

57967



Public Disclosure Authorized

Public Disclosure Authorized

Public Disclosure Authorized

FREIGHT TRANSPORT FOR DEVELOPMENT TOOLKIT:

Ports & Waterborne Freight



DFID Department for International Development

C. Bert Kruk

Michel Donner



The Transport Research Support program is a joint World Bank/ DFID initiative focusing on emerging issues in the transport sector. Its goal is to generate knowledge in high priority areas of the transport sector and to disseminate to practitioners and decision-makers in developing countries.

Ports & Waterborne Freight

©2009 The International Bank for Reconstruction and Development / The World Bank
1818 H Street NW
Washington DC 20433
Telephone: 202-473-1000
Internet: www.worldbank.org
E-mail: feedback@worldbank.org

All rights reserved

This volume is a product of the staff of the International Bank for Reconstruction and Development / The World Bank. The findings, interpretations, and conclusions expressed in this volume do not necessarily reflect the views of the Executive Directors of The World Bank or the governments they represent.

The World Bank does not guarantee the accuracy of the data included in this work. The boundaries, colors, denominations, and other information shown on any map in this work do not imply any judgment on the part of The World Bank concerning the legal status of any territory or the endorsement or acceptance of such boundaries.

Rights and Permissions

The material in this publication is copyrighted. Copying and/or transmitting portions or all of this work without permission may be a violation of applicable law. The International Bank for Reconstruction and Development / The World Bank encourages dissemination of its work and will normally grant permission to reproduce portions of the work promptly.

For permission to photocopy or reprint any part of this work, please send a request with complete information to the Copyright Clearance Center Inc., 222 Rosewood Drive, Danvers, MA 01923, USA; telephone: 978-750-8400; fax: 978-750-4470; Internet: www.copyright.com.

All other queries on rights and licenses, including subsidiary rights, should be addressed to the Office of the Publisher, The World Bank, 1818 H Street NW, Washington, DC 20433, USA; fax: 202-522-2422; e-mail: pubrights@worldbank.org.

CONTENTS

ACKNOWLEDGEMENTS	3
EXECUTIVE SUMMARY	ERROR! BOOKMARK NOT DEFINED.
EXECUTIVE SUMMARY	4
1. WORLD MARITIME TRANSPORT.....	8
1.1. CARGOES	8
1.2. SHIP TYPES AND FLEET.....	9
1.2.1. <i>Overview of all ship types of today.....</i>	<i>10</i>
1.2.2. <i>Details of some types of vessels.....</i>	<i>10</i>
1.3. DETAILS OF THE TOTAL WORLD FLEET	12
1.4. SHIP CHARACTERISTICS	13
2. THE CONTAINER.....	14
2.1. HISTORIC DEVELOPMENTS.....	14
2.2. CONTAINER SPECIFICS	14
2.3. CONTAINER VESSELS	15
2.4. WORLD CONTAINER PORTS	18
2.5. THE IMPACT OF CONTAINERIZATION	19
2.6. CONTAINERS, HINTERLAND CONNECTIONS AND INLAND CONTAINER DEPOTS	19
2.7. PRIVATE CONTAINER TERMINAL OPERATORS	22
3. PORTS.....	23
4. PORT AND TERMINAL EFFICIENCY AND PERFORMANCE INDICATORS	26
4.1. PORT AND TERMINAL EFFICIENCY	26
4.2. KEY PERFORMANCE INDICATORS (KPI'S) FOR CONTAINER TERMINALS	27
5. PORT MANAGEMENT TYPES AND FUNCTIONS AND PORT REFORM	30
5.1. PORT MANAGEMENT TYPES	30
5.2. PORT REFORM	31
5.2.1. <i>Port Reform Modalities.....</i>	<i>32</i>
5.2.2. <i>Port Reform Tools</i>	<i>33</i>
5.3. REGULATION	38
5.4. PPI PROJECT DATABASE OF THE PPIAF AND THE WORLD BANK	38
5.4.1. <i>Country Information</i>	<i>40</i>
5.4.2. <i>Investment Commitments in Seaports per Region.....</i>	<i>40</i>
5.4.3. <i>Global Developments in Terms of Financing of Port Projects before the Financial Crisis</i>	<i>41</i>
6. MARITIME TRANSPORT AND PORTS AND CLIMATE CHANGE	44
6.1. MEASURES TAKEN OR PROPOSED BY THE SHIPPING INDUSTRY TO DECREASE POLLUTION	44
6.2. MEASURES TAKEN OR PROPOSED BY PORT AUTHORITIES	45
6.3. MEASURES TAKEN OR PROPOSED BY TERMINAL OPERATORS	46
6.4. MEASURES TAKEN OR PROPOSED BY TERMINAL EQUIPMENT MANUFACTURERS	47
7. HEALTH, SAFETY AND SECURITY IN PORTS AND MARITIME TRANSPORT	48
7.1. SAFETY AND HEALTH	48
7.2. HIV/AIDS	49
7.3. SECURITY	50
7.3.1. <i>ISPS Code.....</i>	<i>50</i>
7.3.2. <i>Supply Chain Security.....</i>	<i>51</i>
8. CITY-PORT RELATIONSHIP	56
9. THE IMPACT OF THE FINANCIAL CRISIS ON PORTS AND MARITIME TRANSPORT	57

9.1.	INTRODUCTION	57
9.2.	WORLD MARITIME TRANSPORT	57
9.3.	FREIGHT RATES	58
9.4.	CHARTER RATES	58
9.5.	NEW VESSEL ORDERS	59
9.6.	VESSEL DEPLOYMENT	60
9.7.	CONTAINER PORT THROUGHPUT	62
9.8.	EMPTY CONTAINERS.....	63
9.9.	SHIPPING LINES	63
9.10.	PORT LABOR.....	63
9.11.	NEW PORT PROJECTS AND CONCESSIONS	63
9.12.	NEW SHIPPING ROUTES.....	64
9.13.	IS THE FINANCIAL CRISIS ONLY LEADING TO PROBLEMS?	65
10.	FINAL REMARKS.....	66
10.1.	THE WORLD BANK TRANSPORT BUSINESS STRATEGY 2008-2012	66
10.2.	TOP QUESTIONS.....	66
10.3.	A VIEW TO THE FUTURE.....	68
ANNEX 1 –	SHIPS’ CHARACTERISTICS	70

List of Figures

Foreword

Introduction

Several years ago, a former Minister of Development Cooperation of the Netherlands, when on mission in a developing country, made the following statement: “The development of a country starts with the development of its ports”.

Although this statement may be somewhat exaggerated, there is yet quite a lot of truth in it.

Ports form the window of the country to the outside world. Experience shows that those that are under-developed, congested, too small, too shallow, badly managed, poorly equipped, and unfortunately often in a combination of these factors, lead to higher consumer prices of goods that have to be imported and/or to less competitive prices of export products on the world market.

It is important that ports are well managed and that the facilities and operations respond to the requirements of international maritime transport and trade logistics, not only for the country itself, but also for the land-locked countries that use ports as their principal import/export window.

However, ports are complicated. Ports are a combination of technology, trade facilitation, human resources, safety and security, city-port relationship, environmental issues, managerial procedures, finance and human resources. And of course, not to be excluded: politics.

Although this paper addresses the topic ‘Waterborne Transport’, the main focus will be on maritime (ocean) transport, and far less on Inland Water Transport (IWT). However, Paragraph 2.6 addresses the importance and developments in IWT.

On the basis of our extensive experience in port and waterborne transport, we drafted a list of ‘Top Questions’. They represent the major issues that are, in varying compositions, the most frequently asked questions in ports around the world, and often essential ingredients of the World Bank projects that we have been and are supporting in this sector.

Physical and Operational Characteristics

- What design capacities are appropriate in port expansion planning processes?
- How to measure port efficiency?
- What are shipping lines considerations when identifying ports of call?
- What issues are involved in planning a national port strategy?

Port Management and Reform

- What are the modalities and tools used in Port Reform processes?
- How to introduce effective commercialization of a port?
- How to establish appropriate and enforceable port regulations?

Port Finance

- What financing models are available for port extension / developments of new facilities?
- How to produce an effective port business plan?

- What will be the impact of the Financial Crisis, and, more specifically, what will be the longer term effects in the global port and maritime sectors?

Hinterland Connections and City-Port Relations

- How to rationalize port access modalities with environmental and social factors included?

Social and Environment Issues

- Which human resource efficiency methods are available?
- Which are the port labor redundancy policies that are applied most frequently?

Safety and Security

- How should planning take into account the safety and security of the passage of freight?

This Freight Flagship Ports and Waterborne Transport report will explain and discuss all relevant issues related to the sector. At the end of the report the Top Questions will be repeated and will then make reference to the paragraphs that discuss the issues contained in each of the questions.

C. Bert Kruk

Michel Luc Donner

ACKNOWLEDGEMENTS

The “Freight Transport for Development: Port & Waterborne Transport” has been prepared for the World Bank Transport Anchor group (ETWTR) in Washington which administers and manages the Transport Research Support Program, a financing of DFID, the Department for International Development of the United Kingdom Government.

The paper is a sub-sector contribution to a major World Bank Flagship publication focusing on the contribution of freight transport as a whole to economic and social development.

We would like to express our thanks to Bert Kruk and Michel Donner who provided the framework and the technical content. Peter O’Neill, Adviser, ETWTR, provided guidance and advice throughout the preparation of the study. Michel Audige, Sector Manager Transport, Gylfi Palsson, Lead Transport Specialist, and Jean-Francois Marteau, Senior Transport Specialist provided additional expertise and review. Jacqueline Dubow, TRS Coordinator, managed the overall production.

EXECUTIVE SUMMARY

The estimate of the United Nations Conference on Trade and Development is that more than 80 percent, or close to 8 million tons in 2007, of world freight is transported by sea. Most, if not all, freight transport moves from the producer to the consumer through logistic processes thereby passing a number of nodal points. As for waterborne transport, sea and river ports and terminals form these nodal points where freight is transferred from one mode to another. Given the importance of global maritime and inland water freight transport, it is obvious that ports and terminals should be functioning as efficiently as possible to ensure a seamless transfer. The handling of cargoes in a port should be as fast and efficient as possible at the least possible costs. This means that terminals should work efficiently in terms of operations and that administrative (such as those of customs and inspections), safety and security procedures should not obstruct the smooth flow of cargoes through the port. It also implies that ports should have good connections to the hinterland, and, if surrounded by a city (as many ports are) the city does not obstruct this flow, whereas, at the same time, the negative impact of the port in terms of pollution for instance, should be as limited as possible. This paper provides an extensive overview of the many components of freight transport in the waterborne sector.

Chapter 1 provides data on World Maritime Transport and explain the different types of cargo that pass which are carried by the world merchant fleet and the cargoes they carry. It also is explained that the former general cargo type of vessels have evolved into vessel designs that have specifically been designed for different types of cargoes. Most spectacular in that respect is the development of crude oil carriers (tankers) and the container vessel. An overview of the development of the world fleet is provided as well. Ports have to be designed in such a way that they can safely receive various types of ships. In addition, in order to classify ports and terminals in terms of performance and efficiency, it is important to have an insight into the major characteristics of ships and barges.

The introduction of the container about 50 years ago has probably made the most drastic change in maritime transport and port and terminal design and operations. **Chapter 2** provides an extensive overview of the development of the container in terms of what containers are, how dedicated container vessels have developed as well as the impact of containers on logistic processes, including hinterland connections. The development of the capacity and the fleet of container vessels is described in detail. Whereas in the 1970-s the largest container ship had a capacity to carry about 2,000 TEU (the standard dimension of a 20ft long container), in 2009 the largest vessel has a capacity of 14,000 TEU. Not only the capacity increased, but also the dimensions length, width and draft. The impact of this development has been massive. The former container vessels were designed in such a way that they could transit the Panama Canal, but the mega vessels of today cannot. For this reason, Panama is now building new locks at the cost of some US 5 billion. The larger and deeper draft vessels also required deeper ports, larger terminals and more sophisticated operations and equipment. Ever increasing global trade (before the beginning of the Financial Crisis in 2008) required more container vessel capacity of ever larger vessels for the main trade routes, applying the economy of scale. As obtaining finance before the financial crisis was not a major obstacle, the major shipping lines placed many orders for new large vessels. In December 2008, the TEU capacity on order was almost equal to the TEU capacity in service. This chapter also describes the various types of inland water vessels, or barges, as these are applied around the world, not only for containers, but for all types of cargoes, as described in chapter 1.

The chapter also provides details of the development of the so-called Global Terminal Operators (GTO's); specialized private container terminal operators. In 2008 the 5 largest GTO's handled around 50% of the global world container throughput.

Chapter 3 provides an overview of the world port in terms of numbers and classifies the largest ports in the world in terms of total cargoes, containers and dry bulk. From these tables it is obvious that in particular East Asian ports are now among the largest in the world, overtaking the former largest world ports in Europe and the USA.

Port efficiency and performance indicators are important data to gauge the overall performance of port and terminals. **Chapter 4** presents an overview of the indicators used in ports. It is argued that port efficiency is difficult to measure and strongly depends on the criteria used to express or measure efficiency. The chapter also explains two important aspects to measure performance, definitions and indicators. In the first place it has to be ascertained that the definitions used are uniform when comparing different situations, and secondly that comparing ports or terminals in different locations has only a limited value and should therefore be treated as such. On the other hand, performance indicators can be very useful when measured in one single location using the same definitions. On the basis of field work and literature studies the World Bank has developed Key performance Indicators (KPI's) for container terminals.

Chapter 5 describes how ports around the world are owned and managed. First the major characteristics and functions of ports are described and possible ownership structures are explained. In the past most ports were owned and operated by the public sector. These ports are called Public Service Ports. When port investments and –operations became more difficult, capital intensive and complex, the shift to engage in Public Private Partnerships (PPP) was set in motion. This resulted in the establishment of the Landlord Port Management form which is today, the preferred port management system, provided it is well designed and implemented. The landlord port management form is not new; the former Hanseatic ports in Europe already applied this. The process of shift in management and operational port functions is called Port Reform. In 2007 the World Bank produced the Second edition of the Port Reform Toolkit. This Toolkit provides a complete overview of all components, including the Port Reform Modalities and Tools. Chapter 5 lists an extensive overview, as well as a description of Regulation issues. Regulation is important when the public sector decides to engage in an agreement with the private sector for providing certain functions in a port. The public sector has to protect the national economic interest and has to ensure that the private sector does not harm these. The magnitude of global Public-Private Investments (PPI) in transport, in general, and in ports, in particular, is also provided using the data of the PPI Project Database of the World Bank. This Chapter also provides an overview of global financing issues including capital requirements when developing a port or terminal.

