Data Collection Survey on International Logistics Centered on Sri Lanka

Final Report

November 2012

JAPAN INTERNATIONAL COOPERATION AGENCY

PADECO Co., Ltd.

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Abbreviations and Acronyms

AANZFTA	ASEAN–Australia–New Zealand Free Trade Agreement
AATS	Asia Automobile Terminal Singapore
ACFTA	ASEAN China Free Trade Area
ADB	Asian Development Bank
AJCEPA	ASEAN–Japan Comprehensive Economic Partnership Agreement
AKFTA	ASEAN Korea Free Trade Agreement
APL	American President Lines
APTA	Asia Pacific Trade Agreement
ASEAN	Association of Southeast Asian Nations
AWPT	Asia World Port Terminal
BIMSTEC	Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation
BOT	Build, Operate, Transfer
BSW	Botataung Street Wharf
CAGR	Compound Annual Growth Rate
CCT	Chittagong Container Terminal
CCTL	Chennai Container Terminal
CFS	Container Freight Station
CICT	Colombo International Container Terminal
CITPL	Chennai International Terminals
CMHI	China Merchants Holdings (International)
CPEP	Colombo Port Expansion Project
DP World	Dubai Port World
D-8	The Group of Developing Eight
ECOTA	Economic Cooperation Organization Trade Agreement
ECT	East Container Terminal (South Harbor of Colombo Port)
EDB	Export Development Board
EFTA	European Free Trade Association
EIA	Economic Integration Agreement
EPZ	Export Processing Zone

ERD	Department of External Resources
EU	European Union
FDI	Foreign Direct Investment
FTA	Free Trade Agreement
GCB	General Cargo Berths
GCC	Cooperation Council for the Arab States of the Gulf
GDP	Gross Domestic Product
GNI	Gross National Income
GSTP	Global System of Trade Preferences
GTICT	Gateway Terminals India Container Terminal
HDC	Haldia Dock Complex
ICD	Inland Container Depot
ICT	Information and Communications Technology
ICTT	International Container Transshipment Terminal
IEE	Initial Environmental Examination
IMF	International Monetary Fund
ISC	Indian Sub Continent
ISFTA	Indo- Sri Lanka Free Trade Agreement
IT	Information Technology
JBIC	Japan Bank for International Cooperation
JCT	Jaya Container Terminal
JETRO	Japan External Trade Organization
JICA	Japan International Cooperation Agency
JNPCT	Jawaharlal Nehru Port Container Terminal
JNPT	Jawaharlal Nehru Port Trust
KCT	Karnaphuli Container Terminal
KDS	Kolkata Dock System
KICT	Karachi International Container Terminal
KPT	Karachi Port Trust
KPT	Kolkata Port Trust
LOA	Length overall

LPI	Logistic Performance Index
LSCI	Liner Shipping Connectivity Index
Mercosur	Common Market of the South (Mercado Comum do Sul)
MIFFA	Myanmar International Freight Forwarders Association
MIP	Myanmar Industrial Port
MITT	Myanmar International Terminals Thilawa
MOL	Mitsui O.S.K. Lines
MPA	Maritime Port Authority of Singapore
MPA	Myanmar Port Authority
NCT	New Mooring Container Terminal
NPD	Department of National Planning
NSICT	Nhava Sheva International Container Terminal
NYK	Nihon Yusen Kaisha
OD	Origin and Destination
OIC	Organisation of the Islamic Conference
PCC	Pure Car Carrier
PCTC	Pure Car and Truck Carrier
PICT	Pakistan International Container Terminal
PIL	Pacific International Lines
POL	Petroleum, Oil and Lubricant
PPP	Public Private Partnership
PSA	Port of Singapore Authority Cooperation
PSFTA	Pakistan-Sri Lanka FTA
PTA	Preferential Trade Agreement
PTN	Protocol on Trade Negotiations
PTP	Port of Tanjung Pelepas
QGC	Quay Gantry Crane
SACU	South African Customs Union
SAEZ	South Asia Economic Zone
SAFTA	South Asian Free Trade Area
SAPTA	South Asian Preferential Trading Agreement

SAARC	South Asian Association for Regional Cooperation
SCT	South Container Terminal (South Harbor of Colombo Port)
SEZ	Special Economic Zone
SLAVO	Sri Lanka Association of Vessel Operators
SLPA	Sri Lanka Ports Authority
SWOT	Strengths, Weaknesses, Opportunities, Threats
TEU	Twenty-foot Equivalent Unit
TIFA	Trade and Investment Framework Agreement
TPS	Trade Preferential System Among the Member States of the Organisation of the Islamic Conference
UAE	United Arab Emirates
UCT	Unity Container Terminal
UNCTAD	United Nations Conference on Trade and Development
UDA	Urban Development Authority
VTS	Vessel Traffic Surveillance
WCT	West Container Terminal (South Harbor of Colombo Port)

1. Introduction

1.1 Survey Background

Sri Lanka has sustained an economic growth rate of about 7% in the last five years. Growth in her southern region was especially significant over this period. After the end of the civil war in 2009, the annual economic growth rate achieved 8.0% and GNI per capita exceeded USD 2,000. The government of Sri Lanka aims to sustain an economic growth rate of 8.0% per annum throughout the next 6 years, and increase the annual per capita income to above USD 4,000, thus positioning Sri Lanka as a middle income country.

Transport infrastructure, which is the basis of the economic growth of the country, are also being developed step by step with the assistance of development partners. In 2011, a Japan Bank for International Cooperation (JBIC) / Japan International Cooperation Agency (JICA) provided a construction loan for Sri Lanka's first toll road connecting Colombo and the suburb of Galle, a distance of 140 km. A Loan Agreement for the Colombo Airport Expansion Project is scheduled to be concluded soon between the government of Sri Lanka and JICA. Colombo Port, the major port of Sri Lanka, has been expanded and developed also with the assistance of the Japanese government. In addition, Hambantota Port, constructed with Chinese assistance, was opened in 2011. However, the role and purpose of Hambantota Port has not become clear because its construction started without a comprehensive development plan.

The major characteristics of the social economy of Sri Lanka are its small population and high social indicators such as literacy rate (over 90%). The major industries are tea production and apparel manufacturing. Although the labor quality is high, the cost is higher than that of neighboring countries such as Bangladesh. In order to achieve further development, it is necessary to initiate a development strategy based on the strengths of the country.

Taking advantage of Sri Lanka's geographic setting, the government of Sri Lanka aims to develop the country as an economic and trading hub in the South Asian region, and to become a key base for maritime and air transportation, a center of commerce, energy trading and exchange of knowledge by connecting the east and the west. Sri Lanka is also focusing on international logistics which is increasingly in demand as a result of globalization of trade. However, in order to attain these development targets, it is essential that the potential of Sri Lanka in the global economy is analyzed and the factors that give Sri Lanka its distinctiveness over neighboring nations are identified.

1.2 Survey Objectives

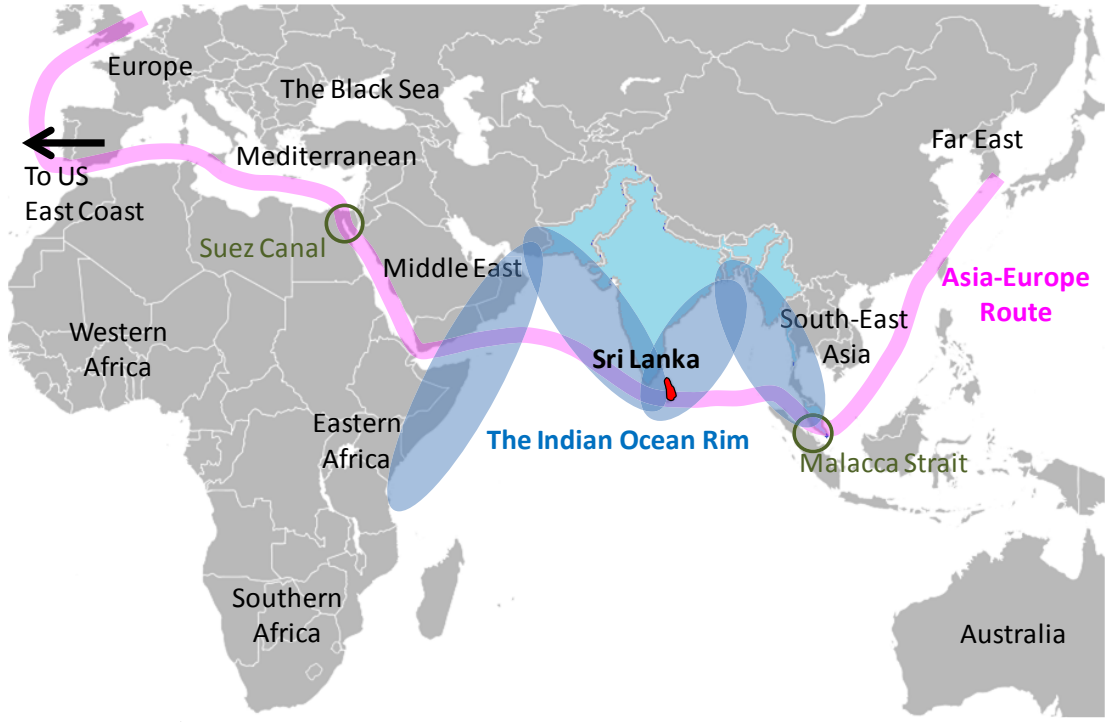
The objective of the study is to quantitatively analyze the comparative advantage of Sri Lanka over its neighboring countries in international logistics, especially in respect to Indian Ocean Rim logistics services. Specific recommendations will be made to the government of Sri Lanka on the necessity of capital investments and service improvements in the port sector to secure its comparative advantage.

In particular, recommendations will be made on the specific roles of the ports of Colombo and Hambantota based on each port's advantages in attracting foreign investment and trade, and identification of investors' needs.

1.3 Survey Area

The survey area is the Indian Ocean Rim centered on Sri Lanka as shown below, which covers parts of Africa, Europe, the Middle East, South and South East Asia as well as the Far East. The

field survey was conducted in Sri Lanka and other countries which significantly affect the traffic on the Indian Ocean Rim, i.e. India, Myanmar, Singapore and Malaysia.



Source: JICA Study team

Figure 1.3.1: Survey Area

Sri Lanka is located right in the center of the Indian Ocean Rim and is also in the middle of Asia-Europe trade route which is the busiest maritime traffic route in the world. There are several sea ports in Sri Lanka as shown in Figure 1.3.2. This study focuses on Colombo and Hambantota Ports in the Southern region of the country.

Figure 1.3.2: Location of Sri Lankan Ports

1.4 Target Port and Commodities of the Survey

Since the 1980's Colombo port has been enjoying its position as the container transshipment hub for the Indian subcontinent. The government of Sri Lanka recently developed Hambantota Port at the Southern tip of the country, and the construction of container terminal has also started as its second phase development.

This study focuses on Colombo and Hambantota Ports, and containers.

1.5 Countries, Ports and Organizations Visited in the Field Survey

Four countries were visited in addition to Sri Lanka to gather data and information. The list of countries and organizations visited is presented below.

Table 1.5.1: List of Countries and Organizations Visited

No.	Country	City	Organizations Visited
1	Sri Lanka	Colombo, Hambantota	• JICA Sri Lanka Office • Ministry of Economic Development • JETRO Sri Lanka Office • Sri Lanka Port Authority (SLPA) • Sri Lanka Association of Vessel Operators (SLAVO) • National Planning Department (NPD) • Ministry of Industry and Commerce • Ministry of Port and Highway • Export Development Board (EDB) • Custom Department • DAMCO • NYK Lines & Hayleys Group • Chamber of Commerce • Ceyline • Colombo and Hambantota Ports
2	India	Cochin, Tuticorin, Mumbai, Delhi, Kolkata	• JICA Delhi Office • JETRO Mumbai Office • Ministry of Shipping • Indian Ports Association • APL, NYK, MOL, PIL, Maersk • Cochin Port Trust • DP World • Tuticorin Port Trust • PSA Tuticorin • Kolkata Port Trust • St. John Co Ltd • Atlas Logistics • TATA Chemicals • Videocon • Cipla • Alok • NYK Auto Logistics • Cohin, Tuticorin and Kolkata Ports
3	Myanmar	Yangon, Nay Pyi Taw	• JETRO Yangon Office • Mingaladon Industrial Park • Myanmar International Freight Forwarder Association (MIFFA) • Ben Line Agencies • Myanmar Five Star Line • Myanmar International Terminals Thilawa (MITT) • Myanmar Port Authority • Ministry of Transport • Ministry of Commerce • Ministry of Industry • Yangon and Thilawa Ports
4	Singapore	Singapore	• PSA Singapore • NYK, APL, PIL, Maersk • NYK RORO (ASIA) Pte. Ltd. • Port of Singapore
5	Malaysia	Johor Baru	• Tanjung Pelepas Port

2. Current Status and Trend of Maritime Transport on Indian Ocean Rim and South Asian Economic Zone

2.1 Macro-Economy

2.1.1 Socioeconomic Conditions of Indian Ocean Rim and South Asian Countries

The major socioeconomic indicators for Indian Ocean Rim and South Asian countries in 2010 and estimates for 2017 are shown in Table 2.1.1.

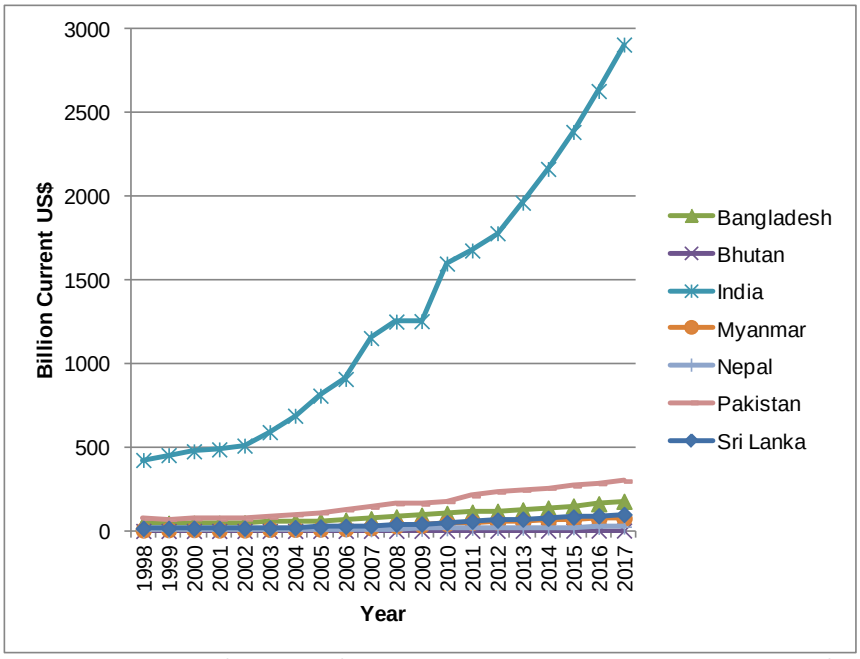
Although the economies of the countries in the region are all **growing, the rate of growth and** the size of economies vary by country as shown in Figure 2.1.1. India has the largest economy in the region, which is about nine times that of the second largest, Pakistan. According to the IMF forecast, the average annual GPD growth rate from 2010 to 2017 is 6% to 7% in India, Sri Lanka, Bangladesh and Myanmar. Bhutan's GDP is forecasted to grow in that period by an average of 10.4% annually while that of Pakistan and Nepal is estimated as 3% to 4%.

Though population in the region is also increasing as shown in Figure 2.1.2, the growth rate is smaller compared to that of GDP. Per capita GDP in 2017 is forecasted to be about 1.4 to 1.5 times 2010's level in the major countries in the region including India, Bangladesh and Sri Lanka. In other words, share of consumption is expected to grow rapidly in the region in the near future.

Table 2.1.1: Major Socioeconomic Indicators in Indian Ocean Rim and South Asian Countries

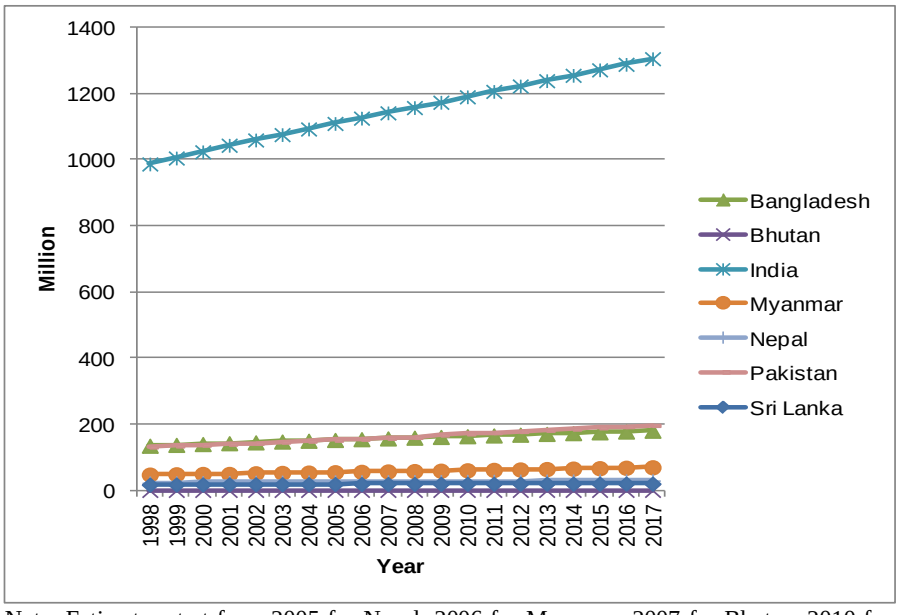
	GDP (current price: million USD)		GDP per capita (current price: USD)		Population (thousands)	
Country	2010	2017	2010	2017	2010	2017
Bangladesh	106,216	177,657	723	1,123	164,425	181,083
Bhutan	1,409	3,424	1,940	4,561	7	707
India	1,630,47	3,171,010	1,370	2,428	1,190,520	1,305,770
Myanmar	45,38	77,676	742	1,104	61,187	70,334
Nepal	15,956	27,225	533	814	28,185	30,166
Pakistan	176,478	274,819	1,028	1,392	171,730	197,191
Sri Lanka	49,552	90,741	2,429	4,241	20,401	20,964

Source: IMF, *World Economic Outlook Database*, October 2012



Note: Estimates start from 2010 for Bangladesh, Myanmar and Nepal, and 2011 for India, Pakistan and Sri Lanka. All data for Bhutan is estimated.
Source: IMF, *World Economic Outlook Database*, April 2012

Figure 2.1.1: Trends of GDP Growth (Current Price)



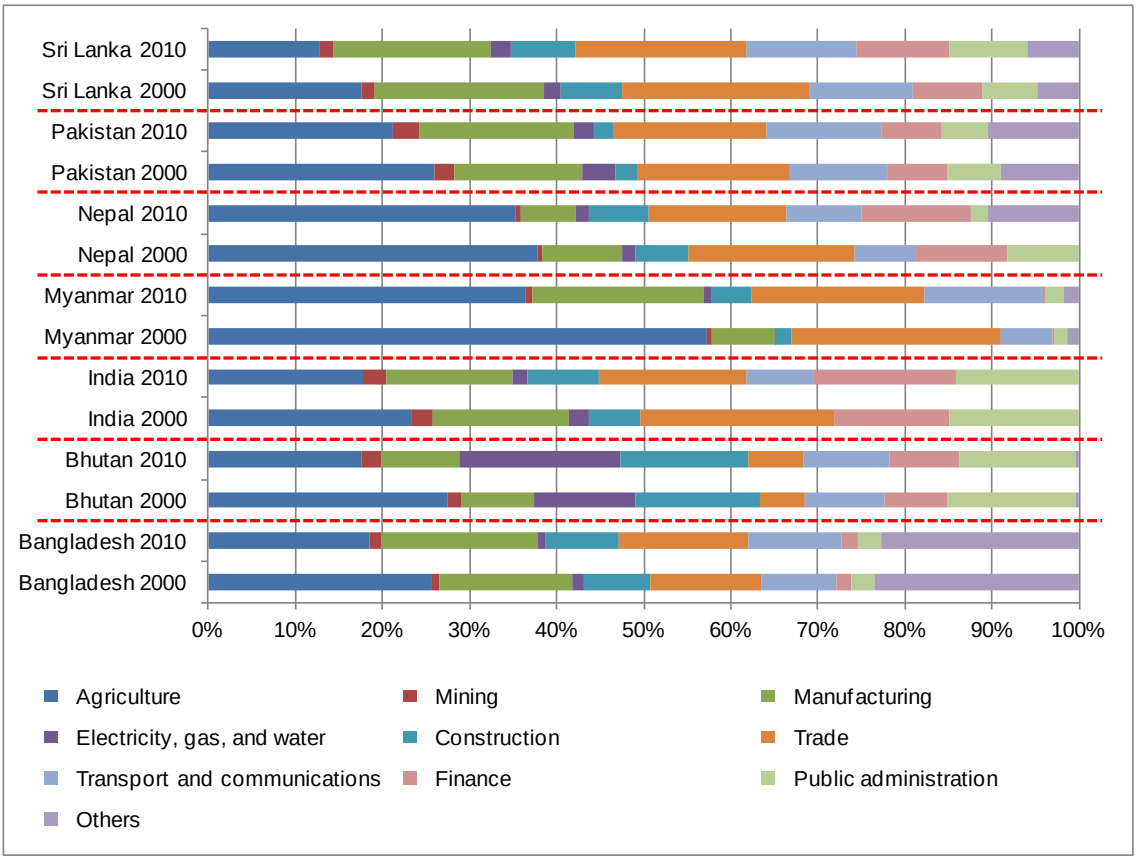
Note: Estimates start from 2005 for Nepal, 2006 for Myanmar, 2007 for Bhutan, 2010 for Bangladesh and India, and 2011 for Pakistan and Sri Lanka.
Source: IMF, *World Economic Outlook Database*, April 2012

Figure 2.1.2: Trends of Population Growth

2.1.2 Industrial Structure

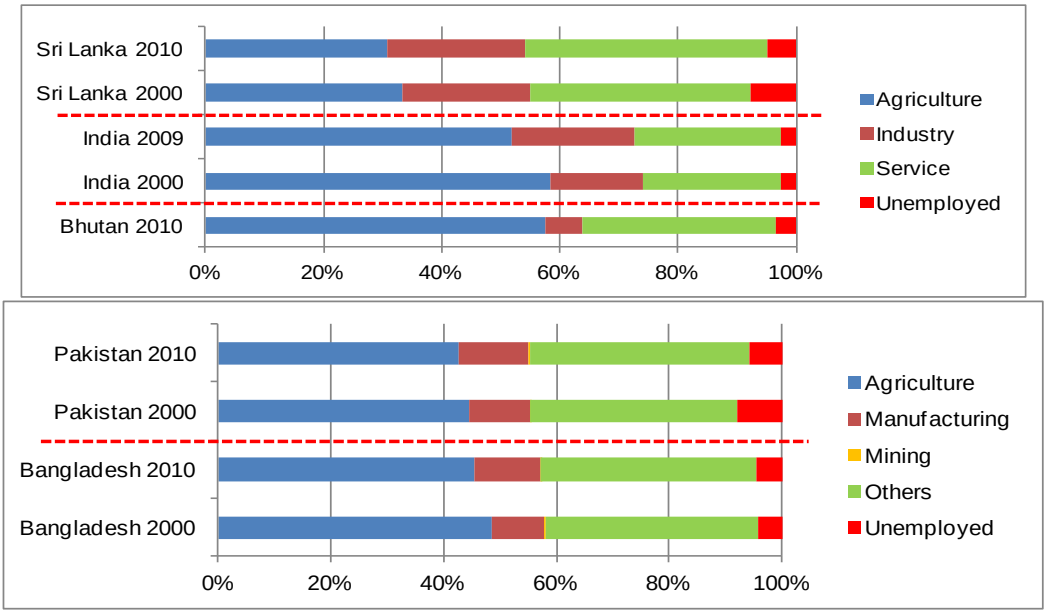
Although the economies of Indian Ocean Rim and South Asian countries have been growing rapidly, the tendency of industrial development is obviously different from the neighboring economy, South East Asia. In South East Asia, the major driving force of economic growth has been manufacturing while the manufacturing sector's share of GDP in Indian Ocean Rim and South Asian countries is relatively low. On the other hand, the service sector's share in GDP tends to be higher in the target region compared to South East Asia. One of the major reasons development of the manufacturing sector has been relatively poor in the target region is inadequate infrastructure that has not kept pace with the growing economy (e.g. lack of energy infrastructure to provide power for manufacturing, insufficient transport infrastructure and so on). In the inland countries of Nepal and Bhutan especially, where transport cost is higher than in neighboring countries, the share of manufacturing is less than 10%.

The following Figure 2.1.3 shows the share of different industrial sectors in the GDP of Indian Ocean Rim and South Asian countries in 2000 and 2010. The share of the labor force in different industrial sectors is shown in Figure 2.1.4. As shown on Figure 2.1.3, agriculture's share of GDP has declined while that of the service sector has grown significantly in all target countries. However, as shown on Figure 2.1.4, the share of labor force in the different sectors has not changed much in the same period.



Source: ADB, *Key Indicators for Asia and the Pacific*, 2012

Figure 2.1.3: Industrial Structure



Source: ADB, *Key Indicators for Asia and the Pacific*, 2012

Figure 2.1.4: Labor Force in Different Industrial Sectors[12]

The characteristics of industries of each target country are described below.

Sri Lanka is a trade-oriented economy where trade is the largest single subsector, accounting for about 20% of GDP in 2010. The combined services sector, including trade, transport and communication, finance, and public administration, generates about 60% of GDP. The manufacturing subsector dominates the industrial sector, and accounted for 61% of total industrial output in 2010. Privately owned export-oriented factories produce the vast majority of manufacturing output. The manufacturing base is dominated by the garment industry, although the production of food and beverages, as well as chemicals and rubber-based goods, is also important. The agricultural sector's share of GDP decreased from 17.6% in 2000 to 12.8% in 2010. But, agriculture is still an important determinant of GDP since it employs over one-third of the workforce and has strong indirect links to manufacturing and services.

In Pakistan, the economy has been dominated by the textile sector, which accounts for around two-thirds of export income. However, Pakistani manufacturers appear to be shifting towards lower-value products in the face of competition, particularly from China. The manufacturing sector has grown as a proportion of GDP from 14.7% in 2000 to 17.7% in 2010. On the other hand, agriculture has declined from 25.9% in 2000 to 21.1% in 2010.

In Nepal, the contribution of agriculture to total GDP was 35.4% in 2010, higher than other surrounding countries. Although agriculture's share has been decreasing, more than 80% of the population remains dependent on the sector for their livelihoods. The manufacturing sector, which is limited largely to low-end consumer items, carpets, garments and handicrafts, accounted for 6.3% of GDP in 2010. In contrast to other surrounding countries, the share of the manufacturing sector decreased from 9.2% in 2000 to 6.3% in 2010. The share of the service sector increased from 44.9% in 2000 to 49.5% in 2010.

[1] Data for Nepal and Myanmar is not available, Bhutan data for 2000 is not available, 2010 data for India is not available.
[2] ADB's "*Key Indicators for Asia and the Pacific*" reports labor force data for Sri Lanka, India and Bhutan in different industrial sectors than those for Pakistan and Bangladesh.

In Myanmar, agriculture remains the biggest sector accounting for 36.4% of the total GDP in 2010. However, agriculture's share of overall GDP has dropped from 57.2% in 2000, as a result of growth in services and the development of a small manufacturing sector. Share of the industrial sector increased from 9.7% in 2000 to 26.0% in 2010, mainly contributed by the growth of the manufacturing sector, which was 7.2% of the total GDP in 2000 and increased to 19.5% in 2010. One of the major reasons for the rapid industrial growth is the modest inflows of foreign and local investment. The manufacturing sector is dominated by the processing of agricultural products, fish and timber, as well as garment manufacturing. Among service sectors, share of trade in the total GDP declined from 24.0% in 2000 to 19.8% in 2010 while, that of transport and communication increased from 6.0% in 2000 to 13.8% in 2010.

The Indian economy is characterized by two distinct structures: on the one hand, a cutting-edge and globally competitive knowledge-driven services sector that employs the brightest of the middle class, and on the other hand, a sprawling, largely rain-fed agricultural sector that employs the majority of the poorly educated labor force. The share of the service sector in total GDP has grown rapidly from 50.5% in 2000 to 55.1% in 2010. At the same, the industrial sector has been relatively stable, accounting for 27.1% of GDP in 2010 versus 26.2% in 2000. Although the manufacturing sector has been traditionally weak, this tendency has been changing rapidly in recent years. The share of agriculture declined from 23.4% in 2000 to 17.7% in 2010. The majority of landholdings are farmed at a subsistence level and many farming families live below the poverty line. India has some of the poorest human development indicators in the world, particularly in rural areas. However, it also has a large number of highly qualified professionals, as well as several internationally established industrial groups.

In Bhutan, an estimated 70%80% of the population is involved in agriculture. However, the share of the agricultural sector in GDP has dramatically decreased from 27.4% in 2000 to 17.5% in 2010. Within the service sector's 53.0% of GDP in 2010, the share of "others" is more than 20%. Tourism is included as the major industries of the country and accounts for much of this. The government is emphasizing the hydropower sector as a main driver of the economy and the fastest route to achieving its goal of economic self reliance. The most important policy principle is "gross national happiness", whose core components are equitable and sustainable socio-economic development, preservation of Bhutanese cultural values, environmentalism and establishment of good governance.

In Bangladesh, the share of the agriculture in GDP declined from 25.5% in 2000 to 18.6% in 2010 but the sector still provides employment for more than one-half of the labor force. Bangladesh imports most intermediate inputs used in manufacturing, particularly in the garment sector. Moreover, the agricultural sector relies heavily on imported fertilizer, and all steel coils are imported. This heavy reliance on imports limits the value added by domestic production. The government is attempting to diversify the economy and the export base by promoting industries such as information technology (IT) and agricultural processing, but such programs have had only limited success. The manufacturing sector accounted for 17.9% in 2010. Industrial activity is mostly concentrated in the two largest cities, the capital, Dhaka, and Chittagong.

2.1.3 Direct Investment

Recent years have seen the rise of Foreign Direct Investment (FDI) in South Asia. One of the major reasons is that most South Asian countries have offered an increasingly liberal policy regime to FDI inflows since the early 1990s when India liberalized its FDI policy dramatically as part of a New Industrial Policy adopted in July 1991. The new policy marked a major departure from the past with the abolition of the industrial licensing system except where it is required for strategic or environmental grounds and creation of an automatic system for

clearance of FDI proposals that fulfill stated conditions. Foreign ownership up to 100% is permitted except in most equipment where it is limited to 26% and for items reserved for production by small-scale industries where is limited to 24%. India has also entered into Double Taxation Avoidance Treaties with 65 countries, and Bilateral Investment Promotion and Protection Agreements with 58 countries.

The liberalization of India's FDI policy was followed by similar liberalizations in Pakistan and Nepal. Sri Lanka liberalized its FDI policy regime much earlier in 1978. Bangladesh has offered a national FDI policy since 1980. The key features of the FDI policy regimes of South Asian countries include: up to 100% foreign ownership in most sectors except for a few due to sensitivities and security concerns; full repatriation of capital and remittances of profits, dividends, technical fees and royalties; incentives including tax holidays for a certain number of years and special packages of facilities and incentives in the export processing zones. The South Asian countries have entered into bilateral investment promotion and protection treaties and double taxation avoidance treaties with a large number of partner countries including countries that are major sources of investments. A summary of the FDI policy regimes of the South Asian countries is provided in Table 2.1.2.

Following liberalization of their policy regimes and their emergence as fast growing economies, South Asian countries have been receiving increasing amounts of FDI flows over the past several years. FDI inflows attracted by South Asia grew steadily from USD 6.7 billion in 2001 to USD 50.6 billion in 2008 before declining to USD 39.1 billion in 2009 as a result of the global financial crisis (Figure 2.1.5). The growth of FDI inflows to the region has accelerated since 2005 to an annual average rate of 68%. The majority of investments have been made in India and Pakistan the largest of the South Asian economies. In 2010, FDI inflow to India accounted for 87% of the total FDI of South Asia and Pakistan accounted for 7%.

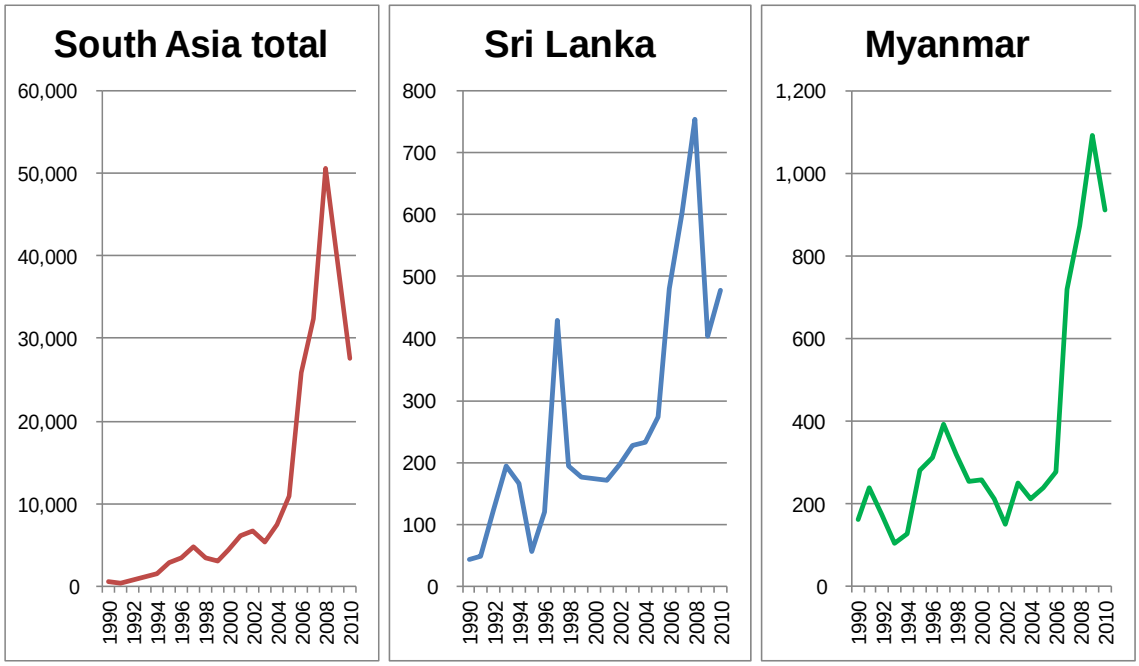
Although FDI inflows to South Asia have been increasing rapidly, from a global and regional comparative perspective South Asia has been a relatively small destination for FDI inflows. In fact, South Asia received only around 13% of inflows attracted by developing Asia and about 8% of FDI inflows in developing countries in 2008. However, South Asia's relative position as a destination for FDI among other Asian developing countries is dramatically improving. Major reasons for this are the rapid economic growth rate of the region since 2000 and less impact of the global financial crisis compared to other developing countries. It is likely that the region will further strengthen its place as a recipient of FDI considering the expected high economic growth rate in the coming years.

Table 2.1.2: Policies and Incentives of Foreign Direct Investment in Major South Asian Countries

	Bangladesh	India	Sri Lanka	Pakistan	Nepal
Entry restrictions	Arms, ammunition & defense products, nuclear energy, security printing and minting, forestry in reserved forest areas, and railways.	Arms and ammunition, atomic energy, nuclear power, agriculture and plantations, real estate business, settlements, retail trading (multi brand), atomic energy and lottery business, gambling and betting, rail way, coal, lignite, mining of iron, manganese, chrome, gypsum, sulphur, gold, diamonds, copper, zinc. Investment in stock markets and real estate requires prior approval.	Money lending, pawn brokering, retail trade with capital of less than $ I million, coastal fishing, education	Arms and ammunitions, high explosives, radioactive substances, alcoholic beverages or liquors.	Business, management, consulting, accounting, engineering, legal services, defense sector, alcohol, cigarettes, retail sales.
Foreign ownership	Up to 100%	100% in most sectors except insurance (26%), mining (74%). Sectoral caps apply in service sectors.	100 per cent foreign ownership. 40% for restricted list.	100% in most sectors, except agriculture 60%, service sector 100% to 60% reduction within 2 years.	Up to 100%
Profit transfer and convertibility	Full repatriation of invested capital, profit and dividends allowed	No restriction on remittances for debt service or payments for imported inputs. Dividend remittances permitted without approval from the RBI. All profits, dividends, royalty, license payments can be repatriated.	No restriction on repatriation of earnings and fees. Foreign exchange restrictions for current a/c transaction removed	Full repatriation of capital, capital gains, dividends and profits is allowed; 100% foreign equity allowed and can be repatriated.	All profits and dividends are not guaranteed for repatriation.
Taxation	Tax holiday facilities for 5-7 yrs depending on location of the industry.	40% with special tax treatment for infrastructure sector. Foreign nationals working in India are generally taxed only on their Indian income. Corporate tax holiday for a block of 10 years out of 20 years. Tax and duty concessions for mega power projects.	35-39%. Tax relief as first year allowance for specific categories for expansion, balancing, modernization & replacement in existing industries.	Full tax holiday from 2-20 yrs, up to 0% tax on turnover up to $25 m in EPZ.	25% with no income tax on profit from export. Hydropower developers exempt first 15 yrs.

	Bangladesh	India	Sri Lanka	Pakistan	Nepal
Other incentives	Duty free import of raw materials, tax holiday of 10 yrs, concessionary tax for 5 yrs, fully serviced plots, factory building etc.	10 yr tax holiday for knowledge based start-ups. Almost 659 units EPZ in 8 sectors, automatic approval for foreign equity investments up to 51%. Issue of equity shares against lump sum fee, royalty and external commercial borrowings in convertible foreign currency already due for payment/repayment permitted	No import duty or turnover tax on machinery and equipment. Concessionary tax of 15%. Import duty exemption on project related goods, exemption from turnover tax on sales and exchange control. An initial tax holiday, often for five years, followed by a short period of a concessional income tax rate and finally a long-term concessional rate, varying from 15 to 20 per cent depending on the industry.	Custom duty of 5% chargeable on import of plant, machinery & equipment, not manufactured locally. Zero rated sales tax on import of plant, machinery & equipment. Locally manufactured plant, machinery & equipment are also exempted from payment of sales tax.	Hydropower developers exempted from income tax for first 15 yrs, no income tax on profit from exports, tax incentives to locate outside the Katmandu No EPZ or free ports.
Bilateral Tax Treaties	20 countries	57 countries	39 countries	23 countries	3 countries
Agreement of double taxation avoidance	20 countries	63 countries	52 countries	52 countries	3 countries

Source: UNESCAP Working Papers, 2011



Source: World Bank, *World Development Indicators*

Figure 2.1.5: Trend of FDI Inflow (BoP, Million Current USD)[3]

2.2 Trade Structure

2.2.1 Economic Cooperation

South Asia has been considered the least integrated region in the world despite its attempts to liberalize trade using various unilateral, bilateral, regional and multilateral arrangements. It has long been argued that South Asia's limited success in liberalizing regional trade is due to limited tariff reductions and remaining barriers present in trade agreements. In addition, it is said that inadequate attention is paid to trade facilitation measures such as efficiency of customs and other border procedures, quality of transport, and cost of international and domestic transport.

The major regional and sub-regional arrangements of South Asia, covering Indian Ocean Rim, for economic cooperation are: (i) South Asian Free Trade Area (SAFTA); (ii) Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation (BIMSTEC); and (iii) Asia Pacific Trade Agreement (APTA). Descriptions of these agreements follows.

South Asian Preferential Trading Agreement (SAPTA) and South Asian Free Trade Area (SAFTA): The framework agreement on SAPTA was finalized and signed in 1993 by the South Asian Association for Regional Cooperation (SAARC) member countries (Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan and Sri Lanka). The SAPTA came into force in December 1995 after conclusion of first round of negotiations in April 1995. Four rounds of trade negotiations took place under the aegis of the SAPTA. In 2004, SAPTA became the South Asian Free Trade Area (SAFTA), which came into effect in 2006 with the objective of creating a FTA to include eight South Asian countries. Afghanistan was given membership in SAARC in 2005. It was agreed that SAFTA is a steppingstone to higher levels of trade liberalization and economic co-operation among SAARC member countries. The Agreement reflects the desire of

[3] South Asia total includes Bangladesh, Bhutan, India, Nepal, Pakistan and Sri Lanka. However, data of Bhutan from 1990 to 2002 and that of Nepal from 1992 to 1995 is not included because of data availability.

the member states to promote and sustain mutual trade and economic cooperation within the SAARC region through the exchange of concessions.

Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation (BIMSTEC): BIMSTEC emerged in 1997 as a link between South Asia and Southeast Asia. The member countries were Bangladesh, India, Sri Lanka and Thailand. At the beginning this was known as Bangladesh, India, Sri Lanka, Thailand Economic Cooperation (BIST-EC). Nepal and Bhutan became member in 2004. The agreement was formed for strengthening economic cooperation within the region and to fully realize the potential of trade and development for benefit of their nations. BIMSTEC acts as a stimulus to the strengthening not only of economic cooperation among the partners but also to lower costs, increase intra-regional trade and investment, increase economic efficiency, create a larger market with greater opportunities and larger economies of scale and enhance the attractiveness of the partners to capital and talent.

Asia Pacific Trade Agreement (APTA): APTA was formed in 1975. Initially it was known as the Bangkok agreement. It is the oldest preferential trade agreement among developing countries in the Asia Pacific Region. Bangladesh, China, India, Republic of Korea, Lao PDR and Sri Lanka are the members in this agreement. It aims at promoting regional trade through exchange of mutually agreed concessions by the member nations.

2.2.2 Free Trade Agreement (FTA)

In addition to regional and sub-regional agreements of South Asia, India and Pakistan, the countries with the largest economies in the region, have attempted to strengthen their trade through Free Trade Agreement (FTA), Economic Integration Agreement (EIA), Preferential Trade Agreement (PTA) and so on with individual countries inside and outside of the region as well as other economic zones. Nepal and Bhutan have only one FTA which is a bilateral agreement with India. Table 2.2.1 to Table 2.2.7 summarize the FTAs, EIAs, PTAs and other trade related agreements of the target countries. Descriptions of the major bilateral agreements between countries in Indian Ocean Rim and South Asia are as follows.

Indo- Sri Lanka Free Trade Agreement (ISFTA): The Indo-Sri Lanka Free Trade Agreement was signed in 1998 having the objective of promoting economic relations between India and Sri Lanka through the expansion of trade and the provision of fair conditions of competition for trade between India and Sri Lanka. The aim was to remove barriers to trade in attaining harmonious development and expansion of world trade. The contracting parties also agreed to establish a Free Trade Area for the purpose of free movement of goods between their countries through elimination of tariffs on the movement of goods.

Pakistan-Sri Lanka FTA (PSFTA): The free trade agreement between Pakistan and Sri Lanka was signed in 2002 and came into effect from July 2005. The objectives of this agreement are to promote harmonious development of economic relations between Pakistan and Sri Lanka through the expansion of trade in goods and services**,** to provide fair conditions of competition for trade in goods and services between Pakistan and Sri Lanka and by the removal of barriers to trade in goods and services to contribute to the harmonious development and expansion of bilateral as well as world trade**.**

Bhutan-India Free Trade Agreement: Bhutan India FTA was signed in 2006 with the objective of expanding bilateral trade and collaboration in economic development of India and Bhutan. It came into force in July 2006 and is planned to remain in force for a period of ten years.

India- Afghanistan Preferential Trade Agreement: India-Afghanistan PTA was signed in 2003 for strengthening intra-regional economic cooperation through removal of barriers to trade and the harmonious development of national economies. It is in force since 2003.

India –Bangladesh Bilateral Trade Agreement: The original bilateral trade agreement between India and Bangladesh was signed in 1980 for a three year period. The amended agreement was signed in 2006, recognizing the need to explore all possibilities, including economic and technical cooperation, for promotion, facilitation, expansion and diversification of trade between the two countries on the basis of equality and mutual benefit.

India-Nepal Treaty of Trade: This PTA was signed in 1991 and is in force since 1991. The objective of the agreement is to strengthen economic cooperation between the nations and thereby develop their economies and to take advantage the benefits of mutual sharing of scientific and technical knowledge and experience to promote mutual trade.

Table 2.2.1: Trade Rerated Agreements of Bangladesh

Target region/ country	Title	Scope	Type	Status
D-8 PTA	Preferential Tariff Agreement - Group of 8 Developing Countries	Cross-Continental Multilateral	Preferential Trade Agreement	In force since 2011
GSTP	Global System of Trade Preferences among Developing Countries	Global (developing countries)	Preferential Trade Agreement	In force since 1989
Mongolia/ APTA	Accession of Mongolia to Asia-Pacific Preferential Trade Agreement	Country – Bloc	Preferential Trade Agreement	Under negotiation since 2011
Pakistan/ Bangladesh	Pakistan-Bangladesh Free Trade Agreement	Bilateral	Free Trade Agreement	Under negotiation since 2003
PTN	Protocol on Trade negotiations	Cross-Continental Multilateral	Preferential Trade Agreement	In force since 1973
TPS-OIC	Framework Agreement on Trade Preferential System Among the Member States of the Organisation of the Islamic Conference	Cross-Continental Multilateral	Framework Agreement	Pending country ratification

Source: UN ESCAP, *Asia - Pacific Trade and Investment Agreements Database*

Table 2.2.2: Trade Rerated Agreements of Bhutan

Target region/ country	Title	Scope	Type	Status
Bhutan-India	Bhutan-India Free Trade Agreement	Bilateral	Free Trade Agreement	In force since 2006

Source: UN ESCAP, *Asia - Pacific Trade and Investment Agreements Database*

Table 2.2.3: Trade Rerated Agreements of India

Target region/ country	Title	Scope	Type	Status
ASEAN/ India	ASEAN -India Free Trade Area	Country – Bloc	Free Trade Agreement	In force since 2010
Bhutan/ India	Bhutan-India Free Trade Agreement	Bilateral	Free Trade Agreement	In force since 2006
European Free Trade Association (EFTA)/ India		Country – Bloc	Free Trade Agreement	Under negotiation since 2008
Global System of Trade Preferences (GSTP)	Global System of Trade Preferences among Developing Countries	Global (developing countries)	Preferential Trade Agreement	In force since 1989
India/Afganistan	India-Afghanistan Preferential Trade Agreement	Bilateral	Preferential Trade Agreement	In force since 2003
India/Australia	India-Australia Comprehensive Economic Cooperation Agreement	Bilateral	Free Trade Agreement	Under negotiation since 2011
India/Canada	India-Canada Economic Partnership Agreement	Bilateral	FTA & EIA	Under negotiation since 2010
India/Chili	Preferential Trade Agreement between the Republic of India and the Republic of Chile	Bilateral	Preferential Trade Agreement	In force since 2007
India/Egypt	India-Egypt Preferential Trade Agreement	Bilateral	Preferential Trade Agreement	Under negotiation since 2002
India/EU		Country – Bloc	Free Trade Agreement	Under negotiation since 2007
India/Cooperation Council for the Arab States of the Gulf (GCC)	Framework Agreement on Economic Cooperation between the Republic of India and the Member States of the Cooperation Council for the Arab States of the Gulf	Country - Bloc	Framework Agreement	In force since 2006
India/Israel	India-Israel Free Trade Agreement	Bilateral	Free Trade Agreement	Under negotiation since 2012
India/Malaysia	Cooperation Agreement between the Government of the Republic of India and the Government of Malaysia	Bilateral	FTA & EIA	In force since 2011
India/Mauritius	India-Mauritius Comprehensive Economic Cooperation and Partnership Agreement	Bilateral	Framework Agreement	Under negotiation since 2005
India/Mercosur	India - Mercosur Preferential Trade Agreement	Country - Bloc	Preferential Trade Agreement	In force since 2009
India/Nepal	Revised Treaty of Trade between the Government of India and the Government of Nepal	Bilateral	Preferential Trade Agreement	In force since 2009
India/South African Customs Union (SACU)	Preferential Trade Agreement between South African Customs Union and India	Country - Bloc	Preferential Trade Agreement	Under negotiation since 2007

Target region/ country	Title	Scope	Type	Status
India/Singapore	Comprehensive Economic Cooperation Agreement Between the Republic of India and the Republic of Singapore	Bilateral	FTA & EIA	In force since 2005
India/Sri Lanka	Free Trade Agreement between the Republic of India and the Democratic Socialist Republic of Sri Lanka	Bilateral	Free Trade Agreement	In force since 2001
India/Thailand	India - Thailand Framework Agreement for establishing a FTA	Bilateral	Framework Agreement	In force since 2004
Japan/India	Comprehensive Economic Partnership Agreement between Japan and the Republic of India	Bilateral	FTA & EIA	In force since 2011
Korea/India	Korea - India Comprehensive Economic Partnership Agreement	Bilateral	Free Trade Agreement	In force since 2010
Mongolia/ Asia-Pacific Preferential Trade Agreement (APTA)	Accession of Mongolia to Asia-Pacific Preferential Trade Agreement	Country - Bloc	Preferential Trade Agreement	Under negotiation since 2011
New Zealand/India	New Zealand-India Free Trade Agreement	Bilateral	Free Trade Agreement	Under negotiation since 2010

Source: UN ESCAP, *Asia - Pacific Trade and Investment Agreements Database*

Table 2.2.4: Trade Rerated Agreements of Nepal

Target region/ country	Title	Scope	Type	Status
India/Nepal	Revised Treaty of Trade between the Government of India and the Government of Nepal	Bilateral	Preferential Trade Agreement	In force since 2009

Source: UNESCAP, *Asia - Pacific Trade and Investment Agreements Database*

Table 2.2.5: Trade Rerated Agreements of Myanmar

Target region/ country	Title	Scope	Type	Status
AANZFTA	ASEAN - Australia - New Zealand Free Trade Agreement	Country - Bloc	Free Trade Agreement	In force since 2010
ACFTA	Agreement on Trade in Goods of the Framework Agreement on Comprehensive Economic Co-operation between the Association of Southeast Asian Nations and the People's Republic of China	Country - Bloc	Preferential Trade Agreement	In force since 2005
AJCEPA	Agreement on Comprehensive Economics Partnership among Japan and the Member States of the ASEAN	Country - Bloc	Free Trade Agreement	In force since 2008

Target region/ country	Title	Scope	Type	Status
AKFTA	Agreement on Trade in Goods under the Framework Agreement on Comprehensive Economic Co-operation Among the Governments of the Member Countries of the Association of Southeast Asian Nations and the Republic of Korea	Country - Bloc	Free Trade Agreement	In force since 2010
ASEAN	ASEAN Free Trade Area	Regional	Free Trade Agreement	In force since 1992
ASEAN/India	ASEAN-India Free Trade Area	Country - Bloc	Free Trade Agreement	In force since 2010
GSTP	Global System of Trade Preferences among Developing Countries	Global (developing countries)	Preferential Trade Agreement	In force since 1989
United Status/ ASEAN	Trade and Investment Framework Agreement (TIFA) between the United States of America and the Association of Southeast Asian Nations	Country - Bloc	Framework Agreement	In force since 2006

Source: UN ESCAP, *Asia - Pacific Trade and Investment Agreements Database*

Table 2.2.6: Trade Rerated Agreements of Pakistan

Target region/ country	Title	Scope	Type	Status
China/Pakistan	Free Trade Agreement between the Government of the People's Republic of China and the Government of the Islamic Republic of Pakistan	Bilateral	Free Trade Agreement	In force since 2007
D-8 PTA	Preferential Tariff Agreement - Group of 8 Developing Countries	Cross-Continental Multilateral	Preferential Trade Agreement	In force since 2011
ECOTA	Economic Cooperation Organization Trade Agreement	Regional	Preferential Trade Agreement	In force since 2003
GSTP	Global System of Trade Preferences among Developing Countries	Global (developing countries)	Preferential Trade Agreement	In force since 1989
Malaysia/Pakistan	Agreement Between the Government of the Islamic Republic of Pakistan and the Government of Malaysia for a Closer Economic Partnership	Bilateral	FTA & EIA	In force since 2008
Pakistan/ Bangladesh	Pakistan-Bangladesh Free Trade Agreement	Bilateral	Free Trade Agreement	Under negotiation since 2003
Pakistan/Iran, I.R.	Preferential Trade Agreement between the Islamic Republic of Pakistan and the Islamic Republic of Iran	Bilateral	Preferential Trade Agreement	In force since 2006

Target region/ country	Title	Scope	Type	Status
Pakistan/Mauritius	Preferential Trade Agreement Between The Islamic Republic Of Pakistan And The Republic Of Mauritius	Bilateral	Preferential Trade Agreement	In force since 2007
Pakistan/Mercosur	Pakistan-Mercosur Preferential Trade Agreement	Country - Bloc	Preferential Trade Agreement	Under negotiation since 2006
Pakistan/Morocco	Pakistan-Morocco Preferential Trade Agreement	Bilateral	Preferential Trade Agreement	Under negotiation since 2005
Pakistan/Sri Lanka	Free Trade Agreement Between the Islamic Republic of Pakistan and the Democratic Socialist Republic of Sri Lanka	Bilateral	Free Trade Agreement	In force since 2005
Pakistan/Turkey	Pakistan-Turkey Preferential Trade Agreement	Bilateral	Preferential Trade Agreement	Under negotiation since 2004
PTN	Protocol on Trade negotiations	Cross-Continental Multilateral	Preferential Trade Agreement	In force since 1973
Singapore/Pakistan	Singapore-Pakistan Free Trade Agreement	Bilateral	Free Trade Agreement	Under negotiation since 2005
TPS-OIC	Framework Agreement on Trade Preferential System Among the Member States of the Organisation of the Islamic Conference	Cross-Continental Multilateral	Framework Agreement	Pending country ratification
United States/ Pakistan	USA - Pakistan Trade and Investment Framework Agreement	Bilateral	Framework Agreement	Under negotiation since 2004

Source: UN ESCAP, *Asia - Pacific Trade and Investment Agreements Database*

Table 2.2.7: Trade Rerated Agreements of Sri Lankan

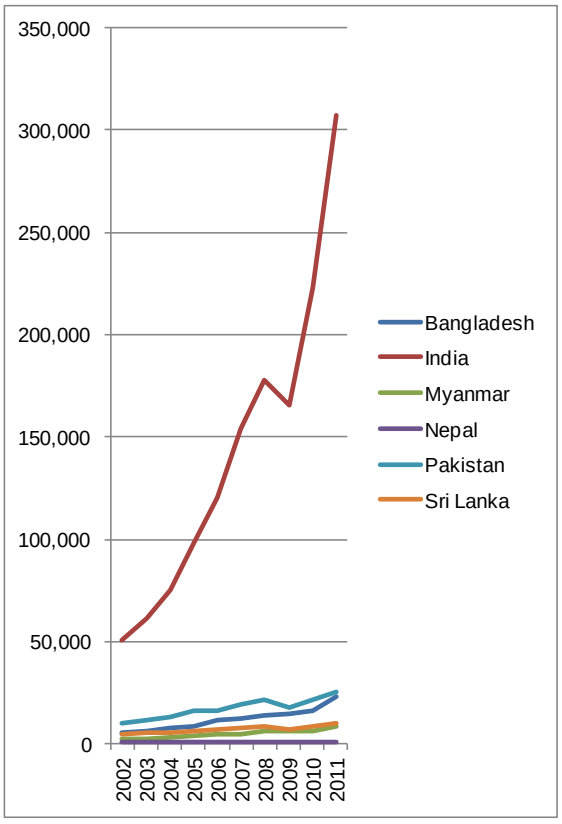
Target region/ country	Title	Scope	Type	Status
GSTP	Global System of Trade Preferences among Developing Countries	Global (developing countries)	Preferential Trade Agreement	In force since 1989
India/Sri Lanka	Free Trade Agreement between the Republic of India and the Democratic Socialist Republic of Sri Lanka	Bilateral	Free Trade Agreement	In force since 2001
Mongolia/APTA	Accession of Mongolia to Asia-Pacific Preferential Trade Agreement	Country - Bloc	Preferential Trade Agreement	Under negotiation since 2011
Pakistan/Sri Lanka	Free Trade Agreement Between the Islamic Republic of Pakistan and the Democratic Socialist Republic of Sri Lanka	Bilateral	Free Trade Agreement	In force since 2005
Sri Lanka/ Singapore	Singapore - Sri Lanka Comprehensive Economic Partnership Agreement	Bilateral	Framework Agreement	Under negotiation since 2003

Target region/ country	Title	Scope	Type	Status
Sri Lanka/Iran	Preferential Trade Agreement between Sri Lanka and The Islamic Republic of Iran	Bilateral	Preferential Trade Agreement	In force since 2004

Source: UN ESCAP, *Asia - Pacific Trade and Investment Agreements Database*

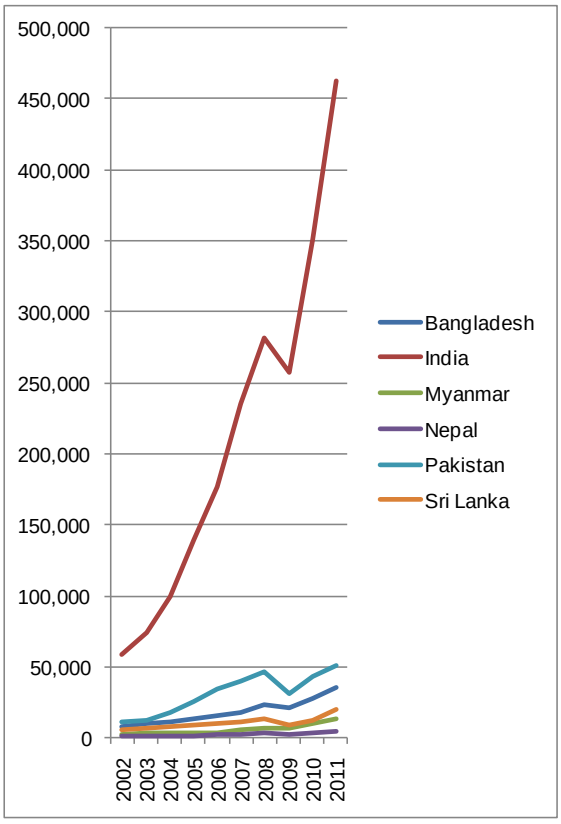
2.2.3 Freight OD on Country Basis Based on Trade Statistics

In recent years, the value of trade of Indian Ocean Rim and South Asian countries has been rapidly increasing along with their economic growth. Although the world financial crisis caused the import and export values of most countries in the region to decline in 2009, the region's trade growth has recovered with an even higher growth rate. India accounts 82% of the region's total export value followed by Pakistan with 7% and Bangladesh with 6%. Moreover, India's share of the region's total import value is 78% followed by Pakistan at 9% and Bangladesh at 6%. Although India is one of the main trade partners of the other countries in the region, intra-regional trade accounts for only a small portion of India's total trade value. It should be also noted that the value of imports is higher than that of exports in the all target countries in 2011. (See Figure 2.2.1 and Figure 2.2.2)



Source: IMF, *Direction of Trade Statistics Database*
Note: Data of Bhutan is not available

Figure 2.2.1:
Trend of Total Export Value
(2002–2011: Million USD)



Source: IMF, *Direction of Trade Statistics Database*
Note: Data of Bhutan is not available.

