Ports:
Importance, Institutional Status and Growth Prospects

AY 2002/2003 Inception Report

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**THE MALAYSIAN TRANSPORTATION ENTERPRISE**

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</tbody>
</table>
Summary
This report aims to provide an initial comprehensive assessment of the port subsystem of the Malaysian transportation sector. Using an integrative perspective, the major parameters of the port industry are discussed. These include the major ports, the potential competition, the shipping industry, the institutional and regulatory status, multimodalism and logistics, port security and safety. The major Malaysian ports are in an expansion phase and have the capacity to service the growing international and national trade, currently handling 90% of all the goods imported and exported from Malaysia. The Malaysian shipping industry, on the other hand, is still lacking the capacity to cater effectively and autonomously to the needs of the national trade. Finally, the hinterland network in Malaysia is based principally on highways and cargo trucking and secondly on rail, with a significant percentage of the national cargo also transported by feeder ships from secondary to main ports.
1. Introduction

Importance of the Port Industry for Malaysia
Malaysia is one of the powerful nations in the SE Asia region, a member of the Indonesia-Malaysia-Thailand Growth Triangle, with aspirations to become a developed country by 2020. The Malaysian economy is based on the export trade of manufactured products, raw materials and petrochemicals. In fact it is placed 13th globally in terms of export quantity. At the same time, Malaysia is an oceanic state, situated next to a major waterway that connects Asia with the west coast of the US and simultaneously with the Middle East and Europe as shown in the map of Figure 1.

![Figure 1: Major shipping routes in SE Asia (source: [1])](image)

The importance of sea freight transport and the port industry for this kind of economy is self-evident and it is no surprise that 90% of the total international trade is conducted by sea. The additional opportunity for Malaysian ports of serving as transshipment hubs make them highly valuable assets. Their significance is summarized by the Malaysian Prime Minister Dr. Mahathir in his speech for the IAPH's World Port Conference in Kuala Lumpur in May 1999, when he said: “No matter how information technology advances, the world trade cannot be materialized without ports. This is exactly why every country needs to develop much more advanced and efficient ports for its prosperity.” [2] Apart from this, it is obvious that inefficient and thus costly port operations affect the competitiveness of the export industries of a nation as well as the prices of the imported goods.
Global Conditions
The introduction of globalized manufacturing and the integration of world economies under free trade agreements (see section 5.3) increased the need for reliable provision of transportation services and logistics. The evident advantages of container shipping have resulted in a growth of 8% annually of the total containers shipped with the biggest growth observed in Asia, while the total sea trade increased with a rate of only 3.7%. [2] In fact, a study by the UN predicts that by 2011 in the SE Asia region there will be a need for 124 new container berths and estimates their cost at US$8 billion [3]. A trend worth noting is the increase in size of container ships. Although there is ambivalence over the viability of this trend [4] the consequent concentration on certain itineraries and the prevalence of a hub and spoke transshipment model remains.

Under these competitive conditions the ports should be pro-active in addressing the challenges of high performance and constant productivity. Malaysia was among the leaders in port privatization with the port authorities undertaking the role of the trade facilitator, supervisor and regulator of the operations.

General Malaysian Overview
Once dependency upon Singaporean ports became expensive, a series of policies strengthened significantly the port industry in Malaysia with focus on Port Klang. These included the building of container handling capacity, privatizations, emphasis on productivity and efficiency, and adhering to low tariffs with zero inflation [5: Asia Review]. These measures eventually led to the 7.7% on average increase in total cargo throughput from 1995 to 2000 reaching a total 221m FWT tons. The increase was mainly due to containerized and liquid bulk cargoes (see also Table 2). Additionally, 6.7m passengers passed through the ports in 2000 [6]. The main focus of current policies remain on containerization with the liquid bulk and petrochemical cargoes coming next. The dry bulk and general cargo handling are of lower relative importance.

Objectives
This report forms part of an integrative approach to the Malaysian transportation industry. The movement of freight and people, vital for any economy, is related to issues that range from the applications of Intelligent Transportation Systems (ITS) for the vehicle fleet in Kuala Lumpur to public transportation, and from the land-use patterns for metro development to the local vehicle industry, the highway infrastructure and the ports as nodes for the internal and external trade. The structures involved can be approached with the perspective of a Complex Large-scale Integrated Open System (CLIOS) analysis as described in [7].

Following this perspective, our report identifies and provides an initial assessment of the major issues related to the port subsystem. More specifically this report aims to:
- Assess all major Malaysian port facilities including their landside access and the generated land traffic (Section 2),
- Identify the most important neighboring ports and their potential competitiveness (Section 3),
- Overview the shipping industry nationally and in the SE Asia region (Section 4),
Outline the influential national and international institutions, the organizational structure and the major regulations (Section 5),

- Provide information on the Malaysian approach to multimodalism and logistics (Section 6), and

- Discuss briefly other important port-related issues including port security, port sustainability, new technologies, and pricing (Section 7).

2. The Major Malaysian Ports

The first step in the assessment of the dynamics of the port and maritime sector is to identify the major players. This implies the need for an initial assessment of their capacity (infrastructure and equipment), future expansion plans, hinterland connections, and organizational status. Viewing the port facilities as part of the Malaysian transportation infrastructure, we estimated their contribution to the land traffic. Since there were no data available at this point from our sources, we relied on calculations based on the port throughput as explained in Appendix 2. The following section offers a comprehensive outline of the important Malaysian port facilities.

2.1 General Overview

Currently there are the following seven major federal ports: Port Klang, Penang Port, Bintulu Port, Johor (Pasir Gudang) Port, Port Tanjung Pelepas, Kuantan, Port and Kemaman Port. All major federal ports, with the exception of Kemaman, have been privatized. (On the distinction of major and minor, federal and state ports see section 5.1).

Of the major federal ports in Malaysia the most important are:
- Port Klang Authority (PKA)
- Port Tanjung Pelepas (PTP)
- Port Penang Commision (PPC)

They all have international role aspirations since they are situated in the same major waterway (Malacca straits) and have significant potential (already partially utilized in the first two) due to location for becoming international transshipment hubs. Other important ports, in regional and national level, are:
- Johor Port
- Kuantan Port
- Kemaman Port
- Bintulu Port (Sarawak)
- Kota Kinabalu (Sabah)

Figure 2 shows the relative location of these ports as well as ports of lesser importance.
The total freight composition transported through all Malaysian ports in 2000 was:

<table>
<thead>
<tr>
<th>Composition of Cargo Throughput (in million tons)</th>
<th>Source: MATRADE [8]</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Cargo</td>
<td>26.0</td>
</tr>
<tr>
<td>Dry Bulk Cargo</td>
<td>30.7</td>
</tr>
<tr>
<td>Liquid Bulk Cargo</td>
<td>82.8</td>
</tr>
<tr>
<td>Containerized Cargo</td>
<td>81.3</td>
</tr>
<tr>
<td>TOTAL</td>
<td><strong>220.8</strong></td>
</tr>
</tbody>
</table>

Finally, a comparative distribution for containerized and total freight for the major Malaysian ports for the years 1993 to 2001 can be seen in Figure 3.
In Appendix 1 there is a brief description for each freight category. Regarding the containerized cargo, it should be noted that the throughput figure incorporates the transshipment moves. Care should be taken for the interpretation of figures since each transshipped container is counted twice.

### 2.2 Port Klang

**General Description:**
Port Klang is situated about 40 km from Kuala Lumpur. Based on a Government directive in 1993, Port Klang is considered as the National Load Center and eventually a hub for the region. Its geographical location makes it the first port of call for ships on the eastbound leg and the last port of call on the westbound leg of the Far East-Europe trade route. Its operations include container terminals, general, dry bulk, liquid bulk and passenger handling. In 2001, it handled 33% of the nation’s trade and 52% of container throughput. Port Klang Authority (PKA) was the first port authority to corporatize and privatize facilities in Malaysia and among one of the first in the world. Now it supervises three major operators. Port Klang ranks 12th (for 2002) among the world’s top ports.

**Connections:**
The PKA facilities are connected via highway and rail to the national transportation network. Highways that connect are the Shah Alam Expressway (4-lanes), the South Klang Valley Expressway and West Coast Expressway. There is direct rail connection to Singapore and Bangkok. Finally, PKA is close to Kuala Lumpur International Airport (KLIA).

**Organization:**
The Port Klang Authority (PKA) is a supervisory body following the landlord port operation scheme. Two competing companies operate container terminals and other facilities under the supervision of PKA: Northport (Malaysia) Bhd (NMB) that operates Northport facility and Kelang Multi Terminal S/B Bhd (KMT) (30% owned by Hutchison Port Holdings) that operates Westport facility. NMB is the subsidiary of NCB Holdings Bhd, of which PKA partakes 5.3%. MISC holds 15.4% of NMB and accounts for 40% of throughput. Finally Southport is involved mainly in bulk cargo handling.

