo/containers are transported to Afghanistan by railway from PQA in 6 lines per month and one line is formed with 30 to 35 wagons. Average number of monthly containers volume transported is 2,500 TEU per month.

Source: PQA

Figure 3.6 Master Plan of Port Qasim

Figure 3.7 General Plan of Port Bin Qasim 2013

3.3.5 Outline of Feasibility Study of Capital Dredging of Existing Port Qasim Navigation Channel and Development of Alternative Navigation Channel

The depth of the existing access channel in the outer channel is maintained at 13m, but originally the trap on the west side of the Access outer channel had been developed to accommodate in- fill material on the sea bed caused by high waves during the monsoon.
The present depth of this trap is got shallower around 2-3m due to no maintenance dredging had been carried out. As a result of such maintenance of the Channel, the trap does not function of originally aimed objectives to trap the in-fill material to minimize the deposit of in-fill in the main outer access channel.

PQA has been conducting regular maintenance dredging annually of the outer access channel parts, but not at the trap area. The maintenance dredging volume is around 5 mil cum/year. PQA purchased hopper suction dredger of 7,000 cum holding capacity in 2012 and carry out maintenance dredging after monsoon season every year.

<u>Background</u>

Port Qasim was established in the Indus Delta on Sindh Coast in 1973. The area around the port is lying with major and minor creeks, marshes and mangroves. The Port is accessible from Arabian Sea through 45 km long navigation channel. The navigation channel in the outer channel is prone to siltation due to wave action, soil erosion, under water sand dunes movements.

The phenomena intensify during the monsoon period from May to September every year, which causes considerable reduction in depths. Refer to the location of proposed study for navigation Channel (Outer and Inner Channel) in Figure 3.8.

<u>Approach Channel Dredging</u>

PQA observed the whole alignment of the access channel were as follows;
PQA observed that present alignment of the channel had been completely changed and topography around the outer and inner channels was changed completely from the 1982 when the port was opened as follow;

- The island made with sand sediment called Bundle Island which was located at the entrance of the inner channel was disappeared.
- Traps made at navigation buoy B-9 and B-13 were filled up by in-fill material and disappeared
- Sedimentation in the inner channel had been observed regularly from the year of 2000. The sediment deposit in the inner channel was removed as parts of the maintenance dredging.

Presently the depth of Approach channel is 15.3m and of inner Channel is 14.0 m with minimum of 200 m width. In order to maintain the depth and width in the channel, PQA conducts regular dredging works to clear 4.5 to 5.0 mil cum siltation (around 4.0 Mil ton in Outer Channel and 1.0mil ton in the inner channel)/ sedimentation on yearly basis. The regular dredging works had been carried out by PQA's owned dredgers from 2012.

At present the Port received 2,400 ship round trips in 2014. PQA had developed three turning basin (310 m diameter) along the inner channel, one in front of marginal wharf, 2nd is in front of QICT -2 and 3rd one is in front of IOCB jetty. One more turning basin at least is required around LNG terminal area for tankers safe sail. The depth of inner channel was -13.0m, which was deepened to -14.m in 2013 together with the dredging works of turning basin in front of new QICT 2.

Considering the trends of enlargement of ships transporting containers and bulk cargo and increasing traffic volume of ships by additional jetties to be developed within next 5 years, like 4 private jetties of import coal, 2 jetties of import clinker terminal, in particular of transporting coal to meet the demands of coal fired power plants development program in future, the maintenance of access channel is essentially required infrastructure to operate the port service, thus the port can generate national economy of importing raw material required for power plants, LNG, cement factories. PQA considers it necessary to study and review existing Port Navigation Channel aspects.

Development of Secondary Inner Channel

PQA is interested in carrying out the study to develop alternative/secondary inner channel through Chara-Chhan Waddoo Creeks, for two way traffic, which is located in the south from the existing channel through Phitti creek to enhance the channel access capacity of marine traffic through the access channel.

At present all the ships are sailing through one channel coming and going out of the port
At present number of ships called to the port is 1,083 ships x 2 (round) =2,166 ships round trips in 2013.

In case alternative channel is opened the additional sailing route. The capacity of ships sailing to the port will increase and port handling volume can be enhanced. Subsequently required volume of coals can be delivered and provide power plants continuously.

The present depth of alternative/secondary route is 7-9m in the upper part closer to port area and more than 12m in the lower parts of the channel. The length of alternative channel is 17 km and the channel shall be dredged to the depth of 13 to 14m and width of 200m. The project cost is estimated around 60-65 Mil US$.

Required Scope of the Study

PQA propose the following study by 2 phases.
Detailed feasibility study including channel design of existing and alternative Navigation Channel including secondary inner channel based on numerical and simulation models while taking into account international safety standards and practices is required.

In 1st Phase, feasibility study for existing and alternative channel shall be conducted including the following subjects

- Minimum depth & width required along with realignment of the channel bends in the existing channel to accommodate vessels of 14.0m draught, 355 m LOA and 55 m Beam, whereas, ships handling parameters and Nav Aids for alternate navigation channel need to be ascertained on the basis of feasibility study.
- Site investigations, such as soil investigation (Geotech), Tidal flow regime, winds, waves, and current effects
- Determine the channel alignment and bends alignment and requirement of turning basin and its location and area, Waiting area, inshore anchorage along the channel
- Risk assessment of Marine Traffic and risk analysis, Operational limits,
- Accessibility of vessels at all stages of tide and with tidal benefit

- Environmental impact assessment
- Review the existing duping area and selection of suitable sites in creak area and offshore
- Assessment of requirement of installation of VTMS

In 2nd Phase, the location in the required alignment and distance for capital dredging in existing and alternate navigation channels to be proposed basis of feasibility study shall be determined by an internationally renowned Hydraulics Lab.

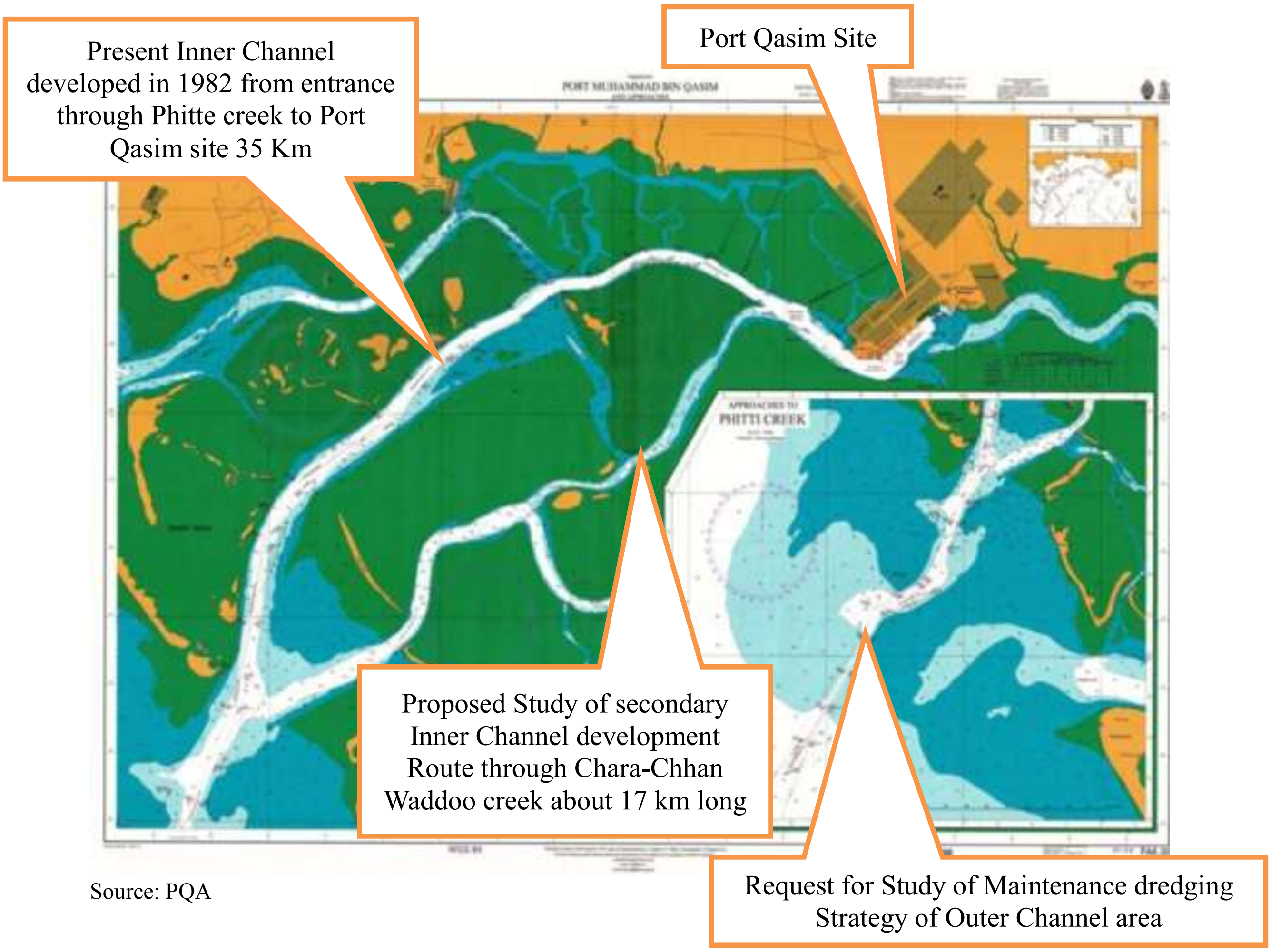
Benefits by the Project

Maintenance of access channel by effective maintenance dredging strategy is essential aspect for port operation and subsequently to minimize maintenance dredging cost, which will contribute financial management of the Port. The development of second inner channel will enhance marine traffic capacity of the channel. Thus the port can develop additional terminal facilities of accepting bulk cargo required for power plants and cement factories and LNG. In order to make shorter turning round time of ships to the port an effective navigation aid facilities and VTM are required.

- LNG terminal for importing LNG gas was developed adjacent to the grain/fertilizer and container terminal area in Port Qasim in 2011. The location of LNG terminal is not good and PQA regulated when the LNG ship is incoming and outgoing the port, all ships shall not sail in and out the channel and port area, which cause heavy time loss for container ships and others. Since this area has dual tidal changes, High water level is for 6 hours, during this time all big and deep draft ships must sail in and out to the port.

- As a result of such terminal development the capacity of channel for sailing large ship had got limited. In future number of dry bulk carriers will increase to call the port for delivery of coal, exporting cement. Without alternative/secondary inner channel port users in the industrial parks of the port hinterland and power plants in upcountry will face heavy damages and cause of stopping economic activities in national level. Secondary inner channel is essentially required to enhance the capacity of the channel.

- Number of industrial parks, and textile city were developed behind the Bin Qasim port area and number of Japanese manufacturers had already been operating in these parks. They import and export products from the Port Bin Qasim.



Source: PQA

Figure 3.8 Location of Proposed Study for Navigation Channel Outer and Inner Channel

3.3.6 Future Development Plans

The present handling cargo volume through PQA is 25.7 mill tons in 2014, the capacity is estimated 60 Mill ton/year. The following projects are planned to be implemented in near future.

- Coal terminal for importing coal to power plants, Development of PIBT (developing railway connectivity and truck yards, increase handling volume from 8 mil ton to 25 mil ton).
- Development of oil terminal (Pipe line installation for transport LNG 3 lines x 6000m).
- LNG terminal development (Engro Energy Terminal); having storage tanks 120,000, 151,000m3) and by SSGC for 2nd terminal development.
- Reinforcement of importing Iron/ore coal volume to increase steel products by Steel Mill.
- Development of 1st QICT and 2nd QICT (Qasim International Container Terminal) together Marginal Wharf development by deepening the depth along the waterfront area and widening the on land area, the present handling volume in 2014 is more than 75 % over capacity and expansion of terminal facilities are essential including the basin planning.
- Development of capital dredging of Access channel and secondary inner channel.
- The access channel is only one way to reach the port for delivery cargo and transshipment to up country.

- PQA planned to develop 2nd grain terminal, container terminal and 2nd coal terminal for coal fired power plants.

3.3.7 Private Container Terminal Operator (QICT)

DP World developed second terminal on the marshalling wharf in adjacent to the grain/fertilizer terminal.
QICT transport the some volume of container by railway transport up to border countries region

The terminal QICT has holding capacity of 1.0 Mil TEU and plans to increase 1.2 mil TEU in future. The terminal capacity can be increased by shortening the dwelling time of import containers in the yard from 10 days to 5days, the terminal capacity can be improved to 2 mil TEU.

Table 3.12 Trends of Container Traffic from 2009-2014

Year	2009-2010	2010-2011	2011-2012	2012-2013	2013-2014
Import (TEU)	374	382	355	356	420
Export (TEU)	382	397	377	366	434
Total (TEU)	756	779	732	722	854

Source: QICT

QICT had handled 942, 800 TEU in 2013-2014 and expecting to handle 1.0mil TEU in 2015.

Table 3.13 Major Shipping Line calling QICT

Main lines calls	Shipping companies
	CMA-CGM EPIC service
	MSC Europe service
	MSC US Service
	MSC African Service
	Maersk FM 3 service Indamex Service (APL, CMA, OOCL& HLL
	MINA Service (UASC-Med/India/North Atlantic)
	EPIC 2 (H sud & HLL)
	NYK Far East service
Regional vessels (Feeder vessels)	MSK (Dubai Feeder)

Source: QICT

QICT receive in average 56 vessels calls per month.

- Containers from this terminal are transported by trucks to Afghanistan. Its volume is 15% of the total volume in case the railway carries 60 TEU by one train.
- There is shortage of the locomotive and less capacity of pulling force to pulling the container train carrying 60 TEU. There are demands to Railway to transport containers, but the reinforcement to increase the capacity of available equipment. The railway carries empty containers from the port to dry port near Lahore in 24-48 hrs and 35-40 % of import

containers were transported to upper country.

- The container ships are getting larger, draft depth of 14m container ships will come to the Port, the depth of the channel and turning basin is required to be 14m and width of the channel shall be widened to receiving larger container ships.
- QICT plans to widen the yard on the marginal wharf by extending water front berth alignment offshore to obtain the required water depth and present length of berth shall be extended to 335 m to receiving large size container ship of Length of 370m.
- QICT had already developed 5 depots outside the port area, approximate 13,000 TEU can be stored in the depot and to increase handling capacity at the terminal.

The following advantages for QICT operating at Port Qasim:

i) Away from city center of Karachi and good road networks are developed and direct access to up country
ii) Vast area are available for growth in direct hinterland of the port
iii) Deep draft & potential for 14.0m provided
iv) Textile city developed with 750 acres allotted in PQA area
v) Garment city to be developed 500 acres and planned to operate in 2011
vi) 80 % of automotive plants are operating in industrial area in Port Qasim

Figure 3.9 View Picture of QICT 2 at Port Qasim

Figure 3.10 Security Check post at QICT

Security Set up

- Over 70% of Pakistan Exports to USA were moving out from QICT.
- US Customs & Pakistan customs selected Port Qasim as pilot program for CSI – IC3 facility.
- Land given to Customs – 10 acres
- Facility is linked with US Custom in USA (Target center)
- QICT manages and operates National Block of IC3.
- Average of 210 containers per day for US exports.
- Capacity – 250-350 containers per day.
- 2nd Scanner installed in 2009 to cope up with the volume.
- Exporters Saving Scanning Charges paid earlier on Transshipment Ports & invaluable time.
- Under such background
- QICT set up "Customs and Border Protection" according to the regulation and specifications by US Govt.
- QICT manages the National Block of this facility.
- Security provided by QICT is as follows.
- IC 3 – means
  a) Radioactive check.
  b) Scanning
  c) Hand held instrument check if scanning fails.
  d) FSN (Foreign Service Nationals) operate the facility.

NLC Off-Dock Terminal Facility (Overview)

- Construction works was started on 2nd week of Nov, 2004 and completed May 15' 2005 for 20 years on BOT basis.

- Operated and managed by DP WORLD Karachi.

Facility is built to handle CY & CFS Cargoes

- Location: Mai Kulachi Road Karachi (close vicinity to KICT/PICT).
- Area in 10 acres
- CFS Shed: in 5,000 sq. meters
- Equipment:
  - a) Reach Stackers 02 units
  - b) Fork Lifters 09 units
  - c) ITV 01 unit
  - d) Weigh Bridge 01 unit
- Handling Capacity: 4,500 TEUs
- Reefer Plugs 28 Plugs

OICT developed ICD at Prem Nagar near Lahore City with the following functions. The site is located about 1,000 km from Karachi city and direct connection by rail, which takes 25 to 30 hours transit time. One train transports 60 TEU. QICT controlled train operation and ICD. The facilities was constructed by QICT at own cost for 35 years contract period.

Table 3.14 Facilities of ICD Developed in Nagar Lahore

Facility	Phase 1(2010)	Phase 1+2(2013-2014)
Area to be developed	13 acres	14 acres
Handling Volume (TEU)	54,000 (Approx)	110,000 (Approx)
Warehouses (Sq m)	4,300	7,000
Work shop (Sq m)	530	530
Rail line to be provided by Pakistan Railway		
Operation Line	2 nos.	2 nos.
Engine escape line	1 no	1 no

3.3.8 Liquid Bulk Cargo Terminal

- ADB conducted study of developing dedicate oil terminal in Pakistan in 1992. ADB study recommended to develop dedicate oil terminal of importing furnace oil, since there is no such facilities in the metropolitan Karachi area. Based on the recommendation PQA called tender from private investors and FOTCO made agreement with PQA in 1992 and FOTCO Started operation in April 1995 at cost of 100 Mil US$. FOTCO handled 125 mil ton of importing diesel oil, furnace oil and export of crude oil after 25 years. FOTCO developed one jetty handling capacity of 9 mil ton/year, which capacity will be enlarged to 12 mil ton/year, while ADB study recommended developing three jetties, 4 km length of trestle from the on land storage tanks to jetties and pipe line installed for oil transport. Based on the ADB study FOTCO can develop three jetty to handle 27 mil ton, but the demands up to now less than 9 mil ton which is the capacity of 1 jetty. When the demands are reached to the capacity, FOTCO will develop additional jetty.

- Port in Karachi is getting congested badly by inflow and out flow cargo transport vehicles and there is no space for oil cargo handling within the Port area.

- From 1996-1997 the large volume of diesel oil is required to import. Government decided to shift such facilities at PQA, The Jetty of FOTCO in PQA are used for importing motor gas together with diesel oil which had been increased 25 to 35 % per year and pipe lines to transport motor gas oil are installed from FOTCO jetty to storage tanks on land. At present this jetty handle 8 mil ton by diesel oil and motor as oil and improving the capacity up to 12 mil ton by improving handling efficiency.

- Pakistan had strong demands of LNG about 2 Bill ton/day. The present import volume is shortage of 2 Billion cubic feet. In future demands after 2020 3.0-3.5 Billion cubic meter/year. It is serious if the import gas is stopped, all electric power will be stopped, and no fuel to industries will be stopped. The importers forecasted that after 2020 import oil volume will not be increased so large, since small and large refinery plants in Pakistan are planned to be developed such as National Refinery plant and Pakistan Refinery plant in Karachi area and others around Lahore city area in Punjab province, the demands is forecasted to grow at rate of 6 % per year. Under such situation after 2020 FOTCO watch carefully the growth of demands and decide time to develop additional jetty construction. The estimated construction cost will be around 60-65 Mil US$ for handling 2.5 mil ton of Motor gas.

- FOTCO plans to expand the handling capacity of gas to increase 600 MCM/Day (Mega cubic meter per day) by construction additional jetty and pipeline installation by 2017.

- FOTCO concerns that once KPT develop a deep see container terminal (depth -16m to -18m), no container shipping line will go to DP World terminal in Port Qasim, it takes more than 12 hours from the entrance of the channel to the terminal and its water depth is only 14.0m. The container traffic volume through PQA will gradually decrease. Port Qasim should develop to handle bulk cargo. KPT should develop to handle containers and general cargo. In Karachi port there is no storage area of container storage within the port.

3.3.9 Industrial Parks

National Industrial Parks (NIP) developed 2 industrial parks around the Karachi city, one is at Korangi site of 240 acre, and other is at Bin Qasim site of 930 acre Phase 1 and Phase 2 & 3.

(1) Bin Qasim Industrial Park

- The water supply and electric power supply 4 MGW are arranged by (Karachi Electric Company). NIP planned to develop own electric power supply by coal not by gas for industries in NIP, which capacity is 180 MGW.

- This land was owned by Pakistan Steel Mill. The Steel Mill and NIP agreed the land use for industrial parks development by NIP.

- The advantages of this industrial park is as follows:
- Located closer to the Qasim port and national highway which make smooth logistic of import/export cargo between the Port and upper countries area; The land price is cheaper than other industrial estates; and as industrial special economic zone provide security infrastructures, water & electric power supply.

- There is no public transport from the gate of the National highway to the port area and industrial parks; NIP is providing public transport for more than 1000 labors working now in this Port area and factories in the industrial zone in the port hinterland.

- NIP planned to develop an Industrial Estate at Korangi first. Today about 95% of the land in the Industrial estate were sold to local companies and investors. From this Industrial Estate the products are containerized to export 40,000 ton through Karachi port and 80,000 ton through Qasim Port.

- Japanese industry, Yamaha Motor Co.,Ltd established factory in the 50 acre plot of Bin Qasim industrial parks in Karachi city to fabricate motor cycle manufacturing business and to sail in the domestic market, not for exporting neighbor countries. The construction of new factory having 17,000 m2 was started April 2014 and completed in April 2015.

- The Yamaha Motor's new medium–term management plan is to produce 30,000 units in the first year 2015 and target the production between 300,000 to 400,000 units by 2020 considering the current population of 180 mil, which is expected to reach 200 mil by 2020. The country's motorcycle market will reach 1.65 mil units in 2014, which is expected to exceed 3 mil units by 2020. The Yamaha set up the strong Sales Network of 140 dealerships to provide Yamaha motor products all around Pakistan.

- According to the JETRO report 2015, Toyato, Suzuki and other Japanese manufacturers had established their factories in Bin Qasim Industrial Parks and others sites locating around Karachi city from 1980s. The total products of cars in 2014/2015 was 186, 436 and the Japanese maker's products in 2014/2015 was 180,516 units, the products of Japanese makers took 96.8 % of the market.

- NIP provided the following main two privileges i) income tax exemption for ten years, ii) custom duty on import equipment is exempted one time

- The Pakistan Steel mill established Subsidy Company of steel import business. At present the steel price in Pakistan is getting lower by large volume of steel material imported from China. The company of Asia Steel by Mitsubishi and Local partner is facing difficulty of sale in price competition in Pakistan market by the cheaper price of steel material from China.

(2) International Special Economic Zone (ISEZ)

The Government of Sindh has earmarked 2,000 acres of land for development of International Special Economic Zones on National Highway in Dhabuji area of Thatta District. The land is located near Port Qasim industrial area, which is only 50 km from Karachi airport.

The memorandum of Understanding (MOU) was signed with Japanese entrepreneur group for the establishment of industrial Enclave on 250 acres of the land under Japan Special Economic Zone, Dhabeji, Thatta. The Japanese group will establish the most modern and advanced industrial Enclave for attracting the investment under this initiative.

The Provincial Government is engage with Japanese, Korean, Chinese and other potential foreign investors to finalize arrangement for infrastructure development of this zone.

3.3.10 Pakistan National Shipping Cooperation

- PNSC had started in 1963 as NSC and changed the name to PNSC in 1979.

- PNSC has 4 tankers (Panamax) in size of 105,000 DWT, to 70,000 DWT and 5 Bulk carriers (Handy max size) to transport dry bulk, coal, but no container carrier ships and import oil from Persian Gulf by chartered ships to transport oil. The company held feeder size/small container ships in 1970s, but due to not large volume of containers from Persian the company stop to transport containers.

- The water depth in the access channel is 13m, which is good enough for receiving present oil carriers, but the capacity of storage tankers on land is not enough to accept the total volume by tankers in storage tanks. There are three oil piers in Karachi Port located along the access channel near the entrance of the channel, and there are storage tanks in the back up area connecting between Jetty and Tanks by pipe lines. The depth of access channel and port basin channel area should be deepened especially in front of the oil jetty for receiving 105,000 Oil carriers. The present depth of channel and basin is good for container transport to KICT/PICT, but not enough for large oil tankers.

- KPT planned to rehabilitate the existing 3-Oil Pier and deepening the basin in front of the piers, but does not plan to enlarge the oil terminal, expansion of oil jetty nor construction of additional tanks, while the bulk terminal for handling coal at B-1, 2 and 3 is planned to located in adjacent to SAPT development area. The coal is transported by railway from this area to the power plants up country. It was discussed the proposal of developing additional oil jetty inside the SAPT terminal basin area with KPT, since there is large land area available within SAPT area. PNSC requested to include this plan in their master plan of SAPT development Plan.

- In case oil jetty is developed inside the SAPT terminal area, PNSC plans to purchase additional vessels of one oil tankers size of 205,000 DWT for carrying oil and one tanker to carry jet fuel, and clean oil. After 10 years around 2025PNSC will purchase 16 vessels (from 9 ships in 2015 to 25 vessels in 2025) tankers, bulk carriers, general cargo.

- The Company transport crude oil to Karachi port and fuel oil and diesel are transported to Port Qasim. For sailing in the access channel to Port Qasim the present depth of the channel is good enough.

- The ships belong to PNSC are not visit to Gwadar port since there is no demands, and new cars were transported from the factories in Jakarta, Indonesia

3.3.11 Afghanistan Forwarders

- The company operates and manages the export through cross border between Pakistan and Afghanistan. The company started Forwarder business in 1997/1998, there are only 22 companies establish an association to join Forwarder business. Without registration in this association there are no jobs. At present the company is ranked at top 5 forwarder companies in this forwarder business in Pakistan.

- At present the railway transport small volume of cargo between Karachi and Peshawar, Karachi to cities in Punjab province. It takes 3 days by trucks between Karachi-Punjab, and 5 days to Peshawar and 4 days to northern parts of country. While by train it is required 30 hrs from Karachi to Peshawar due to shortage of lines only single train line.

- Auto industries in Pakistan is only domestic market, Nissan does not fabricate cars in the Factory located near Port Qasim industrial parks and other makers have fabricated same model and no improvement in quality of cars for last 30 years.

- Government is concerned to improve the security of cargo transport under the present management and operation of the railway, which is one of the departments of the Government organization, not function as public transport service.

- Two container terminals in Karachi port is not enough capacity to meet the demands. The space of both terminals are narrow, since stock yard area is small the all containers are unloaded and stocked in the yard there is no other space in the yard to receive the containers by next ship, which must wait till the empty space in the yards are made. Subsequently the turning basin, channel area are got congested. More spaces in both terminals and extending berth length are required.