Figure 2.2.2:
Trend of Total Import Value
(2002–2011: Million USD)

Indian Ocean Rim and South Asian countries are more involved in trading with countries outside of the region than those within the region as shown on Table 2.2.8. Their largest trade partners are United States, developed countries in Europe, China and United Arab Emirates (UAE). A substantial portion of the region's trade also takes place with countries in other East Asian and Middle East countries especially high-income countries in those regions (e.g. Japan, Korea, Singapore, Hong Kong, Saudi Arabia and Kuwait).

Table 2.2.8: Main Trade Partners of Indian Ocean Rim and South Asian Countries in 2011

Top 5 Export Partners (% of total)	
Bangladesh	United State (17%), Germany (14%), United Kingdom (9%), France (6%), Italy (4%)
India	United Arab Emirates (13%), United States (11%), China (6%), Singapore (5%), Hong Kong (4%)
Myanmar	Thailand (38%), China (18%), India (14%), Japan (6%), Korea (3%)
Nepal	India (58%), United States (10%), Germany (5%), Bangladesh (3%), United Kingdom (3%)
Pakistan	United States (14%), United Arab Emirates (8%), Afghanistan (8%), China (8%), Germany (5%)
Sri Lanka	United States (21%), United Kingdom (12%), Italy (6%), Belgium (6%), India (5%)
Top 5 Import Partners (% of total)	
Bangladesh	China (18%), India (13%), Malaysia (5%), Singapore (4%), Japan (4%)
India	China (12%), United Arab Emirates (8%), Switzerland (7%), Saudi Arabia (6%), United States (5%)
Myanmar	China (39%), Thailand (23%), Singapore (10%), Korea (5%), Malaysia (4%)
Nepal	India (58%), China (25%), Singapore (2%), Saudi Arabia (2%), Thailand (1%)
Pakistan	China (18%), Saudi Arabia (11%), United Arab Emirates (11%), Kuwait (6%), Malaysia (6%)
Sri Lanka	India (22%), China (11%), Singapore (8%), Iran (7%), Japan (5%)

Source: Compiled from IMF, *Direction of Trade Statistics Database*
Note (1): Countries were selected on the basis of the value of exports/imports as percentage of Indian Ocean Rim and South Asian Countries trade with the world.
Note (2): Data of Bhutan is not available.

Regarding intra-regional trade, one of the major characteristics is that the share of primary commodities is high except for Indian exports. Although India exports various goods to other countries in the region including manufactured products, the major intra-regional export products of the other countries are unprocessed food materials and/or mining products, as shown in Table 2.2.9. The tendency to trade primary commodities without significant intra-regional trade in finished and semi-finished goods indicates that supply chains have not developed to a great degree among Indian Ocean Rim and South Asian countries. However, it should be noted that bidirectional movement of intermediate goods is observed in the garment/apparel industry. For example, India exports cotton and fabric to surrounding countries such as Bangladesh, Pakistan and Sri Lanka and those countries export apparel products made of Indian fabric. Such intra-regional trade in the apparel industry is seen not only between India and other countries in the region but also between countries in the region other than India.

Table 2.2.9: Matrix of Major Traded Commodities in Indian Ocean Rim and South Asian in 2010[45]

Exporter	Importer						
	Bangladesh	Bhutan	India	Myanmar	Nepal	Pakistan	Sri Lanka
Bangladesh		Prep vegetables, fruit, nuts or other plant parts (44%) Articles of iron or steel (14%)	Vegetable textile fibers (21%) Textile art (14%)	Pharmaceutical products (61%) Iron and steel (33%)	Electric machinery etc (33%) Knitted or crocheted fabrics (13%)	Vegetable textile fibers (80%) Furniture bedding etc (7%) Tobacco (5%)	Pharmaceutical products (23%) Apparel articles and accessories, not knit etc (22%) Apparel articles and accessories, knit or crochet (13%) Vegetable textile fibers (13%)
(Value)		**USD 4,154,000**	**USD 359,128,000**	**USD 9,554,000**	**USD 10,460,000**	**USD 73,901,000**	**USD 12,620,000**
Bhutan	Low volume		Iron and steel (65%)	N/A	Salt; sulfur; earth & stone; lime & cement plaster (38%) Mineral fuel, oil etc (36%)	Low volume	Low volume
(Value)	**USD 2**		**USD 186,144,000**	**N/A**	**USD 1,821**	**USD 18,000**	**USD 25,000**
India	Cereals (17%) Cotton (15%)	Mineral fuel, oil etc (23%) Iron and steel (12%)		Pharmaceutical products (39%) Iron and steel (14%)	Mineral fuel, oil etc (27%) Iron and steel (13%)	Cotton (22%) Organic chemicals (17%) Edible vegetables & certain roots & tubers (8%)	Vehicles (21%) Mineral fuel, oil etc (17%)
(Value)	**USD 2,333,892,000**	**USD 640,818,000**		**USD 163,640,000**	**USD 2,920,907**	**USD 1,559,920,000**	**USD 2,549,355,000**
Myanmar	Wood and articles of wood; wood charcoal (80%)	N/A	Edible vegetables & certain roots & tubers (59%)		Low volume	Edible vegetables & certain roots & tubers (78%) Wood and articles of wood; wood charcoal (10%)	Sugars and sugar confectionary (43%) Cereals (25%) Edible vegetables & certain roots & tubers (25%)
(Value)	**USD 55,478,000**	**N/A**	**USD 1,120,998,000**		**USD 27**	**USD 58,945,000**	**USD 6,603,000**

[4] Because of data availability, data of 2007 was adapted for Bangladesh import. Other data is for of 2010.
[5] Percentage shows share in the total trade between specific origin and destination pair of that year.

Exporter	Importer						
	Bangladesh	Bhutan	India	Myanmar	Nepal	Pakistan	Sri Lanka
Nepal	Nuclear reactors, boilers, machinery etc (52%)	Articles of iron or steel (67%) Electric machinery (20%)	Iron and steel (18%) Plastics and articles thereof (12%)	Low volume		Optic, photo etc (28%) Organic chemicals (21%)	Low volume
(Value)	**USD 152,000**	**USD 12,793,000**	**USD 506,711,000**	**USD 0**		**USD 1,346,000**	**USD 138,000**
Pakistan	Cotton (65%) Manmade staple fibers (8%) Cereals (7%)	Low volume	Edible fruit & nuts (19%) Mineral fuel, oil etc (12%) Salt; sulfur; earth & stone; lime & cement plaster (12%) Organic chemicals (12%)	Salt; sulfur; earth & stone; lime & cement plaster (61%) Pharmaceutical products (24%)	Plastics and articles thereof (34%) Edible fruit & nuts (17%)		Cotton (32%) Cereals (18%) Salt; sulfur; earth & stone; lime & cement plaster (11%) Edible vegetables & certain roots & tubers (10%)
(Value)	**USD 189,115,000**	**USD 161,000**	**USD 321,344,000**	**USD 9,011,000**	**USD 3,846**		**USD 281,450,000**
Sri Lanka	Albuminoidal substitute; modified starch; glue; enzymes (22%) Cotton (18%)	Low volume	Ships, boats and floating structures (16%) Coffee, tea, mate & spices (13%) Rubber and articles thereof (11%) Food industry residues & waste (10%)	Coffee, tea, mate & spices (52%)	Low volume	Rubber and articles thereof (42%) Edible fruit & nuts (12%) Coffee, tea, mate & spices (11%) Vegetable plaiting materials & products (11%)	
(Value)	**USD 15,654,000**	**USD 0**	**USD 519,675,000**	**USD 121,000**	**USD 749**	**USD 53,369,000**	

Source: Compiled from Global Trade Atlas (based on 2-digit HS code commodity categories)
Note (i): N/A: not available
Note (ii): For an origin and destination pair with low trade volume from which it is difficult to analyze the trade pattern, “Low volume” is written instead of major trade commodities.
Note (iii): “Cotton” includes yearn and woven fabric thereof.
Note (iv): “Manmade filaments” includes yearns and woven fabrics.

2.3 International Maritime Container Traffic

2.3.1 General

The wave of containerization started in the 1970's. As the overall volume of maritime trade increased and containerization progressed, the size of container vessels became larger and larger. As a result, the concept of Hub and Spoke system appeared and is still evolving.

As the capacity and size of container vessels increased the role of hub and feeder port became clearer. The existing feeder port can be transformed into hub port provided that cargo volume in the surrounding area increases significantly and attracts mother vessels to drop anchor and pickup/discharge their cargoes.

On the other hand, a hub port may suddenly lose its status by a change in shipping lines' strategy. Shipping lines pay constant attention to reducing their transportation cost so to survive in this market ports must continuously work to meet the requirements of their users.

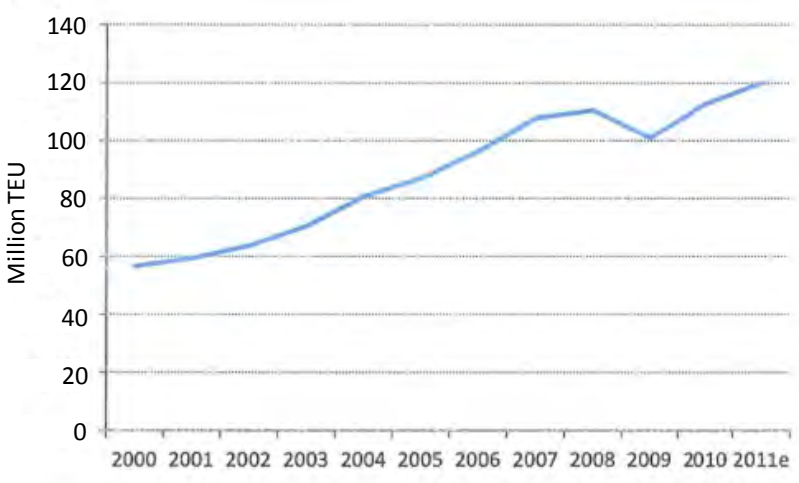
Currently, three major routes, namely Asia–North America, Asia-Europe and Intra Asia together carry more than 50% of the world's container volume. As such, it can be said that Asia is the center of the container trade.

Sri Lanka's Colombo port of is located in the middle of the Asia-Europe route and has been called an "Oasis" by the shipping lines. Due to the port's ideal location, vessels that navigate through this trunk route call at Colombo for replenishment, repatriation of crews and ship repairs in addition to discharging and loading cargo.

2.3.2 Trend of Maritime Container Volume

(1) Global Trend

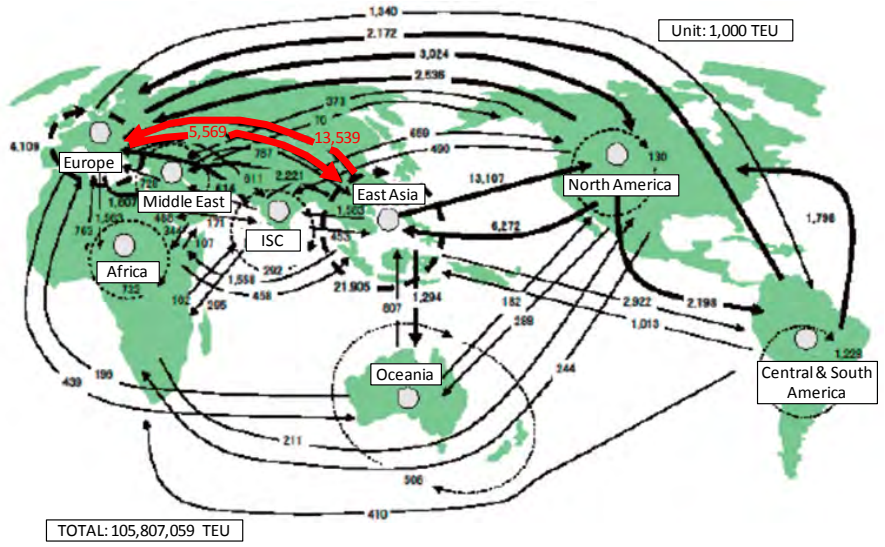
Global container traffic is continuing to increase as shown below. Affected by the financial crisis and recession in 2008, the volume dropped in 2009. Volume (laden) has recovered quickly and reached 115 million TEU in 2011. During 2000 to 2011, the average growth rate is reported as 7.1% while the global economic growth rate was 7.3%, showing that the container traffic is closely linked with the global economy.



Source: Japan Maritime Center, March 2012

Figure 2.3.1: Global Maritime Container Traffic Volume

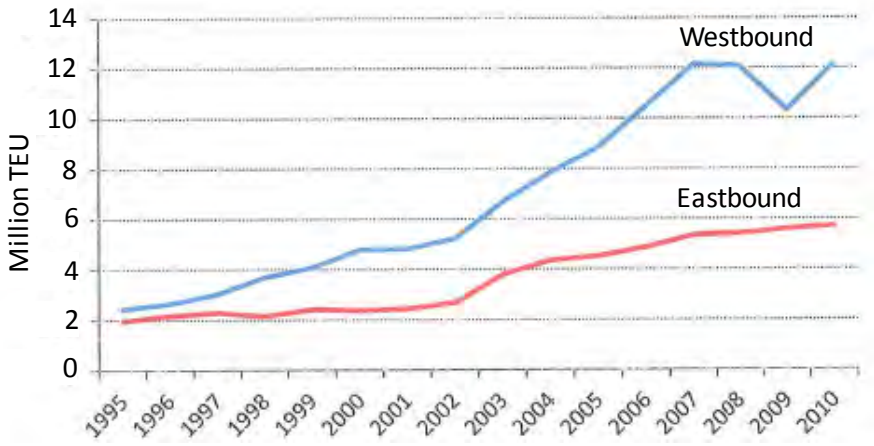
The liner route between Asia and Europe is one of the primary arteries in the shipping world. Most shipping companies that use this route have deployed the most modern vessels to enhance service speed and cargo carrying capacity to meet the growing demand. The estimated global container traffic movement in 2010 is shown below.



Source: Prepared by JICA Survey Team based on MLIT Kaiji report, 2011

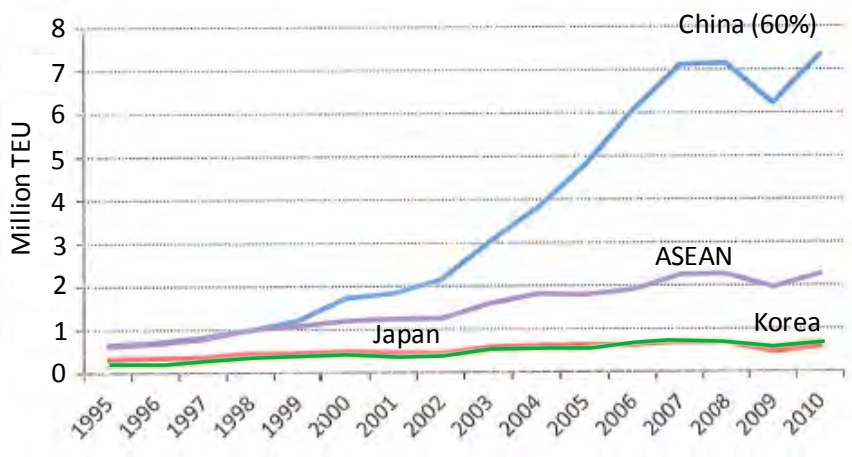
Figure 2.3.2: Global Container Traffic Estimate

The trend of traffic volume on the Asia-Europe route is shown in Figure 2.3.3. The volume is slightly different from Figure 2.3.2 above due to use of a different data source. The total volume has increased five times in the last 15 years. For the westbound containers, more than 60% is from China, and for eastbound containers, more than 40% is for China as shown in Figure 2.3.4 and Figure 2.3.5.



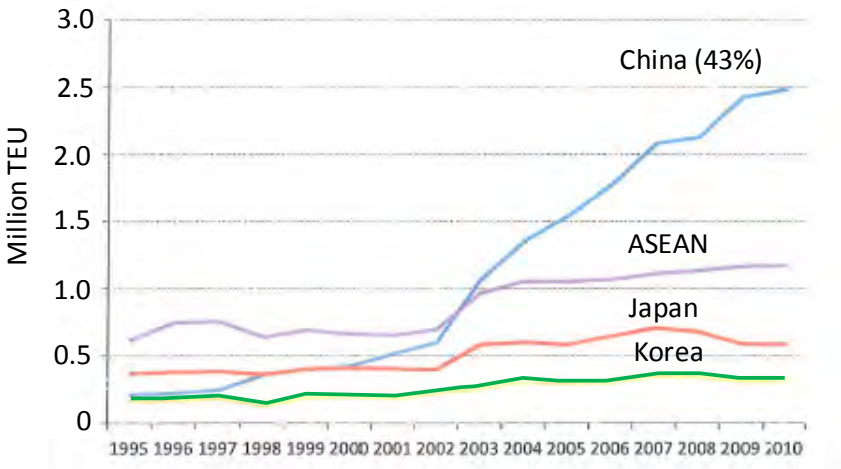
Source: Japan Maritime Center, March 2012

Figure 2.3.3: Container Traffic Volume of Asia-Europe Route



Source: Japan Maritime Center, March 2012

Figure 2.3.4: Origin of Westbound Containers



Source: Japan Maritime Center, March 2012

Figure 2.3.5: Destination of Eastbound Containers

(2) Trend of Hub Ports

It is important to look at the trend of throughput at major hub ports when considering the maritime traffic of Indian Ocean Rim. Table 2.3.1 shows the traffic volume of six major hub ports in the last 12 years, and their location is shown in Figure 2.3.6.

Table 2.3.1: Container Handling Throughput for Hub Ports on Asia/Europe Route

(million TEU)

Port	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Colombo (Sri Lanka)	1.70	1.73	1.73	1.76	1.96	2.22	2.46	3.08	3.38	3.69	3.48	4.00
Salalah (Oman)	0.65	1.03	1.19	1.22	2.00	2.23	2.49	2.39	2.60	3.07	3.49	3.49
P.Klang (Malaysia)	2.55	3.21	3.76	4.53	4.84	5.24	5.54	6.33	7.12	7.99	7.31	8.87
J. Nehru (India)	0.89	1.19	1.57	1.93	2.27	2.37	2.67	3.30	4.06	3.95	4.11	4.75
T. Pelepas (Malaysia)	0.00	0.42	2.05	2.66	3.49	4.02	4.17	4.77	5.50	5.60	6.02	6.53
Singapore (Singapore)	15.94	17.04	15.52	16.80	18.10	21.33	23.19	24.79	27.94	29.92	25.00	28.43

Source: Containerisation International Year Book

Source: JICA Survey Team

Figure 2.3.6: Location of Major Hub Ports along Asia–Europe Route

In 2000, Maersk Line and Evergreen shifted their hub of container port operations from Singapore to the Port of Tanjung Pelepas (PTP), a newly constructed container port located at the southern end of Malaysia in Johor water way. The reason is said to be long waiting times at Singapore due to a shortage of berths. In other words, the number of vessel calls exceeded the berth capacity. As a result, a lot of Malaysian cargo which had come to Singapore by land through the causeway diverted to PTP. Therefore, Singapore's container throughput dropped in 2001 because of the opening of PTP. Realizing the success of its new competitor PTP, Singapore improved its terminal administration to increase the satisfaction of terminal users and its volume returned to an upward trend. Learning a lesson from this experience, the Port of Singapore Authority Corporation (PSA, the terminal operator at the Port of Singapore) expanded it terminal operation business to other countries and became one of the biggest global terminal operators. PSA is in the first rank in container throughput of 65.1 million TEU in 2010.

Damietta, a huge Egyptian container port located near the mouth of Suez Canal lost container cargo because the major shipping lines shifted their hub operations to Algeciras in Spain.

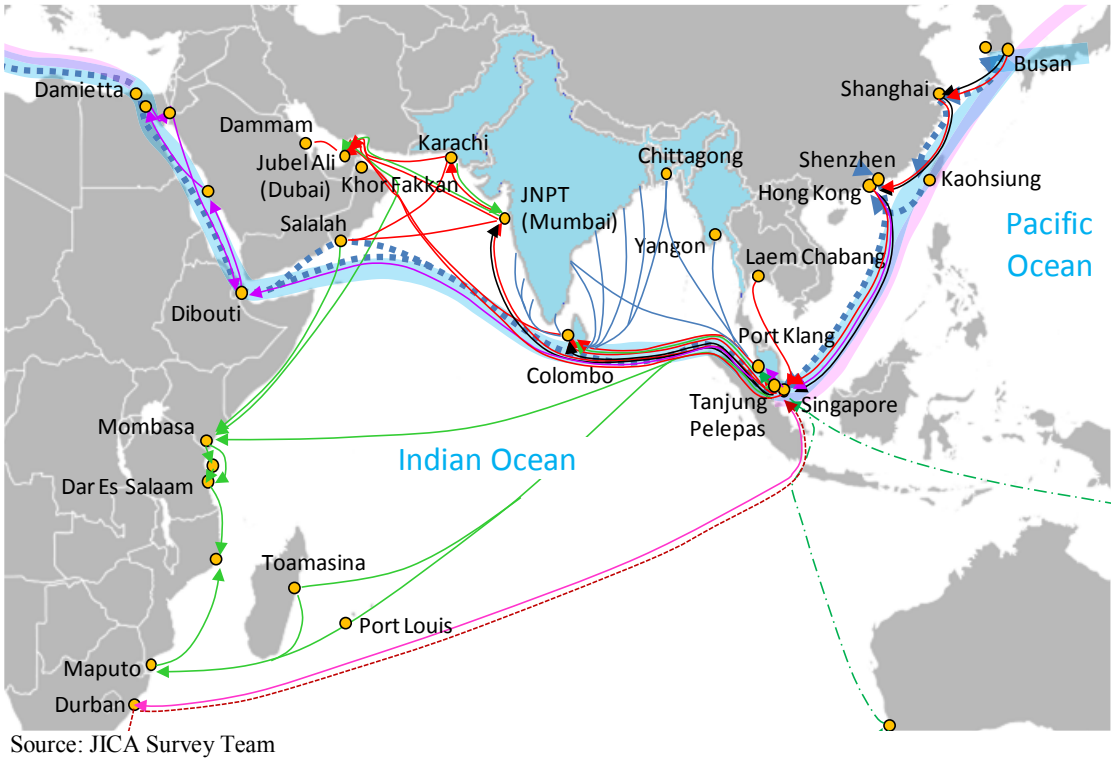
Colombo's case is similar. Major shipping lines transferred their hub of operation to Salalah, newly built mega container terminal in Oman. It can be seen in Table 2.3.1 that for three years after the start of operation at Salalah in 1999, container handling throughput at Colombo stagnated.

These examples show that the status as a hub port is not guaranteed. There is always a possibility of losing hub status if the ports or the port operators stop their efforts to satisfy their users/customers.

It is apparent that the container transshipment business is a so called "foot-loose" business, and the market always favors the buyers' side. Ports and terminal operators are therefore obliged to continuously monitor the status of developments in the shipping industry to appreciate the needs and requirements of vessel operators and port users to maintain their competitiveness.

2.3.3 Maritime Route Network

Current maritime network of the Indian Ocean Rim and South Asia is shown below.



Source: JICA Survey Team

Figure 2.3.7: Current Maritime Route Network of Indian Ocean Rim

In addition to Asia Europe trunk line, there are various routes connecting each region as shown in Table 2.3.2. Not all of these routes are related to Sri Lankan Ports.

Table 2.3.2: Maritime Route

Ref	Route	Sri Lanka's involvement
1.	Asia – Middle East Route	Service
2.	Asia – Eastern Africa Route	Currently no service
3.	Asia – Southern Africa Route	No service
4.	Asia – Western Africa Route	No service
5.	Asia – Australia Route	No Service
6.	Indian Subcontinent – Asia/Europe Route	Service
7.	China – India Route	Service
8.	Bay of Bengal Feeder Route	Service
9.	Middle East – Eastern Africa Route	No Service

(1) Africa Routes

The container service patterns from Asia to Africa are clearly divided into Eastern Africa and Southern Africa due to geography, cargo types and volumes and port facilities/capacity. The ports in Mozambique are located in between these two zones, and covered by both routes depending on the shipping lines' order of port calls. Some ships call at Port Louis of Mauritius and Toamasina of Madagascar before calling to Durban. The container throughput in these two ports remained at more or less the same level for the last few years: some 430,000 TEU for Port Louis and some 130,000 TEU for Toamasina.

Major ports of call for the Eastern Africa Route are Mombasa in Kenya and Dar es Salaam in Tanzania, with berth alongside depths of 11.0 m and 11.5 m, respectively. Their terminal facilities are relatively poor, and congestion due to the lack of handling capacity is notable. The maximum size of vessels calling at these ports is 2,700 TEU. Current service patterns to Eastern Africa are direct from Europe, shuttle services from Durban or Salalah, and directly from Asia. Vessels serving the Asia–Eastern Africa route mostly bypass Colombo.

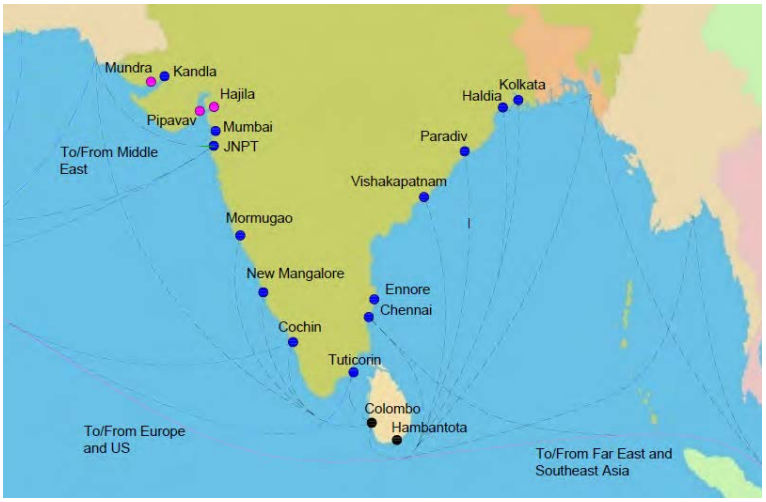
APL Line gave up Eastern Africa service a few years ago because of continuous long waiting times for berths and inefficient terminal operations at Mombasa and Dar es Salaam which made it difficult to maintain a fixed weekly service. Another reason is that shipping lines are prohibited by the Tanzanian Government from imposing the congestion surcharge on the ocean freight. In consequence, shipping lines cannot help suspending the liner service to Dar es Salaam due to constant loss for maintaining such service.

Most shipping lines in the Southern Africa route go directly from Singapore to Durban through the Malacca Straits. Approximately 50% of all African cargo moves to Southern Africa, out of which more than 50% is for the Durban and Johannesburg areas. Therefore, the first port of call in this route is Durban, and then vessels call other Southern Africa ports in a standard rotation.

There is another service between Jawaharlal Nehru/Pakistani ports/Jubel Ali in UAE and Eastern Africa. It is presumed that many Indian and Arabic people live in the Eastern Africa towns along the Indian Ocean, and therefore goods flow between India and Eastern Africa. However, this route does not affect Sri Lanka as Sri Lanka's ports are outside of the service route. The same is true for the service from Europe/Mediterranean to Eastern Africa.

(2) India–Asia/Africa Route

Among 13 major ports and 176 minor ports in India, Jawaharlal Nehru Port (JNPT) is the hub port on the West coast, while Chennai is on the East coast. Presently there are direct services between Europe, Asia, and the Middle East to these hub ports, but all others are basically feeder ports. The current maritime network of India is shown in Figure 2.3.8.



Source: JICA Survey Team

Figure 2.3.8: Current Maritime Route Network of South Asian Economic Zone

India, as a former British colony has historically close ties with Europe and particularly with the UK. There is a significant amount of trade between India and Europe. As such larger size container vessels are deployed to service India/Pakistan with Europe/Mediterranean countries. Owing to its large volume of cargo, JNPT/Mumbai is a gateway port of Delhi and northern India's manufacturing zone along the artery from Delhi to Mumbai.

JNPT, the largest container port in India and ranked 23rd in the world, handled 4.8 million TEU in 2010. JNPT suffers from long waiting times for berthing as too many vessels call at this port in comparison with its existing facilities and capacity. There are three detached types of berths of 13 m alongside depth. Maximum size of vessels that can call here is 6,400 TEU. Some shipping lines call at Pipavav and/or Mundra, which also serve as gateways for Delhi. But railroad conditions to Delhi from Pipavav and Mundra are not good, and there is only a small volume of export cargo. Therefore, many shipping lines have to call at JNPT in order to pick up sufficient volume of cargo.

The condition of inland transportation for containers in India is not good. Containers are carried by railroad and trucks, but the carrying capacity of the railroad is insufficient which makes truck hauling inevitable for most of the volume. However, the roads are not always well paved and flooding in the rainy season often suspends traffic resulting in increased cost. It is estimated that the cost to move freight between Mumbai and Delhi by road is around 1.6 times higher than by railroad[6].

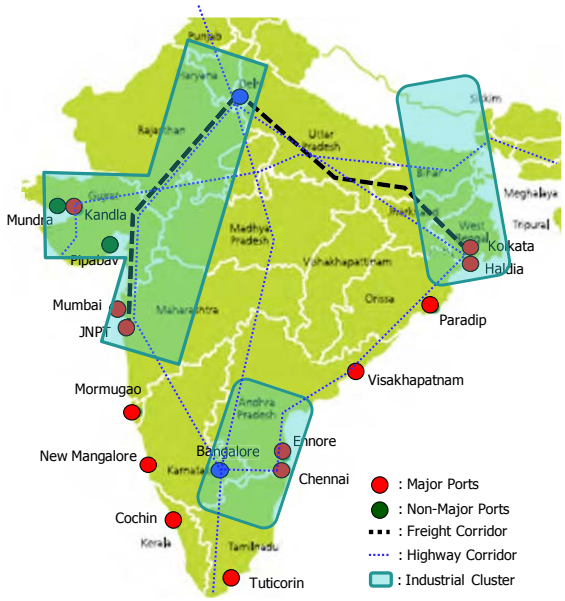
Chennai is the gateway port on the east coast in southern India, where it is connected with Bangalore, the center of southern India's manufacturing zone. The road from Bangalore to Chennai is narrow and congested with heavy traffic throughout the day. Trucks are prohibited to pass the inner city zone in daytime and there is long truck queuing at the terminal gate for cargo delivery. But Chennai and Vasakhapatnam (north of Chennai on the east coast of India) are the only Indian ports to have direct service to Europe and China by mother vessels.

[6] According to India Logistic Map by JETRO, March 2009, freight cost per 40 foot container between Delhi and Mumbai is 73,254 Rupee for road and 44,925 Rupee for rail.

Some shipping lines have Chennai in their routes connecting Asia, Australia, and/or Europe with mother vessels of 3,000 to 4,000 TEU. Some of these also call at Visakhapatnam. Others are shuttle services between Chennai and Colombo, and Chennai and Port Klang/Singapore.

Certain automobile manufacturers utilize Ennore which is only 24 km north from Chennai in the State of Tamil Nadu. It appears that shippers who wish to transfer their gateway port from Chennai to Ennore are increasing Pure Car Carriers (PCC) has already begun calling at Ennore to avoid heavy congestion in Chennai.

There are three major industrial zones in India; North, South and East as shown in Figure 2.3.9. Cargo usually does not move between each zone and is imported or exported through major ports in each zone. The gateway port for northern zone cargo is JN/Mumbai, and additional subsidiary ports Mundra and Pipavav on the west coast. Chennai is the gateway port for southern zone cargo. Occasionally partial cargo is transported to Kochi on the west coast. Cargo for the eastern manufacturing zone of India is handled through the Kolkata and Haldia gateways.



Source: JICA Survey Team

Figure 2.3.9: Location of Industrial Zones in India

Northern cargo rarely uses Chennai, and vice versa, southern cargo rarely flows to JN/Mumbai. The reason is that railway capacity to carry cargo is insufficient, the condition of the roads is poor, and some tax or additional payments are required when passing the state boarder. The documentation for passing the state border is complicated as well.

The ports of Kolkata and Haldia in the north end of Bengal Bay have been feeder ports due to draft restrictions. This situation is likely to remain unchanged. Shipping lines use small container vessels to operate shuttle services to and from Kolkata and Haldia and Singapore or Colombo. Kolkata is an impounded dock type river port around 145 km from the mouth of the River Hooghly. The port can accommodate vessels of no more than 172 m in length (LOA) and 8.5 m in draft. Convoys can navigate through the river channel only at high tide. Upriver and downriver convoys generally meet at the midway point and exchange pilots. Therefore the maximum container vessels allowable are approximately 1,000 TEU. All vessels have to stop their engines and are guided by tug boats inside the dock. Some berths have two (2) units of mobile cranes on the quay, but ships' gears are used in other berths.

Kolkata is an important gateway port for land-locked countries like Nepal and Bhutan. Around eight thousand TEU of containers are imported to these countries in a month, but are returned empty as export cargo from these countries is small.

Haldia is also a river port along the River Hooghly, around 40 km from the ocean. Haldia is a little larger than Kolkata. Haldia mainly handles bulk and break bulk cargo though container vessels do call. A plan to construct a new port on Sagar Island at the north end of Bengal Bay has been on the table, but at the moment nothing proceeds.

The status of these ports is expected to remain unchanged for at least the next several years.

There are liner services from Kolkata/Haldia to both Colombo and Singapore. Most shipping lines have tried to induce container cargo to Singapore by offering lower freight rates even though the navigational distance to Singapore is longer than to Colombo. The ocean freight rate is $250/20FT and $400–500/40FT for Kolkata/Singapore versus $400/20FT and $600–700/40FT for Kolkata/Colombo.

The shuttle service pattern between Colombo and Kochi/Tuticorin is expected to remain as is for the next several years. The distance is quite short and is only a half day sail from Tuticorin to Colombo.

In India, each state government makes its individual policy. Even though the Central government has prepared a kind of master plan or comprehensive program, each state makes its plan for expansion of the port or policy to induce shipping lines without coordinating with the other states. In this way the states are always competing with each other.

Furthermore, foreign shipping lines are not permitted to carry Indian domestic cargo between Indian ports due to Cabotage Laws. Indian vessels are insufficient in number, and all are very old. The cabotage freight rate by Indian vessels is far more expensive than foreign[7] vessels due to high wages of seamen. It is an obstacle in gathering cargoes to the regional hub ports from smaller ports.

The independent strategies of Indian states and Cabotage Laws hamper the development of hub ports. This causes many smaller, similar scale ports to come on line. Because every port wishes to build up corridor construction to inland Free Trade Zones or Special Economic Zones where large demand can be expected, it takes much longer to develop a great hub port.

(3) Middle East Route

The Asia/Bombay (Mumbai) route is the first liner route established more than 100 years ago, and it expanded to the ports in the Gulf via Karachi.

Cargo traffic along this route remains stable with modest import cargo to the Gulf ports. There is little backhaul traffic in this lane. The majority of containers are returned empty.

Nowadays in extreme cases, the increase in cargo volume necessitated augmenting capacity of container vessels to more than 8,000 TEU. Some shipping lines have deployed 11,000 TEU container vessels to the hub ports of Dubai, Jubel Ali, and Kohr Fakkan.

[7] According to the interview in India, it was reported that cabotage freight rates are three times more expensive than foreign vessel rates.

Dubai and Damman have sufficient facilities to accommodate mega container vessels in the Persian Gulf. These ports are the hubs catering to feeder ports such as Kuwait and Doha, among others.

This pattern resembles the route connecting these ports with Mediterranean and European ports. Dubai, Jubel Ali, Kohr Fakkan, Salalah were commissioned as hubs for transshipment to other ports on a feeder basis.

(4) Bay of Bengal Route

Ports on the East coast of India, Bangladesh, and Myanmar are along the Bay of Bengal. Though the navigable distance is longer to Singapore than to Colombo, the frequency of feeder service is much higher in Singapore. Singapore has the priority in transshipment services by its large scale of port facilities, efficient and high quality services and already established vast network of feeder services to all over the world. Therefore, shipping lines seem to intentionally solicit volume for the Singapore route.

In Yangon port of Myanmar, vessels should go 87 km upstream from the mouth of the Yangon River. Two sand bars often disturb the vessels' straight navigation, and maximum LOA of 167 m and 8.5 m draft vessels are permitted to enter the port. Tidal range of 5.5 m must be taken into consideration when entering/exiting the port, which is managed and controlled by the Myanmar Port Authority. As such, the maximum size of vessels that are now allowed to enter the port are 610 TEU.

The length of navigation channel at Yangon port is 11 km from Pilot station to outer bar, 24 km from outer bar to Thilawa area, 30 km from Thilawa are to Inner bar, and 7 km from inner bar to the Yangon container terminal operated by the port authority. There is another 7 km to AWPT container terminal operated by a private company. All the feeder vessels are connected to Port Klang and Singapore by shuttle service, except for one that is between Chennai in India.

From Chittagong port in Bangladesh, small vessels of 500 TEU are used for shuttle services between Colombo and Singapore/Port Klang. There is one 1700 TEU vessel deployed, which is the maximum size in this route. The frequency to Colombo is far below that to Singapore/Port Klang. There is much more connecting services to Singapore and even cargo to Europe is transported to Singapore despite the longer distance.

2.3.4 Container Traffic OD

Considering the roles of the major ports of Sri Lanka as transshipment hubs, current container traffic volumes between major international ports in the region and other regions of the world were studied. Future container traffic volumes between those ports and regions were estimated for further demand forecast purposes. The results of this analysis follow.

(1) Container Traffic OD in 2010

The volume of container traffic (TEU) between each origin and destination (OD) pair in 2010 was calculated based on the data of "Cargo Trade Statistics Limited". Here, only the loaded container traffic was used and any returning empty containers were excluded. The result of the calculation is shown in Table 2.3.3.

Table 2.3.3: Matrix of Container Traffic Volume in 2010 (TEU)

Origin		Destination	Pakistan		Indian Sub-Continent																Sri Lanka		Bangladesh			Myanmar	South East Asia				Other South East Asia	Far East	North Europe	Mediterranean	Middle East	North America	South America	Southern & West Africa	East Africa	Australia & Oceania	**Total**
					India																						Thailand															
			Karachi	Karachi-Muhammad Bin Qasim	Mundra	Kandla	Pipavav	Mumbai	Nhava Sheva	Marmagao	Mangalore	New Mangalore	Cochin	Tuticorin	Chennai	Visakhapatnam	Haldia	Kolkata	Other Indian Sub Cont	Colombo	Trincomalee	Mongla	Dhaka	Chittagong	Yangon	Laem Chabang & Bangkok	Other Thailand	Songkhla													
Indian Sub-Continent	Pakistan	Karachi	0	0	24	0	0	0	1	0	0	0	0	318	0	0	0	0	0	350	0	0	1	916	34	164	0	6	2,187	12,031	96,263	61,172	3,768	6,524	1,427	1,333	9,296	1,603	197,418
		Karachi-Muhammad Bin Qasim	0	0	4	0	0	0	15	0	0	0	3	65	22	0	2	0	0	1,049	0	0	253	3,241	46	45	0	0	1,029	4,506	-	-	6,606	85,501	6,417	29,958	22,426	1,079	162,267
	India	Mundra	26	24	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	121	0	0	0	1,711	2	513	0	0	3,706	4,918	84,090	53,989	10,846	34,888	18,223	13,513	14,166	719	241,457
		Kandla	0	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	91	0	0	2	610	0	7	0	0	1,320	1,759	-	-	6,582	1,036	59	2,466	2,976	94	17,011
		Pipavav	0	281	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	139	0	0	0	1,770	21	328	0	17	5,912	10,481	16,162	18,316	8,642	6,456	5,615	9,484	5,801	329	89,754
		Mumbai	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	13	3	0	17	0	0	15	0	54
		Nhava Sheva	530	1,610	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,162	0	0	95	4,524	349	1,082	0	61	31,984	21,723	226,815	178,580	54,656	151,304	53,694	62,273	37,192	10,392	838,026
		Marmagao	3	24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	0	0	0	71	0	340	0	34	565	341	-	-	832	315	70	29	38	89	2,759
		Mangalore	24	35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	23	0	0	0	44	0	441	0	39	819	2,003	-	-	672	1,185	10	136	64	21	5,516
		New Mangalore	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0	0	2	0	-	-	233	17	107	3	9	0	377
		Cochin	4	400	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	80	0	0	42	251	1	220	0	28	987	810	14,833	14,044	3,208	8,788	810	900	406	790	46,602
		Tuticorin	523	306	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	231	0	0	3	1,386	0	169	2	2	1,075	3,442	57,706	29,486	4,368	25,761	5,745	3,574	2,678	869	137,326
		Chennai	713	879	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2,853	0	0	46	4,093	0	310	0	1	2,735	8,239	78,675	47,330	12,617	28,374	8,350	7,877	7,022	2,639	212,753
		Visakhapatnam	73	184	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	370	0	0	0	57	0	37	0	4	597	4,194	2,829	2,057	1,649	1,691	409	668	268	5	15,092
		Haldia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	32	0	0	0	0	0	7	0	0	205	5,640	2,723	7,162	1,458	773	731	2,615	956	20	22,322
		Kolkata	671	76	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	292	0	0	0	4	0	15	0	0	6,348	8,179	16,272	17,357	4,627	6,265	1,069	2,270	2,176	354	65,975
		Other Indian Sub Cont	0	0	0	0	1	0	12	0	0	0	0	0	0	0	0	0	0	12	0	0	0	101	8	14	5,734	10	85,633	109,046	15,285	18,459	256	94,442	19,032	17,712	11,995	3,645	381,397
	Sri Lanka	Colombo	182	5	64	0	4	0	1,040	44	1	0	157	1,171	965	6	0	0	21	0	0	0	13	660	0	622	0	3	4,238	6,697	53,912	30,985	6,674	15,060	2,389	1,893	799	689	128,294
		Trincomalee	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-	0	0	0	0	0	0	0
	Bangladesh	Mongla	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	32	1,292	708	5	280	0	1	0	0	2,324
		Dhaka	25	3	0	0	0	0	21	0	0	0	0	0	4	0	0	0	0	20	0	0	0	2	0	6	0	0	66	190	10,379	2,951	651	2,151	21	60	45	28	16,623
		Chittagong	913	8	6	0	0	0	84	0	0	0	0	2	27	0	0	99	0	181	0	0	0	0	0	9	0	0	768	4,115	124,416	45,935	3,197	47,607	1,045	1,068	2,431	2,233	234,144
South East Asia	Myanmar	Yangon	2	0	0	0	0	0	20	0	0	0	297	0	0	0	0	0	0	57	0	0	0	24	0	30	0	0	105	1,005	2,824	2,283	78	79	33	55	8	30	6,930
	Thailand	Laem Chabang & Bangkok	1,279	3,077	154	233	686	5	8,663	24	99	0	412	257	11,397	946	691	1,672	574	11,925	0	0	398	3,144	117	0	0	0	68,693	108,749	308,767	170,324	36,912	155,190	43,233	40,826	11,358	70,269	1,060,074
		Other Thailand	0	105	205	0	0	0	260	0	0	12	99	80	4	0	30	40	36,456	258	0	0	0	0	0	0	0	0	206	118			46,392	7,736	5,273	31,828	9,312	54,538	192,952
		Songkhla	0	0	79	0	21	0	6	0	0	0	0	0	22	0	6	0	0	18	0	0	0	0	0	0	0	0	68	3,053			115	5,303	1,081	135	11	563	10,481
	Other South East Asia		5,141	5,368	1,118	551	1,045	16	20,492	140	292	0	1,854	1,802	6,502	190	677	2,553	85,677	19,774	0	40	413	10,366	636	26,454	1,387	195	113,108	260,647	953,082	438,462	186,562	694,101	133,752	131,036	48,616	181,652	3,333,701
Far East			29,035	28,307	4,559	2,497	25,944	261	153,221	701	530	2	4,355	3,409	51,516	2,983	7,545	24,555	436,476	31,255	0	173	5,898	44,745	3,162	130,558	760	1,364	335,305	674,667	7,223,949	4,388,505	995,276	5,312,473	1,531,023	828,011	209,543	772,683	23,265,246
North Europe			118,012	-	62,113	-	16,187	4,777	284,750	-	-	-	8,631	9,520	93,102	6,592	12,559	17,203	54,921	21,580	-	425	2,907	28,305	4,679	170,800			719,729	2,953,857	140,501	1,321,938	932,858	2,064,110	924,382	698,605	101,599	298,699	11,073,341
Mediterranean			51,766	-	26,826	-	9,470	3,051	130,029	-	-	-	4,663	9,212	47,719	2,673	6,244	9,896	18,120	18,664	-	11	392	26,633	1,462	73,818			318,457	1,383,398	915,647	940,247	704,143	1,033,074	426,565	389,925	180,362	147,572	6,880,039
Middle East			8,744	9,128	3,142	1,788	2,760	12	28,756	324	247	0	2,248	5,512	14,430	740	3,371	5,930	11,341	18,009	0	0	400	31,832	903	14,094	13,305	173	214,782	385,953	194,439	299,101	91,026	71,336	28,953	134,040	123,174	22,106	1,742,099
North America			9,656	60,573	52,055	4,029	2,521	1,320	163,143	292	163	0	6,298	11,712	58,213	1,426	5,384	6,321	71,949	5,916	0	15	254	16,158	36	62,443	2,030	1,390	600,459	2,709,840	1,746,093	990,920	343,503	37,918	1,244,852	171,073	34,848	259,951	8,682,754
South America			3,162	9,353	3,372	8,775	317	464	15,903	0	26	0	252	1,545	6,817	342	179	992	4,827	6,149	0	0	92	2,070	120	18,598	1,092	224	87,290	558,725	1,061,598	437,633	193,654	806,498	881,475	115,262	12,427	24,913	4,264,146
Southern & West Africa			394	221	236	865	591	6	1,832	66	22	0	445	328	663	0	101	123	8	47	0	0	4	248	0	12,754	4,334	53	123,955	335,486	461,491	142,882	66,556	85,071	22,432	42,134	47,490	19,558	1,370,396
East Africa			39	73	379	51	95	0	773	0	14	8	19	235	74	0	62	45	0	5	0	0	0	57	47	4,216	1,557	155	26,609	64,019	84,417	60,384	34,721	14,202	1,411	7,906	14,167	376	316,116
Australia & Oceania			170	240	198	3	80	0	1,258	1	0	10	250	1,448	997	15	64	124	20	950	0	0	0	858	981	31,120	6,950	52	241,478	562,971	136,574	50,609	44,398	168,621	29,910	23,585	6,956	345,112	1,656,003
Total			231,087	120,289	154,534	18,792	59,722	9,912	810,281	1,592	1,394	32	29,983	46,616	292,474	15,913	36,915	69,553	720,390	141,621	0	664	11,213	183,881	12,604	549,220	37,151	3,811	3,000,426	10,210,840	14,031,047	9,771,822	3,807,741	10,974,147	5,399,598	2,772,254	920,630	2,223,620	66,671,769

Source: Compiled from data of *"Container Trade Statistics"*

(2) Estimation of Container Traffic OD in 2017

Container traffic volumes of the same target origin and destination pairs as 2010 were estimated for 2017 to study the future trend. For this estimation, the level of container trade potential was assumed to follow GDP. The sum of GDP of the countries in an origin region and those of a destination region were used for this estimation. The equation used follows:

$$CV_{ij} = k_{ij} \times GDP_i^{\alpha} \times GDP_j^{\beta}$$

Where:

CV_{ij}	Container traffic volume between Origin Region *i* and Destination Region *j*
GDP_i	Sum of GDP of the countries in the Origin Region *i*
GDP_i	Sum of GDP of the countries in the Destination Region *j*
α_i	Elasticity coefficient of CV_{ij} to GDP_i
β_j	Elasticity coefficient of CV_{ij} to GDP_j
k_{ij}	Coefficient value for the pair of Origin Region *i* and Destination Region *j*

In order to calculate the coefficient values α_i, β_j, k_{ij}, container traffic volumes of selected years from 2000 to 2011 between eight regions (64 origin and destination pairs), estimated by Mitsui O.S.K Lines, Ltd., were used as well as GDP of countries in the target regions. Only selected years from 2000 to 2011 were used to estimate coefficient values to make t-values and r2-values more applicable. The years whose data was used for estimation of coefficient values of each origin and destination pair are shown in Table 2.3.5.

Coefficient values calculated through the process above were applied to 2010 container traffic volumes (Table 2.3.3) and projected future GDP to calculate future container traffic volumes. The result of the calculation for 2017 is shown in Table 2.3.6. GDP values of 2010 and 2017 used for this calculation are shown in Table 2.3.4 for reference.

Table 2.3.4: GDP in 2010 and 2017 (billion USD: Current Price)

County	GDP in 2010	GDP in 2017
Pakistan	176.87	298.65
India	1,597.95	2,906.49
Sri Lanka	49.54	98.97
Bangladesh	105.56	177.83
Myanmar	45.38	76.44
Thailand	318.91	522.56
South East Asia	1,874.28	3,786.10
Far East	13,094.31	22,172.34
North Europe	14,652.62	19,845.19
Mediterranean	6,330.82	8,368.03
Middle East	1,638.71	2,774.40
North America	17,138.99	23,412.92
South America	3,864.87	6,039.08
Southern & West Africa	915.92	1,574.12
East Africa	197.70	333.63
Australia & Oceania	1,401.69	2,180.85

Source: Compiled from "IMF, World Economic Outlook Databases"

Table 2.3.5: OD Data Used for Estimation of Coefficient Values

Origin	Destination	Year									
		2000	2001	2002	2004	2005	2006	2007	2008	2010	2011
North America	North America	○	○	○	○	○	○	○	○	-	○
North America	East Asia	○	○	○	○	○	○	○	○	○	○
North America	Europe	○	○	○	○	○	○	○	○	○	○
North America	South America	○	○	○	○	○	○	○	○	○	○
North America	Middle East	○	○	○	-	○	○	○	○	○	○
North America	South Asia	○	○	○	○	○	○	○	○	○	○
North America	Africa	○	○	○	○	○	○	○	○	○	○
North America	Oceania	○	○	○	○	○	○	○	○	○	○
East Asia	North America	○	○	○	○	○	○	○	○	○	○
East Asia	East Asia	-	○	○	○	○	○	○	○	○	○
East Asia	Europe	○	○	○	○	○	○	○	○	○	○
East Asia	South America	○	○	○	○	○	○	○	○	○	○
East Asia	Middle East	○	○	○	○	○	○	○	-	○	○
East Asia	South Asia	○	○	○	○	○	○	○	○	○	○
East Asia	Africa	○	○	○	○	○	○	○	○	○	○
East Asia	Oceania	○	○	○	-	○	○	○	-	○	○
Europe	North America	○	○	○	-	○	○	○	-	○	○
Europe	East Asia	○	○	○	○	○	○	○	○	○	○
Europe	Europe	○	○	○	-	-	-	-	○	○	○
Europe	South America	○	○	○	○	○	○	○	○	○	○
Europe	Middle East	○	○	○	○	○	○	○	○	○	○
Europe	South Asia	○	○	○	○	○	○	○	○	○	○
Europe	Africa	○	-	○	○	-	-	○	-	○	○
Europe	Oceania	○	○	○	○	○	○	○	○	○	○
South America	North America	○	○	○	○	○	○	○	○	○	○
South America	East Asia	○	○	○	-	-	○	-	○	○	○
South America	Europe	○	○	○	-	-	○	-	-	○	○
South America	South America	-	-	○	○	○	-	○	○	-	○
South America	Middle East	○	○	○	○	○	○	○	-	-	-
South America	South Asia	○	○	-	-	-	○	○	-	-	-
South America	Africa	○	○	○	○	○	○	○	○	○	-
South America	Oceania	○	○	○	○	○	○	○	-	-	-
Middle East	North America	○	○	○	-	○	○	-	○	○	○
Middle East	East Asia	○	○	-	○	○	○	○	-	○	○
Middle East	Europe	○	○	○	○	○	○	○	○	○	○
Middle East	South America	○	○	-	-	○	○	○	-	-	-
Middle East	Middle East	○	○	-	○	○	○	○	○	○	○
Middle East	South Asia	○	○	○	-	-	-	○	○	○	○
Middle East	Africa	○	○	○	○	-	○	○	○	○	○
Middle East	Oceania	○	○	○	○	-	○	○	-	-	-
South Asia	North America	○	○	○	○	○	○	○	○	○	○
South Asia	East Asia	-	○	○	○	○	-	○	○	○	○
South Asia	Europe	○	○	○	○	○	○	○	○	○	○
South Asia	South America	○	○	○	○	○	○	○	-	-	-
South Asia	Middle East	○	○	○	-	○	○	○	○	○	○
South Asia	South Asia	○	○	○	-	-	○	○	○	○	○
South Asia	Africa	○	○	○	○	○	○	○	○	○	○
South Asia	Oceania	○	○	○	○	○	○	○	-	-	-
Africa	North America	○	○	○	○	○	○	-	-	○	○
Africa	East Asia	○	○	○	-	○	○	○	○	○	○
Africa	Europe	○	○	○	○	-	-	○	○	○	○
Africa	South America	○	○	○	○	○	-	○	-	-	-
Africa	Middle East	○	○	○	○	○	○	○	○	○	○
Africa	South Asia	○	○	○	○	○	○	○	○	○	○
Africa	Africa	○	○	○	○	○	○	○	○	○	○
Africa	Oceania	-	-	○	○	○	○	○	-	-	-
Oceania	North America	○	-	○	-	○	○	○	○	○	○
Oceania	East Asia	○	○	○	○	○	○	○	○	○	○
Oceania	Europe	○	○	-	-	○	○	○	○	○	○
Oceania	South America	○	○	○	○	○	○	○	-	-	-
Oceania	Middle East	○	○	○	○	○	○	○	-	-	-
Oceania	South Asia	-	-	○	○	○	○	○	-	-	-
Oceania	Africa	○	○	○	○	○	○	○	-	-	-
Oceania	Oceania	○	○	○	○	○	○	○	○	○	○

Source: JICA Survey Team

Note: Data of the year showing "○" were used for estimation of coefficient values for each pair of origin and destination.