Global Warming and Climate Change are very much in world focus. **Chapter 6** describes this topic. Studies have shown that maritime transport and ports are responsible for approximately 2.7% of the world Green House Gasses (GHG) emission. The chapter not only describes the aspect of emissions, but also describes other forms of pollution sources of the sector, as these are noise, light, dust and soil and water pollution. It goes on to describe how the shipping industry, the port authorities, the terminal operators and equipment manufacturers are addressing this issue in an attempt to reduce the impact of their activities on the environment.

Although decreasing in number and changing in skills, port workers are an important component of port management and operations. As is explained in **Chapter 7**, port work has gradually changed from pure physical work to processing control using dedicated and complicated equipment and automated systems. Similarly, the work of seafarers has changed. Notwithstanding the human factor in ports and maritime transport is still working in a dangerous and often polluted environment; often in 24/7 shifts work. This draws heavily on the work force. It is for this reason that organizations such as the ILO, the IMO and the ITF have developed Codes and Conventions to ensure that HSS (Health, Safety and Security) measures that protect the

workers are developed and enforced. Ports, being a nodal point in the transport chain are also locations where the risk of HIV transmission is anticipated to be high. Chapter 7 addresses this issue by describing the results of a study in this field executed in Ghana. Safety and Security do not only apply to the human factor but also to the safety and security of cargo flows passing through the ports of the world. In particular after 9/11, the attention for safety and security intensified and has drastically changed the port and maritime environment. The first global initiative was the International Ship and Port (Facility) Security (ISPS) Code that was introduced in July 2004. Chapter 7 describes the impact that the ISPS Code implementation has had on the industry. Actually, the ISPS Code is a component of a much wider and far-reaching global awareness: that of Supply Chain Security (SCS). Whereas the ISPS focuses on ports and terminals, SCS aims to introduce systems, procedures and technologies that are intended to eliminate threats to the entire supply chain, including ports and maritime transport. There are many initiatives introduced, but the real present and future impact of the introduction is rather vague, so the World Bank decided to develop the Supply Chain Security Guide. Chapter 7 describes the contents and conclusions of the SCS Guide. Specific attention is paid to the issue of cargo scanning and to the US decision that as of 2012 all containers that enter the USA have to be scanned.

Many ports were developed in or very close to cities. In former times, this was an obvious choice; port labor was labor intensive and the city and its surrounding were an important market. However, the environmental impact of the port as described before, the technology and consequently the requirements of developments in vessels and terminal operations changed over time. Ports required deeper water, wider port basins and larger terminals. Moreover, industrial activities concentrated around the port, required even more space but also resulted in more pressure on the city, and the City-Port Relationship changed over time. Ports moved closer to the sea or to locations where there was less impact and more space available. This phenomenon is described in **Chapter 8** and provides tools as to how cities can cope with this issue; in particular how former port areas can be and have been re-integrated in the city.

As described above, the environmental impact of ports and maritime transport is very much in focus, yet this has partly been overshadowed by a more recent global development: the Financial Crisis. **Chapter 9** describes the enormous impact that the Crisis has had, and still has, on all aspects of the port and maritime industry. The impact on world maritime transport has been huge. In a short period of time much less cargo was offered to be transported. This put heavy pressure on the freight and charter (vessel hire) rates. Chapter 9 presents a number of examples comparing rates that were charged in 2008 with those in the same period in 2009. As mentioned in Chapter 2, in December 2008, several large container vessels had been ordered, as well as many orders for other types of vessels, like dry bulk carriers. When the capacity requirement fell, ship owners tried to cancel orders or postpone delivery dates, often at very high costs. Having too much capacity available forced many ship owners to withdraw vessels from their fleet and to lay them up, waiting for better times to come. Container terminals around the world also saw a sharp decline in throughput, sometimes even more than 20% in a couple of months. For some of them, suffering from congestion, this however came as a short term, relief. But the impact for most terminals led to postponing extensions and investments and even reduction of the work force. For a short time the overcapacity, combined with relatively low fuel costs resulted in new shipping routes. A number of large shipping lines re-routed their vessels on the Asia-Europe stretch around Africa, rather than through the Suez Canal; the Canal transit costs were higher than the additional sailing distance. However, when the fuel costs started to increase again, the companies returned to the much shorter Suez route. All these components are described in Chapter 9, which ends with a few relatively positive notes that the Crisis will decrease the vessel over-capacity anticipated before 2008 and many older, fuel inefficient and pollution vessels will disappear from the market.

Chapter 10 finally provides a comparison between the World Bank’s Transport Business Strategy paper 2008-2012 and the issues presented in this overview of Ports and Waterborne Transport. The Chapter also addresses a number of common port and maritime transport related questions presented in the Introduction of this overview and refers to the related Chapters and lists a number of useful references. To conclude, Chapter 10 addresses an outlook on the future of the Ports and Waterborne Transport sector.

1. WORLD MARITIME TRANSPORT

Figure 1 shows the development of World Maritime Transport between 1990 and 2007 as presented in a review published by UNCTAD¹. UNCTAD estimates that over 80 percent of total world trade, expressed in units of tons (or 1,000 kilograms), is carried out by maritime transport. As maritime transport in principle means transport from one port to another, this also implies that ports are a very important factor in world freight transport.

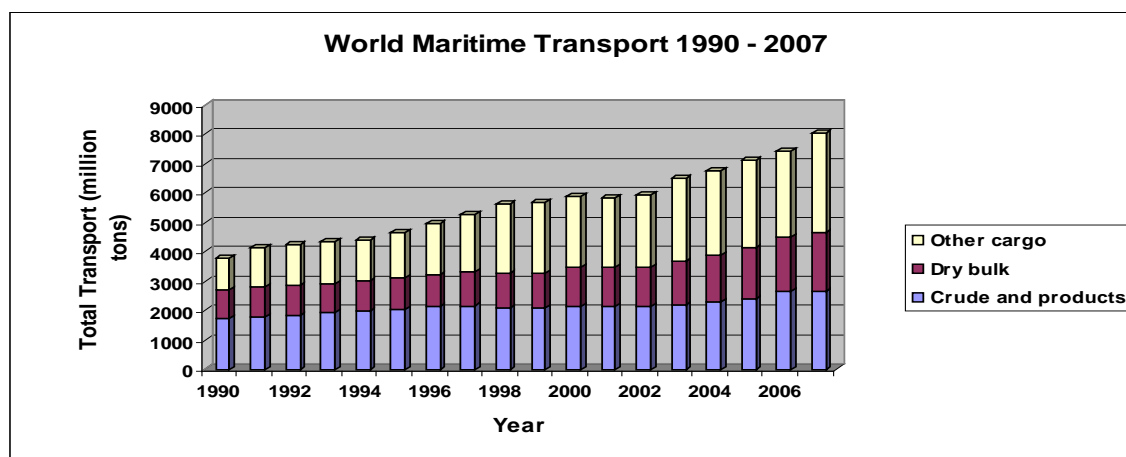


Figure 1 – World Maritime Transport (Source: UNCTAD)

1.1. CARGOES

As indicated above, maritime transport is very important for global freight trade. Figure 1 indicates the general forms of “appearance” of world commodities: Crude oil and oil products, Dry bulk cargoes and “Other cargoes”.

In order to avoid misunderstandings, it is useful to explain these “appearance” forms of different types of cargoes in more detail.

Crude oil and oil products

“Crude oil and oil products” refers to commodities such as crude oil, kerosene, diesel and liquefied gas. The cargo is transported in liquid bulk form in tanks within the vessel and loaded (pumped into the vessel) from the shore and unloaded (pumped out of the vessel) by means of the vessel’s pumps.

Dry bulk cargoes

This group of cargo refers to commodities that are transported in bulk form: i.e. not packaged. Examples: coal, iron ore, phosphate rock and grains and derivatives. The loading and unloading methods are diverse and relate most of all to the nature of the cargo. Distinction is made in loading or unloading procedures and in the so-called ‘free flow’ characteristics. This implies, in simple terms, that the product is rather rounded, ‘non-sticky’

¹ Review of maritime Transport, 2008, United Nations Conference on Trade and Development, Geneva, Switzerland

and the individual cargo particle is not too big in size. A typical example of a free-flow product is for instance corn, whereas coal is an example of a non-free flow commodity.

All dry bulk commodities can be loaded and unloaded by means of quay-side cranes or ship's gear such as cranes or derricks equipped with grabs or clamshell devices.

Loading of all products can also be executed by means of shore-based equipment that is connected to the cargo to be loaded by means of conveyor belts.

Unloading of free flow products can, as mentioned above, be executed with grabs, but also by using suction. Unloading of non-free flow products can also be carried out by mechanical means whereby attachments to the suction pipe or the spiral conveyor 'scrape' the product towards the direction of the equipment.

Other cargoes

Other cargoes refer to all the other types of cargo, often classified by their packaging, appearance or loading / unloading method. In the past, all this cargo was identified as 'general cargo', but as cargo handling methods improved (with the objective to reduce the time required to load and unload a vessel in port) new distinctions were made.

A few examples are provided below:

- Pallets: cargo assembled on a wooden or plastic pallet that allows the simultaneous handling of more units per period of time
- Roll-on/Roll-off (or roro): This concept refers to the horizontal handling method (via ramps located mostly at the stern of the vessel, but also on the side(s) or at the bow. The genuine roro cargo is any type of vehicle on its own wheels, motorized or not, or cargo placed on temporary wheels using trailers or wheeled platforms. Non-genuine roro cargo includes conventional break-bulk cargo, such as pallets or bundled sawn timber/iron products/ingots/bulk bags, as well as containers which are loaded via roro vessels ramps on roro chassis, but unloaded and stowed in the vessel's garages by forklifts or toplifters.
- Containers: Containers (usually steel or alumina boxes) were introduced some 50 years ago, with the objective to achieve efficient door-to-door transport and increased cargo handling productivities (also due to the fact that containers may have a maximum pay load of about 28 tons). The introduction of the container has led to a revolution in cargo handling in terms of vessel capacity and dimensions, new types of terminals and changes in hinterland connection modalities. Containers are usually expressed in TEU (Twenty foot Equivalent Unit), meaning a container with the basic dimensions of 20ft length, 8ft wide and 8ft 6inches in height. Next to the so-called dry van container, various other types and dimensions have been developed for specific types of cargoes such as 'volume' (large volume combined with low specific weight), refrigerated or cooled and liquid bulk cargoes.

1.2. SHIP TYPES AND FLEET

Until about a hundred years ago, when the first small crude oil tankers were introduced, all merchant vessels in the world belonged to the 'general cargo' type. They often carried a combination of all possible types of cargoes, whereby the maximum weight of an individual piece of cargo was limited by the carrying capacity of a dockworker or the maximum lifting capacity of the ship's gear or of quay-side cranes.

Today there are a large variety of vessels, all specifically designed for the type or appearance form of cargo to be carried, as described above.

1.2.1. Overview of all ship types of today

Liquid Bulk Carriers

- Crude oil carrier
- Parcel or chemical tanker
- Liquefied gas carrier

Dry Bulk Carriers

- Dry bulk carrier
- Combined bulk carrier (bulk carriers capable of carrying liquid and dry bulk at the same time or alternatively)

Other Cargo Vessels

- General cargo vessel
- Multipurpose vessel - vessels with considerable container storage capacity, also known as semi-container vessels
- Reefer - specialized vessel for the transport of cargo under temperature control
- Container vessel
- Roll on/Roll off or roro vessel - vessel equipped with a ramp that allows cargo to be driven on and off the vessel
- Car carrier - vessel that solely carries passengers cars and other vehicles
- Barge carrying vessel - vessel that carries large barges that are either floated in and out or lifted by crane into the vessel
- Heavy lift carrier - dedicated vessel that carries heavy loads such as container handling equipment or factory components
- Live stock carrier - vessel that carries live animals (in particular sheep from Australasia to the Middle East)
- Passenger or cruise vessel.

1.2.2. Details of some types of vessels

Crude oil carrier

Crude oil carriers, or oil tankers, carry crude oil from the oil producing regions / countries in the world (such as the Middle East, Mexico, Venezuela, Indonesia and Libya) to the locations where the crude oil can be refined to oil products such as gas, diesel, kerosene, etc.

Crude oil carriers are the largest cargo vessels that have been built until date. In 1945 the largest crude carrier measured 17,000 DWT²; already a giant in those days. In 1960 the first 100,000 DWT crude carrier was built,

² DWT (Dead Weight Tons) is the cargo weight in metric tons of 1,000 kilograms a vessel can carry until its maximum loading depth, see Box 1

followed in 1966 by the 200,000 DWT version, in 1968 by the 300,000 DWT carrier, and in 1976 by the largest vessels built until now, measuring 550,000 DWT.

There were two reasons for building larger crude carriers: Economy of Scale and the closures of the Suez Canal due to the hostilities and wars in that region, which forced the trade to take the route via Cape of Good Hope on the voyage between the Middle Eastern oil-producing countries and the European markets. As only two European ports, Antifer near Le Havre and Rotterdam had sufficient depth to receive these vessels fully or partially loaded, feeding of smaller depth ports with feeder vessels called off-topping at sea (transfer of the cargo from the large vessel to a smaller one) were required arrangements. The feeder system led to double handling, therefore increasing costs, and the transfer at sea was no longer allowed for environmental reasons. This inflexibility of the system resulted in the scrapping of the so-called ULCC's (Ultra Large Crude Carriers) and the capacity decreased to about 300,000 DWT, the VLCC (Very Large Crude Carrier). This vessel stills holds the Economy of Scale, but can enter, fully loaded, many more ports in the world.

Product or Parcel Tanker

From the refineries the products have to be carried to other destinations: the distribution points and markets. This transport can be executed by road, rail or inland water transport (usually for smaller quantities), by pipe line or by maritime transport.

