Chapter 5 Assessment of Port Development Priorities

5.1 Indices of Assessment

Project evaluation is generally made by means of a cost benefit analysis comparing the benefit to be obtained through the implementation of a project with the cost necessary for the project. Cost Benefit Ratio (CBR) or Economic Internal Rate of Return (EIRR) is usually calculated for the project evaluation. In case of port development projects, the benefit is a reduction in maritime transportation cost, through which prices of imported goods may be reduced and the export may become competitive and the production may be expanded. Both consumers and producers enjoy the benefit of port development. Port development priorities may be assessed by comparing CBR or EIRR.

Cost benefit method is a good tool to evaluate project alternatives and select the most cost effective one. However, it can be difficult to calculate the benefit to a region when the implementation of a project is expected to have wide effects. The pattern of trade flow may be changed by port development projects but the projection of such changes may be difficult and not so reliable due to unforeseen factors.

It is therefore recommendable that initial screening of projects shall be implemented by means of rating important factors related to port development. The Checklist in Table 5.1-1 shows important factors to be considered at the initial stage of port project evaluation in ASEAN. From the viewpoint of ASEAN maritime network, emphasis shall be placed on the item 1) Responding to Maritime Transport Demand, 3) Reduction in Maritime Transport Cost, and 5) Coping with regional transportation corridors.

Table 5.1-1 Checklist for the Initial Assessment of Port Development Projects

Items	Important Factors	Rating
1) Responding to Maritime Transport Demand	1-1) Measures coping with the shortage of port capacity	High, Mid., Low
	1-2) Measures responded to larger vessels to be deployed	High, Mid., Low
	1-3) Measures for improving the productivities	High, Mid., Low
2) Effects on Regional Development	2-1) Development of Economic Special Zones/Industrial Zones around the port	High, Mid., Low
	2-2) Scale of Foreign Investment in Port Development	High, Mid., Low
3) Reduction in Maritime Transport Cost	3-1) Reduction inprices of imported goods	High, Mid., Low
	3-2) Reduction in sales prices of exported goods and expansion of the production	High, Mid., Low
	3-3) Reduction in the cost of coastal shipping	High, Mid., Low
	3-4) Number of beneficiaries and Scale of the benefits	High, Mid., Low
4) Reduction in Land Transport Cost	4-1) Reduction in the distance of inland transportation	High, Mid., Low
5) Coping with Regional Transport Corridors	5-1) Roles in line with Regional Corridor Projects	High, Mid., Low
	5-2) Roles in ASEAN Maritime Network	High, Mid., Low
6) Others	6-1) Roles in Navigational Safety	High, Mid., Low
	6-2) Coping with Port Security	High, Mid., Low
	6-3) Rehabilitation of Port Facilities	High, Mid., Low
	6-4) Port Environment Protection	High, Mid., Low

5.2 Assessment of Port Capacity

5.2.1 Identification of Bottlenecks

In order to assess the capabilities for dealing with regional maritime transportation, it is important to examine the factors listed in Table 5.1-1, in particular 1-1) Measures coping with the shortage of port capacity, 1-2) Measures responding to larger vessels to be deployed, and 1-3) Measures for improving the productivities shall be examined carefully. The recommended procedures for assessing port capacity are shown in Figure 5.2-1.

Based on cargo forecast of each network port, its cargo handling capacity shall be checked from the point of view of cargo types to be handled, terminal facilities available, capacity of terminals, cargo handling productivities, restrictions on ship access navigation and the capacity of hinterland transportation. Following the procedures in the table, present and future bottlenecks of the port shall be firstly identified and measures to cope with the bottlenecks shall be planned for network ports.

Standard levels of each port facility are included in Chapter 4 of this report for reference. Since bulk cargo and liquid cargo are mainly handled at private facilities of industrial companies, their transportation is not dependent on the maritime network. Regular services by Ro/Ro ships are mainly for local coastal transportation and services by PCC ships are only for distribution of manufactured cars. Network plays an important role for liner services, especially for container transportation. Ferry services for passengers are also for coastal transportation and sub-regional links in ASEAN. International cruisers have less relation to the port network. Therefore, efforts shall be placed on examining the capability of liner services in the region and assessing the container handling capacity of network ports.

Bottlenecks are categorized in four areas in Table 5.2-1, namely 1) insufficient port facilities, 2) low productivity in operation, 3) restrictions on navigation, and 4) restrictions on land transport. Consequently, measures to cope with these bottlenecks are not only the development of infrastructure but the improvement in port management and information systems.

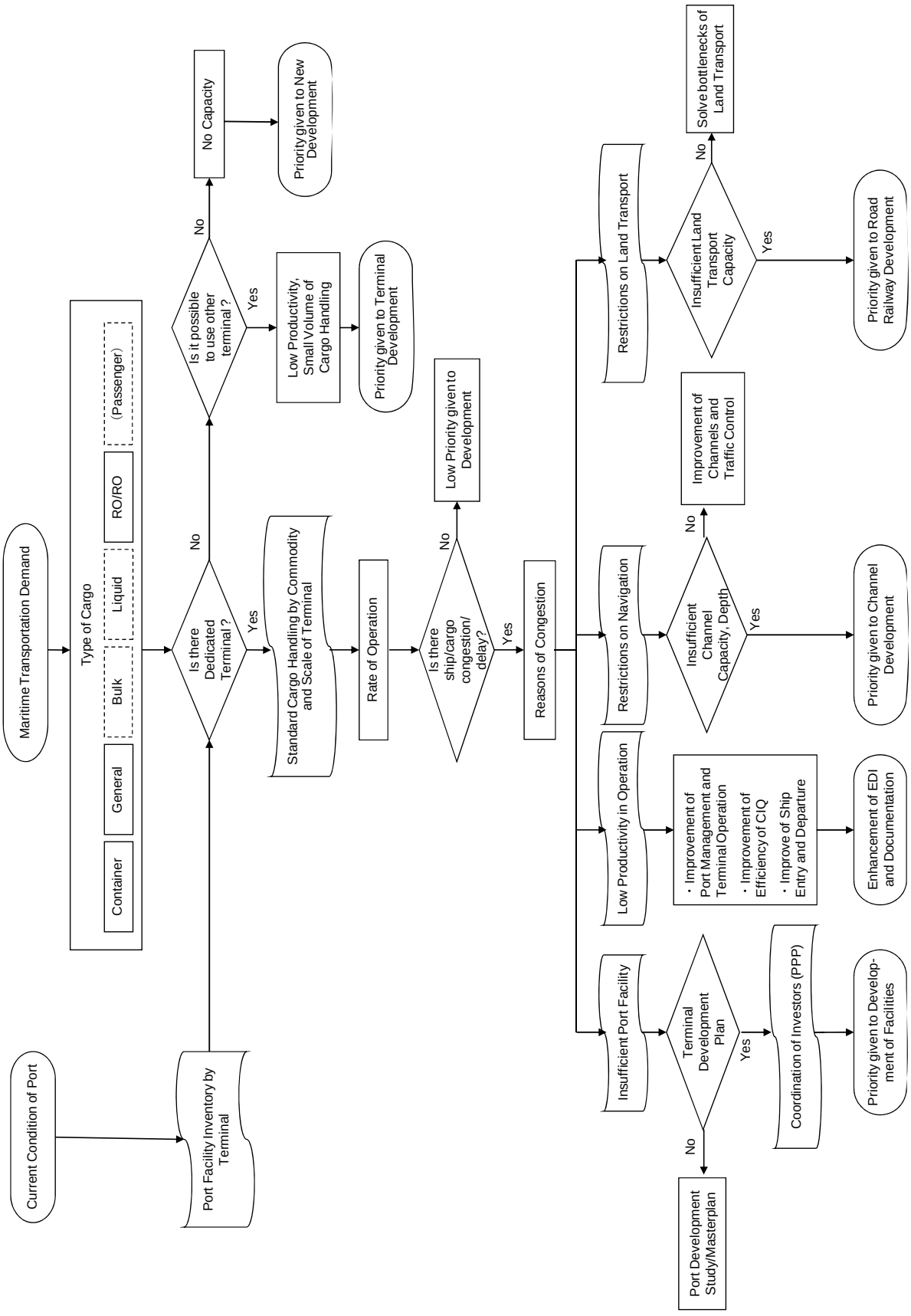


Figure 5.2-1 Assessment Procedures of Port Capacity

5.2.2 Expected Performance Levels of Container Terminal Operation

The same performance cannot be expected at every container terminal due to the difference in sizes of calling vessels, terminal facilities, volume of cargo handling, and other operational factors. As mentioned in Chapter 4.2, the capacity of container terminals in the ASEAN region is analyzed and concluded as shown in Table 5.2-1. Expected performance levels are proposed based on previous studies, design samples of mega terminal operators and the result of the analysis in Chapter 4.2.

The best performance of the world class transshipment ports serving as hubs of trunk liner services (Type 1), i.e. Singapore, Tanjung Pelepas and Port Klang, is expected to be 600-750 thousand TEUs per berth and its operational outcome is about 75%-85% of the best performance. World class ports serving as main gateways to a country (Type 2) are expected to have the best performance of 470-730 thousand TEUs per berth and the minimum performance of 300 thousand TEUs per berth, i.e. ports of Tanjung Priok, Manila, Laem Chabang, and Ho Chi Minh.