Table 2.3.6: Matrix of Estimated Container Traffic Volume in 2017 (TEU)

Origin		Destination	Indian Sub-Continent																								South East Asia				Far East	North Europe	Mediterranean	Middle East	North America	South America	Southern & West Africa	East Africa	Australia & Oceania	**Total**
			Pakistan		India															Sri Lanka		Bangladesh			Myanmar	Thailand			Other South East Asia												
			Karachi	Karachi-Muhammad Bin Qasim	Mundra	Kandla	Pipavav	Mumbai	Nhava Sheva	Marmagao	Mangalore	New Mangalore	Cochin	Tuticorin	Chennai	Visakhapatnam	Haldia	Kolkata	Other Indian Sub Cont	Colombo	Trincomalee	Mongla	Dhaka	Chittagong	Yangon	Laem Chabang & Bangkok	Other Thailand	Songkhla													
Indian Sub-Continent	Pakistan	Karachi	0	0	29	0	0	0	1	0	0	0	0	381	0	0	0	0	0	426	0	0	1	1,085	34	160	0	6	2,764	12,175	105,306	63,131	4,279	9,535	9,115	2,841	18,727	2,269	232,265
		Karachi-Muhammad Bin Qasim	0	0	5	0	0	0	18	0	0	0	4	78	26	0	2	0	0	1,277	0	0	300	3,838	46	44	0	0	1,298	4,560	-	-	7,501	124,962	40,989	63,843	45,177	1,528	295,496
	India	Mundra	31	29	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	149	0	0	0	2,051	2	459	0	0	4,348	4,574	84,048	50,907	10,963	49,760	195,001	25,291	25,062	1,281	453,959
		Kandla	0	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	112	0	0	2	731	0	6	0	0	1,506	1,636	-	-	6,653	1,478	631	4,615	5,265	167	22,814
		Pipavav	0	337	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	171	0	0	0	2,121	19	294	0	15	6,825	9,748	16,154	17,271	8,736	9,208	60,085	17,750	10,263	586	159,583
		Mumbai	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	13	3	0	24	0	0	27	0	72
		Nhava Sheva	635	1,930	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,432	0	0	114	5,422	323	969	0	55	36,795	20,205	226,701	168,387	55,247	215,800	574,571	116,549	65,800	18,514	1,509,448
		Marmagao	4	29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0	0	0	85	0	305	0	30	735	317	-	-	841	449	749	54	67	159	3,834
		Mangalore	29	42	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	28	0	0	0	53	0	395	0	35	1,050	1,863	-	-	679	1,690	107	255	113	37	6,376
		New Mangalore	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	4	0	-	-	236	24	1,145	6	16	0	1,435
		Cochin	5	480	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	99	0	0	50	301	1	197	0	25	1,185	753	14,826	13,242	3,243	12,534	8,668	1,684	718	1,407	59,418
		Tuticorin	627	367	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	285	0	0	4	1,661	0	151	2	2	1,267	3,201	57,677	27,803	4,415	36,742	61,476	6,689	4,738	1,548	208,655
		Chennai	855	1,054	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3,515	0	0	55	4,906	0	278	0	1	3,192	7,663	78,635	44,629	12,754	40,469	89,352	14,742	12,423	4,701	319,224
		Visakhapatnam	88	221	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	456	0	0	0	68	0	33	0	4	690	3,901	2,828	1,940	1,667	2,412	4,377	1,250	474	9	20,416
		Haldia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	39	0	0	0	0	0	6	0	0	235	5,246	2,722	6,753	1,474	1,103	7,822	4,894	1,691	36	32,021
		Kolkata	805	91	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	360	0	0	0	5	0	13	0	0	7,236	7,607	16,264	16,366	4,677	8,936	11,439	4,248	3,850	631	82,528
		Other Indian Sub Cont	0	0	0	0	1	0	15	0	0	0	0	0	0	0	0	0	0	15	0	0	0	121	7	13	5,136	9	98,973	101,424	15,277	17,405	259	134,699	203,658	33,149	21,221	6,494	637,877
	Sri Lanka	Colombo	222	6	79	0	5	0	1,281	54	1	0	193	1,443	1,189	7	0	0	26	0	0	0	16	803	0	501	0	2	4,478	5,600	48,082	26,070	5,825	20,828	49,024	3,007	1,200	1,640	171,584
		Trincomalee	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-	0	0	0	0	0	0	0
	Bangladesh	Mongla	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	32	1,417	733	6	410	0	2	0	0	2,607
		Dhaka	30	4	0	0	0	0	25	0	0	0	0	0	5	0	0	0	0	24	0	0	0	2	0	6	0	0	84	193	11,386	3,054	742	3,146	132	128	91	39	19,091
		Chittagong	1,081	9	7	0	0	0	101	0	0	0	0	2	32	0	0	119	0	220	0	0	0	0	0	9	0	0	957	4,175	136,483	47,538	3,643	69,631	6,570	2,285	4,917	3,139	280,920
South East Asia	Myanmar	Yangon	3	0	0	0	0	0	32	0	0	0	478	0	0	0	0	0	0	108	0	0	0	34	0	54	0	0	222	1,853	4,296	3,362	115	121	58	81	12	27	10,856
	Thailand	Laem Chabang & Bangkok	1,868	4,495	255	386	1,137	8	14,355	40	164	0	683	426	18,885	1,568	1,145	2,771	951	23,166	0	0	579	4,575	212	0	0	0	138,160	197,285			54,433	242,394	76,840	60,339	16,493	66,334	1,649,992
		Other Thailand	0	153	340	0	0	0	431	0	0	20	164	133	7	0	50	66	60,408	501	0	0	0	0	0	0	0	0	414	214	469,397	250,649	68,413	12,083	9,372	47,041	13,522	51,484	264,814
		Songkhla	0	0	131	0	35	0	10	0	0	0	0	0	36	0	10	0	0	35	0	0	0	0	0	0	0	0	137	5,539			170	8,283	1,921	200	16	531	17,053
	Other South East Asia		5,691	5,420	1,353	661	1,169	20	24,496	179	358	0	2,230	2,299	5,014	0	671	2,860	102,538	26,350	0	47	372	11,266	1,327	53,203	2,789	392	282,517	560,867	1,460,271	650,557	264,903	874,018	226,490	177,010	65,031	113,368	4,983,395
Far East			41,004	39,975	7,303	4,000	41,559	418	245,444	1,123	849	3	6,976	5,461	82,523	4,778	12,086	39,334	699,187	58,698	0	243	8,297	62,945	5,829	236,850	1,379	2,474	719,242	1,247,620	10,992,236	6,464,114	1,461,737	8,079,763	2,706,238	1,212,900	301,570	704,248	35,498,408
North Europe			142,872	-	70,949	-	18,490	5,457	325,257	-	-	-	9,859	10,874	106,346	7,530	14,346	19,650	62,734	22,906	-	515	3,526	34,329	6,467	234,294			1,059,430	4,088,415	140,259	1,319,752	1,536,710	2,129,332	1,300,817	868,632	126,716	366,207	14,032,669
Mediterranean			59,720	-	29,199	-	10,308	3,321	141,533	-	-	-	5,076	10,027	51,941	2,909	6,796	10,772	19,723	18,878	-	13	453	30,780	1,991	99,796			461,809	1,887,088	914,133	938,757	1,052,067	1,054,906	583,615	472,937	219,434	181,354	8,269,335
Middle East			8,575	8,952	2,483	1,413	2,181	9	22,728	256	195	0	1,777	4,356	11,405	585	2,664	4,687	8,964	10,841	0	0	395	31,426	2,719	39,167	36,974	481	1,165,742	1,180,419	352,522	503,825	149,335	158,039	117,501	360,084	344,137	30,435	4,565,273
North America			8,966	56,245	55,909	4,327	2,708	1,418	175,223	314	175	0	6,764	12,579	62,523	1,532	5,783	6,789	77,276	7,635	0	14	235	14,936	52	90,222	2,933	2,008	854,896	3,907,236	1,762,656	969,718	351,625	24,228	1,543,666	388,270	79,972	259,501	10,738,335
South America			5,354	15,837	5,130	13,349	482	706	24,193	0	40	0	383	2,350	10,370	520	272	1,509	7,343	8,172	0	0	156	3,517	180	27,178	1,596	327	165,240	844,548	1,259,639	515,321	370,030	1,218,488	1,306,021	313,536	32,896	45,253	6,199,937
Southern & West Africa			526	295	236	864	591	6	1,831	66	22	0	445	328	662	0	101	123	8	33	0	0	5	334	0	13,391	4,550	56	123,185	349,586	483,496	149,645	127,777	129,251	33,220	84,303	93,917	17,217	1,616,069
East Africa			48	90	350	47	88	0	714	0	13	7	18	217	68	0	57	42	0	3	0	0	0	71	49	4,402	1,626	162	26,187	66,346	88,316	63,152	65,256	21,489	2,085	15,635	27,692	331	384,561
Australia & Oceania			229	323	311	5	126	0	1,976	2	0	16	393	2,274	1,566	24	101	195	31	1,811	0	0	0	1,150	974	30,760	6,870	51	247,541	559,207	131,282	47,215	75,582	292,837	43,511	23,585	6,956	459,871	1,936,770
Total			279,266	136,394	174,068	25,053	78,878	11,363	979,664	2,033	1,817	46	35,442	53,228	352,600	19,453	44,084	88,916	1,039,190	187,754	0	832	14,560	218,616	20,233	833,161	63,854	6,136	5,418,353	15,091,102	18,876,322	12,381,299	5,711,993	14,989,070	9,276,270	4,327,836	1,550,203	2,340,347	94,687,095

Source: JICA Survey Team

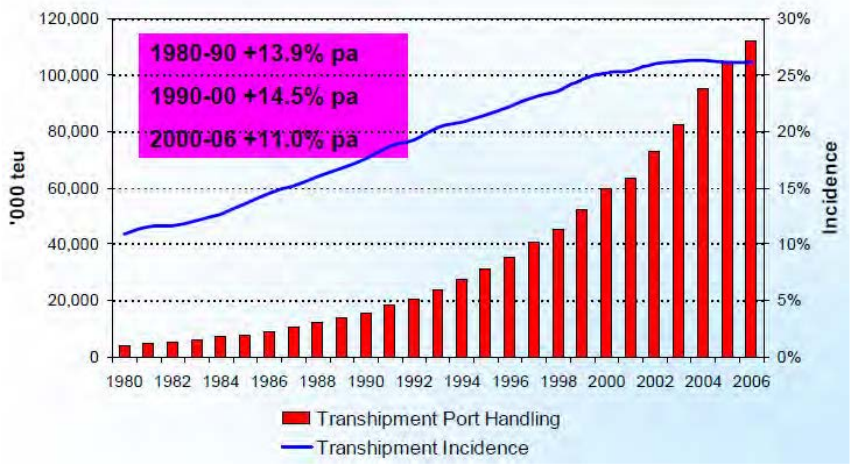
2.3.5 Container Transshipment

To save time and cost on long distance routes, particularly Asia to Europe, shipping lines prefer to shorten transit times from the port of origin to destination ports by not calling on ports along the way. Therefore, some major shipping lines traverse directly from China to destination ports in Europe. Numerous shippers and consignees favor this mode of operation because their cargo reaches its destination much faster. However, in the event that the vessel's cargo space is not fully occupied operators will often accept short distance transshipment cargo for discharge at ports along the way.

Shipping lines and associated alliances maintaining arterial routes therefore have two distinct offerings. One is direct or non-stop service for long distance transportation between China and Europe without calling on main ports, such as Singapore, Port Klang, and Colombo. This satisfies the requirement of cargo owners who require rapid arrival of their cargo at the port of destination. In this case shipping companies are normally compensated by the high freight rates on time-sensitive and/or high-value cargo.

The other mode of cargo transport is transshipment. The vessels call at hub ports for discharging and loading containers to be transshipped between mother and feeder vessel, which forms the so called Hub and Spoke operation. One of the favorable points of this service for shipping lines is they can avoid additional time and cost for deviating from the trunk route to pickup local cargo at feeder ports. Although the gross profit of shipping lines is higher in transporting local cargo compared to transshipment cargo because no additional container handling cost is needed, Hub and Spoke operation is more economical and efficient if the local cargo volume at feeder ports are not large enough for a mother vessel to call.

As shown below, transshipment volume is increasing as the vessel size becomes larger and the hub and spoke system dominates the shipping market.



Source: "Transipment and Global Container Traffic Growth" by Drewry, June 2007

Figure 2.3.10: Trend of Transshipment Incidence and Volume

In considering transshipment hubs on the Asia-Europe route, more vessels call at Singapore than Colombo. There are several reasons for this. Singapore originates more feeder port services than Colombo. Also, the container handling system and documentation procedures in Singapore are superior to Colombo's.

The requirements for a competitive transshipment hub port are:

- Connectivity (Frequency of services)
- Port Facility (Sufficient depth and quay length)
- Port Operation Efficiency (Quick dispatch of vessels)
- Geographic Location (Less deviation from trunk route)
- Local Cargo (More profit for shipping lines)

2.3.6 Alliance of Shipping Lines

An Alliance is an agreement amongst shipping companies establishing the terms of liner service in a particular route. The Alliance agreement covers not only service schedules, but also vessel sizes, rotation of port calls and space exchange. The agreement covers all services as if one shipping line administers and maintains the service on the designated route. The member companies benefit by avoiding concentrated heavy investment in vessels to serve the route and maintaining a well balanced circulation of container boxes to the world's ports.

Number of vessels currently deployed by the major alliances including independent shipping lines and their loading capacity are summarized below.

Table 2.3.7: Capacity of Major Alliance and Independent Shipping Lines

Operator	No. of Ships	TEU	Member Liners
Grand Alliance	322	1,408,958	NYK, Hapag-Lloyd, OOCL
The New World Alliance	318	1,338,166	MOL, APL, HMM
Green Alliance	410	1,819,953	K-Kine, COSCON, Yan Ming, Hanjin
APMM Group	566	2,200,491	Maersk and others
MSC	447	1,983,174	-
CMA-CGM	407	1,326,575	-
Evergreen	167	597,623	-
CSCL	121	534,450	-
PIL	135	259,429	-
ZIM	71	279,687	-
G6 Alliance	More than 90	-	Six carriers of Grand Alliance and The New World Alliance (Far East–Europe / Mediterranean Route only)

Source: Containerisation International Yearbook 2012

In the shipping industry today there are three big alliances, namely New World Alliance, Grand Alliance, and Green Alliance and several large independent shipping groups. The independent groups also have agreements for such things as slot charters and/or joint service among them. This system gives the allied or grouped shipping lines improved equalization of investment costs and operational expenses. Shipping lines are able to cover their service networks through cooperation with alliance partners according to this system and have a wider service network over the small ports in the world by through carriage agreements. The feeder services and the local shipping lines in Bengal Bay and the Persian Gulf operate better services because of these contracts among them.

In 2011, six leading shipping lines who are members of Grand Alliance (Hapag-Lloyd, NYK, OOCL) and New World Alliance (APL, HMM, MOL) agreed to create one of the largest vessel networks in the Far East to Europe Route called G6 Alliance. The operation of G6 Alliance is scheduled to start from April 2012 with more than 90 container vessels calling more than 40 ports along the route.

G6 Alliance was formed in response to the the economic crisis in Europe. In the wake of the crisis container volumes from China to Europe decreased significantly and ocean freight rates fell, affecting financial status of the shipping lines. G6 Alliance aims to cut down the maintenance and operation cost of larger vessels by sharing it among the members.

2.3.7 Dimensions of Container Vessels

Table 2.3.8 shows the rapidly increasing size of container vessels. In 2010/2011, almost twice the number of vessels over 10,000 TEU appeared in the shipping fleet and ninety three vessels over 10,000 TEU are currently deployed in the Asia/Europe route (Some vessels are double counted as they are in service in two loops). Container vessels and total capacity now under operation are as follows.

Table 2.3.8: List of Container Vessels Deployed

Size of Vessel (TEU)	August 2010			August 2011			Differences		
	Nos.	1,000 TEU	Share	Nos.	1,000 TEU	Share	Nos.	1,000 TEU	Share
>10,000	53	656	5%	101	1,283	9%	+48	+626	+95%
8,000~9,999	254	2,169	16%	279	2,386	16%	+25	+218	+10%
5,000~7,999	516	3,045	22%	542	3,221	21%	+26	+176	+6%
3,000~4,999	897	3,638	26%	922	3,774	25%	+25	+106	+3%
1,000~2,999	1,984	3,626	26%	2,003	3,657	24%	+19	+32	+1%
< 1,000	1,187	708	5%	1,161	700	5%	-26	-8	-1%
Total	4,891	13,841	100%	5,008	14,991	100%	+117	+1,150	+8%

Source: NYK's Report

Table 2.3.9 shows that more than 90% of the mega container vessels (carrying capacity of 10,000+ TEU) are deployed in the Asia/Europe route. Presently, Colombo can accept ships with maximum size up to around 9,500 TEU. These mega container vessels are bypassing Sri Lanka Island in the seaway off Colombo.

These mega container vessels have huge fuel oil tanks with capacity to navigate for more than 30 days. Even if they consume 320-350 tons of fuel oil per day they do not need to stop to top up bunker oil at ports along the way like Colombo. This "non-stop service between Asia and Europe" by most major shipping lines is advertised in the shipping schedule.

Table 2.3.9: Mega Container Vessels on Asia/Europe Route (as of June 2011)

Size of Vessel (TEU) / Operator/Alliance	10,000	11,000	12,000	13,000	14,000	15,000	Total
Maersk				6		8	14
Green Alliance	10			2			12
MSC		4	5	1	22		32
Maersk/CMA-CGM				10			10
CMA-CGM	4	12					16
CSCL/CMA-CGM/Evergreen/UASC	1		1	1	3		6
CSCL/Evergreen	1						1
CSCL/Evergreen/Zim	2						2
Total	18	16	6	20	25	8	93

Source: NYK's Report

Water depth at the terminal operators' berths and the depth of the port's channel determine the size ships that a container terminal can accommodate. However, water depth does not always constrain ship size when the shipping lines have a strong incentive to maintain the service.

Shipping lines will try to enter larger size vessels than the facilities can accommodate if there is an opportunity to accept significant cargo. In many cases ships are not fully loaded and many empty containers are onboard for inventory. Moreover, ship masters will adjust the ship's draft with ballast water.

The largest container vessels under construction are 18,000 TEU ordered by Maersk line. Other major shipping lines have also placed orders for container vessels larger than 12,000 TEU. Most of them are sure to be deployed into the Asia/Europe route, and the cascading will likely replace the vessels of other routes with larger types soon.

2.3.8 Possible Future Changes of Maritime Routes

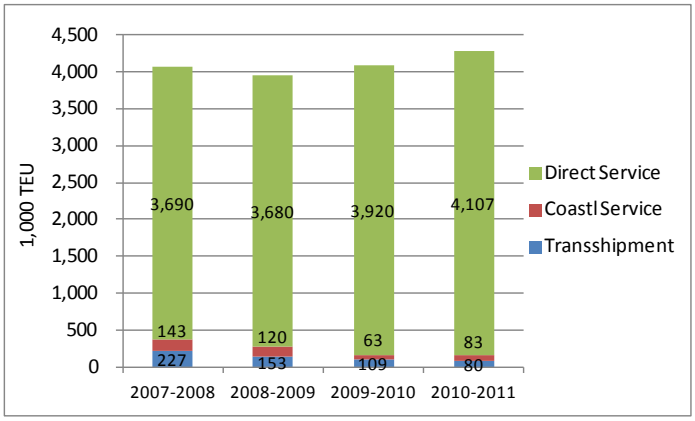
When the economy and container traffic of a certain region grows, or the existing FTA is expanded or even a new FTA is established, courses or loops of container trunk lines will remain unchanged and the increased volume will be covered by a new or wider feeder services network.

If the cargo volume at a certain port of origin or destination increases, the service frequency will be increased first. Then the type of vessel becomes larger, and some of the feeder services will be swapped with the middle distance direct services by larger vessels.

In this chapter, possible changes of maritime trade routes are analyzed in relation to the Indian Ocean Rim and South Indian economic zone.

(1) More Direct Services to India

When the container traffic grows to a certain volume, direct services will be dominant over feeder services. The figure below shows the trend of container shipping services at JNPT from 2007–2008 to 2010–2011. It can be seen that direct service is increasing year by year. During 2010–2011, 96.2% of JNPT's total throughput was carried by direct services.

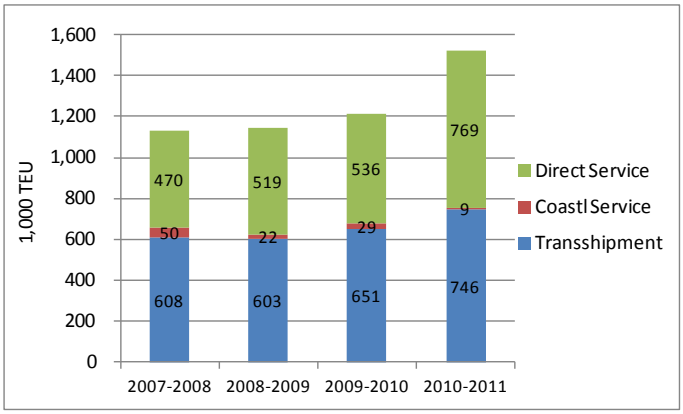


Source: JICA Survey Team

Figure 2.3.11: Breakdown of Container Shipment Service at JNPT

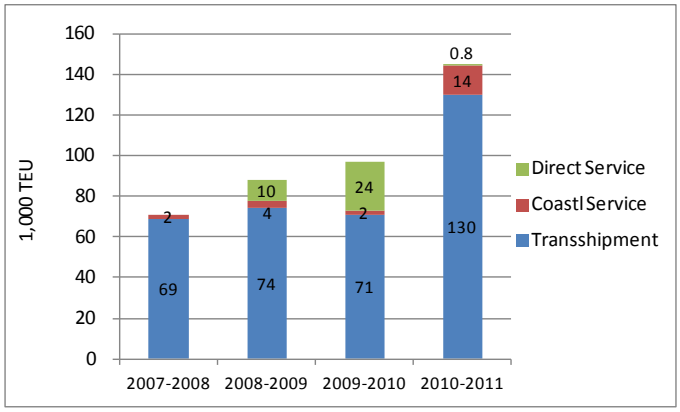
Chennai port, currently handling around 1.5 million TEU annually is the hub port on the east coast. Approximately 50% of Chennai's container volume is handled in direct services as shown in Figure 2.3.12. The other 50% is transshipped at Singapore, Port Klang or Colombo. However, as Chennai's total throughput increases to the same level as JNPT currently (which is expected by the year 2020) direct services are expected to be dominant just as happened at JNPT.

Another major port on the east coast is Visakhapatnam port. It has 16.5 m berth alongside depth and is the deepest sea port among all the major ports in India. In the maritime agenda 2011-2020 set by the Ministry of Shipping of India, Visakhapatnam is expected to serve as one of the four hub ports of the country: JNPT and Cochin on the west, Chennai and Visakhapatnam on the east. At present direct services account for a small percentage of the volume at Visakhapatnam, but again, direct services are expected to be the dominant service if the container volume grows.



Source: JICA Survey Team

Figure 2.3.12: Breakdown of Container Shipment Service at Chennai



Source: JICA Survey Team

Figure 2.3.13: Breakdown of Container Shipment Service at Visakhapatnam

(2) Asia–Sri Lanka–Eastern Africa

The vessels that go to Eastern Africa ports actually bypass Sri Lanka at the moment. There is a possibility that shipping lines will take into consideration the potential to improve the present Eastern Africa service pattern by utilizing Colombo as transshipment hub. This would make Colombo a valuable key port in the route from Asia to East Africa.

Actually, there had been such service by APL Line as mentioned previously. APL stopped the service due to unreliable port operations at Mombasa and Dar es Salaam as well as long waiting times for berths.

However, the construction of a new container terminal at Mombasa port has already started from March 2012 with the financial assistance of the Japanese government. The new terminals are expected to commence operation from February 2016. Dar es Salaam Port has also decided to construct new container terminals with Chinese assistance.

After the completion of these new terminals service levels are expected to improve, congestion is likely to ease and the feeder service once stopped is likely to start again.

(3) Myanmar–Sri Lanka–Europe/America

Myanmar has been governed under a military regime since 1988 but recently achieved democratization and opened up the country to the global market. The country has a population of nearly 60 million (59 million in 2010) and is said to have huge potential for economic growth. Many international development agencies and private investors are coming in to Myanmar to support the development of the country and also to find business opportunities.

Consequently, economic sanctions have been lifted and foreign trade between European countries and the US is expected to start. At present, the majority of maritime trade is handled at Yangon Port which is connected by feeder services to Singapore and Port Klang. The port is restricted by the shallow draft of the Yangon river, and therefore only feeder service by smaller vessels is available.

When the trade with western countries develops there is a possibility of a new feeder network connecting Yangon port and Sri Lanka because the navigational distance is shorter compared to going to Singapore or Port Klang.

2.4 Existing Container Terminal Facilities and Development Plan

2.4.1 Overview

Containerization in global logistics is progressing feeding the demand for development of new container terminals. The size of container vessels also continues to increase which makes deeper berths sufficient to accommodate larger vessels an essential condition for container ports, especially hub ports.

Major development plans of container terminal on the Indian Ocean Rim and South Asian Countries are summarized below.

Table 2.4.1: Summary of International Container Terminal Development (1/2)

Country	Port	Project	Facility Detail	Designed Capacity (mil. TEU)	Status / Target Year of Completion
Sri Lanka	Colombo	Colombo Port Expansion Project	L=1,200 m × 3 terminal D=18 m	7.2	Under construction East Terminal, first 450 m by 2014 South Terminal first 600 m by 2013 South Terminal remaining 600 m by 2016
	Hambantota	Phase 2 development	TBD	20.0	Waiting for Loan confirmation from China (construction is scheduled to start in 2012)
India	Chennai	Mega Container Terminal	L=2,000 m D=22.0 m	4.0	Under Bidding Completion target by 2020
	Ennore	Construction of Container Terminal Phase-1	L=1,000 m D=15.0 m	1.5	Under Construction Completion target by February 2014
	Chennai–Ennore	Chennai–Ennore Port road connectivity project (formerly EMRIP)	Total length = 30.1 km	-	Under construction Completion target by 2013
	Visakhapatnam	Terminal Expansion Phase 3	L=350 D=15.0 m	-	It is scheduled to start after achieving 350,000 TEU with existing terminal
	Tuticorin	Conversion of berth 8 as container terminal	L=345 m D=12.8 m	-	Under Bidding
	JNPT	Development of fourth container terminal Phase-1	L = 700 m	2.4	Under Bidding Completion target by 2015
		Development of fourth container terminal Phase-2	L = 1,000 m	2.4	Completion target by 2017 (2 years after phase 1)
		Extension of container berth	L = 330 m	0.8	Under Bidding Completion target by 2013
		Deepening and Widening of Access Channel and Basin Phase 1	D = 14.0 m	6,000 TEU class	Under Bidding (Est. 300 million USD) Completion target by 2014
		Deepening and Widening of Access Channel and Basin Phase 2	D = 17.0 m	18,000 TEU class	Under preparation Completion target by 2020
		Development of fifth Mega Container Terminal	L = 4,000 m D = 16.0 m	10.0	Under design by Scott Wilson Completion target by 2020

Table 2.4.2: Summary of International Container Terminal Development (2/2)

Country	Port	Project	Facility Detail	Designed Capacity (mil. TEU)	Status / Target Year of Completion
Bangladesh	Chittagon	Karnaphuli Container Terminal Project	L = 600 m	0.6	Target completion by end of 2013
	Sonadia	Sonadia Deep Sea Port Project	L = 1,500 m (by 2020) L = 2,700 m(by 2035) L = 5,700 m(by 2055)	2.0 7.5 18.6	Seeking additional investors (other than China)
Pakistan	Karachi	Karachi Deep Sea Port	D = 18.0 m, L=1,500 m (Phase1)	No Information	BOT by Hutchison
	Gwadar	Gwadar Container Terminal	No Information	No Information	Pending due to pullout of PSA from the operation of current multi-purpose terminal
Singapore	Singapore	Pasir Panjang Container Terminal Phase 3 & 4 project	Total of 16 berths D = 18 m, 23 m	14.0	Under construction, partial operation from 2014
Malaysia	Port Kelang	Development of the Third Container Terminal	L = 1,500 m	3.0	Under approval stage
	Tanjung Pelepas	Port Expansion – Phase 3	L=360 m × 2 berth D=19.0 m	0.6	Under contract negotiation, operation by mid-2014

Source: Prepared by the JICA Survey Team

2.4.2 Sri Lanka

(1) National Port Development Plan

The latest development policy framework of Sri Lanka is summarized as Mahinda Chintana – Vision for the future, published by the department of national planning of Ministry of Finance and Planning in 2010.

Development of port infrastructure has been given the highest priority in recent years, and it is stated that all ships traveling to Europe, Far East, Middle East, Africa, Australia and the Pacific Rim countries will be served by Colombo and Hambantota ports and the capacity of these ports will be enhanced to accommodate modern container vessels.

Mahinda Chintana also states that cargo villages will be developed in the vicinity of Colombo, Hambantota, Galle, Trincomalee, Kankasanthurai and Point Pedro ports.

The location of Sri Lankan Ports and ongoing key port development projects are shown in Figure 2.4.1 and Table 2.4.3 respectively.

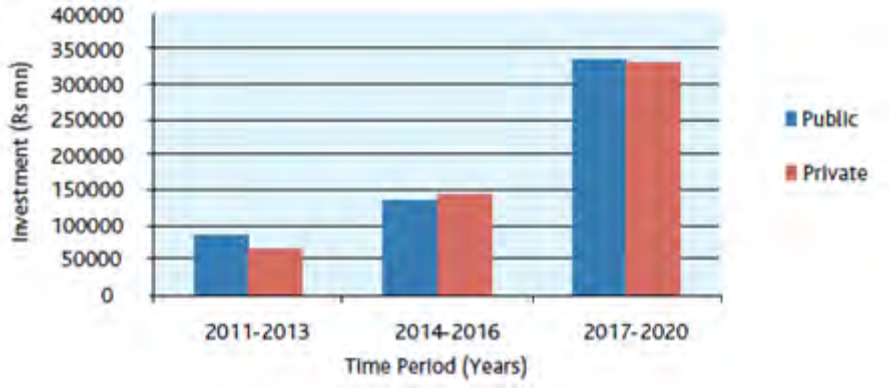
Figure 2.4.1: Location of Sri Lankan Ports

Table 2.4.3: National Port Development Plan of Sri Lanka

Project	Activities	Investment (million USD)
Colombo South Harbour	Construction of; ✓ A new harbor basin area of 285 hectares with 570 m wide approach channel ✓ A new major breakwater and small breakwater ✓ A new marine operations center ✓ Three container terminals	Domestic: 152.2 ADB: 253.7 Private:253.7
Port of Hambantota	Construction of; ✓ A breakwater of L = 1,000 m ✓ Two berths and approach channel ✓ Harbor basin and dredging up to 16 m depth	Domestic: 64.9 Exim bank of China: 259.6
Port of Oluvil	Construction of; ✓ Two breakwaters of L = 550 m and L = 755 m ✓ Dredging 8 m of the harbor basin to accommodate 5,000 DWT vessels in the first phase and 16,000 DWT vessels in the second phase	Domestic: 9.5 Netherland: 38.0
Port of Galle	Construction of; ✓ A multi-purpose terminal and a breakwater ✓ Channel and harbor basin dredging ✓ Procurement of equipment and navigational aids	Domestic: 26.0 JICA: 104.0
Kankhasanthuri Harbour (KKS)	✓ Repair of the main breakwater and existing structure in the harbor ✓ Remove the three sunken vessels laying close to the KKS port	Domestic: 0.1 Foreign: 0.6

Source: The development policy framework, Government of Sri Lanka 2010
Note: The investment amount is calculated with the rate of Rs=0.00769 USD as of 01 May, 2012

Investments by both the public sector and the private sector are expected to increase to support the planned development activities as shown in Figure 2.4.2.



Source: The development policy framework, Government of Sri Lanka 2010

Figure 2.4.2: Expected Investments in Port

(2) Colombo Port

Colombo port has three container terminals. Jaya Container Terminal and Unity Container Terminal are operated by Sri Lanka Port Authority (SLPA), while SAGT Terminal is the first private container terminal. SAGT is owned and operated by South Asia Gateway Terminal Pvt., Ltd., a consortium of local companies, foreign partners such as A.P. Moller Group and Evergreen International SA, Peony Investment SA of Panama, and SLPA.

SAGT signed a Build, Operate, Transfer (BOT) concession agreement for 30 years with SLPA in 1999 and took over the operation and management of the terminal. After the redevelopment and extension of existing Queen Elizabeth Quay, it started operation in 2003.

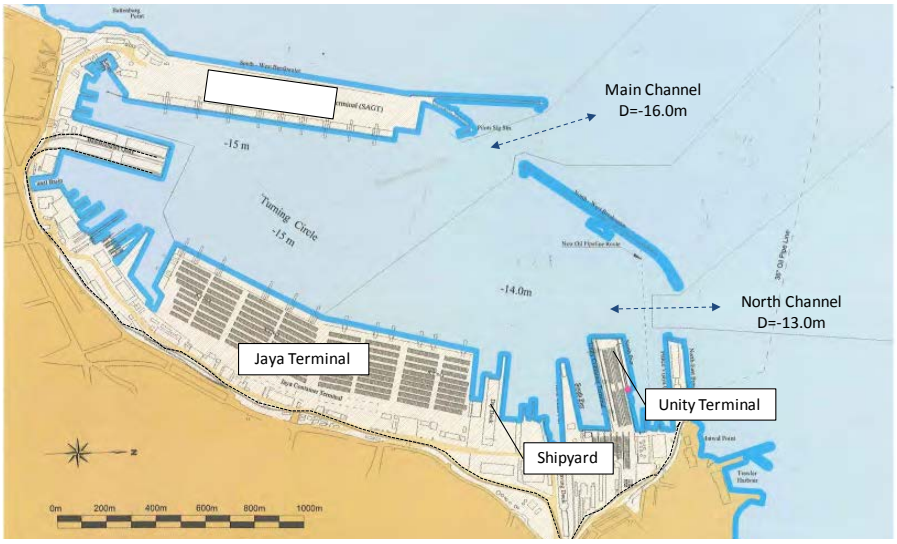


Figure 2.4.3: Layout of Colombo Port

Figure 2.4.4: View of Colombo Port

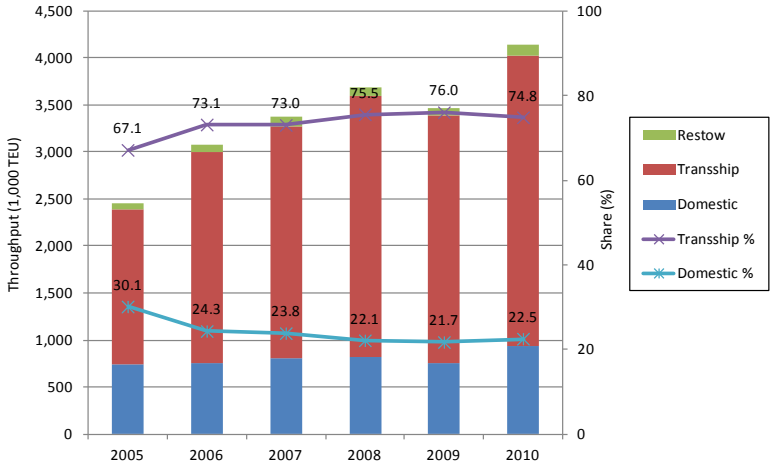
Table 2.4.4: Container Terminal Facility of Colombo Port

Facility \ Terminal	Unit	Jaya	Unity	SAGT
Access Channel Depth	m	13.0 and 16.0		
No. of Berth	No	4+2	2+1	3
Berth Length	m	1,292 +350	590	940
Berth Depth	m	12.0-15.0	9.0-11.0	15.0
No. of Quay Crane	No	19	3	9
Port Area	Ha	45.6	1.53	20.0
Throughput (in 2010)	TEU	2,167,187		1,970,254
Handling Capacity	TEU	4,500,000		
Operator	-	SLPA	SLPA	SAGT (Pvt.) Ltd.

Source: JICA Survey Team

There are two navigation channels with 16.0 m and 13.0 m in depth respectively. Navigation as well as berthing/un-berthing of the vessel at Colombo Port is said to be troublesome during the monsoon seasons, but according to some shipping lines the situation improved after the completion of the breakwater for South Harbor Development Project.

Existing capacity of the three terminals is 4.5 million TEU and throughput in 2010 was 4,137,441 TEU. Container transshipment business plays a significant role for Colombo port accounting for almost 75% of total throughput. Container throughput and its breakdown are shown below.



Source: JICA Survey Team

Figure 2.4.5: Breakdown of Container Throughput of Colombo Port

Colombo South Harbor Project is in progress with financial assistance by ADB, which is a major expansion of Colombo port. Three container terminals will be developed in phases, each with 1,200 m quay length and 18 m alongside depth. The access channel will be 20 m depth. The first South Container Terminal (SCT) which is under construction will be operated by private operator Colombo International Container Terminals Ltd (a subsidiary of China Merchants Holdings International Co., Ltd.) under BOT agreement for 35 years. The planed layout and facility detail are shown below.

Source: SLPA

Figure 2.4.6: Layout Plan of Colombo South Harbor

Table 2.4.5: Container Terminal Facility of Colombo Port

Facility \ Terminal	Unit	SCT (South Container Terminal)	ECT (East Container Terminal)	WCT (West Container Terminal)
Access Channel Depth	m	20.0		
No. of Berth	No	3	3	3
Berth Length	m	1,200	1,200	1,200
Berth Depth	m	18.0	18.0	18.0
No. of Quay Crane	No	No information	No information	No information
Port Area	Ha	58	58	58
Handling Capacity	TEU	2.4 million	2.4 million	2.4 million
Operator	-	CICT	To be confirmed	To be confirmed

Source: JICA Survey Team

The container handling capacity according to SLPA's development plan is shown below. At least two terminals out of three will be operated by private operators as agreed with ADB.

Table 2.4.6: Development Schedule of Colombo South Harbor Project

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Existing Terminals	4.5	4.7	4.7	4.7	4.7	4.7	4.7	4.7	4.7	4.7	4.7
SCT (1st 600 m)				0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
SCT (2nd 600 m)						1.5	1.5	1.5	1.5	1.5	1.5
ECT (1st 400 m)					0.8	0.8	0.8	0.8	0.8	0.8	0.8
ECT (2nd 800 m)							1.6	1.6	1.6	1.6	1.6
WCT (1st 600 m)									1.2	1.2	1.2
WCT (2nd 600 m)											1.2
TOTAL	4.5	4.7	4.7	5.6	6.4	7.9	9.5	9.5	10.7	10.7	11.9

Note: Schedule of ECT (East Container Terminal) and WCT (East Container Terminal) is tentative
Source: Prepared by the JICA Survey Team based on the information obtained from interviews

(3) Hambantota Port

Hambantota Port is located at the Southern Province of Sri Lanka, and is only 15 nautical miles deviation from maritime trunk line of Asia–Europe route. The port was developed with financial assistance (loan) from the Ex-Im Bank of China, and was constructed by Chinese contractors. The port is expected to contribute to the improvement the regional and national economy by creating employment and enhancing related industries as part of the regional development plan.

SLPA has announced that all automobile shipments will be done at Hambantota from June 2012. The port has already implemented automobile shipping of mainly imports of new vehicles. Transshipment of Korean cars manufactured in India (Chennai) has started as well.

Figure 2.4.7: Image of Hambantota Port

The construction of Phase 1 started in 2008 and was completed in 2010. Phase 1 included dredging of the access channel and turning basin with 17 m depth, construction of a 600 m multi-purpose berth, a 120 m small craft berth and a 310 m bunkering jetty. Rail gauge for quay gantry crane for container handling is installed at the multi-purpose berth but the cranes have not yet been installed. Phase 2 which will construct a container terminal is scheduled to start soon also with financial assistance by China.

Figure 2.4.8: Multi Purpose Berth and Oil Loading Jetty

Table 2.4.7: Terminal Facility of Hambantota Port

Terminal / Facility	Unit	Multi-purpose	Small Craft	Container (Phase 2 plan)
Access Channel Depth	m	16.0		
No. of Berth	No	2	1	No information
Berth Length	m	600	120	No information
Berth Depth	m	17.0	17.0	17.0
No. of Quay Crane	No	0	NIL	No information
Port Area	Ha	1600 (including water area)		
Handling Capacity	TEU	-	-	20,000,000
Operator	-	SLPA	SLPA	No information

Source: JICA Survey Team

2.4.3 Indian Major Ports

(1) National Port Development Plan

Indian ports have been developed under the National Maritime Development Programme formulated by the Ministry of Shipping in 2005, which identified 276 projects to be completed during the period 2005 to 2012. The programme, which included reviews and the perspective plans for port development over the next decade, was summarized in the Maritime Agenda: 2010–2020 completed in January 2011. The agenda includes the business plans of not only the 13 major ports but also non-major ports which contribute about one third of the sea borne trade of India.

Figure 2.4.9: Location of Ports in India

The projection of maritime traffic, port capacity, Compound Average Growth Rate (CAGR) as well as proposed investments is shown in Table 2.4.8 and Table 2.4.9. It is estimated that 2,494.95 million tons of cargo will be handled at both Major and Non-major ports by 2020, and the total capacity of these ports will be enhanced to accommodate 3,130.04 million tons which is around 20% greater than the forecasted volume. With reference to the container traffic in 2020, it is projected as 22.29 million TEU and 16.52 million TEU for Major Ports and Non-major ports respectively.

Table 2.4.8: Traffic Volume and Capacity Projection for Major Ports

2009-2010	Projections (million ton)			CAGR(%) between 2009-10 and		
	2011-12	2016-17	2019-2020	2011-12	2016-17	2019-2020
Traffic Volume (All Cargo)						
561.09	629.64	1031.50	1214.82	5.93	9.09	8.03
Traffic Volume (Containers in million TEU)						
6.89	9.32	19.58	22.39	-	-	-
Capacity						
616.73	741.36	1328.26	1459.53	9.64	11.58	9.00

Source: Prepared by the JICA Survey Team based on Maritime Agenda 2010-2020

Table 2.4.9: Traffic Volume and Capacity Projection for Non-Major Ports

2009-2010	Projections (million ton)			CAGR(%) between 2009-10 and		
	2011-12	2006-17	2019-2020	2011-12	2016-17	2019-2020
Traffic Volume (All Cargo)						
288.80	402.50	987.81	1280.13	18.05	19.21	16.06
Traffic Volume (Containers in million TEU)						
1.18*	2.49	11.17	16.52	-	-	-
Capacity						
346.31	498.68	1263.86	1670.51	20.00	20.31	17.04

Source: Prepared by the JICA Survey Team based on Maritime Agenda 2010-2020
Note: * was calculated from 12.5 ton/TEU as there was no data in TEU available

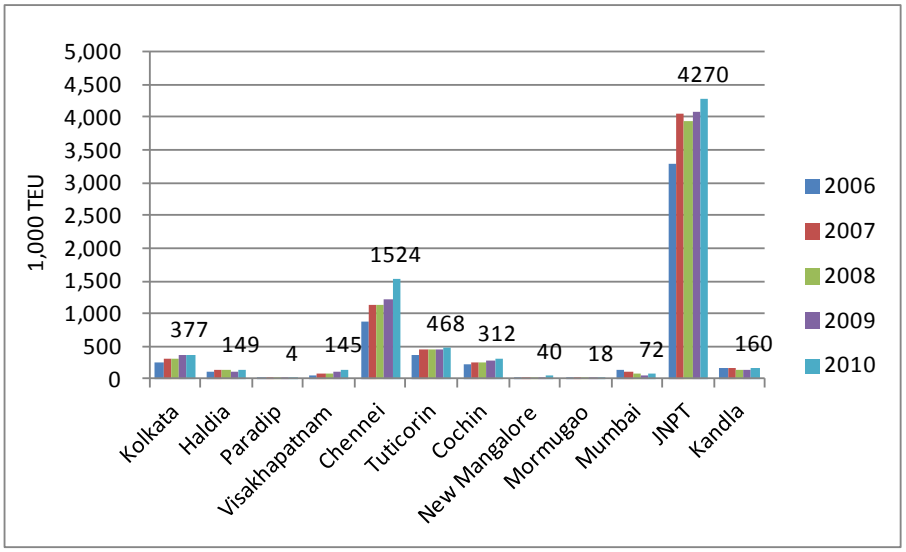
Taking above forecast and analysis into consideration, proposed investment in major ports by the Indian government is summarized below.

Table 2.4.10: Summary of Proposed Investment

	Proposed Investments						
	Ongoing No. of Projects	Phase1 (by 2012)		Phase2 (by 2017)		Phase3 (by 2020)	
		No. of Projects	Est. Cost	No. of Projects	Est. Cost	No. of Projects	Est. Cost
Major Ports	72	141	5,744	146	11,042	65	3,756
Non-Major Ports	-	-	6,221	-	17,997	-	7,259
Total	-	-	11,965	-	29,039	-	11,005

Source: Prepared by the JICA Survey Team based on Maritime Agenda 2010-2020
Note: The investment cost is in million USD, calculated with the rate of Rs=0.01877 USD as of 01 May, 2012

Container throughput of the major ports between 2006 and 2010 is shown below. JNPT and Chennai account for 54% and 20% of the total throughput, respectively, of all the major ports. The strong growth of volume at these two ports can be seen as well. It can be said that JNPT and Chennai are the two hub ports in West and East coast.



Source: Prepared by the JICA Survey Team based on Major Ports of India, A Profile: 2010-2011
Note: Figures in the graph is the throughput of 2010

Figure 2.4.10: Trend of Container Throughput of Indian Major Ports

(2) JNPT and Mumbai Ports

JNPT (Jawaharlal Nehru Port) is the biggest container port in India, handling 4,269,600 TEU in 2010 which is nearly 45% of the country's total throughput and ranked 23rd among the world's container ports. This volume is owing to the growing demand of its hinterland which covers Delhi and Mumbai, the two largest cities of India.

Mumbai port is very old port with history of more than 130 years. There are three docks, namely Princess, Victoria and Indira from the North to the South. Mumbai city area is just behind the port yard and insufficient port access road capacity has been one of the major issues. This is exactly the reason JNPT was developed so that container handling can be shifted to JNPT and ease traffic congestion in Mumbai city.

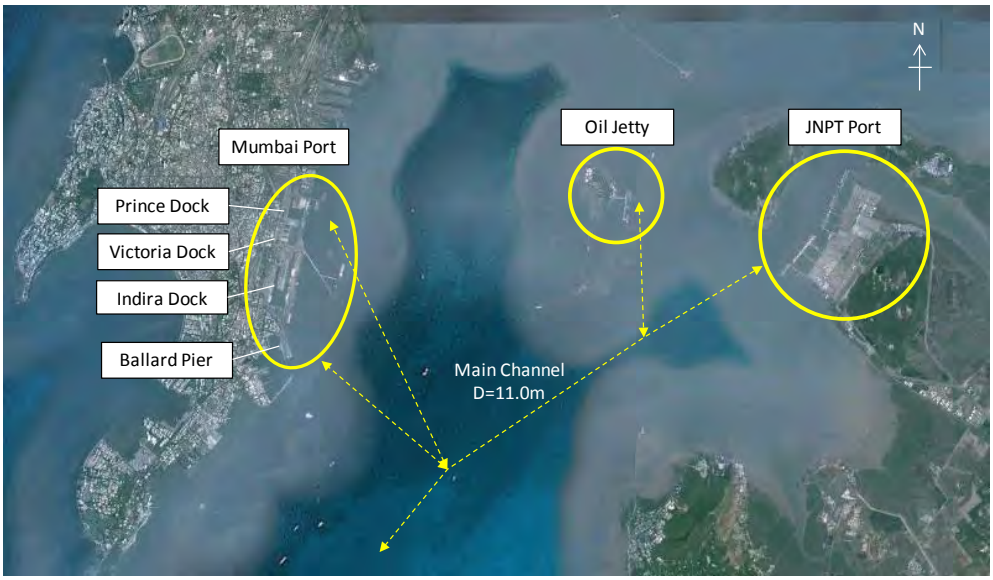


Figure 2.4.11: Location of JNPT and Mumbai Ports

There are three container terminals at JNPT, two of which are operated by international mega operators. The port is connected by road and rail to the hinterland directly or through ICDs (inland container depot), and more than 30% of the containers are transported by rail. Port facilities of each terminal are shown in Table 2.4.11.

Table 2.4.11: Terminal Facility of JNPT

Facility \ Terminal	Unit	GTICT	NSICT	JNPCT
Access Channel Depth	m	11.0		
No. of Berth	No	2	2	4
Berth Length	m	712	600	680
Berth Depth	m	13.5	13.5	13.5
No. of Quay Crane	No	10	8	8
Port Area	Ha	54.0	26.0	59.0
Handling Capacity	TEU	1,800,000	1,200,000	1,100,000
Operator	-	APM Terminals	DP World	Port Trust

Source: JICA Survey Team

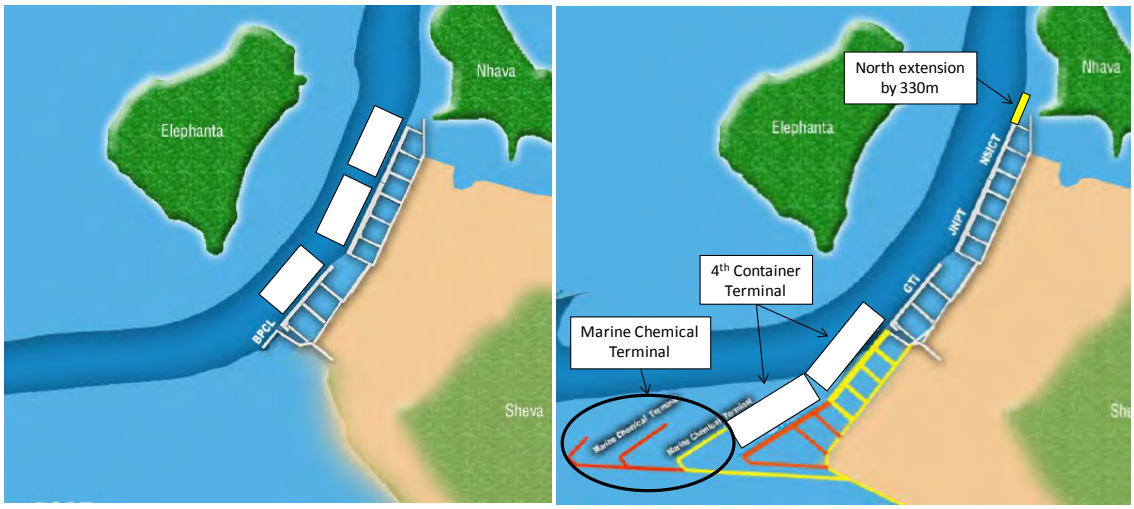


Figure 2.4.12: Present Layout (Left) and Future Plan (Right)

The planned development project includes north extension of the container terminal by 330 m and construction of the 4th container terminal in two phases (L = 700 m for 1st phase and L = 1,000 m for 2nd phase). These developments will add annual handling capacity of 5.6 million TEU. In addition, capital dredging of the access channel is planned also in two phases (D = 14.0 m for 1st phase and D = 17.0 m for 2nd phase). This will enable JNPT to accommodate 6,000 TEU and 18,000 TEU vessels. All these projects are targeted for realization by 2020.

Major commodities of Mumbai Port are liquid cargo, dry bulk cargo and break bulk cargo. Containers are also handled (72,000 TEU in 2010). The port facility is shown in Table 2.4.12. In order to accommodate growing demand for containers, the development of Indira Container Terminal (ICT) outside Victoria Dock is ongoing with designed handling capacity of 800,000 TEU annually. The terminal is being developed by Indira Container Terminal (ICT) Pvt Ltd, which is a consortium of local and foreign companies under BOT scheme. The layout of new container terminal is shown below.

Table 2.4.12: Terminal Facility of Mumbai Port

Terminal / Facility	Unit	Prince and Victoria Dock	Indira Dock	Ballard Pier
Access Channel Depth	m	8.0		
No. of Berth	No	Being reclaimed to be used as container stacking yard	5	1
Berth Length	m		812	244
Berth Depth	m		9.1	10.0
No. of Quay Crane	No		mobile crane only	2
Port Area	Ha		67.4	2.5
Handling Capacity	TEU		-	-
Operator	-	ICT Pvt Ltd	Port Trust	ICT Pvt Ltd

Source: JICA Survey Team

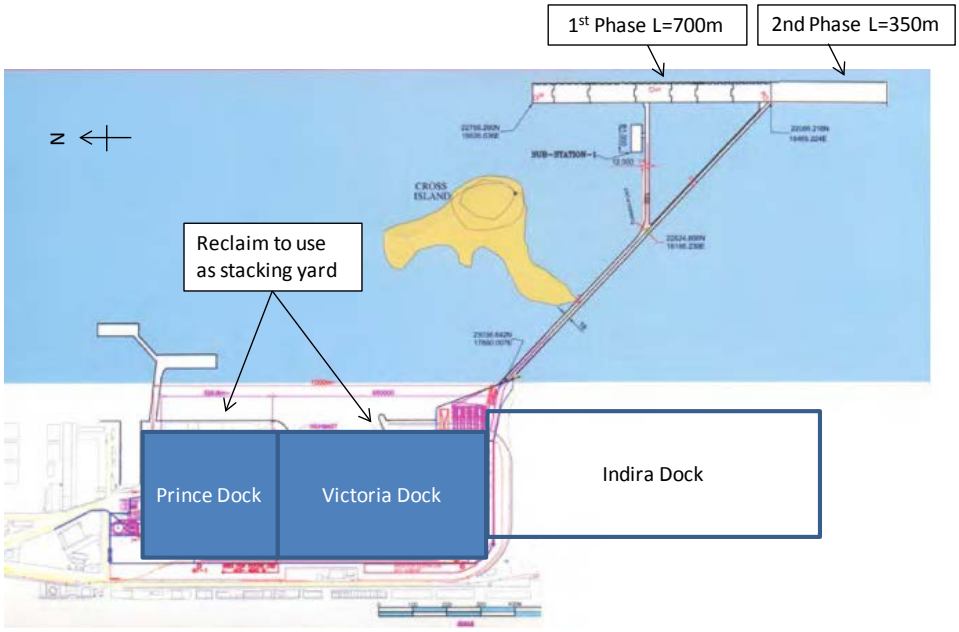


Figure 2.4.13: Planned Layout of ICT

(3) Cochin Port

New International Container Transshipment Terminal (ICTT) at Vallarpadam Island was developed and commenced operation in 2011. The port has a geographical advantage of being only 76 nautical miles and 12 nautical miles deviation from Asia-Europe route and Asia-Middle East route, respectively. The operator is DP World under BOT agreement for 30 years. All container cargoes which had previously been handled by the port trust were shifted to this new terminal. This is the first transshipment terminal as well as the first container terminal to operate in a Special Economic Zone (SEZ) in India. The location of ICCT and present view (1st phase development) of the port is shown below.