In the latter case this is executed by means of so-called product or parcel tankers or -carriers. Of the total fleet a part carries only one product (oil product or chemical), whereas the remaining part can carry several different types of liquids ('parcels') at the same time. As these vessels carry the products from the larger refinery ports to the 'user ports', the dimensions, in particular the draft (see Box 1) are far less than that of the crude oil carrier.

Liquefied Gas Carrier

Another group of liquid bulk vessels is formed by the so-called LGC's (Liquefied Gas Carriers). These vessels carry LNG (Liquefied Natural Gas), LPG (Liquefied Petroleum Gas) or other gasses respectively from the mining areas (LNG) or the production areas (LPG and other gasses) to the ports where the LG is required. Today the maximum carrying capacity of LNG carriers (the so-called Q-Max Class)³ is 267,000 m³ of liquefied gas, or 250,000 times 634 m³ of gas (at 20 degrees Celsius and atmospheric pressure), or some 160 million m³ of gas(!).

Container vessel

The introduction of the container and the container vessel, some 50 years ago, marked the beginning of what is now considered the revolution in the transport of general cargo. The container actually is just a box that is loaded with any of the types of conventional cargoes mentioned above, but has resulted in a re-shaping of international trade, new logistic systems and economies of scale. The introduction of the container ship and its impact will be discussed in detail in Chapter 2.

³ 'Q' stands for Qatar. The Q-Max vessel is 345 m long, 55 m wide and has a draft of 12.3 m.

1.3. DETAILS OF THE TOTAL WORLD FLEET

The total number of merchant vessels in 2008 is presented in Figure 2⁴.

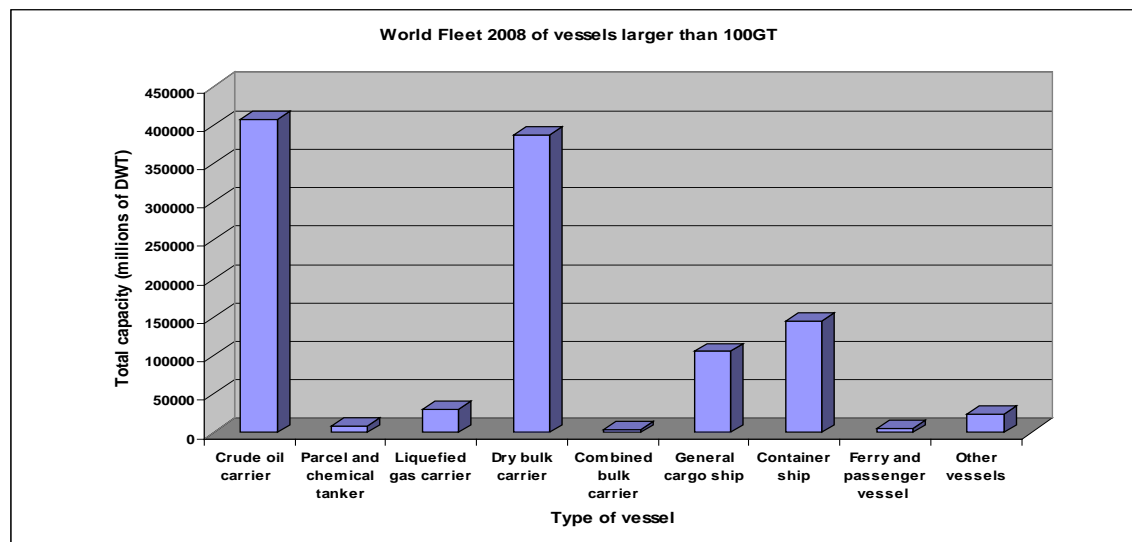


Figure 2 - World Fleet 2008 of vessels larger than 100 GT⁵ (Source: UNCTAD)

On January 1, 2008 the total number of ships larger than 1,000 GT amounted to 36,313.

The largest fleets (in terms of Dead Weight Tons⁶) were owned by the following countries, and distributed in vessels flying the national flags of the owner's home country or that of a foreign country. See Table 1.

Country	National flag	Foreign flag	Total
Greece	736	2,379	3,115
Japan	714	2,801	3,515
Germany	404	2,804	3,208
China	1,900	1,403	3,303
Norway	792	1,035	1,827
USA	855	914	1,769
Republic of Korea	756	384	1,140

⁴ UNCTAD: Review of Maritime Transport 2008

⁵ See Annex 1 for the definition of GT

⁶ See Annex 1

Hong Kong, China	311	346	657
Singapore	536	333	869
Denmark	317	544	861
Top 10 Total	7,321	12,943	20,264
World Total	16,798	19,515	36,313
Share Top 10 of World Total (%)	44	66	56

Table 1 - Country ownership of the world fleet (Source: UNCTAD)

Most of the vessels that are not carrying the flag of the owner’s country have been flagged out to so-called Open Registry Countries (formerly also referred to as Flags of Convenience) such as Bahamas, Bermuda, Cyprus, Liberia, Malta, Panama and Vanuatu. The world trend is that the percentage of the foreign-flagged world fleet (expressed in DWT) is increasing: in 1989 the percentage was around 41.5%, whereas in 2007 the percentage had increased to about 66.4%.⁷

In 2007, according to UNCTAD, the Developed Economy countries controlled close to 66% of the world fleet (as percentage of the total world fleet in DWT of all vessels larger than 1,000 GT). The share of the Developing Economy countries was in the order of 31 percent. The remainder is controlled by the group of ‘Countries with Economics in Transition’.

1.4. SHIP CHARACTERISTICS

Ships can be distinguished according to the type, but more importantly for port managers, operators, engineers, shippers and receivers are the specific characteristics which identify the carrying capacity and the physical specifications such as length, beam (width) and draft. Annex 1 lists the basic characteristics used in the port and shipping industry.

⁷ Sources: UNCTAD and Lloyds’ Register – Fairplay 2007

2. THE CONTAINER

2.1. HISTORIC DEVELOPMENTS

Of all vessels mentioned above the introduction of the container vessel probably is the most spectacular one. This vessel had a major impact on world maritime transport.

Containers for military use (with small capacities) were introduced more than 100 years ago. There also have been attempts to introduce containers in the traffic across the English Channel, be it that these boxes were of a smaller size than the units used today.

Containers were introduced about 50 years ago. The pioneer was Malcolm McLean, the owner of a trucking company in the United States. McLean developed a detachable truck component that could be lifted from a truck and loaded on board a vessel. At the port of destination the box was unloaded and placed on a truck. This system allowed the introduction of the door-to-door (or house-to-house) concept. In addition, the number of tons that could be loaded and unloaded per unit of time increased considerably. An additional advantage was that loading and unloading could be continued in adverse weather; also leading to saving in transport time, and thus in reduction of costs. Other advantages were less damage to the cargo and less pilferage of goods.

2.2. CONTAINER SPECIFICS

The first containers had a length of 33ft⁸, but later the ISO⁹ decided on the first ISO norm (Series 1A and 1AA) for sea containers, listing lengths of 10, 20, 30 and 40ft, heights of 8ft and 8ft 6inches, and a standard width of 8ft.

The maximum cargo load for a 20ft container (1 TEU) was in the range of 22 tons, and of the 40ft box (2 TEU) of about 28 tons. In the course of time several types have been developed such as the reefer, the (dry) bulk container, the tank container and the collapsible and open top container.

Container dimensions increased over time. Most commonly known are the High Cube (9ft 6 inches high) and the 45ft long containers. These containers were developed as a consequence of the increasing maritime transport of so-called Volume Cargo: goods with a large volume and a relatively low specific weight, such as garments and electronics.

Figure 3 illustrates the development of the total number of containers (expressed in TEU) in the world¹⁰.

⁸ This length was related to the maximum legal truck length in the USA in that period

⁹ International Organisation for Standardisation

¹⁰ Source: Containerisation International

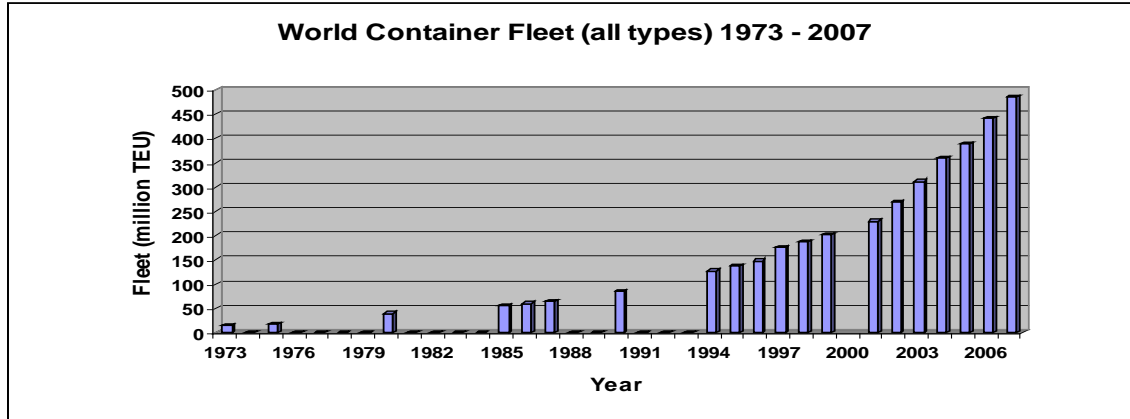


Figure 3 - World container fleet development 1970-2007 (Source: various)

As mentioned above, the first containers had a length of 33ft. This length was increased to 35ft when US legislation allowed this length to be moved on the national highways. When the ISO decided the world standard lengths to be 10, 20, 30, and 40ft, a portion of the 35ft container fleet was lengthened to 40ft, but the remaining 35ft fleet disappeared from the market.

The ratio 20ft / 40ft has shifted over the years. There were two main reasons for this.

- In the beginning of containerization the number of shippers (the party that sends goods to another destination) and / or the number of consignees (the party that receives the goods) that could fill a 40ft in one consignment was relatively small, so the 20ft box was the 'handy' size.
- The second reason was the increasing world trade in Volume Cargo (as mentioned above). In particular when the production of this type of goods started to boom in East Asia, the requirements for more 40ft boxes increased sharply.

The following data illustrate this development:

- In 1986 the ratio of the numbers of 20ft and 40ft boxes was 2.16.
- In 2007 this value had decreased to 0.94. In other words: in 2007 there were more 40ft than 20ft in the world (marine) container population.

2.3. CONTAINER VESSELS

The first container vessels consisted of modified general cargo vessels or tankers with a limited TEU capacity. The vessels were referred to as First Generation container vessels. The vessels maintained services between a number of US ports and to ports in the Caribbean and Hawaii.



The first Transatlantic crossing of a container vessel took place in 1966. More detailed and interesting information can be found in the book 'The Box' by Marc Levinson.¹¹

The first dedicated (or 'full') container vessels were designed and built in the mid-1960-s. These vessels carry only containers, below and on deck. Capacities ranged from 800 to approximately 1,700 TEU. This vessel was referred to as the Second Generation. Soon after that even larger vessels were built with capacities of more than 3,000 TEU; the Third Generation. The vessels were employed on the longer hauls, such as those between East Asia and the USA and Europe.

It is important to note that the design of these vessels was limited in the width (or beam) dimension. The maximum beam dimension was 32.2m which is the maximum beam that can be accommodated in the locks of the Panama Canal. The major reason behind this limitation was that a significant number of container vessels in those days were owned by US companies. The US law states that in times of crisis, the Government may force vessel owners to make vessels available to the Defense Department for supply of the troops. For that reason it was required that the vessels could transit the Panama Canal.

In addition, shipping companies opted for the flexibility of deployment: either Asia-US East Coast or Asia-Europe. These vessels were later on referred to as Panamax container vessels.

In 1987, American President Lines (APL) launched the first Post-Panamax vessel. The reason for overstepping the Panama beam dimension was simple: APL was intending to employ these vessels in a rotation scheme between a number of Asian and US West Coast ports, so transit of the Panama Canal was not a condition for employment.

This APL initiative was a sign for all major container shipping lines to follow the example and the result was a wave of larger and greater number of vessels.

Figure 4 presents the development of the TEU capacity of container vessels.^{12 13} Figure 5 presents the composition of the world container fleet, in service and on order until 2013, in December 2008.

¹¹ The Box by Marc Levinson, Princeton University Press, ISBN: 978-0-691-13640-0. The subtitle of the book is: 'How the Shipping Container made the World Smaller and the World Economy Bigger'.