- Afghanistan requires import cargo, there is no export cargo from them. The transportation cost of container from Karachi to cities in Afghanistan is at present 2,500 US$/TEU, when fuel price is got higher the cost will be 3,500US$/TEU and during rainy season there is less volume the cost is got lower around 1,000 to 1,500 US$/TEU by truck.

- The truck companies register their trucks in Pakistan and Afghanistan, when trucks run in Pakistan, truck put Pakistan vehicle number and when they run in Afghanistan, the Afghanistan vehicle number is attached.

- The Company of PAKLINE and Shipping Line transport operation of cargo from CIS, Cargo from CIS are not safe, which is required guarantee by the insurance companies, thus cause large opportunities of smuggling cargoes. The on-land transport infrastructure in CIS are very poor, they needs development of roads and railway.

- It takes about 2-3 days for cross border in processing time of custom and there is no corruption between custom office and truck companies and take 4-5 days for unloading and loading cargo.

- More trucks are required and improvement of damaged roads is required to repair and additional road infrastructure is required... N-9 road was started the construction, the highway road between Gwadar to Karachi was also started construction works. The motor way between Karachi and Hyderabad and Peshawar and Lahore are planned.

- Transshipment charge of container through the port is 500US$ in Dubai port, and 300US$/TEU through Karachi port.

- Crude palm oil is imported from Port Kelang in Malaysia and transship at the Karachi port to Middle East countries.

(1) Transit Trade Customs Clearance

The majority of Afghan imports which do not originate in neighboring countries transit Pakistani sea ports before heading to Afghanistan via truck or rail. Timely customs clearance and freight forwarding in Pakistan are essential for U.S. agricultural exporters to be competitive in the Afghan market. This report outlines the customs and freight forwarding procedures for Afghan cargo transiting Pakistani sea ports.

Commercial cargo bound for Afghanistan is offloaded and transferred to the Afghan Transit Shed at Karachi Port. Note that per Pakistani government regulations cargo bound for Afghanistan must transit via Pakistani railways or by trucks associated with the National Logistics Cell (NLC).

NLC is a Pakistani military run trucking and rail company. Although the regulation states that only NLC trucks can transport Afghan goods from Pakistani Ports, this regulation is currently interpreted that NLC trucks include private carriers licensed/bonded by NLC. Pakistani freight forwarders can provide the information on what trucking lines are approved by NLC for transit to Afghanistan.

However, it should be noted that the Pakistani government has changed their interpretation of the NLC regulation and at certain times only NLC trucks can carry good bound for Afghanistan. This variable interpretation adds uncertainty to the transportation logistics of shipping Afghan goods through Pakistan.

(2) Requirements for Commercial Cargo Ex-Arrival Karachi Port

Documents Required: Bill of Lading, Commercial Invoice, Packing List, and Jawaz Nama (Afghan Import License)

The Commercial Invoice and Packing List should declare “Goods in Transit to Afghanistan” on each document.

The consignee or supplier’s representative should send the Jawaz Nama, issued by the Ministry of Commerce and Industry and attested by the Afghan Consulate in Karachi, and a letter authorizing the freight forwarder to act on behalf of the consignee to the freight forwarder.

Once these documents are received the freight forwarder can proceed with customs examination by submitting the Bill of Lading, Commercial Invoice, Packing List, Jawaz Nama, and Authorization Letter to the Karachi Customs House.

Customs clearance normally takes 3-5 business days. Once clearance is granted, copies of these documents are provided to the Pakistani Central Board of Revenue in order to request a letter of transportation or Transit Permit for transit on NLC or NLC bonded carriers. It normally takes 2-3 business days for NLC to issue a Transit Permit. This is the only option for land transport to deliver cargo to Afghanistan.

3.4 Gwadar Port

3.4.1 Potential

Gwadar Port is emerging as the third port of Pakistan - Karachi and Port Qasim being the other two. Gwadar borders on Arabian Sea and lies in the Balochistan Province. Gwadar Port is located at the mouth of Persian Gulf and outside the Straits of Hormuz. It is near to the key shipping routes used by the mainline vessels in the region with connections to Africa, Asia and Europe and enjoys high commercial and strategic significance.

The development of Gwadar was started in March 2002, which could bring economic gains to Balochistan and potentially capable to act as industrial power house, a suitable transit and transshipment hub. Currently, it is becoming almost a pro-verbal to narrate Gwadar Deep Sea Port as a "Game Changer" in trade and economic development.

Economic benefits of Gwadar port, are: capitalizing the opportunities for trade with landlocked Central Asian Republics and Afghanistan; promotion of trade and transport with Western China; trans-shipment, essentially of containerized cargo; unlocking the development potential of the hinterland; socio-economic uplift of the province of Balochistan; establishment of shipping-related industries, oil storage, refinery and petro-chemicals, export processing industrial zones and many more avenues. Gwadar Port is also the gateway of China – Pakistan Economic Corridor (CPEC).

Gwadar could emerge as a key shipping point, bringing Pakistan a much-needed income, and when combined with the surrounding areas could become a trade hub, once road and rail links connect it to the rest of Pakistan, Afghanistan, Central Asia and China. A road from Gwadar to Saindak, said to be the shortest route between Central Asia and the sea, is under consideration. Gwadar provides landlocked Afghanistan, the Central Asian Republics and Western China access to the sea. Goods, oil and gas reserves from these countries could be shipped to global markets through Gwadar Port.

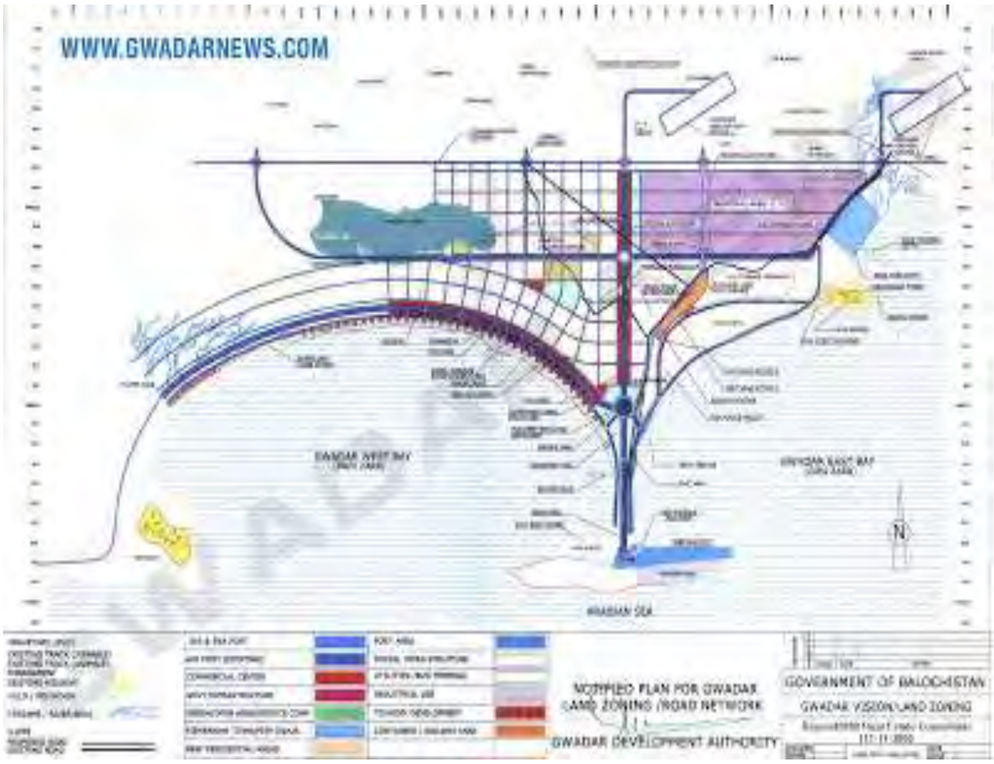
3.4.2 Deep Sea Port

The definition of a deep sea port is that the mother ship comes directly at the port and is unloaded. Presently the depth is 14.5 m but ultimately it will be increased. Gwadar port plans to develop deep sea terminal. As per the vision envisaged for Gwadar port development, 88 mother ships will anchor at a time by 2050. The port is equipped with essential port handling equipment and required infrastructure for smooth port operation.

3.4.3 Facilities Development in Phase-I (Completed)

The port is planned to develop 3 multipurpose berths-each berth has 200 m berths (3x200m long), receiving ship size up to 25,000 to 30,000 DWT containers vessels and bulk carriers 50,000 DWT bulk carriers @ 12.5 meter maximum depth respectively.

- 1 Ro-Ro facility, 1-100 meter service berth
- 4.7 km long approach channel dredged to 14.4 m depth at outer channel, 13.8 m at inner channel /turning basin and 14.5 m depth alongside berth.
- Outer channel is-206 m and inner channel width in 155m
- Turning Basin 595 m diameter



Source: Gwadar Port Authority web site (www.//gwadarport.gov.pk)

Figure 3.11 Master Plan of Gwadar Port Development

Table 3.15 Planned Area of the Facilities in the Port

Port area	64,000 sq. m
Container stacking area	48,300 sq.m
Empty Container Stacking Area	6,875 sq.m
Storage area	28,700 sq.m
Transit shed	3,750 sq.m
Maintenance workshop	1,440 sq-m
Vehicles servicing garage	450 sq-m
Common offices for GPA, customs,	4 ,144 sq-m
Future development area	118,575 sq-m

In phase-II, it will have nine additional berths.

i) Four container berths.
ii) One bulk cargo terminal (to handle 100,000 DWT ships).
iii) One grain terminal.
iv) One Ro-Ro terminal.
v) Two oil terminals (to handle 200,000 DWT ships).

In the Pakistan Vision 2025, the future development plans of the Gwadar Port and regional linkages are described as follows;

- The Port will be built as a leading port in the region to serve as a gateway to the China-Pakistan Economic Corridor.

- Two important roads and highways projects include the development of linkages between the port of Gwadar and the National Trade corridor, and upgrading the Karakoram Highway to cater for increased traffic with China.

- The CPEC project is aimed at enhancing economic regional integration in investment, energy, trade and communication and to create linkages between the Western Region of China and Pakistan by establishing communication links and developing Economic and Trade Corridors.

- The CPEC offers a unique opportunity to Pakistan to integrate with regional developments and become a hub for trade and manufacturing with Gwadar port developed as an international free port.

- Pakistan will take advantages of CAREC helps Central Asia and its neighbors realized their significant potential by promoting regional cooperation in four priority areas; transport; trade facilitation; energy and trade policy. Pakistan will take benefit of its strategic location to serve as gateway to Central Asia and attain energy security by connecting to Central Asia.

3.4.4 Geographical Location

In comparison to Gulf ports, especially Dubai, it gives more facilities and will handle more cargo and trade because Gwadar is a deep sea port, and is located at the mouth of the Gulf and is a gateway to Central Asian Republics (CARs) / Western China.

For Dubai, ships have to wait for days for the route clearance due to Strait of Hormuz, where only a few ships can cross at a time. As far as the Iranian Ports (Chah Bahar & Bandar Abbas) are concerned, they will not be able to attract and generate business while the Iranian state remains hostile to major western powers. Moreover, these ports are in creeks and require colossal maintenance cost, which from a business point of view, is not so attractive.

Source: Gwadar Port web site

Figure 3.12 Geographic Site of the Gwadar Port

3.4.5 Transit Trade

The land locked Central Asian States are dependent on Gwadar. Similarly Western China and North Western India shall have a short route to the world market through Gwadar. Presently Transit Trade facilities are provided to Afghanistan (from Karachi) and the same can be extended to CARs from Gwadar.

The location of Gwadar Deep Sea Port is such that the whole world business converges and diverges at this place. In comparison, Dubai lacks all this.

3.4.6 Trans-shipment

The whole region, indeed the whole world can take advantage of trans-shipment facility. The transit cargo (liquid and dry both) can easily be undertaken from Gwadar and transported to any part of the world in a short span of time, in comparison to other ports.

Imagine a ship carrying 5,000 – 8,000 containers, the enormity of warehousing, transportation and manpower required to handle all this.

3.4.7 Warehousing/Container Yards

Due to trans-shipment there will be a lot of requirement of warehousing and container yards. All consignment/cargo has to be unloaded and kept in warehouses before shipment. Similarly all cargo/consignment unloaded from ships has to be stored in warehouses/container yards and then transported to their final destination. Being a deep sea port on the main shipping route, it will facilitate the movement of cargo. There will be a major requirement of warehouses, both open as well as bounded.

3.4.8 Transport

The movement of containers / cargo to and from the up countries will either be done through railway or heavy transport.

The rail network should be laid by the government. There is a dire need for a modern railway network as the existing rail networks is of old vintage and will not be able to sustain new load volume.

For heavy road transport the private sector will be involved. The transport industry will have to import all kind of vehicles and especially heavy vehicles for fast delivering of goods at the far destination as well as in the city limits.

Transportation of goods through air also stands a chance due to long distances, and for urgent deliveries, thus an international airport is required.

3.4.9 Trade & Business / Import & Export

The trade and business of all kinds and quantity, starting from a needle till ships, will flourish, irrespective of the cost. Import and export of all items and magnitude is possible, because the means of transportation like sea/road/rail (being developed) are available and linked with all important countries and trade routes. Gwadar shall be the “Meeting Point” for sellers and buyers, rich and poor, haves and have nots, and so on.

Manufacturing Industries: Being a deep sea port and with facilities for transportation available, the industry of any kind is feasible, both from raw material as well as finished material point of view.

The mineral resources of Central Asia have no shorter route to get transported and to reach world markets, than Gwadar. The developed world cannot reap these benefits except through Gwadar. Invariably what may happen, it is a natural phenomenon that industry develops at all ports due to availability of all kinds of facilities.

3.4.10 Gas/Oil Refinery and Petro Chemicals

Gwadar Port should be termed as an energy port. The gas and oil deposits of CARs will find their new storage destination at Gwadar, because of its natural flow direction. Even Iran can benefit from Gwadar by securing an opening to the world market for gas and oil. The Pacific countries, India and other countries short of energy can easily be supplied Liquid Natural Gas (LNG) from Gwadar. There will be a need for an oil refinery rather an “Oil City” to cater for all these.

China has to pump Iranian gas through National Trade Corridor (NTC). Similarly the Middle Eastern oil will also be pumped to China, being cheap in terms of distance and time, through NTC.

3.4.11 Fisheries

Presently fishery is one of the most important economic activities in Gwadar district, in which a vast majority of the population is engaged. The district has a 600 kilometers long coast line which provides the residents not only a means of income, but also food to subsist. About one fourth of the total catch of different varieties in Pakistan is produced in Gwadar.

At present there are two jetties (Gwadar and Pasni) in the district. Till today fishing is a family skill. There is a need for training on modern fishing techniques. On an annual basis there is potential for an additional catch of at least 70,000 tons. Fish processing at Gwadar is providing employment to many of the local educated and uneducated unemployed youth.

In case fish farming and shrimp farming are encouraged, it can double the quantity, besides improving the quality.

3.4.12 Construction

Presently Gwadar has no building or accommodation to accommodate the human influx and store the bulk supplies of any kind. The construction industry has so much potential that one has to start from the making of bricks, till the construction of high rises, for which there is no limit, “Sky is the limit”.

Job opportunities: The Gwadar project can provide job to thousands of people of the country in a short span of time, as everything new has to be developed and there will be a large requirement of human resource i.e. from laborers till the executive class.

3.4.13 Economic Significance of Gwadar Port Development

Presently Gwadar is a fishermen’s town, having a population of fifty thousand people. Gwadar is connected through a coastal highway, approximately 600 Km long, with Karachi. The travelling time is 7 – 10 hours depending on mode of transportation.

The master plan of the city has been prepared (Refer to Figure 3.11). Necessary road networks within the port area have been completed, but the main roads from neighbor countries, northern parts of China and Big city of Pakistan Karachi are not developed yet.
For Export Processing Zone (EPZ) 46,000 acres of land has been earmarked on the eastern side with 10 years Tax Holiday.
Gwadar Port Authority has been part of all planning and appraisal processes of China Pakistan Economic Corridor programe. The following projects related to Gwadar Port & Port City of Gwadar have been agreed.

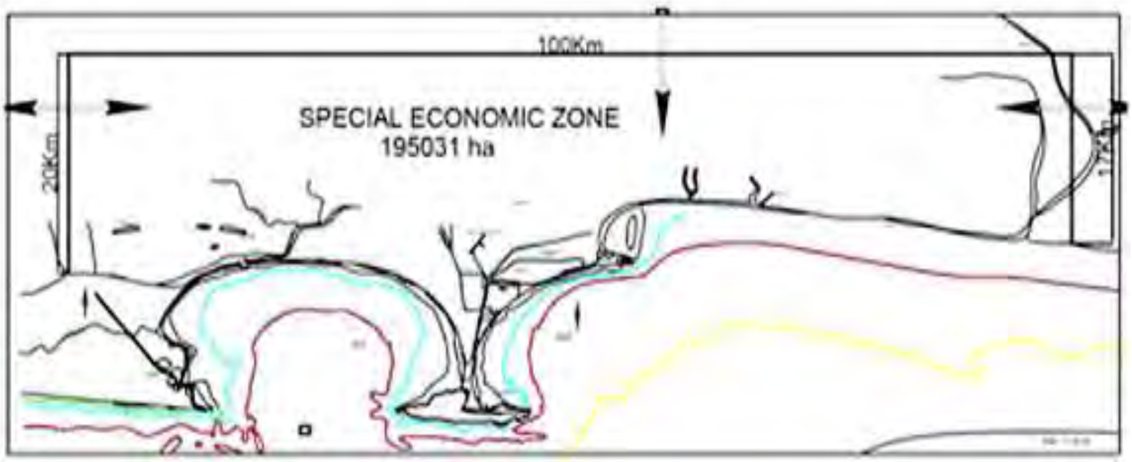
- Construction of Breakwaters, Gwadar Port
- Dredging of Berthing Areas & Channels, Gwadar Port
- Pak-China Technical & Vocational Institute
- Infrastructure Development for Free Zone & EPZs, Gwadar
- EPZA & GIEDA
- Necessary Facilities of Fresh Water Treatment, Water Supply GDA
- China-Pakistan Friendship Hospital (Up-gradation of existing 50 bedded hospital GDA
- A desalination plant has been set-up at Gwadar Port to supply 100,000 gallons/day of drinking water to ships calling Gwadar Port
- Coal-based Power Plant at Gwadar Min of Water & Power
- Construction of Gwadar International Airport CAA

3.4.14 Setting up port area as Special Economic Zone

In order to facilitate rapid commercial and economic development, Gwadar will be declared a Special Economic Zone for a certain period. The length of this period has not yet been determined.

The SEZ is likely to cover the city of Gwadar and the industrial areas currently planned. The specific incentives-regime is likely to include general tax-holidays, no VAT and generous incentives pertaining to business ownership and employment of foreigners.

The main purpose of this concept is to accelerate economic development and investments, both foreign and local, in general. This in turn will spur industrial development and port traffic throughput demand. It would also contribute more rapidly to employment creation and uplifting of the Gwadar district and of Balochistan province of Pakistan.



Source: Gwadar Port web site

Figure 3.13 Special Economic Zone in Gwadar Port Area

3.4.15 Observation by Business men in Pakistan

- In the case of development of Gwadar port, the handling volume of import oil by FOTCO will also increase to meet the demands in western parts of China, Central Asian countries and Afghanistan, which oil is transported by the existing pipelines from Karachi port/Qasim port. But the Gwadar port cannot be operated independently by commercial basis. KPT/PQA are operated and managed by commercial basis and independently. The distance between Gwadar to Karachi is about 700km.

- The company expects new logistic business by development of the Gwadar ports and regional economic development through North China/North Russia/Tran/ Baluchistan and Karakorum corridor by crossing the border of China under the new agreement between China and Pakistan, especially cargo transport between Karachi to CIS (Central Asian countries) will increase and Port of Karachi will handle transshipment cargo from this economic corridor. The railway transport cargo will be required large and important rolls.

Figure 3.14 Port Activities on the cargo berth in 2015

4. Sri Lanka

4.1 Colombo Port

It has grown significantly during the last century, and was followed soon after by rebuilding work in the 1980's to accommodate container handling facilities. Four state of the art container berths came into operation from 1985 to 1997 making Colombo a preferred destination for transshipment of containers.

The Port of Colombo, located in the South-West corner of the island is rated amongst the Top Container ports in the world. The Port of Colombo, located in the South-West corner of the island is rated amongst the Top Container ports in the world.
The port's natural geographic location is strategically positioned on the main East-West shipping route, linking the Far East with Africa, Europe, and the East Coast of the US, providing ideal connections to the trade in the Indian sub-continent. This makes the Port of Colombo a superb strategic hub.
This had helped the country's economy by reducing freight rates and attracting investors because of the large number of ship calls that helped them in economic just in time operations.

Public Private Partnership towards further development of container operations in the Port of Colombo resulted in South Asia Gateway Terminals being established in 1999 and further expansion of port facilities outside the Port of Colombo in the mega Colombo South Harbor Development works now underway.

4.1.1 Terminal Conditions of Old Terminal Area

The Port of Colombo is the foremost port of Sri Lanka. Its strategic location for global shipping helped to attract transshipment container traffic in volumes that rapidly saturated new capacity. Transshipment involves the shipment of goods or containers to an intermediate destination and from there to another destination taking advantage of movement logistics. Presently Colombo harbor doesn't have space for bulk cargo, mainly operating as a container terminal. Bulk cargo now handling are cement, steel, wheat etc. at JTC.

Presently the depth is -9.0m at JCT, JAYA, SGABT and hence it is not sufficient to handle larger vessels which needs -12.0 m depth.

Under Metro Colombo Master Plan, it is proposed to develop port access road and to widen it from 4 lanes to 6 lanes and to connect existing highway network.

Of the total number of over 4.9 million TEU of containers handled in the Port of Colombo in 2014 almost 75% consist of transshipment containers. The container traffic volume through Colombo port has been growing as follows;

Table 4.1 Container Traffic and Ship Calls

Year	Container traffic total (Mil TEU)	SLPA	SAGT	CICT	Number of ship calls
2012	4.187	2.317	1.870	No	3,870
2013	4.306	2.502	1.747	0.356	2,449
2014	4.908	2.559	1.662	0.414	2,467
2015 (Aug)	3.438	1.520	0.924	0.995	2,792

Source; MOL Colombo Office/Ceylon Association of Ships Agents

About 60% of the transshipment containers handled originates from the Indian Subcontinent.

Table 4.2 Traffic Volume of Non-Containerized Cargo through Colombo Port 2012-2015

	International Trade					Domestic Traffic volume	
Year	Cargo Discharge (× 1000 ton)	Cargo Loaded (× 1000 ton)	Vehicle by Ro-Ro (unit)	Number of Ship calls		Cargo Discharge	Cargo Loaded
2012	8,151	13	39,069	643			
2013	7,095	191.5	n.a,	268		14,814	4,220
2014	7,394	71.4	n.a	251		16,027	4,397
2015	4,914	210	n.a	293		5,103	207

Source; Ceylon Association of Ships Agents

SLPA received number of the following requests for development of old parts of Colombo port from users, particularly shipping lines;

- Deepening the existing draft of berths and turning basin up to-12m, while the existing depth is around -9.0m.
- It is not easy to deepen the existing depth of 9.0 m to 12.0 m due to foundation of wharf structure. To accommodate deeper draft ships the depth of the access channel and turning basin shall be deepened. Once longer length of ships is coming to the port, the area of turning basin shall be enlarged and the length of berth shall be expanded. Gantry crane in old terminal has capacity of 18 laws, while the south terminal of South harbor has 24 laws. SLPA plan to install higher tall crane.
- SLPA had developed the port inner roads within the port area and yard expansion. Custom inspection had been conducted outside the port area, which was shifted previously it was conducted inside the port area.

SLPA plans to renovate the existing passenger berths built in 1900 to be able to handle general cargo, Berth No 1, 2B, 11 and 12 of SJT and provide the berthing facilities to feeder ship lines of Mega Carriers. The existing depth of the berth is too shallow for the feeder ships, which cause non economical transportation cost for cargo owners and shipping lines.

SLPA plans as development concept of tourist attracting area combined to gather with the port facilities and number of colonial design buildings located around the port area. In order to meet such concept the long distance cruiser ship terminal may be developed at the land available behind the aged berthing facilities.

Port related following infrastructures are required immediately.

- Port Access road development to increase 6 lanes from existing 4 lanes, which is already planned and some parts had started construction.
- SLPA plans to develop custom inspection area by X ray monitoring system.
- Constructing residence for SLPA's employees along the planned port access road. Transporting unusual cargo
- The connection point with highway and port which is planned to locate at the entrance of the Port.
- Alignment of Port Access shall be planned such as city traffic does not come into the Port area. Modification of road and cargo handling yards including warehouses and improvements for safety measures are needed, including the elevated port access road to be constructed for easy access to port while improving mobility and increasing connectivity with expressway network.
- Establishment of Dry Ports as Inland Container Depots in Sri Lanka
- The objective of constructing dry ports in Sri Lanka is to alleviate congestion in the area in and around Colombo Port by constructing inland container depots in the vicinity of Colombo, that have the ability to connect to the Colombo port by environmentally friendly and economical rail transport. Financial viability of such initiative under public or public private partnership is highly considered as to assure return on investment and assure the competitiveness of imports and exports.
- The container traffic in the Colombo port has been 4. Mil TEU. It is expected that by 2020, the total number of TEUs will increase to 6.2mn.

In view of the above, feasibility study was conducted for development of ICD near the Colombo port based on the criteria of adequacy of available lands for future expansion, distance to Colombo port, length of connection between existing railway and the proposed site, external resettlement cost, environmental impacts and quality of onward access to rail and road network. As a result, the following four candidate sites have been identified.

Site	Subtotal costs (US $ mn) in 2012 prices				Total cost	FIRR	EIRR
	Civil & building	Railway works	Equipment[1]	O & M[2]			
Veyangoda	43	7	23	149	222	11%	29%
Enderamulla	81	6	48	268	403	19%	24%
Peliyagoda/Telangapata	164	6	48	218	489	12.9%	12.9%
Ratmalana	34	4	30	130	198	4.4%	>12%

Source; NPD

The following projects are planned to be implemented in the Port of Colombo:

- Construction of a modern Port City inclusive of all facilities in the area of 575 acres
- Modernization of Road Network within the Port Premises
- Expansion of facilities of JCT for handling of Inland Containers. Introduction of a suitable Automated Cargo Management System after identifying the present malfunctions and areas to be improved is required.
- Development of new cargo village as Inland Container Depots at 4 candidate sites including Peliyagoda.
- Development of North Harbor of Colombo port
- Development of Passenger Terminal Facilities for World Cruise Passenger vessel and ferry service.