Large scale ports serving mainly for regional container shipping (Type 3) are expected to have the best performance of 350-500 thousand TEUs per berth and the minimum performance of 250 thousand TEUs per berth on the assumption that berth length is around 300 meters. The best performance of small scale ports serving mainly for regional container shipping services (Type 4) is expected to be 190-260 thousand TEUs and the minimum performance is expected to be 125 thousand TEUs.

Small scale ports/terminals for coastal shipping and/or sub regional services (Type 5) are expected to have the best performance of 70-100 thousand TEUs per berth. These ports are not equipped with quay gantry cranes for container handling and use portal cranes or mobile cranes. The performance of these ports/terminals can be improved by installing quay gantry cranes.

Table 5.2-1 Expected Performance of Container Terminals

	Minimum Per-formance (1000TEUs/Berth)	Best Performance (1000TEUs/Berth)
Type 1. World class transshipment port serving as a hub of trunk line services	-	600-750
Type 2. World class port serving as a main gateway to their country	350	470-730
Type 3. Large scale port serving manly for inter regional container shipping	250	350-500
Type 4. Small scale port serving mainly for intra regional container shipping	125	190-260
Type 5. Small scale port (terminal) mainly for coastal and/or sub-regional services	-	70-100

5.2.3 Expected Sizes of Calling Vessels

About 4,500 full container ships are registered in the world as of June 20084 and its distribution by sizes is shown in Figure 5.2-2. The 500-999 TEU class accounts for the largest number of vessels at 814 followed by the 1,000-1,444 TEU class with 677. The main size of feeder container vessels in the ASEAN region has a capacity of around 1,000 TEUs or less. In the future, larger vessels of 2,000 TEUs, i.e. around 30,000 DWT, may be introduced due to the effect of stepping down of large size of container vessels from trunk liner services.

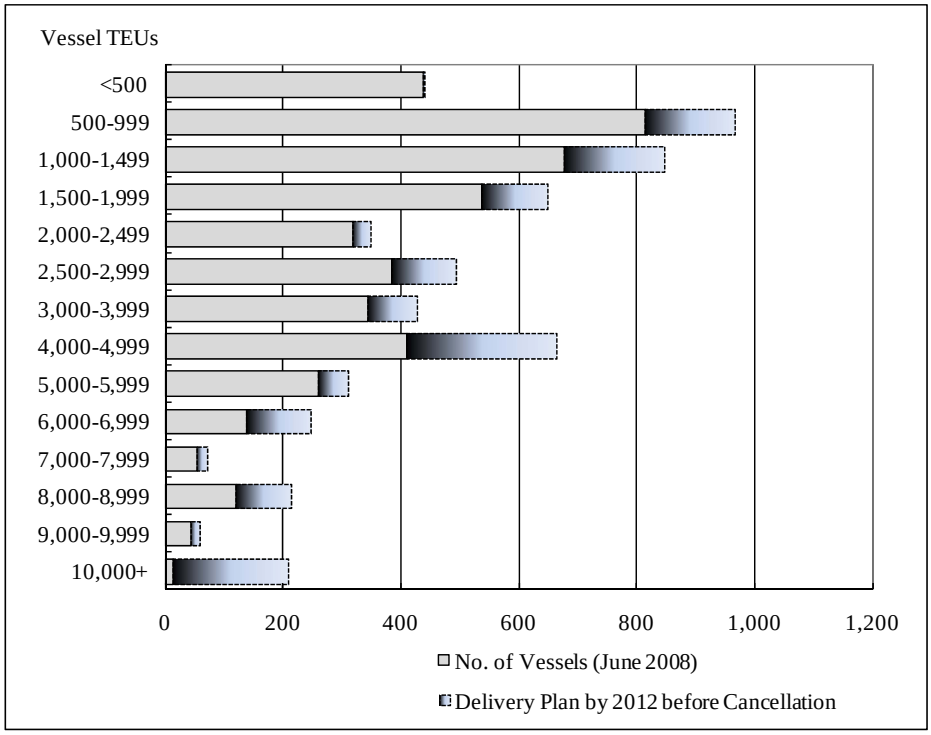
Besides the vessels in the 2,000 TEU class, the 4,000-4,999 TEU class is largest. Vessels of this class are Panamax size and used to be deployed in long distance trunk liner services, but have

[4] Drewry Container Insight, World (Cellular) Containership Fleet, 30 June 2008, Issued July 2008

been replaced with over Panamax vessels. Container vessels of this class may be deployed in inter-regional trunk liner services in Asia. Therefore, large scale ports serving for regional container services will be required to accommodate container vessels of this class.

Container vessels over 6,000 TEUs are used in long range trunk liner services, and will be major size engaging in Asia-USA and Asia-Europe services, so the type 1 ports and some type 2 ports in ASEAN (listed in Chapter 6.1) may be required to have port facilities to accommodate vessels of this class. Figure 5.2-2 also shows the delivery plan of container vessels by 2012, but many of them might have been cancelled due to the world recession since October 2008.

Dominant size of container vessels deployed in major trunk liner services will be 6,000-8,000 TEUs and much larger containerships with a capacity of 100,000-150,000 TEUs will be assigned to specific services. However, not so many ports are required to cope with vessels of this size. For regional container services, container vessels with a capacity of 2,000 TEUs or under will play an important role.



Data Source: Drewry Container Insight, June 2008

Figure 5.2-2 Distribution of Containership Sizes-World Fleet-

5.3 Performance Levels of Container Terminals in Network Ports

Berth productivities of container terminals in networks ports are estimated as shown in Table 5.3-1. Taking into account the characteristics of each network port, types of terminals are indicated in the table, which are given in accordance with the types of ports summarized in Chapter 6.1. While terminals located in the types 2 or 3 ports are generally classified as types 2 or 3, terminals only for coastal ships or small feeder services are classified as types 4 or 5 in accordance with expected port capacities.

The highest berth productivity was identified at the Port of Laem Chabang, Terminal B4, whose container throughput reached 737,000 TEUs in 2008. The berth length of B4 Terminal is 300m and the area is 10.5ha, which are rather small scale compared with recent modern container terminals. Next highest productivity was also seen at Laem Chabang Port, Terminal B3, which handled 630,000 TEUs in 2008. The size of terminal is the same as B4.

While the berth productivity of each terminal in Port of Singapore was not released, average berth productivity of all PSA terminals was estimated at 537,000 TEUs per berth in 2008. Port of Tanjung Pelepas achieved a berth productivity of 560,000 TEUs per berth in 2008. These three ports represent as the best performance ports in the region.

Cat Lai Terminal in Ho Chi Minh city, Vietnam, achieved a berth productivity of 288,000 TEUs per berth in 2008, which corresponds to 509,000 TEUs per berth (assuming a length of 300m). The port achieved higher productivity with small/medium class port facilities.

The berth productivities of type 2 ports are from 220,000 -737,000 TEUs per berth and those of type 3 ports are from 120,000-310,000 TEUs per berth. Type 4 ports attained a berth productivity from 30,000-150,000 TEUs per berth in 2008. Type 5 ports handled containers at a multi-purpose berth or general cargo berth, and thus the berth productivity is therefore lower than the other types. These ports may need to refurbish or build a container terminal in accordance with the demand for container handling.

Table 5.3-1 Container Throughputs and Berth Productivities

Country	Network Ports	Terminal	Type	Container Throughput (TEUs)	No. of Berths	TEU/ Berth
Brunei	Muara	Muara Container Terminal	4	90,372	2	45,000
Cambo-dia	Sihanoukville	New Container Terminal	4	258,775	2	129,000
	Phnom Penh	Main terminal*	5	47,349	3	16,000
Indone-sia	Belawan	INTERNATIONAL TERMINAL	4	352,522	4	88, 000
	Tanjung Priok (Jakarta)	Jakarta International Container Terminal	2	1,995,781	9	222, 000
		Terminal Petikemas Koja (TPK Koja)	2	704,618	3	235, 000
		Multi Terminal Indonesia. PT	2	175,511	2	88, 000
	PALEMBANG	CONTAINER	4	78,469	1	78, 000
	Panjang	Container Terminal	4	104,142	1	104, 000
	Pontianak	Container Terminal	4	132,732	2	66, 000
	TANJUNG PERAK	Terminal Petikemas Surabaya (TPS)	3	1,161,974	6	194, 000
	Tanjung Emas (Semarang)	Terminal Peti Kemas Semarang (TPKS)	3	373,646	2	187, 000
	Makassar	Makassar Container Terminal	4	353,247	4	88, 000
	Bitung	Bitung Container Terminal	4	80,053	1	80, 000
	Jayapura	Dermaga 1 and Dermaga 2	5	42,563	2	21, 000
	Banjarmasin	Trisaksti (Kade 270 sd 510)	4	251,543	2	126, 000
Malay-sia	Port Klang	Northport	1	3,005,020	12	250, 000
		Westport	1	4,967,659	11	452, 000
	Penang	North Butterworth Container Terminal	3	929,639	3	310, 000
	Johore (Pasir Gudang)	CT1～3	3	934,767	3	312, 000
	Tanjung Pelepas	Bearth1-10	1	5,600,000	10	560,000
	KUANTAN		4	127,061	3	42, 000
	BINTULU	BICT	4	290,167	2	145, 000
	Kota Kinabalu	Sapangar Bay Container Port	4	193,854	2	97, 000
Myan-mar	Yangon	Asia World Terminal (AWPT)	4	110,265	4	28, 000