¹² The graph shows the largest capacity that was launched in a particular year. Source: Clarkson

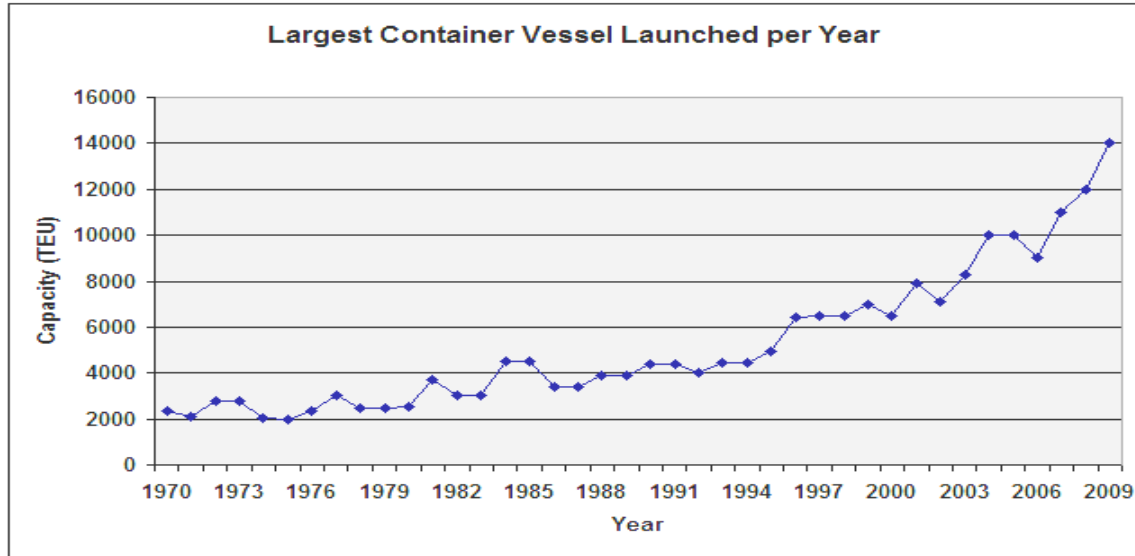


Figure 4 - Development of the largest container vessel capacity (in TEU) (Source: Clarkson and others)

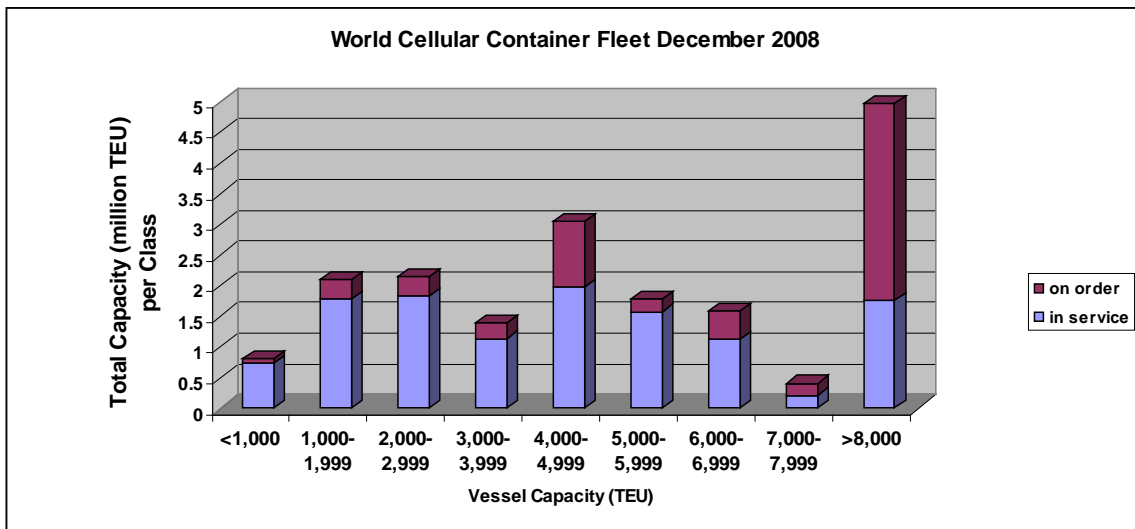


Figure 5 – World Container Vessels (in TEU capacity) in Service and on Order (until 2013) in December 2008 (Source: Containerisation International)

The most remarkable issues that can be observed from the data presented in Figure 5 are:

- In December 2008 the **total** container vessel capacity on order was about 50% of the fleet in service at that moment
- In terms of total vessels of the fleet: In service 4,661 and on order 1,181, or some 25% of the December 2008 fleet

¹³ In literature one often finds indications such as ‘Super Port-Panamax’. As there is no global definition for this kind of characterization, it is preferred to only use the indication Post-Panamax: indicating a vessel with a beam of more than 32.2, whereas the capacity (in TEU) describes the vessel in sufficient detail (as a Post-Panamax vessel).

- Most remarkable, however, is the number of Post-Panamax vessels on order in the capacities of 7,000 to 7,999 TEU and 8,000+ TEU.
- 7,000 to 7,999 TEU: In service 29 vessels and on order 27, or almost a doubling of the number of vessels in 5 years
- 7,000 to 7,999 TEU: In service 213,091 TEU and on order 196,740 TEU, so also close to doubling
- 8,000+ TEU: In service 196 vessels and on order 295, or an increase close to 50%
- 8,000+ TEU: In service 1,756,513 TEU and in order 3,217,598 TEU, or an increase of about 83%.

Further details of this development (and its relation to the Financial Crisis) are presented in paragraph 9.5.

The largest container vessel in 2009 is the MSC Daniela, with a capacity of 14,000 TEU.

2.4. WORLD CONTAINER PORTS

The development of the world port container throughput is another way to illustrate the success of the introduction of the container. See figure 6.

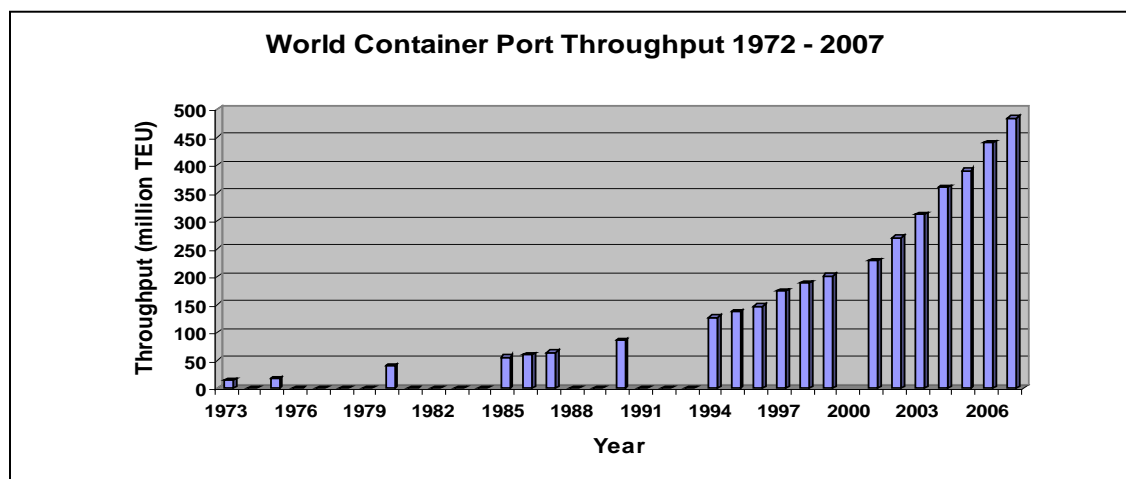


Figure 6 - World port container traffic 1973-2007 (in TEU) (Source: various)

In 1985, the largest container throughputs were recorded in the following ports:

- Rotterdam 2.7 million TEU
- New York 2.4 million TEU
- Hong Kong 2.3 million TEU
- Kaohsiung 1.9 million TEU, and
- Kobe 1.9 million TEU.

In 2008, this sequence and the throughputs had changed as follows:

- Singapore 29.9 million TEU
- Hong Kong 27.1 million TEU
- Shanghai 24.3 million TEU
- Shenzhen 21.4 million TEU, and
- Busan 13.4 million TEU.

The data clearly shows that Asian ports have taken the lead at the expense of the US and European ports.

2.5. THE IMPACT OF CONTAINERIZATION

Today, containers are a common feature in maritime transport. Yet, the impact has been and still is enormous. The following are a number of examples of the impact of containerization.

- Reduction of port labor
- Conventional general cargo could easily be identified by its appearance, shape and smell, but containers all look the same. The only difference between one box and the other may be the color or the dimension. As a result, port personnel, from port workers to Customs officers, have to rely on information rather than physical features
- Container vessels are expensive in construction costs, and consequently also in daily operational costs. The result: container vessels should stay in port for as short period of time as possible
- In order to handle ships and cargo with speed and efficiently, large investments are required for the construction of new, stronger and deeper, terminals
- In addition, new cargo handling equipment had to be designed such as the quay-side gantry cranes and the various types of yard handling equipment, and
- Larger terminals cannot be operated without the use of sophisticated computer systems.

The international transport of containers, as a consequence of these requirements, also has led to new identifications of ports. The major larger ports in developed countries started to develop in so-called Main or Hub Ports. Smaller ports in the region were soon identified as Feeder Ports and connected to the Main Ports by means of so-called feeder services.

Today, the system has developed even further. In every region of the world there is one or a number of so-called Global Main Ports such as Shanghai, Singapore, Hong Kong, Dubai, Los Angeles and Rotterdam. These ports are either connected to Regional Main Ports, or are the starting and final point of regional multi-port services. Examples of Regional Main Ports are, for instance, Durban, Algeciras, Gio Tauro, Jeddah and Kingston. Ports, or rather terminals, may move up in the system, i.e. they 'upgrade' from Feeder Port to Regional Main port. The main reasons for the shift are: increase in throughput in the port and / or increased efficiency, and /or better physical conditions (deeper water in particular).

2.6. CONTAINERS, HINTERLAND CONNECTIONS AND INLAND CONTAINER DEPOTS

As mentioned above, the basic idea behind the introduction of the container was to consolidate cargo and move boxes, using the maritime and land legs, as one single unit from producer to consumer.

This objective assumes that containers always carry full loads from point A to point B. Of course, this is not correct. There are many cargo consignments that have a volume that is less than the volume of a 20ft (32m³) or of a 40ft (64m³) container, leave alone the volume of a 45ft High Cube (86m³).

Cargo consignments that are less than the volume of one container but requiring the use of efficient container transport require so-called *consolidation* activities through *stuffing* (loading) and *stripping* (unloading) activities.

In the beginning of containerization these activities were executed in so-called Container Freight Stations (CFS). The container terminals of the 1950's to 1970's usually had a CFS within their premises. Later these

activities were transferred to locations outside the terminal as the terminal itself was foremost serving the purpose of loading and unloading of vessels, temporary stacking in the yard and delivery or receipt of containers to/from hinterland connections.

A container that arrives at a terminal from an overseas terminal may be characterized as follows:

- The box contains import cargo for one single consignee. After temporary storage and finalization of the required administrative, financial, Customs, inspection and security procedures the box is loaded on a hinterland mode (truck, train, inland water barge or other sea-going vessel (in case of transshipment)) and dispatched to its next or final destination. If the destination is an inland location, the container may be moved directly to the consignee or via an inland location, usually referred to as an Inland Container Depot or Dry Port. In terminal terminology this box is referred to as an **FCL (Full Container Load)**.
- The container may alternatively contain cargo for more than one consignee. If the container is stripped in the terminal CFS, this box is referred to as an **LCL (Less than Container Load)** box. The box is stripped in the CFS and the separate cargo parcels are transported as general cargo by train, truck or barge.
- However, if this box is first transported to an **Inland Container Depot (ICD)** or **Off-Dock Depot** (and be stripped there) the terminal will classify this container as an FCL (the container is not stripped within the terminal), whereas the ICD will classify this box as an LCL.

Similar processes and 'labels' can be used for export cargo.

As mentioned, inland container transport may take place by truck, rail or inland water barge. In the early years of containerization conventional train wagons, trucks and barges were used. In particular in road transport this led to accidents as the box could not be properly secured to the truck (by means of the so-called twist locks which are inserted in the so-called corner castings of the box to secure it).

Today, most countries have introduced dedicated trucks, trains and barges (if inland waterways such as canals, rivers and / or lakes are available).

Road transport

In almost all countries around the world the maximum truck capacity is limited to a 40ft container, provided that the axle load is within the official limits. In some countries, such as Australia and South Africa, 3 TEU and even 4 TEU truck and trailer combinations are allowed on dedicated routes.

Train transport

In most countries container train capacity ranges from 50 to 100 TEU. In some countries, so-called Double Stack trains are used, such as in the USA. These trains may carry up to 400 TEU.

Inland Water Transport

Transport of containers by barge requires dedicated barges¹⁴ and adequate Inland Container Barge Terminals (ICBT). Most self-propelled barges have capacities ranging from 50 to 100 TEU. The known maximum barge

¹⁴ The term 'barge' may refer to self-propelled barges or a barge that is pushed or towed by a pusher or pulling tug

capacity is plying between the Port of Rotterdam and a number of ICBT's in Germany. This pushed barge combination has a capacity of 470 TEU.

Container barges are not the only inland vessels to transport cargoes. Dry bulk and all types of general cargoes can competitively be transported by water as well, and is actually happening in many countries.

The following overview pictures provide a glimpse of a number of barges used on the European inland waterways.



Three aspects related to Inland Water Transport (ITW) are important to mention:

- Transport by water, ocean transport and Inland Water Transport, measured in fuel efficiency, is the cheapest mode of transport
- In most circumstances IWT transport is slower than rail or road transport, be it that IWT does not encounter traffic jam problems
-
- In most situations where IWT is applied, additional transport by road and / or rail will be required to connect the shipper and the consignee to the transport flow. In other words, various modes have to be used; this is usually referred to as Multimodal Transport. This requires more handling of cargoes

(loading and unloading) and interruption of the cargo flow. Yet, certainly when the main IWT distance is large, this disadvantage is only marginal.

The following example¹⁵ compares the use of an IWT container barge with the required number of trucks to transport the same number of containers: At least 100 trucks of 2 TEU capacity are required to transport the full load of a 200 TEU capacity barge. This example clearly illustrates the savings in fuel and labor costs.

In particular in Western Europe and in the United States IWT is a competitive transport mode. Not only for liquid and dry bulk cargoes, but also for roro and container cargoes.

2.7. PRIVATE CONTAINER TERMINAL OPERATORS

As discussed in Chapter 5, container terminals, in particular, are increasingly built, managed and operated by private operating companies. The largest 10 private container terminal operators are often referred to as Global Terminal Operators (GTO's). In September 2008 Drewry published the share of the Top 10 GTO's of the total world port container throughput as illustrated in figure 7.

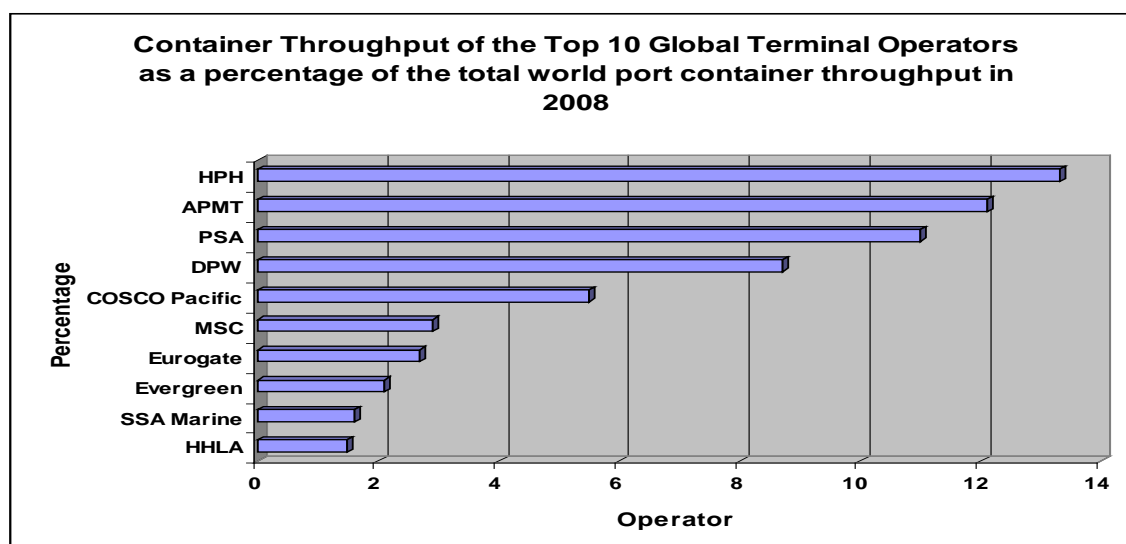


Figure 7 – Top 10 Global Container Terminal Operators share of the total world port container throughput in September 2008. (Sources: Drewry, Cosco Pacific Limited, other data sources and own research)¹⁶

The data indicates that the Top 10 GTO in 2008 jointly handled more than 61% of the world's total port container throughput. The Top 4 GTO's operate terminals in all regions of the world.