The above development projects of the Colombo port planned by SLPA and investment plan are consistent with the recommended project list of Western Region Megapolis Master Plan published in January 29, 2016 by Ministry of Megapolis and Western Development, except the development of North Harbor of Colombo port.

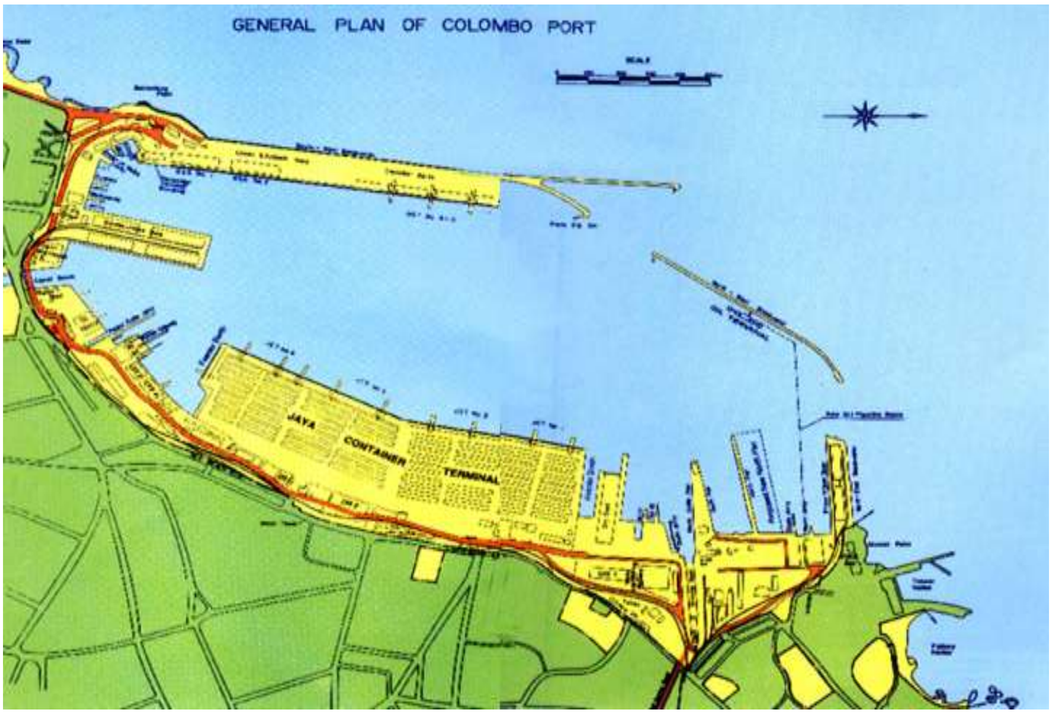
SLPA planned to develop the North Port of Colombo port located at the north of JCT, but the time of investment plan of this facility is not set yet. SLPA put priority of development of South Harbor. SLPA schedule to start a development of the western terminal of South Harbor after 2020 by observing the trends of traffic growth. SLPA does not set specific investment plan for development of the North Harbor project.
The facilities available at the Port of Colombo are depicted as shown in Figure 4.1. The port dimensions of Colombo port are as follows;

Harbour Area at low water; 195 ha, Length of South –West Breakwater 1,570 m, North-West Breakwater 810m, North-East breakwater 330m,

Total number of berths is 27, Dimensions of main terminals is extracted below;

Table 4.3 Port Facilities of Main Terminal in Colombo Port

Jaya Container Terminal (JCT)	i) 4 container berths and 2 feeder berths, 1,292 m Main berth and 350m feeder berth ii) Depth alongside berth 12.0-15.0m iii) 45.5 ha of container terminal Area iv) 1,548 TEUs reefer stacking capacity
Unity Container Terminal (UCT)	i) 2 container berths + 1 multipurpose berth ii) Depth alongside berth 7.5m to 11.0m iii) 1.53 ha of container terminal area iv) 8,000TEU stacking capacity
South Asia Gateway Terminals (PVT) The hub of Tomorrow's World	i) 940 m long of main quay wall container berth ii) Depth alongside berth 15 .0m iii) 5,544 TEU stacking capacity
Bandaranaike Quay	920m long of berth, Depth 7.0 to 9.5m
Passenger Terminal	180m long of berth, Depth 9.5 m

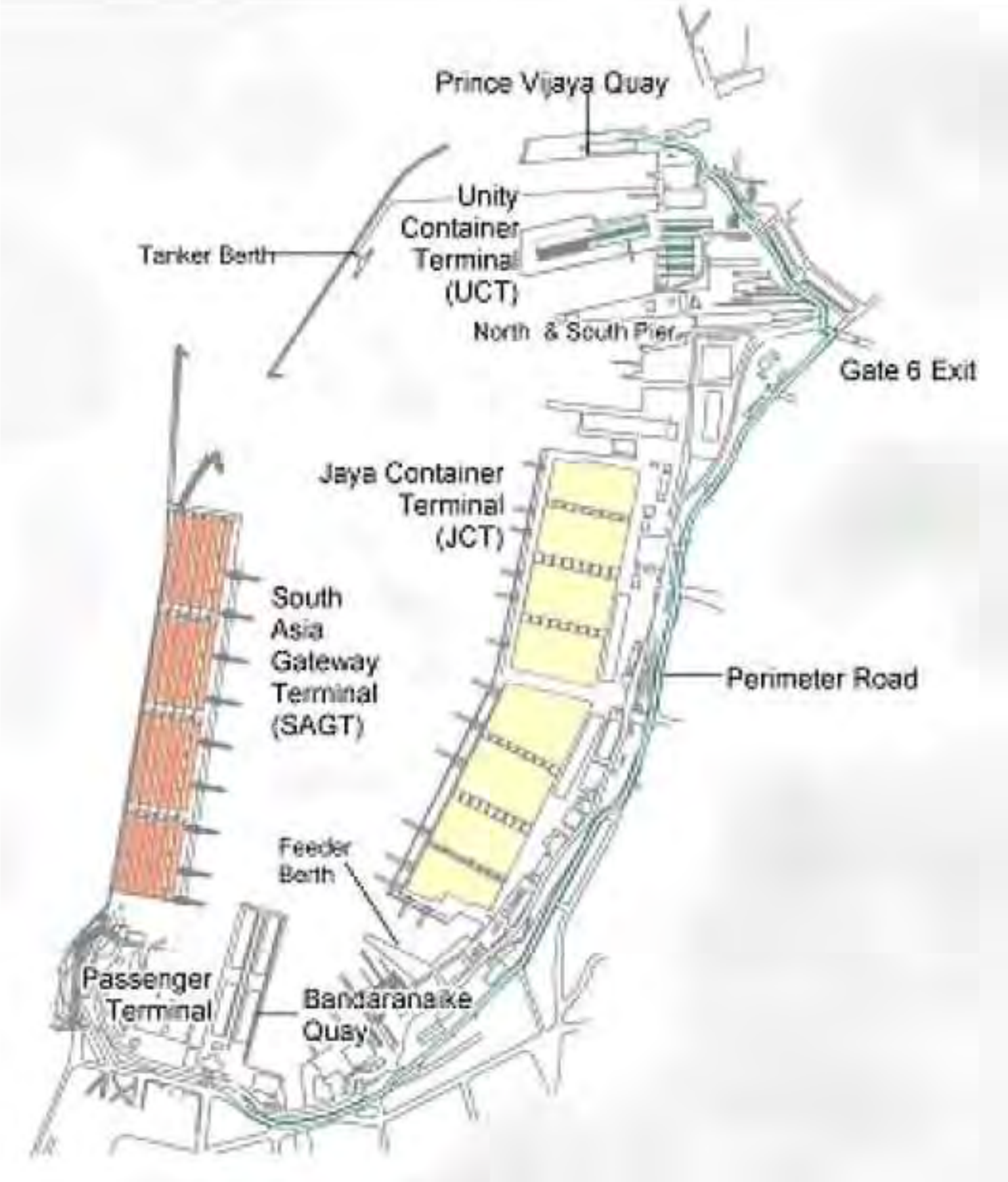


Source: SLPA

Figrure 4.1 General Plan of Colombo Port

Source: Survey Team

Figure 4.2 Photograph of container terminal at Jaya Container Terminal



Source: SLPA

Figure 4.3 Location and Name of Terminals of Colombo Port

4.1.2 Colombo South Harbor (Development Plan)

The layout of the proposed Colombo Port Expansion Project (CPEP) has been designed to accommodate vessels with an overall length of 400m, beam of 55m and draft of 16m. The proposed layout illustrated shows that CSH will be created by the construction of a major new breakwater to the west of the existing harbour and a smaller secondary breakwater.

The harbour will be served by a new two-way channel with a depth of 20m and a width of 570m. The new breakwaters in the initial phase will enclose a basin area of 285 ha which will support three new terminals each with a quay length of 1200m and a land area of 58 ha. The basin will be dredged to –18m with provision to deepen it to -21m for receiving a new generation of deep drafted vessels come on line. There is also provision to extend the breakwater under a second phase to provide area for a fourth Terminal.

- Three Terminals – Each terminal three berths with 1,200m quay length, and designed yard area of 58 ha each terminal with design capacity of 2.4 mil TEU
- Water depth alongside the berth; 18.0m
- Water depth of access channel -20m
- Tard area 58 ha per Terminal (Yard width 470m)
- 1ST development is South Terminal, 2nd is East terminal, then the West Terminals
- Commence Break water construction of 6,830m long as Phase 1 in 2008 & completion of 1st Terminal by 2013

The SLPA had developed three terminals (East, South and West terminals) in the 'Colombo South Harbor' located west of the present south west breakwater (Queen Elizabeth Quay) with a water area of approximately 600 hectares. Each terminal has 1,200m length x 500m back distance of stock yard of 3 berths, draft of -18.0m. The length of breakwater is 6.4 km constructed at cost of 300.0 Mil US$ by ADB bank and others cost of 150 Mil US$ by SLPA. The berth construction and equipment installation are developed by private investors.

SLPA is expecting a joint venture partner to operate East Terminal of Colombo South Harbor, and now SLPA is waiting for executing of the equipment procurement procedures.

The harbor will be enclosed by a total length of 6.83 km of breakwaters and will have 4 terminals, each 1,200 m in length to accommodate 3 berths with an alongside depth of 18 m and provision to deepen to 23 m in future.

The channel width of the harbor is to be 560 m with a depth of 20 m. The harbor basin is designed for a depth of 18 m with a 600 m turning circle. There are not encountered rocks below the existing sea bed.

The target volume of handling container volume per terminal is set at 3.5 to 4.0 Mil TEU/Terminal, practical level of handling volume will be 2.4 to 3.0 Mil TEU.

SLPA developed East Terminal 470m long of the berth at -18.0m depth by 2015. SLPA owned 49% of the shares of developing this terminal. SLPA made the concession agreement with China investor to develop the south terminal named as "CICT (Colombo International Container Terminals Limited" with following berthing facilities.

Table 4.4 Port Facilities of CICT

Alongside depth	18.0m
Number of berths	4 berths
Berth length	1,200 m
Quay cranes Post-Panamax	12 units
Rubber Typed Gantry Cranes	40 units
Yard area Yard width	35 ha 470m
Designed annual throughput Capacity	2.4 mil TEU

Source; SLPA

It is planned to call the tender for procurement of container handling equipment in the beginning of 2016 and to call the terminal operator with SLPA for developing the remaining parts of East Terminal (length of 470m).

The development of Phase-1 of the Colombo South Harbor is to be carried out in two stages.

- The first stage of development includes the construction of breakwaters, dredging of the approach channels and harbor basin, and construction of ancillary facilities estimated at Rs. 43,500 million of which 85% will be provided by the ADB as a concessionary loan.
- The second stage comprises terminal facilities with private sector participation estimated to cost US$. 350 million.

The construction work of the East terminal was commenced in April 2008 and the terminals are due to be operational by 2011/2012. When the demands saturate the present capacity of container handling in the port, West terminal is planned to develop in 2018 to 2020. The development cost is estimated 500 Mil US$.

It was reported that the container traffic through Indian ports in 2014 had decreased 6 %, while the volume through Colombo port had increased 6 %. It was concerned due to the labor problems in the ports of India and social environmental issues, while there is no such issue in Colombo port.

Source: SLPA

Figure 4.4 Proposed Development Plan of Colombo South Harbor – An Extension to Port of Colombo

Colombo South Harbor will be accessible via a two – way channel of 20 m depth.

- Full access & exit with turning maneuvers for 400m (LOA) Vessels with 55 m beam is acceptable.
- Each Terminal will comprise of a minimum of 730m continuous quay length.
- Minimum alongside depth will be dredged to 18 m with provision of 21 m if required.
- The rated capacity of each terminal is 2.4 MIL TEU.
- Proposed yard area is 64 Ha.
- Equipment to be employed is 12 RMGS & 40 RTGS.
- Construction of Phase 1 is to be completed by 2013.

4.1.3 Observations by Ministry of Ports and Shipping

(1) Strength of Colombo port as a Hub Port in this region

The strengths of Colombo Port as a regional hub port are as follows;

- Ideal geographical location with minimum deviation from the main shipping route
- Fully equipped berths for largest container vessels
- Excellent well established Feeder Network
- Most competitive rates in the South Asian Region
- Multi-country consolidation and Entrepot cargo

(2) Development of the South Harbor

Ministry of Ports and shipping looks for investors and call shipping line for South Harbor terminal development.

CICT (Colombo International Container Terminal) had developed the whole facilities of berth 1,200m, stock yards of 35 ha behind the berth as the south terminal in the South Harbor. CICT operate the south terminal and installed 20 units of the Post Panamax type large gantry crane which arm length is 24 laws.

SLPA developed only first berth of 470m of the East terminal. SLPA will call a tender for purchase the container handling equipment in the beginning of 2016 and plans to make it operational in the next year. West terminal development will be decided by Ministry and SLPA when the capacity and demand are balanced.

(3) Development Projects being Implemented in the Port of Colombo

- Construction of a modern Port City inclusive of all facilities in the area of 575 acres
- Modernization of Road Network within the Port Premises
- Expansion of facilities of JCT for handling of Inland Containers
- Development of new cargo village at Peliyagoda.
- Improvement of Specific Ro-Ro Terminal with sufficient depth and length of berth
- Development of Passenger Terminal Facilities for World Cruise Passenger vessels snd ferry service

(4) Proposals of investment projects of other main ports

- Ministry received one proposal for construction of dock yard in the Hambantota port.
- Ministry plan to develop Trincomalee port for handling cement, dry bulk cargo, as transshipment port
- In Sri Lanka 60 shipping companies transporting general cargo, container, and bulk cargo

are registered in this Ministry.
- Ministry requested to study and submit an investment proposal of maritime industry in Sri Lanka

4.1.4 Northern Ports Development Plans

Considering the development of number of deep sea ports in India to accommodate large container mother ships, 6 ports on the east coast and 3 ports on west coast, SLPA developed the south harbor to meet the container traffic demands by 2030. However the development of bulk cargo terminals for handling coal for power plants, cement factories, and fertilizers will also be necessary. The regional ports of Kankasanthurai, Manner, Point Pedro & Karainagar located along the north coast should be reinforced for enhance the handling capacity and to improve trade between southern states of India and northern parts of Sri Lanka.

Table 4.5 Traffic Volume through Ports of Kankasanthurai, Manner, Point Pedro & Karainagar

Year	Discharge (Tones)	Cargo Loaded (Tones)	Number pf ship calls
2012	59,814	0	44
2013	33,021	0	25
2014	21,204	0	34

Source; Ceylon Association of Ships' Agents

SLPA acknowledges the necessity of rehabilitation/reinforcement of the existing port facilities at Manner and Kankesanturai (near Jaffna) and to develop multipurpose terminal for handling general cargo, container, bagged cargo, Ro-Ro service as regional port so as to prepare the increasing trade with India Ports near future.

The port of Kankesanturai requires break water and deepening the water depth along the jetty up to 8m. The trunk road from Jaffna-Colombo (A9 Road) has already developed.
Once the existing port facilities are upgraded to handle containers by installing cargo handling equipment and stock yard area, the project will contribute a great potentials for developing industrial estates alongside the trunk road and accelerate the trade with India, subsequently contributing to regional development.

4.1.5 Observations by Shipping Companies on Colombo Port

(1) MOL

MOL has used Jaya Container Terminal (JCT) berth number 1 (2 berths) depth -12.5 m and second berth -10.5m and 3 / 4 berth length of 500m depth -15.0m. These berths are also used by other shipping line such as Evergreen, APTM. The container ship size is getting enlarged loading capacity of 13,000 to 18,000 TEU. The present berth at JCT is not sufficient. It is planned to introduce further larger size of 20,000 to 24,000 TEU loading container ships. MOL had 6 container ships of this class.

Colombo port handled car, but the Government decided the following allocation of cargo handling between Port of Colombo and Hambantota.

- Colombo shall concentrate to handle containers as transshipment terminal, other cargo like bulk cargo from India should be transferred to Hambantota which should develop Ro-Ro terminal for car transshipment.

- Regarding the handling and transship car at Hambantota, Colombo port had limited open land area for storage of car, while the Hambantota has the large parking space area of 2000 ha in hinterland. Colombo port does not have Ro-Ro terminal to accommodate large car carriers, while the Hambantota had developed Ro-Ro berths and terminal as Phase 1 project.

Shipping lines start the studying whether car transshipment at Hambantota would be feasible.

MOL will continue the business policy of using this port by developing and expanding business as Transshipment terminal. 75% of total container cargo through Port of Colombo is transshipment cargo. Out of which destination of trade lanes is 80% to West, (North EU, Mid, US East coast) and 20% are transported to East (ASEAN region and Far East countries).

Cargo transport among nations in this region,
Present cargo flow from Pakistan to India is transported to Port of Colombo first and transship to India, which is faster, and cheaper. In the case of cargo from Bangladesh to India, Cargo is transported to Port of Colombo, then transship to India, which is faster taking average 3 days and half.

Handling charges at Colombo is 30-45 % cheaper than SGP. SLPA gives 21 days free time in port for storage, while SGP gives 15 days. Transshipment charges through Colombo port is 82 US$ for discharge and loading, SGP charge 70 US$ only one way (Discharging only, unloading is required pay additional 70 US$.

Cargo delivery between Bangladesh and India,
Cargo from Bangladesh is transported to Chittagong port to deliver to Port of Colombo. There is treaty agreement of transport cost by feeder ship for discounting 10 % of official tariff, i.e. 82 US$ (normal transport cost) x 10 % discount =77.8 US$ (10 % of such saving become the company's profit. This discounting agreement is applicable east side of Indian Ports only.

(2) Maersk Line

Next 5 years Maersk line will not change the transshipment business at Colombo port. the container ship size in 2010 was average 6500 TEU loading, but in 2014-2015 14,000 to 15,000 TEU loading container ships are coming, average ship size become 10,000 TEU loading. The presently operating small size ship will be replaced by larger size.

No ports in India can accommodate such large ships they have to come to Colombo port which has deeper draft berth and channel.

Between Bangladesh to Colombo, 4 times a week feeder ship travelling between two countries. Maersk observed the following to ports in India by feeder ships from Colombo port as follows;

- The Chennai port is the best and most important and large potential for future development of port and its related infrastructures. Terminals are operated by BS, DP World, but the port cannot accommodate more than 650 TEU loading ships.

- Unless the on land transport is not improved the transport cost will be maintained higher and no gantry crane but ship gear used for loading and discharging cargo from/to ship). It is planned to convert existing bulk cargo jetty to container jetty.

- This port handle 30 % of total cargo volume of India, Its hinterland developed large industrial estate by Japanese Companies, industries especially auto manufacturers, and home electric apparent. The ports on east coast have high potential of handling containers, while ports on west coast have reached to full capacity.

- Cochin port is operated by DP World with limitation of container handling capacity up to 8,000 TEU, which cannot function as transshipment. The inland road networks are not fully developed and additional expenses for state border crossing.

- Cochin port cannot handle transshipment Cargo but only for feeder port level. There are more than 20 ports along the east and west coasts of India. Shipping line considers as main important ports for larger ships and small ports by feeder ships for collection of cargo.

- MCCT (feeder Ship Company of Maersk line) operate 33 feeder lines based on Colombo port. They operate independently based on Colombo and Tanjung Pelapas. MCCT is restricted by management board to collect cargo and deliver up to Bangladesh, They operate Bangladesh-SGP –Tanjung Pelapas by 4 feeder service between Bangladesh and Colombo with average container ship size of 2,500 to 3,000 TEU loading container ship size.

- The container handling capacity of CICT (accommodating bigger ship), JCT (less than 10,000 DWT ship) and JCT is estimated 2.4 Mil TEU, 2.0 Mil TEU and 2.0 Mil TEU respectively. JCT will increase the capacity by deepening the berth and install higher height of the Gantry crane.

- East terminal of South harbor should install higher Gantry Crane and deep draft in order to accommodate large container ships.

- The Company is interested to participate tender for extension of East terminal by SLPA, if the SJTA (old terminal) and East terminal could be combined one terminal by demolishing the separate partition between SJTA and new East terminal. The Company had already sounded SLPA its possibility and convinced that it will provide higher transshipment efficient.

- Maersk transported containers to neighbor islands, but the traffic volume was small and closed. The annual traffic volume was in average 60,000 TEU only. There is only importing cargo to these islands from Colombo, there is no export cargo from them, which was higher cost for shipping lines. In addition to the storage period of free charge is only 2 days. Feeder ships collect empty containers from these islands, which is generally delayed to call the port. Shipping line has to pay storage charges. Thus it is too attractive to stop the operation.

4.2 Hambantota Port

4.2.1 Background for Development of Hambantota port

The following issues are raised from users of Colombo port:

- Insufficient facilities at Colombo for General cargo
- No Space at Colombo for Port Related Industries
- No Space at for Bunkering Services
- No Space for ship Repair & Building Facilities
- Supplementary Port to Colombo Port
- For cater for economic imbalance

The survey of site selection for development of secondary international port had been conducted and select optimum site for secondary international port from the following criteria:

- Deeper Contour are obtainable closer to shore line area
- Availability of Lands for development of the port
- NO Constrains in Planning
- LESS Unemployment ratio
- LOW Contribution to national income

In view of all above criteria, the Hambantota site is the best location for secondary main port in Sri Lanka.

4.2.2 Development Plan by SLPA

- In Phase 1; Ro-Ro terminal to accommodate car carriers for transshipment,
- General cargo, bunkering service to ships calling the port, together with the development of Roads,
- In Phase 2; it plans to expand the handling volume of transshipment containers.

The Port of Hambantota so developed and located at 6° 07 north and 8l° 06' east facing the southern ocean, will have direct access to the main international shipping route linking the Asia Pacific Region with Europe and North America.

Hambantota is to be developed as a leading urban waterfront community with the development of port facilities which is now underway.

4.2.3 Facilities to be Developed by Stages

Hambantota is planned as a multipurpose, industrial and service port. The design provides facilities for transshipment, value addition business, storage and distribution in the international transportation network among other port facilities. Construction work has commenced and is planned for implementation in three stages.

Stage 1 is to provide a useful multi-purpose port in the total area of 1,500 ha, with a wide range of business options for customers at a relatively small investment cost. The project is now at Phase 2 stage. The following main facilities will be developed.

Key Project Features:

- Depth of Basin - 17m
- Depth of Channel - 16 m
- Circle of Turning basin - 600m
- Cargo Quay Length - 600 m
- OIL & GAS Quay length - 310 m
- Service Terminal - 105 m
- Break water length - 1,450 m
- Dredging volume - 12 Mil Cu m

The Stage 1 for construction of Ro-Ro terminal with 600m long of 2 berths and 17.0 m depth was completed and already started operation as car terminal and oil terminal with 2 jetties with 1 berth of 300m and dolphin type jetty of 150m and oil storage tanks for bunkering service which is planned to expand to develop LNG supply facilities in Phase 2 or 3.

Dredging works consist of the approach channel in the length of 1 km from the depth of -20m offshore and basin 17m depth.

At moment about 500 employees of SLPA are working and about 1,000 construction workers working at this site.

Table 4.6 Traffic Volume through Hambantota Port 2012-2015

Year	Discharge (Tones)	Cargo Loaded (Tones)	Number pf ship calls	Vehicles
2012	17,081	2,635	34	10,849
2013	37,794	9,056	76	n.a
2014	176,389	81,076	192	160,000
2015	129,998	78,838	203	n.a

Source; Ceylon Association of Ships' Agents

Source: Hambantota Port Management Office

Figure 4.5 Site Conditions before Starting Dredging and Reclamation Works

Source : Hambantota Port Management Office

Figure 4.6 Hambantota Port Development Plan

Source: the Survey Team

Figure 4.7 Pure Car Carriers Unloading Car at Ro-Ro Terminal

- Stage 2 will provide further expansion providing coal handling and Ro-Ro terminals, together with the establishment of new container terminals and commercial operations commencing by 2015. The Project of Stage 2 is ongoing for construction of the following facilities, it is scheduled to complete 90 % by the end of this year

- Bulk terminal of handling sugar, fertilizer, petrochemical products, if possible there is demands of containers the container yards will be provided from the parts of bulk terminal area.

- The total berth length of bulk terminal is 2,400 m and depth of -17.0m for accepting 100 to 120,000 DWT bulk carriers.

- The berthing facilities was constructed by caisson concrete structure after the berth position was made by excavating original ground to design depth of -17m, which excavated area is converted to the turning basin area by water in- take from the sea.

- These excavated soil material and channel dredged material are used for development of offshore man made artificial island which will be developed tourist attraction area.

- Stage 3 will introduce a major container transshipment terminal that will relieve the other existing terminals in Sri Lanka which by then would have reached full capacity utilization. This stage is expected to begin by year 2025. SLPA plans to see the traffic demands up to Stage 2 and to take intermitted time for proceeding with the next stage of Phase 3 and 4 for review the present development plan.

The requirements to foster development would include infrastructure for road, rail, power and water supply and housing facilities. The development of Karagam Leywaya into a wet dock with breakwaters at its entrance from the sea to provide a number of deep water alongside berths is planned.

The following development projects of road and railway are planned.