Country	Network Ports	Terminal	Type	Container Throughput (TEUs)	No. of Berths	TEU/ Berth
Philip-pines	Manila	Pier 3 & Pier 5 of South Harbor	3	743,555	6	124, 000
		MICT	2	1,519,077	5	304, 000
	Subic Bay	New Container Terminal-1(NCT-1)	4	29,370	1	29, 000
	Cebu	Cebu International Port	4	157,633	3	53, 000
	Zamboanga		4	64,960	4	16, 000
Singa-pore	Singapore	All PSA Terminals	1	29,000,000	54	537, 000
		Jurong Terminal	3	920,000	5	184,000
Thai-land	Bangkok	Terminal 1	3	851,996	4	213, 000
		Terminal 2	3	510,332	4	128, 000
	Laem Chabang	A-0	2	561,155	2	281, 000
		A-2	2	463,984	2	232, 000
		A-3	2	327,609	1	327, 000
		B-1	2	591,816	1	592, 000
		B-2	2	536,141	1	536, 000
		B-3	2	629,777	1	630, 000
		B-4	2	737,347	1	737, 000
		B-5	2	632,421	2	316, 000
		C-1	2	335,149	2	168, 000
		C-2	2	335,149	2	168, 000
		C-3	2	424,680	2	212, 000
	Songkhla		4	140,356	2	70, 000
Viet-nam	Ho Chi Minh City	Cat Lai Terminal	2	2,018,105	7	288, 000
		Vietnam International Container Terminal	3	540,164	4	135, 000
	Da Nang	Tien Sa Terminal	4	61,881	1	62, 000
	Hai Phong	Chua Ve*	3	509,667	3	170, 000
		Doan Xa*	4	111,665	1	112, 000
		Transvina*	4	104,198	1	104, 000
		Green Port*	4	173,759	2	87, 000
		Dinh Vu*	4	123,993	2	62, 000
	Cai Lan	B5-B7	3	102,061	3	34, 000

* Year 2007

Source: Answers to the Questionnaire

5.4 Roles in line with Regional Corridor Projects

Important factors for assessing port development priorities are listed in Chapter 5.1, where gateway ports for the regional corridor plan are deemed to have higher priorities. There are three regional corridor plans in the Greater Mekong sub region, namely, East-West Corridor, North-South Corridor, and Southern Corridor. There are also plans to strengthen the connection between the Philippines and Malaysia by ferry from Sandakan to Zamboanga, and connection between Malaysia and Indonesia by Ro/Ro and/or Ferry service from Penang to Medan. Ports necessary for these projects shall be given a priority.

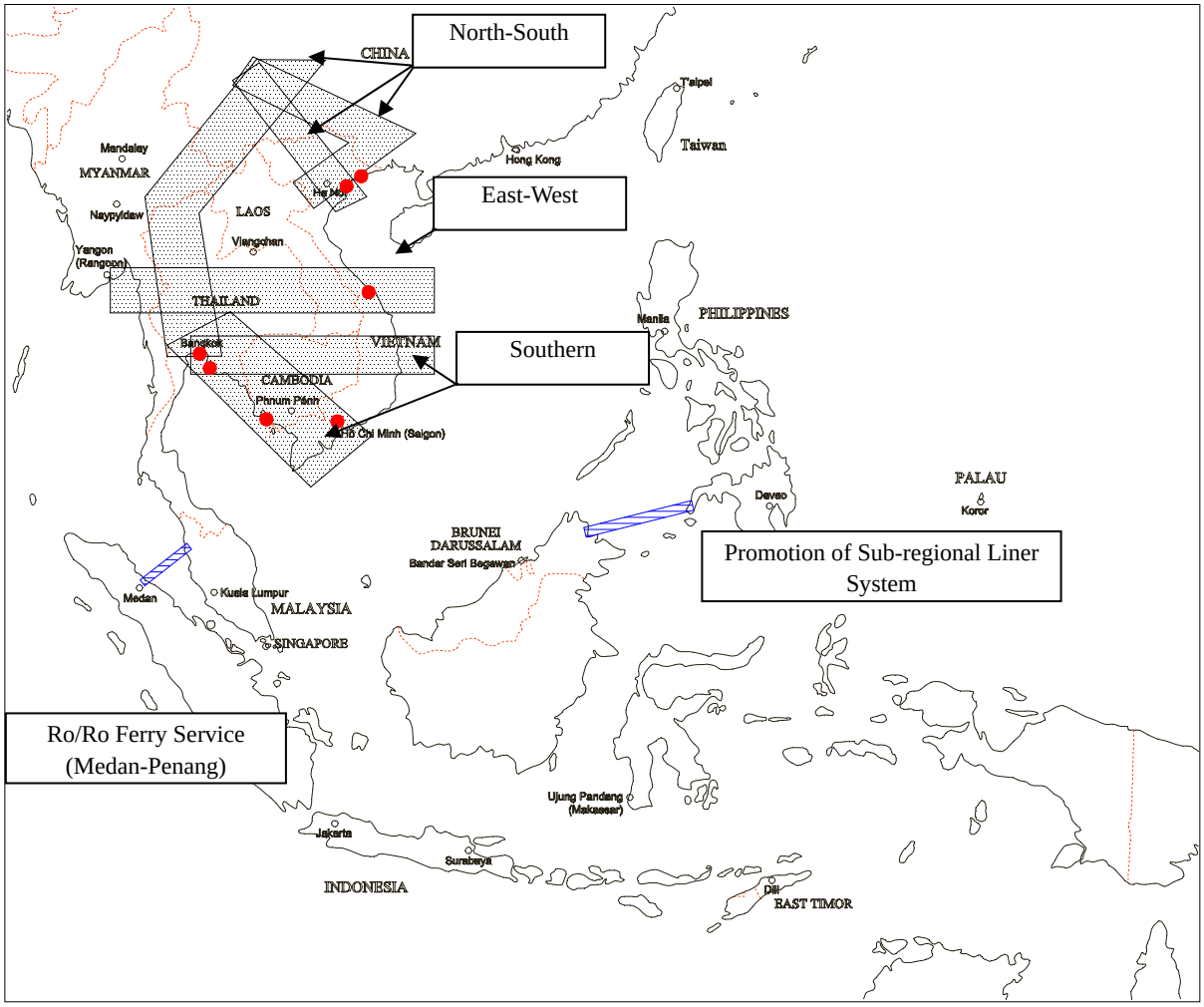
Related ports to Regional Corridor Project are as follows:

North-South Corridor:	Hai Phong, Cai Lan, Bangkok, and Laem Chabang
East-West Corridor:	Da Nang, (Mawlamyine[5])
Southern Corridor:	Ho Chi Minh, Phnom Penh, Sihanoukville, (Dawei[6])

Ro/Ro Ferry Service (Medan-Penang):	Belawan, Penang
Sub-regional Liner System (Sabah-Mindanao):	Sandakan, Zamboanga

These corridors and sub regional Ro/Ro ferry connections are illustrated in Figure 5.4-1. Beside these routes, there are important connections between Java and Kalimantan, and between Java and Sulawesi in Indonesia. Related ports are Balikpapan, Banjarmasin and Makassar.

[5] Mawlamyine, Myanmar, Not included in network ports
[6] Dawei, Myanmar, Not included in network ports



: Corridor : Ferry Ro/Ro Route

Source: ADB GMS Corridor Plan, ASEAN

Figure 5.4-1 GMS Corridor Plans and Sub regional Ferry Ro/Ro Plans

Chapter 6 Application of Guidelines

6.1 Types of Network Ports and Expected Roles

Types of network ports are classified from the viewpoint of the scale of cargo throughput, transshipment port or origin-destination port, area of partner ports on liner services, and the dimensions of port facilities. Through on-site visits, classification of network ports is concluded as shown in Table 6.1-1.

Table 6.1-1 Classification of Network Ports

Types	Ports
1. World class transshipment port serving as a hub of trunk line services	Port Klang; Tanjung Pelepas; Singapore
2. World class port serving as a main gateway to their country	Tanjung Priok (Jakarta); Manila; Laem Chabang; Ho Chi Minh
3. Large scale port serving manly for inter regional container shipping	Tanjung Perak; Tanjung Emas (Semarang); Penang; Johore (Pasir Gudang); Kuching; Bangkok; Hai Phong; Cai Lan
4. Small scale port serving mainly for intra regional container shipping	Muara; Sihanoukville; Belawan; Palembang; Panjang; Makassar; Balikpapan; Banjarmasin; Pontianak; Kuantan; Bintulu; Kota Kinabalu; Yangon; Thilawa; Batangas; Subic Bay; Cebu; Iloilo; Cagayan de Oro; Davao; Zamboanga; Da Nang
5. Small scale port (terminals) mainly for coastal and/or sub-regional services	Phnom Penh; Bitung; Dumai; Jayapura; Sorong; Kemaman; Sandakan; Kyaukphyu; General Santos; Songkhla

Type 1

World class hub ports used for the transshipment of long distance trunk liner services are required to handle several thousand TEUs in 24 hours. Dwelling time of a container in trans-shipment port is shorter than origin-destination ports and a transshipment container is counted two times in container throughput. Consequently the berth performance is usually higher than the other type terminals. Therefore, world class hub ports with the high ratio of transshipment are classified as type 1.

Type 2

World class ports serving as a main gateway to their country are classified as type 2. Ports in this class are mainly origin-destination ports and their transshipment cargo ratio is not so high. Type 2 ports may be required to accommodate Over Panamax container ships with a capacity of 6,000-8,000 TEUs.