**Statistics:**

<table>
<thead>
<tr>
<th>Cargo Throughput</th>
<th>Million tons (2001)</th>
<th>Type of Cargo</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liquid Bulk</td>
<td>4.6</td>
<td>Type: Fuel (diesel, industrial, gasoline), palm &amp; coconut oil, latex</td>
</tr>
<tr>
<td>Dry Bulk</td>
<td>7.1</td>
<td>Imports: wheat, sugar, soybeans, feedmeal, fertilizer</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Exports: Palm Kernel expeller</td>
</tr>
<tr>
<td>General</td>
<td>5.5</td>
<td></td>
</tr>
</tbody>
</table>

| Passengers       | 346.000             |

<table>
<thead>
<tr>
<th>Container Throughput (2001)</th>
<th>Total</th>
<th>Transshipment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3.2m TEU</td>
<td>1.8m TEU</td>
</tr>
</tbody>
</table>
### Estimation of port generated truck and vehicle itineraries (moves)

<table>
<thead>
<tr>
<th>Type</th>
<th>/year</th>
<th>/day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Container</td>
<td>1,872,000</td>
<td>5200</td>
</tr>
<tr>
<td>Bulk</td>
<td>688,000</td>
<td>1880</td>
</tr>
<tr>
<td>Passenger</td>
<td>69,200</td>
<td>190</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>2,629,200</strong></td>
<td><strong>7270</strong></td>
</tr>
</tbody>
</table>

### Berths and Equipment

<table>
<thead>
<tr>
<th>Berths (for containers)</th>
<th>Number: 47 (17)</th>
<th>Length: 9670m (3790m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Container Quay Cranes</td>
<td>38</td>
<td></td>
</tr>
<tr>
<td>Yard Gantry (RTGs)</td>
<td>71</td>
<td></td>
</tr>
<tr>
<td>Straddle Carriers (SCs)</td>
<td>89</td>
<td></td>
</tr>
<tr>
<td>Conventional Storage</td>
<td>Covered space 387,000 m²</td>
<td>Open space 188,000 m²</td>
</tr>
<tr>
<td>Container Storage</td>
<td>CFS 73,500 m²</td>
<td>Yard 150,000 m²</td>
</tr>
</tbody>
</table>

**Various Facts:**
- Westport operates a Vehicle Terminal Center (VTC) for the import and export of vehicles (mostly cars) with a capacity of 20,000 cars.
- PKA has received the ISO 9000 Certification on August 2000 for the management and facilitation of trade at the Northport and Westport terminals.
- A Free Commercial Zone (FCZ) covers both Westport and Northport.
- PKA employs a Vessel Traffic Managements System (VTMS) for safer navigation and an Electronic Data Interchange (EDI) system (see also section 6.2).
- In 2001 Northport handled 62% of total containers and Westport the remaining 38%.

### 2.3 Port of Tanjung Pelepas

**General Description:**
The Port of Tanjung Pelepas (PTP) is a recently constructed port (it began actual operations in 2000). It aims mainly to the facilitation of the container market. Its location on the southwestern tip of the Malaysian peninsula is in close proximity to Singapore’s port (PSA). This feature underlines its PSA-rival status as a transshipment hub. In 2001 PTP managed a throughput of 2m TEUs. Of this volume, 90% is from transshipment operations. It is outfitted with state-of-the-art mechanical equipment, electronic yard management system (NAVIS), EDI and Vessel Clearing System (VCS). Its current capacity with “Phase 1” completed is estimated to be around 4.5m TUEs/year. After the completion of Phase 2 (in 2003) this capacity will reach 6m TEUs. The container stacking yard has a capacity of 110,000 TEUs With a draft of 15.5m it can accommodate the largest container ships currently available as well as the next generation.

**Connections:**
It is directly connected to Malaysia - Singapore highway (it is situated next to the Second Link to Singapore) and just in 2002 connected to the Malaysian railway network that offers a gateway to Thailand’s industrial regions. PTP is close to Sinai Airport.
THE MALAYSIAN TRANSPORTATION ENTERPRISE

Port Report

Organization:
It is privately owned and operated under the supervision of Johor Port Authority. Thirty percent of the equity is owned by MAERSK Sealand. PTP is developed by Seaport Terminal (Johor) Sdn Bhd under a privatisation agreement signed in March 1995 with the Malaysian Government and the Johor Port Authority. [20] Currently, PTP is 70% owned by Seaport Terminal Sdn Bhd (a private company not listed on the exchange) and 30% foreign owned by AP Moller.

Statistics:

<table>
<thead>
<tr>
<th>Container Throughput (2001)</th>
<th>Total</th>
<th>Transshipment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2.05m TEU</td>
<td>1.8m TEU</td>
</tr>
</tbody>
</table>

Estimation of port generated truck and vehicle itineraries (moves)

<table>
<thead>
<tr>
<th>Type of freight</th>
<th>/year</th>
<th>/day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Container</td>
<td>243,000</td>
<td>670</td>
</tr>
</tbody>
</table>

Berths and Equipment

<table>
<thead>
<tr>
<th>Berths (for containers)</th>
<th>Number: 6 (6)</th>
<th>Length: 2160m (2160m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quay Cranes (outreach)</td>
<td>18 (18box) 4(22box)</td>
<td></td>
</tr>
<tr>
<td>Yard Gantry (RTGs)</td>
<td>57</td>
<td></td>
</tr>
</tbody>
</table>

Conventional Storage

<table>
<thead>
<tr>
<th>Covered space - m²</th>
<th>Open space - m²</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Container Storage

<table>
<thead>
<tr>
<th>CFS - m²</th>
<th>Yard - m²</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Various Facts:

- PTP has a free commercial zone and free industrial zone.
- PTP goes for a market share in direct competition to PSA. It offers almost 50% lower tariff for transshipment. PSA at the time is retaining its price policies not wanting the otherwise very low profit margin. For Evergreen this means a difference of US$5.7m for 1.2m TEUs throughput. [5n]
- MAERSK Sealand and Evergreen shipping companies transferred part of their operations from PSA to PTP in 2000.
- High productivity standard of 29 moves per hour (mph) per crane on average.
- Currently employs 900 non-unionized workers.
- world ranking

2.4 Penang Port

General Description:
The Port of Penang (PPC) is located on the northwestern coast of the Malaysian peninsula close to the borders with Thailand. PPC has two container terminals: North Butterworth (NBTC) with a 12m draft which is expanding and has a capacity of 660000 TEUs/year, and Butterworth with a 9m draft which is limited to a capacity of 270000 TEUs/year and maybe closed when the expansion of NBTC is completed. Both terminals operate in FCZ. The expansion works on NBTC are expected to provide a 1m TEU capacity by 2007 (Investment: US$85).
**Connections:**
PPC is directly connected to North-South and East-West Highways, as well as to rail line.

**Organization:**
The Port of Penang is a corporatized port. It is managed by the Penang Port Commission (PPC) and operated by Penang Port Sdn. Bhd (PPSB). The facilities are leased for 30 years. PPC acts as a regulatory body setting performance standards and proper land use (Landlord type).

**Statistics:**

<table>
<thead>
<tr>
<th>Cargo Throughput</th>
<th>Million tons (2001)</th>
<th>Destination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liquid Bulk</td>
<td>4.1</td>
<td>Imports: 3.550.000 FWT, Exports: 550.000 FWT</td>
</tr>
<tr>
<td>Dry Bulk</td>
<td>3.75</td>
<td>Imports: 3.370.000 FWT, Exports: 330.000 FWT</td>
</tr>
<tr>
<td>General</td>
<td>2</td>
<td>Imports: 750.000 FWT, Exports: 1.200.000 FWT</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year</th>
<th>1997</th>
<th>1998</th>
<th>1999</th>
<th>2000</th>
<th>2001</th>
</tr>
</thead>
<tbody>
<tr>
<td>Passengers*</td>
<td>4.300.000</td>
<td>82.000</td>
<td>2.500.000</td>
<td>940.000</td>
<td>150.000</td>
</tr>
</tbody>
</table>

* Note the very uneven ferry passenger pattern!

<table>
<thead>
<tr>
<th>Container Throughput (2001)</th>
<th>Total</th>
<th>Transshipment</th>
<th>Destination</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.6m TEU (4.9% decline from 2000)</td>
<td>-</td>
<td></td>
<td>Import: 0.32m TEU, Export: 0.28m TEU</td>
</tr>
</tbody>
</table>

**Estimation of port generated truck and vehicle itineraries (moves) for 2001**

<table>
<thead>
<tr>
<th>Type</th>
<th>/year</th>
<th>/day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Container</td>
<td>592.800</td>
<td>1625</td>
</tr>
<tr>
<td>Bulk</td>
<td>443.250</td>
<td>1215</td>
</tr>
<tr>
<td>Passenger</td>
<td>30.000</td>
<td>82</td>
</tr>
<tr>
<td>Total</td>
<td>1,066.50</td>
<td>2,922</td>
</tr>
</tbody>
</table>

**Berths and Equipment**

<table>
<thead>
<tr>
<th>Berths (for containers)</th>
<th>Number: -</th>
<th>Length: 1470m (930m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quay Cranes</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>Yard Gantries (RTGs)</td>
<td>32</td>
<td></td>
</tr>
<tr>
<td>Conventional Storage</td>
<td>Covered space 104,000m²</td>
<td>Open space 470,000m²</td>
</tr>
<tr>
<td>Container Storage</td>
<td>CFS 20,400m²</td>
<td>Yard 578,000m²</td>
</tr>
</tbody>
</table>

**Various Facts:**
- PPC was awarded the ISO 9000 Steering committee prize in 1996 and after quality and organizational improvements it was obtained the ISO 9002 quality award in 1999.
- PPC has very limited transshipment throughput (~0.4%).
- Penang Port aims to develop commercial uses. One plan underway will restructure one pier (Sweetenham pier) as a dedicated cruise terminal facility including shopping.
(duty free) and recreation areas (Project cost RM61m). Furthermore there is a project for the construction of a yacht Marina (RM 18m). [4]

- PPSB employs an electronic port billing and Cargo operations system (Computerized Cargo and Marine System - PELPIN).
- PPC employers are hired with contracts for both shore-based and ship-based activities. Shipping lines engage registered stevedores and cargo handlers directly from private companies.
- The freight to and from Penang Port comes 25% from direct ship calls and, via feeder ships, 45% from Singapore and 30% from Klang.
- World ranking

2.5 Johor Port

General Description:
Johor Port is located close to PTP. It is a diverse port aiming towards both bulk and container freight facilitation. With the emerging high capacity container dedicated PTP the Joport aspires to become a dry bulk transshipment center. Johor Port provides dedicated berths and facilities to handle palm oil, petroleum and petrochemical products as well as dry bulk and general cargo.