Road Development

- Extension of Highway to Mattala
- 6 Lane Roads in & outside Port
- Service/Utility Corridor
- Flyovers at Major Junctions in & outside Port

Rail Connection

- Extension of Rail Line and Air Port development
- Port internal Railways

Source: Hambantota Port Management Office

Figure 4.8 Road Development Plan at Hambantota New City

4.2.4 Ro-Ro terminal Development

Hambantota Port; this port is located about 300 km away from the Colombo port The port is planned to handle bulk cargo, cement, sand, steel transported as transshipment of cargo by conventional cargo ships. **In 2014 the port handled 160,000 car units.**

It is estimated that the distance from the Hambantota coast to the world's busiest shipping route is about 10 nautical miles and around 100 vessels pass by the area every day.

- 70% of import car are transported to this port by Japanese shipping lines, like NYK, MOL and K-Line by occasionally 20,000 car carriers.

- 4 years ago the Ro-Ro terminal was constructed and started to accept import cars at 3000 units per year, Today 2014-2015, 60,000 to 70,000 units of import cars are handled at two berths. The imported cars are transshipped to Africa countries, and EU countries.

- Some investor from India like IOC (India Oil Company) and PSA come to indicate the interest of investment, but no Japanese investors come. Chinese investor organizes 5 to 6 business fields companies and factories come to negotiation of investment.

- Water supply and Electric power supply are provided by the central government like CER (Ceylon Electric Board) when the project office /users make official request of water supply and electric power supply at their cost to the project site, the users shall pay according to consumption.

4.2.5 Forwarder Working in This Port

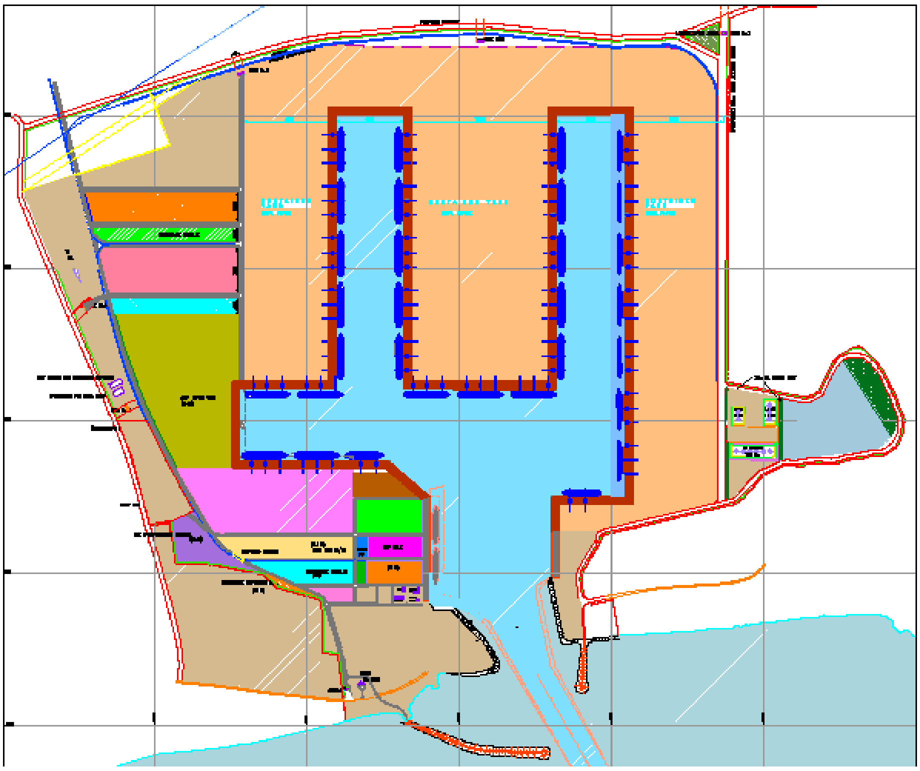
This company operates the import car transport from the stock yard in the Hambantota Port after custom clearance by shipping agent to their car stock yard area, then from this yard to Colombo city designated site by the auto dealers of makers. The company has 1 ha stock yard area outside the port and plans to expand the area and make proper pavement in the stock yard area, no ware houses to be constructed. Around the port area about three forwarders companies operate to transport cars from here to Colombo and other cities specified by auto dealers. There are 4 main import car dealers working this port.

They carry about 500 import cars per month. They started this service about 4 years ago, the transported 300 units per month, after 4 years, they now handle 5 to 600 units per month. The volume of imported car had increased very much.

Share of imported car is 70 % of Japanese car, 25 % of Chinese car and 5 % of Korean car.

Railway transport is not safe and time is slow and is always delay. Dealers ask to transport car as earlier as possible to meet the customer requests. Forwarders do not think to use the rail way for car transport. The company has 6 chassis capable to carrying 5 cars, so they can transport 30 units of car in one time.

The port allows 14 days for free storage of car inside the port stock yard area.



Source: Hambantota Port Management office

Figure 4.9 Master Plan of Development of Hambantota Port

Source: Hambantota Port Management office

Figure 4.10Plan of Facilities upon the Completion of Phase 1 Project

4.3 Trincomalee Port

(1) Port Facilities

Trincomalee harbor is a national asset of unparalleled value. Besides the one million ton tankage for oil in China Bay, a fishery harbor was built at Cod Bay in the 1960's, a flour mill in 1978 at China Bay and a cement production mill in the 1980's in Cod Bay. The SLPA constructed a 13 m deep, 257 m long common user alongside berth in China Bay (Ashraff Jetty) in 1998 to act as a catalyst for the development of Trincomalee. This berth can be further extended as traffic volume is getting large.

Trincomalee harbor is identified as the second best natural harbor in the world. The port has 5,099 acres of land vested in the government. Trincomalee has the potential to develop into a Port City comparable 'to Singapore. Careful planning to optimize development potentials while keeping natural beauty intact will be a responsibility owed to the future generations of Sri Lanka.
The Port of Trincomalee has the potential for the development of a variety of industries including, tourism and agriculture besides port related industries. Compatible land-use plans have been drawn up for development.

Trincomalee harbor, which was formerly a British Naval base, was taken over by the Government in 1956 to be developed as a commercial port. It is one of the finest natural harbors in the world and can accommodate a large number of ships of any size.

The Outer Harbor comprises the Trincomalee Bay. The Inner harbor has a water area of about 1,630 hectares and a land area of nearly 5,260 hectares. The Sri Lankan naval base is located in the Inner Harbour. The area of land vested in SLPA is about 2,065 hectares.

The unfavorable security situation which prevailed hitherto has delayed systematic development of the Port of Trincomalee. However an integrated master plan for the development of Trincomalee including a land use plan with zoning has been drawn up.

The land use proposals envisage exploiting the tourism potential, ensuring common user port facilities, making land available for mixed development with an emphasis on industrialization whilst retaining the beauty of the surroundings and taking into account environmental concerns.

Trincomalee port is surrounded by good natural conditions by deep draft of 14 to 20 m depth of access channel, protected by bay, which can be made good natural harbor. The Port is located closer to India, but little far away from main shipping line. SLPA developed general cargo berth for handling bulk general cargo and established Trincomalee port authority. There is navy base and air force base. The ferry transport was operated between India (Tuticorin) and Sri Lanka (Colombo Port), but now it was stopped.

(2) Traffic volume in 2014

The port handled Coal; 100,000 ton, Clinker 50,000 ton, Urea ; 259,000 ton and expecting to increase 417,000 ton in 2015.

Table 4.7 Traffic Volume through the Port in 2012-2015 (Aug)

Commodities		2012	2013	2014	2015(Aug)
Ship Arrival		161	92	90	95
Cargo Discharged	Break Bulk	0	1.5	0.1	0
(x 1000ton)	Dry Bulk	2,468	1,389	1,474	1,518
	Liquid Bulk	179	106	142	112
Total Discharged		2,646	1,496	1,706	,630
Cargo Loaded	Break Bulk	161	89	94	114
(x 1000 ton)	Dry Bulk	53	18	0	25
	Liquid Bulk	0	0.8	0	0
Total Loaded		214	108	94	139
Total Port Cargo Handled		2,859	1,604	1,800	1,769

Source; Ceylon Association of Ships' Agents

4.3.2 Master Plan by ADB

Master Plan study for the development in Trincomalee region was conducted by ADB, SLPA indicated the following comments on the port in the draft master plan .

- The Master plan of Trincomalee region development, shall cover by considering the development of Airport, Port, Industrial Zone, tourist attractions, agriculture etc. Environmental natural and social facilities.

- Potential to develop industrial complex and to be international port by considering its culture of the multi ethnic people living in the area.

- Since the Trincomalee region have stabilized, the Government of Sri Lanka formulated a development plan to utilize the coastal district area in Trincomalee region as an industrial city, and plans to develop a Trincomalee harbor as its basic infrastructure to support the coastal industrial complex.

- SLPA concerns that the master plan of land use of Trincomalee area as drafted by ADB is required to be finalized, since number of industries of private investors, Indian companies' and others had selected convenient site mainly along the coastal area for their factories before finalizing the master plan study. The sites selected by these investors is located closer to the sea and availability of railway connection from this port area to the destination of demands inland and connectivity of paved road.(Finalization of DFR by taking into account of the comments by SLPA is not confirmed)

- The survey team indicated that there are large land areas available in this region for developing large industrial complex as an estate in the port hinterland. It is advised that the ministry concerned should take initiative to prepare long term regional land use plan As Master plan of Trincomalee area.

4.3.3 Industrial Investment

- Tokyo Cement (product cement for domestic demands, not for export), expecting increase product volume. Cement factories by JV of Japan Company and Local cement manufacturing company called "Tokyo Cement Trincomalee Factory" for fabricating cement for domestic use.

- Prime Ceylon wheat dry mill products, Local companies established the wheat mill factory called "Prima Ceylon Flour Mill Company" They import largo volume of wheat, which data is not available in SLPA. Presently, Prima has its own jetty to handle wheat flour and the pay only the navigation charge to SLPA.

- IOC (Indian Oil Company) for bunkering services to ships call the port, Indian Oil Company (IOC) constructed the oil supply bunkering service.

- It is planned to develop dry dock construction.

- At present the port does not handle containers.

4.3.4 Demands of Dry Bulk for Power Plants and Fertilizer in Upcountry

- The port of Trincomalee is handling the import of coal, which are transported to the power plants sites by Railway and trucks.

- These coals are imported from Indonesia and China, east side from the Sri Lanka. The port is located shorter distance to the original ports than Colombo city. The port is situated in the calm bay with deep draft 14 to 20 m of access channel.

- SLPA office at Trincomalee port informed that the port imported about 2.2 Mil ton of coal for power plant of 900 MGW at Colombo area, which are transported by railway. Near future the power plant to produce 1,200 MGW, which need more than 3.0 Mil ton of coal.(This estimated volume is worked out by SLPA Trincomalee port office.)

- There are large demands of power plants development in Sri Lanka, such as 2,500 MGW by Indian company, 300 MGW of power plants at Norochiyore and 3 other additional plants areas. They need large volume of coal to produce electric power required.

- SLPA office at Trincomalee port informed that the port had received import coal of 100,000 MT/year and import Clinker of 50,000 MT/year for Holeimm Lanka , which were transported by road to factory and power plants.

- SLPA office estimated that the cost will be Rs. 3.65 per MT per km if transported by train. SLPA worked out coal transport plan by railway transportation. The existing raiway up to Malo for 154 km is required to upgrade the existing railway track and then developing a new track to Putlam, 86 km which cost is estimated around US $ 9 mil per km.

- If this proposal is materialized, the coal requirement for Norochchole power plant is estimated around 2.2 million tons per year to be handled thrugh Trincomalee port ..

- Now Sampoor Coal Power Plant is in the starting stage, this is a joint venture of India and Sri Lanka, the plant capacity is 2x250 MW which needs handling of another 1.3 million tons of import coal per annum can be done in Trincolamee port either by receiving them at exiting jetty or constructing a new jetty.

- Fertilizer requirement for the country is also imported, which is directly unloaded in Trincomalee port and distributed to factory in the port hinterland.

- It is forecasted that the port is required to handle coals up to 1,200 mil ton to meet the power plants development. The present arrangement of accepting coal is not sufficient and efficient bulk cargo handling and transporting manners to meet the future demands of bulk cargo. The port also accepts Oil Tanker of 80,000 DWT class

4.3.5 Requirements for Development of the Port Facilities of SLPA

SLPA presently needs another pier and navigation lights and demarcation buoys. The survey team propose to implement the project (1) and (3) as follows by integrated one project.

(1) Additional Berthing Facilities

The existing jetty called Ashraf Jetty constructed in 2007 for public service of SLPA is only 270m long and 12.5m depth. The maximum bulk carriers can berth up to 30,000 DWT. When the large mother ship comes to the port, coal is transferred between mother ship and 8,000 ton barge directly off shore and transported to the terminal equipped with railway facilities at Samper located in Koddyar Bay within the Trincomalee water area.

The port management office of SLPA Trancomalee port estimates the traffic volume of Urea raw material for fabrication of fertilizer. The port unloaded 259,000 ton in 2014 and expects 417,000 ton in 2015. These raw materials are delivered to 23 fertilizer companies in Sri Lanka.

Beside the above commodities, the port handles 100,000 ton coal for cement fabrication and 50,000 ton of clinker to fabricate cement. Other large number of clinkers is imported by Tokyo Cement factory, which data is not available with SLPA.

The Port Management office of SLPA conducted site selection study to develop additional berth at or to extend the existing pier to accommodate large dry bulk carriers to meet demands of dry bulk near future.

(2) Navigation Lights and Demarcation Buoys

The Port needs the navigation facilities like navigation lights and demarcation buoys to indicating anchorage area, and demarcation buoys along the channel and 2 light houses for night safety sailing for 40-45,000 DWT class bulk carriers. The number of ships call is increasing and there is number ships wanting to sail and calling the port during night time. This proposal was discussed with the SLPA head office in Colombo. SLPA recognized the necessity of these facilities, but SLPA considered it not urgently required. SLPA is reluctant to install such facilities in the access channel to the Trincomalee Port.

(3) Study of Transportation Cost of Dry Bulk (Coal) by Railway

The SLPA port office is conducting the study of possibility of transporting such large coal by railway from the Trincomalee (Sampur) to respective sites of the Power Plants and construct additional berth by expanding the present berth or new deep draft berth at Sampur.

According to CGR (Ceylon Government Railway) the rail line construction cost is around 3 to 4 Mil US$/Km. There is rail line from Colombo to Trincomalee. There is a study of developing a new line by short cut distance through Matale. New line is planed from China Bay in Trincomalee to Habarana area by the existing line and from Habarana area to Matale is new rail line, then from Matale to Colombo by the existing line by short cut route.

SLPA informed that coal bulk handling at Trincomalee area is not environmentally friendly project. At present coal are transported by road from Trincomalee to Norocholai power plant on the west coast of the Sri Lanka. We study to utilize existing railway line from Trincomalee to Maho. From Maho we may need to transport either by highways or by the new railway line to be created later. Only during non-monsoon season (about 6 months in a year) mother ships of coal carrier can come to the west coast near the power plant to unload coal to large barges at off shore and transport it to the power plant jetty.
The above transportation study of coal originated from the Trincomalee port area will contribute to provide continuous power supply in the Colombo metropolitan area by developing railway line and new coal terminal at Sampur .

Source: the Survey Team

Figure 4.11 Unloading Clinker for Cement at SLPA berth in Trincomalee Port

Source: the Survey Team

Figure 4.12 Cement Factory and SLPA berth behind the Factory Building

Source; the Survey Team

Figure 4.13 Coal Transport Barges 8,000 DWT anchoring the SLPA Berth

4.4 Galle Port

Galle remained a lighterage port until 1971 when a 1400 feet long quay wall with a depth of 8.9 m was commissioned along with warehouses as the first berth in the Port of Galle. A further 9.0 m deep pier was constructed in the year 2001.

The Port of Galle located 120 km south of Colombo city has 3 berths with water depths of 8.0 - 9 m together with warehouse accommodation. The length of ship that can enter the port is restricted to 130m due to the geometry of the channel at the entrance to the port.

The main commodity handled at present is cement, clinker, Gipsum. Rice, sugar and flour have not passed through this port for several years.

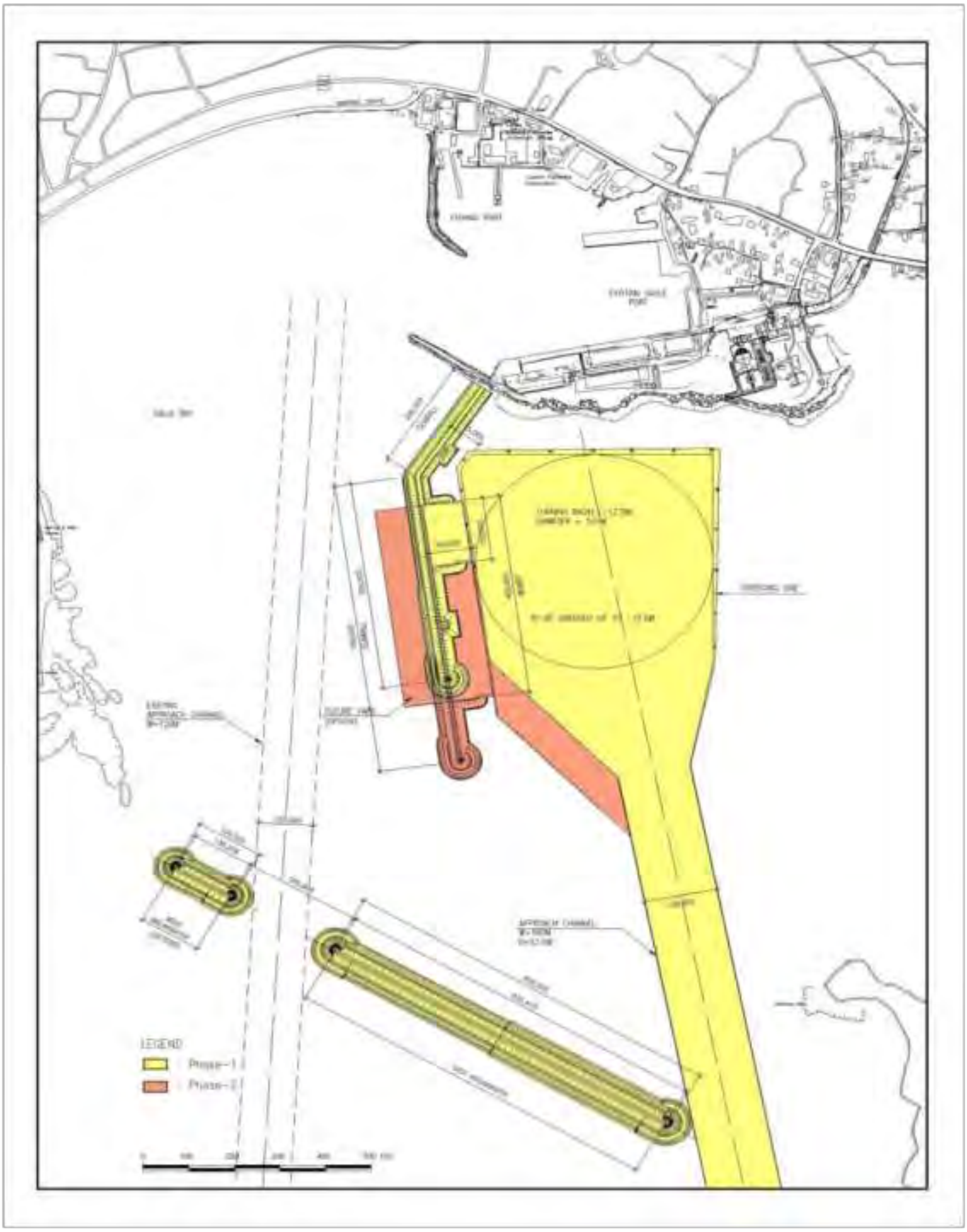
4.4.1 Development of Port Facilities

The Galle Port will be developed as a Regional port for handling general cargo required in this region, bulk cargo for cement factories in the port hinterland and tourist attracting facilities. Considering its close proximity to world heritage sites including the Galle Fort, it could complement the activities of the tourism sector. Therefore the development of the Port of Galle will provide port facilities of handling general cargo, bulk cargo and receiving cruise ships and yacht leisure based tourist arrivals .

Thus the proposed development of the Port of Galle is being undertaken in two phases, commercial and tourism. In the commercial phase a new breakwater will be constructed outwards commencing from the south breakwater of the existing port. The proposed new port will consist of one multipurpose berth of 300 m length and -12 m depth and it will be sheltered by a 1400 m long .breakwater extended from the multipurpose berth.

SLPA expects that in the existing port, the facilities offered to the yachtsman will be enhanced in the tourism phase of development. The proposed development will provide a fully fledged yacht marina. SLPA plans that the port provide berthing facilities for 80 yachts of up to 15 m length and -3 m draft along with basic amenities including service and repair facilities for yachts with a workshop, club house, duty free shop, information centre, dry berthing facility for yachts, launderette and shower, toilet facilities.

Considering the future traffic demands of cargo, the proposed new berth shall handle general cargo and occasionally calling of passenger ships, the existing berths are handling bulk cargo of cement and its related cargo.



Source: SLPA Galle Management Office

Figure 4.14 Revised Development Plan of Galle Port

4.4.2 Traffic Volume Handled

Main cargo to the Port is clinker imported for cement factories located behind the existing bulk berth. Last few years the domestic demands of cement had increased and cement production volume also increased. The present port capacity is 700 ton/m, which is enough to meet the demands and no need to expand the capacity by the wharf extension.

Table 4.8 Traffic Volume through the Port in 2013 and 2014

Commodities	Tonnage Handled	
	2013	2014
No of vessels	30	50
Clinker in Bulk	153,193	355,542
Cement in bulk	10,413	8,201
Bag Cement	829	n.a
Gipsum in bulk	35,954	29,450
Fish	n.a	403
Transshipment		
Unload	344	11
Load	6,722	370
Total Tonnage		
Unload	200,733	393,607
Load	6,722	370

Source; SLPA Galle Port Office

Beside the bulk cargo, the port received cruise ships during December to April (non monsoon season) about 10 ships last year, because there is no proper passenger terminal facilities in the port, thus the number of visit cruise ship and number of passengers were not much. Although there is the world heritage of Gall Fort located closer to the port.

Galle port; in 2007 while the engineering study was on going, UNESCO clearance to raised issues is not required for the project implementation, but in 2010 the project site is recognized as natural heritage area. SLPA complied with such issues and prepared the proposal to economic development and request UNESCO to reconsider the issue. SLPA observed that UNESCO showed the sign of acceptance;

4.4.3 Clearance of UNESCO Comments

SLPA has clarified all comments made by UNESCO in last 4 years. Finally, SLPA received the indication that permits to proceed the project from UNESCO. The UNESCO conference to approve the clarification of SLPA project, UNESCO requests to protect the present view of the world heritage from the sea by protecting facilities of the project.

As shown in Figure 4.13 on revised Galle Port development plan, SLPA revised original development plan and planned to construct two break waters, one for 150m long and other is 850m long. The top elevations of breakwater is set lower and accepting overtopping of waves, but make the port minimum dangerous environment facilities.

The conclusion of assessment of revised Galle Port Development Plan by UNESCO is subtracted from the report as follows;

“Heritage Impact Assessment Proposed Port Development Near to the World Heritage Property of Old Town of Galle and its Fortification” is prepared for the Sri Lanka Ports Authority, in June 2015.

Table 4.9 Status on Heritage Impact Assessment

World Heritage property	Old Town of Galle and its Fortifications, Sri Lanka (Ref: 451)
Geographic location	N 6° 1’ 17, E 80° 13’ 7
Date of World Heritage inscription	1988 (CONF 001 XIVA)
Specific HIA focus	Revised Galle Port Development Project
Contractual references	The HIA proposal was accepted by Dr Nanda Wickramasinghe, Secretary of the Ministry of National Heritage with letter NH/04/02/04/07 of 4 December 2014.
An independent consultancy services agreement for a ‘Heritage Impact Assessment (HIA) of the Galle Port Development Project at the World Heritage property of “Old Town of Galle and its Fortifications”, Sri Lanka’ was signed by the Sri Lanka Ports Authority and Sarah Court, on behalf of Jane Thompson, on 29 December 2014.	

The final HIA report, the conclusions, should also be taken into consideration for the planning and implementation of all further development within Galle Harbour and in other coastal areas around the World Heritage property.

In conclusion, it is the opinion of the HIA team that there is an extraordinary opportunity for sustainable tourism which could bring benefits to the Old Town of Galle and its Fortifications, the new town of Galle and indeed the entire Southern Province

It would appear that this could be done without too much further delay. Indeed, there are already many positive elements to the proposed project that could be enhanced in order to protect Galle Harbour and increase its maritime activity. It is strongly recommended that the State Party, funding bodies and the World Heritage Committee work together to ensure that sufficient time and funding are provided to allow this to happen, as it would be lamentable for Sri Lanka if the project were prevented or if it were implemented inadequately due to unrealistic time or financial constraints.

However, this opportunity can only be seized if there is effective planning, together with balanced decision-making, for Galle’s port facilities involving all relevant stakeholders at local and national levels.

Galle has the potential to become a leading example of sustainable development that draws on its heritage while protecting cultural and natural values, sustaining and enhancing them long into the future. Galle raises many of the management and conservation challenges being faced by World Heritage properties worldwide and could provide an international model.

A sensitive port development project taken forward within the context of a well-coordinated sustainable tourism agenda could see Sri Lanka becoming an international benchmark for the use of heritage assets to gain social and economic benefits for its citizens, while guaranteeing international standards in heritage management.