Type 3

Large scale ports used for inter regional container shipping services are classified as type 3, where liner services in the Asia region or between the Middle East are dominant. Ports in this class may be required to accommodate container ships up to 2,500-4,000TEU and achieve a fairly good berth productivity.

Type 4

Small scale ports used for intra regional container shipping services are categorized as type 4. Ports in this class are sometimes located in rivers and have restrictions on the draft and/or length of calling ships. Type 4 ports may be required to accommodate container ships up to 2,000-2,500 TEUs.

Type 5

Small scale ports/terminals for coastal shipping and/or sub-regional services are categorized as Type 5. Ports in this class do not have a dedicated container berth and use general cargo berth or multi-purpose berth for container handling. Productivity of container handling, therefore, remains at a low level. Type 5 ports may have difficulties in port facilities and operation, so it is necessary to study the needs for improvement carefully.

6.2 Estimate of Container Terminal Performance

The result of productivity analysis on container terminals in the ASEAN region is summarized and the expected performance of container terminals is shown in Table 6.2-2. Expected performance may be realized when the terminal facilities are well installed and the operation is conducted appropriately.

Possible performance of a container terminal mainly depends on numbers of quay gantry cranes available, their productivities, the length and water depth of a berth, and the size of container terminal area, subject to conditions that other factors like hinterland transportation are well organized and managed appropriately.

Applying a formula shown in Figure 4.2-1 in Section 4.2.2, expected performance can be calculated by the model shown in Table 6.2-1, which is designed on an Excel sheet. The output of this model is an estimation of the performance of a container terminal in terms of TEUs per berth.

Table 6.2-1 Container Terminal Expected Performance Estimate Model

	(1)		(2)	(3)	(4)	Output
Parameters	Length of Berth	Water Depth	Number of Quay Cranes	Productivity of a Quay Crane	Area of Terminal	Expected Performance
Unit	m/berth	m	units/berth	boxes/hour	m^2/berth	TEUs/berth
Inputs		*****				

Please fill in the above four cells from (1) to (4) to calculate Berth Productivity

***** Given automatically in accordance with "Length of Berth"

Parameters of this estimate model are calculated from examples of busy container terminals and the method of multiple regression analysis explained in Section 4.2.2. Allowable ranges of parameters are as shown in the following box. The model can calculate the performance even if parameters are not in the allowable ranges, but the result is not reliable due to small volume of container throughput.

Allowable Ranges of Parameters

Length of a berth:	150m-500m
Number of quay cranes per berth:	1-5
Quay crane productivity:	18-35units/hour
Area of terminal per berth:	3ha -12ha

Water depth of the basin in front of a berth is an important parameter in view of the size of calling container vessels. However, the length of a berth is also a parameter to indicate the size of calling vessels and has a correlation with the water depth of a berth. The model adopted the berth

length as a parameter and the water depth is not included to avoid duplication. Other factors, such as number of yard cranes, their productivity, number of ground slots, ratio of empty containers, are also important for estimating the container terminal capacity, but these factors are also represented by the parameter “Area of Terminal”.

The capacity of a container terminal shall be estimated by means of simulation using all important factors which influence the operation. This model estimates operational performance of a container terminal. Operational performance is generally lower than the design capacity due to seasonal changes in container transportation, redundancy for future demand and other operational reasons. Estimated performance seems to be 75%-85% of actual terminal capacity.

Provisional results of the application of this model are shown in Table 6-2-2, where “Fairly Full” indicates the terminal has a little more handling capacity corresponding to their facilities and productivities. In case their quay crane productivity is low, it is indispensable to increase not only the productivity of quay gantry cranes but also the productivity of all yard facilities and operation. The optimal solutions for these terminals shall be carefully examined.

Estimated performance of conventional berths is not indicated in Table 6.2-2 due to the fact that there is no quay gantry crane installed and their performance of container handling is very low compared with that of container terminals. It is indispensable for these terminals to install quay gantry cranes in order to increase the productivity of container handling.

Table 6.2-2 Estimated Best Performance of Terminals in Network Ports

Country	Network	Terminal	Container Throughput/ Berth, 2008 (TEUs/Berth)	Estimated Performance/ Berth (TEUs/Berth)	Develop-ment Plan
Brunei	Muara	Muara Container Terminal	45,186	85,000	Planned
Cambo-dia	Sihanoukville	New Container Terminal	129,388	Fairly Full	-
	Phnom Penh		50,000	**	Planned
Indone-sia	Belawan	INTERNATIONAL TERMINAL	88,131	142,000	Planned
	Dumai		0	**	
	Tanjung Priok (Jakarta)	Jakarta International Container Terminal	221,753	276,000	Planned
	Tanjung Priok (Jakarta)	Terminal Petikemas Koja (TPK Koja)	234,873	Fairly Full	
	Tanjung Priok (Jakarta)	Multi Terminal Indonesia. PT	87,756	199,000	
	PALEMBANG	CONTAINER	78,469	135,000	None
	Panjang	Container Terminal	104,142	281,000	Planned
	Pontianak	Container Terminal	66,366	**	None
	TANJUNG PERAK	Terminal Petikemas Surabaya (TPS)	193,662	226,000	-
	Tanjung Emas (Semarang)	Terminal Peti Kemas Semarang (TPKS)	186,823	297,000	Planned
	Makassar	Makassar Container Terminal	88,312	129,000	-
	Balikpapan	SEMAYANG	82,961	**	
	Bitung	Bitung Container Terminal	80,053	205,000	Planned
	Jayapura	Dermaga 1 and Dermaga 2	21,282	**	-
	SORONG	Dermaga 1	9,339	**	
	BANJARMASIN	Trisaksti (Kade 1 sd 270)	251,543	**	-
Malaysia	Port Klang	Northport	250,418	309,000	Planned
	Port Klang	Westports	451,605	Fairly Full	
	Penang	North Butterworth Container Terminal	309,880	340,000	Planned
	Johore (Pasir Gudang)	CT1～3	311,589	Fairly Full	None
	Tanjung Pelepas	Bearth1-10	560,000	Fairly Full	Planned
	KUANTAN		42,354	187,000	None
	Kemaman	East Wharf	0	**	
	Kemaman	West Wharf	0	**	
	BINTULU	BICT	145,084	Fairly Full	Planned
	Kuching	Senari Terminal	58,213	**	
	Sandakan		39,612	**	
	Kota Kinabalu	Sapangar Bay Container Port	96,927	**	
Myan-mar	Yangon	AWPT	110,625	Fairly Full	Planned
	Thilawa	Hutchison	0	**	Planned
	Kyaukphu		0	**	Planned

Country	Network	Terminal	Container Throughput/ Berth, 2008 (TEUs/Berth)	Estimated Performance/ Berth (TEUs/Berth)	Develop-ment Plan
Philip-pines	Manila	Pier 3 & Pier 5 of South Harbor	123,926	Fairly Full	Planned
	Manila	MICT	303,815	Fairly Full	
	Batangas		497	203,000	
	Subic Bay	New Container Terminal-1(NCT-1)	29,370	260,000	None
	Cebu	Cebu International Port	52,544	**	Planned
	Iloilo	TMO-Loboc	42,142	**	
	Iloilo	TMO-Fort San Pedro	39,794	**	
	Cagayan de Oro	Cagayan de Oro	13,636	**	
	Davao	Sasa Wharf	349,006	Fairly Full	
	General Santos		113,886	**	
	Zamboanga		16,240	**	
Singa-pore	Singapore	All PSA	537,037	Fairly Full	Planned
	Singapore	Jurong Terminal	184,000	307,000	
Thailand	Bangkok	Terminal 1	212,999	Fairly Full	None
	Bangkok	Terminal 2	127,583	Fairly Full	
	Laem Chabang	A-0	280,578	**	Planned
	Laem Chabang	A-2	231,992	Fairly Full	
	Laem Chabang	A-3	327,609	542,000	
	Laem Chabang	B-1	591,816	Fairly Full	
	Laem Chabang	B-2	536,141	Fairly Full	
	Laem Chabang	B-3	629,777	Fairly Full	
	Laem Chabang	B-4	737,347	Fairly Full	
	Laem Chabang	B-5	316,211	Fairly Full	
	Laem Chabang	C-1	167,574	349,000*	
	Laem Chabang	C-2	167,574	233,000*	
	Laem Chabang	C-3	212,340	330,000*	
	Songhkla		70,178	**	-
Vietnam	Ho Chi Minh City	Cat Lai Terminal	288,301	Fairly Full	Planned
	Ho Chi Minh City	Vietnam International Container Terminal	135,041	Fairly Full	
	Hai Phong	Chua Ve	169,889	Fairly Full	Planned
	Da Nang	Tien Sa Terminal	61,881	275,000	Planned
	Cai Lan	B5-B7	34,020	74,000	Planned

** : Conventional Berth

* : Not fully equipped

Fairly Full indicates the terminal has a little more handling capacity corresponding to their facilities and productivities.

6.3 Procedures for Assessing Development Priorities

Following studies on measures no.5 and 6, demand forecast for network ports will be executed in the course of measure no.7 of the Roadmap. In order to cope with future cargo throughput estimated at each network port, their acceptable performance can be examined by the method given in the guidelines. In case that cargo throughput came near to or over the estimated performance in network ports, examination shall be made on their operation productivities and the level of port facilities.