Statistics:

<table>
<thead>
<tr>
<th>Cargo Throughput</th>
<th>Million tons (2001)</th>
<th>Destination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Bulk (Estimated)</td>
<td>14.4</td>
<td>Import: ~50% Export: ~50%</td>
</tr>
</tbody>
</table>

* There was a lack of information on the port’s bulk throughput.

<table>
<thead>
<tr>
<th>Container Throughput (2001)</th>
<th>Total</th>
<th>Transshipment</th>
<th>Destination</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.64m TEU</td>
<td></td>
<td>-</td>
<td></td>
</tr>
</tbody>
</table>

Estimation of port generated truck and vehicle itineraries (moves) for 2001

<table>
<thead>
<tr>
<th>Type</th>
<th>/year</th>
<th>/day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Container</td>
<td>632,200</td>
<td>1730</td>
</tr>
<tr>
<td>Bulk</td>
<td>684,000</td>
<td>1870</td>
</tr>
<tr>
<td>Passenger</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>Total</td>
<td>1,316,000</td>
<td>3600</td>
</tr>
</tbody>
</table>

Berths and Equipment

<table>
<thead>
<tr>
<th>Berths (for containers)</th>
<th>Number: -</th>
<th>Length: 4200m (760m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quay Cranes</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Yard Gantries (RTGs)</td>
<td>- (Uses SCs)</td>
<td></td>
</tr>
<tr>
<td>Conventional Storage</td>
<td>Covered space - m²</td>
<td>Open space - m²</td>
</tr>
<tr>
<td>Container Storage</td>
<td>Yard -m² (25,000 TEU)</td>
<td></td>
</tr>
</tbody>
</table>

The container terminal has an estimated capacity of 1m TEUs.
Organization:
This Port Authority was established in 1973. The Port began operations in 1976 and in 1993 it was privatized under Malaysia’s Privatization Program. Johor Port Authority (JPA) acts as landlord and regulatory body. The port is operated by Johor Port Bhd (Joport). The port was fully privatized in August 1995 to Seaport Terminal (Johore) Sdn Bhd which became the holding company of Johor Port Bhd. The ownership of the infrastructure remains to JPA and is leased for 30 years. It has also two subsidiaries namely JP Logistics Sdn. Bhd. and JP Transport Sdn. Bhd. [9], [10], [11]

Various Facts:
- Joport has initiated a strategic cooperation with PTP. JP Logistics will offer haulage service connecting the two ports.
- PTP may be considering a merger with Joport.
- Johor Port ranks 82th in global container terminals

2.6 Kuantan Port

General Description:
Kuantan Port is located on the central eastern coast of peninsular Malaysia (East Coast Industrial Corridor). Nearby areas of Gebeng, Pahang and Kertih host major petrochemical plants and a large volume of petrochemical and liquid bulk products is transferred through Kuantan Port making it a major petrochemical gateway. Kuantan Port aspires to become regional hub on petrochemicals. Central Utility (part of the common pipe rack) and Central Tankage facilities for petrochemical products exist in the port [12]. At the same time there is a container terminal facility that had a throughput of 65,000 TEUs in 2000. The cargo breakdown that goes through the port in the first quarter of 2000 (presumed typical) is Chemical 21%, Petroleum 10%, Palm Oil 17%, Steel pipes 16%, Containers 13%, Timber 5%, Other 18%. [13]

Statistics:

<table>
<thead>
<tr>
<th>Cargo Throughput</th>
<th>Million tons (2001)</th>
<th>Destination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Bulk (estimated)</td>
<td>5.22m</td>
<td>Import: 49.3% Export: 50.7%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Container Throughput (2000)</th>
<th>Total</th>
<th>Transshipment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>65.000 TEU</td>
<td>-</td>
</tr>
</tbody>
</table>

| Estimation of port generated truck and vehicle itineraries (moves) for 2001 |
|-----------------------------|-------|-----|
| Type           | /year | /day |
| Container      | 64.200 | 176 |
| Bulk           | 255.000 | 700 |
| Passenger      | -     | -   |
| Total          | 319.200 | 876 |
### Berths and Equipment

<table>
<thead>
<tr>
<th></th>
<th>Number: -</th>
<th>Length: -</th>
</tr>
</thead>
<tbody>
<tr>
<td>Berths (for containers)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quay Cranes</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Yard Gantries (RTGs)</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Conventional Storage</td>
<td>Covered space - m²</td>
<td>Open space - m²</td>
</tr>
<tr>
<td>Container Storage</td>
<td>Yard -m² (25,000 TEU)</td>
<td></td>
</tr>
</tbody>
</table>

To facilitate liquid cargo Kuantan Port operates 3 dedicated liquid chemical berths (LCB) with a total length of 620-m. The third berth was completed in 2002.

**Organization:**
Kuantan Port is a privatized port supervised by the Kuantan Port Consortium Sdn Bhd (KPC). Road Builder (M) Holdings Bhd, a diverse construction company, owns 60% of KPC and an agreement to buy the remaining state owned 40% is under way.

**Connections:**
The Port is linked to the manufacturing belt by highway and railway as well as Common Pipe Rack facilities.

**Various Facts:**
- KPC also operates Kemaman port. This nearby port currently services one major company: Perwaja Steel. This port has a remarkably deep draft of 15m and is undergoing privatization with prospects to become significant bulk center. [14]

### 2.7 Bintulu Port

**General Description:**
Bintulu Port is situated in the central west coast of Borneo in the Sarawak province. It is the main port for the Sarawak region but serves some cargo for Sabah and Brunei too. Bintulu Port aims to specialize in the Liquefied Natural Gas (LNG) transport market. The LNG handled is produced in the offshore field of Central Luconia and it currently represents 60% of the port’s throughput. At the same time it operates general, dry bulk and container facilities. It is the only Malaysian port in the Borneo that has a dedicated container terminal: Bintulu International Container Terminal (BICT). BICT berths have a draft of 14m. It is the only terminal in the region that can service Post-panamax class vessels and has a capacity of 400,000 TEUs per year.

**Statistics:**

<table>
<thead>
<tr>
<th>Cargo Throughput</th>
<th>Million tons (2000)</th>
<th>Destination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Bulk (estimated)</td>
<td>20.6m</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Container Throughput (2000)</th>
<th>Total</th>
<th>Transshipment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>65,000 TEU</td>
<td>-</td>
</tr>
</tbody>
</table>
### Estimation of port generated truck and vehicle itineraries (moves) for 2001

<table>
<thead>
<tr>
<th>Type</th>
<th>/year</th>
<th>/day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Container</td>
<td>64,200</td>
<td>176</td>
</tr>
<tr>
<td>Bulk</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Passenger</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Total</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

### Berths and Equipment

<table>
<thead>
<tr>
<th></th>
<th>Number: -</th>
<th>Length: -</th>
</tr>
</thead>
<tbody>
<tr>
<td>Berths (for containers)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Quay Cranes</td>
<td>-</td>
<td>2</td>
</tr>
<tr>
<td>Yard Gantries (RTGs)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Conventional Storage</td>
<td>Covered space - m²</td>
<td>Open space - m²</td>
</tr>
<tr>
<td>Container Storage</td>
<td>Yard -m²</td>
<td></td>
</tr>
</tbody>
</table>

**Organization:**

Bintulu Port Authority acts as a regulatory and supervisory body of the port operations. These are taken over by Bintulu Port Bhd, a private sector company. Petronas and Malaysian government own collectively 65% of the company. MISC considers acquiring 10% of it.

**Connections:**

There is a highway connection.

### 2.8 Other Ports

**Sabah Ports (Kota Kinabalu, Tawau, Lahad Datu and Sandakan)**

A privatization agreement has been signed for these ports in August 2002. The Sabah Port Authority will still be the supervisory body.

**Lumut Perak**

A new bulk terminal the Lekir Bulk Terminal has begun operations in 2002. With a 20-meter draft and a significant open storage area may become an attractive alternative to major ports.

### 3. International Competition

Part of the regional system overview is to establish the port facilities that are important players in the SE Asia region outside Malaysia’s borders.

**Important Shipping lines**

The major lines that are of interest for the SE Asian ports are the following:
- Sumatra and Bay of Bengal <-> E. Asia and N. America Pacific Coast,
- Australasia, N. Zealand <-> Europe and N. America Atlantic Coast,
- West India & Persian Gulf <-> S.E Asia and N. America Pacific.

Although counterintuitive, some of the freight for the N. America Atlantic coast originating from Asia follows the route through Suez Canal instead of using the Panama Canal or unloading on the west coast and transported by land across the continent.
As shown in Figure 1, the main shipping lines connecting East Asia and the west American coast to Europe pass through the Malacca straits. The routes through Sunda or Lombok are currently underutilized partly due to lack of infrastructure although they present some advantages in terms of accessibility, like greater depths and less traffic [1]. The unique vessel concentration of the Malacca straits presents an opportunity for expansion for the regional port industry and fiercer competition at the same time.