By improving understanding in this area, Galle could become much more than a seafaring hub between the Indian Ocean and the Sri Lankan interior, by becoming a vehicle for greater

Appendix4:
Project Profile

(1) Sea Port

<table>
<tr><th colspan="6">Project Outline</th></tr>
<tr><th>Project ID</th><th>Country</th><th>Location</th><th colspan="2">Type</th><th>Scheme</th></tr>
<tr><td>SP-B-1</td><td>Bangladesh</td><td>Chittagong Port</td><td colspan="2">Sea Port</td><td>PPP</td></tr>
<tr><td colspan="2">Project Name</td><td colspan="4">Construction of Karnafully Container Terminal (KCT) at jetty 10,11,12,&13 (PPP)</td></tr>
<tr><td colspan="2">Project Description</td><td colspan="4">Renovate the existing wharfs and introducing container handling equipment such as installing quay gantry cranes, RTG yard cranes. The old wharfs are renovated and the depth along the berth is deepened to -12.0m.
KCT (Karnaphuli Container Terminal);, Berth No 10 to 13B are planned to be renovate d to container terminal
CCT (Chittagong Container Terminal); 4 units cranes are operating which are changed to movable cranes</td></tr>
<tr><td colspan="2">Estimated Cost</td><td colspan="4">320 Mil US$ for construction and equipment procurement</td></tr>
<tr><td colspan="2">Current Issues</td><td colspan="4">The Port needs to expand container handling capacity.</td></tr>
<tr><th colspan="6">Relevance and Importance to Economy/Industry</th></tr>
<tr><td colspan="2">Related Plans, Programs and Projects</td><td colspan="4">HPC (Hamburg Port Consulting Gmbh) had been conducting the Chittagong Port Master Plan and study site selection survey to develop alternative terminals in Chittagong port for expanding container handling capacity. The Final report is submitted in September 2015.According to this master Plan study, The study (FS study, DD for construction works) will be completed in 2015. CPA process the construction works</td></tr>
<tr><td colspan="2">Hinterland Area/ Beneficiaries</td><td colspan="4">The hinterland of this project will be Chittagong, Dhaka Metropolitan area and neighbor countries in the North. Number of Japanese manufacturers developed in the industrial parts around Dhaka city and will receive benefit by development of container terminals</td></tr>
<tr><td colspan="2">Benefit for Japanese Companies</td><td colspan="4">Japanese shipping lines use this terminal and transports freeze cargo by containers from Chittagong port to Mongla Port. They will receive benefit of faster cargo handling operation and reducing berthing time of ships.</td></tr>
<tr><th colspan="6">Demand of Freight Transport</th></tr>
<tr><td colspan="2" rowspan="2">Handling of Future Container Demand</td><td colspan="2">Baseline</td><td colspan="2">2030</td></tr>
<tr><td colspan="2">CPA handle 1.73 Mil TEU in 2014</td><td colspan="2">3.35 Mil TEU as a total of the Southern Chittagong area
Designed capacity is 2.74 Mil TEU. Demands will reach in the year 2019. Marginal demands have to be handled in a new port(s).</td></tr>
<tr><td colspan="2" rowspan="2">Handling of Future Non-Container Demand</td><td colspan="2">Baseline</td><td colspan="2">2030</td></tr>
<tr><td colspan="2">CPA handle 43.37Mil ton of dry and liquid bulk cargo and general cargo in 2014</td><td colspan="2">The present design capacity will be around 60 mil ton/year of dry and liquid bulk and general cargo</td></tr>
<tr><td colspan="2">Expected Function</td><td colspan="4">The port function as international gate port of the nation and transit cargo to neighbor countries</td></tr>
<tr><th colspan="6">Improvement of Efficiency</th></tr>
<tr><td colspan="2">Improvement of Cargo Handling Efficiency</td><td colspan="4">Container handling capacity will be enhanced to meet the demands of 2020. The waiting time of ships for berthing at port was 10-11 days, which is improving to 5 -6 days.
The transportation cost of cargo/containers will be reduced by providing additional terminal area</td></tr>
<tr><td colspan="2">Connection with Other Modes</td><td colspan="4">The Chittagong Port is connected with the hinterland by road, railway and river (Inland water way). The existing road 4 lanes from Chittagong to Dhaka will be widened to 6 lanes.</td></tr>
<tr><th colspan="6">Ease of Implementation</th></tr>
</table>

Preparation Status	Engineering study of feasibility study and design works are progressed. CPA will call a tender to select private operator for the project implementation (PPP Scheme)
Impact on Natural/Social Environment	The project is implemented on the existing terminal area by renovating existing facilities. Impact on natural/social environment will be mitigated.

Project Outline				
Project ID	**Country**	**Location**	**Type**	**Scheme**
SP-B-2	Bangladesh	Chittagong Port	Sea Port	PPP
Project Name		**Construction of Laldia Bulk Terminal under Public Private Partnership (PPP)**		
Project Description		Laldia Terminal having 1.0 km length of berth located on the right bank of the river "Karnaphuli" near the Airport of Chittagong. The existing facilities are planned to renovate to bulk terminal to enhance bulk cargo handling capacity.		
Estimated Cost		1 mil US$ for FS /Engineering study and 35 Mil US$ for development of Bulk terminal		
Current Issues		The Port needs to expand bulk cargo handling capacity.		
Relevance and Importance to Economy/Industry				
Related Plans, Programs and Projects		HPC (Hamburg Port Consulting Gmbh) had been conducting the Chittagong Port Master Plan and study site selection survey to develop alternative terminals in Chittagong port for expanding container/bulk handling capacity. The Final report is submitted in September 2015. This project is under study (FS study, DD for construction works) based on the proposal of this study.		
Hinterland Area/ Beneficiaries		The hinterland of this project will be Chittagong, Dhaka Metropolitan area and neighbor countries in the North		
Benefit for Japanese Companies		No		
Demand of Freight Transport				
Handling of Future Container Demand		**Baseline**	**2030**	
		1.73 Mil TEU at Chittagong Port in 2014	3.35 Mil TEU as a total of the Southern Chittagong area Designed capacity is 2.74 Mil TEU. Demands will reach in the year 2019. Marginal demands have to be handled in a new port(s).	
Handling of Future Non-Container Demand		**Baseline**	**2030**	
		43.37Mil ton of dry and liquid bulk cargo and general cargo in 2014	The present design capacity will be around 60 mil ton/year of dry and liquid bulk and general cargo	
Expected Function		The port function as international gate port of the nation and transit cargo to neighbor countries		
Improvement of Efficiency				
Improvement of Cargo Handling Efficiency		Bulk cargo handling capacity will be enhanced to meet the demands of 2020. The transportation cost of bulk cargo/containers will be reduced by providing additional terminal area.		
Connection with Other Modes		The Port is connected with the hinterland by road, railway and River (Inland water way). The existing road 4 lanes from Chittagong to Dhaka will be widened to 6 lanes		
Ease of Implementation				
Preparation Status		Engineering study of feasibility study and design works are progressed		
Impact on Natural/Social Environment		The project is implemented on the existing terminal area by renovating existing facilities. Impact on natural/social environment will be mitigated.		
Project Outline				

Project ID	Country	Location	Type	Scheme
SP-B-3	Bangladesh	Chittagong Port	Sea Port	PPP

Project Name	**Construction of Bay Container Terminal and Extension of Port services**	
Project Description	Bay Container Terminal (BCT) berth length of 2.5km and back up length of 1.0 km (250 ha area) facing to the open sea to Bay of Bengal. The project site is located along the coast next to the Port Link Road. This road is connecting the N1 highway to Dhaka and to the existing port. This site would be technically more feasible than other sites. The post panama size container ships can be called.	
Estimated Cost	978.5 Mil US$	
Current Issues	The Port has limited water depth because of the river port and cannot accept larger container ships, while the port needs to expand container handling capacity by accepting larger container ships.	
Relevance and Importance to Economy/Industry		
Related Plans, Programs and Projects	HPC (Hamburg Port Consulting Gmbh) had been conducting the Chittagong Port Master Plan and study site selection survey to develop alternative terminals in Chittagong port for expanding container handling capacity. The Final report is submitted in September 2015. CPA process of procurement of consulting for detailed design	
Hinterland Area/ Beneficiaries	By this upgrading the existing facilities in short and medium term development projects, CPA estimates the handling capacity will increase to 2.70 to 3.00 Mil TEU. The demands will reach such volume in 2025.	
Benefit for Japanese Companies	Japanese shipping lines use this port and transport freeze cargo from Chittagong port to Mongla Port. They will receive benefit of faster cargo handling operation and reducing berthing time of ships.	
Demand of Freight Transport		
Handling of Future Container Demand	**Baseline**	**2030**
	CPA handled 1.73 Mil TEU in 2014	3.35 Mil TEU as a total of the Southern Chittagong area Designed capacity is 2.74 Mil TEU. Demands will reach in the year 2019. Marginal demands have to be handled in a new port(s).
Handling of Future Non-Container Demand	**Baseline**	**2030**
	CPA handled 43.37Mil ton of dry and liquid bulk cargo and general cargo in 2014	The present design capacity will be around 60 mil ton/year of dry and liquid bulk and general cargo
Expected Function	The port function as international gate port of the nation and transit cargo to neighbor countries	
Improvement of Efficiency		
Improvement of Cargo Handling Efficiency	Container handling capacity will be enhanced to meet the demands of 2020. The waiting time of ships for berthing was 10-11 days, which is expected to be improved to less 5 -6 days. The transportation cost of cargo/containers will be reduced by providing additional terminal area.	
Connection with Other Modes	The Chittagong Port is connected with the hinterland by road, railway and river (Inland water way). The existing road 4 lanes from Chittagong to Dhaka will be widened to 6 lanes	
Ease of Implementation		
Preparation Status	Engineering study of feasibility study and design works are progressed. CPA will call a tender to select private operator for the project implementation (PPP Scheme)	
Impact on Natural/Social	The project is implemented on the existing terminal area by renovating	

Environment	existing facilities. Impact on natural/social environment will be mitigated.

Project Outline				
Project ID	**Country**	**Location**	**Type**	**Scheme**
SP-B-4	Bangladesh	Mongla Port	Sea Port	Finance
Project Name	**Development of New Container Terminal in Mongla Port area**			
Project Description	Constructing two berths (180m each x 2 berths at depth of 8.5m) on the extension of the existing cargo berths with container stock yards area, installing cargo handling equipment and other equipment to reach handling capacity targeted to 400,000 TEU with 2 container berths and 5 existing cargo berths.			
Estimated Cost	Approx; 135 Mil US$			
Current Issues	The Port has limited water depth because of the river port and can not accept larger container ships, while the port needs to expand container handling capacity by accepting larger container ships. Central government approved the projects of improving connectivity of roads, railways and airport. The construction works of bridges were started in 2014.			
Relevance and Importance to Economy/Industry				
Related Plans, Programs and Projects	MPA intends to request for JICA assistant (Technical cooperation, and project loan) to develop a new container terminal. MPA conducted feasibility study and EIA for the project in 2015.			
Hinterland Area/ Beneficiaries	By new container terminal development projects, MPA estimates the handling capacity will be increased to 400,000 TEU. The hinterland of this Port are Bhutan, Nepal and Dhaka city and neighboring border area of India.			
Benefit for Japanese Companies	Japanese shipping lines use this port and receive freeze cargo by containers from Chittagong port. They will receive benefit of efficient container handling operation and reducing berthing time of ships.			
Demand of Freight Transport				
Handling of Future Container Demand	**Baseline**		**2030**	
	MPA handled 43,370 TEU in 2014		Approximately 800,000 TEU Design capacity is set 400,000 TEU. Marginal demands have to be handled in a new port(s).	
Handling of Future Non-Container Demand	**Baseline**		**2030**	
	MPA handled 4.08Mil ton of dry and liquid bulk cargo and general cargo in 2014		The design capacity of the present facilities is not set.	
Expected Function	The port function as international gate port of the transit trade service to neighbor countries Nepal, Bhutan, and border area of Neighboring country (India)			
Improvement of Efficiency				
Improvement of Cargo Handling Efficiency	Container handling capacity will be enhanced to meet the demands of 2020. The transportation cost of cargo/containers will be reduced by providing exclusive container terminal area.			
Connection with Other Modes	Mongla port is located about 131 km away from the sea and about 150km from Dhaka. The government MOS issued the following supporting programs for development of container terminal in this port i) Improvement of connectivity from Dhaka by development of highway, railway link from Mongla to Khulna, ii) Padma Bridge will be constructed for /efficient connectivity between Mongla and Dhaka iii) Airport is developed at Khanjahan Ali about 21 km from Mongla to			

	Dhaka
Ease of Implementation	
Preparation Status	MPA submitted the proposal of container terminal development to MOS. MOS approved this proposal and submitted to National Economic Council. MPA process the feasibility study in 2015 and call a tender to select private operator for the project implementation (PPP Scheme)
Impact on Natural/Social Environment	The project is implemented on the extension of the existing cargo berth by expansion of the existing jetty. Impact on natural/social environment will be mitigated by EIA assessment.

Project Outline				
Project ID	**Country**	**Location**	**Type**	**Scheme**
SP-B-5	Bangladesh	Matarbari area	Sea Port	Finance

Project Name	**Development of Deep Sea Port around Matarbari area**	
Project Description	Construction of deep sea port was planned at the same location as planned industrial port for power plant to combining industrial port as one deep sea port. The development plan is planned with the new deep water (depth -16.0m) to handle containers (8 mil TEU) and general cargoes by developing 30 berths by 2040. The site was selected at Southern Moheshkali district in adjacent to the planned deep water industrial port in Matarbari Island.	
Estimated Cost	1.0 to 1.2Bil US$	
Current Issues	New deep sea port is required for handling container and general cargo to meet the demands after 2026	
Relevance and Importance to Economy/Industry		
Related Plans, Programs and Projects	Development survey had been carried out in 2015. The study report proposed to conduct a feasibility study for development of an exclusive deep sea port. The government MOS has not yet indicated to proceed the further study of development of the deep sea port. Bangladesh is required to develop deep sea port to receive large container and bulk ships	
Hinterland Area/ Beneficiaries	Hinterland of this project will be whole of nation of Bangladesh, Nepal, Bhutan, and India.	
Benefit for Japanese Companies	Japanese shipping lines prefer to maintain the present working feeder network. Once deep sea port is developed, shipping lines have to reorganize the feeder networks and establish mother terminal.	
Demand of Freight Transport		
Handling of Future Container Demand	**Baseline**	**2030**
	No service	Design capacity is set 5.49 mil TEU in 2041.
Handling of Future Non-Container Demand	**Baseline**	**2030**
	No service	The design target volume of general cargo is set 9.78 Mil ton
Expected Function	The port function as international gate port of the transit trade service of containers and general cargo to neighbor countries (India)	
Improvement of Efficiency		
Improvement of Cargo Handling Efficiency	The deep sea port can receive the larger container and bulk ships. The transportation cost will be reduced. The transportation cost of cargo/containers will be reduced by providing direct connectivity between the port and Dhaka metropolitan area.	
Connection with Other Modes	Roads, bridge and railway will be required to connect the existing national road and railway lines from the port as parts of the Port for improvement of connectivity between the port to destinations.	
Ease of Implementation		
Preparation Status	The current development survey proposed to conduct feasibility study of	

	exclusive deep sea port development .Central Government MOS had acknowledged the necessity of development of 2^{nd} deep sea port in Bangladesh.
Impact on Natural/Social Environment	There is environmental restrict area in the Project area, which shall be protected during the Project implementation and operation stages.

<table>
<tr><th colspan="5">Project Outline</th></tr>
<tr><th>Project ID</th><th>Country</th><th>Location</th><th>Type</th><th>Scheme</th></tr>
<tr><td>SP-B-6</td><td>Bangladesh</td><td>Payra deep sea Port Development</td><td>Sea Port</td><td>Finance by foreign government</td></tr>
<tr><td colspan="2">Project Name</td><td colspan="3">New Deep Sea Port Development Project in Payra site</td></tr>
<tr><td colspan="2">Project Description</td><td colspan="3">Planned Implementation Schedule;
Stage1; Commence limited scale of port operation by December 2015 through lighter vessel bringing merchant ships at outer anchorage
Stage 2; Complete major components of port infrastructure with 2.5km terminal facilities including river bank protection and capital dredging (volume around 100 Mil cum) and breakwater by 2018.
Container terminal of 2 km berth length at -14,0m draft,
Dry bulk terminal for coal fired power plants,
Multipurpose terminal with 1 km length of berth,
The port is located in the Meghna Estuary at Rabnabad Channel in the Kalapara Upazila,
Stage 3; Complete remaining port facilities by 2023.
The jetty alignment is selected at the depth of -8m to -15m, which can accommodate deep draught and bigger size vessels.
Total berth length 10,350m, port area 340.5 ha</td></tr>
<tr><td colspan="2">Estimated Cost</td><td colspan="3">2,208 Mil US$</td></tr>
<tr><td colspan="2">Current Issues</td><td colspan="3">New deep sea port is required for handling container and general cargo to meet the demands after 2026.</td></tr>
<tr><th colspan="5">Relevance and Importance to Economy/Industry</th></tr>
<tr><td colspan="2">Related Plans, Programs and Projects</td><td colspan="3">The project phase 1 had been started in 2014. The consultant (UK) is conducting engineering study of the project planned for Stage 2 in 2015. The study report will be submitted by the end of 2015 including the feasibility study of the Stage 2.</td></tr>
<tr><td colspan="2">Hinterland Area/ Beneficiaries</td><td colspan="3">There would be benefits by development of Payra Port as follows; i) Faster and easier for export agriculture products,
ii) Enhanced fish processing and export together with increase employment opportunity,
iii) Boost generation of garment industries & accelerated exports, iv) Boost generation of other industrial development in the exclusive Economic Zone
v) Enhanced economic networks in the country,
vi) Enhanced international trade facilities,
vii) Development of Eco-Tourism, and
viii) Enhanced waterway communication,
ix) Development of exclusive economic zone.</td></tr>
<tr><td colspan="2">Benefit for Japanese Companies</td><td colspan="3">Japanese shipping lines prefer to maintain the present working feeder network. Once a deep sea port is developed, shipping lines have to reorganize the feeder networks and establish mother terminal.</td></tr>
<tr><th colspan="5">Demand of Freight Transport</th></tr>
<tr><td colspan="2" rowspan="2">Handling of Future Container Demand</td><td colspan="2">Baseline</td><td>2030</td></tr>
<tr><td colspan="2">No service</td><td>Design capacity is set 3.94 mil TEU in 2030.</td></tr>
<tr><td colspan="2" rowspan="2">Handling of Future Non-Container Demand</td><td colspan="2">Baseline</td><td>2030</td></tr>
<tr><td colspan="2">No service</td><td>The design target volume of 70.7 mil ton of general cargo, bulk</td></tr>
</table>

		cargo, liquid bulk
Expected Function	The port function as international gate port of the transit trade service of containers and general cargo to neighbor countries (India)	
Improvement of Efficiency		
Improvement of Cargo Handling Efficiency	The deep sea port can receive the larger container and bulk ships by developing deep sea port. The transportation cost will be reduced. The transportation cost of cargo/containers will be reduced by providing direct connectivity between the port and Dhaka metropolitan area.	
Connection with Other Modes	The existing road from Dhaka to Payra have 2 lanes and future to be widen to 4 lanes, It is planned to construct the Padma bridge, which will reduce the distance to Dhaka. Ferry service is available to cross Payra River.: Road distance from Payra to Dhaka; 242 km. Connecting points from the Planned port site; To North; 4 lanes Reinforced concrete road for 6 km, to connecting bridge for 800m and to South 4 lanes road in 12 km away, Water route Distance is from Payra to Dhaka 267 km.	
Ease of Implementation		
Preparation Status	Central Government MOS had already approved the Project. Both governments exchanged the agreement of implementing this project	
Impact on Natural/Social Environment	The heavy dredging volume is required for capital channel development and large volume of maintenance dredging are required. Appropriate maintenance dredging strategy is essentially required for sound financial port management	

Project Outline				
Project ID	**Country**	**Location**	**Type**	**Scheme**
SP-I-1	India	Kolkata	Sea Port	Finance
Project Name		**Sagar Island Project**		
Project Description		The project is to develop port facilities at Sagar Island including rail-road connectivity and construction of a rail-cum-road bridge over Muriganga River. This new port is planned to handle bulk commodities (iron ore, limestone, coal, steel, fertilizer, POL), general cargo and containers. Phase I project targeting the year 2019–2020 comprises 9 berths (quay length 2,470 m, permissible draft 13.5 m) to handle 54 million tons including 300,000 TEU of containers.		
Estimated Cost		The project cost is expected to be INR 48.06 billion for port construction and INR 30.14 billion for rail and road connectivity including rail cum road bridge.		
Current Issues		Limited capacity and permissible draft at Port of Kolkata		
Relevance and Importance to Economy/Industry				
Related Plans, Programs and Projects		- Indicated in the Maritime Agenda 2010-2020, as a project for the period 2012-2017. - The project is in line with two of the three pillars of the Sagar Mala Concept, namely “port modernization” and “efficient evacuation systems”.		
Hinterland Area/ Beneficiaries		State of West Bengal		
Benefit for Japanese Companies		172 Japanese companies or Japanese-affiliated companies are identified in the State of West Bengal.		
Demand of Freight Transport				
Handling of Future Container Demand		**Baseline**	**2030**	
		630,000 TEUs (2014-2015)	1.04 million TEU	

	10,068,000 tons (2014-2015) * Kolkata + Haldia	
Handling of Future Non-Container Demand	**Baseline**	**2030**
	36,225,000 tons (2014-2015) * Kolkata + Haldia	93 million tons
Expected Function	Regional gateway port	
Improvement of Efficiency		
Improvement of Cargo Handling Efficiency	Improvement of limited capacity and permissible draft at Port of Kolkata	
Connection with Other Modes	The project includes development of rail-road connectivity	
Ease of Implementation		
Preparation Status	A feasibility study has been done. A study to re-validate the formerly conducted demand forecast and project proposal has been completed. Another study which is to assess the two options for the access to the mainland namely bridge vs. tunnel will be completed in early 2016.	
Impact on Natural/Social Environment	The project requires capital dredging of 89.18 million m^3, according to the initial study	

Project Outline				
Project ID	**Country**	**Location**	**Type**	**Scheme**
SP-I-2	India	Kolkata	Sea Port	Finance

Project Name	**Diamond Harbour Container Terminal Project**	
Project Description	The project is to develop a dedicated Container Terminal at Diamond Harbour, on the east bank of the river Hooghly. The first phase of the project will comprise a contiguous quay length of 900 m (design capacity: 1.2 million TEUs).	
Estimated Cost	INR 12 billion	
Current Issues	Increasing the cargo handling capacity	
Relevance and Importance to Economy/Industry		
Related Plans, Programs and Projects	- Indicated in the Maritime Agenda 2010-2020, as a project for the period 2012-2017. - The project is in line with one of the three pillars of the Sagar Mala Concept, namely “port modernization”.	
Hinterland Area/ Beneficiaries	State of West Bengal	
Benefit for Japanese Companies	172 Japanese companies or Japanese-affiliated companies are identified in the State of West Bengal.	
Demand of Freight Transport		
Handling of Future Container Demand	**Baseline**	**2030**
	630,000 TEUs (2014-2015) 10,068,000 tons (2014-2015) * Kolkata + Haldia	1.04 million TEU
Handling of Future Non-Container Demand	**Baseline**	**2030**
	36,225,000 tons (2014-2015) * Kolkata + Haldia	93 million tons
Expected Function	Regional gateway port	
Improvement of Efficiency		
Improvement of Cargo Handling Efficiency	Increasing containers and multi-purpose cargo	
Connection with Other Modes	N/A	
Ease of Implementation		
Preparation Status	The bidding procedure as a PPP project was undertaken, however, no one	

	eventually participated in the bidding. Currently the Diamond Harbour Project is being revised to include the handling of non-container cargo. The new Feasibility Study is planned to be conducted soon.
Impact on Natural/Social Environment	Unknown (to be investigated)

Project Outline				
Project ID	**Country**	**Location**	**Type**	**Scheme**
SP-I-3	India	Paradip	Sea Port	Finance
Project Name		**Outer Harbour Project**		
Project Description		Project to handle vessels up to 22 meters draft or large capsize vessels up to 2,500,000 DWT. Construction of 6 berths which will increase capacity by 100 MT.		
Estimated Cost		USD 769 million		
Current Issues		Limited capacity and permissible draft		
Relevance and Importance to Economy/Industry				
Related Plans, Programs and Projects		The Project is one of the Mega Port Projects in the pipeline, which was presented by MOS at the 3rd Japan-India Shipping Policy Forum Meeting, Tokyo, 10 Sep 2015.		
Hinterland Area/ Beneficiaries		States of Orissa, Jharkhand, Chhattisgarh, Madhya Pradesh, Uttar Pradesh, Bihar and West Bengal		
Benefit for Japanese Companies		Benefit for Japanese Companies 713 Japanese companies or Japanese affiliated companies are identified in the states above.		
Demand of Freight Transport				
Handling of Future Container Demand		**Baseline**		**2030**
		4,000 TEU (2014-15)		N/A
Handling of Future Non-Container Demand		**Baseline**		**2030**
		70,940,000 Tons (2014-15)		120 million tons
Expected Function		Regional Gateway Port		
Improvement of Efficiency				
Improvement of Cargo Handling Efficiency		Improvement of limited capacity and permissible draft		
Connection with Other Modes		The project does not include major improvement of access road /rail.		
Ease of Implementation				
Preparation Status		Mackinsey – AECOM are carrying out a Techno-Economic Feasibility Study, which is expected to be completed soon. The project is expected to be awarded on 31March 2017.		
Impact on Natural/Social Environment		Unknown (to be investigated)		

Project Outline				
Project ID	**Country**	**Location**	**Type**	**Scheme**
SP-I-4	India	Ennore (Kamarajar)	Sea Port	Finance
Project Name		**Greater Kamarajar Port Project**		
Project Description		Kamarajar port handled 30.24 million tonnes of cargo in 2014 and will have a handling capacity over 100 million tonnes by 2020. However, as the cargo handling volume is rapidly increasing (recent growth - 28% per annum) there is a concern that the cargo handling capacity will be reached in the next decade. The Project under consideration is expected to increase		

	the capacity to 200 million tonnes to cater the growing export/import trade.	
Estimated Cost	USD 1,153 million	
Current Issues	Limited capacity	
Relevance and Importance to Economy/Industry		
Related Plans, Programs and Projects	The Project is one of the Mega Port Projects in the pipeline which was presented by MOS at the 3rd Japan-India Shipping Policy Forum Meeting, Tokyo, 10 Sep 2015. Also indicated in the "Make in India" in Jan. 2015, as one of the investment opportunities in Ports and Shipping sector.	
Hinterland Area/ Beneficiaries	State of Tamil Nadu, Karnataka and Andhra Pradesh	
Benefit for Japanese Companies	1,229 Japanese companies or Japanese affiliated companies are identified in the states above.	
Demand of Freight Transport		
Handling of Future Container Demand	**Baseline**	**2030**
	N/A	N/A
Handling of Future Non-Container Demand	**Baseline**	**2030**
	30,250,000 Tons (2014-15)	101 million tons
Expected Function	Regional Gateway Port	
Improvement of Efficiency		
Improvement of Cargo Handling Efficiency	Improvement of limited capacity	
Connection with Other Modes	The project does not include major improvement of access road/rail.	
Ease of Implementation		
Preparation Status	Kamarajar Port Ltd proposed a Techno-Economic Feasibility Study for development of Greater Kamarajar Port Project in August 2015. Detailed Project Report (DPR) is under preparation. The project is expected to be awarded on 31March 2017.	
Impact on Natural/Social Environment	Unknown (to be investigated)	

Project Outline				
Project ID	**Country**	**Location**	**Type**	**Scheme**
SP-I-5	India	Chennai	Sea Port	Finance
Project Name		**Development of New Outer Harbour to the North of the Bharathi Dock**		
Project Description		The project includes the development of 6 berths (quay length 1.5km, 15m draft, sheltered by 4.75 km breakwater) to handle a mix of cargo comprising containers, dry , break bulk and liquid cargos over the long term. When commissioned, the capacity of the port will exceed 100 million tonnes per annum.		
Estimated Cost		INR 51 billion		
Current Issues		Increasing containers and multi-purpose cargo (clean cargo)		
Relevance and Importance to Economy/Industry				
Related Plans, Programs and Projects		Indicated in the Maritime Agenda 2010-2020, as the former project, "Creation of Mega container terminal" for the period 2010-2012. Also indicated in the "Make in India" in Jan. 2015, as one of the investment opportunities in Ports and Shipping sector.		
Hinterland Area/ Beneficiaries		State of Tamil Nadu, Karnataka and Andhra Pradesh		
Benefit for Japanese		1,229 Japanese companies or Japanese affiliated companies are identified		

Companies	in the states above.	
Demand of Freight Transport		
.Handling of Future Container Demand	**Baseline**	**2030**
	1,552,000 TEU (2014-15)	2.03 million TEU
Handling of Future Non-Container Demand	**Baseline**	**2030**
	52,540,000 Tons (2014-15)	N/A
Expected Function	Regional Gateway Port	
Improvement of Efficiency		
Improvement of Cargo Handling Efficiency	Increasing containers and multi-purpose cargo (clean cargo)	
Connection with Other Modes	The project does not include major improvement of access road/rail.	
Ease of Implementation		
Preparation Status	Procurement stage on a BOT basis. Bidding was not successful in 2014 and redoing the procurement is under consideration. ChPT will approach the Government for financial assistance for reclamation in the proposed site.	
Impact on Natural/Social Environment	Supreme Court banned the handling of coal, iron ore and other dusty cargo in Chennai Port in October 2011.	