The guidelines also proposed the classification of network ports as shown in Chapter 6.1 and possible ship sizes calling at each class of network port. Navigational restrictions on ship entry shall also be examined in line with the guidelines as well as other operational restrictions.

Measure no.8 aims at developing project priorities to raise performance and capacity levels bridging gaps in ASEAN network ports. Firstly, a long list of projects shall be prepared by examining the gap between demand and expected performance in each network port. Secondly, screening shall be executed by a checklist for initial assessment of port development in ASEAN shown in the guidelines. Thirdly short list shall be selected from the long list and rough cost of each project will be estimated for evaluation. Finally, priority shall be given to projects in the short list by port types and by sub-regions in ASEAN. Sub-regions are provisionally deemed to be Greater Mekong Sub-region, Philippines Archipelago Sub-region and Indonesia Archipelago Sub-region and Malay Peninsula Sabah Sarawak Brunei Sub-region. Study procedures for measure no.8 are shown in Figure 6.3-1.

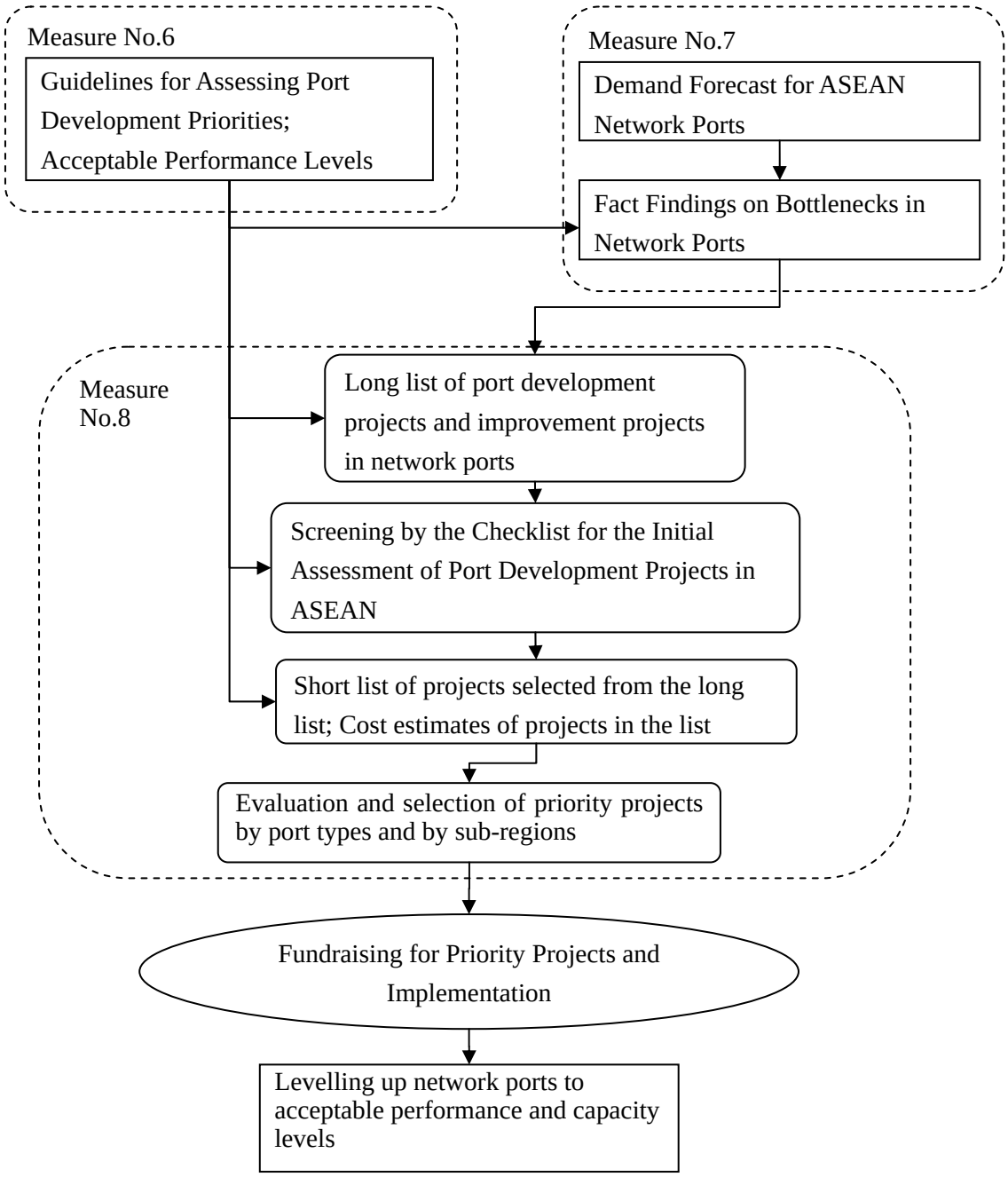


Figure 6.3-1 Possible Study Flow for Assessing Port Development Priorities

REFERENCE

ROADMAP TOWARDS AN INTEGRATED AND COMPETITIVE MARITIME TRANSPORT IN ASEAN

No	MEASURES	IMPLEMENTING BODY	TIMELINE
I. Developing a single ASEAN voice			
1	Adopt the general principles and framework for a common shipping policy. **(Done)**	Senior Transport Officials Meeting (STOM) through the Maritime Transport Working Group (MTWG), in consultation with ASEAN Ports Association (APA), ASEAN Federation of Forwarders Associations (AFFA), Federation of ASEAN Shipowners Associations (FASA) and Federation of ASEAN Shippers Councils (FASC).	December 2007
2	Establish mechanism for the consultation, coordination and consensus of ASEAN responses to emerging maritime issues, which may have an impact on the interest of ASEAN Member Countries. **(Lead Coordinator: Malaysia)**		December 2008
II. Infrastructure			
3	Review list of ports[1] in the ASEAN transport network to ensure that all ports of regional significance are included. **(Done. On-going)**	STOM through the MTWG in coordination with the APA. *(For measures 5-8, to be done through seeking technical assistance from external donors institutions)*	December 2007
4	Compile a database on ASEAN network ports. This could include inventory of the facilities available, shipping services, port tariffs, and other indicators. **(Lead Coordinator: APA)**		December 2008
5	Develop a database of maritime trade movements to and from within ASEAN. **(Lead Coordinator: Malaysia)**		December 2009
6	Develop guidelines for assessing port development priorities, including acceptable performance levels. **(Lead Coordinator: Brunei Darussalam)**		December 2009

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[1] *Insertion of ASEAN ports of regional significance will be done through the proper channels of MTWG.*

No	MEASURES	IMPLEMENTING BODY	TIMELINE
7	Identify required improvement areas in ASEAN network port performance and capacity, based among others, on regular forecasts of maritime trade and requirements. **(Lead Coordinator: Malaysia)**		December 2009
8	Develop project priorities, based on the guidelines for assessing port development, to raise performance and capacity levels towards bridging such gaps in ASEAN network ports. **(Lead Coordinator: Viet Nam)**		December 2010
9	Explore funding mechanisms, where necessary, to support the implementation of identified projects in the ports of ASEAN Member Countries.	ASEAN Member Countries, with assistance of the ASEAN Secretariat	December 2012
10	Ensure that all ASEAN network ports meet the acceptable performance and capacity levels. **(Lead Coordinator: Brunei Darussalam)**	ASEAN Member Countries	December 2015
III. Market Integration			
11	Confirm the principle of open access to the international maritime trade of all ASEAN Member Countries, as per the decisions of the other relevant ASEAN sectoral bodies, such as the ASEAN Coordinating Committee on Services (CCS), and ASEAN Maritime Transport Sectoral Negotiation Working Group. **(Lead Coordinator: Indonesia)**	STOM through the MTWG	December 2009
12	Develop the strategies for an ASEAN Single Shipping Market. **(Lead Coordinator: Indonesia)**		December 2009
13	Implement the ASEAN Single Shipping Market.		December 2011

No	MEASURES	IMPLEMENTING BODY	TIMELINE
IV. Harmonisation			
14	Develop guidelines on acceptable practices in the provision of fiscal support for shipping operations **(Lead Coordinator: The Philippines)**	STOM through the MTWG	December 2009
15	Harmonise ship registration practices. **(Lead Coordinator: The Philippines)**		
16	Develop guidelines for structure of port tariffs in ASEAN transport network ports. **(Lead Coordinator: Thailand)**		
V. Human Resources and Capacity Development			
17	Establish centres of logistics excellence at selected tertiary institutions within ASEAN. **(Lead Coordinator: Singapore)**	STOM through the MTWG	December 2009
18	Develop strategy, including encouraging private sectors, for enhanced shipboard placements. **(Potential Lead Coordinators: Indonesia and the Philippines – tbc. Or ASEAN Association on Maritime Education & Training Institutions)**		December 2009
19	Establish regional centres of maritime excellence to provide advanced training in high technology aspects of maritime operations and specialised courses in areas such as port and shipboard security **(Lead Coordinator: Singapore)**		December 2011
20	Implement single labour market for ASEAN seafarers[2].		December 2013

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[2] *In accordance with the decisions of the other relevant ASEAN sectoral bodies, such as the ASEAN Coordinating Committee on Services (CCS), and ASEAN Maritime Transport Sectoral Negotiation Working Group.*