¹⁵ Source: Netherlands Inland Water Transport Office

¹⁶ HPH: Hutchison Port Holdings, APMT: APM Terminals, PSA: Port of Singapore Authority, DPW: Dubai Ports World, MSC: Mediterranean Shipping Company, HHLA: Hamburger Hafen Lagerhaus Aktiengesellschaft

3. PORTS

The number of ports in the world has been estimated by different organizations such as UNCTAD and ESCAP¹⁷. The publication Lloyd’s List Ports of the World 2008¹⁸ lists almost 2,900 commercial ports in the world. World Port Source¹⁹ lists some 3,000 ports in the countries of the world. In this publication the countries with the largest number of ports are: United States (364), United Kingdom (260), Japan (144), China (157), Indonesia (100), and Canada (99). The following table provides (per World Region) the largest ports measured in terms of port calls in 2006 (Source: Lloyd’s List).

Africa		Asia		Australasia	
Las Palmas	5,060	Singapore	60,548	Melbourne	3,441
Alexandria	4,711	Hong Kong	31,493	Brisbane	2,593
Durban	4,325	Busan	22,480	Botany Bay	1,614

Europe		North America		South America		West Indies/ Central America	
Rotterdam	28,461	Houston	7,451	Santos	5,556	Freeport	2,933
Antwerp	15,329	New York	5,598	Buenaventura	4,759	San Juan	2,852
Hamburg	14,499	Port Everglades	4,423	Cartagena	4,000	St Thomas	2,276

Table 2 - Largest Ports per Region 2006 (number of ship calls per year) (Source: Lloyd’s List)

The same publication also lists the number of port calls per region in 2000 and 2006, providing a possibility to calculate the relative increase (2000 = 100). It should be noted that this data solely lists the number of port calls that does not necessarily have a direct relation with the volumes of cargo handled.

Region	Ship calls 2000	Ship calls 2006	Relative Increase

¹⁷ Economic and Social Commission for Asia and the Pacific

¹⁸ Lloyd’s MIU, London, United Kingdom (www.lloydsniu.com)

¹⁹ www.worldportsource.com

			(2000 = 100)
Africa	79,110	87,615	111
Asia	507,148	562,375	111
Australasia	33,945	36,452	107
Central America / West Indies	59,429	59,224	100
Europe	670,586	700,239	104
North America	88,979	114,090	128
South America	63,533	78,454	123

Table 3 - Ship calls per Region 2000-2006 (Source: Lloyd’s List)

Other publications mention that there are some 6,000 (sizable) port facilities in the world. “Sizable” means that these ports handle a number of types of cargoes (see ‘Cargoes’) in considerable quantities. It is assumed that if one takes into consideration every landing stage for cargo and/or passengers in the world, including fishery ports and naval facilities the total number of port facilities in the world most probably runs into the 10-s of thousands.

Ranking of ports can also be done in terms of the total quantity of cargo handled. The following figures (8, 9 and 10) show the Top 10 World Ports Ranking 2007 measured in all cargo, containers and dry bulk.

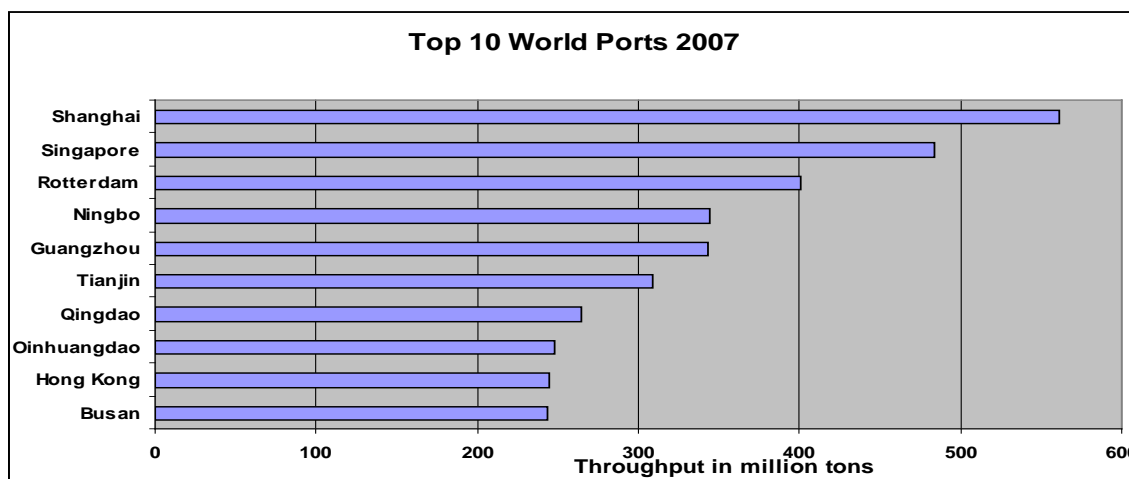


Figure 8 – Top 10 World Ports 2007 – all cargo (Source: Containerisation International)

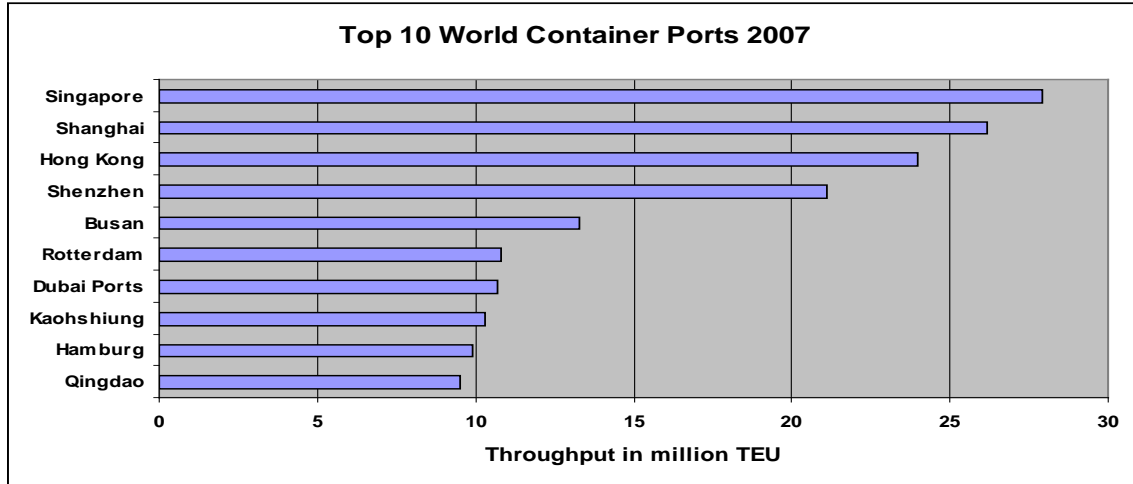


Figure 9 – Top 10 World Container Ports (Source: Various)

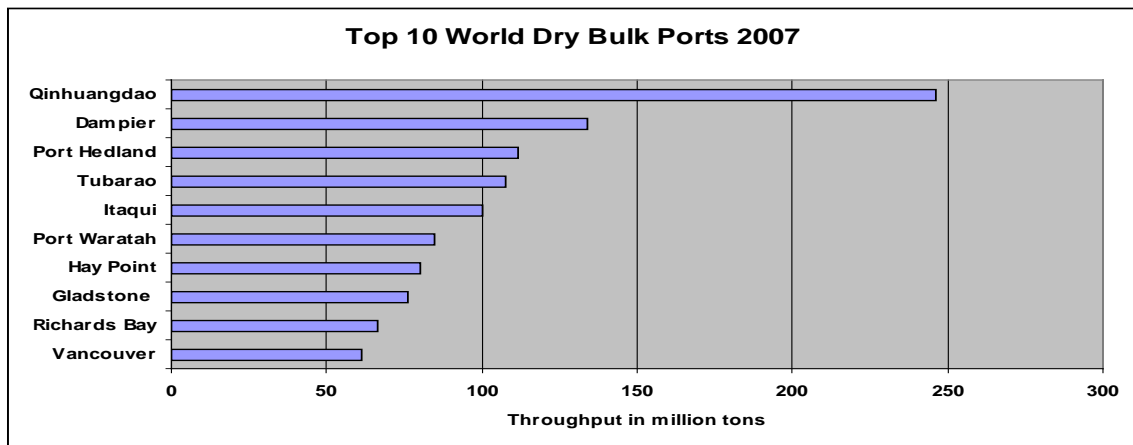


Figure 10 – Top 10 World Dry Bulk Ports 2007 (Source: World Port Development)

From these data the following conclusions can be drawn:

- Of the Top 10 All Cargo Ports, seven are located in China, one in Korea, one in Singapore and one in Korea. This demonstrates the dominance of China in maritime transport
- As for the World Top 10 Container Ports, the dominance of Asia is evident; seven of the Top 10 ports are located in Asia. The only competitors are Dubai in the Middle East and Rotterdam and Hamburg in Europe
- As for Dry Bulk Ports, the majority is located in Australia, be it that the largest one, Qinhuangdao in China, has a throughput that is almost twice the throughput of the second largest port, Dampier in Australia. The other large dry bulk ports are located in Brazil, South Africa and Canada.

4. PORT AND TERMINAL EFFICIENCY AND PERFORMANCE INDICATORS

4.1. PORT AND TERMINAL EFFICIENCY

Many papers and books have been written which attempt to establish criteria that allow ports and terminals to be classified and compared in terms of efficiency.

A critical observation: The problem is that efficiency is a relative, comparative and often a subjective value. Another important point is that different authors may have a different definition of a certain criterion which makes a useful comparison actually impossible.

A typical example is the efficiency parameter 'Dwell Time'. Dwell Time is the period of time that a container stays within a container terminal before it is moved to a hinterland destination or loaded on a vessel. Terminals usually allow a few days of free storage. After that the owner of the cargo in the container is charged a fee per day. Therefore, it is important for terminal operators to keep record of the dwell time so as to charge the client correctly. Field investigations indicate that terminal operators do not apply the same method to establish the start of the free dwell time. Some operators start calculating the period that cargo is in the port or terminal from the moment the container is placed in its assigned location in the stack. Others start the record from the moment that the unloading operations start, whereas another method observed is from the moment cargo unloading operations have been completed.

Criteria that often are used to determine port and terminal efficiency are, for instance:

- Physical aspects
 - Total quay length
 - Water depth
 - Total port area
 - Location of the port related to main shipping lines
 - Number, types and capacities of port equipment
 - Theoretical throughput capacity
- Non-physical aspects
 - Number of lines calling at the port
 - Waiting times of vessels
 - Dwell time (usually expressed in the number of days) that cargo stays in port before being dispatched or loaded
 - Safety and security arrangements
 - Supporting facilities such as banks, transport companies, freight forwarders, shipping agents, etc.
 - Efficiency of Customs
 - Level of automation
 - Number and skills of port labor and management, and
 - Value added activities and industry.

The paper ‘Efficiency Measurement in the Port Industry: A Survey of the Empirical Evidence’ by María Manuela González, mmgonzalez@daea.ulpgc.es, DAEA, Universidad de Las Palmas de Gran Canaria, Lourdes Trujillo, trujillo@daea.ulpgc.es, DAEA, Universidad de Las Palmas de Gran Canaria and CCRP, City University of London may be regarded as a typical paper trying to establish port efficiency criteria. It contains a large number of relevant other resources for reference.

In fact, the determination of efficiency or establishment of performance indicators for one particular port or terminal (in a time series) will probably result in useful data. On the other hand, comparing several ports or terminals in different locations and / or with different characteristics will, at best, lead to a relative comparison, unless the boundary conditions are comparable.

4.2. KEY PERFORMANCE INDICATORS (KPI’S) FOR CONTAINER TERMINALS

Conventional KPI’s

For container terminals a specific number of so-called Key Performance Indicators (KPI’s) have been developed. The ones most used are:

- Number of TEU handled per hectare of stacking space per year
- Number of TEU handled per running meter (m’) of quay per year
- Number of TEU handled per Quay-side Gantry Cranes (QGC) per year.

The World Bank developed, on the basis of the study of a number of publications and of its own field experience, the following KPI’s.

They have been separated for two different sets of terminals (in an attempt to try and compare more or less comparable situations):

HTT: High Turnover Terminals, and

ACT: Average Container Terminals.

An HTT is a large terminal handling more than 1 million TEU per year, and a considerable percentage of which are transshipment boxes; usually more than 40%. Such a terminal usually has a long straight quay of at least 1,000 m length and a Berth Occupancy Factor (BOF) in the range between 0.5 and 0.6. The ship-to-shore handling equipment consists of quay-side gantry cranes. The largest container vessels call at these terminals and the call sizes (numbers of boxes loaded and unloaded per vessel call) are considerable.

An ACT is a medium to smaller size terminal, handling the full range of vessels from (occasionally) the largest ones until the small feeders and possibly inland water transport barges. The ship-to-shore handling equipment consists of Quay-side Gantry Cranes, possibly supported by a number of (heavy duty) mobile cranes (with a lower performance). The call sizes vary from small (less than 50 moves per call) to the larger segments of a few hundred moves. The percentage of transshipment containers is generally low. The quay length starts from around 500 meters, and the BOF is in the range of 0.6 and higher.