Nature of competition
Generally for the port industry the competition relies (i) on attracting cargoes for shipping from the mainland and (ii) on attracting transshipment traffic from one hub port to another. In Malaysia both these cases occur. Malaysian freighters have the option of choosing Singapore for their shipping needs, due to the proximity and good mainland connections. At the same time Malaysian and other SE Asia ports are competing for the transshipment market. The latter is the most prominent competition arena. Since bulk freight is rarely if ever serviced by non-national ports (only special cases of lack of equipment or dramatic price differences would justify a different strategy), the “rival” or potentially “rival” ports are examined here in terms of their container handling capacity.

3.1 Singapore
Singapore Port Authority (PSA) operates the biggest port in the SE Asia region and is second in the 2001 global ranking after Hong Kong. As a result, it dominates the regional market. In 2001 it had a 15.5m TEU throughput. Regional competition, though, resulted in a 9% reduction compared with the 2000 container volume. Cheaper tariffs and deals drove MAERSK Sealand and Evergreen to PTP. PSA is a government owned port, which has undergone partial privatization. Additionally to the national market, PSA has ventures in nine foreign ports (Dalian, Fuzhou, Guangzhou, China; Genoa, Venice, Civitavecchia and Livorno in Italy; Sine in Portugal; Aden in Middle East; Tuticorin and Picava in India; of importance are also the operations of a PSA Marau Terminal in Brunei) [5], [15] Beyond the foreign competition, it faces also small-scale internal competition by the recently founded Jurong Port.

The market segment that is attracted to PKA is quite different than that of PSA. A UN study [3] based on a container flow model, the Maritime Policy Planning Model (MPPM), indicates in the container transshipment market PKA will appeal mostly to Western Asia, ANZ Pacific Islands and other

Figure 4: Comparative Transshipment Destinations Projections for PSA, PKA and PTP by 2011 (Source: [3])
destinations whereas PSA mostly to SE Asia markets. This reduces the competition effects between the two ports. This is not true for PTP, which has transshipment freight directly competitive to PSA (See Figure 4). The same study predicted that the throughput volumes to be, by 2011, 24m TEUs for PSA, 3.6m TEUs for PTP and 4.2m TEUs for PKA. Since PSA and PTP share the same market segment and with such proximity the probable paths are either fierce competition or eventual cooperation and even conglomeration.

In terms of pricing, a second UN study on Port Tariffs for the ESCAP region -conducted in 2000- indicates that the comparative difference between Malaysian (PKA) tariffs and PSA ranges to about 50% in absolute currency [16]. This difference is reduced when the comparison is based on Purchasing Power Parity for the two countries. On this account PSA has actively pursued price reductions. For example, PSA announced discounts on handling charges for empty containers and other rebates [14]. These actions may indicate price war policies for the major players in the region but of not great extent. PSA is not afraid of losing its dominating position in the regional market mostly relied on the high quality services it offers. As a result of this attitude shipping line representatives have stated complaints of “arrogant” organizational behavior. [14]

3.2 Indonesia
A bit distanced from the transshipment waterway, Indonesian terminals have a potential to become competitive. Although affected more than Malaysian facilities by the 1997 crisis, Indonesian Ports have regained their position. The two most important Indonesian facilities are the Tanjung Priok and Tanjung Perak.

_Tanjung Priok_
This is a privately owned facility of which Hutchison group owns 50% of the shares. It features two major terminals: Koja Terminal and Jakarta International Container Terminal. They are referred to as Jakarta Container Port (JCP). JCP had a 2.5m throughput in 2001, a 2% increase compared to 2000. JCP has electronic management system (EDI) and an estimated annual capacity of 3.5m TEUs. Their berths are equipped with 20 STS (5 of which are post panamax) and 42 RTGs for the container stacking yards. [9]

_Tanjung Perak_
This facility handles containers in dedicated as well as conventional multi-purpose berths. In 2001 it handled 1.2m TEUs. The dedicated container terminal Surabaya International Container Terminal (SICT) handled the international containers and 35% (181.000 TEUs) of the domestic. containers are handled in conventional wharves and the rest are handled in the (TPS). There were some security considerations on its operations. SICT is operated by a joint venture between Pelabuhan Indonesia III and Australian based P&O Ports. They are investing in expansions and new equipment and a new container terminal called Terminal Petikemas Surabaya (TPS). [9]
Except the two ports mentioned above, other facilities of interest are the Tanjung Emas Port in Semarang (212,000 TEUs in 1998) and the Port Belawan in Bedan (202,000 TEUs in 1998). [15]

3.3 Thailand
Thailand hosts a number of industries that present a significant market for international shipping. A segment of the Thailand’s market is captured by the Malaysian ports (mostly Klang, but also Penang and now PTP) either by use of feeder services or rail. The two major port facilities that operate in Thailand is Laem Chapang and the Bangkok Port. Both facilities are owned and operated by the Port Authority of Thailand (PAT).

Laem Chabang Port (LCP)
LCP handled 2.3m in 2001, marking an increase of 10% from the 2000 figure. LCP’s current capacity is estimated to be 2.8m TEUs per year. It currently handles almost 60% of Thailand’s container traffic. PAT’s policy of diverting traffic from Bangkok’s port to LCP is successful and the importance of Bangkok Port is undercut. Announced expansion plans aim to achieve 4m TEUs by 2010. The new facilities will be leased to private vendors. Currently 49% of LCP is owned by the Philippine based CTS. [9], [15] The LCP development could pose some competitive threat to Malaysian ports mainly in regaining the national cargo and not so much in the transshipment market since LCP is further away from the main waterway.

Bangkok Port (BKP)
BKP handled 0.98m TEUs in 2001, marking a 9% reduction from 2000 volume. The port plays an important role in the development of the Bangkok region but not as the major national commercial seaport anymore. Other roles as logistics center and/or cruise terminal are being examined. One of the reasons behind this policy is to reduce the traffic congestion problems of the Thai capital.

3.4 Other countries
The ports described above would be considered the most important potential competitors for Malaysia. Other potentially competitive ports in the region, which either lack the facilities and infrastructure for competitiveness or are too remote, are the following.

Philippines: Manila Port
The major international port in Philippines is Manila port. It has 3 container terminals: Manila International Container Terminal (MICT), North Harbor and South Harbor. Their combined throughput in 2001 reached 2.3m TEUs (0.7% increase from 2000). The market served is mostly national and 72% of Philippines international container traffic with small percentage of transshipments. MICT is operated by International Container Terminal Services Inc (ICTSI). The Hutchinson group acquired the overseas port development subsidiary with interests in Tanzania and Brazil.

Brunei Darussalam: Muara Port
Muara Port in Brunei has a container terminal owned and operated by PSA. This terminal competes with the Bintulu and Sabah ports for the Brunei market.
Vietnam: Saigon Port
Myanmar: Yangon Port
Cambodia: Port of Sihanoukville (Kampong Saom)

These ports currently lack the infrastructure to pose a competitive alternative for Malaysia in the near future. They serve a part of their national markets.

Sri Lanka: Colombo

Colombo has been a traditional port of call and transshipment hub. In 2001 its throughput reached 1.7m TEUs. Two container terminals operate in Colombo port: Jaya Container Terminal (JCA) owned and operated by the Sri Lanka Port Authority and South Asian Gateway Terminal (SAGT) owned by a consortium. Being in an expansion phase, it seeks investors for its expansion and modernization of facilities, and contacts were made with the Westport and PTP companies for possible cooperation [News 14:17 07/08/02 Asia Indian Sub-continent Financial Terminal]. It may compete with Malaysian ports for the Indian and Gulf transshipment needs.

4. Shipping in Malaysia and SE Asia

The operation of port facilities and the utilization of their capacity are directly influenced by the shipping industry. In this section we offer an outline of important shipping trends, the major shipping companies that operate in the region, and the current regulatory status in Malaysia.

4.1 General trends in shipping

The shipping industry tends to concentrate in the major players and their formed alliances. The top ten shipping companies handled 56% of global containerized cargo in 2001. This means they have significant market power as far as port operators are concerned. This is illustrated by the example of the PTP getting an important share of PSA’s throughput by the transferring of MAERSK/Sealand and Evergreen operations to the former. Some of these shipping companies are also partners in and/or operators of port facilities. Figure 5 presents comparatively the largest container shipping companies for 2001.

Furthermore, there is an indication of overcapacity in global shipping industries partly due to the low cost of purchasing new ships. This may result in lower freight prices and further pressure on port operators to reduce their profit margins. At the same time, the lower prices may attract less profitable cargoes that were traditionally carried in bulk to be carried in containers (neo-bulk) [17].