Container Terminals

Terminal No.	Country	Port	Terminal	Container Cargo Throughput			
				2008 TEUs	2007 TEUs	2008 tons	2007 tons
1	Burnei	Muara	Muara Container Termnal	90,372	98,989	494,199	480,384
2	Canbodia	Sihanoukville	New Container Terminal	258,775	253,271	1,319,590	1,192,667
3	Indonesia	Belawan	INTERNATIONAL TERMINAL	352,522	320,515	5,120,839	5,062,407
4	Indonesia	Tanjung Priok (Jakarta)	Jakarta International Container Terminal	1,995,781	1,821,292		
5	Indonesia	Tanjung Priok (Jakarta)	Terminal Petikemas Koja (TPK Koja)	704,618	702,861		
6	Indonesia	Tanjung Priok (Jakarta)	Multi Terminal Indonesia. PT	175,511	135,019	2,125,791	1,670,511
7	Indonesia	PALEMBANG	CONTAINER	78,469	82,546		
8	Indonesia	Panjang	Container Terminal	104,142	79,767	1,407,572	1,016,322
9	Indonesia	Pontianak	INDONESIA PORT COORPORATION II	132,732	143,443	1,596,381	1,671,114
10	Indonesia	TANJUNG PERAK	Terminal Petikemas Surabaya (TPS)	1,161,974	1,119,351	25,563,428	24,625,722
11	Indonesia	Tanjung Emas (Semarang)	Terminal Peti Kemas Semarang (TPKS)	373,646	385,095		
12	Indonesia	Makassar	Makassar Container Terminal	353,247	302,023	4,099,671	3,929,817
13	Indonesia	Balikpapan	Terminal Semayang				
14	Indonesia	Bitung	Bitung Container Terminal	80,053	55,623	762,325	499,107
15	Indonesia	Jayapura	Dermaga 1 and Dermaga 2	42,563	35,771	438,020	412,180
16	Indonesia	SORONG	Dermaga 1, Demaga 2 and Dermaga 3				
17	Indonesia	BANJARMASIN	Trisaksti (Kade 270 sd 510)	251,543	225,867	2,870,527	2,549,736
18	Malaysia	Port Klang	Northport	3,005,020	2,805,997	52,909,095	49,964,665
19	Malaysia	Port Klang	Westports	4,967,659	4,312,717	77,248,796	53,407,447
20	Malaysia	Penang	North Butterworth Container Terminal	929,639	925,991	17,090,890	17,356,805
21	Malaysia	Johore (Pasir Gudang)	CT1～3	934,767	927,285		9,404,564
22	Malaysia	Tanjung Pelepas	Bearth1-10	5,600,000	5,500,000		
23	Malaysia	KUANTAN		127,061	127,600	1,585,096	1,779,950
24	Malaysia	BINTULU	BICT	290,167	251,800	4,307,318	3,852,758
25	Malaysia	Kota Kinabalu	Sapangar Bay Container Port	193,854	105,239	2,194,329	1,491,055
26	Philippines	Manila	Pier 3 & Pier 5 of South Harbor	743,555	768,632	4,377,595	5,164,898
27	Philippines	Manila	MICT	1,519,077	1,371,731	16,726,541	15,253,114
28	Philippines	Batangas	Container Terminal	497	572	8,638	8,160
29	Philippines	Subic Bay	New Container Terminal-1(NCT-1)	29,370	36,451		
30	Philippines	Cebu	Cebu International Port	157,633	169,190		
31	Philippines	General Santos		113,886	103,577	1,482,619	1,238,128
32	Philippines	Zamboanga		64,960	63,675	852,707	873,841
33	Singapore	Singapore	All PSA	29,000,000	27,932,000		
34	Singapore	Singapore	Brani Terminal				
35	Singapore	Singapore	Keppel Terminal				
36	Singapore	Singapore	Tanjong Pagar Terminal				
37	Singapore	Singapore	Pasir Panjang Terminal				
38	Singapore	Singapore	Jurong Terminal	920,000		832,000	
39	Thailand	Bangkok	Terminal 1	851,996	964,352	7,945,956	9,520,905
40	Thailand	Bangkok	Terminal 2	510,332	611,177	5,876,911	6,756,188
41	Thailand	Laem Chabang	A-0	561,155			
42	Thailand	Laem Chabang	A-2	463,984	500,926	5,663,584	5,890,132
43	Thailand	Laem Chabang	A-3	327,609	623,686	2,922,786	5,318,788
44	Thailand	Laem Chabang	B-1	591,816	860,225	6,082,142	7,118,964
45	Thailand	Laem Chabang	B-2	536,141	360,016	5,551,142	3,349,578
46	Thailand	Laem Chabang	B-3	629,777	449,641	6,124,270	3,772,827
47	Thailand	Laem Chabang	B-4	737,347	660,151	3,857,430	6,149,680
48	Thailand	Laem Chabang	B-5	632,421	650,603	3,898,447	6,136,657
49	Thailand	Laem Chabang	C-1	335,149		3,075,792	
50	Thailand	Laem Chabang	C-2	335,149		3,075,792	
51	Thailand	Laem Chabang	C-3	424,680	482,242	4,457,677	4,552,906
52	Thailand	Songhkla		140,356	138,836	1,182,904	1,139,009
53	Vietnam	Ho Chi Minh City	Cat Lai Terminal	2,018,105	1,851,145	27,000,000	23,000,000
54	Vietnam	Ho Chi Minh City	Vietnam International Container Termina	540,164	572,020		
55	Vietnam	Da Nang	Tien Sa Container Terminal	61,881	49,850	640,387	560,683
56	Vietnam	Hai Phong	Chua Ve		509,667		
57	Vietnam	Hai Phong	Doan Xa		111,665		
58	Vietnam	Hai Phong	Transvina		104,198		
59	Vietnam	Hai Phong	Green Port		173,759		
60	Vietnam	Hai Phong	Dinh Vu		123,993		
61	Vietnam	Cai Lan	B5-B7	102,061	104,401	878,168	1,032,899

Details of Container Terminals

Terminal No.	Quay						Operation	Yard	
	Number of Berths	Total Length of Berths(m)	Water Depth (m)	Maximum Vessel Alongside (DWT)	Number of Quay Cranes	Lifting Capacity of Quay Cranes	Quay Ganrty Crane Productivity (moves/hour/crane)	Total Area (m2)	Container Yard Area (m2)
1	2	250	12.5		2	40.5	26		72,500
2	2	400	10.0	20,000	2	35	22	174,000	109,000
3	4	850	11.0		6	40	18	188,090	137,070
4	9	2,139	14.0	60,000	21	45	29	1,306,000	461,400
5	3	650	14.0	60,000	6	35	20	306,000	218,000
6	2	404	9.0	14,562	4	35	26	70,000	60,000
7	1	265	9.0	18,500	1	28	24	47,000	40,000
8	1	401	12.5	40,027	2	30.5	21	81,000	75,000
9	2	205	5.0		2	30.5	15	52,000	47,000
10	6	1,450	10.5	55,000	11	40	20	930,000	400,000
11	2	495	10.0	23,500	5	35	24	220,998	170,000
12	4	850	12.0	20,000	5		22	126,400	114,400
13									
14	1	292	12.0	19,710	2	35.6	21	50,000	30,000
15	2	214	12.0	14				13,362	4,562
16	3	300	11.0	16				40,000	16,000
17		240	9.0	13	1				
18	12	3,000	15.0		27	40	25	1,450,000	1,450,000
19	11	3,200	15.2		34	40	35	648,000	648,000
20	3	900	12.0	77,000	9	40	18	200,000	200,000
21	3	759	14.0	104,000	7		27		250,000
22	10	3,600	15.0		44		32	8,000,000	1,200,000
23	3	660	11.2	45,000	4	40	29	1,000,000	32,000
24	2	450	14.0	55,000	2	40.6	20	179,973	66,450
25	2	500	12.0	30,000			15	150,000	150,000
26	6	825	12.0		7	40	25	160,000	
27	5	1,300	12.0		10	40	29	754,000	370,000
28	2	450	13.6		2	51			66,000
29	1	280	13.0		2	40.6	25	131,600	55,700
30	3	500	8.5	10,000	3	42		140,000	90,000
31	9	850	8.5	52,522	0	-	-	34,022	29,720
32	4	500	10.0	75,000	0	-	-	11,515	11,515
33	54	16,069	16.0		190			6,000,000	6,000,000
34	9	2,629	15.0		32			800,000	800,000
35	14	3,220	14.6		42			1,000,000	1,000,000
36	8	2,320	14.6		29			850,000	850,000
37	23	7,900	16.0		87			3,350,000	3,350,000
38	5	1,400	14.1		14			288,000	288,000
39	4	680	8.2	12,000	8	40	22	98,600	98,600
40	4	641	8.2	12,000	6	40	23	49,000	49,000
41	2	590	14.0	50,000				160,000	160,000
42	2	400	14.0	50,000	4	50	35	115,000	115,000
43	1	350	14.0	50,000	4	50	35	100,000	100,000
44	1	359	14.0	50,000	4	40	35	105,000	105,000
45	1	300	14.0	50,000	4	50	35	105,000	105,000
46	1	300	14.0	50,000	4	40	35	105,000	105,000
47	1	300	14.0	50,000	5	40	35	105,000	105,000
48	2	400	16.0	80,000	4	50	35	140,000	140,000
49	2	700	16.0	80,000	3	50	35	315,000	315,000
50	2	500	16.0	80,000	2	50	35	225,000	225,000
51	2	500	16.0	80,000	4	50	35	225,000	225,000
52	2	360	9.0			-	18	50,000	20,000
53	7	1,189	12.0	30,000	15	40		800,000	800,000
54	4	678	10.5	20,000	7	40	25	200,000	130,000
55	1	225	12.0	40,000	2	36	20	138,251	100,000
56	3	500	7.8	25,000	6	40		179,400	179,400
57	1	235	7.8	10,000		-		120,000	80,000
58	1	169	7.8	16,000	1	40		41,200	41,200
59	2	320	7.8	16,000		-		105,000	10,500
60	2	420	8.7	25,000	2	-		187,200	187,200
61	3	680	12.0	40,000	2	40		49,000	93,000