The KPI’s are presented in Table 4.

KPI	HTT	ACT
-----	-----	-----

Number of TEU handled per m' of quay per year	900 to 1,300	700 to 1,000
QGC productivity per year (TEU)	120,000 to 140,000 ²⁰	75,000 to 95,000 ²¹
Number of TEU handled per hectare of stacking area per year	35,000 to 45,000	15,000 to 30,000

Table 4 – Container Terminal KPI's (Source: The World Bank)

A report of MTBS²² of January 2009 presents performance indicators on the basis of global surveys executed by Drewry and Ocean Shipping Consultants (OSC). Drewry indicates that on world scale (the average of 188 container terminals) the major KPI's are:

- TEU per meter quay wall per year: 1,037;
- TEU per gantry crane per year: 130,784, and
- TEU per hectare per year: 29,073.

OSC concludes that the average KPI's for a number of terminals in North West Europe are:

- TEU per meter quay wall per year: 1,150, and
- TEU per hectare per year: 18,500.

Moves per Berth Hour (MBH)

It is important to note that container shipping lines and terminal operators are increasingly using a more useful performance indicator than the ones described above: the number of Moves per Berth Hour, or MBH.

This indicator represents the quotient of the total number of boxes (and not TEU!) that are unloaded and loaded during a ship's call (the 'call size') and the time that this has taken. This indicator is very important for shipping lines, as can be explained as follows. Shipping lines often publish their vessel schedules half a year in advance. This allows importers and exporters to plan their logistics. Before a vessel calls at a port, the call size is known and knowing the terminal's MBH record, the ship's captain has a fair indication of the time it will take 'to turn the vessel around'. Examples indicate that the contract between the terminal operator and a shipping line is structured in such a way that the operator guarantees a turn-around time on the basis of the call size. Not achieving that performance may lead to reductions in operational tariffs.

It will be obvious that this indicator most of all applies to liner shipping of larger companies with large call sizes.

²⁰ The TEU/Box ratio is assumed to be in the range of 0.6 to 0.7. The gross number of **moves** per crane per hour ranges from 27 to 32 (for the larger full container vessels). The maximum number of moves per crane per hour (unloading un-lashed deck containers) may reach 60 moves per hour (for the larger vessels)

²¹ The TEU/Box ratio is assumed to be between 0.6 and 0.7. The gross number of moves per crane per hour: ranges from 25 to 30 (for the larger vessels). The maximum number of moves per crane per hour (unloading un-lashed deck containers) may reach 60 moves per hour (for the large vessels)

²² Maritime transport business solutions: a private consulting company of Rotterdam, the Netherlands

Estimates are that most of the larger terminals achieve between 50 and 120 MBH. The recorded maximum performance was achieved at the Maersk Terminal in Rotterdam: 178 MBH. The larger shipping companies that employ the largest vessels in the world have indicated that in the future the MBH will have to increase to 250, and possibly even 400 MBH.

5. PORT MANAGEMENT TYPES AND FUNCTIONS AND PORT REFORM

5.1. PORT MANAGEMENT TYPES

Ports may be classified according to the activities that take place in the port, such as:

- Multi cargo ports (handling more than one type of cargo)
- Container ports (handling foremost containerized cargo)
- Bulk ports (handling mainly dry or liquid bulk cargoes)
- Industrial ports (a port serving the requirements of a large industrial area)
- Specialized ports (such as ferry ports, leisure ports or marinas, or fishery ports).

Every port is a dynamic combination of a large number of functions, such as:

- The landlord function
- The regulatory function
- The financial function
- The planning function
- The nautical function
- The safety and security function
- The marketing and promotion function
- The cargo handling function, and
- General functions.

In the past most or all of these functions were by or under direct control of the public sector. This could be the Government, the province (or State), the region or the city. Such ports usually are referred to as Public Service Ports. Industrial or bulk ports, however, could be the responsibility of the private sector with oversight on issues such as (maritime) safety and security by the public sector.

The introduction of the private sector in the port sector led to new models, commonly known as:

- The Tool Port
- The Landlord Port, and
- The Private Service Port²³.

The basic differences are related to:

- The entity that owns and maintains the basic infrastructure
- The entity that owns, operates and maintains the major cargo handling equipment (the superstructure), and
- The entity that provides the major portion of the port labor.

In a matrix form this may be presented as follows.

²³ These terminologies were first introduced by Professor Jean-George Beaudelaire

Name	Infrastructure	Superstructure	Port Labor	Other functions ²⁴
Public Service Port	Public	Public	Public	Usually Public
Tool Port	Public	Public	Private	Usually Public
Landlord Port	Public	Private	Private	Usually Private
Private Service Port	Private	Private	Private	Usually Private

Table 5 – Port Management models (Source: World Bank Port Reform Toolkit 2007)

The World Bank Port Reform Toolkit²⁵ provides an exhaustive overview of port management forms.

A few observations are provided below:

- Port Reform processes can actually be considered as the movement from the Public Service Port management model form towards the Landlord Port management model.
- The Tool Port management model is not applied in many countries. One of its major disadvantages is that it includes the so-called ‘split-operation’, meaning that the owner of the major cargo handling equipment is the public sector, whereas the cargo handling operations are executed by the private sector. Both parties having opposing interests, coordination and regulation is essential to make this system work efficiently.²⁶
- The Landlord Port management model is considered to be the optimum Public-Private Partnership (PPP), provided that all conditions are met, as will be explained later. Ports in many countries around the world are moving into the Landlord Port direction.
- There are few ports that strictly apply the models as outlined in the table above; most ports apply a mixture of the models presented for various legal, social or financial reasons. Therefore ports are usually classified as: ‘*predominantly* following the ...’port management model’.

5.2. PORT REFORM

Port Reform processes accelerated in the 1980-s and are still continuing today. The Port Reform Toolkit lists the most important reasons why public service ports were entering into the Reform arena, or not (yet). The following listing presents the most important arguments that were (and sometimes are still being used) in favor or against the Public Port management model.

Arguments in favour of (national) public port management are:

- Avoidance of duplication of facilities

²⁴ These other functions are mainly activities such as pilotage, towage and mooring and unmooring services (line handling)

²⁵ Website:

<http://web.worldbank.org/WBSITE/EXTERNAL/TOPICS/EXTTRANSPORT/EXTPRAL/0,,contentMDK:20517158~pagePK:148956~piPK:216618~theSitePK:338594,00.htmlxxxxxx>

²⁶ Until the end of 2008 France was one of the last countries applying the Tool Port management system for its major ports until the French Government decided to change the system into that of the Landlord Port system.

- Protection of national economy interests
- Protection of the environment and safety aspects
- Avoidance of a private monopoly situation
- (Possible) short term horizon of the private sector, an
- Difficult co-ordination between the public and private sectors.

Arguments that are mentioned against national Public Port management are:

- Political control may interfere with (the overall) management decisions
- Restrictions of the management to take immediate market and/or pricing decisions
- Restrictions to hire and fire by performance
- Productivity
- Capacity to invest.

Many studies have been executed to list the reasons why governments decided to opt for involvement of the private sector in the investment and operations of port facilities. A summary of a number of studies leads to the following lists of 'reasons for change', meaning to introduce the private sector into the port domain.

The most important objectives for public entities to opt for increased private sector participation in port and terminal development and / or operations, also confirmed by field visits, execution of Port Reform projects and research are the following:

- Increase port performance and -efficiency, service delivery and competitiveness
- Decrease costs
- Improve commercial responsiveness
- Reduce bureaucracy in port administration (in regulatory and operational functions)
- Utilize foreign managerial experience and improve management skills
- Reduce public expenditures in ports to create the fiscal space for other public expenditures
- Mitigate public sector's exposure to commercial risks (of large investments)
- Reduce public labor force and restrictive labor practices (Unions)
- Demand for growth (international trade index for quantity or value), and / or
- Improve the balance between tariff levels and cost recovery levels.

5.2.1. Port Reform Modalities

As can be observed today, Port Reform can be executed by introducing the following modalities (forms through which Port Reform can be introduced and achieved) that range from relatively simple and not far-reaching actions until the ultimate stage of full privatization which is the sale of public assets and activities to the private sector.

Improvement of the Port Administration

This involves actions such as introduction of MIS (Management Information Systems), introduction of EDP (Electronic Data Processing), and Corporate Planning. This method may be considered as the initial step towards more far-reaching methods.

Liberalization

This is the process through which the public sector makes it possible for the private sector to operate in the same business environment. Liberalization is considered to be a useful first step on the road of transformation from the pure public sector environment to a situation of Public-Private-Partnership, or PPP. The objective of this option is foremost to increase the efficiency and the port user responsiveness of the public sector, as it is forced to compete effectively with the private sector.

It should be noted that in many countries it is required to change the legal framework (the National Port Law or Act) so as to allow the private sector to provide facilities and services within the public domain.

Commercialization

This option is a further step towards the PPP situation. It actually includes the change of the public enterprise management system into a system similar to that of a private enterprise - but still public! Commercialisation includes elements such as the introduction of de-centralised decision making and the relaxation of the hierarchy, including the re-structuring of the organisation introducing important management principles like responsibility and accountability.

Corporatization

This may be regarded as a final step before applying full privatization if so desired by the Government. It actually is the transformation of the public enterprise into a share company, be it that the shares remain in the ownership of the public sector. Most essential is that this process requires the transfer of all assets and liabilities (together with the appropriate contracts) to the new (public) limited liability company.

The corporatized company operates along the principles of a private company with remote public control, including adoption of private sector attitudes and management methods.²⁷

Privatization

This is the final step of the port reform process, provided a Government wants to go this way. It means that the port authority or the terminal, including all its assets and liabilities, is transferred to the private sector. Consequently, privatization is a *divesture* process. In this respect it is essential to mention another definition of Privatization introduced by Gustav de Monie in 1998: “The application of private capital to fund investments in port facilities, equipment and systems”. This variant usually applies to situations in which the private sector undertakes to invest in port components, but usually hands them back to the public sector after the end of the so-called concession period. Full **and permanent** privatization of the port sector has not been applied on a large scale. As a matter of fact, it has been applied in the United Kingdom, some ports in Australia and in New Zealand, and Port Reform experts have differing opinions of its successes.²⁸

5.2.2. Port Reform Tools

There are several so-called tools that can be used to introduce the private sector into port investment, management and -operations. It will be obvious that the impact of each of the tools is different.

²⁷ A well-known example of this process is the Port of Rotterdam case: In January 2004 the former Rotterdam Municipal Port Management transformed into a Corporatized Port Company, the shares of which are owned by the Municipality and the Government of the Netherlands.

²⁸ Reference: World Bank Port Reform Toolkit (2007)

The ones most applied are the following:

- Contracting out of certain services
- Management contract
- Concession contracts, in particular
 - Lease, and
 - BOT schemes.

Contracting Out of Certain Activities

A public Port Authority may decide to contract out (under a service contract or license) certain functions to the private sector instead of executing these functions 'in house'. Normally such decision is made on the basis of the following criteria:

- The function can be executed by the private sector at lower costs than when executed by the public Port Authority
- There are a number of potential providers of the service resulting in a competitive bidding process
- The execution of the activities 'in house' requires considerable investments. A typical example of this is dredging.

Contracting out is usually applied for so-called 'non-core of the business' activities such as:

- Dredging
- Repair and maintenance of equipment or craft, and
- Engineering services.

Management Contract

Actually there are two ways to introduce a Management Contract in a public port environment.

- The classic method is that a public Port Authority decides that the management of the entire port or a certain sector of it is temporarily handed over to a private party against a management fee.
- Another option is that the private sector party invests in the building or leasing contract of a port facility and then, in turn, contracts another private operational company to manage and operate the facility.

In most cases the contractual and financial arrangements of a management contract are that a private company provides managers for certain activities and receives a 'royalty' for the activities (for instance a royalty payment per move or TEU handled). In addition it may include the payment of a bonus in case a higher throughput or a better financial result (such as operating benefit, turnover, or net profit) is achieved. On the other hand, there may be a contract clause that forces the management company to pay a penalty in case of lower results than forecasted.

Concession Contracts

In recent years the concession contract has become the most popular Port Reform Tool. There are two major forms: the Lease contract and the BOT contracts.

Lease Contract

A lease contract is an agreement between a public entity (the Port Authority) and a private company describing the terms and conditions under which a private company leases a certain area within a port area from the public entity and exploits the facility (execution of operations at the request of third parties against a fee) for an agreed (long) period of time. The exploitation may concern cargo handling, storage and / or distribution or industrial activities, or any combination of these. As to the area to be leased, there are two possibilities. It may concern a new facility, a so-called green field site, or an existing facility.

Lease Contract for a Greenfield Site

In case of a green field site, the private company usually only leases the basic infrastructure, i.e. the quay wall and the facility area that are provided by the public sector. The private sector provides the superstructure, such as the buildings, the equipment, and in most cases also the paving of the plot.

It should be noted that the definition of infrastructure and superstructure may differ from one contract to another.

- 'Basic Infrastructure' includes components such as the port entrance channel, the port basin, the breakwaters and the port land
- Cargo handling equipment is considered to be 'Basic Superstructure', or 'Operational Superstructure'.
- Pavement, fencing and lighting of the facility, and internal roads and some buildings may be considered either infra- or superstructure and the question who will be the principal investor in these facilities usually is a major item of concession contract negotiations.

Lease Contract for an Existing Facility

In the case of an existing facility, both parties negotiate the possible take-over (lease or purchase) of the superstructure available in the facility. The agreement may also contain a clause of rehabilitation of the facility.

Basic Elements of a Lease Contract

Basic elements of a lease contract include the following.

- The basic characteristic of a lease contract is that the private sector pays an annual lease amount (expressed in US\$/m² per year) for the facility and provides new superstructure from its own resources if and when required.
- At the end of the lease period (ranging in the majority of cases from 15 to 30 years) the facility is returned to the public entity, unless both parties agree to continue the agreement. Usually the terms of the lease contract are re-negotiated at that moment.
- Lease contracts often state that the facility is to be handed back at the termination of the agreement in the same condition as it was at the beginning of the contract. This may result in higher costs if it established that there is considerable soil contamination and the private sector party is held responsible for this pollution. Therefore, the recommendation is that at the initiation of the lease contract both parties agree on the results of a soil investigation report that serves as the reference for the soil investigation carried out at the end of the contract.
- Another issue may be that the contract terms also require the private sector to remove all superstructures that it placed on the plot during the lease term. A common method is that the lease

contract contains an article that stipulates that the new lessee takes ownership of the superstructure placed by the former lessee.