In terms of fleet growth, Malaysia’s shipping fleet (that is vessels under Malaysian flag owned by Malaysian companies) grew with an average 13.2% in the decade 1990 to 1999 from 1.718 th GWT in 1990 to 5.245 th GWT in 1999 (see also Table 1), while the ESCAP region’s corresponding growth was 0.7% and the global growth 3.1%. [18]
4.2 Malaysian Companies

The Malaysian fleet is comprised approximately as follows: tankers and liquid bulk carriers 33%, general cargo and bulk 35% and container ships 10% (see also Table 1). This fleet carries about 20% of the total Malaysian cargo. The total number of vessels registered in Malaysia is expected to increase from 3,200 ships or 6.5 million GRT in 2000 to 3,800 ships or 8.8 million GRT in 2005 [6].
Table 1: Malaysian National Fleet by Type (Source: [6])

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Oil Tanker GRT ('000)</td>
<td>596.263</td>
<td>727.466</td>
<td>977.852</td>
<td>1.072.220</td>
<td>968.464</td>
<td>1.086.555</td>
</tr>
<tr>
<td>Liquefied Gas Carrier GRT ('000)</td>
<td>12</td>
<td>14</td>
<td>16</td>
<td>18</td>
<td>19</td>
<td>43</td>
</tr>
<tr>
<td>Ore/Bulk/Oil Carrier GRT ('000)</td>
<td>523.523</td>
<td>652.014</td>
<td>754.555</td>
<td>877.098</td>
<td>774.843</td>
<td>835.045</td>
</tr>
<tr>
<td>General Cargo GRT ('000)</td>
<td>369</td>
<td>426</td>
<td>480</td>
<td>484</td>
<td>492</td>
<td>493</td>
</tr>
<tr>
<td>Passenger/Cargo Carrier GRT ('000)</td>
<td>661.849</td>
<td>782</td>
<td>860.762</td>
<td>882.485</td>
<td>773.015</td>
<td>764.274</td>
</tr>
<tr>
<td>Container Ship GRT ('000)</td>
<td>31.652</td>
<td>33.443</td>
<td>35.519</td>
<td>43.127</td>
<td>26.376</td>
<td>39.313</td>
</tr>
<tr>
<td>Vehicle Carrier GRT ('000)</td>
<td>21.7747</td>
<td>31.087</td>
<td>542</td>
<td>685.534</td>
<td>735.326</td>
<td>783.055</td>
</tr>
<tr>
<td>Others GRT ('000)</td>
<td>1.386</td>
<td>1.579</td>
<td>1.875</td>
<td>1.966</td>
<td>1.995</td>
<td></td>
</tr>
</tbody>
</table>

**Malaysian Companies**

The most prominent Malaysian player in the shipping business is the Malaysia International Shipping Corporation Bhd. (MISC). Petronas is MISC’s largest shareholder owning 62% of the company. MISC’s fleet increased from 62 ships in 1995 to 125 in 2000 totaling 4.2m DWT. It has the 25th largest capacity (around 40.000 TEUs) globally in container fleet (see Fig. 5), but is most actively involved in the more profitable LPG, LNG and petroleum transport as well as liquid and general bulk. It operates also as a logistics services provider offering haulage, trucking and warehousing.

Another established company is Global Maritime Ventures Bhd. (GMV). It has joint ventures in Wawasan Shipping Sdn. Bhd. and Malaysian Bulk Carriers Sdn. Bhd. operating dry bulk carriers and tankers. GMV fleet consisted of 13 ships in 2001. Other Malaysian companies actively involved in shipping are: Halim Mazmin Berhad, Nepline, Global Carriers, PDZ, and Malaysian Merchant Marine Berhad, as well as 60 more companies, members of the Malaysian Shipowners Association (MASA). [19]

**Participation in International Alliances**

A growing trend among the shipping companies is the formation of “Alliances”. This is a form of capacity sharing in order to reach a greater amount of destinations without utilizing more vessels. Malaysian companies are member of alliances like the “New Grand Alliance” comprising MISC, Nippon Yusen Kaisha Line, Orient Overseas Container Line (OOCL), Hapag Lloyd and P&O Nedlloyd (PONL). Important alliances in the East-West trade are also the “New World Alliance”, MAERSK/SeaLand, Tricon, Sino-Japanese Alliance [20]. Similar less powerful groups are the “Safari Group”
comprising MISC, Mitsui Osk Lines (MOL), PONL, KLine, and Safmarine, the Far East Australia Service and other.

4.3 National Vision and Policies for Shipping

National Vision

As mentioned in the Introduction section, Malaysian economy is export oriented with large quantities of goods transported to and from Malaysia. Thus, beyond the port industry, the shipping industry has also a vital role to play in the growth of the national economy. The carrying of the majority of freight transport by foreign-owned companies has two major disadvantages: (i) a flow of Malaysian capital to foreign companies, and (ii) an over-dependence on the same companies, which gives them almost monopoly power. Thus, understanding the importance of a national fleet with an adequate capacity, the Malaysian government has stated interest in the sector. The MISC founding by governmental initiative in 1968 is indicative. The aim is to achieve the highest possible share of Malaysia’s international trade carried by a nationally owned and operated fleet. [21]

Supporting Policies

According to the 8th Malaysian Plan [7], the government plans to support the modernization and expansion of local shipping companies. Special encouragement will be given to those companies offering offshore logistics support to increase their capacity through use of the Shipping Fund. There are also possibilities of development in niche markets, namely, for feeder and express shuttle services from national ports to major regional hubs. [3]

To support the national shipping and commercial fleet the following measures were introduced:

- i. Exemption from import duties for ships above 4,000 GRT,
- ii. Accelerated depreciation on ships,
- iii. Income tax exemptions for shipping businesses,
- iv. Tax exemption for seamen serving on board Malaysian ships,
- v. A Shipping Fund to provide financial assistance for ship acquisitions [21]
- vi. A cabotage policy that excludes foreign owned ships to service intra-national lines

Finally, the negotiating position of the Malaysian government on the discussions regarding the General Agreement on Trades in Services (GATS) calls for some restraint in the liberalization of the maritime industry since the national operators are not yet capable in to compete in terms of capacity, skills and technology with foreign firms on a level field. [21]
5. Institutional and Regulatory Status of Ports

Sections 5.1 and 5.2 provide an overview of policy and regulatory issues concerning the operation and development of ports in Malaysia. Section 5.3 outlines the major national and international organizations that are associated with maritime issues and/or influence port policy-making.

5.1 Organizational structure

The Malaysian ports are categorized as Federal and State Ports. The Federal Ports are under the jurisdiction of the Marine Division of the Ministry of Transport (MOT) while the State ports are directed by the respective State Ministry. The Federal Ports are further divided into major and minor ports. Finally, the smaller ports and jetties are controlled by the Marine Dept. of MOT. [21] Figure 6 shows schematically the organizational structure of the marine related MOT branch.

Figure 6: Organization structure of Maritime Transport Administration (Source: IAPH)

Malaysia’s aggressive privatization policy regarding port authorities began with the corporatization of Port Klang Authority in 1983. The majority share (51%) of the national company was sold to KCT in 1986, using the popular Sale of Equity method (SOE – see Appendix 1). These initiatives were considered an example of the benefits of port privatization for all stakeholders including “the workers as a whole” [22]. Similar steps
were taken for the privatization of the other major federal port facilities (see section 2) as well as some of the state ports. In most cases the government retains part of the equity (usually through other government owned companies) and has some control over management decisions. The scheme of privatization retained the existence of the Port Authority in the form of Landlord port. This means the federal government leases the land and existing facilities and equipment to private port operators. In some cases where new investments were required a mixed BOT scheme has been used (PTP).

The role of the Landlord Port Authority can be summarized as regulator, supervisor and facilitator of the port activities. More specifically the Landlord Port Authority is responsible for:

- Setting and enforcing regulations (e.g. navigation control, safety and security, and environmental protection)
- Providing trade facilitation (e.g. provision of port EDI, inter-port cooperation and strategic marketing)
- Managing the port assets
- Setting and verifying performance standards
- Providing licenses and permits of operation and monitoring fair competition
- Planning the future port developments (long-term planning, infrastructure development and maintenance, and coordination with city/regional development) [21], [2]

Notably, among the stated objectives in the 8th Malaysian Plan is the creation of a unified controlling National Port Authority as a regulatory body. This body is expected to undertake the responsibilities of the individual port authorities as mentioned above. Furthermore, it will be capable of serving as a centralized development planning body that will ensure a balanced development of ports according to their dynamic, specialization, equipment and hinterland facilitation. [6], [23]

5.2 National Vision and Policies for Port Development

National Vision and Goals

With the privatization of port facilities under way the Malaysian government aims to:

- Provide a comprehensive range of infrastructure facilities and amenities to facilitate economic growth and open new corridors for development;
- Promote multimodalism to enhance the seamless integration of all modes of transport;
- Increase efficiency, productivity and reliability of service through continuous review and stricter enforcement of performance standards and technical specifications as well as the use of new and adapted technologies; and
- Ensure the availability of reliable infrastructure facilities and services at reasonable costs. [6]

The total port freight throughput is expected to reach by 2005 the 381m FWT compared to 220.8m FWT in 2000 as shown in Table 2. This means an expected annual increase of around 13% for the next 5 year period. To anticipate this traffic there are plans to increase the port capacity from 344m FWT per year in 2000 to 542m FWT in 2005, as shown in Table 3. The projects that are already under way include:

- the construction of berths and storage facilities at Port Klang (West Port);
the expansion of NBCT in Port Penang;
the construction of a dedicated container terminal and a petrochemical jetty in Kuantan Port
an additional berth in PTP
an additional LNG jetty in Bintulu Port, and
the construction of a new port at Ranca-Ranca Labuan. [6]

Table 2: Cargo Breakup for all Malaysian Ports (source: [6])

<table>
<thead>
<tr>
<th>Cargo Type</th>
<th>1995</th>
<th>2000</th>
<th>% change/year</th>
<th>Expected in 2005</th>
</tr>
</thead>
<tbody>
<tr>
<td>General</td>
<td>30.1</td>
<td>26.0</td>
<td>-2.7</td>
<td>35.0</td>
</tr>
<tr>
<td>Liquid Bulk</td>
<td>60.7</td>
<td>82.8</td>
<td>7.3</td>
<td>109.0</td>
</tr>
<tr>
<td>Dry Bulk</td>
<td>23.7</td>
<td>30.7</td>
<td>5.9</td>
<td>37.0</td>
</tr>
<tr>
<td>Container</td>
<td>37.8</td>
<td>81.3</td>
<td>23.0</td>
<td>200.0</td>
</tr>
<tr>
<td>Total</td>
<td>152.3</td>
<td>220.8</td>
<td>9.0</td>
<td>381.0</td>
</tr>
</tbody>
</table>

Table 3: Port Capacity in M tons

<table>
<thead>
<tr>
<th>Year</th>
<th>Capacity</th>
<th>Throughput</th>
<th>Utilization</th>
</tr>
</thead>
<tbody>
<tr>
<td>1995</td>
<td>174.1</td>
<td>152.3</td>
<td>0.87</td>
</tr>
<tr>
<td>2000</td>
<td>344.1</td>
<td>220.8</td>
<td>0.64</td>
</tr>
<tr>
<td>2005 (projected)</td>
<td>541.9</td>
<td>381.0</td>
<td>0.70</td>
</tr>
</tbody>
</table>

**Policies**

To support the growth of the sector a number of measures were announced by the 8th Malaysian Plan in 2000. These include the integration of Port Authorities (see previous section) and port alliances (Johor and PTP); the relaxation of cabotage policy to be extended so that Port Klang and PTP can be connected with foreign owned ships; the provision of ancillary services (see section 6); the encouragement of increased use of technology; and the promotion of continuous employee training programs.