Conventional and Multi Purpose Terminals

Terminal No.	Country	Network	Terminal	Major Handling Commodities
1	Burnei	Muara	Muara Conventinal	Cement / Car / livestock / Bitumen /
2	Canbodia	Sihanoukville		
3	Indonesia	Belawan	Belawan Lama	Conventional
4	Indonesia	Belawan	Ujung Baru	Genaral Cargo, CPO
5	Indonesia	Belawan	Citra	Genaral Cargo, Chemical
6	Indonesia	Tanjung Priok (Jakarta)		
7	Indonesia	Palembang	Palembang	Fertilizer
8	Indonesia	Panjang	Conventional Terminal	Fertilizer/Agri products/Cement
9	Indonesia	Panjang	ISAB Terminal	Fertilizer/Agri products/Cement
10	Indonesia	Pontianak	Conventional Terminal	
11	Indonesia	Tanjung Perak	JAMRUD	Steel Product/Fertilizer/Grains
12	Indonesia	Tanjung Perak	MIRAH	Steel Product/Fertilizer/Grains
13	Indonesia	Tanjung Perak	BERLIAN	Steel Product/Fertilizer/Grains
14	Indonesia	Tanjung Perak	NILAM	Steel Product/Fertilizer/Grains
15	Indonesia	Tanjung Perak	KALIMAS	Steel Product/Fertilizer/Grains
16	Indonesia	Tanjung Emas (Semarang)	SAMUDERA	CEMENT / RAW SUGAR / AGRI PRODUCTS / OTHERS
17	Indonesia	Makassar	Conventional Terminal (Soekarno Quay)	
18	Indonesia	BALIKPAPAN	SEMAYANG	GENERAL CARGO AND CONTAINER
19	Indonesia	BALIKPAPAN	KP BARU	
20	Indonesia	Bitung	Samudera Terminal	Fertilizer/Agri products/Cement/Others
21	Indonesia	Jayapura	Dermaga 1	Wood, rattan, chocolate
22	Indonesia	SORONG	Dermaga 1	Wood, rattan, chocolate, building material, cement, passenger etc.
23	Indonesia	BANJARMASIN	Trisaksti (Kade 1 sd 270)	Pupuk, Semen, Gen Cargo
24	Malaysia	Port Klang	Northport	Steel Product
25	Malaysia	Port Klang	Westhports	Timber/Steel Product/Machinery
26	Malaysia	Penang	Butterworth Wharves	Scrap Irons / Vegetables / Provisions / Others
27	Malaysia	KUANTAN	Multi Purpose/Conventional/	Break Bulk/ Dry Bulk / Containers
28	Malaysia	Kemaman	Kemaman Supply Base	General cargo
29	Malaysia	Kemaman	East Wharf	General cargo, dry bulk
30	Malaysia	Kemaman	West Wharf	
31	Malaysia	BINTULU	Multi Purpose/Conventional/	Fertilizers / Clinker/ Silica Sand / Palm Kernel / containers/ Other General Cargo
32	Malaysia	Kuching	Senari Terminal	Container/Timber
33	Malaysia	Kuching	Pending Terminal	Conventional Cargo, Roro
34	Myanmer	Yangon	Asia World Terminal (AWPT)	Container & General Cargo
35	Myanmer	Yangon	MIPL(Myanmar Integrated Limited)	General Cargo
36	Myanmer	Thilawa	MITT(Myanmar International Terminals Thilawa)	Container & General Cargo
37	Myanmer	Thilawa	MIP(Myanmar Industrial)	Container, Cement & Timber
38	Philippines	Manila	Pier 9 & Pier 13 of South Harbor	
39	Philippines	Manila	Pier 15 of South Harbor	Containers
40	Philippines	Manila	North Harbor	Break Bulk, Bulk, Container
41	Philippines	Batangas		
43	Philippines	Iloilo	TMO-Loboc	Container, cement, fertilizer, soya, wheat, scrap metal, corn, others
44	Philippines	Iloilo	TMO-Fort San Pedro	Container, feeds, rice, sugar, corn, steel bars, bottled cargo, others
45	Philippines	Iloilo	TMO-Muelle Loney	Bottled & iron/steel products, rice, corn, fertilizers, cement, others
46	Philippines	Cagayan de Oro	Cagayan de Oro	Fruits&Vegetables, Molasses, Grains
47	Philippines	Davao	Sasa Wharf	
48	Philippines	General Santos	Mixed Cargo Terminal	Cement/Soya/Fertilizer/livestock/Rice/Tuna/Corn
49	Philippines	Zamboanga	Multi-purpose/RoRo/Others	
50	Singapore	Singapore	Jurong Terminal	steel, forestry products, metals, rubber, machinery & mechanical appliances and project cargo
51	Thailand	Bangkok	22A, 22B-22J	Metal& Steel/Fertilizer/Agri Product/Chemical
52	Thailand	Laem Chabang	A-1	Ro/Ro Passenger
53	Thailand	Laem Chabang	A-4	Bulk
54	Thailand	Laem Chabang	A-5	Ro/Ro
55	Thailand	Laem Chabang	C-0	Conventional
56	Thailand	Songhkla*		Container/reakbulk / frozen tuna
57	Vietnam	Ho Chi Minh City	Sai Gon	Fertilizer, Wheat, Clinker, Rice, Coal
58	Vietnam	Da nang	Tien Sa and Song Han Terminal	Fertilizer, Agri products, Cement, Iron, Steel

Note *Data of Songkhla Port include container terminal of Songkhla

Details of Conventional and Multi Purpose Terminals

Terminal No.	Cargo Throughput		Quay						Operation	Yard
	2008 metric tons	2007 metric tons	Number of Berths	Total Length of Berths(m)	Water Depth (m)	Maximum Vessel Alongside (DWT)	Number of Quay Cranes	Lifting Capacity of Quay Cranes	Berth Productivity (tons/hour)	Area (m2)
1	453,834	488,560	6	611	12.5		0	0		
2	2,054,967	1,818,878	9	1,330		20,000	2	35		210,000
3				675	7.0	4,000	0	0		9,833
4				1,670	9.5	30,000				20,907
5				675	7.5	4,000				8,938
6										
7	10,964,803	10,739,887		473	7.0					
8	16,601,975	13,118,286	5	1,039	12.0	40,027	0	0		18,582
9			2	300	14.0		0	0		
10	4,233,846	4,118,164	6	607	5.0					98,249
11	6,254,635	5,386,012		2,210	9.5	30,000				
12	535,492	360,032		2,210	9.5	30,000	0	0		
13	2,468,795	2,431,363		2,210	9.5	30,000	0	0		
14	3,895,267	4,642,859		2,210	9.5	30,000	0	0		
15	623,033	640,827		2,210	9.5	30,000	0	0		
16			1	605	10.0	45,000				
17	5,668,773	5,584,444		1,360	9.0					
18	35,876,688	42,752,355	8	489	13.0					20,000
19										
20			2	365	10.0					42,773
21	257,945	140,513	1	132	12.0	15,000			20	8,000
22	257,945	140,513	1	140	12.0	11,000			20	8,000
23				270	9.0	13				
24	3,915,971	5,953,703	8	1,286	10.0					127,897
25	2,266,684	894,458	5	1,000	15.0					40,131
26	25,999,896	27,222,120	4	715	9.0	66,000	2	40	43	
27	9,405,465	10,065,095	8	725	11.2	45,000	8	40	50	70,000
28			5	360	8.0	8,000				
29	2,458,822	2,355,728	3	648	16.4	150,000				102,060
30	227,930	103,742	2	510	16.4	150,000				
31	5,386,218	3,833,388		1,584	14.0	55,000				12,348
32	4,847,090	4,698,346	5	635	11.0	20,000	2	35		600,000
33	1,271,446	1,295,317	6	613	8.5	12,500				333,000
34	2,322,347	1,866,211	4	614	9.0	15,000			29	123,175
35	120,605	186,292	1	200	11.0	20,000				150,000
36			5	1,000	11.0	20,000			20	750,000
37	689,491	519,914	2	310	10.0	12,000			20	10,825
38	900,268	791,320	12	765	9.0					
39	1,550,802	1,547,132	5	366	10.7					
40	14,131,055	15,146,479	68	5,200	6.0					540,000
41	597,988	743,129		1,759	12.0					
43	1,006,916	994,212		526	10.5					27,500
44	791,085	748,516		634	6.0					17,000
45	438,788	483,765		3,000	4.0		0	0		0
46	3,542,013	3,515,490	13	1,152	12.3	30,435	1	35		240,000
47	3,597,396	3,372,023		1,125	13.0	34,331				167,806
48	454,235	439,913	9	851	8.5		0	0	27	0
49	722,499	718,823	17	1,220	10.0	5,000			26	
50			19	3,220	12.7		7			1,240,000
51	18,753,965	18,407,742	10	1,660	8.2	12,000	1	50	27	314,867
52	367,438		1	315	14.0	50,000	0			31,500
53	872,877		1	250	14.0	10,000	0			62,700
54	1,230,520		2	527	14.0	80,000	0			248,000
55	260,078		2	550	16.0	50,000	0		60	125,000
56	1,815,920	1,830,381	3	510	9.0		0			50,000
57	13,166,000	13,618,000	25	2,673	11.0	38,000	2	40		500,000
58	712,707	778,530	5	528	7.0	3,000				19,644