Lease Contract Types

There are two major types of lease, the Flat Rate lease and the Shared Revenue lease.

Flat Rate Lease

In case of a Flat Rate lease agreement the private company pays for two basic components of the facility: the land and the quay wall, or pays a flat rate for the entire facility. It should be noted that in several countries the legal system does not allow the quay wall to be leased to a private company, as the quay wall is considered to belong (and remain) to the public domain. As mentioned above, the lease for the land usually is expressed in a number of US\$ per m² per year, and for the quay wall in US\$ per running meter of quay wall.

The Port Reform Toolkit recommends inclusion of a clause that states that the lease amount(s) is / are yearly increased the National Consumer Inflation Index (NCII), or with a combination ('basket') of a number of national inflation indexes. In some cases however, the contract parties cannot agree on this clause. Analysis of recently concluded concession contracts shows that an annual inflation percentage of 2% seems to be an acceptable compromise.

Shared Revenue Lease

In case of a Shared Revenue lease system it is agreed that the private company (the lessee) pays an agreed amount for the lease of the land (and possibly the quay wall), but in addition pays a compensation to the lessor (the public entity) related to the throughput of the facility. In case of container terminals (by far the largest population of this type of concessions), this usually is identified as the (TEU) *Royalty*. In most cases the Royalty (usually expressed in US\$ to be paid per TEU or per box handled), is applied along the principle of a sliding scale, meaning that the higher the throughput, the lower the Royalty.

Another model is that the Royalty is split in a fixed and a sliding component (the better the result, the lower the sliding component). Such concessions also include a penalty clause: if the operator does not achieve the forecasted throughput he will have to pay a penalty. The Shared Revenue lease is the most applied model in the world.

Most lease contracts are signed for periods between 15 and 30 years, and can usually be extended (under re-negotiated conditions).

Contract Depth

It is worthwhile to point another important condition in the lease contract that requires attention as it regularly leads to discussions between the public and private sectors: the so-called Contract Depth.

This is the depth (usually with reference to Mean Sea or River level, or Chart Datum) in front of the quay wall. Most contracts state that the public entity is responsible for maintaining that depth.

BOT (Build/Operate/Transfer) Contract

The basic characteristic of a BOT contract is that a private sector company agrees with the public entity to finance, construct, equip, operate and maintain a port facility (usually including equipment, paving, buildings

and quay). The private company operates the facility (either directly itself or via a management contract with a third party as outlined above) during the concession period and collects its revenues to cover financing and investment costs. At the end of the BOT contract period there are a number of possible scenarios, depending on the conditions set out in the original contract. The most common model is a so-called BOT (Build-Operate-Transfer) contract, indicating that the private company returns the fixed assets to the public entity. Depending on the original agreement, it also is possible that the private company hands over the major mobile assets to the public entity. This may be at written-down value or free of charge.

On a global scale, the BOT model is the one most used, but in the course of time a number of variations of the 'BO' concession have been developed, such are described in the following paragraphs.

BOO (Build/Own/Operate) Contract

The Built/Own/Operate model is a full privatization transaction (See Chapter 2.1.5.) of the terminal since the port land and the facilities built on it are not returned to the Government / Port Authority.

This model requires the legal necessity of private land ownership

EOT (Equip/Operate/Transfer) Contract

In some countries this model is also known as Supply-Operate-Transfer (SOT). This is the model in which the port infrastructure already exists and the private operator supplies the superstructure, i.e. the equipment and operates the facility. Discussion points of this model are the following:

- What is the compensation to be paid to the Port Authority / Government?
- Should transfer of the equipment at the end of the concession period be a contract component?

BTO (Build/Transfer/Operate) Contract

In case of a BTO contract the new port facility is directly transferred to the Government or Port Authority upon completion of the construction. The ownership of the assets that have been financed may be an issue for the lenders who usually require asset-based collateral to secure bank loans. In BTO schemes the only collateral is the concession contract itself which may be insufficient for the provision of bank loans. BTO schemes are necessary in countries where the national law does not permit private ownership of main port infrastructure.

BOOT (Build/Own/Operate/Transfer) Contract

The principal difference between the BOOT and the BOT contract is that the private sector party has legal ownership of the land and facilities during the contract period. But, similar to the BOT model, all assets are handed to the public entity at an agreed price at the end of the concession period. This model may be required in case the lenders require the facility as a security for the loan(s).

Transfer of the Terminal Equipment at the End of the Contract

This issue requires special attention from both contract parties. It is possible that the private operator will be reluctant to invest in new equipment and / or may spend less on equipment maintenance near the end of the contract period. The general recommendation is to regulate this in the concession contract. A commonly used procedure is that an independent third party is contracted to verify the equipment needs and maintenance services near the end of the contract.

5.3. REGULATION

When the public port sector decides to enter into a Public Private Partnership (PPP) with a private operator, it is essential that regulation is introduced, as there is a public obligation to ensure that

- The port or terminal operates efficiently and safely
- Fair and competitive services are provided
- The port or terminal supports and fosters the economic development, both locally and nationally.

For this reason regulation has to be introduced and applied at two different levels:

- National/institutional level
- Port level (port bylaws).

National / institutional regulation should ensure that the activities of the private sector that are executed are fair, efficient and competitive. This is most important if the private sector operates in an environment with limited or weak competition, i.e. in a monopolistic environment. The regulation should ensure that the public sector has the legal means to intervene in the operations of the private sector if it is not convinced that the principles of proper functioning of markets are applied. This intervention can be achieved through setting or controlling tariffs, revenues or profits. Maintenance of fair and competitive behavior and practices is essential and not adhering to it should make it possible to apply sanctions or penalties.

The ideal situation is that an independent high level Regulatory Authority is created that has the power to control and monitor the follow-up of the articles of the agreement between the public and private parties. It should have access to all information and be equipped with the legal means to apply sanctions or penalties if and when appropriate. Independence is essential as the Regulatory Authority cannot be linked in any form to the agreement between the public and the private sector partners as this eliminates the possibility to make an unbiased judgment of a given issue. Practice shows that in many countries this is difficult to achieve as the national legislation does not allow an independent entity to possess the powers it should have to function as an independent Regulator. If this is the case, the only solution left is to incorporate the regulatory components in the partnership agreement between the public and private sectors.

Regulation at port level

Regulation at port level is achieved through the drafting and application of the so-called Port Bylaws or Port Regulations. As a matter of fact, the Port Bylaws present a series of the 'do's and don'ts' and are applicable to all users of the port.

The Port Reform Toolkit recommends that the public sector should seek the advice and support from a professional and experienced consultant, as Regulation is a very complicated, but also an essential, legal issue.

5.4. PPI PROJECT DATABASE OF THE PPIAF AND THE WORLD BANK²⁹

The PPI Project Database lists all public-private-partnerships in developing countries from 1990 to 2006 in the sectors Energy, Telecom, Transport and Water and Sewage. For the Transport Sector, a division is made

²⁹ PPI: Private Participation in Infrastructure; PPIAF: Public-Private Infrastructure Advisory Facility

between Airports, Railways, Roads and Seaports. Figure 11 presents the investment commitments in these sectors as of 1990 in billion US\$. The conclusion from the data presented is that Roads and Railways were driving the growth in 2006. However, the Seaports Ports sector shows considerable increases in 2005 and 2006.

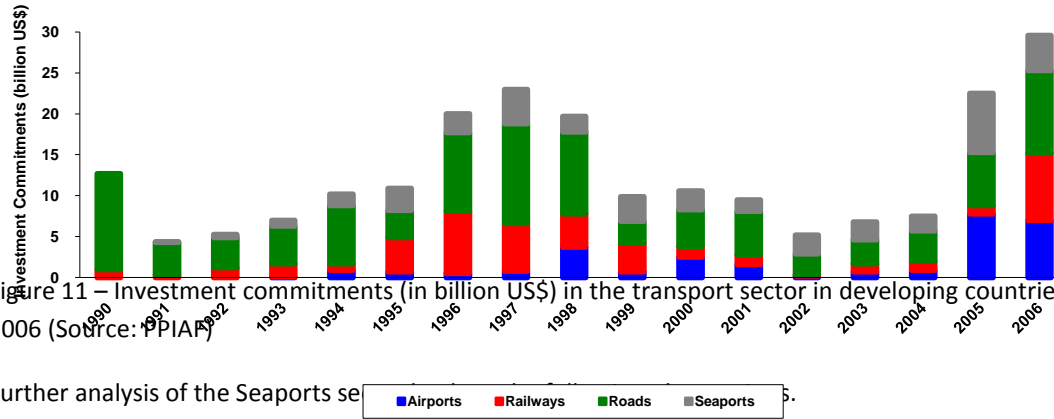
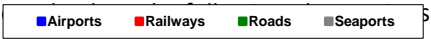


Figure 11 – Investment commitments (in billion US\$) in the transport sector in developing countries 1990 – 2006 (Source: PPIA)

Further analysis of the Seaports se



The PPI Database distinguishes four major PPI types:

- Greenfield Project
- Concession
- Management and / or Lease Contract, and
- Divestiture.

In addition, the Database uses the following sub-types:

- Rehabilitate, Operate and Transfer
- Build, Operate and Transfer
- Build, Own and Operate
- Build, Rehabilitate, Operate and Transfer
- Lease Contract
- Management Contract, and
- Partial or Full Divestiture.

The segments used are:

- Terminal
- Dredging and Terminal, and
- Channel dredging.

Out of the total of 289 projects listed:

- 17 are divestiture projects
- 105 are Greenfield projects
- 147 are Concessions, and

- 22 are Lease and Management contracts³⁰.

It is interesting to note that out of a total of 289 projects, 24 have a dredging component out of which, in turn, 4 projects are restricted to channel dredging only. When only considering the actual terminal projects in the database, the following diagram shows the types of contracts applied in various world regions.

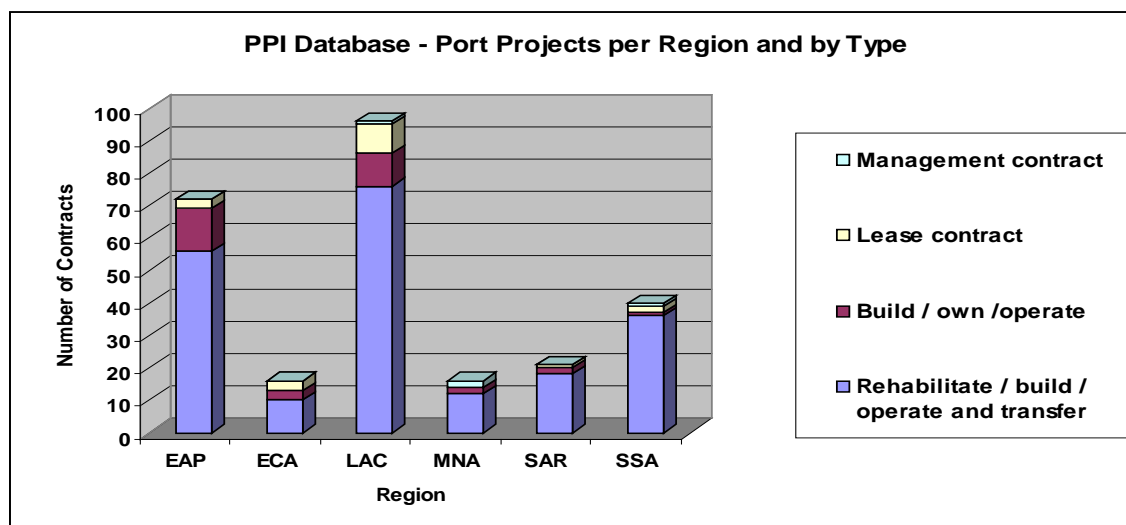


Figure 12 – PPI projects by Regions and Types 1990 – 2006 (Source: PPIAF)

5.4.1. Country Information

In the period 1990-2006, 56 countries implemented seaport agreements with private participation. Out of this total 15 countries entered into PPP contracts. But the activity is very much concentrated in a few countries: China, Nigeria, Brazil, India and Turkey accounted for 55% of projects. When the list is expanded to the top 10 countries by number of projects, these countries accounted for 67% of projects.

The sector ‘Seaports’ doubled its share in total PPI activity from 2.4% in 1990-2001 to 5% in 2002-06.

5.4.2. Investment Commitments in Seaports per Region

Further analysis of the Seaports sector leads to the following observations:

- The total number of projects listed is 299
- The total commitment by the private sector to the Governments amounts to US\$6.63 billion and the investment commitments in physical assets to US\$26.37, bringing the total to US\$33 billion, and
- Per Region this works out as follows:

Region	Number of	Payment commitments to	Investment commitments in	Total investment

³⁰ Unfortunately the PPI classification is not the same as the one used in the Port Reform Toolkit

	projects	the Governments (US\$ million)	physical assets (US\$ million)	commitments (US\$ million)
EAP	79	2,023	12,474	14,497
ECA	27	1,408	1,054	2,162
LAC	107	1,534	6,036	7,570
MNA	17	0	2,125	2,125
SAR	25	254	3,324	3,578
SSA	44	1,708	1,353	3,062
Total	299	6,628	26,368	32,996

Table 6 – Total investment commitments in port projects 1990 -2006 (Source: PPIAF)

5.4.3. Global Developments in Terms of Financing of Port Projects before the Financial Crisis

When PPP projects in ports became common practice, the required funds were usually provided by both the public and private parties. The share of each of the parties depended on the type and agreements contained in the contract. The public sector often received financial support from Regional and / or International Financial Institutions (RFI's and IFI's). The private sector share was usually footed by the private company from its own resources and / or supplemented or supplied by private financial institutions.

In general terms one can state that the share of private sector investment was usually based on the Internal Rate of Return (IRR) of its investment. If the IRR was below the company's threshold, the private sector party would require a larger share in the investment by the public entity, or discontinue the contract negotiations.

In 2005 a report by Drewry³¹ indicated that the global container terminal capacity was reaching 99% utilization in 2011 (and 89% if all proposed projects are indeed a realized), as shown in Table 7.