Table 2.4.13: Terminal Facility of ICTT

Terminal / Facility	Unit	1st Phase	Final Phase
Access Channel Depth	m	16.0	
No. of Berth	No	2	6
Berth Length	m	600	1,800
Berth Depth	m	16.0	16.0
No. of Quay Crane	No	4	16
Port Area	Ha	40.3	115.0
Handling Capacity	TEU	1,200,000	4,000,000
Operator	-	DP World	

Source: JICA Survey Team

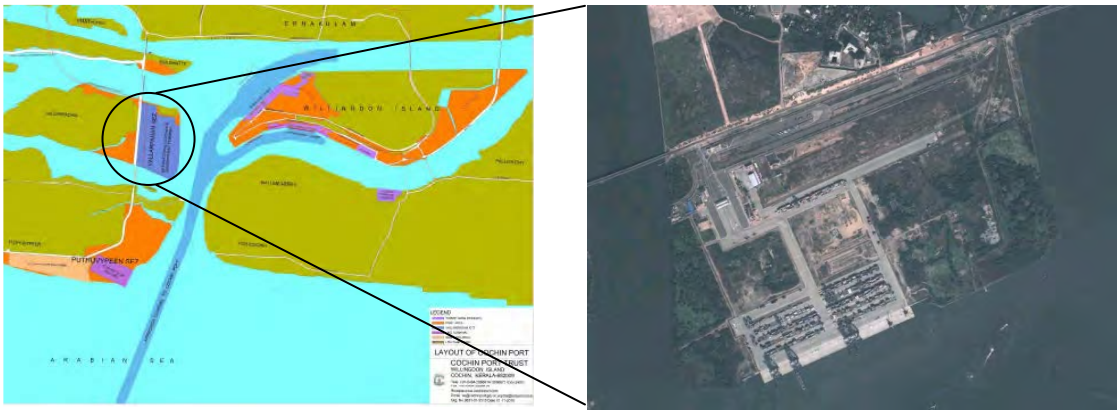


Figure 2.4.14: Location of ICTT (Left) and Photo (Right)

The development of ICTT is planned in phases. 1st phase, which has been completed and commenced operation, included construction of a 600 m berth with 16 m alongside depth, and has handling capacity of 1.2 million TEU per annum. The terminal can accommodate vessels with maximum LOA of 350 m and draft of 14.5 m. Four super post-panamax quay cranes are installed.

There is a dedicated fright road to the city of Edapally as well as a rail connection to the major cities of South India such as Bangalore, Coimbatore, Chennai and Hyderabad.

The terminal handled 329,000 TEU in 2011 and around 425,000 TEU is expected in 2012. Upon completion of the final phase, the port will have total berth length of 1,800 m and 16 super post-panamax quay cranes with annual handling capacity of 4 million TEU.

DP world has been negotiating with the Indian central government to relax existing cabotage laws for containers transshipped to foreign countries with trial period of three years, but nothing has been realized yet. The number of Indian registered container vessels is very small and their condition is bad, which is making ocean freight for Indian flagged vessels very expensive. Unless this cabotage law is relaxed, it seems that the volume of transshipment at ICTT will not show significant increase. It is also said that the terminal is having issues related to the labor union such as strike etc.

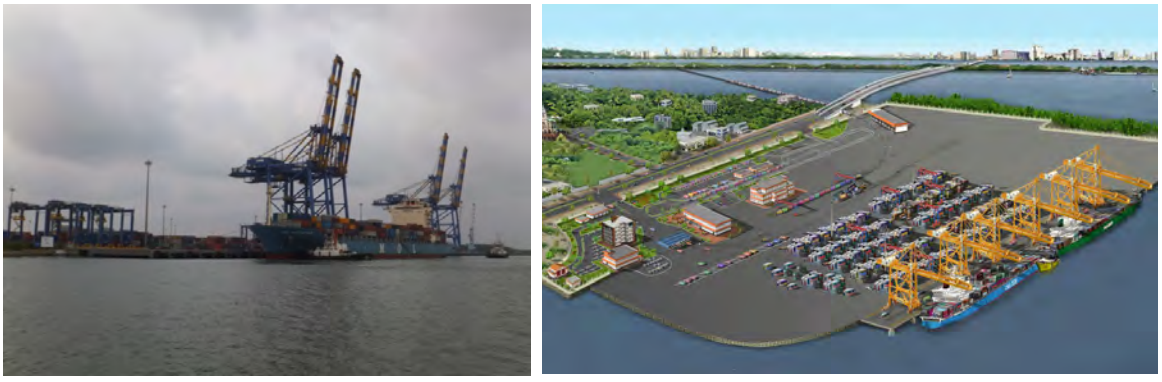


Figure 2.4.15: 1st Phase (Left) and Final Phase Image (Right) of ICTT

(4) Tuticorin Port

Tuticorin Port, now called V.O. Chidambaranar Port, is located only 149 nautical miles from Colombo Port. Due to its short distance (sailing time is only 10 hours), there is daily shuttle service of feeder vessels between Tuticorin Port and Colombo Port.

At present, berth 7 is the only container berth in operation. Berth 7 is operated by the joint venture of PSA Singapore and SICAL of India under BOT agreement for the period of 30 years since 1999. The handling capacity of the terminal is 450,000 TEU, while throughput in 2010 was 468,000 TEU. In reaction to this, the port trust is planning to convert berth 8 to a container berth and is currently in the bidding stage of the conversion project. In order to cater to the growing demand, outer harbor development is planned which includes four (4) new berths for container handling. Present port layout with outer harbor development plan and summary of port facilities is shown in Figure 2.4.16 and Table 2.4.14, respectively.

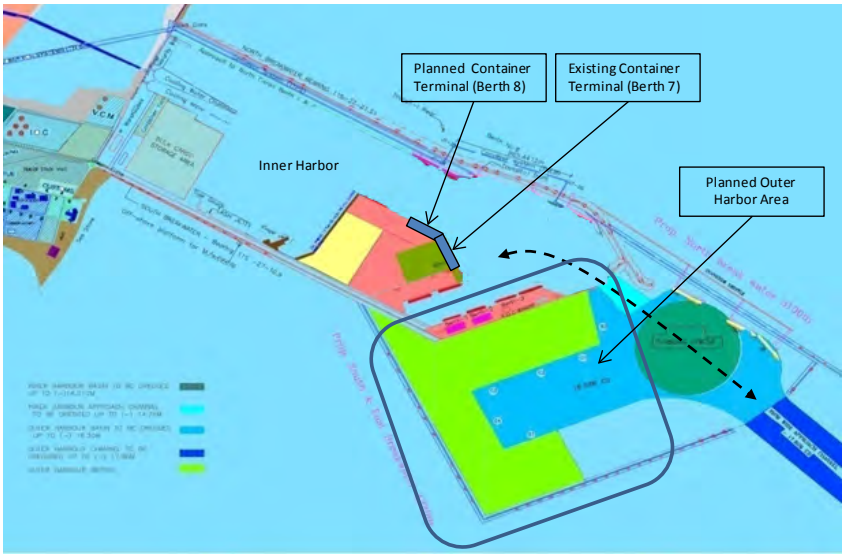


Figure 2.4.16: Layout of Tuticorin Port

Table 2.4.14: Terminal Facility of Tuticorin Port

Terminal / Facility	Unit	Berth 7	Berth 8 (Planned)	Outer Harbor (Planned)
Access Channel Depth	m	14.0		17.8
No. of Berth	No	1	1	4
Berth Length	m	370	345	1,500
Berth Depth	m	11.9	11.9	16.3
No. of Quay Crane	No	3	-	-
Port Area	Ha	10.0	10.0	40.0
Handling Capacity	TEU	450,000	450,000	-
Operator	-	PSA-SICAL terminal Ltd	TBD	TBD

Source: JICA Survey Team

(5) Chennai Port

Chennai Port is the second largest port in India after JNPT, and its container throughput in 2010 was more than 1.5 million TEU. There are two container terminals, CCTL (Chennai Container Terminal) operated by DP World and CITPL (Chennai International Terminals) operated by

PSA-SICAL Terminal Ltd. Due to the limited container stacking yard, usually the containers go through Inland Container Depots (ICDs). There are 37 ICDs and Container Freight Stations (CFSs) around Chennai port.

Chennai area is the hub for automobile and electronic related industries and the investment of major foreign manufacturers is rapidly increasing. In addition, Chennai is only 300 km away from Bangalore, the hub for IT industries. Chennai port, having these two big industrial hubs in its region, is planning to shift its bulk handling operation for iron ore and coal to Ennore Port in order to concentrate and cater to the growing demand for shipment of container cargo. Other than containers, the port handles Hyundai cars for export.

There is a development plan for a third container terminal which is now under bidding stage. Chennai Mega Terminal is designed to have total quay length of 2,000 m with ultimate alongside depth of 22.0 m. The port will be constructed on BOT basis for concession period of 30 years. The port layout including mega terminal is shown in Figure 2.4.17

The port is having a big issue with congestion in the city including the port access road. Because of congestion trucks are allowed to enter and leave the port only during the night time.

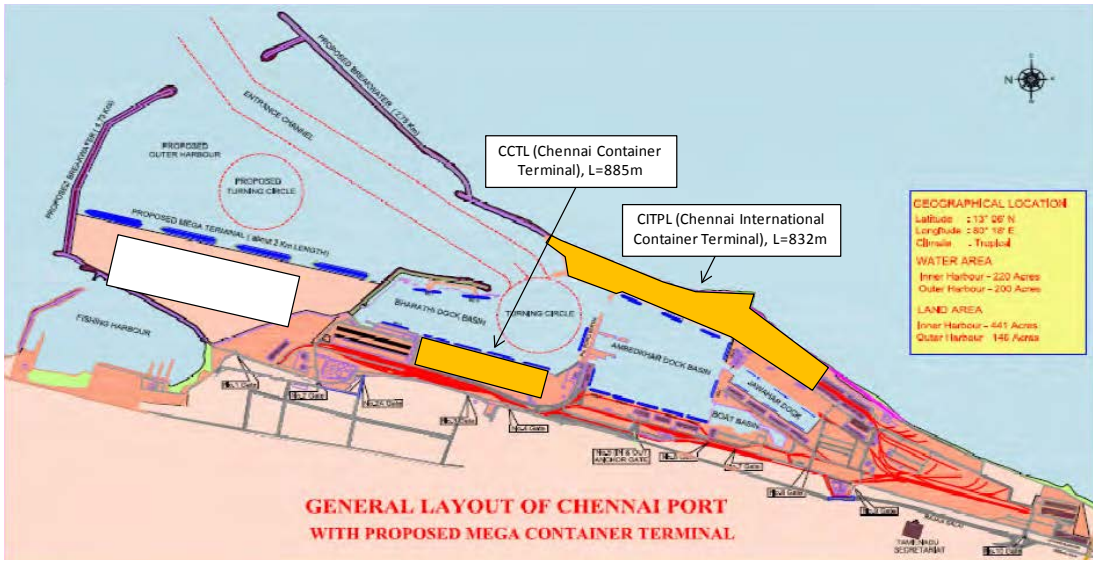


Figure 2.4.17: Layout of Chennai Port

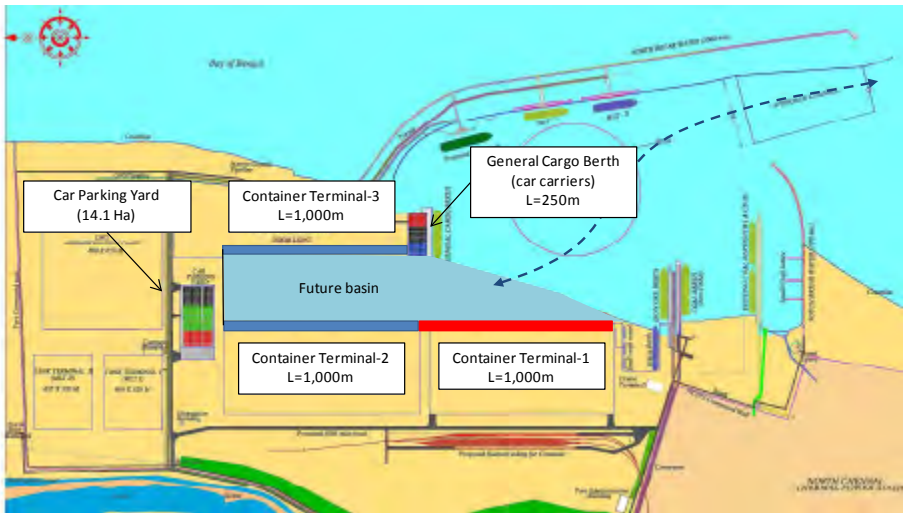
Table 2.4.15: Terminal Facility of Chennai Port

Facility \ Terminal	Unit	CCTL	CITPL	Mega Terminal (Planned)
Access Channel Depth	m	19.2 (Outer), 18.6 (Inner)		
No. of Berth	No	4	3	-
Berth Length	m	885	832	2,000
Berth Depth	m	13.4	13.5	22.0
No. of Quay Crane	No	8	10	-
Port Area	Ha	21.1	35.8	100.0
Handling Capacity	TEU	1,500,000	1,500,000	4,000,000
Operator	-	DP World	PSA-SICAL Terminal Ltd	TBD

Source: JICA Survey Team

(6) Ennore Port

Ennore port is located about 24 km north of Chennai port, and is the first corporatised major port in India. The port originally handled bulk cargo. Recently, as part of the countermeasures to relax congestion of Chennai port, major development has taken place such as marine liquid terminal, coal terminal, iron ore terminal and general cargo berth. Furthermore, a new container terminal is under construction by BOT scheme. The layout plan and facility detail are shown below.



Source: JICA Survey Team

Figure 2.4.18: Layout Plan of Ennore Port

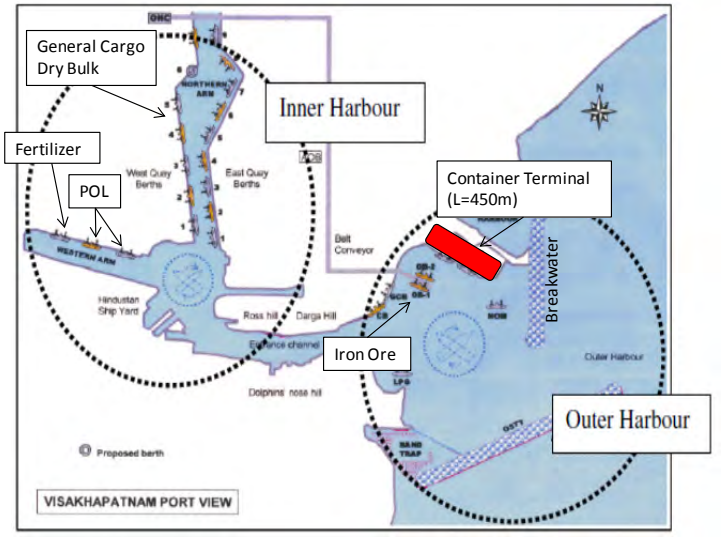
Table 2.4.16: Terminal Facility of Ennore Port

Terminal / Facility	Unit	Container Terminal-Phase1	Container Terminal-Phase2	General Cargo Berth & Cars
Access Channel Depth	m	16.0	16.0	16.0
No. of Berth	No	3	3	1
Berth Length	m	1,000	1,000	250
Berth Depth	m	15.0	15.0	12.0
No. of Quay Crane	No	No information	-	-
Port Area	Ha	50.0	50.0	16.4
Handling Capacity	TEU	1,500,000	1,500,000	300,000 (cars)
Operator	-	Bay of Bengal Gateway Terminal Pvt Ltd	TBA	Ennore Port Limited

Source: JICA Survey Team

(7) Visakhapatnam Port

Visakhapatnam Port is located almost midway between Chennai and Kolkata ports on the east coast of India. Main commodities handled are bulk cargoes such as iron ore, coal and fertilizer as well as Petroleum, Oil and Lubricants (POL). There is the outer port protected by the breakwaters and the inner port. The container terminal is located at the outer port as shown below.

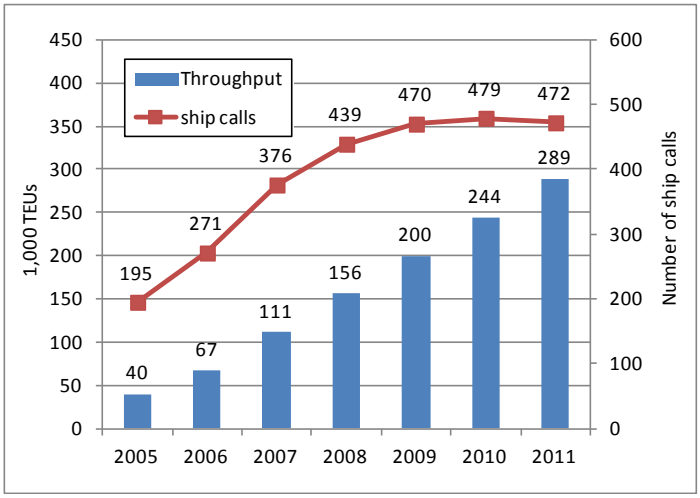


Source: JICA Survey Team

Figure 2.4.19: Layout Plan of Visakhapatnam Port

The port is operated by Visakha International Container Terminal Pvt. Ltd, which is a joint venture of DP World and United Liner Agencies of India Pvt. Ltd and commenced operation in June 2003.

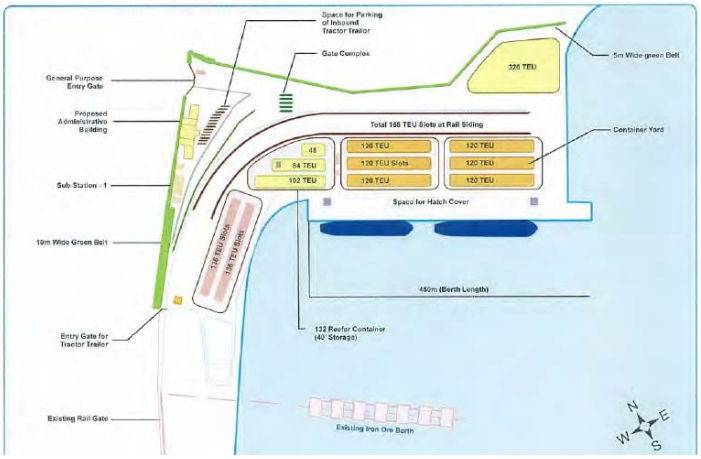
Since the commencement of operation with container handling volume of around 17,000 TEU in the first year, the volume has continued increasing and achieved more than 230,000 TEU in 2011.



Source: JICA Survey Team

Figure 2.4.20: Trend of Container Throughput and Ship Calls

The layout of container terminal and detail of facilities are shown below.



Source: JICA Survey Team

Figure 2.4.21: Container Terminal Layout

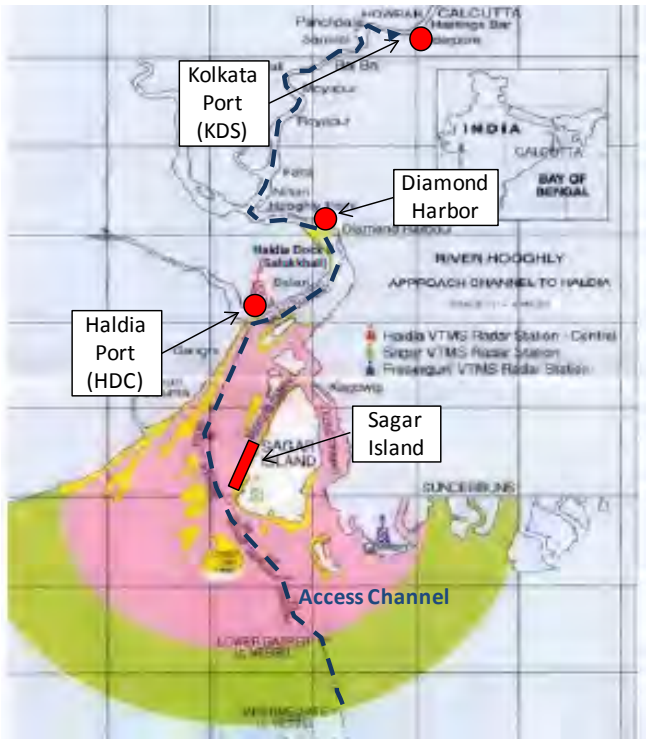
Table 2.4.17: Container Terminal Facility of Visakhapatnam Port

Terminal / Facility	Unit	Phase I (Present)	Phase II (in progress)	Phase III (future extension)
Access Channel Depth	m	18.5		
No. of Berth	No	2	− Additional Quay Crane x 2 − Additional railway line − Additional yard area etc	1
Berth Length	m	450		350
Berth Depth	m	16.5		16.5
No. of Quay Crane	No	2		-
Port Area	Ha	20.0		-
Handling Capacity	TEU	350,000		-
Operator	-	Visakha Container Terminal Pvt. Ltd		-

Source: JICA Survey Team

(8) Kolkata and Haldia Port

Kolkata Port, the oldest port in India, was constructed in 1870. Kolkata Port (Kolkata Dock System: KDS) and Haldia Port (Haldia Dock Complex: HDC) are located 145 km and 41 km upstream from the mouth of River Hooghly, respectively.



Source: JICA Survey Team

Figure 2.4.22: Location of KDS and HDC

These two ports are river ports with shallow draft which makes them naturally feeder ports having connection with mother vessels at international ports such as Singapore, Port Klang and Colombo. There are four (4) container berths at KDS and two (2) berths at HDC. One of the features of Kolkata ports is its vast hinterland which covers not only Eastern India but also import transit cargoes to landlocked countries such as Nepal and Bhutan. Container terminal facilities of Kolkata and Haldia are shown below.

Table 2.4.18: Container Terminal Facilities of Kolkata and Haldia Ports

Terminal / Facility	Unit	Kolkata (KDS)	Haldia (HDC)	Remarks
Access Channel Depth	m	7.1	9.1	-
No. of Berth	No	4	3	-
Berth Length	m	780	644	-
Berth Depth	m	8.0 – 8.7	12.2	-
No. of Quay Crane	No	NIL	2	-
Port Area	Ha	-	-	No information
Handling Capacity	TEU	458,000	333,000	From Maritime Agenda
Operator	-	Kolkata Port Trust		-

Source: JICA Survey Team

New Container Terminal at Diamond Harbor

The development of a new container terminal at Diamond Harbor by Public Private Partnership (PPP) scheme is planned, and is under Request for Qualification stage at this moment. The announcement of shortlist parties for the concessionaire is scheduled to be made by end of 2013.

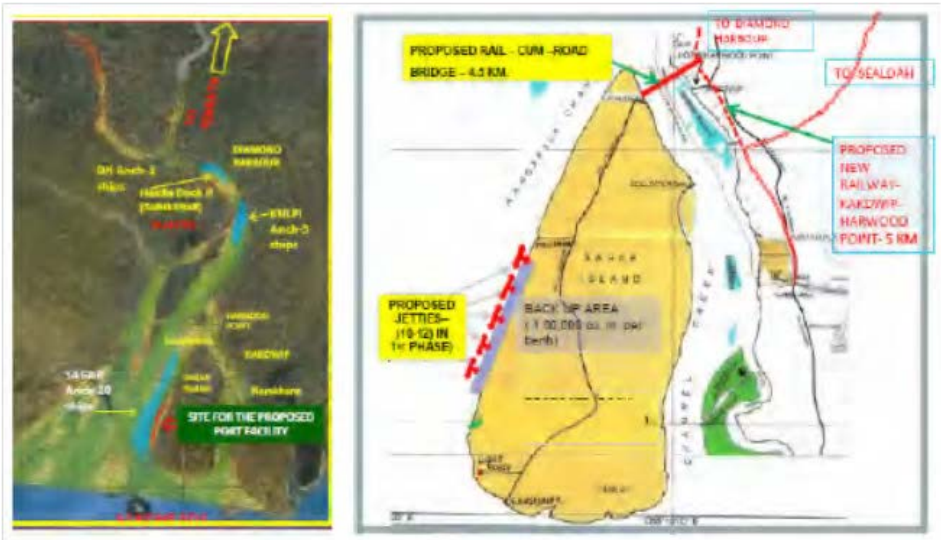
The new terminal includes 900 m quay length and port area of 37 Ha. Annual handling capacity is 1.2 million TEU. The planned berth alongside depth is 9 m.

Source: Ocean Policy Research Foundation, "Reports on Indian Ports" March, 2011

Figure 2.4.23: Proposed Location of Diamond Harbor Container Terminal

New Port Facilities at Sagar Island

other development plan by Kolkata Port Trust is the new port facilities at Sagar Island. Proposed facilities include several jetty type berths with 10.5 m alongside depth which are planned to handle bulk cargoes such as coal and iron ore, and also some containers. In order for the port to be operational, an access bridge needs to be constructed to connect to the main land. The schedule of development is not yet clear.



Source: Ocean Policy Research Foundation, "Reports on Indian Ports" March, 2011

Figure 2.4.24: Proposed Location of Sagar Island Container Terminal

2.4.4 Bangladesh

(1) National Port Development Plan

The national development plan of Bangladesh is summarized as "Outline Perspective Plan of Bangladesh 2010–2021, making Vision 2021 A Reality" and was published by the Planning

Commission in June 2010. In the plan, one of the objectives of waterway transport is stated as to develop an inland container river port for transportation of containers by waterways to / from two sea ports and one deep sea port at Sonadia.

In accordance with the plan, the sixth five year plan for FY 2011–FY2015 had been prepared. Chittagong port, the major river port of the country which handles 95% of the country's seaborne export and import trade, is playing a vital role supporting economic growth. The future growth of the country's economy will largely depend on the competitiveness and efficiency of the port. As such, the improving the efficiency of Chittagong port is the priority.

Another river port, Mongla, is located on the western part of Bangladesh serving all parts of the country as well as Nepal, Bhutan and border area with India. The government is keen on improving this port in order to foster transit trade to inland countries as well as India.

Regarding the deep sea port at Sonadia, which is located around 100 km south of Chittagong, the Bangladesh government is seeking to build a deep sea port on PPP basis with expectation to ease the congestion at Chittagong port, and is looking for an investor at this moment.

Source: JICA Survey Team

Figure 2.4.25: Location of Chittagong Port

(2) Chittagong Port

Chittagong Port is the major gateway for the trade of Bangladesh with the outside world, handling more than 90% of the total maritime trade of the country. The port is located on the right bank of River Karnafuli, nine (9) nautical miles from Bay of Bengal. Vessels calling at the port are limited by the approach channel to a maximum length of 186 meters (153 m at night) and by the depth in the port to a draft of 9.2 meters. The maximum size of container vessel is 1,200 TEU class. There are three locations equipped with the essential equipment to handle containers: (i) Chittagong Container Terminal (CCT), (ii) General Cargo Berths (GCB), and (iii) New Mooring Container Terminal (NCT).

CCT has a 450 meter quay with alongside depth of 9.2 m, equipped with 4 quay gantry cranes to serve container vessels. It has a rail track to serve unit trains carrying containers to the Dhaka

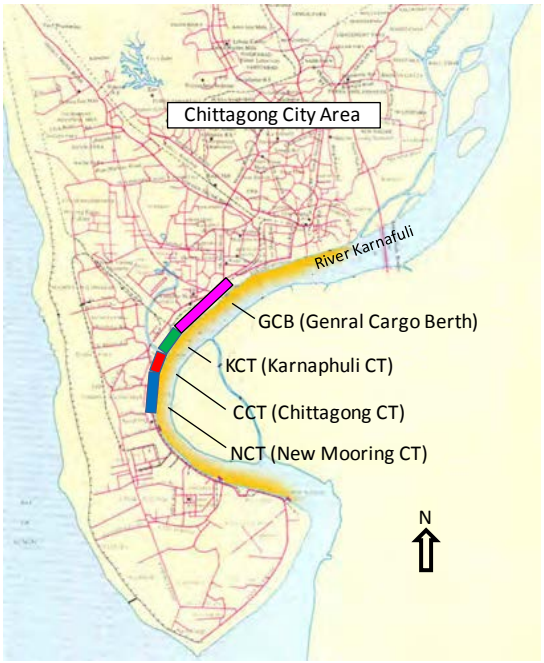
ICD. The terminal currently handles about 40 percent of the port's containers but this proportion has been increasing. CCT is operated by a private company under a three-year operating lease contract.

GCB has 13 general cargo berths built in the 1950s and has alongside depth of 8.6 m. These berths handled about 45 percent of the containers in FY 2008. Berth productivity depends on the quality of vessels' equipment, but a typical performance with two cranes is 20–25 moves per vessel hour. Cargo handling services at these berths were provided, until recently, by 12 private stevedoring companies. It has a container storage capacity of 24 Ha. There is a plan to convert three berths to a proper container terminal equipped with quay gantry cranes which is expected to increase its annual capacity to around 0.75 million TEU.

NCT has a berth length of 1,000 meters and alongside depth of 8.8–9.2 m. There are no quay gantry cranes at this terminal so the terminal is able to accommodate only those ships with cranes. Although not officially commissioned, it is operated by the same company that operates CCT and handles about 15 percent of the container traffic. When the terminal is fully developed, it will be equipped with 10 quay gantry cranes and have annual handling capacity of more than 1.25 million TEU.

The construction of Karnaphuli Container Terminal (KCT) is planned at Jetty No. 11, 12 and 13 by converting old existing general cargo berth. The detail information on the latest status of the project was not available, but it is reportedly targeting to completed by end of 2013.

The location of each terminal and the detail of their facilities are shown in Figure 2.4.26 and Table 2.4.19.



Source: JICA Survey Team

Figure 2.4.26: Location of Chittagong Port

Table 2.4.19: Container Terminal Facilities of Chittagong Port

Facility \ Terminal	Unit	CCT	NCT	KCT (Proposed)
Access Channel Depth	m	5.2 – 7.2		-
No. of Berth	No	3	3	3
Berth Length	m	450	1,000	600
Berth Depth	m	9.2	8.8-9.2	No information
No. of Quay Crane	No	4	NIL	No information
Port Area	Ha	15	22	15
Handling Capacity	TEU	750,000	1,250,000 (when fully developed)	600,000
Operator	-	Private (3 year lease contract)	Same operator as CCT	-

Source: JICA Survey Team

(3) Sonadia Deep Sea Port

The government of Bangladesh has been planning to develop the country's first deep sea port at Sonadia Island in Cox's Bazar district around 100 km south of Chittagong Port. The draft of Sonadia Deep Sea Port Authority Act was approved in principle in order to further proceed with the realization of the project. The proposed layout is shown below.

Source: JICA Survey Team

Figure 2.4.27: Proposed Layout of Sonadia Deep Sea Port

The proposed plan of the port has berth alongside depth of 14.0 m, and the design vessel is 50,000 DWT (4,000 TEU class). The result of demand forecast for the container and development of the facility in the existing study is as follows.

Table 2.4.20: Development Plan of Sonadia Deep Sea Port

Target Year	Berth Detail	Annual Throughput
2020	300 m × 5 berths	2.0 million TEU
2035	300 m × 9 berths	7.5 million TEU
2055	300 m × 19 berths	18.6 million TEU

Source: JICA Survey Team

When such a huge amount of container cargo is generated and the port is developed accordingly, direct services between Europe and US can be expected.

2.4.5 Pakistan

(1) Port Development Plan

The development strategy of Pakistan is described in the Strategic Directions to Achieve Vision 2030 published by Planning Commission of Government of Pakistan in February 2006. Under this vision a medium term (5 year) development framework is prepared.

Since around 95% of the country's import and exports are handled through ports, the importance of effective operation and necessary investment are recognized. The development, management and operation of ports are based on the landlord port concept which will give all the port operations to the private sector.

The two commercial ports enjoy the monopoly situation. Karachi port, maintained by the Karachi Port Trust (KPT) is the major port handling about 65% of the country's container throughput, while Port Qasim, maintained by the Port Qasim Authority, handles the remaining 35%. There are several development projects which have been completed or are in progress to increase the capacity and efficiency of the ports.

Source: Website of CIA World Fact Book

Figure 2.4.28: Location of Ports in Pakistan

Container throughput of Karachi Port and Port Qasim is shown below.

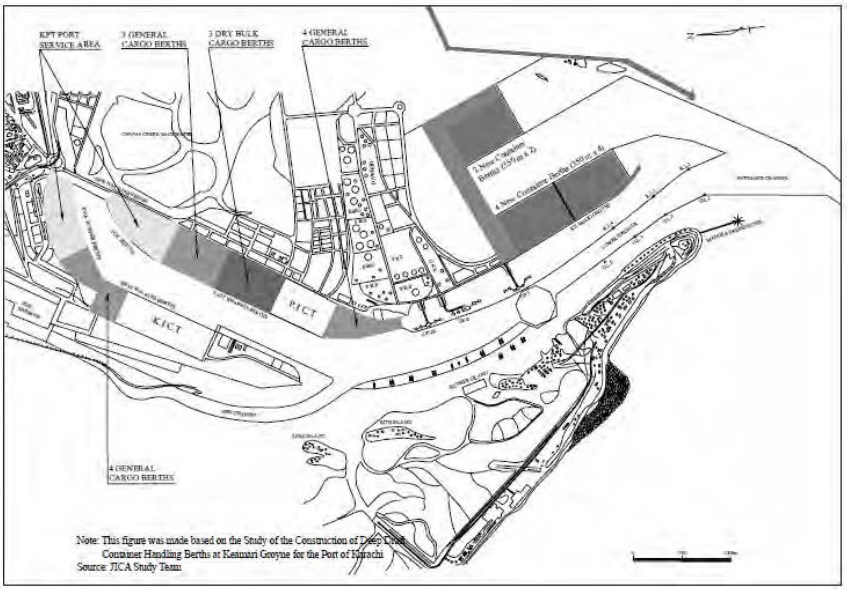
Source: Website of Karachi Port Trust

Figure 2.4.29: Container Throughput Trend of Karachi Port and Port Qasim

(2) Karachi Port

Karachi Port has an ideal location and well-developed connections with Afghanistan, Central Asia and Western China, being the gateways to the region. KPT has consistently maximized this potential with enlightened policies.

Karachi Port has 30 dry cargo berths, 13 berths on West Wharves, 17 berths on East Wharves and 3 liquid cargo berths for POL & Non-POL products. The port has two container terminals, Karachi International Container Terminal (KICT) and Pakistan International Container Terminal (PICT), and both have been established by the private sector on BOT basis. The port layout and the facilities of each terminal are shown below (including Keamari Groyne Container Terminal that is now under construction).



Source: JICA Pakistan Transport Plan Study Final Report, 2006

Figure 2.4.30: Layout of Karachi Port

Table 2.4.21: Container Terminal Facilities of Karachi Port

Facility \ Terminal	Unit	PICT	KICT	Keamari Groyne (under construction)
Access Channel Depth	m	12.5	12.5	No information
No. of Berth	No	4	3	6
Berth Length	m	600	973	2,100
Berth Depth	m	13.5	13.0	16.0 (planned to be deepened to 18.0 m)
No. of Quay Crane	No	6	7	No information
Port Area	Ha	21	26	No information
Handling Capacity	TEU	450,000	700,000	No information
Operator	-	Premier Services Pvt. Ltd.	Hutchison Port Holdings (HPH)	Hutchison Port Holdings (HPH)

Source: JICA Survey Team

(3) Port Qasim

The Port is located about 60 km southeast of the port of Karachi, and became fully operational in 1983 by converting part of the existing general cargo berths into a container terminal. The concession agreement was signed between the port authority and P&O Ports group in 1995 for a period of 30 years. In 2006, P&O Ports was bought by DP World and DP World has operated Port Qasim since then.

Source: Google Map World, Website of DP World Karachi

Figure 2.4.31: Layout of Port Qasim

Table 2.4.22: Container Terminal Facilities of Port Qasim

Facility \ Terminal	Unit	QICT	Remarks
Access Channel Depth	m	16.0	-
No. of Berth	No	5	-
Berth Length	m	1,327	-
Berth Depth	m	13.0 and 16.0	Berth 5–7: 13.0 m Berth 8 & 9: 16.0 m
No. of Quay Crane	No	9	-
Port Area	Ha	40	-
Handling Capacity	TEU	850,000	-
Operator	-	DP World	-

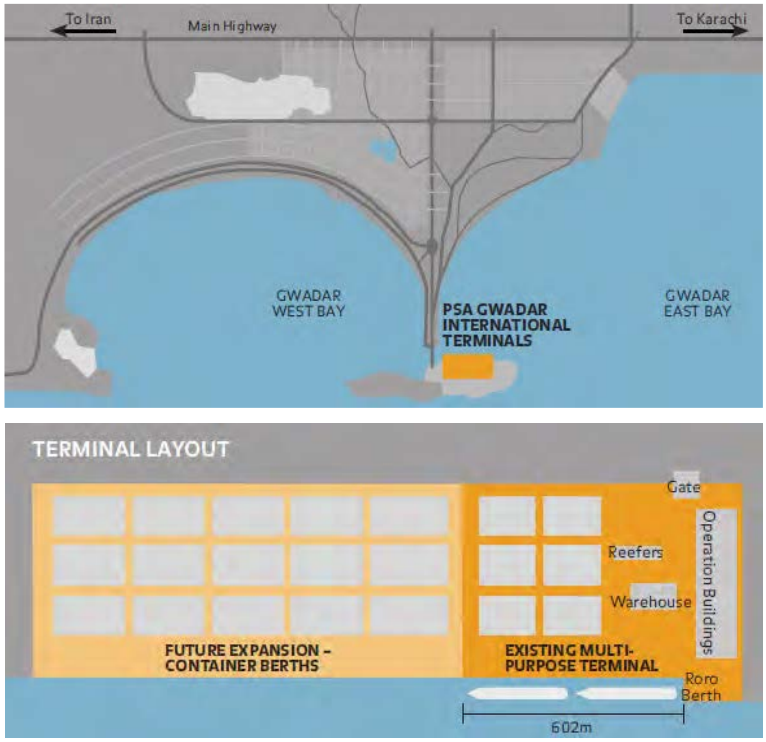
Source: JICA Survey Team

(4) Gwadar Port

Gwadar Port is the third port in Pakistan and is located at the mouth of the Persian Gulf in the western part of the country, just outside the Straits of Hormuz. It is about 530 km from Karachi and 120 km from the Iranian border. The port has three (3) multi-purpose berths with total quay length of 602 m. There are two quay gantry cranes, and the design handling capacity is 500,000 TEU per annum. Alongside depth of the quay is 14.5 m. The terminal is operated by PSA Singapore under a concession agreement signed in February 2007.

According to recent news, China will take over the port operations with a huge amount of investment, followed by the pullout of PSA.

The terminal layout including the future plan is shown below.



Source: Website of PSA Gwadar International Terminals Limited

Figure 2.4.32: Layout of Gwadar Port

2.4.6 Myanmar

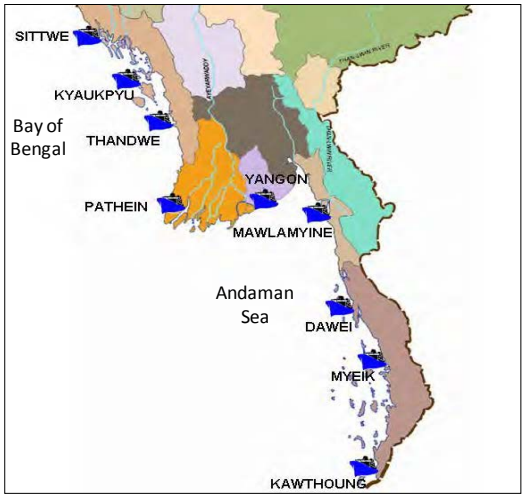
(1) Port Development Plan

There is no port development strategy or master plan for Myanmar. However, after the democratization and opening of the country to the global market economy, economic sanctions by European countries and the US have been lifted, raising expectations of an increase in foreign trade. Under such circumstance, many private investors as well as the governments of developed countries are starting to visit Myanmar to find opportunities in all kinds of sectors including port developments.

At present, more than 90% of the country's foreign import/export cargo is handled at the Port of Yangon. Even though it is a river port with shallow draft, the port is essential to support the

lives of Myanmar's people, therefore the government of Japan has started the feasibility study to construct container terminal at Thilawa area of the Port of Yangon.

The government of Japan is also supporting Myanmar to carry out the transport master plan study as well as port master plan study in order to develop a development strategy. The study will evaluate locating a deep sea port along the shoreline of Bay of Bengal and the Andaman Sea.

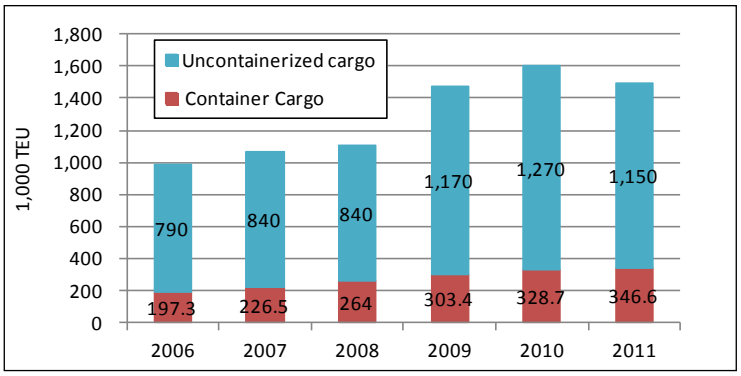


Source: JICA Survey Team

Figure 2.4.33: Ports in Myanmar (Including Future Plan)

Three SEZs related to the ports are planned at Kyaukpyu, Yangon (Thilawa Area) and Dawei. Kyaukpyu and Dawei are facing the outer sea and the development of deep sea ports is planned. There is already an oil loading jetty constructed with Chinese assistance at Kyaukpyu. Dawei is to be developed by a Thailand firm, but the project is not progressing at the moment due to some financial issues.

The volume of cargo (both container and non-container) is shown below. It is clear that the cargo volume is increasing, and according to some reports, annual container throughput of Yangon is expected to reach 1.5 million TEU by 2020. This could be due to economic growth and containerization.

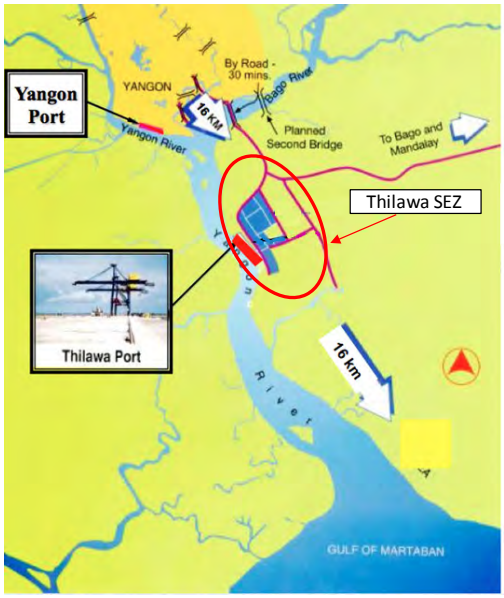


Note: The volume of uncontainerized cargo is calculated as 10.0 ton/TEU
Source: Local information

Figure 2.4.34: Cargo Volume of Yangon Port

(2) Yangon Port

Yangon port is a river port where maximum of 9 m draft is permitted. There are two sand bars along the approach channel which restrict deeper vessels from entering. The port is just adjacent to the city, so there is almost no more space for expansion towards the land. In the Thilawa area there is still plenty of land and many berths are under construction or for sale.



Source: Local information

Figure 2.4.35: Location of Yangon Port

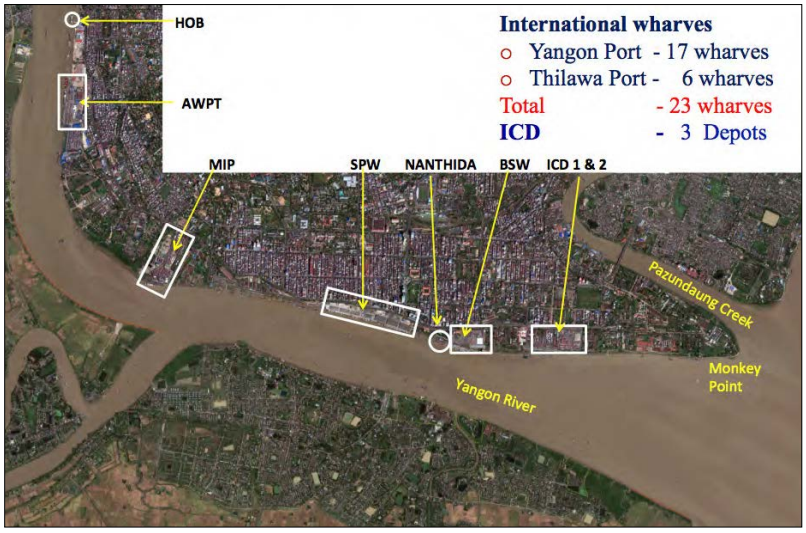
There are four terminals handling containers as shown below. Some 70% of the containers are handled at AWPT. The port infrastructure of Yangon Port is basically more than 50 years old and deteriorated except for MITT which is operated by Hutchison Port Holdings.

Maximum allowable vessels at the port are 15,000 DWT, 167 m LOA and draft of 9.0 m while 20,000 DWT, 200 m LOA and 9.0 m draft vessels are accommodated at Thilawa.

Table 2.4.23: Container Terminal Facilities of Yangon Port

Terminal / Facility	Unit	BSW Wharves	AWPT	MIP	MITT
Access Channel Depth	m	10.0			
No. of Berth	No	3	3	2	5
Berth Length	m	457	614	310	1,000
Berth Depth	m	4.8	9.5	10.2	10.0
No. of Quay Crane	No	6	-	-	2
Port Area	Ha	5.7	6.7	10.8	75.0
Handling Capacity	TEU	850,000			350,000
Operator	-	Myanmar Port Authority	Asia World Port Management Co. Ltd.	Myanmar Port Authority	Hutchison Port Holdings

Source: JICA Survey Team

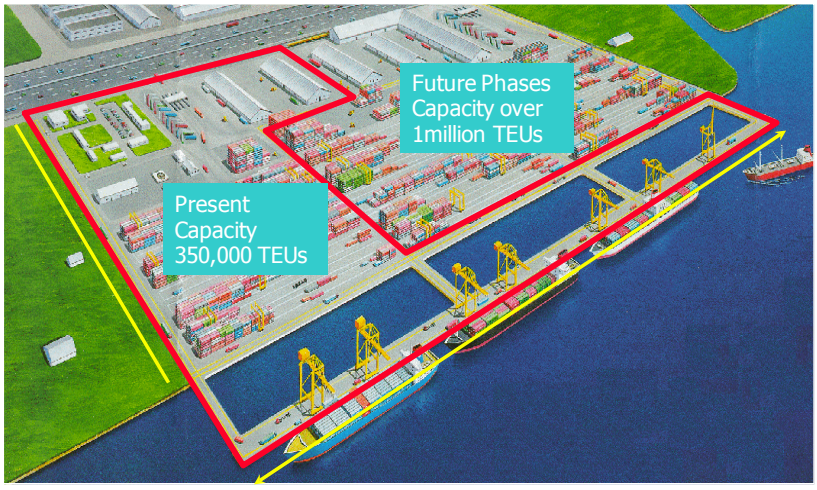


Source: Local information

Figure 2.4.36: Terminal Layout at Yangon Port

MITT of Thilawa area has 1,000 m quay length and present capacity is 350,000 TEU annually. There is further space for expansion for the container stacking yard, and it will be able to handle more than 1.0 million TEU per annum upon full development.

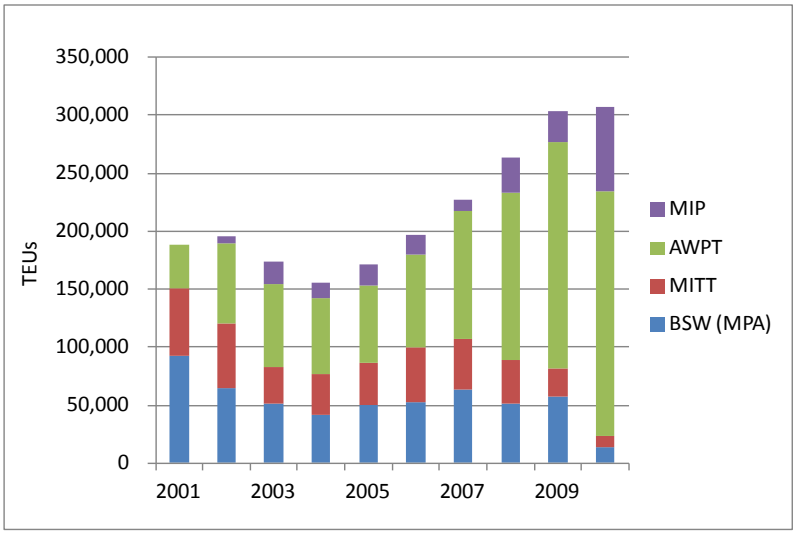
Currently the majority of containers are handled at Yangon port because of the extra cost incurred when transporting the containers between Yangon city and MITT and also limited access. The access issue was solved by constructing a new bridge with sufficient capacity to cater to the heavy loaded container trucks. The extra cost is also being covered by MITT in order to be competitive against AWPT, and container volume of MITT is expected to increase.



Source: MITT

Figure 2.4.37: Development Plan of MITT

The container throughput of the four terminals at Yangon Port is shown below.



Source: Myanmar Port Authority

Figure 2.4.38: Container Throughput of Yangon Port by Terminals

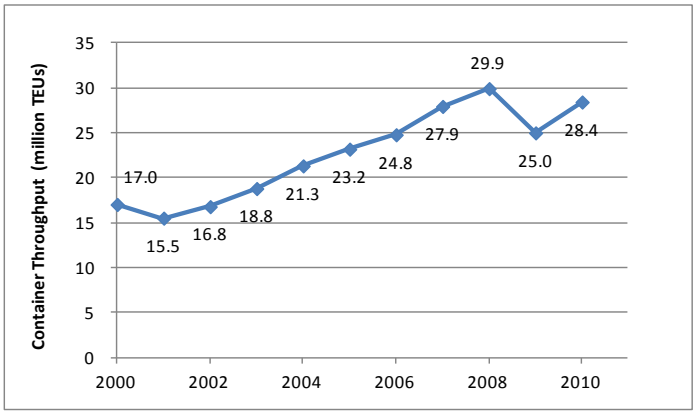
2.4.7 Singapore

(1) Port Development Plan

The Port of Singapore is said to be one of the most efficient hub ports in the world. It is connected to many parts of the world, from Australasia to China, South East Asia and the Indian subcontinent.

The Maritime and Port Authority of Singapore (MPA) is responsible for maritime policy and also acts as Port Regulator only for local cargo. The PSA (Port of Singapore Authority) Corporation, established in October 1997, manages the port's terminals and has grown to be a so called mega operator, operating numbers of terminals in the Far East, Asia as well as Europe.

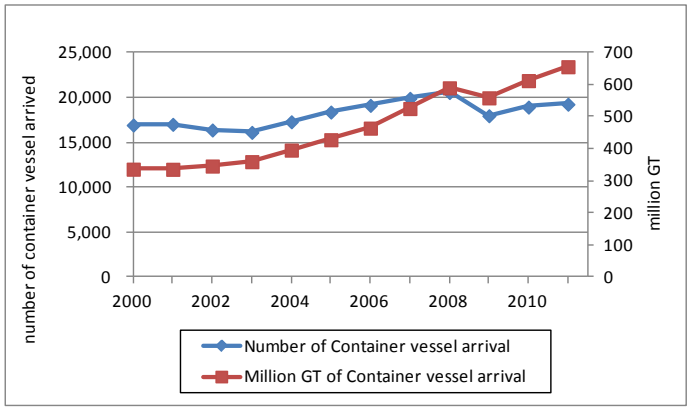
The port of Singapore has been enjoying its status as the main container hub in Asia perfectly located to connect North-South and East-West container trades. Singapore's status is demonstrated by the continuous growth of its throughput as shown below.



Source: Prepared by the JICA Survey Team from Containerisation International Yearbook

Figure 2.4.39: Trend of Container Throughput at Singapore Port

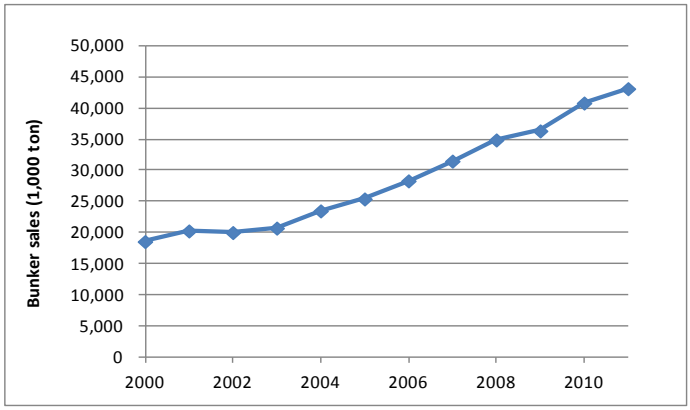
The figure below shows the trend of container vessels calling at the port of Singapore as well as the total gross tonnage of those vessels. The number of vessels is steady since 2005 or 2006, while gross tonnage continues to climb probably due to increased vessel size.



Source: Maritime Port Authority of Singapore

Figure 2.4.40: Trend of Container Vessels' Arrival

Since many vessels call at Singapore, the port functions as a bunkering hub as well. As shown below, bunkering sales have also increased continuously since the early 2000s.



Source: Maritime Port Authority of Singapore

Figure 2.4.41: Trend of Bunker Sales

(2) Port of Singapore

There are four container terminals in Singapore as shown below. According to PSA, they allocate certain terminals to certain alliances or shipping lines, so there is not much container movement between each terminal.

Source: PSA

Figure 2.4.42: Layout of Singapore Port

Table 2.4.24: Container Terminal Facilities of Port of Singapore

Facility \ Terminal	Unit	Tanjong Pagar	Keppel	Brani	Pasir Panjang 1&2
Access Channel Depth	m	-	-	-	-
No. of Berth	No	8	14	9	23
Berth Length	m	2,300	3,200	2,600	7,900
Berth Depth	m	14.8	15.5	15.0	16.0
No. of Quay Crane	No	29	42	32	87
Port Area	Ha	85	42	80	335
Handling Capacity	TEU	36,000,000			
Operator	-	PSA			

Source: PSA

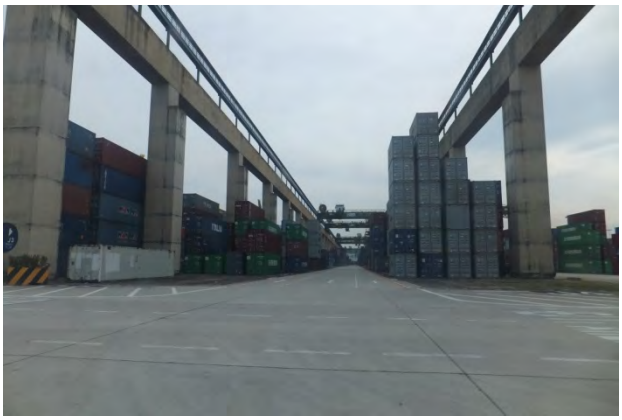
Currently, the construction of Pasir Panjang Terminal Phase 3&4 is in progress as shown in the photo below. Part of expansion is scheduled to commence operations from the middle of 2014. It will add another 14 million TEU to the existing handling capacity, which makes container handling capacity of 50 million TEU per annum in total.

Source: JICA Survey Team

Figure 2.4.43: Reclamation of Pasir Panjang Phase 3 & 4 in Progress

In order to continue attracting shipping liners and cargo owners, PSA is putting its effort into improving port efficiency especially by using modern IT technology. For example, overhead bridge cranes have been introduced in a part of Pasir Panjang Terminal which enables one operator sitting in the central control station to handle six cranes in the yard. The reefer

temperature monitoring system allows cargo owners to check whether their cargoes are properly kept at suitable temperatures. For import/export cargoes, a Flow Through Gate System passes trucks through the port gate in only 25 seconds.