Specifically the Malaysian Government’s port policies can be characterized as “Supply Driven” and “Load Centering”. The Supply Driven strategy aims to provide high quality port services without congestion and low waiting times which in turn requires adequate port capacity and high utilization and is described in the first paragraph of this section. The Load Centering strategy which was initiated in 1993 proclaimed Port Klang as the national load center and the regional transshipment center. All other Malaysian ports would work as feeder ports forwarding when possible cargo to Port Klang. This strategy has been altered with the introduction of PTP towards a dual centered model. At the same time it was understood that specific ports could be specialized (Kuantan port for example).

Infrastructure investments included the railroad connection of PTP and enhanced highway connections for Port Klang. At the same time foreign participation in equity holding was allowed and customer centered tariff pricing was introduced with volume discounts and reasonable rates for regular intra-national feeder services.
5.3 Related Organizations

*International*

The major organizations that are directly involved in international regulation of maritime activities and constitute forums of discussion and cooperation among member states are:

The **International Maritime Organization (IMO)**; it is a UN specialized agency that promotes the adoption of conventions, protocols and recommendations as national laws among member states. It is involved in maritime safety, pollution prevention, liability, legal and security issues.

The **International Association of Ports and Harbors (IAPH)**; it is an organization with NGO status with the objective to establish contacts and promote cooperation between ports and represent the interests of the port industry in international forums. Additionally, it collects statistical data and provides consultation to IMO.

The **ASEAN Ports Association (APA)**; it has similar objectives with IAPH but its members are ports in the ASEAN region (see below).

Among the trade facilitation organizations that influence maritime developments in Malaysia and the SE Asia region are:

The **World Trade Organization (WTO)**; it is an international organization that aims to ensure free trade flow among nations. The WTO inspired, General Agreement of Trade in Services (GATS) has an annex on the liberalization of maritime transport services.

The **Association of Southeast Asian Nations (ASEAN)**; it is a political government association with member states: Indonesia, Malaysia, Philippines, Singapore, Thailand, Brunei Darussalam, Vietnam, Laos, Myanmar, and Cambodia. The ASEAN Free Trade Area (AFTA) agreement increased the intra-regional trade and the maritime trade liberalization procedures. Towards these aims tariff agreements like the Common Effective Preferential Tariff Scheme (CEPT) and the Preferential Trading Arrangements (PTA) were established.

The **Asia Pacific Economic Cooperation (APEC)**; It is a Pacific rim country association numbering 21 members with arrangements on ocean transportation. It has conducted surveys and gathers statistical data on port and maritime developments. The databases are still very incomplete.

The **Economic and Social Commission for Asia and the Pacific (ESCAP)**; It is a United Nations organization focused on Asia. Among other activities, it conducts studies on transportation and maritime developments and issues recommendations.

Others more specialized organizations are:

- the International Navigation Association, IALA,
- the International Association of Lighthouse Authorities, IHMA,
- the International Harbour Masters Association, ICHCA,
- the International Cargo Handling Co-ordination Association, ICS,
- the International Chamber of Shipping and IMPA, and
- the International Maritime Pilots Association.
On the national level influential organizations for the maritime issues are:
The **Federation of Malaysian Port Operating Companies** (FMPOC), which comprises Northport, Westport, Penang Port, Johor Port, Bintulu Port, Kuantan Port, Lumut Maritime Terminal and Port of Tanjung Pelepas.

The **Malaysian Shipowners Association** (MASA); it is an organization represented in the Shipping Council, Port Consulting Committees of various Port Authorities and works closely with MOT.

The **Port Klang Shipping Agents Association** (PKSAA).

The **Northeart Malaysia Shipping Agents Association** (NMSAA).

**Private Public Partnerships**

In the quest for funding and new investment for port and infrastructure development possible partners would be major international companies ranging from ocean carriers and shipping companies to logistics service providers and internationalized port operators (e.g. Hutchison Port Holdings, PSA Corporation, P&O Ports, Stevedoring Services of America and Eurogate (GLG-Eurokai)) [24]. A more detailed approach on the public-private partnerships issue generally for Malaysia is given by John Ward's inception report, titled “Public-Private Partnerships in the Malaysian Transportation Industry.”

### 6. Total Transportation Services

The promotion of multimodalism and of new technologies is among the stated goals for the Malaysian ports and transportation sector (see section 5.2). In this section we discuss the intermodal and multimodal options offered by the Malaysian ports, current developments and opportunities.

#### 6.1 Multimodalism

The European Commission identifies multimodalism as: “an optimal integration of different transport modes enabling an efficient and cost-effective use of the transport system through seamless, customer-oriented door-to-door services, whilst favoring competition between transport operators.” [25]

**Highway Connections**

Trucking is the most common mode of transport for inland traffic in Malaysia, either for containerized or bulk cargo. All major port facilities as mentioned in Section 2 have adequate highway connections leading to an expanding road network.

**Railroad Connections**

The railroad presents an attractive alternative to trucking since it offers comparable speed and reduces the traffic congestion in intensive use areas like KL, and has lesser impact on air quality. In 2000 the containers carried by rail to and from ports were 223,718 TEUs, or ~7% of the non-transshipment port throughput in the same period. The total cargo carried by rail was 5m tons, or ~3.5% of the total port throughput. Generally, the main rail freight traffic comprises mainly containers and cement [7].
All major mainland ports have a rail connection as discussed in Section 2. All railroad connections are shown in Figure 7. PTP was connected in October 2002. With the transshipment market expanding, PTP expects to capture some of the generated spin-off traffic. Containers need approximately 72 hours by rail from PTP to South Thailand, which is comparable to a feeder service. This time will be reduced if the double electric line project materializes. Currently, KTM Bhd, the Malaysian rail company, operates a weekly block train service to transship Thailand traffic to Port Klang. To facilitate this
traffic KTMB has invested $3.7M (2001) to purchase bogey reefer flats (BRFs). Another line that is being utilized by MISC Integrated Logistics is a rail service between Kerteh Petrochemical Hub and Kuantan Port carrying 18,000 TEUs annually. The service costs slightly more than the truck but is preferred for safety reasons. [News, 17:59 03/04/02 Asia Intermodal]

In terms of network expansion, a project to construct a second electrified line from Johor Baru to Padang Besar covering all the length of the west coast peninsular Malaysia. Additionally, KTM Bhd seeks investors to expand services to include Cambodia and Pnom Penh Vietnam. Currently it is linked with Bangkok only. An even longer-term prospect is the possibility of a Trans-Asia link to connect Singapore to Kumming, China transiting Malaysia, Thailand, Cambodia, Laos and Vietnam.

**Air Connections**
A service recently offered by Northport connecting ship and air transport is utilized for specialized cargo. This sea-air transshipment service through KL International Airport (KLIA) involves the transfer of containers to the Northport CFS. The container load is unpacked and then trucked to Northport Distripark. There it is packed again in Unit Load Devices (ULD) to be transferred by trucks to KLIA and transshipped on the plane. MASkargo is currently the company that offers the air-haulage. [News 03] Port Penang and PTP are also close to airports and have the potential to offer a similar service in the future if demand is sufficient.

**6.2 Logistics**
The logistics supplier focuses on providing a high-quality, reliable door-to-door transport service for the customer. Beyond the hinterland access discussed in the previous section, this may involve custom clearance, organization of transportation with the minimum cost for the demanded delivery time, warehousing, packaging, or preparation of the cargo for shipment. Port operators may be able to provide part or even all of the above-mentioned activities, upgrading from a transferring point between different transportation means to an active node in the transport chain. [2]

One of the first steps to be taken towards logistics service is simplified documentation and streamlined customer access to the system. Malaysia is moving towards providing customs services outside the port boundaries and electronic lodging of documents through either the Electronic Data Interchange (EDI) system or the Internet. Regarding custom clearance the United Nations Conference on Trade and Development (UNCTAD) has developed an Automated System of CUstoms DAta (ASYCUDA).