Project Outline				
Project ID	**Country**	**Location**	**Type**	**Scheme**
SP-I-6	India	Tuticorin	Sea Port	Finance

Project Name	**Development of Outer Harbour**	
Project Description	Development of container terminals (length 4,150m; 11 berths), coal berths (length 2,100m; 6 berths) and POL berth (length 300m; 1 berths) as well as breakwaters and dredging, in 3 phases stretching from the year 2015 to 2043. The Planned draft of outer harbour is 16 m capable of handling ultra large container vessels up to 18,000 TEU Capacity, and cape size coal vessels. Total capacity of outer harbour on completion will be 187.5 MTPA.	
Estimated Cost	INR 137.75 billion for Phase 1, including private investment [Phase 1] container terminals (length 1,750m; 5 berths), coal berths (length 1,050m; 3 berths), breakwaters and dredging	
Current Issues	limited capacity and permissible draft at Port of Tuticorin	
Relevance and Importance to Economy/Industry		
Related Plans, Programs and Projects	- Indicated in the Maritime Agenda 2010-2020, as a project for the period 2017-2020. - The project is in line with one of the three pillars of the Sagar Mala Concept, namely “port modernization”.	
Hinterland Area/ Beneficiaries	State of Tamil Nadu	
Benefit for Japanese Companies	577 Japanese companies or Japanese-affiliated companies are identified in the State of Tamil Nadu.	
Demand of Freight Transport		
Handling of Future Container Demand	**Baseline**	**2030**
	560,000 TEUs (2014-2015) 11,034,000 tons (2014-2015)	603,000 TEU (export and import)
Handling of Future Non-Container Demand	**Baseline**	**2030**
	21,380,000 tons (2014-2015)	54 million tons
Expected Function	Transshipment/ Regional gateway port	
Improvement of Efficiency		

Improvement of Cargo Handling Efficiency	Improvement of limited capacity and permissible draft
Connection with Other Modes	The project includes enhancement of road and railway connectivity.
Ease of Implementation	
Preparation Status	A DPR has been prepared. The GOI has officially requested the GOJ to provide a Japanese ODA loan for the project. A project preparatory study by JICA commenced in February 2016.
Impact on Natural/Social Environment	Unknown (to be investigated)

Project Outline				
Project ID	**Country**	**Location**	**Type**	**Scheme**
SP-I-7	India	Colachel	Sea Port	Finance
Project Name		**Development of Colachel Port at Tamilnadu**		
Project Description		The project is to develop a new port with quay length of 5,400 m in 3 phases which would mainly handle container cargo including transshipment cargo. The 1st phase comprises construction of berths (1,400 m), a breakwater (4,639 m), dredging (6.8 million m^3), road/rail connectivity etc. The Phase I project will yield container terminal capacity of 1,606,590 TEU.		
Estimated Cost		INR 54.92 billion for the 1st phase		
Current Issues		Absence of transshipment hub port in India		
Relevance and Importance to Economy/Industry				
Related Plans, Programs and Projects		- The project is in line with two of the three pillars of the Sagar Mala Concept, namely "port modernization" and "efficient evacuation systems".		
Hinterland Area/ Beneficiaries		State of Tamil Nadu		
Benefit for Japanese Companies		N/A		
Demand of Freight Transport				
Handling of Future Container Demand		**Baseline**	**2030**	
		0	1.06 million TEU	
Handling of Future Non-Container Demand		**Baseline**	**2030**	
		0	N/A	
Expected Function		Transshipment port		
Improvement of Efficiency				
Improvement of Cargo Handling Efficiency		N/A (presently no bottleneck)		
Connection with Other Modes		The project includes development of road and railway which connect to the existing lines.		
Ease of Implementation				
Preparation Status		1. Pre-F/S completed. 2. A DPR is under preparation. 3. Potential competition with Vizhinjam Port, which is only 20 km away from the Port of Kolachel and for which the private sector may commence civil works shortly.		
Impact on Natural/Social Environment		No land acquisition for the port development, but some properties would be directly affected by the implementation of the railway line and road connections.		

Project Outline				
Project ID	**Country**	**Location**	**Type**	**Scheme**
SP-I-8	India	Cochin	Sea Port	Finance
Project Name		**Outer Harbour Project**		
Project Description		Construction of two breakwaters and possible reclamation of 2,600 acres of land inside the northern breakwater and about 650 acres inside the southern breakwater. There are also plans to connect this area with the Fort Kochi area through a 1.7km long bridge.		
Estimated Cost		INR 25 billion		
Current Issues		Absence of transshipment hub port in India. Prevention of coastal erosion.		
Relevance and Importance to Economy/Industry				
Related Plans, Programs and Projects		Indicated in the Maritime Agenda 2010-2020, as a project for the period 2017-2020. Also indicated in the "Make in India" in Jan. 2015, as one of the investment opportunities in Ports and Shipping sector.		
Hinterland Area/ Beneficiaries		State of Kerala and Tamil Nadu		
Benefit for Japanese Companies		702 Japanese companies or Japanese affiliated companies are identified in the states above.		
Demand of Freight Transport				
Handling of Future Container Demand		**Baseline**	**2030**	
		366,000TEU (2014-15)	580,000 TEU	
Handling of Future Non-Container Demand		**Baseline**	**2030**	
		21,600,000 Tons (2014-15)	49 million tons	
Expected Function		Regional Gateway and Transshipment Port		
Improvement of Efficiency				
Improvement of Cargo Handling Efficiency		N/A (presently no bottleneck)		
Connection with Other Modes		The project does not include major improvement of access road/rail.		
Ease of Implementation				
Preparation Status		Obtaining Environmental clearance for the project is underway		
Impact on Natural/Social Environment		Unknown (to be investigated)		

Project Outline				
Project ID	**Country**	**Location**	**Type**	**Scheme**
SP-I-9	India	Mormugao	Sea Port	Finance
Project Name		**Multi-purpose Cargo Terminal**		
Project Description		The project is to develop the area west of the breakwater for creating additional cargo handling facilities. This terminal will have 2 berths (total length 600 m) which will handle multi-commodity cargo i.e. bulk, break bulk and containers. The project is deemed to involve construction of a 825 m breakwater and reclamation of about 75 acres of land for storage area. The project is expected to yield additional capacity of 5.74 million tons per annum.		
Estimated Cost		INR 9.50 billion		
Current Issues		Over- dependence on a single commodity		
Relevance and Importance to Economy/Industry				
Related Plans, Programs and Projects		- Indicated in the Maritime Agenda 2010-2020, as a project for the period 2012-2017.		

	- The project is in line with one of the three pillars of the Sagar Mala Concept, namely "port modernization".	
Hinterland Area/ Beneficiaries	States of Goa, Karnataka and Maharashtra	
Benefit for Japanese Companies	In total 1,053 Japanese companies or Japanese-affiliated companies are identified in the States of Goa, Karnataka and Maharashtra.	
Demand of Freight Transport		
Handling of Future Container Demand	**Baseline**	**2030**
	25,000 TEUs (2014-2015) 312,000 tons (2014-2015)	51,000 TEU
Handling of Future Non-Container Demand	**Baseline**	**2030**
	14,399,000 tons (2014-2015)	34 million tons
Expected Function	Regional gateway port	
Improvement of Efficiency		
Improvement of Cargo Handling Efficiency	N/A (presently no bottleneck)	
Connection with Other Modes	The project does not include major improvement of access road/rail.	
Ease of Implementation		
Preparation Status	A tender process to select a concessionaire for development of the multi-purpose cargo terminal under BOT scheme has been completed.	
Impact on Natural/Social Environment	Unknown (to be investigated)	

Project Outline				
Project ID	**Country**	**Location**	**Type**	**Scheme**
SP-I-10	India	Wadhavan (Dahanu)	Sea Port	Finance
Project Name		**New Port (Multi Cargo) at Wadhavan**		
Project Description		Development of a Satellite Port (Multi Cargo) of JNPT. The proposed port will be constructed on reclaimed land at a distance of more than 4 nautical miles off Dahanu coast, near Wadhawan point. It is planned to have a capacity of up to 100 million tonnes.		
Estimated Cost		USD 923 million		
Current Issues		Congestion of JNPT		
Relevance and Importance to Economy/Industry				
Related Plans, Programs and Projects		The Project is one of the Mega Port Projects in the pipeline which was presented by MOS at the 3rd Japan-India Shipping Policy Forum Meeting, Tokyo, 10 Sep 2015.		
Hinterland Area/ Beneficiaries		State of Rajasthan, Madhya Pradesh, Gujarat and Maharashtra.		
Benefit for Japanese Companies		1,096 Japanese companies or Japanese affiliated companies are identified in the states above		
Demand of Freight Transport				
Handling of Future Container Demand		**Baseline**	**2030**	
		N/A	N/A	
Handling of Future Non-Container Demand		**Baseline**	**2030**	
		N/A	Marginal demand which JNPT/ Mumbai cannot deal with will be more than 100 million tons.	
Expected Function		Regional Gateway Port		
Improvement of Efficiency				
Improvement of Cargo Handling Efficiency		Reduction of congestion of JNPT		

Connection with Other Modes	N/A
Ease of Implementation	
Preparation Status	Detailed Project Report (DPR) is under preparation. An environmental conservation group and some local people oppose the project.
Impact on Natural/Social Environment	The construction site is located in the Eco-Sensitive Zone. People opposed to the project say construction works will displace locals and destroy biodiversity.

Project Outline				
Project ID	**Country**	**Location**	**Type**	**Scheme**
SP-P-1	Pakistan	Karachi Port	Sea Port	PPP

Project Name	**Development of Dedicated Coal Terminal from Berths 13 to 17 in East Wharf**	
Project Description	Quay Length 759 m, Terminal area 25 ha, Depth along the berth -14.0m to accept target volume of 8.8. Mil ton of coal terminal, is developed by renovation of the existing berths and backup area for coal terminal. The coal are imported and transported by railway to power plants in Punjab province and cement factory in Sindh Province.	
Estimated Cost	200Mil US$	
Current Issues	KPT provide the developing area for Coal storage terminal.	
Relevance and Importance to Economy/Industry		
Related Plans, Programs and Projects	KPT listed this project as one of the major projects proposed in KPT Business Plan and Strategic Development Plan-Final in September 2011	
Hinterland Area/ Beneficiaries	The hinterland of this terminal will be power plants located in upcountry of Pakistan including Karachi Metropolitan city area.	
Benefit for Japanese Companies	No	
Demand of Freight Transport		
Handling of Future Container Demand	**Baseline**	**2030**
	No container	No container
Handling of Future Non-Container Demand	**Baseline**	**2030**
	In 2014, about 2.0 mil ton of coal was handled.	To handle 8.6 mil ton of coal in 2025/2030
Expected Function	This terminal is expected to function as dedicated coal terminal for power plants and cement factories in Pakistan	
Improvement of Efficiency		
Improvement of Cargo Handling Efficiency	N/A	
Connection with Other Modes	The import coals are transported by railway from the port to power plants in Punjab and cement factories in Sindh Provinces directly. The connectivity of road and railway between the port and destinations were already developed	
Ease of Implementation		
Preparation Status	KPT prepared the development plan and intend to implement this project by PPP scheme by providing development area within the port area. KPT looks for the private investor jointly with GOR	
Impact on Natural/Social Environment	The terminal is located further away from international container terminal in KPT and the residential area (e.g. Clifton). Negative environmental impacts by coal dust will be mitigated.	

Project Outline					
Project ID	**Country**	**Location**	**Type**	**Scheme**	
SP-P-2	Pakistan	Karachi Port	Sea Port	PPP	
Project Name		**Reinforcement and rehabilitation of Existing three Oil Piers**			
Project Description		The existing three (3) Oil Piers are developed as Multipurpose Liquid Bulk Piers to receive the large tankers of 75,000 DWT to 105,000 DWT. The existing oil storage area is expanded up to 118 ha to develop storage capacity up to 21.0 Mil ton. The project is implemented by KPT by own budget.			
Estimated Cost		100-150 Mil US$			
Current Issues		The existing oil piers were constructed with shallow draft. Shipping Companies and Users requested KPT to deepen the depth around piers and access channel and upgrade the pier structures to receive larger tankers of 75,000 DWT to 105,000 DWT.			
Relevance and Importance to Economy/Industry					
Related Plans, Programs and Projects		KPT listed this project as one of the major projects proposed in KPT Business Plan and Strategic Development Plan-Final in September 2011			
Hinterland Area/ Beneficiaries		The hinterland of this terminal will be Karachi Metropolitan city area.			
Benefit for Japanese Companies		No			
Demand of Freight Transport					
Handling of Future Container Demand		**Baseline**		**2030**	
		No container		Not handle containers	
Handling of Future Non-Container Demand		**Baseline**		**2030**	
		In 2014, 15.3 mil ton of liquid bulk were handled.		To handle 21.0 mil ton of liquid bulk in 2020/2025	
Expected Function		This terminal is expected to function as dedicated Multipurpose liquid bulk			
Improvement of Efficiency					
Improvement of Cargo Handling Efficiency		N/A			
Connection with Other Modes		The import liquid bulk cargoes are transported by railway and track trailers from the port to upcountry of Pakistan directly.			
Ease of Implementation					
Preparation Status		KPT prepared the development plan and intend to implement this project by own finance resource.			
Impact on Natural/Social Environment		The study oil piers are located further away from international container terminal in KPT and the residential area (e.g. Clifton). Negative environmental impacts by liquid bulk cargo and oil tankers will be mitigated.			

Project Outline					
Project ID	**Country**	**Location**	**Type**	**Scheme**	
SP-P-3	Pakistan	Karachi Port	Sea Port	Self-finance, PPP	
Project Name		**Development of Pakistan Deep Water Container Port at East of Keamari Groyne for a new container terminal**			
Project Description		Under Phase 1, this terminal will develop four berths with a quay length of 1,500 meters, a yard area of 85 hectares and depths of 18 meters to accommodate deep draft container ships (loading capacity 15,000 TEU, Draft -16m to -18m)			
Estimated Cost		650 Mil US$			

Current Issues	Greater problems for transshipment service will be institutional problems, due to reasons of the security checking and declaration miss, all of the containers have to be checked. Considering such procedures the transshipment business through ports of Pakistan under the present procedures of transshipment, the proposed service will not be feasible.	
Relevance and Importance to Economy/Industry		
Related Plans, Programs and Projects	KPT had contracted with China Investor to develop and operate this terminal in 2009. KPT had carried out access channel dredging works, and land reclamation of container terminal at the cost of KPT. It is scheduled to open the terminal in the middle of 2016	
Hinterland Area/ Beneficiaries	The hinterland of this terminal will be countries in Central Asian, North China, and Middle East Countries.	
Benefit for Japanese Companies	Japanese shipping lines that use KICT of Karachi port does not shift to this terminal from the present terminal.	
Demand of Freight Transport		
Handling of Future Container Demand	**Baseline**	**2030**
	No container	3.32 mil TEU as a total in the Karachi Port (Designed 3.5 mil TEU by Phase 1)
Handling of Future Non-Container Demand	**Baseline**	**2030**
	No bulk cargo.	To handle 70 mil ton/year of coal
Expected Function	The target market of this terminal will be North, Central Asian countries which does not have any sea ports. The terminal functions for regional transshipment and transit of containers to North Africa countries and Central Asian countries.	
Improvement of Efficiency		
Improvement of Cargo Handling Efficiency	N/A	
Connection with Other Modes	This terminal is connected to Layari Expressway to the future Karachi Port crossing from Karachi Deep Water Port.	
Ease of Implementation		
Preparation Status	The Phase 1 project has already implemented and scheduled to open in the middle of 2016.	
Impact on Natural/Social Environment	The project is located at East of Keamari Groyne further away from the residential area (e.g. Clifton). Two access roads connecting to the future Karachi harbor crossing Karachi Deep Water Port are planned to be developed. The traffic contingency within the port and city will be relieved.	

Project Outline				
Project ID	**Country**	**Location**	**Type**	**Scheme**
SP-P-4	Pakistan	Port Bin Qasim	Sea Port	PPP
Project Name		**Development of Coal Terminal in Port Qasim**		
Project Description		The Project is planned to extend the present berth length (300m) for 175 m to accept panamax size bulk ships. The present jetty handling capacity is 4 mil ton, while the demands is estimated 25 mil ton of coal. The present capacity must be enhanced 25 mil ton by accepting 75,000 DWT class ships. Import coals are transported by belt conveyor from the Jetty in the port to the Bin Qasim railway station. The coal storage area is developed at railway station for transit of loading on railway wagons		
Estimated Cost		450 Mil US$ for further two terminals		
Current Issues		Private investor made joint agreement with GOR (government of Railway) to transport coal by railway to power plants and cement factories.		

Relevance and Importance to Economy/Industry		
Related Plans, Programs and Projects	The private investor prepares number of alternative proposal to transport coal between the port and railway station by railway/belt conveyor. They wait for final decision from PQA	
Hinterland Area/ Beneficiaries	The hinterland of this coal terminal will be power plants and cement factories located in Punjab and Sindh Provinces.	
Benefit for Japanese Companies	Japanese private company is interested in the development of power plants development.	
Demand of Freight Transport		
Handling of Future Container Demand	**Baseline**	**2030**
	No container	No container
Handling of Future Non-Container Demand	**Baseline**	**2030**
	4.0 Mil ton of coal	To handle 25.0 mil ton/year of coal
Expected Function	JICA Survey stated that PQA has the capacity to handle required volume of coal for power plants and cement factories in upcountry	
Improvement of Efficiency		
Improvement of Cargo Handling Efficiency	N/A	
Connection with Other Modes	PQA had developed the land, access channel, roads and railway for dedicated private partner to develop and operate water front facilities required by their business.	
Ease of Implementation		
Preparation Status	The private investor waits for the final decision by PQA to transport coal by belt conveyor from the port and Bin Qasim railway station.	
Impact on Natural/Social Environment	Air pollution by coal dust will be mitigated by cover on the conveyor for transporting coal.	

Project Outline				
Project ID	**Country**	**Location**	**Type**	**Scheme**
SP-P-5	Pakistan	Port Bin Qasim	Sea Port	Self-finance, PPP

Project Name	**Development of Oil Terminal/LNG Terminal**	
Project Description	Private investors planned to develop pipe lines of 3 lines x 6,000m for transporting LNG from the jetty to storage tanks and develop storage tanks of 120,000 m3 capacity and 150,000 m3 capacity for 2nd terminal.	
Estimated Cost	130 Mil US$ for LNG terminal, 100 Mil US$ for oil terminal	
Current Issues	Private investor wait for approval from PQA	
Relevance and Importance to Economy/Industry		
Related Plans, Programs and Projects	ADB conducted study of developing dedicate oil terminal in Pakistan in 1992. ADB study recommended to develop dedicate oil terminal of importing furnace oil. PQA and private investors FOTCO made agreement to develop oil terminal to handled 125 mil ton of importing diesel oil, furnace oil and export of crude oil. ADB study recommended developing three jetties, 4 km length of trestle from the on land storage tanks to jetties and pipe line installed for oil transport. The terminal developed by three jetties to handle 27 mil ton.	
Hinterland Area/ Beneficiaries	The hinterland of this oil terminal will be Pakistan as a whole	
Benefit for Japanese Companies	No	
Demand of Freight Transport		
Handling of Future Container Demand	**Baseline**	**2030**
	No container	No container
Handling of Future	**Baseline**	**2030**

Non-Container Demand	4.0 Mil ton of liquid bulk cargo	To handle 25.0 mil ton/year of liquid bulk
Expected Function	The Oil Terminal/LNG Terminal in PQA will be the gate port terminal to handle required volume of liquid bulk for the whole nation.	
Improvement of Efficiency		
Improvement of Cargo Handling Efficiency	N/A	
Connection with Other Modes	PQA had developed the land, access channel, roads and railway for dedicated private partner to develop and operate water front facilities required by their business.	
Ease of Implementation		
Preparation Status	The private investor waits for the final decision by PQA to develop liquid bulk terminal expansion.	
Impact on Natural/Social Environment	Water pollution by liquid bulk will be mitigated by installing oil fence to protect the water pollution in the port area.	

Project Outline				
Project ID	**Country**	**Location**	**Type**	**Scheme**
SP-P-6	Pakistan	Port Bin Qasim	Sea Port	Technical Cooperation and Finance
Project Name		**Feasibility Study of Capital Dredging of Access Channel and Development of Second Inner Channel**		
Project Description		The maintenance dredging volume is around 5 mil cum/year. PQA purchased hopper suction dredger of 7,000 cum holding capacity in 2012 and carry out maintenance dredging of outer channel area after monsoon season every year. Main scope of the study are as follows; • Analysis the mechanism of in-fill deposit in the outer channel and • Establish a maintenance dredging strategy of the outer access channel L= 10 km, Depth=15.3m, width 300 m and • Study of development of second inner channel, PQA proposes, if possible, the capital dredging cost to be financed (L=17 km, depth = 14.0m, width= 200m) by ODA project loan..		
Estimated Cost		Capital dredging Cost; around 150-200 Mil USD, FS study ; 2 Mil US$		
Current Issues		The approach channel is the bottleneck of the Port Operation. Adequate maintenance of the approach channel is essential for the port operation to accelerate national economic development, since the national economic growth will be stagnated due to shortage/suspending of importing raw material such as coal, LNG, liquid bulk cargo, containers required for the power supply and LNG supply and auto industries in their export – import trade and accelerate national economic development. PQA need appropriate maintenance dredging strategy of outer channel for sound financial management of port operation.		
Relevance and Importance to Economy/Industry				
Related Plans, Programs and Projects		PQA prepared project concept paper and submits to MOPS		
Hinterland Area/ Beneficiaries		Maintenance of access channel by effective maintenance dredging strategy is essential aspect for port operation and subsequently to minimize maintenance dredging cost, which will contribute financial management of the Port. The development of second inner channel will enhance marine traffic capacity of the channel. Thus the port can develop additional terminal facilities of accepting bulk cargo required for power plants and cement factories and LNG.		
Benefit for Japanese Companies		Two Japanese motor manufacturers (Toyota, Suzuki,) had operated car manufacturing since 1992 in their factory in Bim Qasim Industrial Park in Karachi city and Yamaha Motor had started motor cycles manufacturing		

	from April 2014 planned to fabricate 40,000 unit /years. These companies import spare parts of car/motor manufacturing through this port. Once the approach channel is closed by sediment deposit in the channel, large cargo/container ships cannot enter to the port, these manufacturers has to stop fabrication of product in their factories.	
Demand of Freight Transport		
Handling of Future Container Demand	**Baseline**	**2030**
	QICT in Qasim port handled 942,800 TEU in 2014	3.49 Mil TEU (Design capacity 2.0 Mil TEU)
Handling of Future Non-Container Demand	**Baseline**	**2030**
	25.7 Mil ton of dry and liquid bulk cargo in 2014	To handle design capacity of 60.0 mil ton/year of dry and liquid bulk
Expected Function	PQA had been functioning as national gate port together with Karachi port for upcountry of Pakistan and neighbor countries including Central Asian countries.	
Improvement of Efficiency		
Improvement of Cargo Handling Efficiency	At present 1,072 ship calls by one way to transport 25.7 mil ton of bulk cargo in 2014. Number of ships to transport 60 ml bulk cargo in 2030 will be around 3200 ships. Ship takes about 12 hours from the entrance of the outer channel to the port. Without the proposed project, the channel will be congested and ships will take more than12 hrs. for one way traffic and larger size of bulk /container ships cannot sail to the port. The transportation cost of cargo/containers will be reduced by implementation of the project.	
Connection with Other Modes	PQA had developed the land, access channel, roads and railway for dedicated private partners to develop and operate water front facilities required by their business.	
Ease of Implementation		
Preparation Status	PQA prepared the concept project paper of the proposed project and submits to MOPS for approval of the implementation and sounding the possibility of project loan.	
Impact on Natural/Social Environment	Water pollution by dredging works will be mitigated by installing protect sheet around the dredging area. Dredging works shall be implemented not to interfere the ship navigation.	