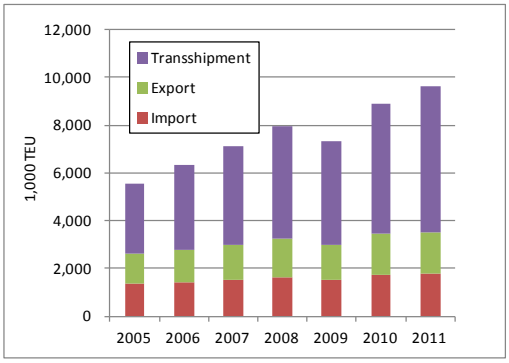
Source: JICA Survey Team

Figure 2.4.44: Overhead Bridge Crane

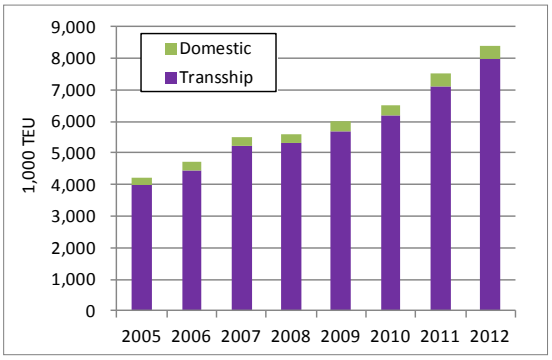
2.4.8 Malaysia

(1) Port Development Plan

Malaysia has a coastline of 1,900 km with more than 30 seaports of varying sizes. The most important of these are Port Klang (North Port and West Port) and Tanjung Pelepas, which have grown rapidly in recent years and now rank among the 25 busiest container ports in the world. Following a price war with Singapore these main Malaysian ports attracted a considerable volume of transshipment containers, as well as serving their own direct hinterland. The graphs below show Port Klang is serving as hub for local import/export cargo and at the same time handling a large volume of transshipments while Port of Tanjung Pelepas is purely a transshipment port.



Port Klang



Tanjung Pelepas

Source: Websites of each port

Figure 2.4.45: Container Throughput of Port Klang and Tanjung Pelepas

(2) Port Klang

Port Klang, located northwest of Singapore in the Malacca Straits, has two main container terminals: West Port and North Port. Both West and North Ports (managed by separate operators) have attracted substantial volumes of container cargo.

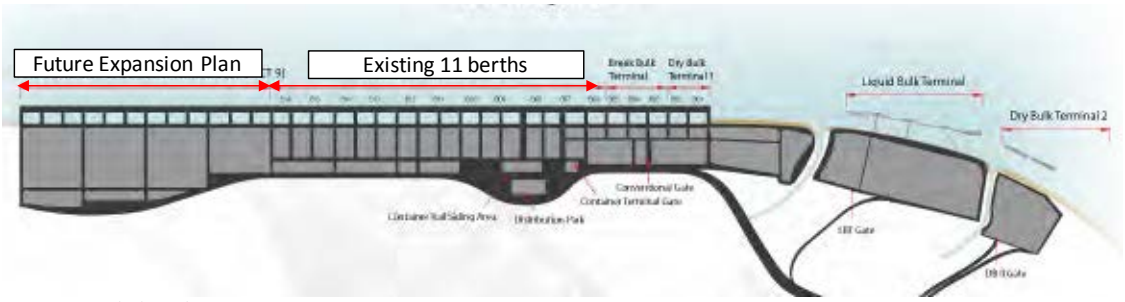
Westport is operated by Westports Malaysia Bhd, and handles around 67 percent of the container volume in Port Klang. In addition to being a transshipment hub, it is trying to become preferred port for local import/export cargoes as well. In 2011, around 1.7 million TEU (26.5%) were local cargo and around 4.7 million TEU (73.5%) were transshipment. Current total quay length is 3,200 m with annual handling capacity of 6 million TEU, and there is another 4 container terminals planned which will add annual capacity of 9 million TEU.

Northport is located 40 km from Kuala Lumpur, and operated by Northport (Malaysia) Bhd which is a fully Malaysian-owned company. The parent company is NCB Holdings Bhd, a transport conglomerate. The port is comprised of two locations, the Northport for containers and the Southport for conventional cargoes.

The location and the layout of both ports are shown below.

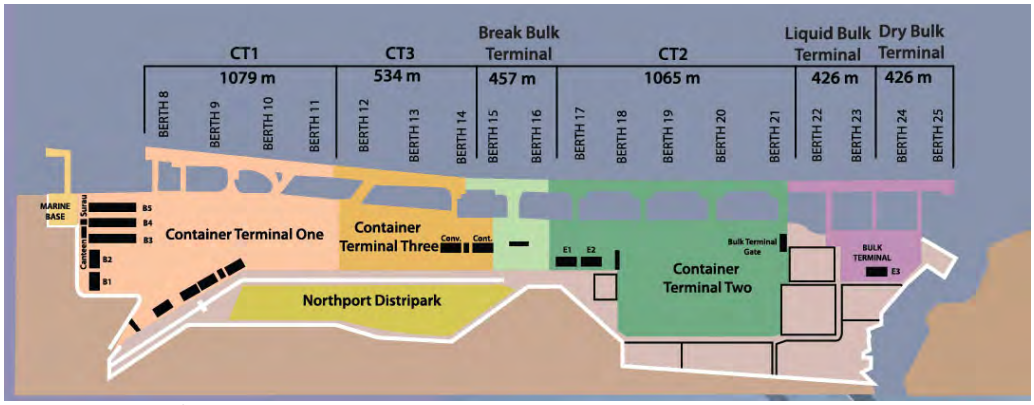
Source: Port Klang Malaysia Marine Information Handbook

Figure 2.4.46: Location of Port Klang



Source: Website of Westport

Figure 2.4.47: Layout of Westport



Source: Website of Northport

Figure 2.4.48: Layout of Northport

Table 2.4.25: Container Terminal Facilities of Port Klang

Terminal / Facility	Unit	North Port CT1	North Port CT2	North Port CT3	West Port
Access Channel Depth	m	16.5			
No. of Berth	No	4	5	3	13
Berth Length	m	1,079	1,065	534	3,700
Berth Depth	m	10.5-13.2	13.0	15.0	16.5
No. of Quay Crane	No	26			40
Port Area	Ha	145			120
Handling Capacity	TEU	5,000,000			7,500,000
Operator	-	Northport (Malaysia) Bhd			Westports Malaysia Sdn Bhd

Source: Websites

(3) Tanjung Pelepas

The Port of Tanjung Pelepas (PTP) is located in a sheltered bay with no tide restriction in the southern Johore State just across the Strait from Singapore. It is only 45 minutes away from the crossroads of the world's busiest shipping lanes. The port grew rapidly after coming on stream in January 2000, handling 6.5 million TEU in 2010 (an increase of 31%) ranking 16th in the world. PTP is a typical transshipment port which accounts for 95% of the total throughput.

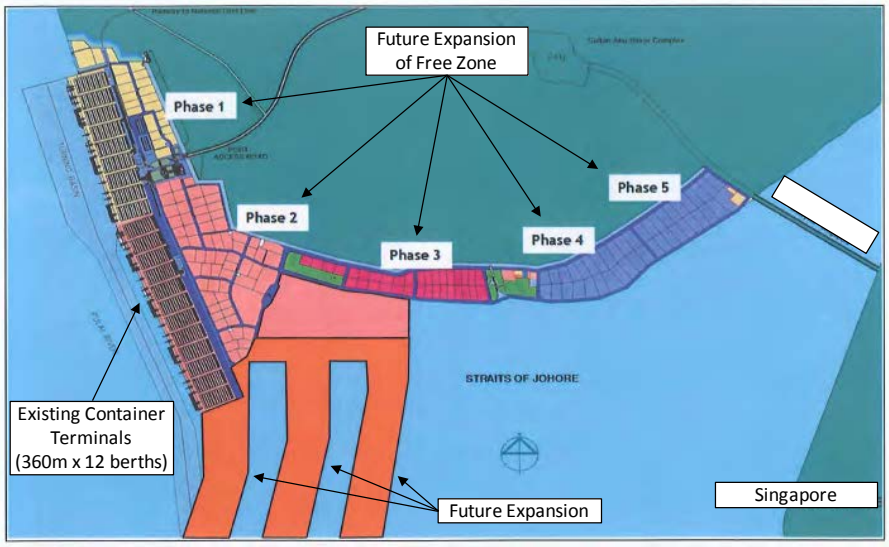
The terminal operator is Port of Tanjung Pelepqas Sdn Bhd. 70% of Port of Tanjung Pelepqas Sdn Bhd is owned by local company MMC Corporation Bhd while 30% is owned by APM Terminals. Port of Tanjung Pelepqas Sdn Bhd agreed with the Malaysian government for a 60 year concession (1995–2055).

The final capacity of the port is estimated at 9 million TEU annually. The public infrastructure is financed by the Malaysian Government. The port has a strong customer base, being the main regional transshipment hub for Maersk and Evergreen.

With the vision of being international gateway for the region through multi modal connectivity, PTP is being developed as maritime hub with adjacent free trade zone to form this area as a logistics center. The location of PTP, layout of the port including future expansion plans, and detail of the port facility are shown below.

Source: PTP

Figure 2.4.49: Strategic Location of Port Klang



Source: PTP

Figure 2.4.50: Port Layout of PTP

Table 2.4.26: Container Terminal Facilities of PTP

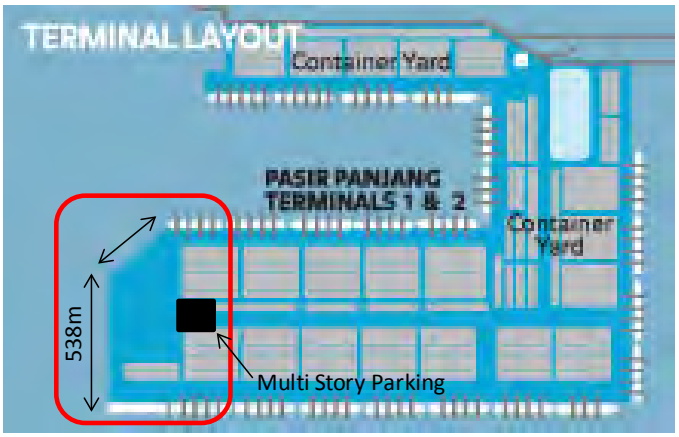
Terminal / Facility	Unit	Phase 1 & 2	Phase 3 (Under contract negotiation)
Access Channel Depth	m	16.0	16.0
No. of Berth	No	12	2
Berth Length	m	4,320	720
Berth Depth	m	14.5-19.0	19.0
No. of Quay Crane	No	44	No information
Port Area	Ha	180	30
Handling Capacity	TEU	9,000,000	1,500,000
Operator	-	Pelabuhan Tanjung Pelepas Sdn Bhd	Same as Phase1&2

Source: PTP

2.5 Transshipment of Cars

2.5.1 Transshipment of Cars at Singapore Port

In 2009, the first auto transshipment terminal in Singapore called "Asia Automobile Terminal Singapore (AATS)" was setup and commenced operation. The terminal is located at the corner of Pasir Panjang Container Terminal Phase 1 & 2 as shown in Figure 2.5.1, and operated by the joint venture of PSA Singapore, NYK and "K" Line. There are two dedicated berths with the total berth length of 538 m, and also multi-story parking building where those cars that stay in the terminal for a relatively long period are parked.



Source: JICA Survey Team and PSA Website

Figure 2.5.1: Terminal Layout of AATS

Source: JICA Survey Team

Figure 2.5.2: Photo of AATS Storage Yard and Multi-Story Parking Building

Newly manufactured cars from Japan, Thailand, Indonesia and Australia as well as some used cars are transported here and stored temporarily until they are transshipped in one vessel (PCC: Pure Car Carrier) to European countries, the Middle East and Bay of Bengal area. Current maritime transport network of AATS is shown below.

Source: JICA Survey Team

Figure 2.5.3: Current Transport Network of AATS

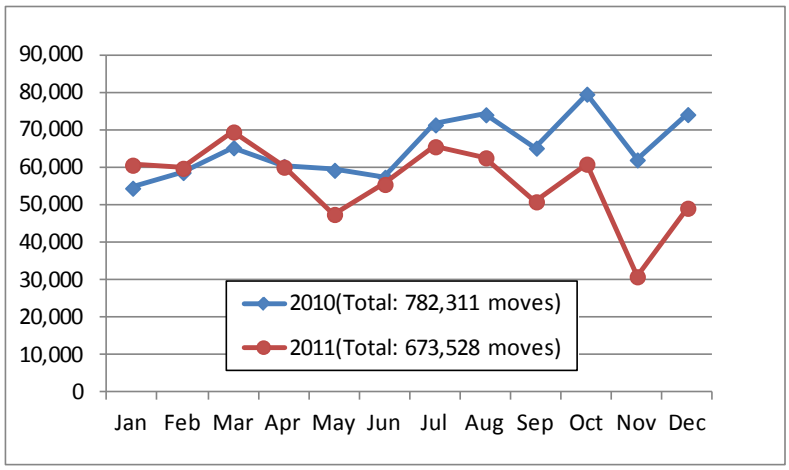
The concept and development plan of AATS was initiated by TOYOTA together with NYK, and Singapore was selected as the most suitable location.

Table 2.5.1: Detail of the Terminal

Specification	Unit	AATS	Remarks
Number of Berth	No	2	There is one common berth
Berth Length	m	538	Common berth L = 394 m
Storage Capacity	Cars	19,930	Multi-story parking: 9,940 Open yard: 9,990
Handling Capacity	Move	100,000	-
Operator	-	JV of PSA, NYK and "K" Line	-

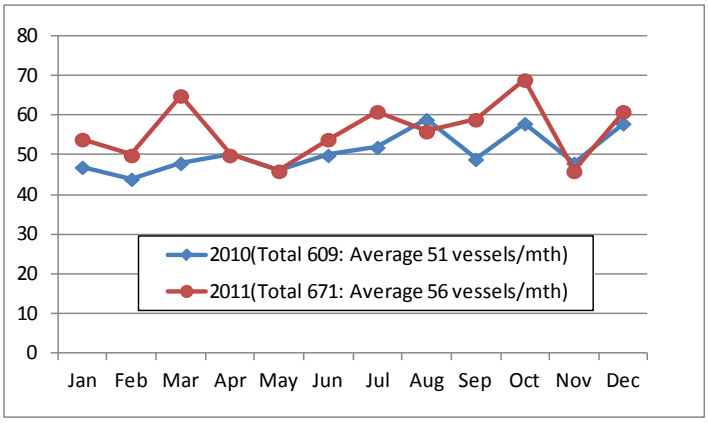
Source: JICA Survey Team

Since the start of the operation, the number of cars handled at the terminal has been increasing. In 2011, the volume of shipments was badly affected by the flood in Thailand but it recovered quickly. The handling volume (transshipment of one car is counted as two moves) and the number of calling vessels are shown below. Besides transshipment, it handled 12,490 cars for local import/export in 2011.



Source: NYK Auto, Singapore

Figure 2.5.4: Number of Transshipment of Cars at AATS



Source: NYK Auto, Singapore

Figure 2.5.5: Number of Vessels Calling at AATS

2.5.2 Transshipment of Cars at Hambantota Port

Sri Lanka has been importing vehicles through Colombo Port. However, it has been reported that there are some complaints from users that car carrier vessels are waiting too long for berthing due to congestion at the port.

After the construction of the multi-purpose terminal Hambantota Port was completed, SLPA made the announcement that from June 2012 onwards, all vehicles (for import) will be handled through Hambantota port, instead of Colombo port

According to the media center for national development of Sri Lanka, as of end of July 2012, eight car carriers have already called at the Hambantota port and unloaded 5,000 vehicles.

Changes were made not only to the port of calling but also to the operation. Hyundai's newly manufactured vehicles from its Chennai factory are now being transshipped at Hambantota and sent to Africa. As of the end of July 2012, it is reported that around 2,500 cars have already been transshipped.

Currently Hambantota has capacity to store 10,000 cars and SLPA is expecting the port to transship one million vehicles in the first five years.

At the time of this Study, there were only Hyundai cars being transported by Korean shipping company.

3. Current Position of Sri Lankan Ports on Indian Ocean Rim and in South Asian Economic Zone

3.1 General

In order to analyze the current position of Sri Lankan ports, SWOT analysis is updated from that made for South Harbor Project (Colombo Port Expansion Project, CPEP). The updated SWOT is summarized as shown in Figure 3.1.1, and detailed discussions will follow:

Strengths	Weakness
External Factors • The port is located very close to the main shipping lane between Singapore and Suez, one of the fastest growing container markets in the world. • Sri Lanka offers lines the opportunity to serve the whole of the Indian subcontinent (ISC) market in both easterly and westerly directions. • Future economic development in Asia is likely to strengthen ties between ISC and the Far East against the traditional markets. Sri Lanka is better placed to benefit from this change in the long term. • Faster growth of container volume is likely from a lower base on the ISC east coast and Bay of Bengal, Sri Lanka's key future hinterland. • South Harbor of Colombo can attract mega container vessels which can transport economically long distance haulage. Internal Factors • Management is implementing appropriate policies. • Colombo is less expensive than Indian ports, and more efficient than many. • Colombo does not have a particularly hostile labor environment.	External Factor • Sri Lanka lacks an adequate domestic cargo base. Shipping lines' clear preference is to serve markets direct if justified by volume. • Shipping lines prefer to serve markets where market conditions result in high freight rates. Higher rates would possibly further encourage direct calls. • India may build a rival transshipment port, modify its present hostility to foreign flag cabotage and introduce a tariff policy which stimulates direct calls. • Transshipment is an interim, not a final solution. Sri Lanka has neither the range of services nor the frequency that Singapore has. • No shipping lines are operating container terminals at Colombo Port. Shipping lines cannot be relied upon to be loyal to a hub – unless they run it. Internal Factor • Colombo productivity (Jaya and Unity Terminals) is still not competitive with the major hubs. • The port is not competitively priced against its eastern competitors. • Implementation of ICT and communication systems at SLPA and JCT is delayed. • The institutional situation is complex. SLPA does not always behave as neutral port authority.
Opportunities	**Threats**
• Sri Lanka offers a low-cost, efficient transshipment alternative to ports on the Bay of Bengal. With service improvements, the cargo using Singapore could be won back. • Sri Lanka can compete with Middle East ports for westerly transits from ports south of Mumbai on price, efficiency and speed of turnaround. • For easterly cargoes, Sri Lanka is well placed to win west coast ISC transshipment for those lines without direct services.	• ISC might not grow to the extent forecasted • Indian government may implement policies against foreign transshipment • Building appropriate infrastructure for a major hub port does not guarantee that it will be used, because the port is largely at the mercy of external events.

Figure 3.1.1: SWOT Analysis of Sri Lankan Ports

3.1.1 Strengths

It is commonly understood that the main strength of Sri Lankan Ports is the geographic location of Sri Lanka in the international maritime transport networks: Sri Lanka is located only 55 Nautical Miles away from the main shipping lane between Singapore and the Suez Canal. This sea lane connects Asia and Europe passing through the fast growing economies of Asia and the Indian Subcontinent (ISC). This sea lane is one of the busiest trade routes in the world and is experiencing significant growth. The cargo volume transported along this sea lane is rapidly increasing and demand for Sri Lankan ports is also growing.

Sri Lanka is also located at the southern tip of ISC, where a remarkable economic growth is generating considerable volume of maritime cargo. The Sri Lankan ports can geographically serve the whole of the growing ISC market in both easterly and westerly directions.

To consolidate its strong geographic position in maritime container transport, SLPA has been developing the South Harbor of Colombo Port which is expected to be partially completed and to open in December 2013. The South Harbor's design when fully completed will include a deep quay of 18 m depth and 3,600 m length. The harbor is designed to accommodate container ships up to 18,000 TEU. China Merchants Holdings (International) (CMHI) was selected as the concessionaire to build and operate the container terminal at the south terminal, while SLPA is planning to operate the container terminal at the east terminal. The South Harbor is encouraging international shipping lines to consider Colombo Port as their hub for mega container vessels.

On the other hand, SLPA has completed the Phase 1 construction of Hambantota Port on the southern coast of the island, which is the commercial port closest (only 15 Nautical miles away) to the main shipping lane between Singapore and the Suez Canal. A quay of 17 m depth and 600 m length is currently usable but not fully utilized. The port will be expanded according to the development plan but cargo that can be attracted to the port is still to be clearly identified. As a wide hinterland is available for industrial use, the port can be flexibly developed to best utilize its geographic strength, and wide and available land for industries and logistics.

3.1.2 Weakness

It is also commonly understood that the main weakness of Sri Lankan ports is lack of Sri Lankan domestic cargo. As shipping lines prefer direct calls when the export and import cargo exceeds a certain amount, they are likely to gradually put direct call service to such ports that have sizable domestic activity. This has already taken place at several Indian ports like JNPT. Transshipment to JNPT at Colombo Port has virtually ceased since shipping lines put their mother vessels into direct call service to JNPT. It would be difficult for Sri Lankan ports to compete with JNPT for cargo that is directly transported by container mother vessels to JNPT.

One of the serious weaknesses of Sri Lankan ports is that they do not have sufficient feeder services to attract mother vessels. Shipping lines prefer faster connection of their cargo to feeder vessels at a hub port. The more feeders that call at a port the more mother vessels will call at that port. This is very true of Singapore Port; even though the shipping route from Chittagong Port to Singapore Port is longer than to Colombo Port, shipping lines use Singapore as their transshipment port not only for their easterly destined cargo but also westerly destined cargo.

3.1.3 Opportunities

There are several opportunities for Sri Lankan ports to sustain their current strong position in the international maritime transport network and keep pace with competitor ports of the ISC and Bengal Bay that are ambitiously planning to develop their infrastructures to meet demand generated by the growing economy of their hinterlands.

One of the opportunities which can be pursued is feeder service to small scale ports on both the east and west coasts of the ISC. When mega container vessels call Colombo Port, more specifically the South Harbor, feeder service will be put in between Colombo Port and the small ports on the both coasts of ISC. The mega container vessels and Colombo's geographic position will enable containers to be transshipped more economically through Colombo Port than Indian ports. Competition for this service from JNPT and Cochin PT on the India's west coast and Chennai PT and Vishakhapatnam PT on the east coast will also be hampered by India's cabotage restrictions on her coastal shipping which it appears will remain in place for the time being.

In addition, when lower transport cost is achieved by the mega container vessels calling South Harbor of Colombo Port and service is raised to a level similar to Singapore Port, westerly bound cargo from/to Bangladesh can be captured. Similarly, westerly bound cargo from/to Yangon Port can also be regained from Singapore Port.

3.1.4 Threats

On the main sea lane, the major threat is that mega carriers will build new container hub ports and move their transshipment business to the new ports from Colombo Port. The similar experience has already taken place worldwide; Maersk Line moved from Singapore Port to Tanjung Pelepas Port as previously mentioned. Maersk Line also built its own container terminal at Salalah which is operated by APM Terminals, a sister company of Maersk Line. As mega carriers are focused on profitability and do not have loyalty to a particular port when the terminal they are using cannot satisfy their business plan or strategy they move to another terminal. When this happens, consequent loss of transshipment containers can be sizable.

On the feeder lanes, particularly coastal shipping lanes of ISC, there is a possibility that the Indian Government will adopt a policy disadvantageous to transshipment from/to Sri Lankan Ports. The liberalisation of cabotage rules related to coastal shipping, for example, is considered to encourage Indian ports to grow as container hubs.

3.2 Colombo Port

3.2.1 Hub of International Maritime Container Transport

Colombo Port established its position as an international container hub port in the 1980's. Since then the Colombo Port has increased the volume of container transshipments. The position as an international hub was first threatened in 1998 by the opening of a container terminal at Salalah Port which was built and operated by APM Terminals. Because of the increase of international maritime container transport and efforts of the management of SLPA, Colombo Port withstood the threat posed by the opening of Salalah Port. In the 2000's, a second threat has been posed by the shipping industry, which started to build mega container vessels to be put in service on the main sea lane.

To sustain Colombo Port as a major international container hub port, SLPA started in 2008 to construct the South Harbor which has an 18 m deep quay to accommodate container ships up to 18,000 TEU capacity. The South Harbor's navigation channel of 20 m depth and 570 m width is sufficient for the expected mega container vessels. The wide port entrance is aligned open to the north so that mega container vessels can enter the port without difficulties from the outer sea where strong swells prevail during the south-west monsoon. South Harbor in view of the Consultants can sustain Colombo Port as an international container hub port by accommodating mega container vessels. Part of the south terminal of South Harbor is expected to be completed by the end of 2013 and the terminal will be capable of handling 2.4 million TEU per annum when fully opened.

3.2.2 Threats by Competitors, Mega Operators, Indian Government

The geographically favored position of Colombo Port as a major international maritime container hub will be weakened by its competitor ports unless appropriate measures are proactively undertaken.

One of the major threats may come from the shipping lines who are also the major customers for the port. They can always compare the tariff rates and service level of Colombo Port among the hub ports. Whenever they are dissatisfied with the tariff or service, shipping lines have the option to change their transshipment hub. As Colombo Port does not have substantial domestic cargo, shipping lines are considered to be more likely to move from Colombo than JNPT, Cochin PT and Chennai PT, which have sufficient domestic cargo generated by the growing economy of the ISC.

Another major threat may come from the mega operators of container terminals. They are influential with the shipping lines (and may be a sister company like APM Terminals). By operating a series of container terminals along the main sea lanes and providing shipping lines with various services around the world, mega terminal operators can offer a shipping line that is dissatisfied with the service at a certain port better service at one of its terminals. SLPA has to be diligent and ensure the service level of container terminals at Sri Lankan ports is higher than or at least same as its competitor ports.

Another major threat may come from Indian Government, which seems determined to make several Indian ports container hubs and transship domestic cargo at those ports. The candidate hub ports are JNPT and Cochin Port on the west coast and Chennai Port and Visakhapatnam Port on the east coast. For the time being, Indian Government is not likely to lift the cabotage imposed on costal shipping. However, collective measures will be required for SLPA to capture transshipment containers which will be generated on both coasts of the ISC.

3.3 Hambantota Port

3.3.1 Traffic Demands

At present, Phase 1 construction consisting of the two break bulk terminals and two liquid bulk terminals is completed and Phase 2 construction consisting of the container terminals having a 2,400 m length in total has reportedly started. When Phase 2 is completed, Hambantota Port will have container terminals of a 2,400 m long quay with a depth of 17 m in addition to the terminals completed in Phase 1. i.e. two break bulk (general cargo) terminals of 600 m length straight quay with a depth of 17 m and two liquid bulk terminals of dolphin type berth of 300 m and 17 m depth.

In June 2012, automobile import and transshipment commenced at the break bulk terminal. However, other cargo is still to be generated by marketing of the port users. There are four private investors who have decided to invest to develop logistics business at Hambantota Port:

- Fertilizer: JV of Hayleys PLC (Sri Lanka) and Dragon Asia Fertilizer Limited of Hong Kong
- Petrochemical: Sidhartha Sen Petrochemical Development Group (India)
- Sugar: Shree Renuka Sugar Ltd. (India)
- Cement: Thatta Cement Company Limited (Pakistan)

It is reported that bulk fertilizer will be imported, bagged and exported. Sugar will be imported in bulk, refined, bagged and exported. Petrochemical semi-products will be imported, processed to final products and exported. Cement clinker will be imported, crashed, ground and bagged. It

is reported that the cement will first be distributed to the southeast of Sri Lanka to meet construction demand and any excess supply will be exported to other countries.

In addition, a Sri Lanka based car manufacturer, Micro Cars Limited, is planning to build a knock-down assembly line at Hambantota and produce "Micro" cars. Parts will be supplied by Ssang Yong Motor Co., Ltd. of Korea, 70% of which has been owned by Mahindra & Mahindra (a large Indian suppler of vehicles) since November 2010. Meanwhile, Hyundai Merchant Marine (HMM) started to use Hambantota for transshipment of vehicles manufactured at Chennai in June 2012.

In coming decades it is very certain that Colombo Port will handle much more container than Hambantota Port and that the terminal operation in Colombo Port will be more profitable than that in Hambantota Port. Therefore, to attract terminal operators for the container terminals to be completed at Hambantota as Phase 2 construction, SLPA may need to provide special conditions preferable to Colombo Port. As Colombo Port will have sufficient capacity to meet all the demand of Sri Lankan ports until 2020, assuming the South Harbor is developed according to the implementation schedule, it would be more convenient for terminal operators to use Colombo as shipping related service providers like forwarders, shipping line agents, etc. are in place. Without such preferable conditions, no terminal operators may move to Hambantota Port in exchange for termination of operations at Colombo Port.

Future expansion at Hambantota is possible but expected demand is too uncertain to justify investment at this time. Hambantota Port can be developed to meet traffic demand. In this regard, land use and developments in the hinterland of the port as well as the development of shipping industries centered at Sri Lanka are considered major factors to generate future traffic at the port.

3.3.2 Factors to be Considered in View of Shipping Industries

- Containerization of the countries which are using Colombo Port as their transshipment hub will further advance. As a result, almost all break bulk cargo will be containerized with exception of cargo that is not easily containerized like steels, vehicles and industrial plants. With specialized container handling, Colombo Port can benefit from this trend. It is considered that Hambantota's will have a chance of container transshipment opportunities are container overflow at Colombo Port or when SLPA offers preferable arrangements to a terminal operator that expresses interest in operating its container terminal at Hambantota Port.

- Dry bulk cargo imported by India, Bangladesh, and South East Asian countries like Myanmar, is expected to increase as these countries' GDP increases. Several private companies are planning to import bulk cargo at Hambantota Port for re-export. If hauling distance is long, like fertilizer from the Baltic region, large bulk carriers can considerably reduce transport cost by transshipment at Hambantota. Small carriers will be used to transport bagged or processed cargo along the shallow navigation channels or inland waterways on the coast of the ISC and the Bay of Bengal. It can be economically feasible to use Hambantota Port to transship and re-export dry bulk cargo.

- Auto manufacturers are producing cars in India, Australia, Malaysia, Thailand and Indonesia. They export or will export a considerable number of cars produced in these countries. For the convenience of the countries to import these cars, one pure car carrier (PCC) will be used to transport several types of cars produced in different countries. Singapore has already built and operated a dedicated terminal for automobile transshipment. However, demand for car transshipment is expected to exceed the

capacity of the terminal and its expansion seems difficult because of congestion at the port. Hambantota, as it is near India and located very close to the sea lane from Asia to Europe, is a candidate for this car transshipment.

- As container handling increases at Colombo Port its capacity to handle dry bulk cargo will decrease. Hambantota can absorb the import of dry bulk like forage, cement and wheat which is currently handled at Colombo Port.

3.3.3 Factors to be Considered in View of Hinterland Development

(1) Ship-Building & Repairing

The development plan of Hambantota Port tentatively shows the location of the ship-building & repairing yard. The yard is located at the west bank of the outer port basin, where a dry dock is indicated. However, a ship-building & repairing yard needs a considerable length of waterfront to fit out the ships. In this regard, the west bank is not sufficiently long for ship-building & repairing. It is recommended that a comprehensive layout plan be developed to properly allocate a suitable area for ship-building.

In addition, before the port master plan is laid-out, a feasibility study should be conducted on the viability of building and repairing ships at Hambantota Port.

(2) Oil Refinery

In Sri Lanka, there is one small hydroskimming refinery plant in Colombo which imports Iranian light crude oil and produces gasoline, diesel, kerosene, fuel oil and asphalt. Its production capacity is 2.5 million tons p.a. and 50,000 bbl/day. An expansion project is underway to increase its capacity to 5.0 million tons p.a. and 100,000 bbl/day and further to 10.0 million tons p.a. and 200,000 bbl/day. However, no project is reportedly to be implemented at Hambantota at present. In view of concentration of population and industries on the west coast of Sri Lanka, where the products are mostly consumed, the refinery is reasonably located in Colombo.

Therefore, as the government desires an oil refinery to be built at Hambantota and a tank yard equipped with liquid berths and pipelines is almost completed, the government should provide some preference to the company planning to invest to build the refinery in order to compensate for the disadvantages of the location. A feasibility study should be conducted before finalizing the master plan layout of Hambantota Port.

(3) Bunkering

In case a refinery plant is built in Hambantota, fuel oil produced at the plant can be used for bunkering.

In case a refinery plant cannot be built at Hambantota, the only option is to import fuel oil, most probably from a refinery plant in the Middle East, for bunkering services.

(4) LNG

An LNG plant is being planned at the west coast near Colombo, which is the consumption center of LNG to produce electricity. Therefore, it is unlikely that an LNG plant will be built at an early stage of the port's development.

Should it be the case that an LNG plant is planned in Hambantota, the port should be provided with a jetty to accommodate an LNG tanker and LNG pipelines, which usually need a wide

water area. A feasibility study has to be conducted, as it much affects the master plan layout of the port.

3.4 Competitor Ports for Sri Lankan Ports

3.4.1 Ports on Asia–Europe Sea Lane

(1) Singapore Port

Exploiting its geographic advantages, Singapore Port has become the largest container transshipment hub on the sea lane between Europe and Asia. Singapore Port handled about 28.43 million TEU of transshipment containers in 2010, which is seven (7) times the volume of Colombo Port. Singapore Port will be the largest competitor port to Colombo Port in container transshipping.

Singapore Port's geographic advantages consist of the following.

a. Container ships plying the route between East Asia, Far East Asia and Europe, and even the US East Coast have to pass through the Strait of Malacca where Singapore is located. This is similar to Colombo Port which is located very close to the same sea lane.

b. Singapore is closer to China than Colombo Port. China is the largest exporter of containerized commodities to Europe.

   Sri Lanka's ports are closer to India than Singapore and could soon have a large volume of container transshipments as India is expected to generate export/import cargo for its economic growth.

c. Singapore is surrounded by the ASEAN countries where economic growth has been generating demand for containerized cargo. Singapore is a founding member of ASEAN.

   Bangladesh, Myanmar and Indian States on the east coast of ISC are areas with potential to increase containerized cargo and use Colombo Port as a hub. Singapore Port is a potential threat to Colombo Port in competing as a hub for the ports in these areas.

d. As a result of a. b. and c., connectivity to Singapore Port is far better than Colombo Port, as there are many feeder services using Singapore Port as a hub. A typical example is that containers originated from Myanmar destined to Europe are transshipped at Singapore Port not at Colombo Port.

e. There are several industries in Singapore which generate import/export containerized cargo accounting for about 15% of total throughput (Approx. 4.2 million TEU in 2010 which is about 4.5 times Sri Lanka).

In addition, Singapore Port has been investing not only in the improvement of physical port facilities but also trade facilitation by use of advanced ITC technology.

From the brief point of view above, the strategy Sri Lanka should undertake consists of the following:

a. To exploit its geographic comparative advantages; to capture the containerized cargo originated from or destined to the ports on the Bay of Bengal and East Africa

b. To ensure minimum required connectivity at Colombo Port.

c. To capture the containerized cargo originated from Far East to East Africa

d. To promote domestic industries which can generate export/import

e. To facilitate trade by use of ITC technologies

(2) Tanjung Pelepas Port

Tanjung Pelepas is the new container transshipment port which was opened in 2000. The new port was required because of heavy congestion at Singapore Port and a political decision of the Malaysian government to export and import domestic cargo through a Malaysian port and not through Singapore Port. Tanjung Pelepas handled approximately 6.5 million TEU of transshipment containers in 2010, which is about one fourth of Singapore Port and approximately 2.1 times Colombo Port. Since Maersk Line moved their major container transshipment operation from Singapore to Tanjung Pelepas in 2000, almost all the transshipped containers handled at the port have been those carried by Maersk Line, whose group company APM Terminals owns a 30% share of the terminal operator.

Maersk Line is the predominant user of the container terminal at Tanjung Pelepas Port and at the same time indirectly owns around 26% of SAGT container terminal at Colombo Port – actual holder is its parent company; AP Moller-Maersk Group. It seems unlikely that Maersk Line would move container transshipment from Colombo Port to Tanjung Pelepas Port, as Maersk Line can enjoy the advantages derived from both the ports, one is the hub for East Asia and the other for South Asia. Therefore, Tanjung Pelepas should not be a threat to Colombo Port's container transshipment business.

(3) Port Klang Port

Located on the major sea lane between Asia and Europe, Port Klang Port transships containers. Its container transshipment was approximately 8.9 million TEU in 2010 which is approximately 30% of Singapore Port and 2.2 times Colombo Port. Approximately 60% of its container throughput is comprised of export/import containers of Malaysia and approximately 40% is comprised of transshipment containers. The container transshipment is considered a side business of export and import of domestic cargo.

Port Klang Port is too near to Singapore and Tanjung Pelepas to compete with them in container transshipment. Consequently, the port will not be a threat to Colombo Port.

(4) Salalah Port

Like Tanjung Pelepas Port, Salalah Port is a container transshipment port developed by Maersk Line. Terminal operator APM Terminal is a sister company of Maersk Line. Containers transshipped at Salalah Port are originated from and destined to the ports on the rim of Arabian Sea and the Persian Gulf, and those on the coast of East African countries and South Africa. In this regard, Salalah Port and Colombo Port have a common transshipment market only at East African countries. In near future when the mega container vessels can call at Colombo Port, however, Colombo Port will be able to transship containers originated from the countries of East Asia destined to East African countries and compete with Salalah Port. Salalah Port will continue to transship containers originated from European countries.

As a result of the considerations above, Salahah Port will not compete with Colombo Port with respect to containers originated from and destined to countries of Asia, Middle East and Africa but a competitor port with respect to transshipment of containers moving between Europe and Asia.

3.4.2 Ports on Indian Subcontinent

(1) Chennai Port

Currently two mega operators are engaged in container terminal operation at Chennai Port; DP World's Chennai Container Terminal Pvt. Ltd. and PSA's Chennai International Terminals Pvt. Ltd. The port handled approximately 1.5 million TEU in 2010, which is about 40% of the throughput of Colombo Port. The port has a development plan to build "Chennai Mega Terminal" which will have a continuous quay length of 2 km with 22 m alongside depth. It is expected to accommodate large container ships with capacity over 18,000 TEU and 400 meter length. Volume is projected to be 4 million TEU p.a. The development project is scheduled to be completed by January 2020.

As it appears the Indian Government will continue cabotage on the Indian Coast, there will not be a strong negative impact on the transshipment business of Colombo Port. But even though cabotage is not lifted, Chennai Port will be capable of transshipping containers to the ports of Bangladesh and Myanmar. In this regard, the port is one of the competitor ports on the Bay of Bengal. Should the Indian Government lift cabotage, Chennai Port would be one of the serious competitors to Colombo Port.

Visakhapatnam Port, located on the same East coast of India as Chennai and has deep berth alongside depth, will handle 0.37 million TEU of containers in 2020 according to the estimate by the Indian government. With such volume, it is not likely that Visakhapatnam Port will be a competitor for Colombo Port.

(2) Cochin Port

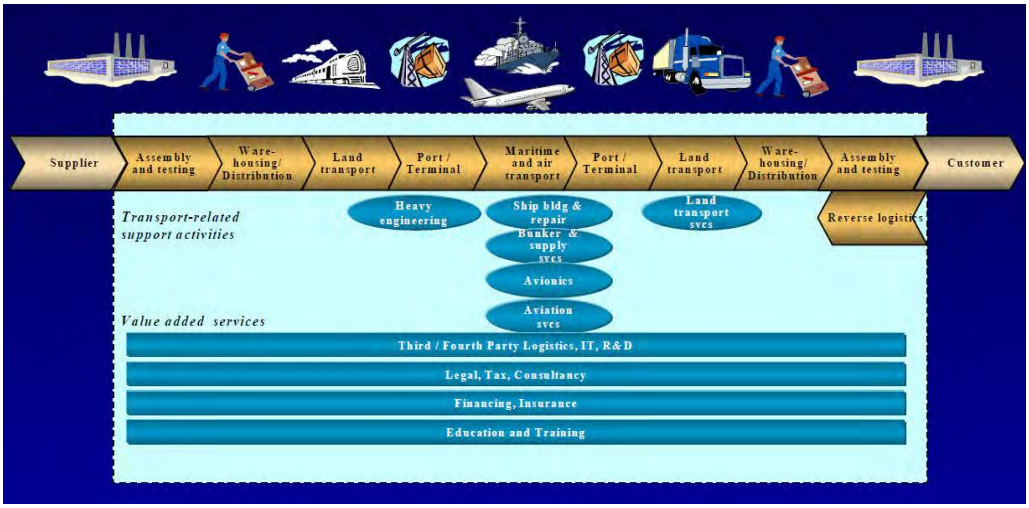
DP World has completed a container terminal in 2011 as the Phase 1 development. The terminal has a quay of a 600 m length and 16 m depth capable of handling 425,000 TEU p.a. When the final phase development is completed, the terminal will have a capacity to handle 4 million TEU p.a. So far it appears the Indian Government will continue to impose cabotage so the port is not permitted to transship containers originated from and destined to India's small ports. However, it will considerably reduce containers which are currently transshipped at Colombo Port, particularly those from/to East Asia. Should the cabotage be lifted, the port will be a threat to Colombo Port's container transshipment business.

4. Trend of International Logistics and Demands from Port Users

4.1 Trend of International Logistics

4.1.1 Introduction

International logistics industry has evolved from individual transport and storage mode to integrated supply chain management service which includes all transport modes such as road, rail, ocean and inland shipping, air etc to provide customers door to door service. The typical flow of such logistics chain is shown below.



Source: Presentation material from SLAVO (Sri Lanka Association of Vessel Operators)

Figure 4.1.1: Typical Flow of Logistics Chain

As the backbone of international trade, logistics includes not only transportation but also warehousing, border clearance, payment systems etc. These functions are usually performed by private companies for private traders and cargo owners, but policies of national governments as well as regional and international organizations are also important.

The improvements in global logistics have been driven by innovation and a significant increase in international trade, but there are still many areas to be improved and problems to be solved for more efficient and economical services.

Ports are connection points between countries or regions and the importance of their role in the international logistics chain is unquestionable. There are ports of origin and ports of destination, and also transshipment ports in between these two.

4.1.2 Logistic Performance Index (LPI)

World Bank conducts a worldwide survey every two years to measure performance along the logistics supply chain. By surveying global freight forwarders and express carriers, the Logistic Performance Index (LPI) is calculated for 155 countries. LPI is a summary indicator of logistics sector performance, combining data on the following six components.

Component 1: The efficiency of the clearance process (speed, simplicity, and predictability of formalities) by border control agencies, including customs

Component 2: The quality of trade- and transport-related infrastructure (ports, railroads, roads, information technology)

Component 3: The ease of arranging competitively priced shipments

Component 4: The competence and quality of logistics services (transport operators, customs brokers)

Component 5: The ability to track and trace consignments

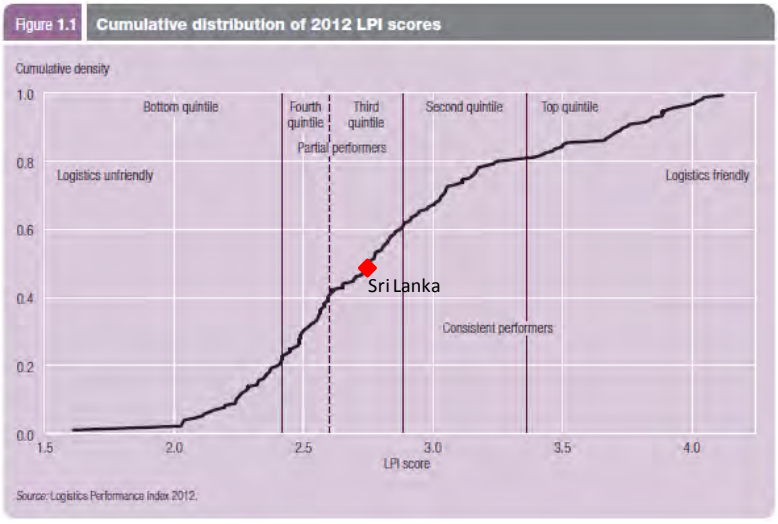
Component 6: The frequency with which shipments reach the consignee within the scheduled or expected delivery time

Sri Lanka was ranked 81st in 2012. The rank and score of Indian Ocean Rim countries are shown in Table 4.1.1.

Table 4.1.1: Ranking of LPI

2012			2010			2007		
Country	Rank	Points	Country	Rank	Points	Country	Rank	Points
Singapore	1	4.13	Singapore	2	4.09	Singapore	1	4.19
Hong Kong	2	4.12	Hong Kong	13	3.88	Hong Kong	8	4
Malaysia	29	3.49	Malaysia	29	3.44	Malaysia	27	3.48
India	46	3.08	India	47	3.12	India	39	3.07
Oman	62	2.89	Oman	60	2.84	Oman	48	2.92
Pakistan	71	2.83	Bangladesh	79	2.74	Pakistan	68	2.62
Sri Lanka	**81**	**2.75**	Pakistan	110	2.53	Bangladesh	87	2.47
Myanmar	129	2.37	Myanmar	133	2.33	**Sri Lanka**	**92**	**2.4**
Bangladesh	No data		**Sri Lanka**	**137**	**2.29**	Myanmar	147	1.86

With the score shown above, Sri Lanka is categorized as "Partial Performer – includes countries with a level of logistics constraints most often seen in low- and middle-income countries".



Source: World Bank

Figure 4.1.2: LPI Category of Sri Lanka

4.1.3 Multi Country Consolidation (MCC)

One example of the international logistic system is multiple country consolidation (MCC). MCC consolidates multiple less-than-container-load (LCL) cargos from different shippers and origins into one full-container load (FCL) shipment, giving customers lower transit costs and fixed transit times using weekly sailings and smooth connections to the final destination. It can be done for air freight and ocean freight.

At the interview in the regional office of one of the international logistics companies in Sri Lanka, the following advantages of MCC were highlighted (This logistics company already does some MCC operation for air freight in Sri Lanka):

- All shipments arrive on the same day and in the same container
- Faster access to goods as container yard boxes can be collected earlier than CFS shipments
- One customs entry
- One container yard for collection instead of several CFS shipments
- One terminal handling charge/documentation fee
- Reduced trucking charges for full container load instead of multiple LCL

4.1.4 Example of Port of Tanjung Pelepas

Port of Tanjung Pelepas (PTP) was accorded Free Zone status in 1998. The Malaysian government also appointed PTP as a Free Zone Authority (FZA) in 1999, to administer both the Commercial Free Zone and the Industrial Free Zone.

Pelepas Free Zone (PFZ) is situated adjacent to the port (container terminal) and covers an area of about 400 Hectare (Ha). Out of this 400 Ha, 160 Ha is designated as Free Commercial Zone (FCZ) reserved for distribution, logistics, and warehousing activities for consolidation, international procurement centre and distribution centers etc. The remaining 240 Ha is the Free Industrial Zone (FIZ) which is reserved for light, medium and heavy manufacturing industries.

Tax incentives are given to the companies doing businesses as well as advantages such as competitive land cost, supply of water and electricity, competitive labor cost for skilled and semi-skilled workers, vast land for business expansion, fast and efficient movement of cargo in and out of the Free Zone and the port, integrated logistics hub within Malaysia and so on.

Setting up such manufacturing factories, warehouses, distribution centers etc right adjacent to the container terminal enables smooth logistic flow and also contributes to the growth of handling volume of the port. The port is also connected to other modes of transport:

Air: 25 minutes from Senai Airport where an Air Cargo Hub is being developed, and 45 minutes from Changi Airport in Singapore.

Road: Connected by a 5.4 km access road to the national highway network, to northern parts of Johor city, central and northern regions of Peninsular Malaysia, and also to Singapore and Southern Thailand.

Rail: Connected to the national rail network and also accessible to Southern Thailand. There is a plan to connect this rail all the way to Yangon (Myanmar), Laos, Phnom Penh (Cambodia), Da Nang (Viet Nam) and Kunming (China) in the future.

4.2 Demands of Port Users

4.2.1 General

Every container port/terminal is competing for terminal users at moment. Ports will lose users if they do not pay attention to their needs. Shipping lines are always paying attention for a more advantageous hub port. Forwarders and cargo owners need assurance that their cargo will be delivered on schedule without any damage. Demands of the port users in general are;

- No berth waiting time, and guaranteed direct berthing.
- High productivity of quay gantry crane operation
- Proper layout of stowage and carriage for quick and efficient handling of transshipment containers at the quay and the yard.
- Proper arrangement to provide sufficient number of quay gantry. Twin spreaders and double stack type trailers are preferred.
- Low terminal handling charge. It is important to maintain competitive overall terminal cost, and efficient planning of the work and good maintenance of equipment are necessary.
- Minimize cargo damage and mishandling.
- Advanced IT system which enables smooth documentation/custom clearance for local import/export cargo, and prevents trucks from making long queue to enter the port. Local cargo will be ready in time for loading. Sufficient parking area for trucks inside the terminal is preferred.
- Full time operation (not affected by the natural weather conditions, strike or sabotage of workers etc)
- Continuous training of equipment/vehicle operators.
- Appropriate access to the port which is necessary for timely delivery of cargo to the cargo owner.

During the course of the survey, interviews with shipping lines, forwarders and cargo owners were carried out with reference to the use of Colombo Port and Hambantota Port as well as the situation of international logistics in the Indian Ocean Rim and South Asia economic zone.

Demand, opinion and attitude of port uses towards Sri Lanka and other countries in the ISC are summarized hereafter based on the information obtained from the interviews.

4.2.2 Shipping Lines

During the course of interviews with shipping lines in Sri Lanka and other countries, the following comments/points were raised.

- Colombo Port's greatest advantage is its geographic location but continuous effort to improve the efficiency of port operations is needed.
- Performance of cargo handing is not so good at JCT and UCT in Colombo Port and is around 20 units per hour (24 in UNCTAD standard, and 30 in Japanese Standard).
- SAGT terminal is operating very efficiently with window system for berthing.

- Upon completion of the South Container Terminal (SCT) in Colombo Port, mega container vessels will start to call which will also attract more feeder vessels. Therefore, earliest completion of SCT is expected (some shipping lines said that SCT should have been built much earlier).
- Larger vessels consume more fuel. Therefore, shorter sailing distances will be a key point in selecting hub port and this trend will foster the strength of Colombo Port.
- One shipping line said if there is at least 200 to 300 TEU of westbound containers to Europe, the mega container vessels will call Colombo Port.
- Stevedore charge in Sri Lanka is relatively expensive compared with other countries. Powerful labor union could be one of the reasons.
- Enhancement of export industries is strongly expected by the initiative of the government as Sri Lanka's lack of local cargo market is a weakness.
- One lead agency (steering committee, authority, boards etc) to ensure full authority for decision making and executing the development of logistics is necessary in order to become true hub for the region.
- In India, each State government and Port Authority act by their own policies and strategies which creates difficulty in implementing unified developments.
- Although there are many development plans for deeper container terminals in India, development of a deeper port is not likely for some time, neither is the lifting or relaxation of cabotage.
- Therefore, Colombo Port is, and will remain an important hub port for transshipment of ISC containers for some time.

4.2.3 Forwarders/Logistics Companies

The essential point is smooth and quick performance of documentation for export/import cargo. Relevant government organization is to be built up for single window, progressive IT system. The target is paperless system.

In order to encourage the establishment of new forwarders, customs brokers, non-vessel operating container carriers, the government's support is needed. Consequently, more competitions are created which will make waterside enterprises energetic.

The comments at the interview are listed below.

- One said that customs clearance and other documentation for export cargo from Colombo are manual procedures and very complicated. In addition to long queuing, trucks, carrying containers to the terminal are often late and arrive after closing time. This should be urgently improved.
- The other logistics company told us that there is not a problem for customs clearance and other documentation for export cargo.
- Export containers from Sri Lanka are scanned to make sure there are no narcotics or any arms inside by both SLPA and the Navy. Transshipment containers are also occasionally checked. It is expected that the scanning is to be done only by one agency.
- There is one CFS near the airport operated by a logistics company, and it is doing a small volume of MCC business. Colombo Port could study opportunity for this MCC business in order to grow the throughput of the port with the assistance of the

Government such as setting the longer duration of free storage etc. Negotiation is ongoing with the government.

4.2.4 Cargo Owners

Not many cargo owners or manufactures were interviewed, but below are some of the comments raised at the interviews.

- Sri Lanka has bilateral FTA agreement with India and Pakistan. Hambantota Port has vast area of land available and new port facility with relatively deep draft. So there are opportunities in doing value added logistics business.
- Hambantota Port will have more opportunities if highway and railway is connected to Colombo City which is the major consumption area.

5. Comparative Advantage and Future of Sri Lankan Ports

5.1 Growing Scenario

5.1.1 General Outlook

The Sri Lankan ports have a remarkable advantage in maritime transport since Sri Lanka is located very close to the major sea lane between Europe and Asia. All the ships plying this sea lane between these two big economies have to navigate offshore of Sri Lanka Island. It is due to this advantage that Colombo Port handled approximately 4.1 million TEU in 2010 even though Sri Lanka's economy is relatively at USD 49.54 million GDP in the same year.

At present, the South Harbor of Colombo Port is under construction. Its South Terminal will be completed by the end of 2013 and the handling capacity of Colombo Port will increase by 2.4 million TEU p.a. The port will consequently have a capacity of approximately 7.2 million TEU p.a.. When the East Terminal and West Terminal of the South Harbor are completed as programmed in the Colombo Port Expansion Project (CPEP), Colombo Port will have a capacity of approximately 11.9 million TEU p.a[1].

The majority of the containers handled at Colombo Port are transshipment containers which account for about 75% of the total container throughput in 2010. The major Indian ports like Chennai Port and Cochin Port have transshipped a number of their containers at Colombo Port, as volume at the Indian ports was not sufficient to justify direct service. India's major ports have now started to construct container terminals. The quays of these container terminals will have sufficient length and depth to accommodate larger container vessels which will attract direct service.

In view of the development of India's ports, it is reasonable to re-examine the demand of transshipment containers which was estimated when the South Harbor project was studied. For examination of the demand, the three scenarios below are applied:

Scenario 1 (Medium-case):	Sri Lankan ports will be competitive with Singapore/Port Klang in capturing container cargo from/to Bangladesh/Myanmar but lose the share in transshipping containers from/to Indian major ports.
Scenario 2 (High-case):	Sri Lankan ports will also be competitive with India's major ports in capturing container cargo from/to Indian ports.
Scenario 3 (Low-case):	Sri Lankan ports will not be competitive either with Singapore/Port Klang in capturing container cargo from/to Bangladesh/Myanmar or with India's major ports in capturing container cargo from/to Indian ports.

5.1.2 The Three Scenarios

(1) Scenario 1 (Medium-Case)

Scenario 1 is based on a sort of laissez-faire policy to let the transshipment of containers increase according to the demand with minimum requirements as a container hub port which can accommodate mega container vessels. In this scenario, the transshipment activity is assumed as follows:

[1] 11.9 million TEU p.a. does not include a possible extension of West Terminal. If included, the capacity will be about 13 million TEU p.a.

1. Proportion of transshipment containers from/to Indian major ports handled by Sri Lankan ports will decrease owing to the development of direct services.
2. Proportion of transshipment containers from/to Indian small ports handled by Sri Lankan ports will remain more or less the same as in 2012 owing to cabotage law imposed on the Indian coastal shipping.
3. Westbound transshipment containers from/to Bangladesh or Myanmar will be captured by Sri Lankan ports owing to the improvement of connectivity.
4. Mega container vessels which can call South Harbor will attract transshipment containers of long distance hauling owing to their competitive transport cost.

(2) Scenario 2 (High-Case)

Scenario 2 assumes that intensive promotion activities undertaken by Sri Lankan Government and SLPA can successfully attract more transshipment containers from India's small ports and ports of Bangladesh and Myanmar. Activities to attract transshipment containers are illustrated as follows:

1. To provide incentives to container feeder vessels from/to the ports of India, Bangladesh and Myanmar.
2. To provide Bangladesh and Myanmar with special areas within the port premises for handling their containers.

(3) Scenario 3 (Low-Case)

Scenario 3 assumes that container transshipment at Sri Lankan ports will decline because of implementation of projects and policies undertaken by the governments of India, Singapore and Malaysia. The projects and policies which are considered to have negative impacts on container transshipment at Sri Lankan ports are as follows:

1. Singapore Port and Tanjung Pelepas Port provide incentives to container feeders from/to Bangladesh and Myanmar.
2. Indian State Governments lift tax on shipments that cross state borders so that the major Indian ports handle more containers using direct services for transshipment to neighboring states. Transshipment to the ports of such states from Sri Lankan ports will decrease.