Specifically for EDI, shipping lines and freight handlers can electronically declare their actions in a paperless environment of operations. Information regarding the status of cargo, i.e. dangerous, for import, export, or for transshipment are sent to the Port Authority. The FCZ-EDI (using the UN/EDIFACT standard) system provides real time monitoring of cargo passing through the Free Commercial Zone, notifying the Customs and terminal operators automatically. The approval process takes around 25 minutes whereas the manual system required 180 minutes. Thus the processing time is reduced by
86 per cent, it requires less human involvement and as a result, operating costs are lowered. (PKA data, [27])

The Malaysian government has stated its intention to enhance the supporting, ancillary services associated with logistics like distriparks, bunkering, custom brokerage, insurance, and shipping [6]. All major ports are engaged in value-adding operations like distriparks and Container Freight Stations (CFS), where container load and unload, packing, and container maintenance services are offered. Besides the port-offered facilities a logistics network relies on inland facilities, especially Inland Container Depots (ICD). Port Klang is connected to 5 such depots (Prai, Ipoh, Nilai, Pasir Gudang, and Bangsue – Lat Krabang in Bangkok). KTMB also operates its own depot in KL and provides haulage to Ipoh ICT (see also Fig. 7).

Apart from these, some of the container haulage companies operate their own depots. The five major haulage companies that offer this service are Kontena Nasional, Konsortium Perkapalan, MISC Haulage Services, DiPerdana Corporation and Multimodal Freight. The quality of the trucking haulage services in general, especially during peak demand periods, is important in the overall productivity of a port. If the port operates efficiently but the hinterland connection is creating a bottleneck then the advantage is lost and freight forwarders may opt for other gateways.

7. Related Issues

In this section we discuss a variety of important related issues to the port industry in Malaysia. These issues include security, operational safety, sustainability and environment, advances in port technology, price and tariff setting, and others.

7.1 Security and Safety

Terrorism

In the last two years a relatively new concept of cargo security is being promoted especially by US agencies. It is concerned with the monitoring of containerized cargo. Since the number of containers is so great and the Free Commercial Zones do not demand custom checking of freights until out of the FCZ boundaries, it would be possible to ship malevolent cargo. The US, after the 9/11 terrorist attack, is especially concerned with the issue. In order to defray part of the screening burden from the US ports and at the same time prevent suspicious freights from reaching US soil at all, the US government supports a number of initiatives. These include the Container Security Initiative (CSI) aiming towards higher security levels for the international trade by screening US-bound cargo at ports outside the US and the Customs-Trade Partnership Against Terrorism (C-TPAT), a program designed to improve security along the whole supply chain.

Malaysia decided to join the CSI. Following this decision, PTP has applied to join the C-TPAT. Port Klang and PSA have also stated their interest in participating to the agreement. The participation to the initiatives will enable the ports to be utilized as “screening hubs” for goods that come from ports outside the agreement and perhaps gain an edge over competition. Northport in Port Klang has already received and used an X-
ray scanning machine. A secondary advantage to scanning is the identification of false cargo declarations. What remains questionable is the disruption screening may convey on the logistics process thus causing delays; possible disproportionate cost increases due to equipment and personnel; and even the efficiency of the used techniques. Currently the screening techniques are X-ray machines, portable detection equipment, sniffer dogs, and human inspection. The use of intelligence, the identification of unusual cargo and the revision of port security plans are essential for the screening measures to be reliable.

Regarding the shipping of dangerous cargo (not only for malevolent purpose), the ASEAN Ports Association (APA) plans to create a shared database containing vessel name, cargo and shipper particulars to increase regional maritime security. This database is part of a program for a collective Electronic Data Processing Information System on Dangerous Goods. The system will be part of the current EDI and will distribute dangerous cargo declarations among members and track vessels carrying the materials, in order to allow for immediate action against incidents that present a security threat. [News, 14] Also, IMO is working on the Port Facility Security Code (SPFS) that would be incorporated in Chapter XI of SOLAS (International convention for the Safety of Life at Sea). SPFS aims to provide a standard risk assessment based framework. [28]

**Theft and Piracy**

More conventional but unfortunately still persisting security threats to cargo and crew are the incidents of theft of cargo inside the ports or in the case of piracy while on ship. A theft incident that made it to the headlines of the specialized press in 2002 was the stealing of a 20-ft container loaded with hard disk drives [News 12:17 08/04/02 Asia Shipper]. The theft was most probably made possible by the use of false identification. In response to this, a Smart Card Security System (SCSS) has been introduced in Port Klang. Port-issued smart cards will be required for the entry in the port gates and any transaction will be recorded electronically. The smart cards will contain digitized information of the holder. The cooperation of the haulage companies is needed for this measure to succeed. Tighter security and surveillance measures in general are helpful and improve the quality of the port service.

Piracy on the other hand is an international problem. The Malacca straits are one of the busiest sea routes in confined waters. This means that vessels are vulnerable to armed attacks by modern pirates. Incidents like these occur with a frequency of around one a month. Beyond the cargo and crew safety the risk of ship wreckage with a consequent dangerous goods spill is increased since during the incident control over the ship may be lost. To fight back, Indonesia, Malaysia and Singapore have since 1992 implemented a joint patrol program of the area. This was followed by the adoption of a "Piracy/armed robbery attack" distress alert message to be sent via radio or Inmarsat satellite equipment and an advice by the International Maritime Bureau (IMB) to ship owners to install ShipLoc – a satellite tracking system placed on board vessels. [29]
Safety
The broader issue of maritime safety, which includes security concerns, is addressed on the international level by the IMO, as mentioned in section 5.3. Maritime safety includes navigational safety; vessel inspection and control; dangerous cargo handling; and port worker - stevedore safety. There are a number of recommendations and regulations that cover all parts of the issue and in 2002 the International Safety Management (ISM) code for was introduced. Adherence to the international standards is an appropriate way to safeguard safety, and Malaysia has taken several steps to this direction.

Especially with regard to navigation in the difficult Malacca straits it operates a fleet of enforcement vessels and introduced navigational aids. Malaysia promotes the usage of the Marine Electronic Highway system and the introduction of the Automatic Identification and Differential Global Positioning systems to identify and provide safe guidance to vessels in the straits. Furthermore, there are operational Vessel Traffic Management Systems (VTMS).

7.2 Sustainability and Environment
Port facilities are using the resources of the local community (land, water and air); in turn, it provides jobs for the region and boosts the national economy. The resource usage should be organized in a sustainable way - an issue that was only recently brought up in the port industry. Beyond the environmental impact studies when undertaking new projects, there are issues like ship waste treatment, ship ballast waters treatment, and air pollution by particulates from handling and storing bulk cargo. In Malaysia there are reception facilities for ship waste but there was a lack of information on their effectiveness and method of treatment. International best practice integrates the waste treatment facility of neighboring communities. The European Commission has mandated the ship waste disposal in every port of call, thus allowing for the investments done by the Port Authority in waste disposal facilities to be economically viable. [28] Ballast water quantities on the other hand (especially for empty bulk carriers) are huge and cannot be easily treated through the port. Other solutions like on board treating and/or open sea ballast water exchange may be more viable although not fail proof.

7.3 Port Tariffs and Pricing in Shipping
According to the UNESCAP study [16], the port tariffs in Malaysia were being adjusted with fundamentally the same method since 1963. The study underscored that the “principles of port pricing in Malaysia are not clear, but it is possible that pricing approaches based on cost-based pricing will be taken if the port tariff is revised in the future.” The usual procedure for partial re-adjustments is the following: a cost review of port facilities and services is performed; market sensitiveness is reviewed; opinions are collected from related parties; and finally approval from the government (MOT) is sought. [16]

As mentioned in section 3.1 the port tariffs in Malaysia are significantly lower compared to Singapore (more than 50% in some cases). The possibility of price war tactics is there but PSA has not yet taken drastic steps. Professor C.H. Leong of M.U.S.T, during our meeting at MIT in January 2003, mentioned an indirect subsidy practice from the
Malaysian government to achieve such low rates. No cross-reference of this could be found, but it is possible that certain investments and favorable lease contracts may facilitate low operational costs.

Another issue of pricing is the comparatively low freight rates for cargoes shipping from Malaysia. Although this is good for the forwarders and the competitiveness of the product in the end market, it may result in a preference of shippers to load from more profitable ports of origin. They would prefer to use up their capacity and leave containers in Malaysia waiting for the next available liner resulting in delays to cargo delivery. This phenomenon though with the reduction in the slot utilization levels of container ships may have little impact.

7.4 Other Issues

Trends in Port Technology

The development of port technology has lead to some new high-end applications that can practically increase port productivity. Some examples are the introduction of automation and driverless tractors in container terminals (ETC Terminal in Roterdam, Thamesport in London, Pasir Panjang Terminal in Singapore) or the use of tandem spreaders to lift two containers simultaneously in a single move. Another breakthrough in port design was the introduction of indented berths in a new container facility in Amsterdam. [24] This berth allows the service of big containerships from both sides thus increasing the number of gantries that can be simultaneously used and of course reducing ship turnaround time. Malaysian ports may in the future employ some of the above techniques.

Trends in Shipping Technology

Another area that directly affects the port industry is the constant increase in the capacity of container ships. This trend has led to the currently largest registered container ship (Hapag-Lloyd Hamburg Express with 7500 TEU) [30]. These ships of Super-post-Panamax size can be serviced in Malaysia both by port Klang and PTP. There is an ongoing debate on the economic feasibility of greater ships [4] but some shipyards already promote designs of 10,000 and 12,000 TEU (called Malacca-max since their design is limited by the ability to cross the Malacca straits). Such ships have not been ordered yet. Because of the decline of global economy and the delivery of new container ships ordered during the 1997 boom, the container slot supply far exceeds demand forcing shipping lines to slice rates and merge lines. The current situation does not indicate any willingness in companies to order ships Malacca-max ships in the immediate future. Another trend that could arise is the ordering of smaller and faster ships that will offer premium quality services and the consequent demand of even more efficient port services. The latter scenario now seems more plausible but has not yet been realized. In any case, the two bigger Malaysian port facilities will be capable of servicing the biggest ships available for at least a five-year period. The supply driven policy may force the expansion of facilities and infrastructure but in terms of more and faster post-panamax gantries, berths and corresponding dredging rather than new super-post-panamax ones.
Promotion of passenger service

This report deals primarily with the commercial and trade issues of ports. Malaysian ports though, also facilitate passenger traffic. Although the profit margins for the port facilities are small for this service, they are a gateway for the tourism cruise industry and provide a service to the public with ferry transport. Thus, the improvement of passenger reception facilities, the development of host marinas and other recreational activities surrounding port areas are of importance.