Project Outline				
Project ID	**Country**	**Location**	**Type**	**Scheme**
SP-S-1	Sri Lanka	Colombo	Sea Port	Finance
Project Name		**Expansion of facilities of JCT for handling of Inland Containers**		
Project Description		The depth along the berths of JCT is limited at 12-15m and difficult deepened due to type of quay wall structures. The terminal cannot receive larger container ships. The existing berthing facilities were built in 1985 and got decrepit and aged SLPA will make JCT function as container feeder terminal and need to renovate old facilities for handling of Inland Containers		
Estimated Cost		300 Mil. USD		
Current Issues		It is considered that SLPA should prepare the new long term development plans of the port based on the existing facilities arrangement, since the basic long term development plan of Colombo port was prepared in 1980s. Some of port facilities are needed to renovate old facilities to meet the current demands of cargo and ship size.		
Relevance and Importance to Economy/Industry				
Related Plans, Programs and Projects		Government of Sri Lanka proposed Japan assistant to develop the planned port access highway development project. SLPA planned to develop inner		

	port roads together with such highway project.	
Hinterland Area/ Beneficiaries	Capital city of Colombo, population of capita city at 2,320,000 and 50 % of GDP (74.94 Bil USD/2=37.47 Bil USD in 2014)	
Benefit for Japanese Companies	Japanese shipping lines who are using this terminal will receive large benefit in their logistic supply chain by calling large container ships to New South Harbor and present container ships use the JCT terminal with expectation of higher cargo handing efficiency.	
Demand of Freight Transport		
Handling of Future Container Demand	**Baseline**	**2030**
	Container handling volume 2.554 Mil TEU at SLPA in Colombo port in 2014	Estimated around 3.5 Mil TEU
Handling of Future Non-Container Demand	**Baseline**	**2030**
	JCT handle container only	JCT handle container only
Expected Function	The Port is expected to function as hub port of South Asia Region and Transshipment container terminal. This terminal will function as feeder terminal and South harbor will function as hub port	
Improvement of Efficiency		
Improvement of Cargo Handling Efficiency	Acceptance of larger ships	
Connection with Other Modes	Planned port access highway from the Fort to the Port gate area	
Ease of Implementation		
Preparation Status	SLPA plans to develop East terminal of South Harbor to receive deep draft container ships and to rehabilitate existing facilities of JCT as feeder container terminals	
Impact on Natural/Social Environment	The container traffic congestion around the JCT area and inport roads conecting toplanned port access highways will be relieved and large time saving in logistic supply to terminal users and industries in the hinterland	

Project Outline				
Project ID	**Country**	**Location**	**Type**	**Scheme**
SP-S-2	Sri Lanka	Hambantota	Other Infrastructure	Finance

Project Name	**Development of Ro-Ro Terminal for Specialized Large Ro-Ro Ships**	
Project Description	NPD plans to develop Ro-Ro terminal in Hambantota port to receive large Ro-Ro vehicles carriers and pure car carriers.	
Estimated Cost	150 Mil. USD	
Current Issues	NPD expects increase cargo volume by trucks and by pure car carriers. The new Ro-Ro terminal facilities are required.	
Relevance and Importance to Economy/Industry		
Related Plans, Programs and Projects	The development plan is under preparation	
Hinterland Area/ Beneficiaries	Hambantota	
Benefit for Japanese Companies	At present no Japanese shipping lines, trade companies as port users are not involved yet	
Demand of Freight Transport		
Handling of Future Container Demand	**Baseline**	**2030**
	No container	No container
Handling of Future Non-Container Demand	**Baseline**	**2030**
	Non Container cargo of about 7.5 Mil ton in 2014 were transported by general cargo ships and Ro-Ro	N/A

	ships. The transporting volume by Ro-Ro ships is not clear, but the Ro-Ro ship size are getting larger	
Expected Function	The Port is expected to function as regional hub of Transshipment container terminal, but there will be strong traffic demands of non-container traffic in future. The Ro-Ro service will get larger size and play large share of transport such cargo.	
Improvement of Efficiency		
Improvement of Cargo Handling Efficiency	N/A	
Connection with Other Modes	The traffic from the port will go through the Port Access Highway and Base line Highway.	
Ease of Implementation		
Preparation Status	The development plan is under preparation.	
Impact on Natural/Social Environment	The traffic congestion around the port and city roads will be relieved by development of the planned port access highway	

Project Outline				
Project ID	**Country**	**Location**	**Type**	**Scheme**
SP-S-3	Sri Lanka	Colombo	Sea Port	Finance
Project Name		**Development of Passenger Terminal Facilities for World Cruise Passenger vessel and ferry service**		
Project Description		Government stated the Colombo port shall be developed to the world class cruise ships terminal and to reinforce the tourism attraction by collaboration with the existing colonial buildings around Colombo port area. In order to meet such concept the long distance cruiser ship terminal is planned.		
Estimated Cost		50 Mi. USD		
Current Issues		SLPA stated to prepare the passenger terminal development plan with collaboration of colonial buildings around the port area as city tourism attraction spots		
Relevance and Importance to Economy/Industry				
Related Plans, Programs and Projects		The development plan is under preparation.		
Hinterland Area/ Beneficiaries		Capital city of Colombo, population of capita city at 2,320,000 and 50 % of GDP (74.94 Bil USD/2=37.47 Bil USD in 2014)		
Benefit for Japanese Companies		At present no Japanese shipping lines, trade companies as port users are not involved yet.		
Demand of Freight Transport				
Handling of Future Container Demand		**Baseline**	**2030**	
		No container	No container	
Handling of Future Non-Container Demand		**Baseline**	**2030**	
		No cargo	No cargo	
Expected Function		The Port has potential to develop attractive tourist spots by collaboration with the existing colonial buildings locating around the port area, which will be generated by calling long distance cruise ships.		
Improvement of Efficiency				
Improvement of Cargo Handling Efficiency		Not related to freight transport		
Connection with Other Modes		The traffic congestion from the passenger terminal will be relieved by connecting to plan new port access highway.		
Ease of Implementation				
Preparation Status		The development plan is under preparation		
Impact on Natural/Social		The traffic congestion with passengers and vehicles at passenger terminal		

Environment	are foreseen. The proposed passengers terminal facilities for World Cruise should be planned separately from the container terminals, Ro-Ro terminal with adequate space of vehicle parking.

Project Outline				
Project ID	**Country**	**Location**	**Type**	**Scheme**
SP-S-4	Sri Lanka	Colombo South Harbor	Sea Port	Self-finance (SLPA)
Project Name		**Procurement of Container cranes at East Terminal of South Harbor**		
Project Description		SLPA developed about 470m long of the East Terminal in South Harbor, Container handling equipment are required for terminal operation. SLPA will call the tender for equipment supplier/terminal operator in the beginning of 2016 at their own budget to handle design capacity of 800,000 to 900,000 TEU with 470m long of berth.		
Estimated Cost		100 Mil US$		
Current Issues		A New terminal requires 4 units of larger container cranes to handle containers from large container ships to on shore trucks		
Relevance and Importance to Economy/Industry				
Related Plans, Programs and Projects		SLPA had prepared tender document including technical specification of procured cranes were prepared. SLPA will call the tender in 2016.		
Hinterland Area/ Beneficiaries		Capital city of Colombo, population of capita city at 2,320,000 and 50 % of GDP (74.94 Bil USD/2=37.47 Bil USD in 2014)		
Benefit for Japanese Companies		At present Japanese manufacturers, trade companies are waiting tender notice.		
Demand of Freight Transport				
Handling of Future Container Demand		**Baseline** East Terminal is not opened yet		**2030** Plans to handle 800,000 to 900,000 TEU/year
Handling of Future Non-Container Demand		**Baseline** No cargo		**2030** No cargo
Expected Function		The Easy terminal has potential to receive presently largest container ships more than15,000 TEU loading capacity draft more than -16m as South Asia regional container hub transshipment terminal.		
Improvement of Efficiency				
Improvement of Cargo Handling Efficiency		The average handling volume per hour is targeted at 30 to 35 boxes/hr./crane.		
Connection with Other Modes		It is expected that the gate of South Harbor will be located closer to the new Port Access Highway for easy access of port traffic vehicles.*		
Ease of Implementation				
Preparation Status		The tender documents of procurement of crane suppliers are prepared by SLPA.		
Impact on Natural/Social Environment		The traffic congestion with container transport between Colombo and South harbor shall be avoided by providing nearest connecting point with New Port Access Highway.		

Project Outline				
Project ID	**Country**	**Location**	**Type**	**Scheme**
SP-S-5	Sri Lanka	Colombo South Harbor	Sea Port	Self-finance/ ADB Loan
Project Name		**Procurement of Terminal operator for joint operation with SLPA of East Terminal in South Harbor**		
Project Description		SLPA developed about 470m long of the East Terminal in South Harbor, SLPA needs the private partner to operate the remaining parts of about 800m long of the berth (depth -18m) of the East Terminal. SLPA will call		

	the tender for selection of terminal operator in 2016. The basic infrastructures were developed by the loan of ADB. Terminal facilities are developed by operator to handle design capacity of 1,600,000 to 1,800,000 TEU.	
Estimated Cost	500 Mil US$ for construction of 800m long berth and yard development and equipment procurement	
Current Issues	SLPA need the private partner for East Terminal operation. SLPA will call the tender for selection of Terminal operator in 2016.	
Relevance and Importance to Economy/Industry		
Related Plans, Programs and Projects	SLPA had prepared tender document including technical specification of procured cranes. SLPA will call the tender in 2016.	
Hinterland Area/ Beneficiaries	Capital city of Colombo, population of capita city at 2,320,000 and 50 % of GDP (74.94 Bil USD/2=37.47 Bil USD in 2014)	
Benefit for Japanese Companies	At present Japanese shipping lines, trade companies are waiting for tender notice.	
Demand of Freight Transport		
Handling of Future Container Demand	**Baseline**	**2030**
	East Terminal is not opened yet	Plans to handle 1,600,000 to 1,800,000 TEU/year
Handling of Future Non-Container Demand	**Baseline**	**2030**
	No cargo	No cargo
Expected Function	The East terminal has potential to receive presently largest container ships more than 22,000 TEU loading capacity draft more than -18m as South Asia regional container hub transshipment terminal.	
Improvement of Efficiency		
Improvement of Cargo Handling Efficiency	N/A	
Connection with Other Modes	It is hoped that the gate of South Harbor will be planned to be located closer to the new Port Access Highway for easy access of port traffic vehicles.	
Ease of Implementation		
Preparation Status	The tender documents of procurement of Terminal operator is prepared by SLPA	
Impact on Natural/Social Environment	The traffic congestion with container transport between Colombo and South harbor shall be avoided by providing nearest connecting point with New Port Access Highway.	

Project Outline				
Project ID	**Country**	**Location**	**Type**	**Scheme**
SP-S-6	Sri Lanka	Hambantota Port	Sea Port	Foreign investor
Project Name		**Development of Third Stage Project**		
Project Description		Developing transshipment container terminal in the port area by 2025		
Estimated Cost		700-1,000 Mil US$ for third stage project		
Current Issues		SLPA plans to observe the growth of traffic demands up to Stage 2, till 2025 SLPA takes intermitted time.		
Relevance and Importance to Economy/Industry				
Related Plans, Programs and Projects		The development plan of this port was prepared jointly with SLPA and China Investor. Government plan to make a regional development through the development of this new port.		
Hinterland Area/ Beneficiaries		The hinterland of the transshipment of cars is located in the southern hemisphere of the globe. The port has direct access to the main international shipping route linking the Asia Pacific Region with Europe and North America.		
Benefit for Japanese		Three Japanese shipping lines carrying cars from ASEAN to Australia/		

Companies	South Africa are using this port as transshipment of cars.	
Demand of Freight Transport		
Handling of Future Container Demand	**Baseline**	**2030**
	No container	No container
Handling of Future Non-Container Demand	**Baseline**	**2030**
	in 2014, 160,000 cars and about 460,000 ton non- container cargo were handled	Not set target volume of transshipment cars
Expected Function	The port expected to function as car and bulk terminal to transship cars and supply bulk cargo to the southern hemisphere region.	
Improvement of Efficiency		
Improvement of Cargo Handling Efficiency	Government issued the notice to handle transshipment cars through this port and transshipment containers through Colombo and South harbor ports to minimize the congestion inside the port area and Colombo metropolitan area.	
Connection with Other Modes	The national highway (A-1) direct connection between Colombo City and Hambantota city was developed. The traffic time to transport cargoes directly between capital city and the port is now 2-3hours.	
Ease of Implementation		
Preparation Status	Development plan of container terminal for stage 3 was already prepared by SLPA.	
Impact on Natural/Social Environment	The traffic comgestion around the Colombo capital city and port area are minimized by government notice of separate handling cars through this port and transhipment containers through Colombo ports.	

Project Outline				
Project ID	**Country**	**Location**	**Type**	**Scheme**
SP-S-7	Sri Lanka	Trincomalee Port	Sea Port	Development Survey
Project Name		**Development of a new coal terminal in Trincomalee Port area**		
Project Description		There are big demands of coal for power plants. SLPA and Government Railway plan to transport coal from this port to power plants locating Colombo Capital city area by developing connectivity of railway and roadway. SLPA plans to expand the existing jetty or to build a new terminal at Sampur with railway terminal.		
Estimated Cost		400 Mil. USD		
Current Issues		The scope of railway transport is not clearly specified. Technical study is required.		
Relevance and Importance to Economy/Industry				
Related Plans, Programs and Projects		SLPA at Trincomalee Port had prepared a preliminary document plans and study the railway lines from the port to candidate power plants and work out roughly cost estimate. The development plan is under study by SLPA head office for approval.		
Hinterland Area/ Beneficiaries		Main hinterland of power demands is mainly industries located surrounding Colombo capital city area. Supply coal through the year can be made by the project. The power supply to foreign /local industries is not interrupted by shortage of coal.		
Benefit for Japanese Companies		Japanese industries around Colombo area can keep its operation without interrupting power broken down and improved their products output by contentious power supply.		
Demand of Freight Transport				
Handling of Future Container Demand		**Baseline**	**2030**	
		No container	No container	
Handling of Future		**Baseline**	**2030**	

Non-Container Demand	In 2014, about 2.75 mil ton of bulk cargo were handled	Not set target volume of coal (23 mil ton of bulk as the national total)
Expected Function	The coal terminal is expected to function as bulk terminal to supply coal for power supply required to Colombo capital city area.	
Improvement of Efficiency		
Improvement of Cargo Handling Efficiency	Facilitated transport of coal	
Connection with Other Modes	The new railway access between Colombo capital city and the Trincomalee port is planned to develop.	
Ease of Implementation		
Preparation Status	Preliminary Development plan for bulk terminal by SLPA was already prepared.	
Impact on Natural/Social Environment	The coal handling and transport is considered non eco friendly project by coal dust, which however can be mitigated technically. The impacts by coal dust shall be assessed by EIA stage.	

Project Outline				
Project ID	**Country**	**Location**	**Type**	**Scheme**
SP-S-8	Sri Lanka	Galle	Sea Port	Finance
Project Name	**Development of multipurpose berth and breakwater construction**			
Project Description	The Project consists of construction of multipurpose berth of 300m long and -12m depth and construction of breakwater 1,400m length to shelter the port area from the high waves during monsoon.			
Estimated Cost	80 Mil. USD			
Current Issues	SLPA aware that the project loan by JICA will expire in the year 2016 and wait the diplomatic decision for resuming the project.			
Relevance and Importance to Economy/Industry				
Related Plans, Programs and Projects	SLPA has prepared the revised development plan in compliance with the comments by Heritage Impact Assessment (HIA) to UNESCO and submitted the report to them in 2015. SLPA received the indication of acceptance of revised development plan by HIA UNESCO			
Hinterland Area/ Beneficiaries	The development of the Port of Galle will focus on attracting world cruise ships and yacht based tourist arrivals towards assisting the trend in tourism based on world heritage sites, in addition to multipurpose cargo handling.			
Benefit for Japanese Companies	The development plan was prepared by the consultant under JICA finance, who had assisted SLPA to prepare the clarifications to the comments of HIA, UNESCO since 2010.			
Demand of Freight Transport				
Handling of Future Container Demand	**Baseline**	**2030**		
	No container	No container		
Handling of Future Non-Container Demand	**Baseline**	**2030**		
	In 2014, about 394,000 ton of bulk cargo were handled	23 million ton as a total of the country		
Expected Function	The Galle Port will be developed as a Regional port as well as a center for tourist attraction and provide a fully-fledged yacht marina.			
Improvement of Efficiency				
Improvement of Cargo Handling Efficiency	The Port accepts the ships up to the length of 130m and depth of 9m due to the limited geometry of the channel at the entrance to the port. By the project, longer length and deeper draft bulk carriers can be accepted. Accordingly transport cost of bulk cargo will be reduced.			
Connection with Other Modes	The national highway from Colombo to Hambantota was developed, which provide the better access from the Colombo to Galle. The road from this national highway to the gate of the port is narrow and congested			

	with residents. The port office requested to develop this access road by widening with concrete pavement.
Ease of Implementation	
Preparation Status	The development plan and detailed design were completed. SLPA expects the approval from UNESCO in 2016 and subsequently resuming the project by extending the existing loan.
Impact on Natural/Social Environment	SLPA considers that the project is viable for providing safe shelters from tsunami to fishery operation, and protecting fishery facilities and rampart of Galle Fort from monsoon waves.

Project Outline				
Project ID	**Country**	**Location**	**Type**	**Scheme**
SP-S-9	Sri Lanka	Ports in North Provinces	Sea Port	Development Survey and Finance
Project Name		**Development of regional ports for contribute increasing trades between southern India and northern Sri Lanka**		
Project Description		The regional ports of Kankasanthurai, Myliddy, Point Pedro & Karainagar located along the north coast are required for enhancement of the existing port capacity and to improve trade between southern states of India and northern parts of Sri Lanka.		
Estimated Cost		150 Mil US$ for construction		
Current Issues		SLPA considers that the northern parts of the country have potential to develop industrialization by increasing trade with India.		
Relevance and Importance to Economy/Industry				
Related Plans, Programs and Projects		SLPA acknowledges the necessity of rehabilitation/reinforcement of the existing port facilities at Manner and Kankesanturai (near Jaffna) and to develop multipurpose terminal for handling general cargo, container, bagged cargo, Ro-Ro service as regional port.		
Hinterland Area/ Beneficiaries		The hinterland of these ports will be southern provinces of India and northern provinces of Sri Lanka including Colombo City area.		
Benefit for Japanese Companies		No		
Demand of Freight Transport				
Handling of Future Container Demand		**Baseline**	**2030**	
		No container	No container	
Handling of Future Non-Container Demand		**Baseline**	**2030**	
		in 2014, about 22,000 ton of general and bulk cargo were handled	23 million ton as a total of the country	
Expected Function		These ports are expected to function as regional gate port of Sri Lanka for southern ports of India.		
Improvement of Efficiency				
Improvement of Cargo Handling Efficiency		Once the existing port facilities are upgraded to handle containers by installing cargo handling equipment and stock yard area, the project will contribute a great potential for developing industrial estates alongside the trunk road and accelerate the trade with India, subsequently contributing to regional development.		
Connection with Other Modes		The direct trunk road from Jaffna-Colombo (A9 Road) has already developed.		
Ease of Implementation				
Preparation Status		SLPA acknowledges the necessity of rehabilitation/reinforcement of the existing port facilities at Manner and Kankesanturai (near Jaffna) and to develop multipurpose terminal. SLPA prepares draft concept development plan of the engineering study.		
Impact on Natural/Social Environment		No negative environmental impacts are foreseen		

(2) Other Infrastructure

Project Outline				
Project ID	**Country**	**Location**	**Type**	**Scheme**
OI-B-1	Bangladesh	Mongla Port	Other Infrastructure	Self-finance

Project Name	**Improvement of connectivity from Dhaka by development of highway, railway link from Mongla to Khulna**	
Project Description	Construction of access roadway and railway between the Port and Khulna Mongla port is located about 131 km away from the sea and about 150km from Dhaka. The government MOS issued the following supporting programs for development of container terminal in this port i) Improvement of connectivity from Dhaka by development of highway, railway link from Mongla to Khulna, ii) Padma Bridge will be constructed for /efficient connectivity between Mongla and Dhaka iii) Airport is developed at Khanjahan Ali about 21 km from Mongla to Dhaka	
Estimated Cost	Approximately 300 million USD	
Current Issues	The development of Connectivity to the Port is required	
Relevance and Importance to Economy/Industry		
Related Plans, Programs and Projects	Central government approved this project and the construction works are scheduled to start from 2016.	
Hinterland Area/ Beneficiaries	By development of direct connectivity between the Port and the hinterland, the economic growth of these regions will be generated by faster delivery of goods and peoples.	
Benefit for Japanese Companies	Japanese shipping lines use this port and transports freeze cargo from Chittagong port. They will receive benefit of efficient connectivity in faster delivery of import/export cargo from the port to Dhaka metropolitan area.	
Demand of Freight Transport		
Handling of Future Container Demand	**Baseline**	**2030**
	MPA handled 43,370 TEU in 2014	Approximately 800,000 TEU Design capacity is set 400,000 TEU. Marginal demands have to be handled in a new port(s).
Handling of Future Non-Container Demand	**Baseline**	**2030**
	MPA handled 4.08Mil ton of dry and liquid bulk cargo and general cargo in 2014	The design capacity of the present facilities is not set.
Expected Function	The port function as international gate port of the transit trade service to neighbor countries Nepal, Bhutan, and border area of Neighboring country (India)	
Improvement of Efficiency		
Improvement of Cargo Handling Efficiency	Container and cargo demands to the port will be generated by faster delivery of efficient logistic system. The transportation cost of cargo/containers will be reduced by providing direct connectivity between the port and Dhaka metropolitan area.	
Connection with Other Modes	Roads, bridge and railway development will generate direct delivery cargo volume from the Port to Capital city area.	
Ease of Implementation		
Preparation Status	Central Government had already approved this connectivity projects in 2014 and construction works are scheduled to start in 2016.	
Impact on Natural/Social Environment	The project is implemented on the extension of the existing cargo berth by expansion of the existing jetty. Impact on natural/social environment will be mitigated.	

<table>
<tr><th colspan="5">Project Outline</th></tr>
<tr><th>Project ID</th><th>Country</th><th>Location</th><th>Type</th><th>Scheme</th></tr>
<tr><td>OI-B-2</td><td>Bangladesh</td><td>Narayangonj River Port Development</td><td>Inland Water Transport</td><td>PPP</td></tr>
</table>

<table>
<tr><td>Project Name</td><td colspan="2">Inland Container Terminal (ICT) and Access Link Roads Development of Inland Water Way around Narayangonj river port area</td></tr>
<tr><td>Project Description</td><td colspan="2">BIWTA planned to develop the following projects of inland waterways Narayangonj River Port area by 2030
• Development of ICT at Khanpur area by PPP scheme
• Development of Eco Park at Khanpur area by PPNB(Project Proposal National Budget)
• Modernized terminal building and berthing facilities
• Construction of bank protection with waterway along the Shitalakha river both sides at Khanchpur to Kumudini
• The Link road from Khanpur to Chasara needs to develop & Expand before completes the project at Khanpur terminal</td></tr>
<tr><td>Estimated Cost</td><td colspan="2">30 Mil. USD</td></tr>
<tr><td>Current Issues</td><td colspan="2">To meet the demands of container transport from Chittagong port to Dhaka area, BIWTA plans to enhance transportation capacity of containers by inland waterway from Chittagong Port</td></tr>
<tr><th colspan="3">Relevance and Importance to Economy/Industry</th></tr>
<tr><td>Related Plans, Programs and Projects</td><td colspan="2">BIWTA had already approved to develop ICT by 5 private developers.</td></tr>
<tr><td>Hinterland Area/ Beneficiaries</td><td colspan="2">There would be benefits by development of Inland Container Terminal as follows;
• Enhance the transportation capacity of cargo, container, passengers and vehicles to mitigate traffic congestion of on -land transport.
• Related connectivity modes like roads and railway facilities will be encouraged to improve the logistic traffic flow in nationwide by using inland waterways</td></tr>
<tr><td>Benefit for Japanese Companies</td><td colspan="2">No.</td></tr>
<tr><th colspan="3">Demand of Freight Transport</th></tr>
<tr><td rowspan="2">Handling of Future Container Demand</td><td>Baseline</td><td>2030</td></tr>
<tr><td>Containers at Pangaon: 1,805 TEU</td><td></td></tr>
<tr><td rowspan="2">Handling of Future Non-Container Demand</td><td>Baseline</td><td>2030</td></tr>
<tr><td>In 2015, IWT transport the following traffic volume:
Passengers : 18.46 Mil
Cargo : 8.0 Mil ton
Vehicles : 2.31 mil units</td><td></td></tr>
<tr><td>Expected Function</td><td colspan="2">The development of ICT by BIWT will function as one of main transportation routes of containers from the Chittagong Port. It is also contributed to improve container handling volume at Chittagong Port and in future for Mongla port, Payra Port by transit containers to the Industrial Estates operating around Dhaka area by using water ways.</td></tr>
<tr><th colspan="3">Improvement of Efficiency</th></tr>
<tr><td>Improvement of Cargo Handling Efficiency</td><td colspan="2">The cargo/container handling efficiency will be improved by providing stock yards area within the ports by removing containers quickly from the Port area of Chittagong port and other main ports.</td></tr>
<tr><td>Connection with Other Modes</td><td colspan="2">The connectivity from the river port to city by road and railway are poor conditions. It is necessary to develop or expand the existing facilities. BIWTA plans to develop the roads and commuter public service facilities around the main river port to improve the connectivity.</td></tr>
<tr><th colspan="3">Ease of Implementation</th></tr>
</table>

Preparation Status	BIWTA has approved this projects in the proposed long term development projects by 2030
Impact on Natural/Social Environment	Unknown (to be investigated)

Project Outline				
Project ID	**Country**	**Location**	**Type**	**Scheme**
OI-B-3	Bangladesh	Development of Inland waterway from Kolkata (India) to Ashuganj (Bangladesh)	Inland Water Transport	Finance by foreign government
Project Name		**Inland water way development by Bangladesh and India Government**		
Project Description		The protocol signed between India and Bangladesh to develop the connectivity routes by using the existing water ways from India's Kolkata area to Ashuganj ICT in Bangladesh, in which users will go through the inland waterway and transit at this point to railway and trucks to Akhaura in Bangladesh border and cross to Agartala in Tripura of north east province of India (Tripura, Assam, Mizoram, Aran, and Meghalaya provinces).		
Estimated Cost		200 Mil US$		
Current Issues		India government desires to transport cargo, and passengers between North East Province and Kolkata Region. India Government proposed to utilize inland waterway of Bangladesh. For this objective India and Bangladesh agreed to implement the project and exchange the LOC.		
Relevance and Importance to Economy/Industry				
Related Plans, Programs and Projects		The India government conducted feasibility study in 2014 to select the optimum routes considering the urgency, economic effects, and remote support. The study found that the route 1 is the most practical and the best cost performance among the three routes. The project was urgently required for implementation by large number of users. BIWTA is responsible of maintain the depth of agreed routes (Kolkata – Narayangonj inland river port) of Bangladesh parts at the cost of LOC from India.		
Hinterland Area/ Beneficiaries		For India side; the logistic and communication between North Province and Kolkata region will be improved. For Bangladesh; More than 90% of the traffic is transported from Bangladesh to India. If the infrastructure of inland waterway is developed, the Bangladesh transporting companies can deploy larger ships and transportation capacity is expanded and time will get shorter.		
Benefit for Japanese Companies		No.		
Demand of Freight Transport				
Handling of Future Container Demand		**Baseline**	**2030**	
		N/A	N/A	
Handling of Future Non-Container Demand		**Baseline**	**2030**	
		In 2014, The following cargo volume was transported; Inter country; 1.93 Mil ton. Transit volume; 14,840 ton, Transshipment; 10,000 ton Bangladesh; 1.912 Mil ton, India 21,327 ton	N/A	
Expected Function		This route will function as main corridor of border crossing in the logistic flow for both countries		
Improvement of Efficiency				

Improvement of Cargo Handling Efficiency	BY using the inland water way in Bangladesh, the transport cost and time are substantially saved due to direct delivery between both destinations, instead of taking a roundabout routes from Kolkata area through northern countries to the North-East province
Connection with Other Modes	The connectivity from the river port to city by road and railway are poor conditions. It is necessary to develop or expand the existing roads and rail way facilities.
Ease of Implementation	
Preparation Status	BIWTA has approved this project in the proposed long term development projects and Protocol was signed with India Government for implementation of the project under the LOC.
Impact on Natural/Social Environment	Unknown (to be investigated)

Project Outline				
Project ID	**Country**	**Location**	**Type**	**Scheme**
OI-B-4	Bangladesh	Dhaka	Inland Water way Transport	Finance (Procurement of equipment)
Project Name		**Procurement and installation of VTS (Vessel Tracking System) for safe navigation of Inland waterway in Dhaka city**		
Project Description		Required to install VTS (Vessel tracking System) at the following routes for monitoring the safe operation of ferry ships. The traffic volume of these routes are heavily congested with ferry ships carrying vehicles to cross the river		

Name Route	Distance	Traffic volume
Paturia-Daulatdia, Paturia-Kazirhat,	19 km	Daily 5,000 units of vehicles transported to cross river by 17 ferry
Mawa-Charjanajat, Mawa-Kathalbari	10 – 15 km	Daily 3,000 units of vehicles transported to cross river by 16 ferry

Main equipment required

Equipment supply ; Install radar tower of VTS at above two routes on both sides of the river respectively. Equipment of communications, receiving equipment such as VHF, AIS and GYRO) required to install on each ferry and communicate each other for avoiding the collision among ships and ferry.