Table 5.1.1: Summary of the Scenarios

Scenario	Demand	Capture of Transshipment Containers	Development Scenario	Likeliness
1	Medium	Compete successfully with Singapore and Port Klang but fail to compete with Indian Hub Ports (Cochin and Chennai)	Fully develop container terminals at South Harbor and gradually develop bulk and car terminals at Hambantota to meet the demand	Most likely
2	High	Compete successfully with Indian Hub Ports (Cochin and Chennai), Port of Singapore and Port Klang	Fully develop container terminals at South Harbor first, then gradually those at Hambantota to meet the demand	Likely but dependent on extraordinary service improvements
3	Low	Fail to compete with Indian Hub Ports, Port of Singapore and Port Klang	Gradually develop container terminals at South Harbor and bulk and car terminals at Hambantota to meet the demand	Unlikely

Source: JICA Survey Team

5.2 Forecast of Container Traffic of Sri Lankan Ports

5.2.1 General

Transshipment of containers is the major business of Colombo Port. However, as explained in Chapter 3, Sri Lankan Ports are facing intense competition with other ports in the region such as Singapore, Malaysia and especially India. Sri Lanka's small population of around 21.5 million as of 2011 generates container volume of local import and export of approximately 1.0 million TEU, only 25% of total throughput. This volume is not sufficient on its own to attract larger container vessels so Colombo Port is dependent on transshipment

In order to survive the competition and to meet the growing demand, SLPA is developing Colombo South Harbor which will add handling capacity of 7.2 million TEU per annum when all three terminals are in operation. These new deep terminals are expected to create larger vessel calls at Colombo Port which will result in increased traffic. Furthermore, the new port of Hambantota is planned to have handling capacity of 20 million TEU in the future.

At the same time, the government of Sri Lanka is promoting and fostering export of apparel, tea, rubber products, gems & jewelries, food and spices.

In this chapter, forecasts of future transshipment and domestic import/export container volumes are explained and forecast scenarios are assessed.

5.2.2 Method of Forecast

The flow of forecast is shown in Figure 5.2.1. Transshipment traffic volume was forecast taking into consideration the latest status of port development projects and plans, geographic location of each port, trade partners including industry trends as well as existing services and demand of shipping liners. From the forecast results the three scenarios described in Chapter 5.1 above are verified.

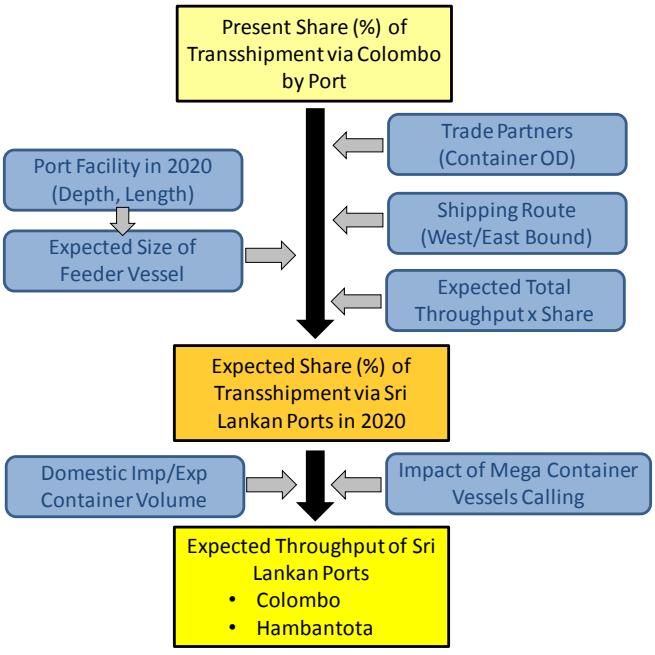


Figure 5.2.1: Flow of Transshipment Volume Forecast

(1) Selection of the Targeted Ports

From the container traffic data obtained from the field survey and other sources, fourteen (14) ports were selected as feeder ports whose containers are partly transshipped at Colombo Port at present.

Table 5.2.1: Present Situation of Colombo Transshipment in 2010

No	Country	Port	(A) Transship volume via Colombo in 2010 (TEU)	(B) Share of (A) in total throughput of the port (%)	(C) Share in Colombo Transshipment (%)
1	India	JNPT	3,000	0.1	0.2
2		Mormugao	18,000	100.0	1.2
3		New Mangalore	16,000	40.0	1.0
4		Cochin	155,000	49.7	10.0
5		Tuticorin	77,000	16.5	5.0
6		Chennai	301,500	19.8	19.4
7		Ennore	–	–	–
8		Visakhapatnam	30,000	20.7	1.9
9		Haldia	59,000	39.6	3.8
10		Kolkata	110,500	29.4	7.2
11	Bangladesh	Chittagong	271,500*	18.5*	17.6*
12		Sonadia (Plan)	–	–	–
13	Myanmar	Yangon	–	–	–
14	Pakistan	Karachi	57,500*	4.0*	3.7*
	Others	Others	448,795	–	29.0
TOTAL			1,547,795 × 2 move = 3,095,590		100.0

Source: JICA Survey Team
Note: * estimated by the JICA Survey Team

(2) Berthing Facility and Size of Vessel

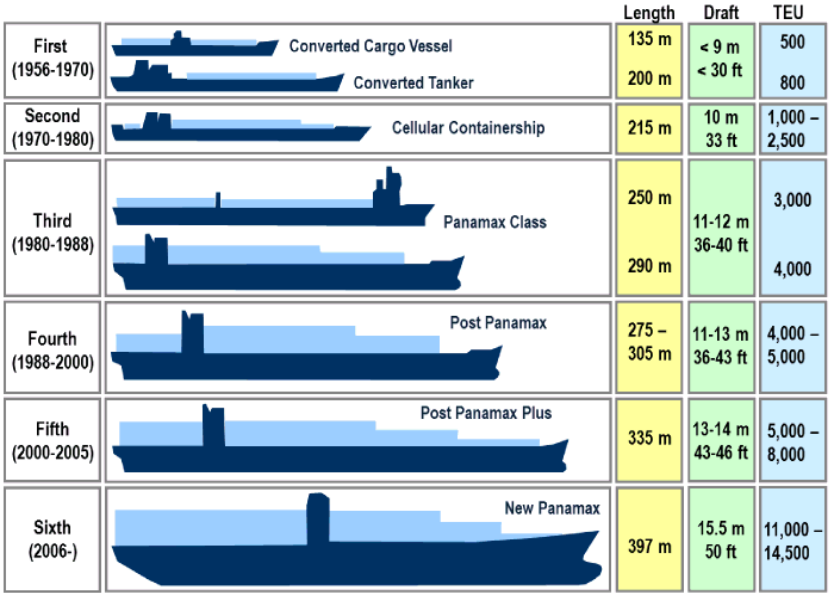
The berthing facility and design handling capacity of each port in 2010 and 2020 are summarized below. Data for 2020 is based on analysis of the ongoing and planned development projects, and most probable situations are selected.

Table 5.2.2: Present and Expected Berthing Facility and Terminal Capacity

No	Port	2010			2020		
		Max. Depth (m)	Total Length (m)	Capacity (TEU)	Max. Depth (m)	Total Length (m)	Capacity (TEU)
1	Colombo	15.0	2,822	4.5	18.0	5,572	11.7
2	JNPT	13.0	1,992	4.1	16.0	10,079	10.9
3	Mormugao	12.0	520	–	12.8	520	0.52*
4	New Mangalore	10.5	990	–	12.5	2,036	0.4
5	Cochin	16.0	600	1.2	16.0	1,800	4.0
6	Tuticorin	10.9	370	0.45	10.9	716	1.2
7	Chennai	13.4	1,717	3.0	22.0	3,746	7.0
8	Ennore	–	–	–	15.0	1,000	1.5
9	Visakhapatnam	16.5	450	0.1	14.5	451	0.4
10	Haldia	12.2	432	0.3	12.2	432	0.2
11	Kolkata	8.6	780	0.5	9.0	1,680	3.3
12	Chittagong	9.2	1,410	1.6	9.4	2,050	2.0
13	Sonadia	–	–	–	14.0	1,500	2.0
14	Yangon	10.0	2,381	0.5	10.0	3,381	1.5
15	Karachi	13.5	1,573	1.45	18.0	3,673	2.5

Source: JICA Survey Team
Note: * estimated by the JICA Survey Team

Based on the expected facilities by 2020 and the port's function (hub or feeder), the size of vessels expected to call at each port is determined. Figure 5.2.2 shows the length and draft in terms of generation of container vessels and Table 5.2.3 shows draft, length and beam of container vessels.



Source: http://www.eurans.com.ua/eng/faq/containerships/

Figure 5.2.2: Generation of Container Vessels

Table 5.2.3: Vessel Size and Necessary Draft

Capacity (TEU)	Draft (m)	LOA (m)	Beam (m)	Remarks
500–800	< 9.0	< 200	–	–
1,000–2,000	10.0	215.0	–	–
2,000–3,000	11.6	239.0	31.5	–
3,000–4,000	12.1	259.0	32.4	Panamax
4,000–5,000	13.0	284.0	33.2	Post Panamax
5,000–6,000	13.7	281.0	39.0	Post Panamax Plus
6,000–7,000	13.9	302.0	40.6	
7,000–8,000	14.6	343.0	42.6	
8,000–9,000	14.3	329.0	42.8	–
9,000–10,000	14.7	344.0	44.0	–
10,000 <	15.5	398.0	56.4	New Panamax
18,000	16.0	400.0	59.0	Maersk Triple E Class

Source: JICA Survey Team

Average capacities of container vessels currently calling at each port are analyzed from the Containerisation International Yearbook 2012. The result of the analysis is shown in Table 5.2.4.

Table 5.2.4: Average Vessel Capacity (TEU) by Ports

No	Port	2010		2020		Type of Port
		Mother Vessel (TEU)	Feeder Vessel (TEU)	Mother Vessel (TEU)	Feeder Vessel (TEU)	
1	Colombo	5,000	2,500	12,000	4,000	Hub
2	JNPT	4,400	4,400	8,000	4,400	Hub
3	Mormugao	–	1,200	1,200	1,200	Feeder
4	New Mangalore	–	1,200	2,500	1,200	Feeder
5	Cochin	2,000	1,200	5,000	2,000	Feeder/Hub
6	Tuticorin	1,000	800	1,200	1,000	Feeder
7	Chennai	2,500	2,000	4,000	2,500	Feeder/Hub
8	Ennore	–	–	5,000	2,500	Feeder/Hub
9	Visakhapatnam	2,500	2,500	2,500	2,500	Feeder
10	Haldia	–	800	–	800	Feeder
11	Kolkata	–	800	–	1,200	Feeder
12	Chittagong	–	500	–	1,000	Feeder
13	Sonadia	–	–	2,000	1,000	Feeder/Hub
14	Yangon		500	–	1,000	Feeder
15	Karachi	2,500	2,500	5,000	5,000	Feeder

Source: JICA Survey Team

(3) Trade Partners (Container Origin and Destination) and Shipping Route

The major trading partners of the targeted ports including origin of import cargo and destination of export cargo determine whether container traffic is classified as westbound or eastbound. Containers from Asia destined for Europe or US East Coast are westbound containers, while the opposite direction is eastbound.

As is explained in a later chapter, some westbound containers originated from the Bay of Bengal including the east coast of ISC (Indian subcontinent) and some eastbound containers destined to the Bay of Bengal are transshipped at Colombo Port. The direction of the container traffic is one of the important factors to forecast the volume which Sri Lankan Ports can capture.

(4) Throughput Forecast of Each Port by 2020

Based on the relevant data and information from several sources, expected container throughput of each port is estimated. For Indian ports, the forecast volume in "Major Ports of India, A Profile 2010–2011" published by Indian Ports Association was referred to. For Bangladesh and Pakistan, throughput forecasts were developed by referring to information on each port authority's website as well as relevant studies and reports.

Table 5.2.5: Throughput Forecast of ISC Ports in 2020

No	Port	Throughput in 2010 (TEU)	Throughput in 2020 (TEU)	Reference
1	JNPT	4,269,000	9,920,000	"Major Ports of India"
2	Mormugao	18,000	20,000	
3	New Mangalore	40,000	360,000	
4	Cochin	312,000	1,450,000	
5	Tuticorin	468,000	1,020,000	
6	Chennai	1,524,000	4,060,000	
7	Ennore	–	1,440,000	
8	Visakhapatnam	145,000	370,000	
9	Haldia	149,000	270,000	
10	Kolkata	377,000	2,200,000	
11	Chittagong	1,468,914	1,500,000	Local information
12	Sonadia (Plan)	–	2,070,000	Local information
13	Yangon	328,700	1,500,000	Report by JICA Study
14	Karachi	1,439,808	3,600,000*	Report by JICA Study
TOTAL		10,539,422	29,780,000	

Source: JICA Survey Team
Note: * is for the 2023–24 as it was the only data available

(5) Expected Share of Transshipment via Sri Lankan Ports

From the analysis of (1) to (4) above, the share of transshipment via Sri Lankan Ports based on the estimated total throughput in 2020 at each port, for each scenario is determined as shown in Table 5.2.6.

Table 5.2.6: Expected Share of Transshipment via Sri Lankan Ports in 2020

No	Port	Transship via Colombo/ Total throughput in 2010 (%)	Transship via Colombo/ Total throughput in 2020 (%)			Remarks
			High	Med	Low	
1	JNPT	0.1	0.1	0.1	0.1	Mainly direct services
2	Mormugao	100.0	100.0	80.0	70.0	Feeder Port
3	New Mangalore	40.0	40.0	32.0	28.0	Feeder Port
4	Cochin	49.7	38.3	34.8	31.3	More direct services
5	Tuticorin	16.5	16.5	13.2	11.6	Feeder Port
6	Chennai	19.8	19.8	9.9	0.1	More direct services
7	Ennore	–	23.7	19.8	15.8	More direct services
8	Visakhapatnam	20.7	20.7	16.6	14.5	Feeder Port
9	Haldia	39.6	39.6	31.7	27.7	Feeder Port
10	Kolkata	29.4	29.4	23.5	20.6	Feeder Port
11	Chittagong	18.5*	30.0	18.5	13.0	Feeder Port
12	Sonadia (Plan)	–	30.0	18.5	13.0	Direct services will start
13	Yangon	–	30.0	18.5	13.0	Feeder Port
14	Karachi	4.0*	0.1	0.1	0.1	Included in the service of JNPT

Source: JICA Survey Team

There are not many feeder services from/to JNPT and Pakistan's ports are included in the services to/from JNPT. As such, the same share (%) is applied to Pakistani ports as to JNPT.

Chennai throughput will increase to the level JNPT handled in 2010, which will attract more direct services and significantly reduce the share of containers transshipped at Sri Lankan ports. Therefore, 9.9% which is half of 19.8% in 2010 is assumed for medium case. Ennore will act

like a sister port to Chennai, and will handle about the same volume as Chennai in 2010. Therefore, the same 19.8 % as Chennai in 2010 is applied for medium case.

Cochin is expected to serve as the transshipment hub for Southern India and become a strong competitor for Sri Lanka. The throughput is expected to reach the same level as that of Chennai in 2010. However, it is located not far from Sri Lanka, and it is unlikely that the port can collect sufficient containers to fully load mother vessels. Therefore, vessels are expected to call both Cochin and Colombo Ports. As such, the average share of Cochin and Chennai in 2010 is applied.

The rest of India's ports are expected to remain as feeder ports for Sri Lanka, but the share of containers transshipped at Sri Lankan ports is expected to decrease year by year. The medium case assumes share decreases 2% per annum while the low case assumes 3% per annum. In the high case, the share (%) remains the same as that of 2010.

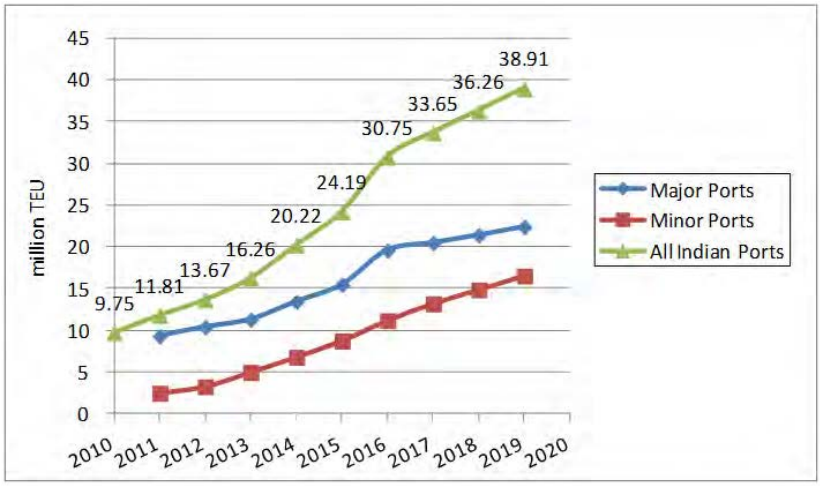
For Chittagong and Sonadia in Bangladesh, export cargoes are mainly destined westbound to Europe and the US and it is obviously shorter in distance to use Colombo Port than Port of Singapore. Current share of containers transshipped via Colombo Port (18.5%) are used for medium case, while 30% and 13% is used for high and low cases respectively.

Yangon is the only international port in Myanmar and there has been no trade with Europe and the US due to the economic sanctions. After the sanctions are lifted and the trade with Western countries resumes in the near future, some of the westbound containers are expected to be transshipped at Sri Lankan port. The expected throughput in 2020 is 1.5 million TEU which is almost the same as that of Chittagong at present. As such, the same share is applied for each case.

Karachi, as explained, has been included in the direct service network to/from JNPT in India, and therefore the same share as JNPT is used.

(6) Transshipment for Indian Minor Ports

For Indian minor ports, strong growth of container demand is estimated as shown in Figure 5.2.3. This demand should not be ignored when there is a high potential that it will be realized.



Source: Maritime agenda 2010–2020, Ministry of shipping, January 2011

Figure 5.2.3: Container Traffic Forecast of Indian Ports

There are 176 minor ports in India, but not all of them handle containers. Some are pure bulk terminals and there are big differences in container volumes in each state. State-wise throughput forecast for 2020 prepared by the Indian government is shown in Table 5.2.7. The state of Gujarat is estimated to account for more than 53% of total containers handled by all the minor ports, followed by Andhra Pradesh with 29.9%. The rest of the states do not show meaningful demand by 2020.

Table 5.2.7: State-Wise Throughput Forecast of Indian Minor Ports in 2020

State	Estimated Traffic (million TEU)	Share in Total (%)	Name of main port
Gujarat	8.8	53.2	Mundra, Pipavav, Dahej, Hazira
Maharashtra	0.58	3.5	Rewas, Jaigad, Dharmatar
Goa	–	–	–
Karnataka	–	–	–
Andhra Pradesh	4.94	29.9	Gangavaram, Krishnapatnam, Nizampatnam & Vadarevu
Tamil Nadu	0.13	0.8	-
Kerala	0.92	5.6	Vizhinjam
Orissa	1.16	7.0	Dhamra
Total	16.53	100.0	

Source: Maritime Agenda 2010–2020, Ministry of Shipping, India

The location of each state is shown below. Among these states, Gujarat and Maharashtra in the northwest is not the market for Colombo Port as these areas are covered by the direct services to/from JNPT. Actually ports like Mundra and Pipavav are already included in the service loop by mother vessels together with JNPT.

Source: Transcontinental Infrastructure Needs to 2030/2050, Final Report, March, 2012

Figure 5.2.4: Location of Indian States and Ports

Containers from/to other states are the potential demand for transshipment at Sri Lankan ports because of the cabotage laws, high cabotage freight rate, independent port development policy, etc. which were discussed in the previous chapters as the issues prevailing in Indian maritime transport.

In addition to the 14 ports of the ISC explained above, the potential demands to be generated by the minor ports in India are also considered. Since detailed information on minor ports was not available during this study, a rough estimation was made based on the possible percentage (%) of containers to be transshipped via Sri Lankan ports with respect to the total throughput of each state. Basically, the same share (%) as major ports with a similar level of container throughput was applied. The result is shown in Table 5.2.8.

Table 5.2.8: Estimate of State-Wise Transshipment via Colombo in 2020

No	State	Est. throughput in 2020 (million TEU)	Transship via Colombo / Total throughput (%)			Remarks
			High	Med	Low	
1	Andhra Pradesh	4.94	19.8	9.9	0.1	Same as Chennai in 2020
2	Tamil Nadu	0.13	30.0	20.7	10.0	Same level as Visakhapatnam in 2010 for medium case
3	Kerala	0.92	38.3	34.8	31.3	Same as Cochin in 2020
4	Orissa	1.16	23.7	19.8	15.8	Same as Ennore in 2020
Total		7.15	1.68	1.11	0.52	
Total Transship Volume (million TEU)			3.36	2.22	1.04	=Total × 2

Source: JICA Survey Team

(7) Transshipment for Other Countries (Non-ISC Countries)

At present, ISC containers are not only containers transshipped at Colombo Port. The volume from/to countries other than ISC countries is obtained by deducting the total transshipment volume of ISC from the total transshipment volume of Colombo Port. In the estimate, this volume was assumed to grow by 5% annually until 2020.

(8) Transshipment of the Containers from the Far East to East Africa

Strong economic growth for East African countries is expected especially for Tanzania and Kenya. As shown below, China is a major source of imports for both Tanzania and Kenya. Japan and South Korea are also sources of imports. Trade volume between these countries is estimated to grow at an estimated annual rate of 5.3% until 2020.

Rk	Partners	Mio euro	%
	World (all countrie	6 083,6	100,0%
1	China	1 044,6	17,2%
2	India	931,9	15,3%
3	EU27	723,1	11,9%
4	South Africa	500,5	8,2%
5	Kenya	418,2	6,9%
6	United Arab Emirati	290,8	4,8%
7	Japan	250,0	4,1%
8	Singapore	242,7	4,0%
9	Bahrain	196,2	3,2%
10	Saudi Arabia	141,6	2,3%
11	United States	136,6	2,2%
12	Indonesia	110,4	1,8%
13	Malaysia	93,4	1,5%
14	South Korea	89,4	1,5%

Tanzania

Rk	Partners	Mio euro	%
	World (all countrie	11 237,7	100,0%
1	EU27	1 700,6	15,1%
2	India	1 671,8	14,9%
3	China	1 489,1	13,3%
4	United Arab Emirati	1 063,1	9,5%
5	South Africa	991,2	8,8%
6	Saudi Arabia	744,6	6,6%
7	Japan	514,0	4,6%
8	Bahrain	337,5	3,0%
9	United States	299,7	2,7%
10	Indonesia	202,6	1,8%
11	Egypt	199,0	1,8%
12	South Korea	196,5	1,7%
13	Hong Kong	191,5	1,7%
14	Pakistan	158,4	1,4%

Kenya

Source: IMF

Figure 5.2.5: Major Import Partners of Tanzania and Kenya in 2010

Mega container vessels which will be deployed in the Far East – Europe route are expected to carry mainly export containers from the Far East (especially China) to Europe. It is likely that these services from the Far East by mega container vessels will be arranged in three routes: 1) Direct to Europe, 2) Stop at Singapore for transshipment, 3) Stop at Colombo for transshipment.

In order to load as many containers as possible, some mega container vessels are likely to load containers for East Africa in addition to those for Europe. However, both Dar es Salaam port and Mombasa port, the two major ports in the region, are not capable of accommodating such large vessels because of draft and berthing facility restrictions. As such, there will be no choice but to transship containers to small or medium size vessels somewhere along the trunk line with minimum deviation.

To maximize the economies of scale of mega container vessels, it is more economical to carry as many containers as possible for as long distance as possible from the port of origin. Colombo port is the farthest port from the Far East along the Asia-Europe route suitably located for transshipment to East Africa. Singapore is too near the Far East and would reduce the benefit of economies of scale. Calling at Middle East ports like Salalah would be too much deviation for mega container vessels. As such, it is likely that Colombo Port will be selected as the transshipment hub for these cargoes. The vessels will offload containers bound for East Africa at Colombo, and load, as their replacement, containers bound for Europe coming from ports in the Bay of Bengal and the east coast of the Indian subcontinent which are not loaded onto the direct services to Europe.

The estimated operation cost of a mega container vessel is approximately USD 29.70 per day (47%) lower than the cost to operate a feeder vessel as shown in Table 5.2.9. The operation cost includes only vessel charter cost and fuel cost in the calculation.

Table 5.2.9: Comparison of Operation Cost/TEU

Vessel type	Capacity (TEU)	Operation cost /TEU (USD/day)	Difference (USD/day)
Feeder Vessel	2,500	56.60	29.70
Mega container vessel	18,000	26.90	

According to Maersk Line, their Triple-E (18,000 TEU capacity) class vessels will call five (5) ports in China: Shanghai, Ning-Bo, Yantian, Xiamen and Hong Kong before sailing to Europe. The cost comparison for transporting from Hong Kong to Mombasa, with transshipment at Colombo versus transshipment at Singapore, is shown in Table 5.2.10. In order to take the effect of economies of scale into account, cost per TEU is used.

Table 5.2.10: Cost Comparison of Transshipment via Colombo and Singapore

Mega Container Vessel (18,000 TEU)			Feeder Vessel (2,500 TEU)			Total	Total
Origin	(NM)	(Days)	Transship	(NM)	(Days)	Destination	(NM)	(Days)
Hong Kong	1,428	2.6	Singapore	3,995	7.2	Mombasa	5,423	9.8
Hong Kong	3,020	5.5	Colombo	2,555	4.6	Mombasa	5,575	10.1
				Difference			152	0.3

Origin	Op.Cost (US$/TEU)	Transship	Op.Cost (US$/TEU)	Destination	Total (US$/TEU)
Hong Kong	70	Singapore	408	Mombasa	477
Hong Kong	148	Colombo	260	Mombasa	408
		Difference	US$/TEU		-69
			x 2,500 TEU		-172,875

It is shown that by doing the transshipment for East Africa at Colombo the shipping lines will save USD 172,875 /Trip compared with transshipment at Singapore.

In addition, mother vessels of medium size will start from Singapore and go directly to Europe and the Mediterranean without making additional stops along the way. Therefore, containers from Southeast Asia to East Africa will be collected at Singapore and loaded in smaller/medium size mother vessels bound for East Africa. The export volume from Southeast Asia to East Africa is small compared to that from the Far East, around 40% only.

The forecasted volume of transshipment containers to East Africa at Colombo Port is shown in Table 5.2.11.

Table 5.2.11: Estimate Volume of Transshipment of East African Containers at Colombo in 2020

Cases	Growth Rate (%)	Volume in 2010 (1,000 TEU)	Estimated Import Volume in 2020 (1,000 TEU)	Transshipment volume at Colombo (1,000 TEU)
High	7.3	209	425	850
Medium	5.3		351	702
Low	3.3		301	602

Source: JICA Survey Team

(9) Impact of Mega Container Vessels Calling

The size of container vessel has become larger year by year as explained previously. Once the new south container terminal of South Harbor of Colombo Port starts operation, it is very certain that mega container vessels of more than 10,000 TEU class will call Colombo Port.

Table 5.2.12 shows current weekly services by mother vessels at Colombo Port and Port of Singapore in the Europe Route. As the major competitor for Colombo Port in transshipment is Port of Singapore, service frequencies at these two ports are compared. 40 services are operating weekly at Colombo Port, out of which 24 services stop at Port of Singapore as well. Port of Singapore has 138 services out of which 24 are also calling Colombo Port.

Out of 40 services at Colombo Port, 15 are destined to Europe (EUR), 11 are to the Mediterranean (MED), 6 are to the Black Sea (BSE) and 8 are to the US East coast (USEC). Comparing the two ports, the number of services to BSE is almost the same. On the other hand, services to EUR and MED are much more frequent at Port of Singapore than Colombo Port (4.8X to EUR and 3.6X to MED). Looking at this table by shipping lines, it can be seen that most of the shipping lines have more services calling Port of Singapore and that some liners servicing these routes do not even call Colombo Port.

Table 5.2.12: Summary of Mother Vessels' Weekly Services by Shipping Lines

No	Shipping Lines	Colombo				Singapore				Both Colombo & Singapore			
		EUR	MED	BSE	USEC	EUR	MED	BSE	USEC	EUR	MED	BSE	USEC
1	ANL		1										
2	APL	2	1		1	5	2		1	2	1		1
3	CMACGM	3	1			4				2			
4	Hapag Lloyd	1		1	1	6	1		1	1			1
5	Hyundai	1			1	5	2		2	1			1
6	Green Alliance					4	4		2				
7	COSCO					3	5	1	1				
8	CSCL			1									
9	Ever Green	1	2			1							
10	Grand Alliance	1	1	1	1	6	2		1	1	1		1
11	Hanjin				1	4	4		2				1
12	K Line					4	3	1	1				
13	Maersk	1				1				1			
14	MSC		1			1	1				1		
15	MOL	1	1		1	6	2		3	1			1
16	NYK	2	2	1	1	7	5		1	1	1		1
17	OOCL	1	1	1	1	6	2		1	1	1		1
18	PIL							2					
19	SAF	1											
20	USAC					3	2		1				
21	Wan Hai					1		2					
22	Yang Ming					3	4	1	2				
23	Zim Col			1		2	1						
	Summ	15	11	6	8	72	40	7	19	11	5	0	8
	Total calling/week	40				138				24			
	Total calling/yr	2,080				7,176				1,248			

Source: JICA Survey Team based on the Containerisation International Yearbook 2012
Note: Maersk is using Tanjung Pelepas port as its hub, and does not use Port of Singapore much

As shown in Table 5.2.13. 4 services to Europe and 6 services to Mediterranean are calling Colombo Port without stopping at Singapore. These 10 services are expected to be replaced with the mega container vessels. Mega container vessels are not likely to be deployed into the Black Sea services due to insufficient berth depth. The largest port in the area is Constanta in Romania which is operated by DP World and its berth alongside depth is only 14.5m, while the draft of mega container vessels is at least 15.5 m.

As such, mega container vessels are expected to be put into EUR and MED destined services after the opening of South Terminal of Colombo South Harbor, and their services are 4 times and 6 times per week, respectively.

Table 5.2.13: Expected Numbers of Services by Mega Container Vessels

Calling Port	A) Colombo only				B) Singapore only				C) Both Ports			
Destination	EUR	MED	BSE	USEC	EUR	MED	BSE	USEC	EUR	MED	BSE	USEC
Number of Services	4	6	6	0	61	35	7	11	11	5	0	8
Total calling/week	16				114				24			
Total calling/year	832				5928				1248			
Size of Vessel	Become larger (>10,000 TEU class)				Become larger (>10,000 TEU class)				Remain current size			

Source: JICA Survey Team based on the Containerisation International Yearbook 2012

According to one of the major shipping lines, it is feasible and more economical for mega container vessels to call Colombo Port if they can collect a minimum two to three hundred TEU than for medium size vessels like Panamax class to collect that volume. On return trip from Europe to Asia, the same situation will happen but the vessels will be picking up empty

containers instead. Considering such circumstances, the impact of mega container vessels calling are calculated as shown in Table 5.2.14. This volume was assumed to grow by 5% annually until 2020.

Table 5.2.14: Expected Container Volume by Mega Container Vessels Calling

Item	Description	unit	Amount
A	Number of Service/week	No.	10
B	Average Container volume	TEU	250
C	Weeks	Week	52
D	Transshipment (x2)	Move	2
E	Bound (Western and Eastern)	-	2
	Total (=A x B x C x D x E)	TEU	520,000

(10) Domestic Import and Export Container

In 2010, domestic import and export container volume was 932,244 TEU according to the Economic and Social Statistics 2011 by Central Bank of Sri Lanka. The estimate volume in 2020 is forecasted by setting the annual growth rate of 5.0%.

5.2.3 Forecast Result

Based on (1) to (10) above, the result of future container volume forecast of Sri Lankan ports is shown in Table 5.2.15, which was calculated in the following manner.

Total throughput of Sri Lanka in 2020 =

(4) Throughput forecast of each port in 2020 × (5) Expected share of transshipment via Sri Lankan Ports +

(6) Transshipment for Indian Minor Ports +

(7) Transshipment for Other Counties +

(8) Transshipment for East Africa +

(9) Impact of Mega Container Vessels Calling +

(10) Domestic import and export containers

It is to be noted that +/−10% of the medium case are considered for high and low of item C, E and F below.

Table 5.2.15: Demand Forecast of Sri Lankan Ports

No	Breakdown	Unit	High	Medium	Low	Remark
A	Transshipment of ISC container including Yangon	1,000 TEU	8,795	6,144	4,338	(4) x (5)
B	Transshipment of Indian Minor Ports		3,280	2,140	960	(6)
C	Transshipment of Other countries' container		1,527	1,389	1,250	(7)
D	Transshipment of Eastern Africa's import container		850	702	602	(8)
E	Impact of Mega Container Vessels		764	695	625	(9)
F	Domestic Demand		1,592	1,448	1,303	(10)
	Grand Total		16,808	12,518	9,078	

Source: JICA Survey Team

5.3 Comparative Advantage of Sri Lankan Ports

5.3.1 General

Sri Lanka is said to be located at geographically strategic location; the intermediate location between Far East and Europe, and has been enjoying the position as the logistic hub for the region. On the other hand as explained in the previous chapters, Port of Singapore is the strongest competitor for Sri Lankan ports.

Geographical advantage of Sri Lanka can also be seen from Table 5.3.1 below comparing the mean distance from feeder ports in the ISC. In most instances, the distance to Colombo Port is shorter than to Singapore, Port Klang, and Tanjung Pelepas in Malaysia and Aden. This proves that Colombo Port is connected with feeder ports in the region by the shortest navigational distance except for the western part of Indian subcontinent which is closer to Dubai.

Table 5.3.1: Mean Distance to the Feeder Ports

Port	Colombo	Singapore	Aden	Dubai
Colombo	-	1,567	1,894	1,687
Singapore	1,567	-	3,461	3,215
Aden	1,894	3,461	-	1,502
Dubai	1,687	3,215	1,502	-
JNPT	**889**	2,435	1,657	898
Kandla	1,255	2,801	1,700	**907**
Chennai	**590**	1,586	2,484	2,277
Tuticorin	**142**	1,617	1,925	1,598
Cochin	**307**	1,853	1,850	1,483
Visakhapatnam	**866**	1,573	2,760	2,553
Kolkata	**1,244**	1,650	3,138	2,931
Haldia	**1,187**	1,593	3,081	2,874
Karachi	1,340	2,887	1,720	**453**
Chittagong	**1,380**	1,571	3,274	3,067
Yangon	1,249	**1,117**	3,143	2,936
Male	**444**	2,011	1,450	1,500
Average ISC	**908**	1,891	2,349	1,956
Average ISC West	1,161	2,708	1,692	**753**
Average ISC East	**1,185**	1,501	3,079	2,872
Average ISC South	**371**	1,767	1,927	1,715

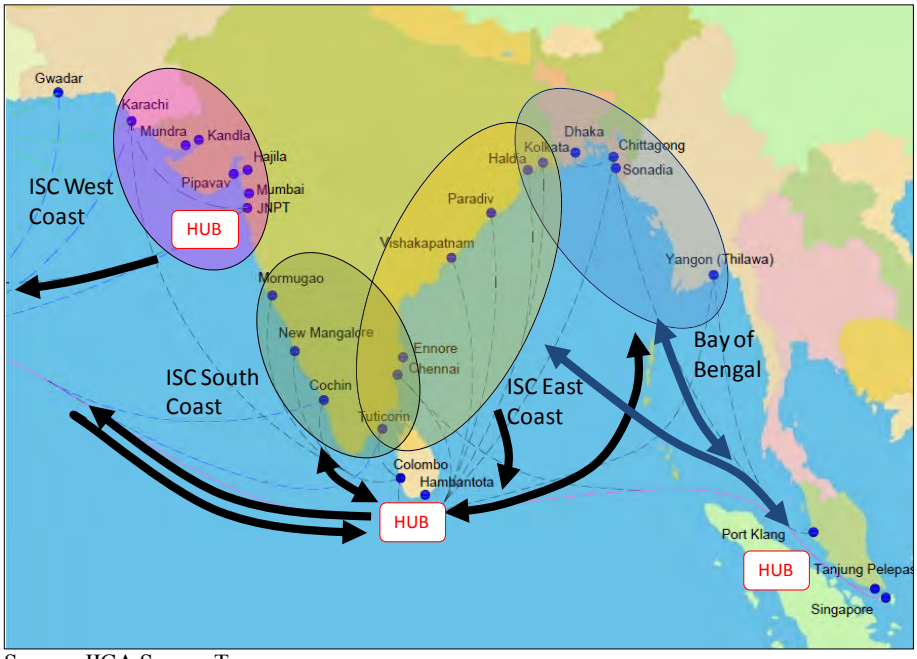
Source: Prepared by JICA Survey Team based on the information from "Analysis on the economic Aspects of Transport Connectivity between India and Sri Lanka, 2010

Even though geographic location of the port is not the only factor to decide shipping lines' preference for a hub port, it is surely one of the most important. In general, the shorter the navigation distance the lower the ocean freight rate becomes due to lower fuel consumption and lower cost for the vessel charter.

Figure 5.3.1 shows the area group of container ODs within the ISC including the Bay of Bengal and current hub ports in the region. In terms of the navigation distance, Sri Lanka has an advantage for westbound cargoes originated from the south and east coast of the ISC and the Bay of Bengal. There are other hub ports shown in the figure such as Singapore, Port Klang, Tanjung Pelepas in Malaysia and JNPT in India. Each hub port has its advantages. For example, Port of Singapore is one of the largest hub ports with hundreds of daily feeder connections,

state-of-the-art IT system as well as huge scale of port facilities. It is also well located and there is almost no deviation from maritime trunk route. JNPT in India has the great advantage of its huge domestic demand, and also it is close to Middle East countries.

As major demands of cargoes handled at Sri Lanka can be found in India followed by Bangladesh, it is important to analyze the advantages of Sri Lankan ports in the international logistics and prepare necessary strategies for its survival as an international maritime hub port.



Source: JICA Survey Team

Figure 5.3.1: Relation of Container OD Areas and Hub Ports

5.3.2 Advantage over Indian Cargo

(1) General

Sri Lanka has been playing a role as the gateway to the Indian subcontinent trade. This is not only because of Sri Lanka's strategic location, but also several issues affecting the port sector of India. Those include issues such as separate policies of each state government, lack of deep sea ports, cabotage law, congestion of the ports, etc.

Despite the large volume of trade which keeps growing at a higher rate than the world average, some 23% to 26% of the Indian throughput has been transshipped at hub ports in other countries such as Singapore, Port Klang, Dubai and Colombo in the past several years.

In the meantime, realizing the strategic importance of developing domestic ports, the central government of India has been implementing the improvement and strengthening of its container port facilities by making use of PPP scheme. India's strategy emphasizes fostering the hub port function of JNPT and Cochin on the west coast, and Chennai and Visakhapatnam on the east coast.

When India's port sector is developed, Sri Lankan ports will have to compete not only with Port of Singapore and Port Klang, but also with Indian ports for certain containers which could have a significant adverse impact on the port development and port business of Sri Lanka.

(2) Northwestern Indian Containers

- The area is already connected with other major countries by direct services
- Northwestern containers are not, and will not be the market for Sri Lankan Ports
- JNPT is not a competitor for Colombo Port

JNPT is the largest container port in India ranked 23rd in 2011 with volume of 4.75 million TEU. Throughput has remained on the same level for about three years from 2007 to 2010, but suddenly increased by 15% in 2011. The increase is likely owing to commencement of full operation of the third container terminal.

The major shipping lines have established services which connect with most of the major ports in the world by direct transportation service networks. The routes go towards east up to Far East countries like China and Japan, and towards west up to Europe and the US East Coast ports through the Mediterranean Sea. They also have service networks to East, South and West Africa. These liner networks cover all the main ports in the world except for US West coast, Indonesia, and the Philippines. The containers for these destinations can be transshipped at Singapore or Chinese ports. When the discharging ports are close, Cabotage or inland transportation seems to be used.

Furthermore, JNPT can also be the hub for transshipment of Arabian Sea cargoes for ports like Salalah and Jeddah. At moment the volume of containers transshipped at JNPT is small. However, when enough berths and container stowing yards are provided here, JNPT will also be utilized as transshipment hub. That could result in larger size container vessels of 8,000 to 10,000 TEU calling at JNPT more frequently.

It is reported that establishment of a fixed weekly schedule has been delayed due to long wait times for berths. Therefore, northern ports in Gujarat state such as Mundra, Pipavav, and Kandra are being used as relief ports by extra calling. Major shipping lines are calling at one of these ports in addition to JNPT for the purpose of avoiding delays at JNPT.

These northern ports have good railway and road connections to Delhi and other cities along the way. However, the shipping lines do not or cannot skip JNPT because Mumbai, the largest city in India and its suburbs have a large volume of export/import cargo which shipping lines are eager to load.

Accordingly Colombo Port is out of the competitive zone in the transshipment of Northern Indian containers in the future, too. JNPT is not and will not be a competitor for Sri Lankan Ports.

(3) Southern Indian Containers

- Major volume will be handled at Chennai and Ennore, while the remaining at International Container Transshipment Terminal (ICTT) at Cochin
- Westbound direct services form Chennai to Europe and US East Coast by Panamax size vessels will increase
- Part of westbound cargoes from Chennai Port will still be transshipped at Colombo Port due to its better frequency of services

ICTT

Containers from/to Southern India have contributed to the throughput of Colombo Port because of proximity and the lack of deep sea ports in Southern India which can accommodate mother vessels. So Southern India containers had to be transshipped at Colombo Port. However as explained in Chapter 2, International Container Transshipment Terminal (ICTT) at Cochin has been operating since 2010 with the berth alongside depth of 16.0 m. There have been direct services between Europe and Cochin, although the services are not that frequent at present.

ICTT, targeted to be the regional hub for transshipment, is significantly affected by Cabotage law which restrains foreign flag feeder vessels from transporting cargoes between Indian ports.

According to the shipping lines and local forwarders, the number of Indian flag feeder vessels is very few and the condition of the vessels is very poor. In addition, labor cost of Indian seaman is said to be very high. All these issues cause high local sea freight rates and disturb the transshipment business at ICTT.

Currently, DP World, who is operating ICTT under BOT scheme, is negotiating with the central government of India to relax Cabotage law for a trial period of three years. However, there seems to be many issues especially with local shipping industries who run the coastal feeder service business and therefore this trial could difficult to realize in the near future. As long as this Cabotage law is in force, ICTT will not be a strong competitor for Sri Lankan ports.

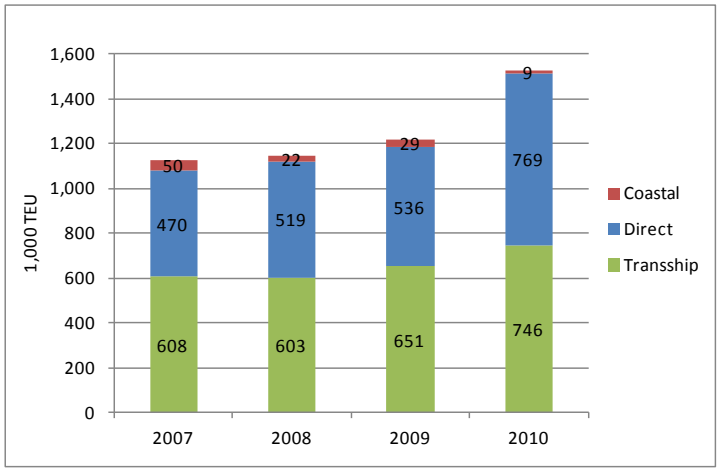
In addition, even if the Cabotage law is relaxed, it is unlikely that Cochin itself will have sufficient containers to fully load mother vessels and therefore mother vessels will have to call Colombo Port as well. This is because a large part of containers from Southern India are shipped from Chennai.

Currently, there is only one weekly service directly connecting Cochin to Europe by Panamax size vessel provided by CMA–CGM Group. It calls Cochin, Damietta, Genoa, Tilbury, Hamburg, Rotterdam and Le Havre according to the website of ICTT (http://www.igtpl.com/). Colombo Port on the other hand, has 40 weekly services as shown in Table 5.2.12. As long as shipping lines cannot collect sufficient containers at ICTT, Colombo Port should maintain its advantage over Cochin for its more frequent services**.**

Chennai and Ennore

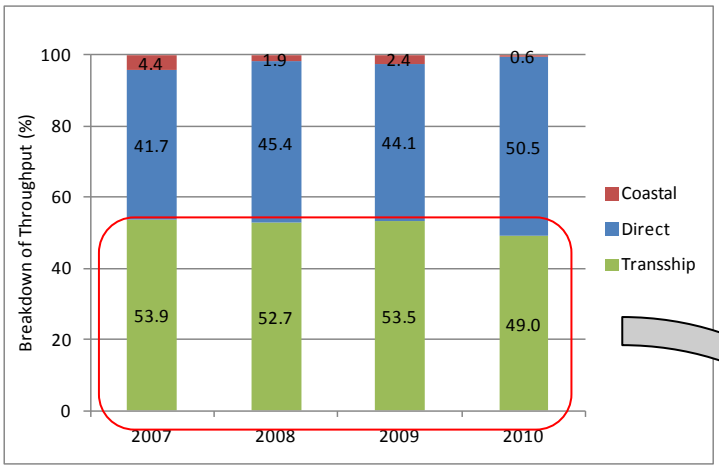
Huge demand derived from industrial development at Bangalore and Chennai area will lead Chennai Port to further increase direct services by mother vessels. This will cause Sri Lankan ports to lose share in the transshipment of Chennai containers.

As shown in Figure 5.3.2, container throughput of Chennai Port increased at an average annual growth rate of 7.8% between 2007 and 2010. Figure 5.3.3 shows the breakdown of containers handled at Chennai Port during the same period, and the increase of direct services can be seen while the share of transshipment is diminishing.



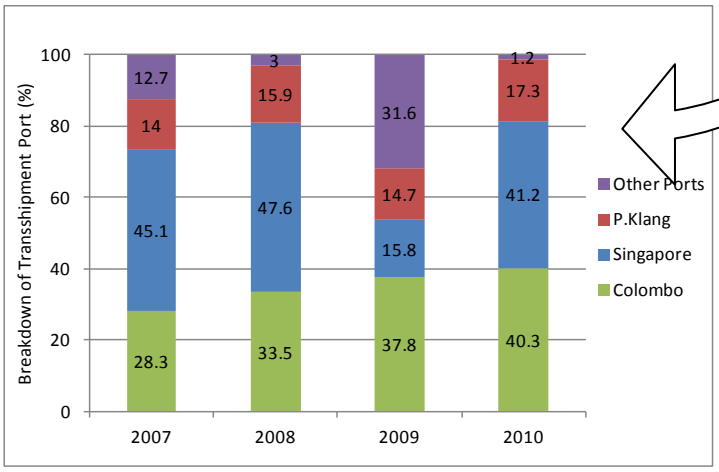
Source: JICA Survey Team

Figure 5.3.2: Container Throughput Trend of Chennai Port



Source: JICA Survey Team

Figure 5.3.3: Breakdown of Throughput at Chennai Port

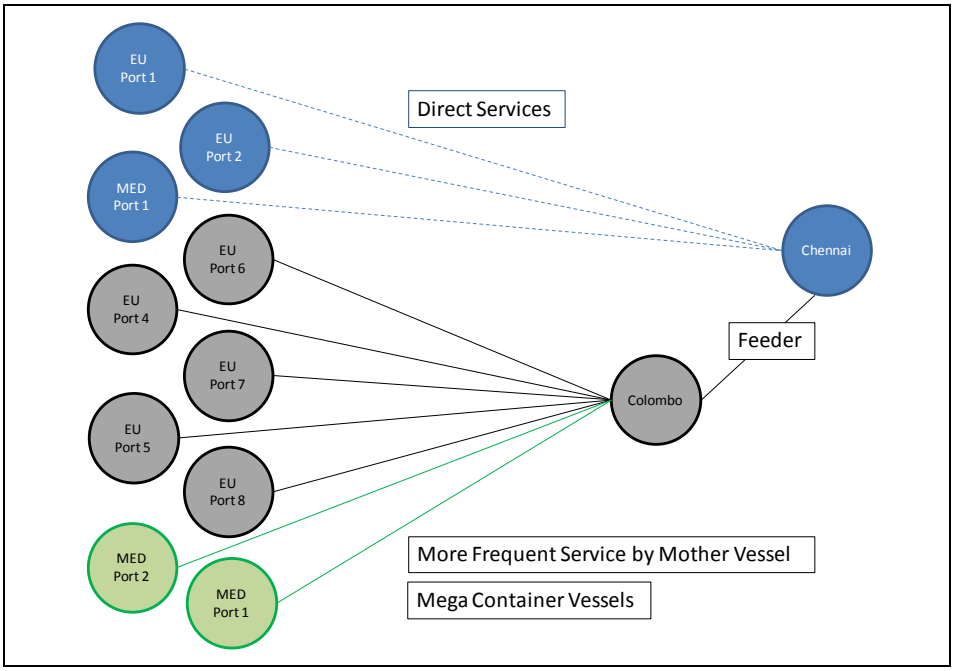


Source: JICA Survey Team

Figure 5.3.4: Transshipment Port of Chennai Containers

Figure 5.3.4 shows where the containers of Chennai Port are transshipped. Among the relevant international hub ports, Colombo Port's share increased slightly possibly because westbound direct services to Europe and the US East coast are not increasing as much as eastbound direct services to the Far East. However, detailed information was not available to verify this assumption. It is inevitable that transshipment share of Chennai's total throughput will continue diminishing due to the increase of direct services, but a part of the westbound containers of Chennai will likely continue to be transshipped at Colombo Port.

More direct services by 4,000 to 5,000 TEU class mother vessels are expected to be deployed from Chennai to Europe and Mediterranean ports as the cargo volume increases. However, those cargoes not destined for these ports will be transshipped at Colombo Port because there are more services and more destination choices. The image of westbound services is shown below. Eastbound cargo to Southeast Asia, Far East or the US west coast will be transshipped at Singapore, Port Klang or Chinese ports and therefore, is not the market for Colombo Port.



Source: JICA Survey Team

Figure 5.3.5: Image of Westbound Services from Chennai and Colombo

With reference to the westbound cargoes, the advantage of Sri Lankan ports in handling Chennai's cargoes is also analyzed from time and cost points of view. Table 5.3.2 shows the time impact of mother vessel deviating from Europe route to call Chennai, and it can be seen that additional 0.9 days is required by this deviation. This doesn't count the difference of ship turn-around time at Chennai and Colombo. Chennai Port is suffering from its congestion and ship turn-around time is longer than Colombo Port which means the actual difference is likely to be more than 0.9 days. From the viewpoint of shippers/consignees, it is not favorable because it takes longer to receive their cargo.

From the shipping lines' point of view, it is also not favorable because it will cost them additional USD 158,895 of ocean cost. According to SAARC Regional Multimodal Transport Study (SRMTS), feeder cost between Chennai to Colombo is around USD 150/TEU. In order for shipping lines to verify this deviation, they must be able to collect sufficient volume of containers for their vessels. The detailed handling charge at Chennai Port is not obtained, but it

is likely that at least more than 800 TEU is needed[2] to compensate about USD 200 consisting of the freight cost from Chennai Port to Colombo Port and handling charges at Chennai Port, assuming the weekly service.

In conclusion, feeder service of Chennai's westbound containers to Colombo Port has advantage in time and cost compared with mother vessels of Asia–Europe route deviating to call Chennai Port unless it grows to a certain volume.

Table 5.3.2: Time Impact of Deviation from Trunk Route

Route	Origin	Destination	Distance (NM)	Total distance (NM)	Diff. (NM)	Diff. (Days)
1	Singapore	Chennai	1,590	2,137	497	0.9
	Chennai	Off Colombo	547			
2	Singapore	Colombo	1,585	1,640		
	Colombo	Off Colombo	55			

Source: JICA Survey Team
Note1: Ship-turnaround time is assumed the same at Chennai and Colombo
Note2: "Off Colombo" means 55 NM from Colombo Port to Europe–Asia route

Table 5.3.3: Cost Comparison of Deviation and Feeder

Opt.	Route	Vessel Size (TEU)	Daily Fuel + Charter (USD)	Additional Sailing Time (days)	Additional Cost (USD)	Remarks
1	Singapore–Chennai Chennai–Off Colombo	4,000	176,550	0.9	158,895	Ocean Cost
2	Singapore–Colombo–Off Colombo					
	Freight cost by feeder service between Chennai–Colombo				150	Total = USD 214/TEU
	Transshipment handling charge (USD 37/move × 2)				74	

Source: JICA Survey Team. Feeder Cost of feeder service is based on SRMTS report

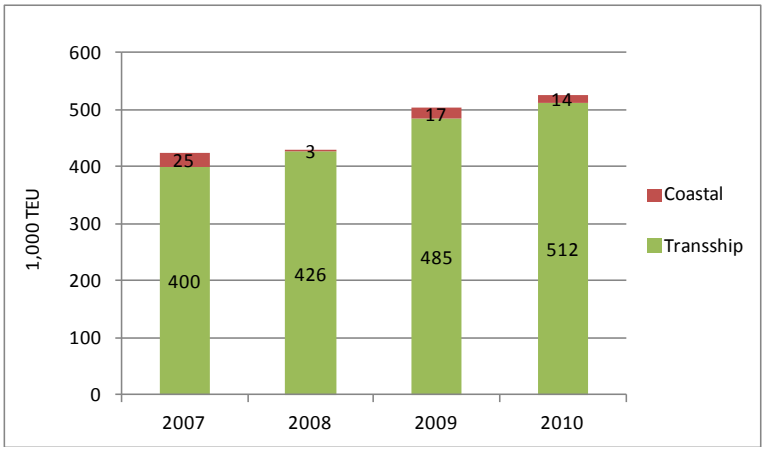
(4) Eastern Indian Cargo

- Westbound containers from Kolkata and Haldia will continue to be transshipped at Colombo Port
- Chennai could take some share of transshipped containers to Europe and US East Coast from Colombo Port
- Eastbound containers are transshipped at Singapore, Port Klang and Tanjung Pelepas, but not at Colombo Port

The container breakdown of Kolkata and Haldia altogether is shown in the following tables. The total throughput increased at an average annual growth rate of 5.5% during 2007–2010. Almost all the containers are being transshipped, and Colombo Port has a 30% share. The remaining volume is mainly being transshipped at Singapore and Port Klang.

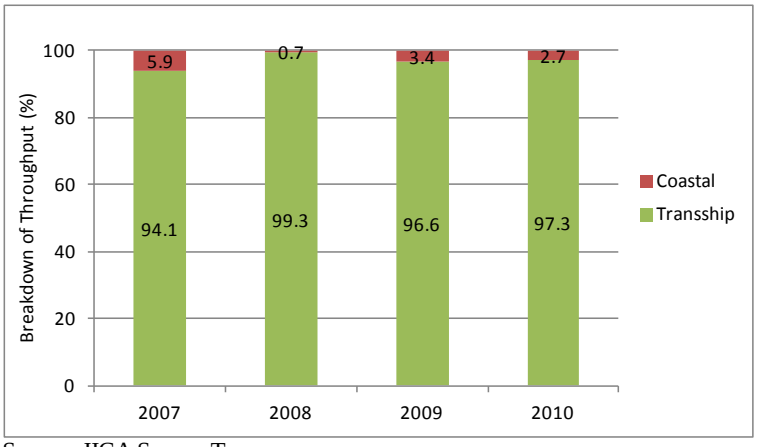
Kolkata and Haldia are river ports with impounded docks and the drafts are quite shallow. These conditions will leave them as feeder ports. Playing the role as the gateway for landlocked countries such as Nepal and Bhutan, they handle inbound loaded containers but most outbound containers are empty. Westbound containers to Europe and the US East Coast are transshipped to mother vessels at Colombo Port.