Service Frequencies Between Network Ports (1)

	Muara	Phnom Penh	Sihanoukville	Belawan	Dumai	Tanjung Priok (Jakarta)	Palembang	Panjang	Pontianak	Tanjung Perak (Surabaya)	Semarang	Makassar	Balikpapan	Bitung	Jayapura	Sorong	Banjarmasin	Port Klang	Penang	Johore Bahru	Tanjung Pelepas	Kuantan	Kemaman	Bintulu	Kuching	Sandakan	Kota Kinabalu	Yangon	Thilawa	Kyaukphyu
Muara																		1.7	1.0					1.0			3.9			
Phnom Penh																														
Sihanoukville																														
Belawan						3.0				8.0								3.6	1.6											
Dumai																														
Tanjung Priok (Jakarta)				10.6					3.0	17.3	4.0	7.3					2.0	9.5		1.0	3.0									
Palembang																		0.5												
Panjang						2.0																								
Pontianak						2.0				1.0																				
Tanjung Perak (Surabaya)				1.7		12.6					6.2	8.7		9.4	2.0		7.0	1.0			1.0									
Semarang						3.0				4.0											1.0									
Makassar						5.3				10.7																				
Balikpapan																														
Bitung						8.4				1.0																				
Jayapura																2.0														
Sorong						2.0																								
Banjarmasin						2.0				8.1																				
Port Klang				7.1		10.0				1.0									12.0	11.2	6.0				1.0		0.7	1.0		
Penang																		16.0			2.0									
Johore Bahru						1.0												5.0			1.0	2.0		1.0	5.0	1.0	1.0			
Tanjung Pelepas			1.0							1.0								7.8	1.0	2.0				1.0						
Kuantan			2.0			0.6																								
Kemaman																														
Bintulu	1.0																		2.0	0.5										
Kuching	1.2																			0.5				3.5			3.0			
Sandakan																		1.0												
Kota Kinabalu	3.2																	3.0								1.0				
Yangon																		1.5												
Thilawa																														
Kyaukphyu																														
Manila						3.0				1.0																				
Batangas																														
Subic Bay																														
Cebu																														
Iloilo																														
Cagayan de Oro																														
Davao																														
General Santos																														
Zamboanga																														
Singapore	4.1			2.0		27.3	0.5	2.0	2.0	9.0	7.0						0.7	70.7	4.0	34.3	14.8	5.0		1.0	4.2		1.0	4.9		
Bangkok																														
Laem Chabang			1.0			0.7												5.6			2.0									
Songkhla																					1.0									
HO CHI MINH CITY		4.0																2.0		1.0	2.0	0.6								
Haiphong																					1.0									
Da Nang																					1.0									
Cai Lan																														
JAPAN						0.9					1.0																0.5			
KOREA																					1.0									
CHINA			2.0			3.0												18.9		2.0	17.0						1.0			
TAIWAN						1.0															2.0									
OCEANIA						2.7				1.2								3.5			2.0			0.2						
SOUTH ASIA																		18.8	6.0		6.8							0.7		
MIDDLE EAST				0.3														11.7			1.0									
AFLICA				0.3		0.2												6.3		0.8	4.0									
EUROPE						0.5												8.2			1.0									
NORTH AMERICA																														
Central & SOUTH AMERICA																														

Total	9.5	4.0	6.0	21.9		91.2	0.5	2.0	5.0	63.3	18.2	16.0		9.4	2.0	2.0	9.7	196.3	27.6	53.3	70.6	7.6		7.7	10.2	2.0	11.1	6.6		

Service Frequencies Between Network Ports (2)

	Manila	Batangas	Subic Bay	Cebu	Iloilo	Cagayan de Oro	Davao	General Santos	Zamboanga	Singapore	Bangkok	Laem Chabang	Songkhla	HO CHI MINH CITY	Haiphong	Da Nang	Cai Lan	JAPAN	KOREA	CHINA	TAIWAN	OCEANIA	SOUTH ASIA	MIDDLE EAST	AFLICA	EUROPE	NORTH AMERICA	Central & SOUTH AMERICA	Total
Muara										1.9																			9.5
Phnom Penh														4.0															4.0
Sihanoukville										1.0		1.0	3.0							1.0									6.0
Belawan										4.0														0.6			0.5		21.3
Dumai																													
Tanjung Priok (Jakarta)	2.0									19.8	1.2	1.4								3.0	2.0	2.0		0.5		1.6			91.2
Palembang																													0.5
Panjang																													2.0
Pontianak										2.0																			5.0
Tanjung Perak (Surabaya)	1.0									6.0								1.0		3.0	2.0	0.7							63.3
Semarang										10.0								0.2											18.2
Makassar																													16.0
Balikpapan																													
Bitung																													9.4
Jayapura																													2.0
Sorong																													2.0
Banjarmasin										0.7																			10.8
Port Klang										58.0	1.0	4.5		3.0					2.0	22.3		2.0	35.7	12.5	13.1	9.2		3.5	216.9
Penang										8.0													1.0	0.6					27.6
Johore Bahru										28.3	1.0	2.0	1.0	2.0						2.0									53.3
Tanjung Pelepas										15.8		3.0		1.0	1.0					13.0	3.0		6.0	9.0	13.0	16.0		2.0	96.6
Kuantan										1.0		1.0								3.0									7.6
Kemaman																													
Bintulu	1.0									2.2											1.0								7.7
Kuching										2.0																			10.2
Sandakan										1.0																			2.0
Kota Kinabalu										3.9																			11.1
Yangon										3.4													1.7						6.6
Thilawa																													
Kyaukphyu																													
Manila			1.0	11.7	5.5	3.0	5.8		3.2	4.0	1.0	4.0						5.0	1.0	23.2	9.3								81.7
Batangas																													
Subic Bay	2.0																		0.5	0.5	1.0								3.9
Cebu	4.5					9.0	2.6	0.7	1.9												2.0								20.7
Iloilo	6.0					2.0			0.5																				8.5
Cagayan de Oro	3.0			8.0	2.0		1.0												1.0										15.0
Davao	1.5			1.0				5.0		2.0											2.0								11.5
General Santos	2.4			1.0			2.0		1.0																				6.4
Zamboanga	3.9				1.0			1.7																					6.6
Singapore	6.0					1.0		1.0			9.8	19.2	1.0	13.0	6.5			11.1	12.4	108.7	14.2	12.2	34.8	23.2	15.7	21.3	2.0	4.5	512.0
Bangkok	1.0									7.0		37.6		1.0				2.2		3.2				0.7	0.2	0.2			53.2
Laem Chabang	2.0									24.7	26.2			12.0				1.5		18.0	2.0					0.1			95.8
Songkhla										3.0					1.0					1.0									6.0
HO CHI MINH CITY			1.0							15.9	6.0	2.0			7.2		1.0	2.0	1.0	13.0	10.0					0.7			69.4
Haiphong										3.0	1.0			4.7		4.5			1.0	21.5	4.0								40.7
Da nang										2.0				4.0	0.5														7.5
Cai Lan														2.0															2.0
JAPAN	3.9									2.0	1.0	1.0		0.2					13.8	19.4	19.0	0.5			0.2		3.2	0.6	67.3
KOREA	2.2						1.0			0.9		1.0		1.0	1.3			4.8		49.1	12.0	0.2					1.0		75.6
CHINA	16.0									96.7	4.0	15.0		13.5	15.0	3.0	1.0	18.9	36.3		29.2	3.5		1.0		2.0	3.0		301.9
TAIWAN	9.0		1.0							2.2		1.0	1.0	3.0	2.0			14.0	5.0	53.0		1.0					3.0		98.3
OCEANIA	3.3		0.5							9.2								1.0	0.2		0.5						0.6	0.2	25.1
SOUTH ASIA										38.6										1.0				7.7	6.0	1.0	1.0		87.5
MIDDLE EAST										15.0	0.5	1.0		0.6				0.2		2.0			18.8		11.0	12.0			74.1
AFLICA										16.3	0.2									3.8	1.0	3.0	5.6	15.0		10.6	1.0	1.0	69.0
EUROPE										12.9		0.1			0.3				0.3	2.0		0.8	1.0	19.0	22.3		2.7		71.2
NORTH AMERICA																		6.0	3.0	1.0	1.0			1.6	1.6	3.2		1.4	18.7
Central & SOUTH AMERICA										2.2									0.5			0.7		1.0	4.5		1.3		10.1

Total	70.7		3.5	21.7	8.5	15.0	12.4	8.4	6.6	426.5	53.0	94.8	6.0	65.0	34.9	7.5	2.0	68.0	78.0	367.6	115.3	26.6	104.6	92.4	87.6	77.9	19.2	13.1	2,540.3