8. Conclusions – Integration

Overview

This report aimed to provide an initial comprehensive assessment of the port subsystem of the Malaysian transportation sector. The major Malaysian ports are in an expansion phase and have the capacity to service the growing international and national trade. Ports account for 90% of the total Malaysian trade. Following an aggressive port management policy that involved early privatizations, investments in new infrastructure and equipment, quality services and very competitive prices, the Malaysian ports are established among the world’s leaders and claim a share of the transshipment market which accounts for the impressive growth of neighboring PSA. Beyond the container market, there is a specialization of ports according to the prevalent cargo that they facilitate, Kuantan port for example specializes in petrochemicals. The organization structure relies on a Landlord scheme, where the federally or state controlled Port Authority supervises one or more private operators. The integration of the Port Authorities into a unified one is declared in the 8th Malaysian Plan.

The Malaysian shipping industry, on the other hand, is still lacking the capacity to cater effectively for the needs of the economy. Its competitiveness is limited and still needs some measures of protection like cabotage. MISC, the leading Malaysian shipping company though, has a respectable container and liquid bulk capacity. The shipping industry in general is moving toward the formation of alliances that increase the power and flexibility of the participants. The big players have significant market power over the port facilities. At the same time, although the containerized shipping is continually increasing there are signs of overcapacity in the global fleet. The world economy did not follow the expectations of the shippers and the utilization of container slots in the liners is decreasing.

This underlines the fact that the transportation sector and consequently the ports are directly linked to the state of the economy of the hinterland, of the region and of the world. The ports, though, that are utilized as transshipment hubs have the opportunity to grow faster than the national economic conditions would permit. This is the case for the Port Klang and Port of Tanjung Pelepas. Competitive price policies have drawn transshipment traffic from PSA to PTP and PKA. Apart from PSA, the other ports in the region have some competitive potential that is not currently active, catering mostly for their hinterland needs.
The hinterland connections in Malaysia are based principally on highways and cargo trucking and secondly on rail. A significant percentage of the national cargo is also transported via feeder ships from secondary ports to the main and vice versa. Rail transport of containers is increasing but still cannot be compared with the truck haulage. The service quality of the hinterland connection and the available ancillary services affect the overall performance of the port link. In the era of logistics and door-to-door transportation services the ports have the opportunity to gain advantage with the provision of paperless electronic transactions (EDI), storage facilities, distriparks, Container Freight Stations and container maintenance. Malaysian port operators are aware of the fact and offer a range of similar services. Finally, in terms of security, screening and identification measures are being implemented in accordance with international efforts. There are also steps taken for the harmonization of the existing regulations on environmental protection and safety with the IMO recommendations.

Schematic presentation
Adhering to the CLIOS analysis approach as presented in the Dodder and Sussman paper [7], the basic interactions and connections that affect the port industry are presented schematically in Figure 8. The economic, institutional and technical issues and their corresponding structures discussed in our report are summarized in this diagram.

Figure 8: CLIOS Representation of Port Subsystem
Further Research – Integration and Issues of Interest

i. The influence of port generated traffic
The real numbers of the port generated truck traffic was unavailable and so for the purposes of this initial report estimates based on the port throughput were calculated. These numbers should be compared to the traffic of areas with problems of congestion (especially KL) and the influence of commercial traffic in general. Of course, since the national policy of Malaysia was towards load centering to Port Klang, the decentralization example of Bangkok cannot be followed. Other measures though, like the incentives for more frequent feeder ship services and the promotion of rail haulage may significantly reduce the generated traffic.

ii. Internal competition and potential overcapacity
The growth of Malaysian ports is notable as Table 3 indicates. At the same time, there are indications of potential infrastructure overcapacity even if the economy grows as expected. Additionally, since the ports vie for more or less the same market there are indications of internal competition. Neither of the two is inherently problematic. Since economic forecasts cannot be accurate, the supply driven strategy that leads to high capacity will utilize any economic surge. At the same time competition would make the port operators increase their efficiency and hence their profit margins. The question is whether further investments in infrastructure are economically justified. A real-option study could assess the opportunity costs of expanding the port infrastructure given various scenarios of economic conditions and the resulting benefits. As discussed in Section 7.4 the shipping industry may not require expanded port capacity for the immediate future. With real-options, different investment choices are studied comparing the economic impact of a spectrum of alternatives. These include the partial construction of projects with the option of expansion if the economic conditions are favorable. A good source on this field is [31]. In any case, the Malaysian government realizes the need for a centralized supervisory body that would be able to exert greater control over general planning decisions and allocate the investments accordingly.

iii. Research in greater detail
Other important issues that have not been assessed are the:
- quality of haulage services
- port tariff schemes
- origins of the exported cargo
- composition of cargo for each port
- financial importance of each cargo type for the port and national economy
- accordance of maritime regulations with international standards

Our new research will focus on the total intermodal freight transportation in Malaysia. Special attention will be placed on the use of Intelligent Transportation Systems (ITS) applications and more specifically Commercial Vehicle Operations (CVO) for the facilitation, management and supervision of freight traffic.
Appendix 1: Terminology - Definitions

Landlord port provides infrastructure only (berths, wharves, yards, access channels etc). Tool Port provides infrastructure and superstructure (gantries, carriers, warehouses etc.) and leases the operations to a company. Service Port infrastructure, superstructure and cargo handling (stevedoring labor).[13]

Degrees of private participation:
(a) Publicly owned and operated port
(b) Private stevedoring in publicly owned facility
(c) Private shore-side cargo-handling and stevedoring in public facility
(d) Private operating concession in public facility
(e) Privately owned and operated terminal [15]

General Cargo: non-containerized unitized cargo (e.g. pallets, steel plates, sacks) it can be more labor demanding
Dry Bulk: Grains, ore, fertilizer etc
Liquid Bulk: Petroleum, Gas, Chemicals, Oils etc.
Containers: unitized, standardized freight in boxes. Liquids can be transported in special containers too.
TEU: Twenty-feet Equivalent Unit.

EDI: Electronic Data Interchange: Paperless form of exchanging shipping information. Greatly reduces processing times, automates procedures, reduces labor requirements and allows for continuous monitoring of cargo from the government’s and Custom’s perspective as well as from the customer. Introduced in 1980 before the Internet. Now the same actions can be performed through internet [17]

Computerized Yard Management: computerized systems that allow continuous monitoring of all import and export containers. Implemented right greatly increases productivity and reduces labor requirements. Most common commercial systems are the Cosmos and Navis.

Privatization methods as followed in Malaysia [12]:
Most of the projects privatized were through the Sale of Equity (SOE) method, which accounted for 56.4 percent of the total. This method involves the selling of part or all of the government owned stocks of a company. Another 13.6 percent was through the Build, Operate and Transfer/Build, Lease and Transfer (BOT/BLT) method and 13.1 percent through the Sale of Asset (SOA) method.

Other methods of privatization such as the Build, Operate and Own (BOO), Management Buy-Out (MBO) and Lease of Asset (LOA) were used to a lesser extent.

FWT: Freight Weight Tons
GRT: Gross Registered Tons
DWT: Dead Weight Tons
Appendix 2: Generated Traffic Calculations

Since in this initial phase the data of the truck traffic generated by the port operations was unavailable the following approximation method was used.

**Container Freight Formula:**

\[
TI = (TT - TS) \times (1 - R) \times ETL \times ETI
\]

where:
- **TI:** Truck Itineraries
- **TT:** Total Throughput in TEUs
- **TS:** Transshipment
- **R:** Rail share
- **ETF:** Equivalent Truck Freights multiplier
- **ETI:** Equivalent Truck Itinerary multiplier

Reasonable values for the two latter parameters are
- **ETF = 0.65** Assuming:
  (i) 40% of the throughput are 40-ft container and the rest 60% 20-ft
  (ii) 20% of the trucks are loaded with 2 20-ft containers

- **ETI = 1.6** Assuming:
  (i) 25% of the trucks bring an Export load and accept an Import Load
  \[ETI = \frac{2}{(1 + \%)}\]

**Bulk Freight Formula:**

\[
TI = TT \times (1 - R) / ETL
\]

where:
- **TT:** Total Throughput in tons
- **ETL:** Equivalent Truck Load in tons

We assume ETL = 20 tons

**Note:** A study of the generated container truck traffic from a US port [32] came up with the following equations:

\[
OUTTK = 310 + 0.7 \times (IMPFU), \text{ where } \]

OUTTK: Outbound Loaded Freight Truck Volume
IMPFU: Total Number of Imported Freight Units

\[
INTK = 1.20 \times (EXPFU)
\]

INTK: Inbound Loaded Freight Truck Volume
EXPFU: Total Number of Exported Freight Units

If applied in PKA, the resulting truck traffic would be 4200 trucks/day instead of the 5200 trucks/day calculated by our method. Given the approximate nature of both methods and the non-Malaysian operational environment where they are both based we consider the results are quite close. More field studies in Malaysia are required to achieve greater accuracy.
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