[2] Assuming loading charge at Chennai is $50/TEU, $50 × 800TEU = $40,000, ($158,895–$40,000) / 800 TEU = $149/TEU, ($149 + $50) = $199/TEU



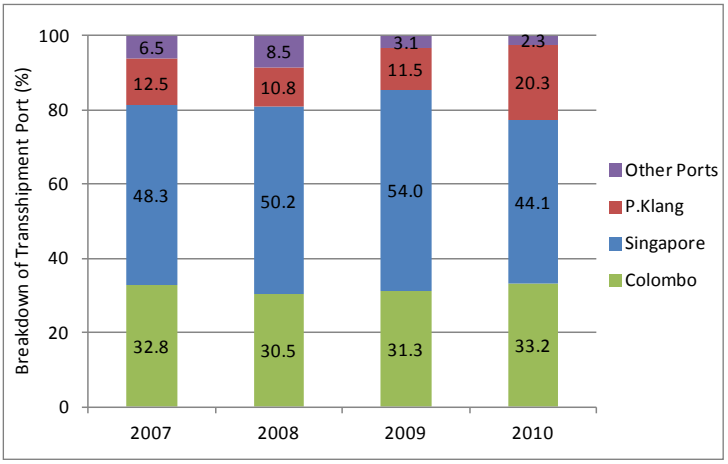
Source: JICA Survey Team

Figure 5.3.6: Container Throughput Trend of Kolkata and Haldia



Source: JICA Survey Team

Figure 5.3.7: Share of Transshipped and Coastal Containers at Kolkata and Haldia



Source: JICA Survey Team

Figure 5.3.8: Transshipment Port of Kolkata and Haldia Containers

The cost comparison of feeder services between Colombo, Singapore, and Chennai is shown below. In case of transshipment at Chennai, the estimation is based on the same rate for the fuel and charter but it was found in interviews with some shipping lines that the ocean freight rate by Indian flag vessel is 2 to 3 times higher than foreign vessels. Therefore, actual cost is considered to be much higher than that shown in the table below.

Colombo Port has a cost advantage in handling westbound containers of Kolkata and Haldia to Europe and the US East coast.

Table 5.3.4: Cost Advantage of Colombo over Singapore

	Distance (NM)	Time (day)	Fuel+Charter (USD/day)	Annual cost (million USD)	Remarks
Colombo	1,216	2.2	220,000	23.3	2 service/week
Singapore	1,622	2.9	290,000	30.7	2 service/week
Chennai	747	1.4	140,000	14.8	2 service/week
(Chennai to Trunk route)	500*	0.9	176,550*	9.4	Total 24.2 mil USD

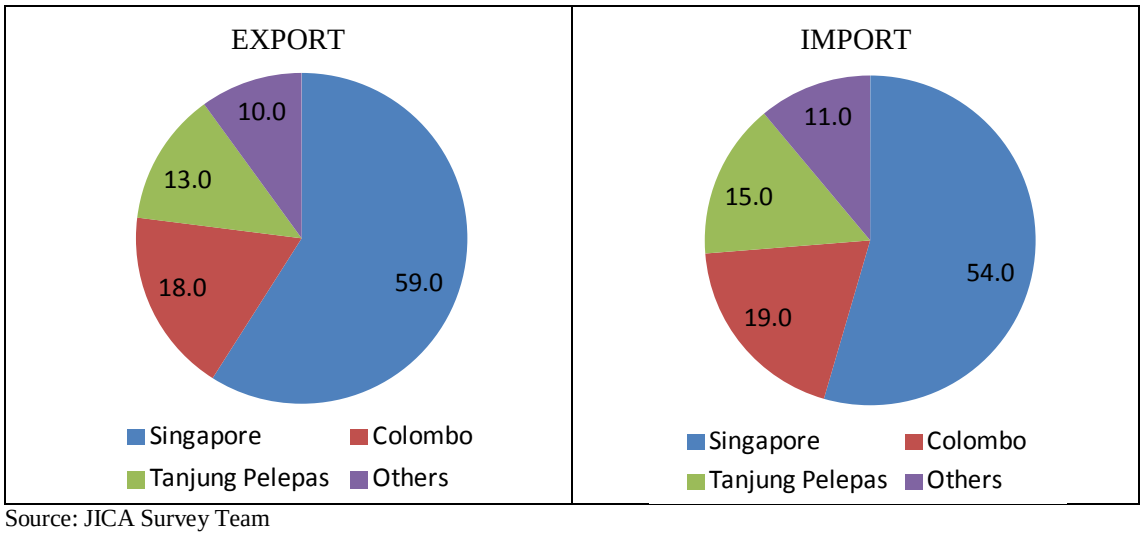
Source: JICA Survey Team
Note: The estimation is based on 1,000 TEU class feeder vessels
*: Estimate by the JICA Survey Team and cost is based on the weekly service by mother vessel of 4,000 TEU class

5.3.3 Advantage for Bangladesh Cargo

(1) General

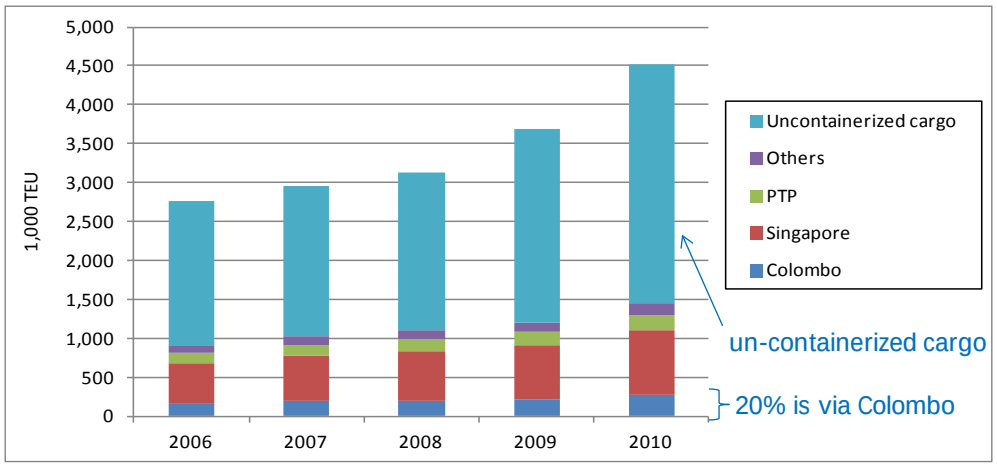
Chittagong Port is the largest container port in Bangladesh and handles more than 90% of the country's trade. Due to the limited depth of the port, it serves as a feeder port using Singapore, Tanjung Pelepas and Colombo as its transshipment ports.

According to Chittagong Port Authority, as of 2006, the largest volume is transshipped at Singapore and it accounts for 59% of imports and 54% of exports. The second is Colombo, 18% of imports and 19% of exports while is Tanjung Pelepas third with 13% of imports and 15% of exports.



Source: JICA Survey Team

Figure 5.3.9: Transshipment Ports of Chittagong Containers



Note: The volume of uncontainerized cargo is calculated as 10.0ton/TEU
Source: JICA Survey Team

Figure 5.3.10: Trend of Cargo and Transshipped Containers at Chittagong Port

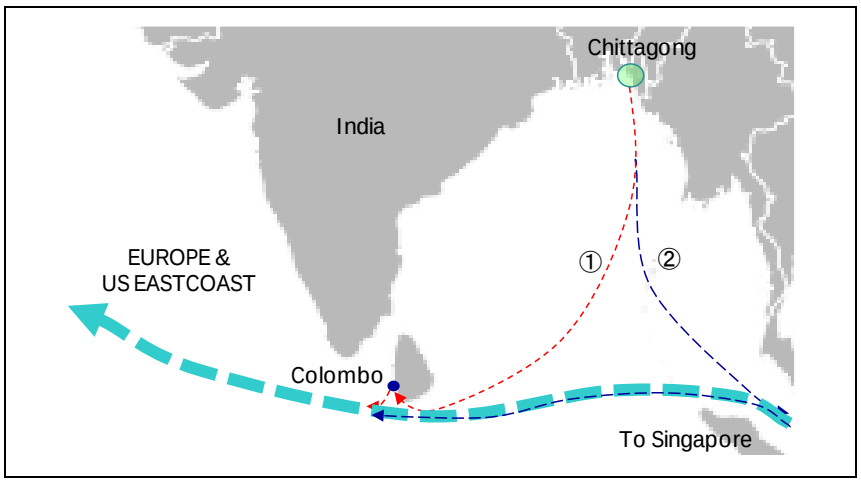
Major export partners of Bangladesh are European countries and the US, while import partners are Far East and Southeast Asian countries as well as India. As explained in the Chapter 2, container throughput of Bangladesh is expected to grow, and more cargo especially for export can be transshipped via Colombo instead of Singapore.

There are several reasons why some of the export containers bound to Europe and the US East Coast are being transshipped at Singapore. In this chapter, the advantages of Sri Lankan Ports over Bangladesh cargo are analyzed.

(2) Geographic Advantage

It has been already mentioned that Sri Lankan Ports are competing with Singapore and Tanjung Pelepas for containers of Bangladesh.

Two routes i.e. one via Colombo and the other via Singapore, are compared as shown in Figure 5.3.11. For westbound cargoes to Europe, the difference in sailing distance is obvious by looking at the figure; the route via Colombo is much shorter for westbound cargoes while the route via Singapore or Tanjung Pelepas is much shorter for eastbound cargoes.



Source: JICA Survey Team

Figure 5.3.11: Route Options of Westbound Services from Chittagong

There is no doubt that export and import cargo to/from Southeast Asia, Far East or the US West Coast will be transshipped at Singapore or Tanjung Pelepas which means there is no advantage or reason to use Colombo Port for transshipment.

The same theory should be applied for export and import to and from Europe, Mediterranean, the US East Coast or the Middle East.

Cost comparison of the two routes is shown in Table 5.3.5 to verify Colombo's advantage for such westbound cargoes. By using Colombo Port for transshipment, the navigation distance will be shorter by around 1,700 nautical miles and the containers will arrive at the destination around 3 days earlier. Total cost via Colombo is estimated to be USD 500,000 cheaper than via Singapore. It is to be noted that this cost estimate is based on the assumption that the same size mother vessels are deployed from Colombo and Singapore. Therefore, if larger vessels are deployed at one port, the case will be different because economies of scale benefit from deployment of larger vessels.

Table 5.3.5: Comparison of Transshipment for Bangladesh Containers

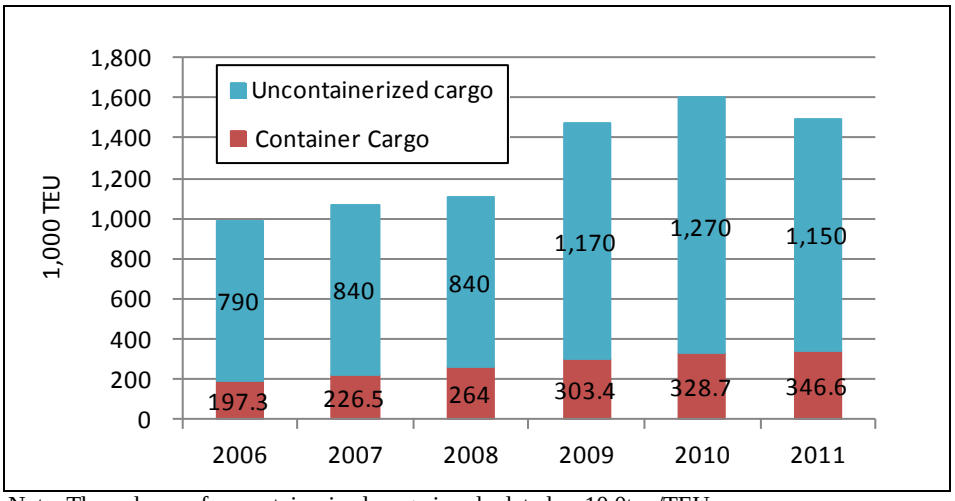
Route	Origin	Transship Port	Destination	Sailing Distance. (NM)	Service Time (Days)	Charter Cost (USD)	Fuel Cost (USD)	Total Cost (USD)
1	Chittagong	Colombo	Europe	1,306+55	2.47	23,535	230,650	254,185
2	Chittagong	Singapore	Europe	1,533+1,538	5.56	87,685	681,942	769,627

Source: JICA Survey Team
Note: Cost estimate is based on feeder vessel of 1,000 TEU class, and mother vessel of 4,000 TEU class

5.3.4 Advantage for Myanmar Cargo

(1) General

Yangon Port, the only port in Myanmar that has international container terminals is a feeder port by nature due to its shallow depth. Yangon is in almost the same situation as Chittagong Port. Although the trade between European countries and US has not yet resumed, the country has a big potential for economic growth. As can be seen in Figure 5.3.12, cargo demand is increasing and there is plenty of cargo which can be containerized.



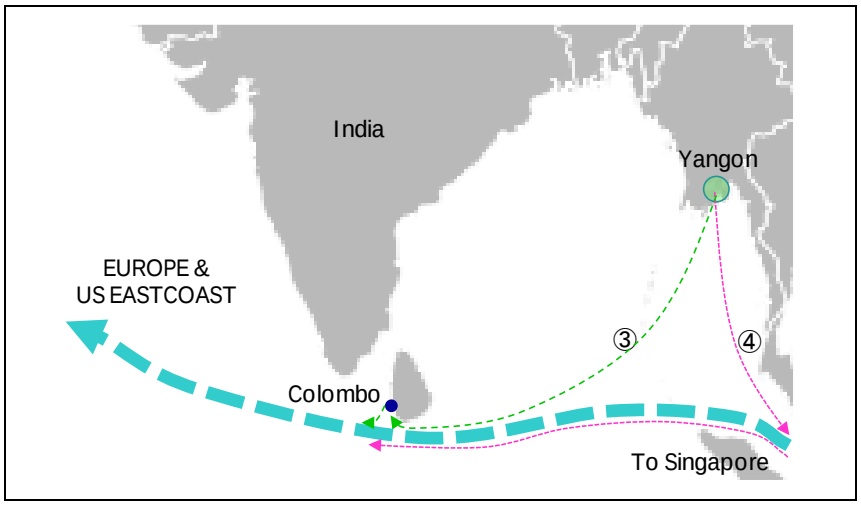
Note: The volume of uncontainerized cargo is calculated as 10.0ton/TEU
Source: JICA Survey Team

Figure 5.3.12: Trend of Trade Volume of Yangon Port

(2) Geographic Advantage

As is the case of Chittagong in Bangladesh, obviously the export cargoes to Southeast Asia, Far East or US west coast will not be transshipped at Colombo Port. Currently all the containers are being transshipped at Singapore and Port Klang, and this situation is expected to continue. There is no advantage or reason to use Colombo Port for transshipment of this cargo.

Colombo's advantage is for the westbound cargo, just like Bangladesh.



Source: JICA Survey Team

Figure 5.3.13: Route Options of Westbound Services from Yangon

Cost comparison of the two routes is shown in Table 5.3.6 to verify Colombo's advantage for westbound cargo. By using Colombo Port for transshipment, the navigation distance will be shorter by around 1,300 nautical miles and the containers will arrive at the destination almost 2.5 days earlier. Total cost via Colombo is estimated to be USD 450,000 cheaper than via Singapore when the same size mother vessels are deployed from Colombo and Singapore to Yangon.

Table 5.3.6: Comparison of Transshipment for Myanmar Containers

Route	Origin	Transship Port	Destination	Sailing Distance.	Service Time	Charter Cost	Fuel Cost	Total Cost
				(NM)	(Days)	(USD)	(USD)	(USD)
3	Yangon	Colombo	Europe	1,260+55	2.38	22,785	223,067	245,852
4	Yangon	Singapore	Europe	1,121+1,538	4.82	80,967	614,022	694,989

Source: JICA Survey Team
Note: Cost estimate is based on feeder vessel of 1,000 TEU class, and mother vessel of 4,000 TEU class

As explained in Chapter 2, there are development plans for a deep sea port along the coast of Myanmar. Even if this port is developed, for cargo exported to Europe or the US east coast, Colombo Port will have a great geographic advantage for transshipment of that cargo.

5.3.5 Advantage by Mega Container Vessels Calling at Colombo

By the time Colombo South Harbor project is realized and the first South Container Terminal commences operation, mega container vessels of more than 10,000 TEU capacity are envisaged

to call Colombo Port. At that time, Colombo Port will be the only port to have a container terminal in the region that can accommodate such vessels.

The cost impact of mega carriers are shown in Table 5.3.7. The larger the vessels become and the more containers they carry, the lower the ocean freight per box that can be offered.

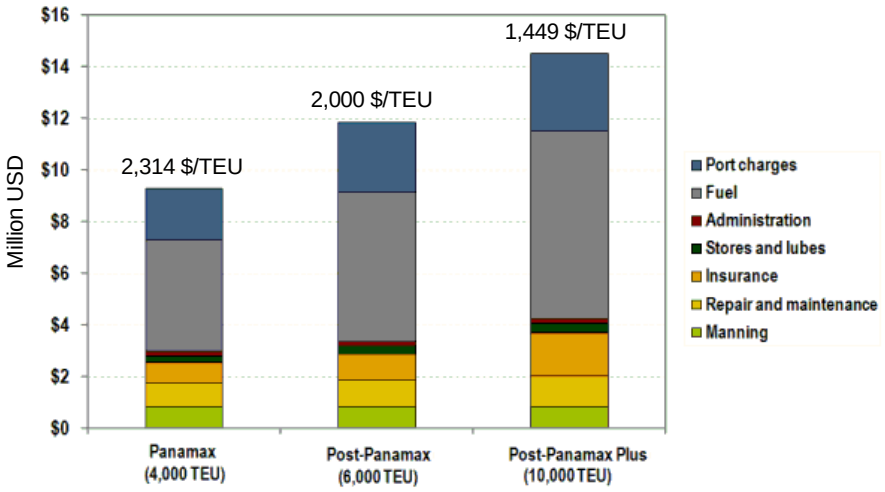
Table 5.3.7: Comparison of Impact of Mother Vessel Size

No	Mother Vessel Size	Fuel/day (USD)	Charter/day (USD)	Total/day (USD)	USD/TEU	Ratio
1	5,000	185,250	24,000	209,250	41.9	1.00
2	8,000	247,000	28,500	275,500	34.4	0.82
3	12,000	305,500	33,000	338,500	28.2	0.67
4	18,000	448,500	35,000	483,500	26.9	0.64

Source: JICA Survey Team

Mega container vessels will call at a limited number of ports along the way because stops on the way to the final destination add time and fuel for deviation. In addition, there will be transshipment charges at intermediate ports which will reduce the positive effect of deploying such large vessels.

The cost advantage of larger vessels can also be proved by looking at the breakdown of operation cost shown in Figure 5.3.14. For mega container vessels with capacity of 10,000 TEU, fuel accounts for 50% of the annual operating cost. Amortization cost is not included in the total cost shown below. Although the principal amortization cost is bigger for larger vessels, it is still less when converted into cost per box.

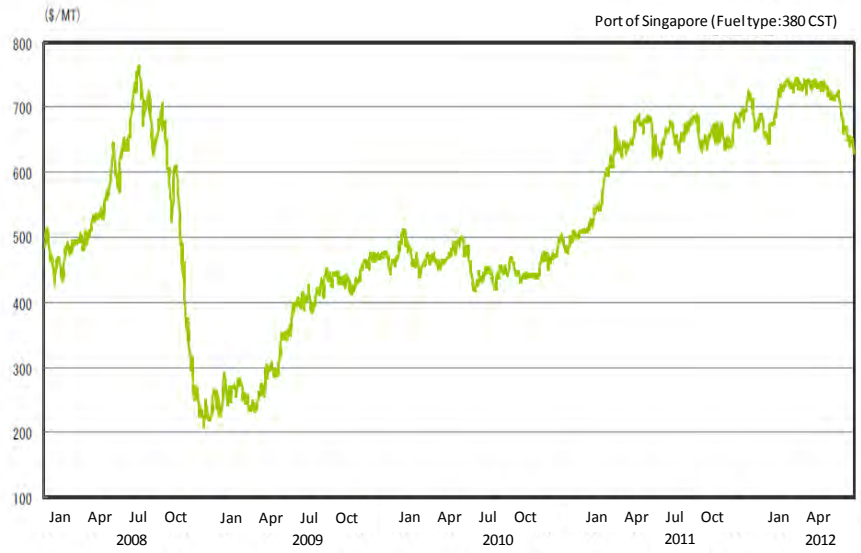


Source: "The geography of Transport Systems", based on data of Drewry Shipping Consultants Ltd and modified by JICA Survey Team

Figure 5.3.14: Operation Cost Breakdown of Container Vessel

Furthermore, as shown in Figure 5.3.15, the price of fuel has been increasing and therefore the shipping lines are very keen to minimize the fuel consumption by reducing sailing speed and taking the shorter distance route.

Berths with sufficient depth to accommodate mega container vessels and location at minimal deviation from the trunk route will be ever greater advantages for Sri Lanka.



Source: JICA Survey Team based on the market report of MOL, 2012

Figure 5.3.15: Trend of Fuel Price

5.4 Strategy and Approach to Survive as International Hub Port

Because of the geographic advantage of location very close to the main sea lane between Europe and Asia, Colombo Port will continue to be an international maritime hub. However, the geographic strength of Colombo Port will be challenged by not only its competitor ports like Singapore Port and Salalah Port but also the major ports on the Indian Coast like Chennai Port and Cochin Port. Unless due measures in line with the right strategy are worked out and undertaken, Singapore Port will capture more transshipment containers coming from Bangladesh, Salalah Port will win the same that are plying between Europe and Asia, and Chennai and Cochin Ports will handle the containers originated from and/or destined to the smaller Indian ports. In this regard, a proper strategy and approach are necessary to consolidate Sri Lanka's strength of geographic location in the international maritime networks, especially in the maritime network on the Bay of Bengal.

(1) Strategy

The strategy can be formulated aiming at the two targets below:

1. To fully exploit geographic strength
2. To cope with the development of the international maritime container transport

In order to transship containers originated from Bangladesh and Myanmar and bound to Europe, Sri Lanka is much better located on the international maritime route than Singapore. However, the majority of such containers in the case of Bangladesh and almost all the container in the case of Myanmar have been transshipped at Singapore Port. This is due to the fact that Singapore Port provides lower tariffs and higher quality service. In addition, the connectivity of Singapore Port is much better than Colombo Port. It is necessary for Sri Lanka to increase the quality of its service to the shipping lines providing feeder service between the ports of Bangladesh and/or Myanmar and Sri Lanka as well as to lower tariff rates for cargo owners.

Regarding the second strategy mentioned above, SLPA is readily carrying out the Colombo Port Expansion Project in which a 20 m deep entrance channel and 18 m deep quay walls are under construction to accommodate mega container vessels.

(2) Approach

Action plans to be implemented in order to materialize the strategy are formulated below:

- To clearly demarcate the roles of each port of Sri Lanka, particularly those between Colombo Port and Hambantota Port
- To implement Colombo Port Expansion Project as scheduled
- To conduct demand forecast and lay out the master development plan for Hambantota Port

To fully exploit their geographic advantages, it is necessary for Sri Lankan Government to coordinate the development of each port. By such coordination, synergy effects among the ports can be maximized. Particularly, it is most important to achieve several synergy effects between Colombo Port and Hambantota Port since a sort of duplication of the developments is observed with respect to container transshipment as a maritime transport hub. Proper demarcation of the roles of each port will further promote the Sri Lankan ports.

It is observed that the shipping lines are interested in servicing their mega container vessels to Colombo Port when the South Harbor is open. The South Harbor should be operational on time in order to convince the shipping lines of the high level of performance of SLPA and consequently attract their mega container vessels. As a result of calls by the mega container vessels, the connectivity between feeder and mother vessels at Colombo Port will be much improved and westbound containers originated from Bangladesh and Myanmar can be won back from Singapore Port.

To appropriately demarcate the roles between Colombo Port and Hambantota Port is vital in exploiting the geographic advantages of Sri Lanka in the maritime transport. Based on the demand forecast which should be conducted with respect to the nationwide port sector development, the master development plan of Hambantota should be worked out. Such master plan can attract and convince the domestic and international investors for their short and long-term business.

Table 5.2.12: Summary of Mother Vessels' Weekly Services by Shipping Lines 5-13
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6. Gap Analysis regarding the Capital Investment and Service Improvement

6.1 Necessary Conditions for International Hub Port

6.1.1 Facilities

(1) Port Facilities

The South Harbor assures that Colombo Port can continue as an international maritime container hub in view of its port facilities.

As previously discussed, several shipping lines have put into service mega container vessels on major maritime transport routes like the Europe–Asia route. Consequently, international maritime container hubs should be equipped with facilities which enable them to accommodate mega container vessels. To be an international maritime container hub, therefore, the following facilities are generally required:

Entrance channel:	deeper than 18 m and wider than 600 m
Quay wall:	deeper than 16 m and longer than 420 m
Stacking yard:	more than 225,000 square meters, rectangular area

The South Harbor of Colombo Port currently being constructed as Colombo Port Expansion Project (CPEP) has an entrance channel of 20 m depth and width of 560 m. As the entrance channel is not long, such width is considered to be technically reasonable. Quay wall consisting of 3 berths is 18 m deep and 1,200 m long (400 m per berth). As the quay wall is aligned straight, such length is considered technically reasonable. The terminal area is 576,000 square meters (480 m × 1,200 m, rectangular) in total including the apron and service area, which is considered sufficient.

(2) Container Handling Equipment

An international maritime container hub located on the major sea lane has to be equipped with efficient container handling equipment to accommodate mega container vessels.

Container quayside cranes have to enable mega container vessels to load/discharge containers with quick dispatch. In case of Colombo Port, crane dimensions, capacities, etc. are specified for loading/discharging Malacca-Max ships with capacity of 17,000 TEU and 24 containers across. The major requirements are shown below:

Outreaches:	70 m at maximum
Lifts above rail:	60 m
Lifting capacity:	80 t or 120 t
Trolley velocity:	250–300 m/min
Hoisting velocity:	100 m/min

Mega quayside container cranes satisfying the above specifications will be installed at South Harbor.

Marshaling containers at the quayside and the stacking area must also proceed with quick dispatch. To this end, sufficient numbers of transfer cranes, tractor heads, chassis and other

container handling equipment has to be provided. Container marshaling within the terminal must be fully controlled with ITC technology. In particular, container transfer cranes have to be selected to meet the automated or semi-automated operation of the container stacking yard.

(3) Security and Safety of Port Facilities and Ships

As outlined below, Colombo Port has been satisfying international standards for security and safety and has had no problems in these areas.

An international maritime container hub shall comply with the International Ship and Port Facility Security (ISPS) Code. The port facilities of Colombo Port, Galle Port, Trincomalee Port and Kankasanthurai Port comply with the provisions of ISPS Code and have been operating in accordance with approved port facility security plan.

At Colombo Port the following facilities are operated according to an approved port facility security plan:

- Passenger ship
- Passenger high-speed craft
- Cargo high-speed craft
- Bulk carrier
- Oil tanker
- Gas carrier
- Mobile offshore drilling units
- Cargo ships other than those referred to above

Regarding vessel navigation to and from ports in Sri Lanka, procedures are set out and relevant information is published in “Guide to Sri Lankan Port & Shipping.” Colombo Port is equipped with Vessel Traffic Surveillance (VTS) by which all the vessels entering and leaving Colombo Port are controlled.

In addition to the measures SLPA undertakes for the security and safety, the container terminal operators should cover by insurance damages which may be incurred by the accidents or stoppage of the terminal operation regardless of their causes.

(4) Access to/from Hinterland

So far as it handles mainly transshipment containers, it is not theoretically important for an international container maritime hub to have a wide and smooth access to the hinterland. This is demonstrated by the fact that an international container maritime hub is situated at an island like Marsaxlokk in Malta. However, in view of the fact that shipping lines prefer direct services rather than transshipment and Sri Lanka has import and export containers which are estimated to be about 1.4 million TEU in 2020, a wide and smooth access to the hinterland is vital for Colombo Port to consolidate its strength as an international maritime container hub. This should be emphasized because of Singapore Port, which is the strong competitor to Colombo Port on the same sea lane, has a substantial domestic import/export container trade.

As the express highway connecting downtown Colombo with the international airport (Colombo –Katunayake Expressway) is scheduled to be completed in 2014, access to the international air transport from Colombo Port will be much improved. In addition, Sri Lankan Government is planning to extend both the expressway and railway from Matara to Hambantota Region, which will connect Colombo Port and Hambantota Port. When they are completed, both ports can have clear-cut roles and grow together in the international maritime transport network.

6.1.2 Service Level

(1) Connectivity

It is essential for Colombo Port to improve connectivity especially to compete with Singapore Port, which exploits better connectivity with Myanmar and Bangladesh to capture even westbound containers despite its geographic disadvantage.

Meanwhile, among approximately 3.1 million TEU of transshipment containers handled at Colombo Port in 2010, about 0.9 million TEU were categorized as from/to countries other than India, Pakistan, Bangladesh and Myanmar. It is considered that these 0.9 million TEU were transshipped between container mother vessels. In other words, the remaining 2.2 million TEU (approx. 70%) of container transshipment were made between mother and feeder vessels. In this regard, Colombo Port should have 8 to 9 weekly services at least by container mother vessels to the major destinations in Europe and Asia, respectively.

(2) ITC Services

Logistics services such as single-window system and one-stop-service are essential for expeditious container handling at marshaling yards. At Colombo Port the one-stop-center is expected to be completed soon and construction of the single-window system is underway. Regarding logistics services, therefore, there will be no problem for Colombo Port.

(3) Non-Stop Terminal Operation

One of the critical issues for maritime container hubs is to ensure that their terminals are operated continuously throughout the year. To this end, a good labor-management relationship has to be developed and maintained to prevent disruption of terminal operations. So far as Colombo Port is concerned, there has been no such disruption since the container terminal operation started in the 1980's.

6.2 Comparison with Other International Ports

6.2.1 General

Understanding the conditions required for the international hub port, JICA Survey Team conducted several analyses to compare Colombo Port and other international ports to assess what further investments or improvements are necessary in terms of port facilities, service quality and level of performance.

(1) Port Facility (Berth Depth and Length)

Berth depths and container terminal lengths at major ports are summarized in Table 6.2.1.

As of 2010, Colombo Port has one of the deepest container terminals in the region, the longest berth length and the largest handling capacity. Upon completion of the ongoing Colombo Port Expansion Project (CPEP), Colombo port will remain as the port with the best facilities in the South Asian Economic Zone.

However, it is to be noted that there are many other international hub ports such as Singapore, Tanjung Pelepas, Port Klang and Dubai which have deeper and/or longer berths and much more handling capacity than Colombo Port.

Table 6.2.1: Summary of Berth Depth and Length

No	Port	Berth			Approach Channel	
		Depth (m)	Length(m)	Capacity (m TEU)	Depth (m)	Width (m)
1	Colombo	15.0	2,822	4.5	13.0, 16.0	190, 230
2	JNPT	13.0	1,992	4.1	11.0	325～450
3	Mormugao	12.0	520	–	13.1, 14.4	250
4	New Mangalore	10.5	990	–	15.4	245
5	Cochin	16.0	600	1.2	16.0	175
6	Tuticorin	10.9	370	0.45	14.0	183
7	Chennai	13.4	1,717	3.0	18.6, 19.2	244～410
8	Ennore	–	–	–	16.0	250
9	Vishakapatnam	16.5	450	0.35	17.0	200
10	Haldia	12.2	432	0.3	9.1	467
11	Kolkata	8.6	780	0.5	7.1	45*
12	Chittagong	9.2	1,410	1.6	5.2–7.2	250
13	Yangon	10.0	2,381	0.5	10.0	100*
14	Karachi	13.5	1,573	1.45	12.5	300
15	Singapore	16.0	16,000	36.0	–	–
16	Tanjung Pelepas	19.0	4,320	9.0	16.0	420
17	Port Kelang	16.5	6,770	12.0	11.0–17.5	500
18	Dubai	16.0	7,475	13.0	17.0	320
19	Salalah	18.5	2,205	5.0	18.0	–

Source: JICA Survey Team
Note: * is minimum width

(2) Connectivity (Frequency)

The Liner Shipping Connectivity Index (LSCI) has been defined and published by the United Nations Council on Trade and Development (UNCTAD). LSCI is an index that measures connectivity in maritime shipping and trade facilitation.

LSCI is calculated based on the five components below. For each of the five components, a country's value is divided by the maximum value of that component in 2004. The average of the five components is calculated, divided by the maximum average for 2004 and multiplied by 100 to index a country's current year with 2004. China had the highest LSCI in 2004.

- Number of ships providing service
- Container carrying capacity of those ships in TEU
- Number of companies that deploy container ships from and to a country's port
- Number of services
- Size of the largest vessel

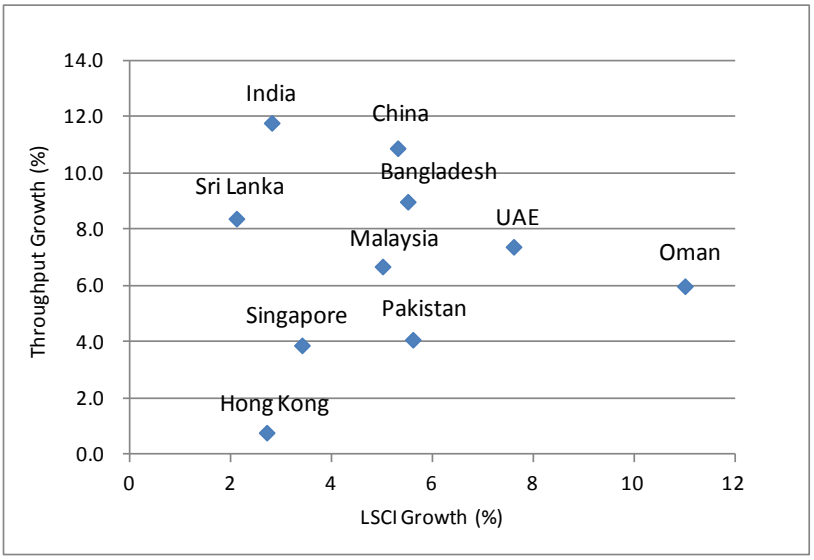
Table 6.2.2 shows the trend of LSCI. China is again the highest in 2011 presumably due to huge demand and the number of ports developed. Hong Kong and Singapore follow China. They are the top two ports, respectively, in terms of throughput. Sri Lanka is ranked 23rd out of more than 160 countries and is at almost the same level as India.

Table 6.2.2: Liner Shipping Connectivity Index

Rank	Country	2004	2005	2006	2007	2008	2009	2010	2011
1	China	100.00	108.29	113.10	127.85	137.38	132.47	143.57	152.06
2	Hong Kong	94.42	96.78	99.31	106.20	108.78	104.47	113.60	115.27
3	Singapore	81.87	83.87	86.11	87.53	94.47	99.47	103.76	105.02
7	Malaysia	62.83	64.97	69.20	81.58	77.60	81.21	88.14	90.96
16	UAE	38.06	39.22	46.70	48.21	48.80	60.45	63.37	62.50
21	Oman	23.33	23.64	20.28	28.96	30.42	45.32	48.52	49.33
22	India	34.14	36.88	42.90	40.47	42.18	40.97	41.40	41.52
23	Sri Lanka	34.68	33.36	37.31	42.43	46.08	34.74	40.23	41.13
36	Pakistan	20.18	21.49	21.82	24.77	24.61	26.58	29.48	30.54
95	Bangladesh	5.20	5.07	5.29	6.36	6.40	7.91	7.55	8.15

Source: UNCTAD

Figure 6.2.1 shows the relationship of the average annual growth rate of LSCI (2004 to 2011) and container throughput (2005 to 2010). The LSCI growth rate of Singapore and Hong Kong is not that significant because they have been well connected to global logistics since 2004. Growth rates for Oman (Salalah, etc.) and UAE (Dubai, Khor Fakkan, etc.) are 7.6% and 11.0%, respectively. This may be due to the fact that these two ports have developed as regional hub ports.



Source: JICA Survey Team

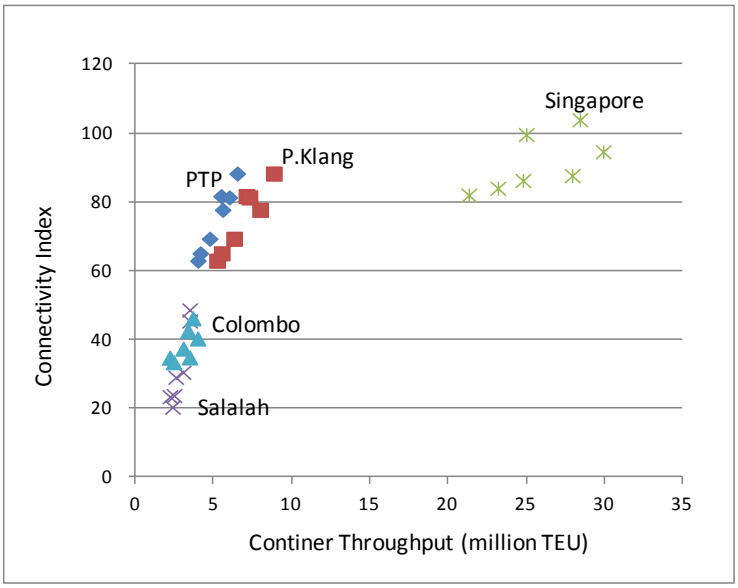
Figure 6.2.1: Relationship of LSCI and Container Throughput Growth Rate

On the other hand, Sri Lanka's connectivity growth rate is the lowest in the region. Even though the container growth rate is quite high, it is necessary to improve connectivity in order to attract more cargo and shipping lines. Sri Lanka's LSCI is expected to improve in parallel with the development of Colombo South Harbor.

Figure 6.2.2 shows the relation of LSCI and container throughput. LSCI is calculated using the total throughput of a country, but the throughput below is based only on the major ports of a country. It is shown that LSCI tends to improve as container throughput increases.

When Colombo Port Expansion Project (CPEP) has been implemented and container throughput reaches more or less 10 million TEU p.a., Colombo Port's LSCI is expected to improve and

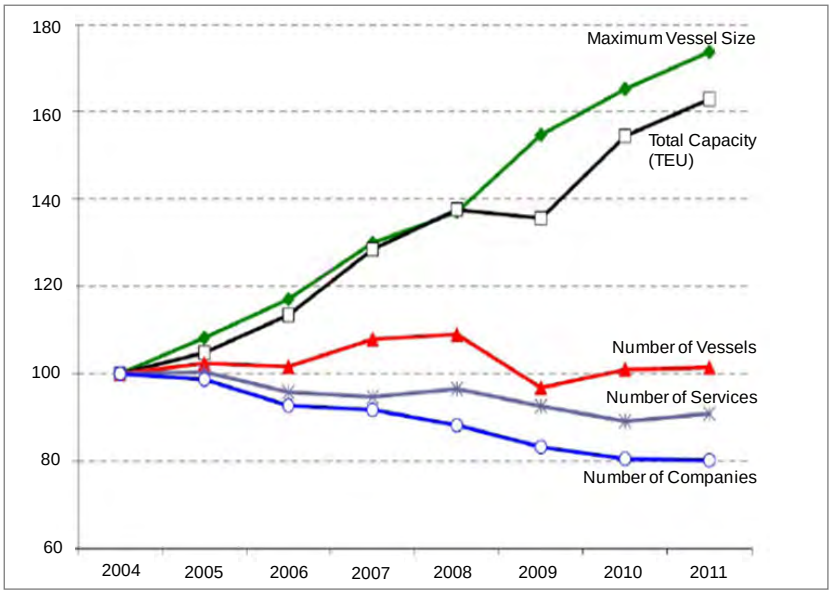
potentially reach a level similar to that of Singapore Port in 2010. This expectation is based on the experience of Port Klang and Tanjung Pelepas.



Source: JICA Survey Team

Figure 6.2.2: Relation of LSCI and Container Throughput

Considering the global trend of LSCI, it is to be noted that out of the five components included in LSCI, only vessel size and vessel carrying capacity show an increasing trend. The number of ships per country deployed to provide regular services has remained stable since 2004 while the average number of companies and services per country decreased.



Source: UNCTAD Transport Newsletter No.52, 2011

Figure 6.2.3: Trends in the Five Components of the LSCI

(3) Deviation from Trunk Route

In 2010, global container traffic was 105.8 million TEUs. Of that, the traffic between Asia and Europe was around 19.1 million TEU (18% of the total). There are more than 260 vessels sailing through this Europe–Asia route both East and West.

When shipping lines consider where to make stop along this Europe–Asia route, the deviation distance is one of the important factors. Being close to the route is a great advantage for a transshipment hub port to attract more feeder vessels and cargo.

Table 6.2.3 shows deviation distance of major international hub ports along the route. Colombo Port's deviation is only 55 Nautical Miles and 15 Nautical Miles for Hambantota. Thus, Sri Lankan ports has a geographic advantage competitive enough from this point of view.

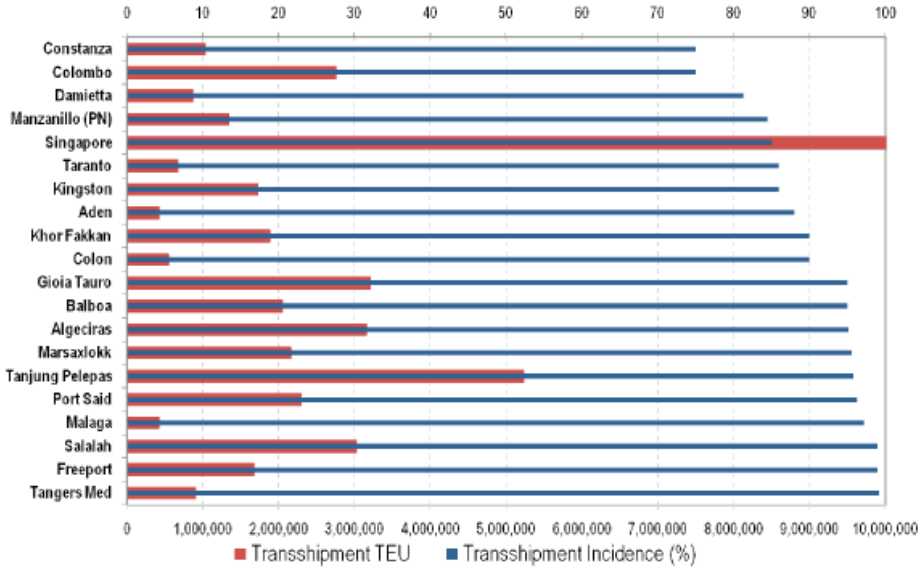
Table 6.2.3: Deviation Distance from Europe Route

Nautical Miles	Ports
0–10	Singapore, Port Said (Egypt), Damietta (Egypt), Aden (Yemen), Algeciras (Spain)
10–50	Tanjung Pelepas (Malaysia), Gioia Tauro (Italy), Hambantota
50–100	Colombo
100–150	Salalah (Oman)

Source: JICA Survey Team

(4) Domestic Cargo

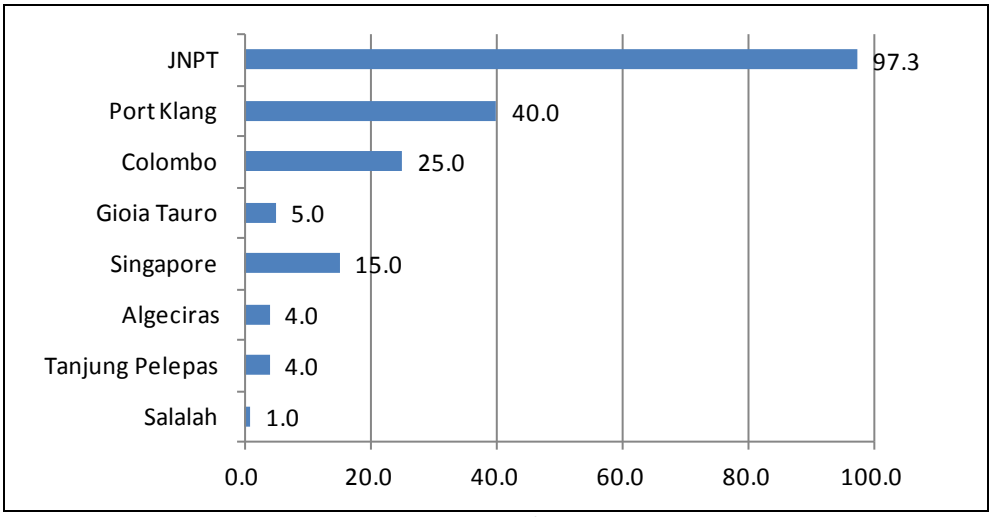
As previously explained, having more local cargo is an advantage for hub ports especially for transshipment hub ports. Substantial local cargo can convince shipping lines to route mother vessels to a port rather than depend on feeder services. A shortage of local cargo is a weakness of Sri Lankan Ports. Figure 6.2.4 below shows the transshipment volume of major transshipment hub ports in 2008 and transshipment's share in the total throughput.



Source: Drewry Consultants Ltd

Figure 6.2.4: Proportion and Volume of Transshipment in 2008

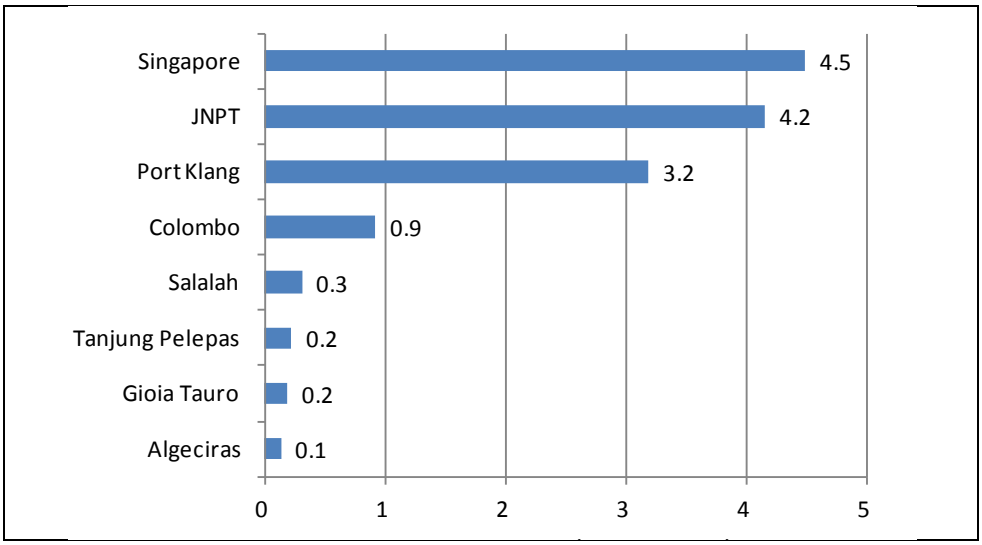
From the figure above, the proportion of domestic import/export container volume is estimated as shown below. Among major transshipment hub ports, Colombo has relatively large proportion of domestic cargo. JNPT is not a transshipment hub, but is shown for reference.



Source: Estimate by JICA Survey Team based on data from Drewry Consultants Ltd
Note: 2010 data is used for JNPT

Figure 6.2.5: Proportion of Domestic Containers in 2008

On the other hand, with respect to domestic container volume, Colombo's local container volume was 0.9 million TEU in 2008, much smaller than that of its competitor Singapore, despite Sri Lanka's larger population of 20.8 million versus Singapore's 5.2 million.[1] There are exceptional cases like Salalah or Tanjung Pelepas which are pure transshipment hub ports with very small local import/export containers.



Source: Estimate by JICA Survey Team based on data from Drewry Consultants Ltd
Note: Data of 2010 is used for JNPT

Figure 6.2.6: Estimate Volume of Domestic Containers in 2008

[1] 2011 population as reported by the World Bank.

(5) Berth Production Rate

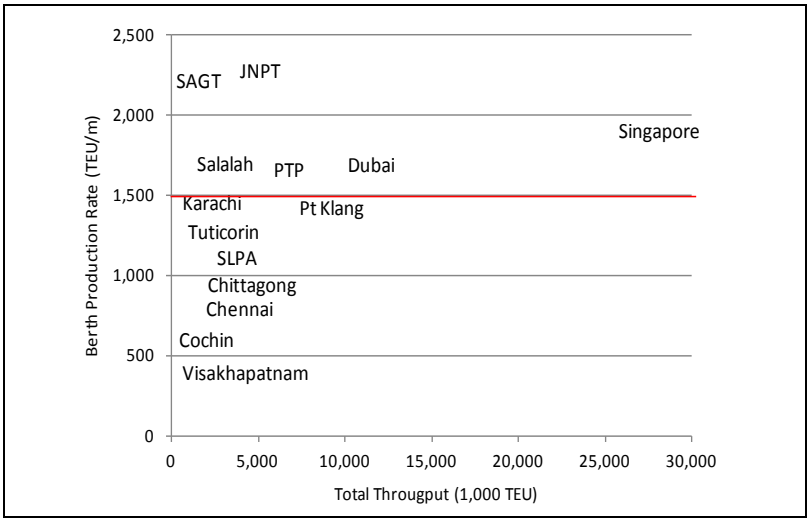
Berth production rate is calculated as total container throughput (TEU) per annum divided by the total berth length (m). Table 6.2.4 shows the production rates of international hub ports. For Colombo Port, JCT and UCT, which are the public terminals operated by SLPA, and SAGT, operated by a private operator, are shown separately. The production rate of Colombo Port is relatively low compared with other international hub ports. However, efficiency of SAGT is higher than Singapore or Tanjung Pelepas. It is very common that privately operated terminals show better production and efficiency, which is very clear in case of Colombo Port.

Table 6.2.4: Production Rate per Berth Length

Item / Port	Total Berth Length (m)	Container Throughput (TEU)	Berth Production (TEU/m)	Average Turn Round Time (days)	Average Ship Waiting Time (hrs)
Singapore	16,000	28,431,100	1,777	-	-
Dubai	7,475	11,600,000	1,552	-	-
Port Kelang	6,770	8,870,000	1,310	-	-
Tanjung Pelepas	4,320	6,530,000	1,512	-	-
JNPT	1,992	4,269,600	2,143	1.94	22.99
Colombo	2,822	4,000,000	1,417	-	-
JCT & UCT	1,882	2,029,746	1,079	-	-
SAGT	940	1,970,254	2,096	-	-
Salalah	2,205	3,485,395	1,581	-	-
Karachi	1,573	2,149,000	1,366	-	-
Chennai	1,717	1,524,000	888	1.73	8.94
Chittagon	1,410	1,328,976	943	6.9	62.64
Tuticorin	370	468,000	1,265	1.86	15.84
Cochin	600	312,000	520	1.78	23.31

Source: JICA Survey Team

In general, it can be said that a production rate of at least 1,500 TEU/m is required to meet the international standard for a transshipment hub port. SAGT of Colombo port exceeds this threshold while the SLPA terminals (JCT and UCT) are below the threshold. The relation of berth production rate and total throughput is shown in Figure 6.2.7.



Source: JICA Survey Team

Figure 6.2.7: Relation of Berth Production Rate and Total Throughput

(6) Quay Crane Performance

A major factor which contributes to berth production is the performance of the Quay Gantry Crane (QGC). Table 6.2.5 summarizes QGC performance by port. The average annual throughput per crane is around 12,000 TEU at major international ports, but that of SLPA terminals are only 9,950 TEU. This is a great disadvantage as it results in a lower berth production rate and slower dispatch of container vessels. This subpar performance significantly affects the attractiveness of the terminal to the shipping lines especially considering that the port is a transshipment hub.

The average berth length per crane at international ports is somewhere around 100 m. In the case of SAGT, berth length per crane is 94 m which meets the international level. However at SLPA terminals, it is 111 m which is around 10 m more than the average. The quay alignment of JCT is not straight and may be one of the reasons affecting this issue.

An improvement of crane efficiency and an increase the number of QGC might be necessary at SLPA terminals.

Table 6.2.5: Performance of Quay Gantry Crane

Item / Port	Total Berth Length (m)	Container Throughput (TEU)	No of QGC (No)	Berth Length/ Crane (m/Crane)	Throughput/ Crane (TEU/Crane)
Singapore	16,000	28,431,100	190	84	12,470
Dubai	7,475	11,600,000	80	93	12,083
Port Kelang	6,770	8,870,000	63	107	11,733
Tanjung Pelepas	4,320	6,530,000	44	98	12,367
JNPT	1,992	4,269,600	26	77	13,685
Colombo	2,822	4,000,000	27	105	12,346
JCT & UCT	1,882	2,029,746	17	111	9,950
SAGT	940	1,970,254	10	94	16,419
Salalah	2,205	3,485,395	21	105	13,831
Karachi	1,573	2,149,000	19	83	9,425
Chennai	1,717	1,524,000	11	156	11,545
Chittagon	1,450	1,328,976	4	113*	27,687**
Tuticorin	370	468,000	3	123	13,000
Cochin	600	312,000	4	150	6,500
Visakhapatnam	450	145,000	2	225	6,042

Source: JICA Survey Team
Note: * 4 QGCs are installed at Chittagong Container Terminal (450 m quay length), so 450 m/4 = 113 m/crane
Note: ** Mobile harbor cranes as well as ships' gears are used at Chittagong Port, so this figure is not actual

(7) Private vs. Public

In most of the major international ports, container terminals are operated by private operators and they show better performance compared to public operators. An example is the comparison of SLPA terminals and SAGT. Below is another good example showing the efficiency of privately operated terminals compared to publicly operated terminals at JNPT of India.

Table 6.2.6: Comparison of Performance of Existing Terminals at JNPT, India

Terminal	JNPCT		GTICT		NSICT	
Operator	Port Trust		AP Moller		DP World	
Throughput in 2010 (TEU)	876,368		1,856,203		1,537,240	
Berth Length (m)	680		712		600	
Berth Depth (m)	13.5		13.5		13.5	
Number of Quay Gantry Crane	8		8		8	
Ave. Berth Stay (day)	1.23	(1.0)	0.56	(0.46)	1.04	(0.85)
Ave. Berth Waiting Time (day)	0.95	(1.0)	0.05	(0.05)	0.24	(0.25)
Ave. Ship Turnaround time (day)	2.87	(1.0)	1.22	(0.43)	2.21	(0.77)
TEU/berth Length (TEU/m)	1,289	(1.0)	2,607	(2.02)	2,562	(1.99)
Crane Production p.a. (TEU)	109,546	(1.0)	232,025	(2.12)	192,155	(1.75)

Source: JICA Survey Team

6.3 Ongoing Investment and Improvements by SLPA

6.3.1 South Harbor Project

Colombo Port's existing handling capacity is 4.7 million TEU per annum which increased from 4.5 million TEU p.a. by the expansion of the land near JCT berth 4.

According to the ongoing development of South Container Terminal (SCT) and the planned East Container Terminal (ECT), the total handling capacity of Colombo Port is expected to expand as shown in Table 6.3.1. It is to be noted that the schedule of ECT and WCT is yet to be confirmed, but the table shows the necessary timing of development to meet the demand forecast.

Table 6.3.1: Container Handling Capacity of Colombo Port

(million TEU)

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Existing Terminals	4.5	4.7	4.7	4.7	4.7	4.7	4.7	4.7	4.7	4.7	4.7
SCT (1st 600 m)				0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
SCT (2nd 600 m)						1.5	1.5	1.5	1.5	1.5	1.5
ECT (1st 400 m)					0.8	0.8	0.8	0.8	0.8	0.8	0.8
ECT (2nd 800 m)							1.6	1.6	1.6	1.6	1.6
WCT (1st 600 m)									1.2	1.2	1.2
WCT (2nd 600 m)											1.2
TOTAL	4.5	4.7	4.7	5.6	6.4	7.9	9.5	9.5	10.7	10.7	11.9

Note: Schedule of ECT (East Container Terminal) and WCT (East Container Terminal) is tentative
Source: Prepared by JICA Survey Team based on the information obtained from interview to SLPA

Besides SCT and ECT, there is still the West Container Terminal (WCT) to be developed. WCT will have quay length of 1,200 m just like SCT and ECT with total handling capacity of 2.4 million TEU per annum. On the completion of the whole South Harbor Project, Colombo port will be able to handle 11.9 million TEU annually which is more than 2.5 times the present capacity.