Provision of training transferring the engineering for operation of such equipment,

Estimated Cost	Approx. 50 Mil US$
Current Issues	As Dhaka is surrounded by the Buriganga, Dhaleswari, Turag, Balu and Shitalakhya waterways. Safe navigation through the heavily congested routes of above is essentially required to avoid collision among ferry ships.
Relevance and Importance to Economy/Industry	
Related Plans, Programs and Projects	N/A
Hinterland Area/ Beneficiaries	Dhaka City area, for ferry users of this routes are about 2.13 mil vehicles and 18.16 Mil passengers in 2014-2015
Benefit for Japanese Companies	No

Demand of Freight Transport		
Handling of Future Container Demand	**Baseline**	**2030**
	N/A	N/A
Handling of Future Non-Container Demand	**Baseline**	**2030**
	Traffic volume through this route	N/A

	by IWT in 2014-2015 Passengers; 18.16 mil Vehicles; 2.13 units	
Expected Function	Providing safe navigation to ferry ships for transporting vehicles and passengers	
Improvement of Efficiency		
Improvement of Cargo Handling Efficiency	Reduction of congestion on roads	
Connection with Other Modes	Main roads on both sides of the rivers concerned are constructed, but connecting access roads between ferry terminals and main roads are required.	
Ease of Implementation		
Preparation Status	BIWTC have already submitted the application to MOS in April 2015 requesting to utilize JDCF (Japan Deft Cancellation Fund) for procurement of 24 water bus ships in 2016-2017 at the cost of 2,555.1MilTK.	
Impact on Natural/Social Environment	Unknown (to be investigated)	

Project Outline				
Project ID	**Country**	**Location**	**Type**	**Scheme**
OI-B-5	Bangladesh	Dhaka	Inland Water way Transport	Finance
Project Name		**Circular Waterway Transport Service around Dhaka Waterway**		
Project Description		The development of waterway transport facilities was implemented and completed in two phases. 1st phase from Sardaghat to Gabtol (16.00 Km) in 2005 and 2nd phase from Gabtol to Ashulia (29.00 km) was completed in 2013. The 3rd Phase 3 from Tongi area to Kachpur (40.50 Km) will be carried out. BIWTC started the circular water way around the Dhaka city to relief the city traffic congestions with 12 water bus ships (40 passengers per ship).		
Estimated Cost		35 Mil US$		
Current Issues		As Dhaka is surrounded by the Buriganga, Dhaleswari, Turag, Balu and Shitalakhya waterways. With the failure to attract the passengers to use the circular waterway, many commercial water vessels are using the route to carry soil or sand as construction materials. According to BIWTA, the number of trips of water vessels carrying sand or soil is decreasing 2,000 daily truck trips which are supposed to enter the city.		
Relevance and Importance to Economy/Industry				
Related Plans, Programs and Projects		BITWA development policy		
Hinterland Area/ Beneficiaries		Dhaka City area for safe navigation of inland waterway area		
Benefit for Japanese Companies		No		
Demand of Freight Transport				
Handling of Future Container Demand		**Baseline**	**2030**	
		N/A	N/A	
Handling of Future Non-Container Demand		**Baseline**	**2030**	
		During July 2014 to Feb 2015 for 8 months, more than 50,000 passengers used this service.	N/A	
Expected Function		BIWTC intends to develop water buses and improve circular water way transport service with loading/unloading facilities around Dhaka		

	metropolitan area.
Improvement of Efficiency	
Improvement of Cargo Handling Efficiency	Reduction of congestion on roads
Connection with Other Modes	Lack of intermodal facilities from the stations Insufficient approach roads to the stations Insufficient approach roads to the stations
Ease of Implementation	
Preparation Status	The project is implemented by their national budget and proposed to include national budget of 2016-2017.
Impact on Natural/Social Environment	Unknown (to be investigated)

Project Outline				
Project ID	**Country**	**Location**	**Type**	**Scheme**
OI-P-1	Pakistan	Karachi Port	Other Infrastructure	Finance

Project Name	**Development of Cargo village Industrial Park / Off Dock Facility**	
Project Description	To develop cargo village-Industrial Park/Off Dock Facility in the Northern part of the Western Backwaters area, west of Karachi Fish harbor. The following facilities are planned in the cargo village. Coal Power Plant (500 to 1000 Megawatts), Refrigerated cargo facilities, Inland Container Depot (ICD), Multipurpose berth of 360m length, Two access roads connecting Cargo Village with Lyari Expressway/Maripur Road in the north and ICI-Bridge in the east, Rail access	
Estimated Cost	200 Mil USD for KPT portions	
Current Issues	The outputs by the FS study shall be made attractive to private investors. KPT looks for the project loans to develop basic infrastructure of the project.	
Relevance and Importance to Economy/Industry		
Related Plans, Programs and Projects	KPT listed this project as one of the major projects proposed in KPT Business Plan and Strategic Development Plan-Final in September 2011. Feasibility study was completed and design consultancy was awarded to German consultant. The project will be executed under PPP scheme/BOT	
Hinterland Area/ Beneficiaries	The hinterland of this terminal will be Karachi Metropolitan city area.	
Benefit for Japanese Companies	No Japanese shipping lines, trade companies have shown any interests.	
Demand of Freight Transport		
Handling of Future Container Demand	**Baseline**	**2030**
	No container	No container
Handling of Future Non-Container Demand	**Baseline**	**2030**
	No bulk cargo	To handle 5.0 mil ton/year of coal
Expected Function	This village will function of transshipment of cargo between the terminals within the KPT and delivery of cargo from these villages to up country through the access road and rails directly by the elevated express way to outside the port area.	
Improvement of Efficiency		
Improvement of Cargo Handling Efficiency	N/A	
Connection with Other Modes	This cargo village is connected to Layari Expressway to the future Karachi Port crossing from Karachi Deep Water Port.	
Ease of Implementation		
Preparation Status	KPT conducted feasibility study by IBRD TA. KPT plans to implement this project by PPP scheme. KPT awarded the design consultant.	

Impact on Natural/Social Environment	The project is located in the Northern part of the Western Backwaters. Two access roads connecting to the future Karachi harbor crossing Karachi Deep Water Port are planned to be developed. The traffic contingency within the port and city will be relieved.

Project Outline				
Project ID	**Country**	**Location**	**Type**	**Scheme**
OI-P-2	Pakistan	Bin Qasim	Other Infrastructure	Development Survey and Finance
Project Name		**Development of Japan Special Economic Zone, Dhabeji, Thatta**		
Project Description		1,000 acres of land are allocated for the establishment of a Special Economic Zone dedicated to Japanese industries by the Sindh Board of Investment.		
Estimated Cost		Approx. 100 Mil. USD		
Current Issues		Industrial development of the province is desired.		
Relevance and Importance to Economy/Industry				
Related Plans, Programs and Projects		Improvement of the Port Bin Qasim		
Hinterland Area/ Beneficiaries		Sindh province and upcountry		
Benefit for Japanese Companies		This project is dedicated to Japanese companies.		
Demand of Freight Transport				
Handling of Future Container Demand		**Baseline**	**2030**	
		N/A	Import of materials and export of products through Port Bin Qasim	
Handling of Future Non-Container Demand		**Baseline**	**2030**	
		N/A	Import of materials and export of products through Port Bin Qasim	
Expected Function		To provide intermediate and final products to domestic and foreign markets.		
Improvement of Efficiency				
Improvement of Cargo Handling Efficiency		Arrangement for bonded transport from/to the port to be considered		
Connection with Other Modes		Easy access of Port Qasim enabling raw material import and finished goods export without incurring major inland transportation costs and saving time. Direct access to the National Highway enabling the transportation of goods to upcountry and Central Asian nations utilizing the National Trade Corridor.		
Ease of Implementation				
Preparation Status		The Sindh Board of Investment has initiated the idea, but feasibility study has not been undertaken.		
Impact on Natural/Social Environment		Unknown (to be investigated)		

Project Outline				
Project ID	**Country**	**Location**	**Type**	**Scheme**
OI-S-1	Sri Lanka	Colombo	Other Infrastructure	Private investment
Project Name		**Construction of a Modern Port City inclusive of all city facilities**		
Project Description		The Project is to develop Coastal Municipal city in adjacent to the South Harbor by reclamation in the area of 575 ha. The reclamation works was already started in 2014 by China Investors		

Estimated Cost	700-1,000 Mil. USD	
Current Issues	N/A	
Relevance and Importance to Economy/Industry		
Related Plans, Programs and Projects	Related Plans will be Colombo South Harbor Development and Port Access Elevated Road Development, City Monorail transport development.	
Hinterland Area/ Beneficiaries	Capital city of Colombo, population of capita city at 2,320,000 and 50 % of GDP (74.94 Bil USD/2=37.47 Bil USD in 2014)	
Benefit for Japanese Companies	No Japanese investors are involved yet.	
Demand of Freight Transport		
Handling of Future Container Demand	**Baseline**	**2030**
	No container	No container
Handling of Future Non-Container Demand	**Baseline**	**2030**
	No cargo	No cargo
Expected Function	Urban development around the international hub port	
Improvement of Efficiency		
Improvement of Cargo Handling Efficiency	N/A	
Connection with Other Modes	N/A	
Ease of Implementation		
Preparation Status	The China investor and SLPA had made the contract agreement of this project in 2014. The Construction works by land reclamation had already started	
Impact on Natural/Social Environment	Development of coastal area by reclamation will cause the changes of coastal line by sedimentation/erosion. It is afraid that the visual appearance of the present coastal scenery will be spoiled by large reclamation.	

Project Outline				
Project ID	**Country**	**Location**	**Type**	**Scheme**
OI-S-2	Sri Lanka	Colombo	Other Infrastructure	Loan

Project Name	**Modernization of Road Network within the Port Premises**	
Project Description	Developing the existing inner Colombo port roads to make a good connection with the planned Port Access Highway called "New Kelani Bridge (NKB) to Fort" and Baseline Highway called "Kirulapone to New Kelani Bridge" which are the parts of Development of Elevated Highway Network in Colombo city (to be developed in 2016).	
Estimated Cost	300 Mil. USD	
Current Issues	Traffic outside the port and within the Colombo port area is heavily congested. The Project is required to be implemented immediately	
Relevance and Importance to Economy/Industry		
Related Plans, Programs and Projects	Government of Sri Lanka proposed Japan assistant to develop the parts of the planned access road development project	
Hinterland Area/ Beneficiaries	Capital city of Colombo, population of capita city at 2,320,000 and 50 % of GDP (74.94 Bil USD/2=37.47 Bil USD in 2014)	
Benefit for Japanese Companies	Japanese companies as Port users will get large benefit in their logistic supply chain by time saving in transport cargo to hinterland area.	
Demand of Freight Transport		
Handling of Future Container Demand	**Baseline**	**2030**
	Container handling volume 4.908 Mil TEU in Colombo port and	Estimated around 8.9 Mil TEU

	South harbor in 2014	
Handling of Future Non-Container Demand	**Baseline**	**2030**
	7,485, 800 ton in 2014	23 million ton as a total of the country
Expected Function	The Port is expected to function as regional hub and Transshipment container terminal in this South Asia /Indian ocean	
Improvement of Efficiency		
Improvement of Cargo Handling Efficiency	The congestion at point of New Kelani Bridge is heavily congested. By development of proposed Port Access highway, the time saving in transport cargo between the port and destination are expected.	
Connection with Other Modes	The development of the proposed port access highway will improve substantially the traffic conditions in Colombo cist and provide the direct access from industrial parks outside the city to the container terminals in Colombo port and South harbor.	
Ease of Implementation		
Preparation Status	ADB conducted feasibility study. ADB started discussion with RDA of possibility of ADB load for this project.	
Impact on Natural/Social Environment	The traffic congestion around the port and city roads conecting to national highways will be relieved and contribute large time saving in logistic supply to port users and industries in the hinterland	

Project Outline				
Project ID	**Country**	**Location**	**Type**	**Scheme**
OI-S-3	Sri Lanka	Colombo	Other Infrastructure	Finance

Project Name	**Establishment of dry ports in Sri Lanka**	
Project Description	There is insufficient land for cargo storage inside and nearby Colombo port. SLPA/NPD planned to develop an off-dock cargo village outside the port area by connecting the Colombo port and proposed cargo village with railway.	
Estimated Cost	100 Mil US$	
Current Issues	The facilities of cargo village and railway are required to enhance port handling capacity particularly transit containers and to mitigate city traffic congestion by railway transport.	
Relevance and Importance to Economy/Industry		
Related Plans, Programs and Projects	The development plan is under preparation	
Hinterland Area/ Beneficiaries	Capital city of Colombo, population of capita city at 2,320,000 and 50 % of GDP (74.94 Bil USD/2=37.47 Bil USD in 2014)	
Benefit for Japanese Companies	Japanese shipping lines of transshipping transit containers through the Port will get large benefit in their logistic supply chain by time saving in transit container.	
Demand of Freight Transport		
Handling of Future Container Demand	**Baseline**	**2030**
	Container handling volume through JCT 2.55 Mil TEU in 2014	Estimated around 3.50 Mil TEU
Handling of Future Non-Container Demand	**Baseline**	**2030**
	The transit container volume in 2014 was around 25 % of total volume (around 1.22 Mil TEU)	Estimated around 3.66 Mil TEU
Expected Function	The Port is expected to function as regional hub and Transshipment container terminal, there will be domestic demands as transit container about 25% of the total container volume.	
Improvement of Efficiency		

Improvement of Cargo Handling Efficiency	Expedited cargo handling
Connection with Other Modes	The new cargo village is located and easy connection to the extension of Port Access Highway and A-1 Highway; Kadawatha to NKB.
Ease of Implementation	
Preparation Status	The development plan is completed and identifies 4 candidate sites for development of dry ports. F/S study is required for selection of optimum site of the project.
Impact on Natural/Social Environment	The traffic congestion around the port and city roads connecting to port access highways will be relieved to access to the cargo village.

(3) Soft Component

Project Outline				
Project ID	**Country**	**Location**	**Type**	**Scheme**
SO-B-1	Bangladesh	Nation-wide Hydrographic Survey of IWT routes	Soft (Inland Water way Transport)	Development Survey/ Technical Cooperation

Project Name	**Nationwide hydrographic survey of Inland water way and Determination of Standard Low water and High Water levels**
Project Description	The objective of this survey is as follows; • To collect water level data through GSM network • To carry out comprehensive hydrographic survey and to produce digital hydrographic data of inland waterway • To grasp the correct position of current state of the nationwide inland waterway, its extension and the water depth. • to review the standard high water level and low water level • to review the current classification of criteria of the current waterway. The distance of inland waterway was 24,000 km in 1974 (which was reduced to 6,000 km during monsoon season and only 3,800 km during dry season), but the distance became 4,800 km in 1989 even during dry season.
Estimated Cost	Approx.; 30-50 Mil US$
Current Issues	Since 18 century, no hydrographic survey was carried out to cover the national inland waterway channels. BIWTA need such survey to obtain the basic data
Relevance and Importance to Economy/Industry	
Related Plans, Programs and Projects	JICA provided the Technical cooperation and providing technical expert to Bangladesh Government for training the staffs to conduct aero photo survey of the nationwide land area. Based on this experience BIWTA requests for JICA TA to conduct hydrographic survey of the nationwide inland waterway routes and technical transfer and training to the government staffs.
Hinterland Area/ Beneficiaries	Bangladesh nationwide inland waterway area
Benefit for Japanese Companies	Japanese Aero photo company had involved the past aero photo survey of whole nationwide land area under JICA assistants by technical cooperation from 2008 up to 2018.

Demand of Freight Transport		
Handling of Future Container Demand	**Baseline**	**2030**
	-	-
Handling of Future Non-Container Demand	**Baseline**	**2030**
	-	-

Expected Function	Results of the hydrographic survey digital data will be used for establishing the basic data for classification of national inland waterway hierarchical and review the present grade of the IWT classification in future.
Improvement of Efficiency	
Improvement of Cargo Handling Efficiency	Potential reduction of congestion on roads
Connection with Other Modes	Potential improvement of connectivity with ports, roads, and railways
Ease of Implementation	
Preparation Status	BIWTA prepare Project Brief of the proposed hydrographic survey and submits to MOS for requesting for JICA T/A.
Impact on Natural/Social Environment	N/A

<table>
<tr><th colspan="5">Project Outline</th></tr>
<tr><th>Project ID</th><th>Country</th><th>Location</th><th>Type</th><th>Scheme</th></tr>
<tr><td>SO-I-1</td><td>India</td><td>-</td><td>Soft</td><td>Technical Cooperation</td></tr>
<tr><td colspan="2">Project Name</td><td colspan="3">Technical cooperation project for capacity development concerning port planning and operation</td></tr>
<tr><td colspan="2">Project Description</td><td colspan="3"><u>Purpose</u>
1) Capacity development for the staff (senior staff and technical staff) of the Ministry of Shipping and Port Trusts in the area of port planning, whereby the staff would become capable for preparation of port development master plans, by engaging consultants as appropriate
2) Technical assistance for the staff (senior staff and technical staff) of port trusts, which will enable the staff to follow up the actions proposed by the recently completed Port Strategic Roadmaps
<u>Input</u>
Dispatch of experts (port planning, technical investigation, technical design, civil work, port management, port operation, port IT system design, economist, financial specialist, environmentalist, social expert), provision of training
<u>Activities</u>
1) Assessment of the current situation in terms of port planning and port operation in India, 2) design and implementation of training programs, including On-the-Job Training (OJT)</td></tr>
<tr><td colspan="2">Estimated Cost</td><td colspan="3">USD 1.5 million</td></tr>
<tr><td colspan="2">Current Issues</td><td colspan="3"><u>Port planning</u>
In India, project preparation is undertaken by port trusts through feasibility studies, followed by preparation of Detailed Project Reports (DPRs). These exercises are conducted without a long-term vision for concerned ports. Therefore, preparation of port development master plans should be considered, which would align with national and regional development plans, and capture the projects to be proposed by the National Perspective Plan under preparation.
<u>Port operation</u>
A technical cooperation project by JICA to alleviate the traffic congestion at Chennai Port is on-going. In addition, a report of Port Strategic Roadmaps which proposes actions with timelines for each major port to improve port efficiency and performance has been prepared. While more and more port facilities are being developed, it is imperative to ensure that the increasing port facilities are properly operated and that the entire port is operated effectively.</td></tr>
<tr><th colspan="5">Relevance and Importance to Economy/Industry</th></tr>
<tr><td colspan="2">Related Plans, Programs and Projects</td><td colspan="3">-</td></tr>
<tr><td colspan="2">Hinterland Area/ Beneficiaries</td><td colspan="3">-</td></tr>
<tr><td colspan="2">Benefit for Japanese Companies</td><td colspan="3">-</td></tr>
<tr><th colspan="5">Demand of Freight Transport</th></tr>
<tr><td colspan="2" rowspan="2">Handling of Future Container Demand</td><td colspan="2">Baseline</td><td>2030</td></tr>
<tr><td colspan="2">-</td><td>-</td></tr>
<tr><td colspan="2" rowspan="2">Handling of Future Non-Container Demand</td><td colspan="2">Baseline</td><td>2030</td></tr>
<tr><td colspan="2">-</td><td>-</td></tr>
<tr><td colspan="2">Expected Function</td><td colspan="3">-</td></tr>
<tr><th colspan="5">Improvement of Efficiency</th></tr>
<tr><td colspan="2">Improvement of Cargo Handling Efficiency</td><td colspan="3">Potential improvement of efficiency by strengthened operational capacity</td></tr>
</table>

Connection with Other Modes	-
Ease of Implementation	
Preparation Status	-
Impact on Natural/Social Environment	-

Project Outline				
Project ID	**Country**	**Location**	**Type**	**Scheme**
SO-S-1	Sri Lanka	Colombo	Port Development	Development Survey/ Technical Cooperation
Project Name	**Study of a long term nationwide ports development project**			
Project Description	The Project is to conduct the study of preparing long term development plan (Master Plan of each port) of all ports of Sri Lanka. Corresponding to the latest demand to the ports of Sri Lanka, SLPA needs the long-term development plan of Colombo harbor and other regional ports in the country.			
Estimated Cost	US$2.0 Mil for the Study			
Current Issues	The old aged berthing facilities in the Colombo Port shall be renovated to modern terminal facilities to meet the current and future demands. The Coal Terminal Development at Trincomalee Port area is national economic viable project and support National energy supply plan to provide through out of the year Development and enhancement of regional ports in northern coast to encourage trade between Southern India and North of Sri Lanka. It is required to prepare long term nationwide port development plan targeted year 2040-2050.			
Relevance and Importance to Economy/Industry				
Related Plans, Programs and Projects	To renovate the existing passenger berths to handle general cargo, Berth No 1, 2B, 11 and 12 of JCT and provide the berthing facilities to feeder ship lines of Mega Carriers. Alignment of Port Access road shall be planned such as city traffic does not come into the Port area. SLPA plans to develop a concept for a tourist attraction area combined to with the port facilities and a number of colonial design buildings located around the port area. In order to realize this concept, a long distance cruiser ship terminal is planned. Improvement of Specific Ro-Ro terminal with sufficient depth and length.			
Hinterland Area/ Beneficiaries	Capital city of Colombo, population of capita city at 2,320,000 and 50 % of GDP (74.94 Bil USD/2=37.47 Bil USD in 2014)			
Benefit for Japanese Companies	Many Japanese companies use the main ports of Sri Lanka. They are interested to know how all ports of Sri Lanka will be developed.			
Demand of Freight Transport				
Handling of Future Container Demand	**Baseline**		**2030**	
	Container handling volume 4.908 Mil TEU in Colombo port and South harbor in 2014		Around 15 Mil TEU by Colombo and South harbor	
Handling of Future Non-Container Demand	**Baseline**		**2030**	
	7,485, 800 ton in 2014		23 million ton as a total of the country	
Expected Function	Colombo port; Main Gate port of the country, and major transshipment port. Other ports function as regional hub port or regional gate port. SLPA shall make the Colombo port together with South Harbor to be rated among the top container ports in the world.			
Improvement of Efficiency				

Improvement of Cargo Handling Efficiency	Potential improvement of efficiency by better coordinated plan among the ports and related infrastructure
Connection with Other Modes	Port Access of all the ports concerned will be improved in the long term period
Ease of Implementation	
Preparation Status	SLPA recognized the necessity to conduct the study of long term national ports development plan. TOR for the study is not yet prepared.
Impact on Natural/Social Environment	The impacts on natural/social environment are assessed under this study.

Project Outline				
Project ID	**Country**	**Location**	**Type**	**Scheme**
SO-R-1	Bangladesh India Pakistan Sri Lanka	-	Soft	Technical Cooperation
Project Name		**Technical cooperation project for capacity development concerning implementation of port projects under PPP scheme**		
Project Description		Purpose Capacity development for the staff (senior staff and technical staff) of the concerned ministries as well as port authorities from the four countries, whereby the staff could enhance capabilities for preparation and implementation of port projects under PPP scheme. Input Dispatch of experts (PPP expert, legal expert, port engineer, economist, financial expert, environmentalist, social expert), provision of training Activities 1) Assessment of capacity of the concerned staff, 2) assessment of past port PPP projects, 3) design and implementation of customized training programs including On-the-Job Training (OJT), depending on the level of each country's experience, 4) provision of a group workshop involving the four countries		
Estimated Cost		USD 1.0 million		
Current Issues		India has a lot of experience in port development under PPP scheme, but the implementation is sometimes subject to delays. In the case of Sri Lanka, though it has some experience with PPP, SLPA feels that their staff needs to enhance their knowledge of PPP in order for future PPP projects to be carried out more effectively. Bangladesh and Pakistan, on the other hand, have limited PPP experience and thus there is an urgent need for capacity development in this area. In this regard, enhancement of technical capability of the public sector for implementation of port projects under PPP scheme is a common area for the four countries.		
Relevance and Importance to Economy/Industry				
Related Plans, Programs and Projects		-		
Hinterland Area/ Beneficiaries		-		
Benefit for Japanese Companies		-		
Demand of Freight Transport				
Handling of Future Container Demand		**Baseline**	**2030**	
		-	-	
Handling of Future Non-Container Demand		**Baseline**	**2030**	
		-	-	
Expected Function		-		
Improvement of Efficiency				

Improvement of Cargo Handling Efficiency	Potential improvement of efficiency through participation of private operators
Connection with Other Modes	-
Ease of Implementation	
Preparation Status	-
Impact on Natural/Social Environment	-