6.3.2 Widening of the Internal Port Road

In addition to the major port development projects mentioned above, SLPA is widening the internal port road in Colombo Port in order to cater for the expected increase in volume caused by the commencement of container handling operation at South Container Terminal.

Part of the road widening project has already been completed by the contractor who is doing the port expansion project. SLPA continues the road widening project. A six lane road was designed by SLPA and the contractor was selected.

The summary of the road widening project and its progress as of August 2012 is shown below.

Table 6.3.2: Progress of Road Widening Project

Stage	Location	Progress	Remarks
I	CH 1+200 to 1+600	Completed	4 lane road
II	CH 1+200 to 1+600	Completed	Remaining works of Stage I
III	CH 0+020 to 0+320	In progress	-
IV	CH 2+200 to 2+600	In progress	-

Source: SLPA

Construction of an underground cross drain for storm water, placing of the storm water manhole, and shifting of the sewer line on the rail line side are also in progress so that the port internal road can be maintained during the monsoon season.

7. Recommendations for Sri Lankan Ports

7.1 Demarcation of Roles between Colombo and Hambantota Ports

7.1.1 Future Demand of Container Throughput

Demarcation of roles among the Sri Lankan ports should be determined in a longer perspective. In order to do so, an expected socio-economic framework is describes and the demand is forecast based on the socio-economic framework expected in the target year. Then, a master plan of the nationwide port sector development should be developed with a time frame of 25 to 50 years. Such time frame is usually applied to analyze economic viability of projects which may be contained in the development master plan. However, there is no such master plan with respect to the port sector of Sri Lanka at present.

The container throughput of Colombo Port in 2040 has been estimated for the South Harbor project presented by SLPA for Colombo Port Expansion Project (CPEP). The demand is summarized below:

South Harbor Project

Exports/Imports	7.745 million TEU
Transshipment	10.86 million TEU
Restow	0.453 million TEU
Total	19.059 million TEU

Source: Business Plan, Appendix 1: Market Analysis & Traffic Forecast, page 97

Colombo Port Expansion Project (CPEP)[1]

"Hold" Market Share Scenario	22.5 million TEU
"Net Loss" Market Share Scenario	17.2 million TEU

Source: Presentation material by SLPA, page 9

From the above, the following is concluded:

1. Container throughput in 2040 is expected to range from about 17.2 million TEU p.a. to 22.5 million TEU p.a.
2. As the capacity of Colombo Port is estimated at about 13 million TEU p.a. when South Harbor is completed, the capacity shortage will be in the range from about 4.2 million TEU p.a. to 9.5 million TEU p.a. in 2040.
3. To meet the demand in 2040, there are theoretically the following alternatives;
   a. Further develop Colombo Port after CPEP is completed.
   b. Develop Hambantota Port
   c. Develop a new container port

The new port development is not discussed as the alternative development but discussed as a potential future development later in this report.

[1] The throughput is defined as transshipment in the presentation. However, in view of the discussions which are made in the following pages, the throughput should be considered as "total throughput including export, import and transshipment containers.

7.1.2 Potential Port Development Alternatives

(1) Further Develop Colombo Port (Alternative 1)

The expansion of the South Harbor i.e. one additional West Terminal and rehabilitation of the exiting terminals such as Jaya and Unity Terminals is to be implemented to increase the capacity of Colombo Port. It should be noted that the rehabilitation of the existing terminals must be intensive i.e. the depth alongside the whole stretch of the quay has to be deepened to facilitate the mother vessels, etc. Technical viability of the rehabilitation should be studied as early as possible.

(2) Develop Hambantota Port (Alternative 2)

In view of the fact that mega container vessels are usually loaded to about 80% capacity and the draft can be adjusted if necessary to pass through the shallow channel, Hambantota Port is technically able to facilitate mega container vessels. The entrance channel of Hambantota Port is 16 m deep below chart-datum. Meanwhile, the mega container vessels put into service on Europe–Asia maritime route are designed to pass through the Suez Canal. Their dimensions have to comply with the "Suez Canal Rules for Navigation." The maximum draft of the mega container vessels is accordingly limited to 16 m. The actual draft when they pass the entrance channel is expected to be about 14 m (= 16.0 m × 80% × 1.1 (trim by the head)). Therefore, Hambantota Port which has a 16 m deep entrance channel and 17 m deep quay wall can be a container hub on Europe–Asia maritime route.

However, as there will be two hubs in Sri Lanka, Colombo Port and Hambantota Port, the connectivity of each port will be less than one hub until sufficient feeders will call each port.

SLPA just started Phase 2 development of Hambantota Port. Phase 2 is to construct container terminals which will have a 2.4 km long and 17 m deep quay. Although the master plan for development of the port is not finalized, it is expected that more container terminals will be constructed after Phase 2.

7.1.3 Demarcation of Roles between Colombo and Hambantota Ports

Demarcation of roles between Colombo Port and Hambantota Port is considered in line with the alternatives for development of the port sector as mentioned above. The demarcation is discussed as follows:

(1) Alternative 1

- Colombo Port is to be the container hub on Europe–Asia maritime route. The port should accommodate mega container vessels and expand container handling facilities to the maximum possible. Facilities to handle dry bulk, break-bulk and others not required for container handling should be removed from the port as much as necessary.
- Hambantota Port is to be the port which will handle containers and other cargo that Colombo Port is not able to handle. Thus, the port will handle containers, dry bulk, break-bulk which will overflow or move from Colombo Port.
- Theoretical priority of project implementation to increase the container handling capacity to meet the demand will be as follows:

  1st : South Terminal (South Harbor, Colombo Port)

  2nd : East Terminal (South Harbor, Colombo Port)

  3rd : West Terminal (South Harbor, Colombo Port)

4th : West Terminal Expansion (South Harbor, Colombo Port)

5th : Phase 2 (Hambantota Port, multi-purpose terminal)

6th : Hambantota Expansion

(2) Alternative 2

- Colombo Port is to be the primary container hub on Europe–Asia maritime route. Its container handling capacity is limited to that achieved by the South Harbor Project, i.e. 13 million TEU p.a.
- Hambantota Port is to be the secondary container hub as well as an industrial port. The port will handle containers, dry & liquid bulk, break-bulk.
- Theoretical priority of project implementation following this development program will be as follows:

1st : South Terminal (South Harbor, Colombo Port)

2nd : East Terminal (South Harbor, Colombo Port)

3rd : Phase 2 (Hambantota Port, container terminals)

4th : West Terminal (South Harbor, Colombo Port)

5th : Expansion of Hambantota Port

The alternative demarcation between Colombo Port and Hambantota Port is summarized in the table below:

Table 7.1.1: Demarcation Alternatives

Alt.	Demarcation	Colombo Port	Hambantota Port	Remarks
1	Colombo: to be container hub Hambantota: to handle container / bulk / break-bulk	To develop South Harbor incl. West Terminal Expansion	To develop Phase 2 as multi-purpose terminal	-
2	Colombo: to be primary container hub Hambantota: to be secondary container hub and handle container / bulk / break-bulk	To develop South Harbor excl. West Terminal Expansion	To develop Phase 2 as container terminal. Expansion to be made to meet container demand.	To review and finalize master plan of Hambantota

7.1.4 Advantages and Disadvantages of Demarcation Alternatives

The advantages and disadvantages of each demarcation alternative are shown below:

Table 7.1.2: Advantages and Disadvantages of Demarcation of Roles

Alt.	Advantages	Disadvantages
1	Connectivity of Colombo Port will be improved at a relatively early stage and consequently the strength of Colombo Port as container hub will be consolidated earlier.	Development of Hambantota Port will be delayed.
2	Hambantota Port can be developed as planned.	Improvement of connectivity of both Colombo Port and Hambantota will be delayed. Special preference has to be made for the shipping lines to move their vessel calls from Colombo Port to Hambantota Port.

From the above table, it can be concluded regardless of the alternatives that the CPEP should be carried out as the first priority project to consolidate the strength of Colombo Port as the maritime container hub. After CPEP is completed and sufficiently competitive connectivity against Singapore Port is achieved, Hambantota Port should be developed as the secondary container hub.

7.1.5 Colombo Port as Primary Container Hub on Europe–Asia Maritime Route

Regardless of the long-term nationwide port sector development, it can be concluded that Colombo Port should be developed as a major container hub on the Europe–Asia maritime route. Currently, South Harbor is under construction and the first terminal will be operational in December 2013. Having an 18 m deep quay, the new terminal can accommodate mega container vessels which can pass through the Suez Canal. They are the largest container vessels which will be put into service on Europe–Asia maritime route. Therefore, there should be no problem for Colombo Port to compete with other hubs on the route once South Harbor is fully completed.

When it is necessary to increase the container handling capacity beyond what is expected to be achieved by the South Harbor development, the existing bulk and break-bulk facilities should be removed from Colombo Port to other ports. Hambantota Port is one of the candidate ports to handle such bulk and break-bulk as the port will be connected to Colombo, the largest consumer market of Sri Lanka, by highway and railway.

7.1.6 Hambantota Port as Secondary Container Hub and Logistics Center in South Asia

To develop Hambantota Port, the master plan for the Sri Lanka's nationwide port sector development and the development plan for Hambantota Port are indispensable. At present, the master plan for the nationwide development has not been drafted and for the development plan for Hambantota Port has not been concluded. On the other hand, as Phase 1 has been completed and there is land available for logistics and industrial use in and around Hambantota Port, many foreign investors are interested in how to use the port. Under this circumstance, therefore, development policy of the port should be concluded.

As previously discussed, Hambantota Port's a 16m deep entrance channel and 17 m deep quay wall can facilitate mega container vessels put in service on Europe–Asia maritime route and the port can be developed as a container hub. In this case, there will be two maritime container hubs in Sri Lanka, namely, Colombo Port and Hambantota Port, and they will inevitably split the transshipment container volume. In this regard, the connectivity of each port will be less than that of a single container hub. This could significantly hamper the competitiveness of Sri Lankan ports against Singapore Port.

Hambantota Port can be used as a vehicle transshipment hub where vehicles will be unloaded from PCC's, assembled and loaded to PCC's for each destination. PCC's will collect several manufacturers' vehicles from Asian countries as well as India and temporarily unload them at Hambantota Port, where a long-distance PCC will load vehicles assembled for destinations along the Europe–Asia route.

Private investors have determined that dry bulk commodities like sugar, fertilizer and intermediate chemical products could be transported by large bulk cargo vessels for long distances to Hambantota Port and the bulk commodities can be mixed or bagged and re-exported to other countries by small cargo vessels or distributed to the domestic market.

In view of the rapid economic growth in Asian countries including ISC countries, Hambantota Port has the potential to be a logistics center for commodities which are transported by large bulk cargo vessels for long distances and distributed to consumers in smaller vessels over short distances.

7.2 The Necessary Investment and Service Improvements

7.2.1 Investment for General Development

(1) Nationwide Comprehensive Development Plan

Since May 2009 when the conflict ceased, Sri Lankan Government has been working for restoration of the social and economic infrastructures wherever possible. Now, it seems the time for the government to work out a comprehensive master plan for the nationwide infrastructure development. The infrastructure development master plan is expected to cover transport networks, generation and distribution of electric power, water supply, information networks, disaster prevention, industrial waste disposal, etc. To achieve balanced and harmonious developments that support the economy and protect the environment, the nationwide development plan is indispensable. Sri Lanka should fund a study, either from the national budget or grant from a donor to ensure an effective development plan is prepared.

(2) Nationwide Port Sector Developments

Port sector developments have to accord with the nationwide transport developments. The developments of Colombo Port and Hambantota Port, by and large, have to be formulated as a sub-program under the nationwide port sector developments.

It seems necessary for SLPA to conduct the study on the nationwide port sector developments before going into master planning of each port. The study is to determine the scale and role of each port to meet the future cargo demand, which will mainly be generated by socio-economic development of Sri Lanka. The roles of Colombo Port and Hambantota Port have to be clearly determined. The study should also conclude whether large scale container terminals should be built at Hambantota Port and whether a new container port will be required in a the long term. If it is required, the study should identify the site for the new container port and when it should be built. Acquisition of a site may start to consolidate the new port's ascendancy as the maritime container hub in coming several decades.

7.2.2 Investment and Service Improvement for Colombo Port

(1) Improvement of Connectivity

The better the connectivity is to smaller ports the more transshipment containers can be captured. Singapore Port has been capturing containers from/to Bangladesh and Myanmar even for their west-bound containers. Currently, SLPA grants rebate of 10% on transshipment containers from/to Bangladesh[2]. Nevertheless, a considerable number of westbound containers from Bangladesh are transshipped at Singapore Port. One of the major reasons is that the connectivity between container feeders and container mother vessels at Singapore has been far better than Colombo.

As Singapore will continue to be the strong competitor port, Colombo Port should have equivalent or better connectivity between feeders and mother vessels to capture transshipment containers. To this end, SLPA should apply the same rebate on transshipment containers from/to Myanmar. In addition, SLPA should provide some preference for the frequent calling of

[2] SRI LANKA PORTS AUTHORITY TARIFF 2011, Article 69.01, (C), East Coast of India and Bangladesh Rebate; Transhipment rebate of 10% will be granted on containers " To and From" East coast of India & Bangladesh.

container vessels from/to Bangladesh and Myanmar ports. SLPA may be able to grant rebate on internal container movements from one terminal to the other within the port premises.

(2) Service Improvement for Transshipment Containers from/to Bangladesh and Myanmar

In addition to the preference on transshipment containers from/to Bangladesh and Myanmar, SLPA may consider offering special logistics areas to handle cargo from/to those countries. The candidate areas may be chosen at East Terminal of South Harbor which will be directly be operated by SLPA. The necessary agreement for the special use of the port areas would preferably be discussed government to government.

(3) Potential Service Improvement for Mega Container Vessels

From the interview survey with a major shipping line in Colombo, it can be foreseen that mega container vessels will start to call Colombo Port when operation of the South Terminal (Colombo International Container Terminal, CICT) of South Harbor starts. It seems likely that the westbound mega container vessels which have called Colombo Port will not call other hub ports on the route to Europe in between Far East and Mediterranean. As a result, they may be able to deliver cargo to Europe faster. This will consequently improve connectivity. In order to capture westbound transshipment containers from Bangladesh and Myanmar to Europe, therefore, SLPA should attract as many mega container vessels as possible.

As mega container vessels usually load and unload more containers than other container vessels, efficiency of ship-to-shore container handling is vital to efficiently handle cargo and quickly dispatch the vessels. To this end, SLPA should request that CICT install QGC's which can shorten the ship-to-shore container handling, e.g. tandem 40 type if viable.

(4) Promotion of Export

Major weakness of Colombo Port as a container hub is that about 75% of the container throughput in 2010 is transshipment and only 25% is export/import containers. It is expected that the share of the transshipment will further increase when CPEP is completed. As shipping lines prefer the ports which have more export/import containers for their container vessels, Chennai and Cochin Ports are the potential competitors as a container hub. To compete with them and consolidate its position as the container hub on the Europe–Asia maritime route, Sri Lanka should increase export containers as much as possible.

(5) Investment for CPEP

Having invested in the South Harbor project, SLPA is planning to operate the East Terminal of the South Harbor. is the JICA Team has heard, however, that the finance for the East Terminal project has not been arranged and selection of concessionaire of the West Terminal has not been started. Meanwhile, it is very important for SLPA to complete the South Harbor project on time so that major shipping lines will have confidence in SLPA. SLPA should complete the South Harbor project as designed and scheduled.

If SLPA has to arrange finance for the East Terminal, several schemes should be considered. A PPP scheme should be taken into account to reduce the cost to be shouldered by SLPA. In this case, as SLPA will directly operate the terminal, a contractor for civil works and/or supplier for container handling equipment will finance the project cost and recover their finance from the profit of the terminal operation by SLPA. The PPP scheme will also expedite the West Terminal project.

(6) Investment for a Large Scale ICD

For efficiency in customs clearance and cargo inspection of the export and import containers through Colombo Port, it will soon be required to have a large scale Inland Container Depot (ICD) near Colombo City. Provision of the large scale ICD will reduce congestion inside the port and make container handling in the terminals faster. As such, the provision of a large scale ICD will indirectly attract mega container vessels. At first, a master plan of ICD should be worked out by use of the government budget or grant assistance by a donor. Conditions of contract for ICD concession may be prepared to select the concessionaire to build civil works and conduct management and operation.

(7) Investment for Rehabilitation of Existing Facilities

SLPA is planning to rehabilitate the existing port facilities. In order to consolidate its position as the container hub on the Europe–Asia maritime route, Colombo Port should improve the exiting container terminals, particularly Jaya Terminal.

At present, the approach speed of the vessels passing through the old breakwaters can be much slower than before owing to the sheltering effect by the development of the South Harbor; the approaching channel is in the lee of the new development and strong currents and waves have subsided near the entrance of the existing port basin. Once deepened to 15m below the chart datum all along the quay face, Jaya Terminal can be rehabilitated to accommodate container mother vessels. The entire quay alignment can be straightened for efficiency.

(8) Investment for a New Container Hub Port

In a longer perspective, it is obvious that Sri Lanka will need container terminals in addition to Colombo and Hambantota Ports. A preliminary concept of the new container port should be examined when the master plan of the nationwide port sector development is studied. If it is concluded that a new container port is necessary to cope with the demand, SLPA should conduct an in depth study on development of the new container port. Land appropriation should start as soon as possible to reduce the acquisition cost in the future.

The new container port should satisfy the following requirements:

- Able to accommodate mega container vessels, preferably 20 m deep approach channel and 18 m deep quay
- Expandable to have a container handling capacity about 20 million TEU p.a.
- Close to Colombo Port so that synergy effects can be exploited
- Accessible to the highway and railway

7.2.3 Investment and Service Improvement for Hambantota Port

(1) Investment for Car Transshipment Terminal

Hambantota Port has a great potential to be a vehicle transshipment hub on Europe–Asia maritime route. This is due to the fact that vehicles produced in East and Southeast Asia as well as Australia are exported to Europe at present and that several international automobile manufacturers are increasing their production in India aiming at European market. Sri Lanka is located at the best position to collect cars from India as well as to accommodate PCC (Pure Car Carrier)/PCTC (Pure Car and Truck Carrier) carrying cars manufactured in East and Southeast Asia as well as Australia destined to Europe or Africa. In this regard, the potential strength of Hambantota Port as the vehicle transshipment hub is as large as Singapore.

Singapore Port started vehicle transshipment in January 2009. One dedicated car terminal has been operated by a joint venture company of shipping lines and PSA. The capacity is to transship about 0.5 million cars p.a. The terminal has two PCC/PCTC dedicated berths and one public berth with an open car yard and the multi car storage yard with about 20,000 car parking slots in total.

To consolidate the strength as the car transshipment hub to compete with Singapore Port, SLPA should encourage shipping lines operating PCC/PCTC's to establish a special purpose company of vehicle transshipment and, if necessary, reserve a dedicated berth and area for SPC inside the premises of Hambantota Port.

(2) Investment for SEZ

Sri Lankan government has promoted six (6) Special Economic Zones (SEZ)[3]. Hambantota is one of these SEZ's. It is reported that, in addition to the 1,700 ha in the port premises, an additional 1,100 ha outside of the port has been earmarked for development of an industrial zone. SEZ at Hambantota aims at logistics, manufacturing, heavy industry and tourism. With respect to port-related developments, ship building & repairing, an oil refinery, bunkering and LNG plant are envisaged. In working out the development master plan of the port, market analysis should be carried out with respect to these industries. If they are determined to be feasible, the port should be laid out to facilitate these industries.

7.3 Action Plan of the Government of Sri Lanka

7.3.1 Promotion of Container Transshipment

As discussed in the demand forecast of transshipment containers, the ports with which Sri Lanka will be most active are located on the Bay of Bengal, i.e. Yangon Port, Chittagong Port (including Sonadia Deep Sea Port in future), Kolkata& Haldia Ports, Chennai & Ennore Ports. SLPA should periodically dispatch representatives to these ports to evaluate the needs of traders and shipping lines and provide them with assistance for trade facilitation.

Sri Lankan government should discuss special usage areas inside Colombo Port or Hambantota Port for the logistics of Bangladesh and Myanmar cargo in order to promote container transshipment and/or establish a supply chain on the rim of Bay of Bengal.

7.3.2 Promotion of Car Transshipment

To consolidate the strength as the car transshipment hub to compete with Singapore Port, SLPA should encourage shipping lines operating PCC/PCTC's to establish a special purpose company (SPC) of vehicle transshipment and, if necessary, reserve a dedicated berth and area for SPC at the port premises.

7.3.3 Master Planning of Port Sector

SLPA should prepare a master plan on the nationwide port sector development so that all the Sri Lankan ports can be developed in a harmonious and balanced manner. Under this nationwide development strategy, master plans of each port should be worked out.

[3] They are at Jaffna, Mannar, Trincomalee, Kalpitiya, Colombo and Hambantota.

Appendix: Examples of Success and Failure of Hub Port on Indian Ocean Rim and in South Asian Economic Zone

A1. General

This appendix provides a review of systems, methods, strategies and impacts of international port operation and policy experiences especially focusing on typical regional hub-ports of Indian Ocean Rim countries.

The operation systems and policies as well as lessons learned from the success and failure of the following ports are reviewed:

- Port of Singapore
- Port of Tanjung Pelepas (Malaysia)
- Port of Colombo (Sri Lanka)
- Port of Salalah (Oman)

A2. Port of Singapore

Port of Singapore is one of the world's top logistics hubs supported by state-of-the-art technologies, high management skills and rapid response to changes in external factors.

Source: PSA

Profile of National Port System:
The Port of Singapore has been the busiest port in terms of the number of containers handled per year since 2005. As the container throughput roughly doubled from 15.5 million TEU to 29.9 million TEU from 2001 to 2008, Singapore Port has demonstrated rapid growth. Although Shanghai overtook Singapore in throughput in 2010 with 29.1 million TEU (28.4 million TEU for Singapore), Singapore has maintained its position as a leading hub port.

Responsible government authority:
Ministry of Transport overseas the development and regulation of maritime and port sector.

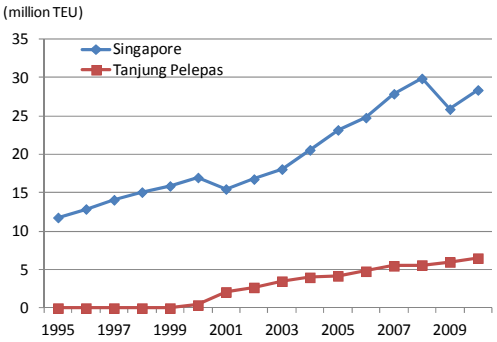
Regulatory responsibility:
The Maritime and Port Authority of Singapore (MPA) regulates and licenses ports, maritime services and facilities.

Number of major seaports: 1

Government Development Policies

- Implementation of State-of-the-art IT
- High IT Management Skills
- Foreign Direct Investment
- Competitive Response

Source: Welsh (2009)
http://www.masterresearch.com.au/downloads/pdfs/ICT_for_Intermodal_Welsh.pdf



Source: Containerisation International Yearbook

Characteristics of Port and its Hinterland (City/State/Country)

Geographic Characteristics

- Singapore has an area of 710 km^2, a population of 5.08 million and a population density of 7,155/km^2 (2010).
- Singapore is located at the southern tip of the Malay Peninsula at the southern end of the Malacca Straits, functioning as a crossroads for traffic between the Pacific and Indian Oceans. Thus, it serves as a strategically important regional hub.
- The port is blessed with a deep natural harbor.

Economic Characteristics

- Singapore's GDP per capita was US$50,123 in 2011.
- Approximately 7% of Singapore's GDP is from maritime trade industry.
- The maritime industry is comprised of more than 4,400 establishments and employs a

total of approximately 86,500 people, representing 4.3% of the total workforce nationwide (2002).

Operational Characteristics

- Singapore Port consists of five (5) container terminals: four (4) terminals operated by PSA Terminals (Tanjong Pagar, Keppel, Brani and Pasir Panjang) and one operated by Jurong Port. PSA handles 97% of the total throughput in the Port of Singapore.
- Approximately 85% of the total throughput is transshipment.
- Information and communication technologies (ICT) are fully utilized for port operation. Three examples; PORTNET, CITOS and Flow-Through Gate System are introduced below.

i) PORTNET

This is a system that spatially interfaces and connects separate technical, institutional and organizational domains. Before ships arrive in Singapore, shipping companies send a message to the terminal operator through the PORTNET system, indicating their arrival time and the number of containers on board as well as applying for berthing space. By processing this information before the vessels arrive, ship turnaround time is minimized. There are 8,000 integrated users of the system, processing 130 million transactions a year. According to a survey by the World Bank in 2007, PORTNET was cited as a key success factor in Singapore's ranking as the world's number one logistics hub, for its role in simplifying and integrating the complex processes involved in moving and tracking cargo worldwide.

ii) CITOS

The Computer Integrated Operating System (CITOS) is an enterprise resource planning system that coordinates and integrates every asset from prime movers, yard cranes and quay cranes to containers and drivers. With CITOS, port equipment and people are managed seamlessly, flexibly and in real-time. The system ensures the best loading and unloading sequences and simultaneously takes into account the next port of call as well as the stacking pattern of boxes in the container yard.

iii) Flow Through Gate System

The Flow Through Gate System is a fully automated system that identifies container trucks according to manifests submitted through PORTNET and provides instructions for their destinations to drivers within 25 seconds. Introduced in 1997, the system handles an average traffic flow of 700 trucks per peak hour and 8,000 trucks per day.

Responsible public agency: Maritime and Port Authority (MPA) for regulatory functions

MPA, established in February 1996 for privatizing the port, manages and administers the port through regulating essential maritime services and facilities of the port as well as ensuring navigational safety and maritime security. It is important to note that MPA is not involved in any operational aspects of the port or terminals.

Most recent reform: Corporatization in 1997

Until 1996, cargo operations and port regulation were handled by three government agencies: the National Maritime Board, the Marine Department and the Port of Singapore Authority, all of which were under the Ministry of Transport. In February 1996, MPA was established by combining the regulatory functions of these agencies. Meanwhile, the commercial and marine

activities of the regional Port of Singapore Authority were separated, resulting in the formation of the PSA Corporation (PSA) in October 1997. The changes are shown in Figure 1.

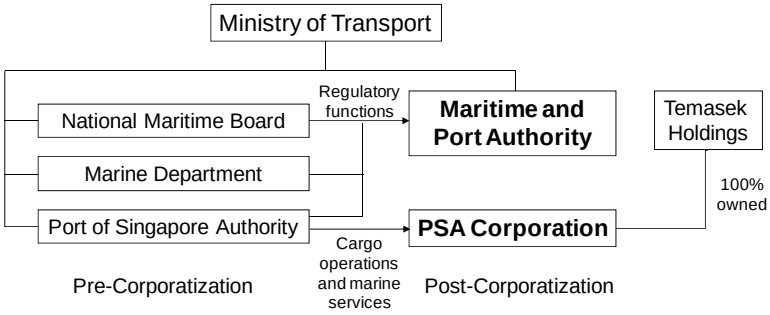


Figure 1: Structural Changes to the Governance of the Port of Singapore

PSA is a wholly owned entity of Temasek Holdings, the investment company under the jurisdiction of the Ministry of Finance. As a result of this corporatization, the Port of Singapore transformed from a government body to an independent asset of the government. Since it has commercial objectives and takes decisions on a commercial basis, PSA is akin to a private sector company, making it possible to operate the port more efficiently so as to increase its profit.

In 2003, PSA group was reorganized and PSA International was created as the main holding company for the group, which was affected by shifting the group's core business to global port management. This sharpened PSA's business focus on its core competence in port development, management and operations throughout the world.

Workforce:

During the period 1990-1998 when container traffic almost doubled, the number of PSA employees remained stable at approximately 7,000 persons. This resulted in a dramatic increase in value added per employee of approximately 72% from S$140,000 to a little over S$250,000. When MPA was established in 1996, 540 employees were allocated to MPA and 6,400 became employees of PSA.

The "Before" Situation

- In 1964, the Port of Singapore Authority (PSA) was established, taking over the functions from the Singapore Harbor Board.
- Big wave of transnational corporation (TNC) manufacturing investment was witnessed in 1960s and 1970s. From 1963 to 1975, the export share of total manufacturing sales in Singapore increased from 27% to 58%.
- After a half decade of inefficient container handling from general cargo vessels, PSA constructed its first dedicated container terminal in 1972.
- With the only dedicated container terminal in Southeast Asia, PSA began attracting break bulk and lower-value export cargo from neighboring countries to be shipped from its terminal after being consolidated into containers.

Pasir Panjang Terminal under construction

Source: Penta-Ocean Construction co., ltd (http://www.penta-ocean.co.jp/english/project/facility/harbor/012.html)

- In 1991, PSA announced that it would sell shares in the port.
- Though Singapore Port achieved rapid growth, the container handling capacity did not keep up with the increasing number of ships calling the port, leading to an increase in berth waiting time to as much as 36 hours.

Operational Development Schemes and Relevant Policy Changes:

Topic 1: Efficient Urban Planning Policies

Due to the limited land available, the authorities of Singapore are implementing efficient urban planning policies such as developing industry in specific zones and equipping the city-state with modern transport infrastructures to support trade.

Topic 2: Free Trade Policies

The Port of Singapore enacted free trade policies that contributed to high growth and attracted foreign investments and firms. To accommodate the volumes of transshipments, Singapore has created a number of free trade zones which allow for a wide range of goods to be stored and re-exported without customs tariffs.

Topic 3: Introduction of State-of-the-Art Information Technologies

PSA has actively integrated its own operations as well as customer operations through information technology. PORTNET, CITOS and Flow Through Gate System, developed and introduced during 1980s and 1990s, are key success factors in Singapore's growth.

Topic 4: Competitive Response

The Port of Singapore lost two of its major customers, Maersk Line and Evergreen Line, in the beginning of the 2000s because the Malaysian government offered them the management of the Port of Tanjung Pelepas along with dedicated berths. PSA responded by cutting fees by a total of S$300 million per year, decreasing the handling rate for empty containers by 50%, etc. The port also commenced a new policy of offering existing and prospective customers the option of dedicated berths operated by them or jointly with PSA. For instance, in December 2003 PSA worked with China Ocean Shipping Group Company (COSCO) to establish the US$94.34 million COSCO-PSA terminal with dedicated berthing arrangement for COSCO ships.

LESSONS LEARNED

The Port's success is attributed to a combination of resources such as its location and other natural conditions as well as resources the port brought to bear such as capital, information technology and operation technologies. IT has played a pivotal role in providing efficient and effective port services. Moreover, high-level IT management skills as a result of efforts in capacity development have contributed to the port's ability to sustain its complex operation.

Singapore's dramatic rise as a transport logistics platform is directly tied to the policies of the developmental state, including the policy of engaging the global economy to remain regionally competitive.

The Singapore government has built an environment where foreign investors and foreign firms can easily start doing business in the country. PSA international is owned by Temasek Holdings Co., who is owned by the government of Singapore. Government's assistance and strong support is indispensable in port development.

As can be seen by 1997's corporatization, 2003's reorganization and the rapid response to the loss of major shipping lines' cargo, it is not a single rapid drastic reform but constant competitive responses that contribute to the success of Singapore Port.

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A3. Port of Tanjung Pelepas

Port of Tanjung Pelepas (Malaysia) achieved the world's fastest growth in container throughput and is the strongest competitor to Singapore for transshipment.

Profile of National Port System:
The Port of Tanjung Pelepas (known as Pelabuhan Tanjung Pelepas in Malay and therefore abbreviated as PTP) is located at the southwest tip of the state of Johor in Malaysia. Just 45 minutes from the world's busiest shipping routes and approximately 11 kilometers from the Port of Singapore, PTP is well-positioned to perform both regional and worldwide transshipment and cargo distribution services.

After a successful three-month trial operation in October 1999, PTP commenced its official operation in March 2000. The Port's rate of growth has been outstanding, setting a world record as the fast growing port by achieving the throughput of 1 million TEU in 571 days from the opening.

By 2003, the Port handled 3.87 million TEU per annum, outstripping Port Klang to become the largest port in Malaysia. By 2007, the volume grew to over 5 million TEU. According to the latest available data, PTP's container throughput in 2010 was 6.5 million TEU, following Port Klang that again became Malaysia's largest port at 8.8 million TEU.

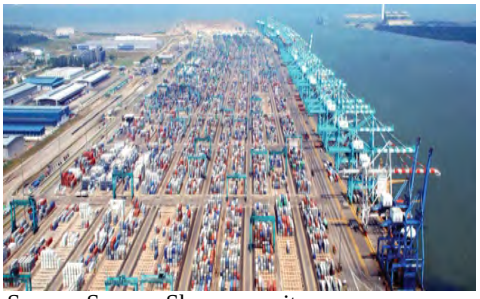
Responsible branch of the government:
Ministry of Transport (MOT) overseas the development and regulation of maritime and port sector.

Regulatory responsibility:
Regulations, trade facilitation, landlord and asset management, performance standards, provision of license and permits, and port planning.

Number of major seaports: 6
Six (6) major ports including PTP are private and regulated by port authorities.

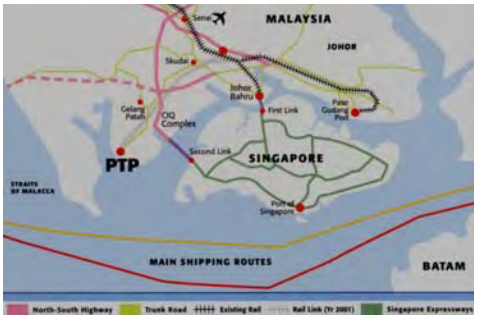
Characteristics to be Highlighted

- Quick Decision Making
- Large Hinterland Economy
- Creating Cargo Demand
- Multiple Terminal Operators
- Competitive Fee/Tariff Setting



Source: Source: Skyscrapercity.com
http://www.skyscrapercity.com/showthread.php?t=140812&page=3

Source: Skyscrapercity.com
http://www.skyscrapercity.com/showthread.php?t=1031181



Source: Wang, M.
http://www.dc.ogb.go.jp/Kyoku/information/kokusai_butsuryu/pdf/01.pdf

Characteristics of Port and its Hinterland (City/State/Country)

Geographic Characteristics

- Malaysia has an area of 329,847 km^2, a population of 28.3 million and a population density of 86/km^2 (2010).
- PTP lies at the mouth of the Pulai River on the southwestern shores of the Malay Peninsula near the major shipping lanes in the Strait of Malacca.
- It is blessed with natural deep water area, and a wide approach channel is available.
- PTP has a larger hinterland (including a large part of Southeast Asia) than the Port of Singapore. However, the immediate hinterland is not yet developed enough to sustain PTP with domestic import/export cargo so PTP focuses mostly on transshipment services.

Economic Characteristics

- Malaysia's GDP per capita is US$8,423 in 2010.
- Approximately 95% of Malaysia's total imports and exports are transported via seaports.
- In June 1999, the Malaysian Government approved a Free Zone Authority within PTP to administer both a Free Commercial Zone and a Free Industrial Zone.

Operational Characteristics

- The operating body is the Port of Tanjung Pelepas (PTP), which is 51% owned by Malaysia Mining Corporation (MCC), 30% by APM Terminals and 19% by the Malaysian holding company called Seaport Terminal.
- PTP is a world-class port with state-of-the-art facilities and infrastructure. The container yard was designed to handle 8 million TEU per annum.
- PTP contains ground slots for 298,000 TEU, 4,000 reefer points, and storage capacity for 200,000 TEU.
- When the acquisition of P&O Nedlloyd by Maersk Sea-Land was announced in May 2005, PTP looked set to gain an estimated 1.5 million TEU from Singapore. However, 92.7% of PTP's capacity had been utilized in 2005. Expansion of the port is underway to accommodate additional throughput.

Responsible public agency:

MOT is responsible for planning, formulating and implementing policies relating to maritime industry including ports, and regulatory bodies such as Johor Port Authority come under the jurisdiction of the Ministry of Transport (MOT). MOT is also responsible for maritime safety, pollution, shipping development etc.

Most recent reform:

PTP itself did not witness a major reform such as the corporatization seen in the Port of Singapore.

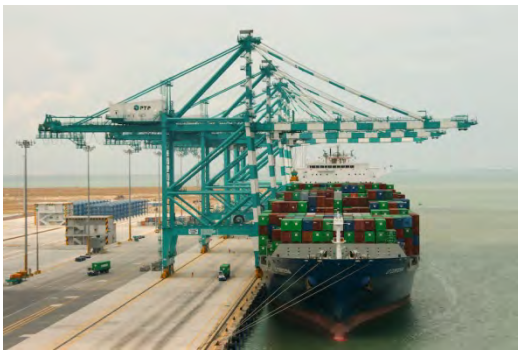
Operation model: BOT

The construction of PTP started after the signing of the Build Operate Transfer (BOT) agreement between the Malaysian Government and Seaport Terminal (Johore), which relegated its rights and obligations to its wholly-owned subsidiary, PTP. The concession period is for sixty (60) years.

Workforce: 700 as of 2002

The "Before" Situation

- Since the beginning of its operation in 1977, the Johor Port at Pasir Gudang had expanded rapidly. Growth predictions showed that the port would suffer capacity problems by 2000.
- As the Johor Port Authority reached maximum expansion of the port with the completion of Phase 4 of Pasir Gudang, the study for an alternative port location began in 1990. Tanjung Pelepas was selected as the most suitable location for Johor's new port that would have the capacity to cater to all future demands.
- In January 1993, a fully government-owned Johor Port Sdn Bhd took over all port facilities and services from Johor Port Authority. The port was fully privatized in August 1995 to Seaport Terminal (Johor) Sdn. Bhd. which became the holding company Johor Port Berhad.



PTP Terminal under development

Source: Dinamare.de (http://www.dinamare.de/schiffe/cortesia/schiff_cortesia.htm)

- In March 1995, the Government of Malaysia and Seaport Terminal (Johor) signed a 60-year concession agreement for the Port of Tanjung Pelepas, leading PTP to manage and operate the port.
- Preparation of a master plan and preliminary design were conducted in a very short period during 1995-1996, enabling the project to commence in 1997 and have its first stage completed in 1999 with the cost of US$737 million.

Operational Development Schemes and Relevant Policy Changes:

Topic 1: Port development schemes

The port is to be developed in five phases over a period of 25 years to 2020. The first phase, completed in 1999, developed six berths with 2,800m quay length. The second phase development began in September 2002. The dredging and reclamation works were completed in 2003 and six berths were commissioned in July 2004. Johor Port Authority plans to build a total of 95 berths at PTP by the end of 2020.

Topic 2: Government's attempt to increase container movement within Malaysian waters

In the early 1990s, Malaysia was shipping over 3 million TEU per annum through Singapore. This was more than the overall capacity of all Malaysia's domestic ports at the time. In order to improve this situation and acquire competitive edge over the adjacent Port of Singapore, the Malaysian government attempted to handle domestic imports and exports through Malaysian ports by relaxing its cabotage law and allowing foreign-flag vessels to provide feeder services within the country. PTP was developed as a part of this strategy.

Topic 3: Allowing major shipping lines to operate its terminals

In contrast with Singapore Port, PTP allows multiple terminal operators. This gives individual lines the opportunity to negotiate specific arrangements and have more control over their businesses. By offering terminal operators flexible and efficient business terms, PTP has successfully attracted the two major customers, Maersk Line and Evergreen Line, convincing these shipping companies to shift their major hub functions from Singapore.

Topic 4: Competitive costs (pricing)

In order to attract shipping lines to PTP, various related charges were set 30-40% lower than those at Singapore including land lease cost, operating cost, labor cost, warehousing cost and office rental rate. Moreover, the exchange rate in Malaysia is weaker than that of Singapore. These lower costs have certainly contributed to attracting shipping lines to PTP.

LESSONS LEARNED

Significant developments have taken place in such a short period of time as demonstrated by the dramatic growth of containers handled. This was presumably achievable owing to the government's quick decision making.

Creating container demand by building Free Commercial/Industrial Zones is another key factor in PTP's success.

The development of PTP and its rapid growth as shown in the establishment of world record to reach 1 million TEU is strongly supported by the government's policy of increasing the movement of container vessels within Malaysian waters so that it could gain more competitive advantages over neighboring Singapore Port.

Employing a strategy opposite to Singapore Port and offering an attractive bargain to port users contributed to some shipping lines moving hub functions from Singapore Port.

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Country Report of Malaysia, Kleywegt, A. et al., 2002. *Competition between the Ports of Singapore and Malaysia*, PTP, Renkema, A. & Kinlan, D., *Tanjung Pelepas Port: From Jungle to Malaysia's Newest Container Port*, Ship-technology.com
(http://www.ship-technology.com/projects/tanjung-pelepas/),

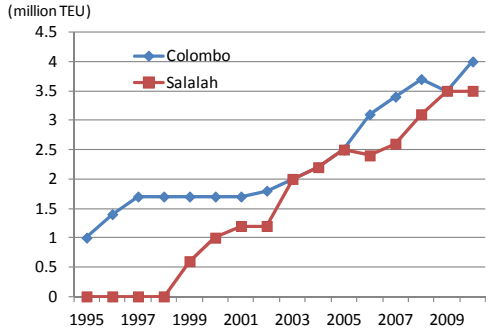
A4. Port of Colombo

Port of Colombo in Sri Lanka is the first port in South Asia to embrace containerization.

Profile of National Port System:

The Port of Colombo is located on the West Coast of Sri Lanka, only 8 hours from the main shipping route connecting Europe and the Far East. Colombo's advantage is its geographic location.

As the first port in South Asia to embrace containerization, Colombo Port has become the transshipment hub for Indian and Pakistani containers. However, the port has witnessed stagnation of container volumes since 1997 as shown in graph below partly due to the emergence of the Port of Salalah in the Middle East. In recent years, competition with neighboring ports has been more intense.



Source: Containerisation International Yearbook

Responsible branch of government:

Ministry of Ports and Aviation administers Sri Lanka Port Authority (SLPA).

Regulatory responsibility:

The operational and technical divisions at SLPA are in charge of operating and maintaining the port facilities and equipment.

Number of major seaports: 7

Colombo, Galle, Trincomalee, Point Pedro, Kankasanthurai, Hambantota and Oluvil.

Characteristics to be Highlighted

- Strategic Geographic Location
- First Port in South Asia to Address Containerization
- Significant Reduction in Workers
- Competition among Terminals

Source: DMTX
http://www.demotix.com/news/princess-chrisanta-ship-approaching-colombo-port

Source: MOFA
http://www.mofa.go.jp/mofaj/gaiko/oda/shiryo/hakusyo/06_hakusho/ODA2006/html/honbun/hp101000000.htm

Characteristics of Port and its Hinterland (City/State/Country)

Geographic Characteristics

- Sri Lanka has an area of 65,610 km^2, a population of 20.9 million and a population density of 333/km^2 (2011).
- Sri Lanka has been a center of international trade for many centuries as it is strategically located in the Indian Ocean, along the main East-West shipping route and just 31 km from Southeast India.
- Colombo City, the capital of Sri Lanka, has an area of 37.3 km^2, a population of 647,100 and a population density of 17,344/km^2 (2001).

Economic Characteristics

- Sri Lanka's GDP per capita was US$1,241 in 2005, and is estimated to reach US$2,830 in 2011

Operational Characteristics

- Two container terminals at the Port of Colombo are operated by the Sri Lanka Port Authority (SLPA), whereas SAGT is operated by a private terminal operator. It is expected that SAGT will promote competition between terminal operators and improve the efficiency of the operation.
- Transshipment accounted for 7% of total throughput in 1979, increased to 52% in 1985 and was 75% in 2011.
- A large part of the transshipment containers move from/to the Indian Subcontinent including India, Bangladesh and Pakistan.

Responsible public agency:

The port sector is administered through the Sri Lanka Ports Authority (SLPA) Act of 1979, which is based on the philosophy of a government-owned service port. SLPA was established on 01 August 1979, amalgamating three institutions; Port Commission, Port (Cargo) Corporation and Port Tally and Protective Services Corporation. It is under the jurisdiction of the Ministry of Ports and Aviation and responsible for operating and administrating all specified ports in Sri Lanka in accordance with the Act No.51 of 1979 and subsequently amended by Act No. 7 and 3 in 1984.

Most recent reform: Privatization of QCT in 1999

The Port of Colombo consists of three container terminals; Jaya, Unity and Queen Elizabeth Terminals. Of these three terminals, the Government of Sri Lanka privatized the Queen Elizabeth Container Terminal (QCT) in 1999 and the concession was awarded to a consortium led by P&O Ports (the other members are Maersk Line, John Kweels and SLPA) and the terminal was renamed the South Asia Gateway Terminal (SAGT). The QCT container facility was transferred to the consortium for a three-phase expansion to increase the handling capacity to one (1) million TEU per annum. SAGT handled 1.97 million TEU in 2010. Hence, the current performance is almost two times larger than the original target.

Operation model: BOT at SAGT

After evaluating the responses to an internationally advertised Expression of Interest (EOI) in 1995 and a long period of negotiation, the 30 year BOT concession agreement to redevelop, re-equip and operate the QCT was signed between the Government represented by SLPA and SAGT in 1999.

Workforce:

Although SLPA had a staffing level of 19,344 in 2000, far in excess of the numbers needed, it fell to 12,828 in 2010 and subsequently 10,982 in 2011. Amongst SLPA employees, the number of workers in Colombo port reached 10,083 in 2011. It is important to point out that after privatization in 1999, SAGT has operated the terminal with approximately 475 people, compared to 2,000 people when managed and operated by SLPA.

The "Before" Situation

- Colombo started container operations in December 1973 on a very small scale with American President Lines (APL).
- In 1980, the first dedicated container terminal at Colombo Port began its operation.
- Although most major ports in the world had been operated by the landlord model, allowing the private sector to operate port infrastructure facilities and addressing the need to react swiftly to a rapidly changing market, the Port of Colombo was operated exclusively by SLPA under the 1979 SLPA Act.

Source: Goyo Construction Co., Ltd. (http://www.penta-ocean.co.jp/project/work/facility/public/001.html)

- Efficiency at the Jaya Container Terminal (JCT) is low as can be seen in container moves per hour. JCT averages 17-19 containers per hour whereas the industry average is at least 25-30.

Operational Development Schemes and Relevant Policy Changes:

Topic 1: Colombo Port Development Master Plan (1989–1995) and National Ports and Shipping Policy of 1997–2002

The Master Plan and Ports and Shipping Policy aimed at giving Sri Lanka the largest hub port in South Asia by developing the Ports of Colombo and Galle. They also encouraged private sector involvement in port development and operation while emphasizing the importance to support port activities with public finance. One indication of the success of these efforts is improvement in offshore waiting times. In 1995, the average offshore waiting time was 21 hours. This was reduced to 7 hours in 2003 leading to a further decrease to 2 hours in both 2005 and 2006.

Topic 2: Reform in SLPA and the cease-fire agreement in 2002

As War Risk Sub-charge (WRS) was added to ships calling Sri Lankan ports, responding to the terrorist attack at Katunayake International Airport in July 2001, major regular shipping lines bypassed the Port of Colombo and shifted their ports of call to neighboring countries. However, the situation changed when all board members at SLPA were replaced in January 2002 and the indefinite cease fire agreement between government forces and the separatist Liberation Tigers of Tamil Eelam (LTTE) was made a month later.

Topic 3: Port Development Plan and Policy (2002–2010) and SLPA Corporate Plan (2006–2010)

These plans continuously sought the development of Sri Lankan ports by developing six ports in the nation. To maintain the Port of Colombo's competitive advantage against neighboring ports the development plans aimed to improve operating efficiency and expand the port's size to increase container handling volume as well as general cargo volume. More specifically, the

short-term development plan of Colombo Port aims at deepening the entrance channel to 16m and the berth area to 15m, upgrading gantry cranes, increasing the container handling capacity at Jaya container terminal and enhancing the service level at Unity container terminal. In the long term, the Port seeks infrastructure improvements to accommodate deeper draft vessels.

Topic 4: Colombo South Harbor Development

In order to compete with rapidly growing neighboring ports and the introduction of large vessels in the container shipping industry, the Sri Lanka Government launched the large development plan called Colombo Port South Harbor Development Project with Asian Development Bank (ADB). The plan aims to develop a harbor with an area of approximately 600 ha, providing three (3) container terminals each with a quay of 1,200m and 18m depth alongside. The project is underway using a public private partnership scheme with ADB's $300 million loan approved in 2007.

LESSONS LEARNED

Steady increase in container throughput at the Port of Colombo has been demonstrated over the past 10 years. This trend was supported by government's plans and policies to strategically develop domestic ports and increase the handling volume of containers and general cargo through involvement of the private sector.

The privatization of QCT in 1999 was successful in that it improved the efficiency of terminal operations. For instance, the number of staff working at QCT (SAGT after privatization) was dropped by approximately 1,525 people. In addition, the average off-shore waiting time was decreased by 14 hours in 2003 compared with 1997.

Privatizing QCT triggered the reduction in SLPA staff, and contributed to improving the efficiency of SLPA terminals' operation by offering competition.

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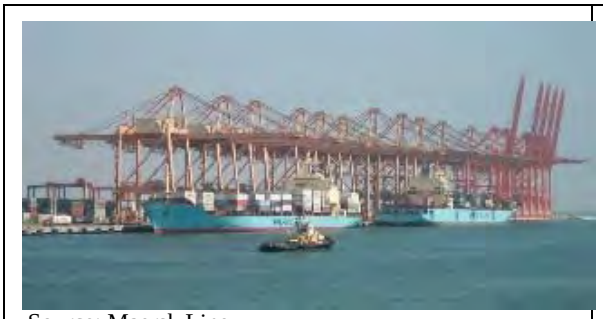
ADB, 2000, Developing Best Practices for Promoting Private Sector Investment in Infrastructure, ADB, 2001, *Report and Recommendation for the Colombo Port Efficiency and Expansion Project*, Central Bank of Sri Lanka, 2011, *Annual Report 2011*, Galhena, R., 2003, Container Terminal Development and Management: The Sri Lanka Experience (1980-2002), *United Nations*, New York and Geneva, Ishimori, K., 2009, Port of Colombo North Pier Development Project (1) (2) Urgent Upgrading of Colombo Port Project, *Ex-Post Evaluation of Japanese ODA Loan Project*, Mannion, M., Neville-Jones, P., Young, M., Abeysiriwardena, S., *Meeting the challenge: expansion of the Port of Colombo*, Sri Lanka Business Online, 2010, *Sri Lanka port loses revenue, sheds dockers* (http://www.lankabusinessonline.com/fullstory.php?nid=179927904)

A5. Port of Salalah

Port of Salalah in Oman has achieved rapid growth by drawing on the prosperity of the Dubai Port and has grown to be one of the major transshipment hub ports.



Source: Maersk Line
http://www.maerskline.com/link/?page=brochure&path=/about_us/photo_gallery/other_pictures/vessel_salalah

Profile of National Port System:

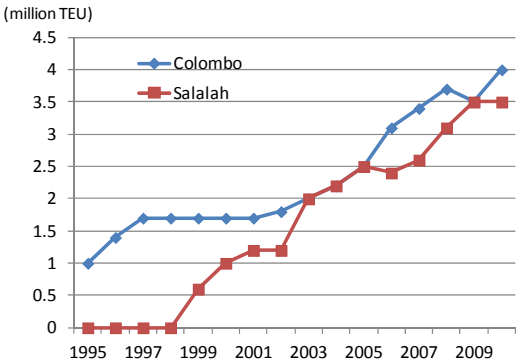
The Port of Salalah (known formerly as Raysut) has increased container handling volume significantly since the commencement of its operation in November 1998, establishing itself as a leading container transshipment center hub.

Responsible branch of the government:

Ministry of Transport and Communication (MOTC) overseas the development and regulation of maritime and port sector.

Number of major seaports: 6

Khasab, Shinas, Sohar, Sultan Qaboos, Duqm and Salalah



Source: Containerisation International Yearbook

Characteristics to be Highlighted

- Strategic Geographic Location
- Price Competitive Port
- Omanization

Source: Constructionweekonline.com
http://www.constructionweekonline.com/article-9206-expanding-salalah-port-sees-15-rise-in-revenue/

Source: World Port Source
http://www.worldportsource.com/ports/OMN_Port_of_Salalah_136.php

Characteristics of Port and its Hinterland (City/State/Country)

Geographic Characteristics

- Oman has an area of 309,501 km^2, a population of 2.77 million and a population density of 9.2/km^2 (2010).
- The City of Salalah is the second largest city in the country.
- The Port is 150 km from major East-West shipping lanes.

Economic Characteristics

- Oman's GDP per capita was US$26,519 in 2010.

Operational Characteristics

- Salalah Port Services Company SAOG is a Public Omani Company with 30% foreign ownership and 70% locally owned. The A.P. Moller - Maersk Group is the largest shareholder with 30%, The Omani Government 20%, Local Private Sector 19%, Government Pension Fund 11% and 20% is traded on the Muscat Securities Market.
- In 1999, the Port of Salalah set the world record for productivity, with more than 250 moves per hour.
- 99% of the throughput is transshipment.
- The port's net profit percentage was 19% in 2003

Responsible public agency: Directorate General of Ports and Maritime Affairs
Directorate General of Ports and Maritime Affairs comes under the jurisdiction of the Ministry of Transport and Communications. The Directorate General is assigned to manage ports and regulate navigation and maritime transport activities.

Most recent reform:
Port of Salalah did not witness a major reform such as the corporatization and privatization.

Operation model: Concession
The terminal operator is Salalah Port Service (SPS), which is 30% owned by APT Terminal and 70% by domestic investors (20% is owned by the government). SPS has a 30 year concession agreement to manage the port on behalf of the Government of Oman.

Workforce:
The number of employees at the Port was 1,300 in 2004, 1.5 times bigger than 2001.

The "Before" Situation

- The first phase construction of Port of Salalah was from 1971 to 1974 followed by the second phase from 1976 to 1980.
- The Government of Oman signed a contract with APM Terminals in December 1996 to build and operate the terminal.
- The container terminal with state-of-the-art equipment started its operation in November 1998 with two berths.
- Two more berths were completed three months ahead of schedule in April 1999.
- In 2003, Port of Salalah achieved for the first time 2 million TEU handled in a single year.

Source : Seefatherblog (http://seefahrer.blog.de/2009/07/27/bremen-verlaesst-deutsche-gewaesser-6599680/)

- In 2008, Berth 6 was completed, increasing annual handling capacity to 4.5 million TEU and Government of Oman signed an MOU with Port of Salalah on the construction of three more new berths.
- In addition to the current seven container berths, the construction of an additional two berths has been approved. Once completed in 2012 the port will have a total quay length of 3,555m.

Operational Development Schemes and Relevant Policy Changes:

Topic 1: Learning from the best practices at the Dubai Port

Drawing on the prosperity of the Dubai Port, the government of Oman and Sea-Land together (before acquisition by Maersk Line) launched the Salalah Port development project, modernizing the container terminals in 1998.

Topic 2: Omanization

The Omani government upholds the program called "Omanization" to integrate more and more Omanis into positions that have been held by foreigners. While the government is committed to privatization, the Port of Salalah has contributed not only to provide world-class port facilities but also to create new employment opportunities for Omani citizens.

Topic 3: Envisaging future steady growth

Having completed two phases of its expansion in 2009, the Port revised its 20 year master plan which envisages providing annual capacity for 20 million TEU, 40 million tonnes of bulk cargo and 5 million tonnes of liquid cargo.

LESSONS LEARNED

Sharp rise in container throughput at the Port of Salalah has been witnessed since its inception. There are several contributing factors to this growth such as learning from the best practices at Dubai Port, setting the terminal and port charges lower than rival ports as well as committing to achieve Omanization.

Having price competitiveness against rival ports is the same strategy taken by the Port of Tanjung Pelepas. Although the location of Salalah is attractive enough to be a container hub, its strategic approach supported by the government is worth pointing out. Furthermore,

political uncertainty in Yemen led shipping lines to bypass the Port of Aden and instead call at the Port of Salalah.

The characteristic of transshipment at the Port of Salalah lies in the feeder services to the Gulf, the Red Sea, Indian Subcontinent and East and South African regions as well as relay transship between trunk shipping lines. Relay transshipment accounts for approximately 20% of the total transshipment.

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