This Table clearly indicates that in 2005 Drewry estimated that in many regions of the world there was a significant requirement for the development of many container terminals, in particular in Latin America and Asia.

Region	Capacity Utilization in 2011	Capacity Utilization in 2011 if Drewry proposed projects are executed
North America	92%	86%
Central America and	82%	73%

³¹ Annual Review of Global Container Terminal Operations 2005 - Drewry

Caribbean		
South America	111%	102%
North America	81%	72%
South Europe	82%	78%
Africa	79%	71%
Middle East	98%	89%
Eastern Europe	92%	73%
South Asia	87%	57%
Far East	109%	105%
South East Asia	108%	91%
Oceania	105%	93%
Global Total	99%	89%

Table 7 – Global container terminal capacity utilization estimate 2011 (Source – Drewry)

The development of these container terminals would require very large investments. It could easily be assumed that many, if not most, Governments or other public port owners would not have the financial means for these large and expensive investments. The building and equipping of a medium size container terminal requires an investment of hundreds of millions of dollars, as shown in the following Table.

Item	Indicative Cost per Unit (US\$)
Dredging (including mobilization and demobilization costs)	7 to 10 per m3
Quay wall	50,000 to 100,000 per meter*
Terminal paving	50 to 100 per m2
Quay-side Gantry Crane	7 to 10 million **
Rubber-Tyred Gantry Crane	1.5 to 2 million**
Toplifter	0,6 to 0.8 million**
Tractor Trailer Combination	0.15 to 0,20 million**

* Cost per running meter depends on the type of construction and the depth in front of the quay wall

** Costs vary with the capacity (lifting capacity) and the dimensions

Table 8 - Indicative Container Terminal Investment Component Costs (2009) – Various sources and own research.

The Drewry publication was considered realistic when it was published. Global trade, and in particular the global container trade in that period of time was increasing very rapidly³² (as indicated before) and it was expected to continue to grow for the shorter term and that justified the forecasts made. On the other hand, in the period 2006 to early 2008 some analysts signaled the first indications of the Financial Crisis or Recession and indicated that this might result in a reduced growth or even decrease of the global (container) trade and, consequently to less container terminal capacity requirement. Also refer to Chapter 9 (The Impact of the Financial Crisis).

Yet in 2005-2006 and not surprisingly, the forecasted lack of capacity drew the attention of private financial institutions other than the traditional ones. Insurance Companies (AIG!), pension funds and hedge funds started investing in port facilities. In that period these institutions regarded investments in ports and in particular in container terminals, as a stable long term investment.

How the market was reacting in 2006 and (partly in) 2007, is witnessed by a few clippings from the maritime press (Source: Lloyds' List November 2006):

- *"IPO's: Oversubscription was much in evidence as from these Chinese examples: the IPO for the terminal at Xiamen was 94 times oversubscribed, Tianjin an amazing 1,703 and Dalian 851 times"*
- *"Dubai Ports World (DPW) paid a multiple of 15.3 times (of the estimated value) for P&O Ports in February 2006" , and*
- *"Peel Ports paid a multiple of 11.5 times (of the estimated value) for Mersey Docks and Harbour Company".*

³² World Port Container Throughput increased from some 200 million TEU in 2000 to more than 470 million in 2007.

6. MARITIME TRANSPORT AND PORTS AND CLIMATE CHANGE

Climate Change is at the center of attention, be it that in 2009 it is partly overshadowed by the Financial Crisis. Next to emissions by cars, housing, agriculture and industry, the emissions produced by maritime transport and ports (as a component of 'Transport') are very much in focus and this has already led to mitigation measures and initiatives for further reductions.

Reports published in 2007 indicated that Maritime Transport was estimated to be contributing some 2.7% of the World Green House Gasses (GHG) emission.

In a port environment there are various air pollution sources (next to water pollution as a result of cargo spills and ship's paint), such as:

- Air pollution by ships
- Air pollution by cargo handling equipment
- Air pollution by hinterland connections (train, truck and barge), and
- Air pollution by the (port) industry.

Other port related pollution sources are:

- Light pollution (port industry and terminals);
- Noise pollution (equipment, hinterland connections, the port industry and terminals), and
- Soil pollution (by equipment and industry).

The maritime and port industry took pollution very seriously and developed several measures to reduce or mitigate the pollution, in particular the GHG emissions. The following lists various initiatives by the principal stakeholders.

6.1. MEASURES TAKEN OR PROPOSED BY THE SHIPPING INDUSTRY TO DECREASE POLLUTION

- **Slow(er) sailing.** Reduction of the vessel speed with a few knots (nautical miles per hour) reduces the air pollution of the ship's engine more than proportionally. But for shipping lines this could result in having to exploit one or more additional vessels in order to maintain the original rotation schedule.
- **Cleaner vessel engine spills.** The shipping industry, in close cooperation with the manufacturing industry developed methods to reduce the exhaust of the main air pollutants (Nox, Sox and Small Particles)
- **Possible return of sailing vessels or nuclear powered commercial vessels.** During the Energy Crisis in the 1980-s naval architects designed vessels that were equipped with giant sails as an alternative (be it additional) source of propulsion.³³ In 2008 a German shipping line developed a vessel that was equipped with a giant kite.
- **Possible switch to LNG.** Liquefied Gas Carriers obtain part of their propulsion fuel from the so-called 'Boil-Off' of their liquefied gas cargoes. Every day a certain percentage of the liquefied gas evaporates and this gas is used for the vessel's engine. The advantage of this fuel is that it is cleaner than the

³³ One such vessel was actually built and in service in Japan.

Heavy Fuel Oil (HFO³⁴) that ships normally use. The disadvantage of this potential solution is that the system is very expensive.

6.2. MEASURES TAKEN OR PROPOSED BY PORT AUTHORITIES

- **Cold Ironing.** Cold Ironing is the system whereby the Port Authority provides special electrical outlets on the terminal to power ships while at berth. Normally ships at berth run (part of) their own power system for the basic functions while the ship is in port.
- These engines also run on HFO or on Diesel fuel and lead to considerable air pollution. The Port of Los Angeles was one of the pioneers of this system, but many ports around the world have already followed the example.
- **Clean(er) Fuel Award.** Many ports also introduced a system to award ship owners when entering and leaving the port using cleaner fuels than HFO.
- **Increase of fees to reduce emissions.** Other ports went the opposite way and started to increase certain fees (such as Port Dues) for ships that did not make attempts to reduce pollution when entering / leaving port or when at berth.
- **Clean Truck Programs.** It is quite common in most ports in the world that the terminal equipment drivers keep their engine running while waiting for the start of a new activity. In many ports drivers of road trucks and trailer combinations have the same habit when waiting to collect or deliver cargo to the port. Stationary running of vehicle engines, in particular when they are old or poorly maintained, results (percentage-wise) in considerable pollution. Many ports have introduced programs of better and more regular truck engine maintenance and / or engine replacements and / or reduction of stationary engine running, as well as anti-idling procedures.
- **Hinterland distribution shares regulated through concessions contracts.** Until date, the only known concession contract that contains conditions that aim to reduce air pollution was signed in the Port of Rotterdam in 2008. The concession agreement that was signed between the Port of Rotterdam Authority and a private Container Terminal Operator contains an article which obliges the Operator that, after an agreed operational start-up period, the percentages of the modes by which containers arrive and leave the terminal be within certain maximum limits. The modes are rail, road and inland waterway (barge). It goes without saying that the percentages, being an article of the concession agreement, are confidential. The objective of this initiative is to reduce road transport, as this is the major polluter of the three modes, as shown in Figure 13.

³⁴ HFO, or bunker fuel, generally sells for half to two-thirds the price of crude oil from which it was refined. Current fuel quality standards set by the IMO allow the use of bunker fuel that contains maximum 45,000 ppm of sulfur, a key fuel contaminant and air pollutant. This is thousands of times more polluting than diesel allowed in road trucks in the USA which can contain no more than 15 ppm of sulfur. Source: Container Ports and Air Pollution by James S. Cannon, Energy Future, Inc.

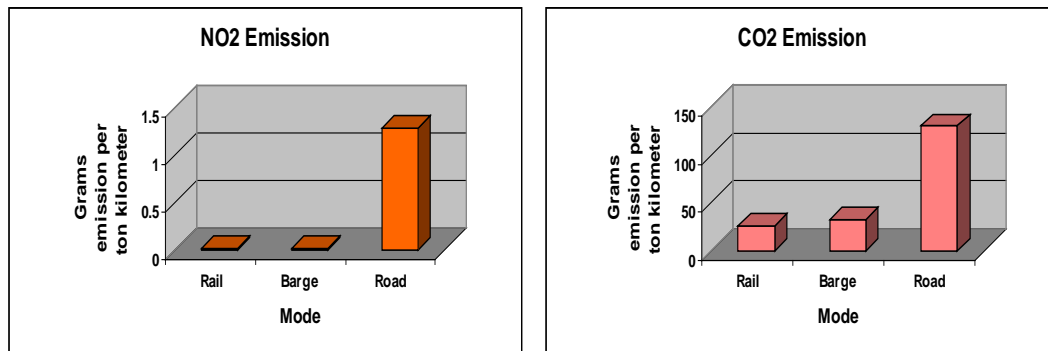


Figure 13 – No2 and CO2 emissions (grams per ton kilometre) for the major hinterland modes

It should be noted that the methods to reduce pollution by the shipping lines coincided with sharp increases of the price of fuel in 2008 when the cost of a barrel increased to close to US\$ 150 per barrel.

The following quotation from Worldshipping.org (2008) illustrates this:

'Fuel costs represent 50-60% of the daily costs of vessels depending on type, capacity and service. The example presented was the following: A 7,750 TEU capacity container vessel has a fuel consumption of some 220 tons per day. On the basis of the HFO price, a 28-day Trans-Pacific round trip will produce a fuel bill of about US\$ 3.3 million.'

6.3. MEASURES TAKEN OR PROPOSED BY TERMINAL OPERATORS

- **Replace terminal equipment diesel engines by diesel-electric or electric engines**

Diesel engines are a major source of pollution, in particular when poorly maintained or old. Many terminals have replaced Diesel engines by diesel-electric or electric engines which are increasingly being offered by the industrial suppliers (so-called green equipment).

- Alternative fuels
- Another method to reduce pollution is through the use of alternative fuels such as bio fuel or low sulphur fuels.
- Fleet modernization
- As indicated above, a proven method to reduce pollution is by modernizing the terminal fleet. New modern equipment usually uses less fuel and is cleaner.
- Reduce waiting times for equipment (terminal and hinterland) through better tracking and tracing
- The waiting times of equipment (both terminal and road equipment (in particular of trucks and trailers) can be quite considerable, both at the operational side (on the quay and in the stacking area), as on the reception / delivery side of the terminal. Reasons for long waiting times are many, but an obvious one is caused by the time it takes to establish the exact location of the cargo or container required. Better tracking and tracing, using modern IT methods and / or GSM technology has proven to lead to considerable reductions in waiting times and, consequently, to a reduction of air pollution
- Increase of operational terminals hours (24/7), and
- Another potential measure is the increase of the operational terminal hours, in particular of the receipt and delivery facilities. Most (container) terminals operate 24/7 on the quay side, as a

consequence of the high daily operational costs of the vessels. But many terminals have less opening hours of the terminal on the land-side. This is not always the decision of the Terminal Operator. It also often occurs that the Customs Office only operates a limited number of hours per day and the same may apply to other services such as shipping agents, Customs Clearance agents, banks, and veterinary services. The limited land-side opening hours for many terminals leads to trucking peaks in the early morning and late afternoon, often leading to long waiting times and, consequently, air pollution and congested roads. It should, however, also be mentioned that energy (electricity) and personnel costs increase when 24/7 is introduced.

6.4. MEASURES TAKEN OR PROPOSED BY TERMINAL EQUIPMENT MANUFACTURERS

Initiatives of equipment manufacturers have introduced various new techniques in the equipment they produce such as:

- Hybrid equipment;
- Reduced fuel consumption by optimizing engine speed;
- Extended diesel engine life, and
- Reduced engine emissions.

Another important development is further reduction of the noise of the equipment, which also a type of pollution.

7. HEALTH, SAFETY AND SECURITY IN PORTS AND MARITIME TRANSPORT

Attention for Health, Safety and Security (HSS) in port and maritime transport is important and quite well regulated through national legislation (be it foremost in developed countries, but also through Conventions and Codes of the ILO (International Labour Office), the IMO (International Maritime Organization), the ITF (International Transport Federation) and local Trade Unions. In this respect it is important to note that Union membership in ports is one of the highest of all industries.

The role of the ITF and the Unions is to signal situations that are considered which are not following recommendations such as those contained in the Code. Through direct negotiations with employers, or indirectly through organizations as the ILO improvement of perceived situations are sought. In this context it is important to note that the membership of the ILO is tripartite: Governments, Employers and Employees (represented by the Unions).

This role of the ITF and the Unions are understandable as one realizes that in many ports in developing countries the HSS situation is quite poor; not only because of lack of the appropriate legislation and its application, but also due to lack of the financial means required to implement HSS measures.

In addition: in many ports around the world, also in developed countries, certain or all port work is executed by casual workers which receive none, or hardly any, occupational training.

7.1. SAFETY AND HEALTH

Health and Safety in port work and maritime transport is closely interlinked, as is witnessed by the ILO publication 'Safety and health in ports'³⁵. The introduction of the Code provides an overview of the port industry which states that:

“cargo handling methods that were both arduous and dangerous remained largely unchanged until the introduction of containers and roll on-roll off systems in the 1960s. Technical developments in the port and maritime industry have continued since then, including the introduction of increasingly sophisticated cargo handling equipment with greatly increased capacity and reach.

While many of these changes in cargo-handling methods have resulted in significant improvements for the safety of port workers, some changes have introduced new hazards and port work is still regarded as an occupation with very high accident rates.

Moreover, privatization in the industry has led to considerable changes in the organization of ports and the employment of people in them, including use of non-permanent workers. Fortunately, systems for identifying and managing risks have also been developed and the need for investment in the training and skills of port workers has been increasingly recognized”.

³⁵ *Safety and health in ports. ILO code of practice.* First publication 2005. ISBN 92-2-11-115287. Also see the website ILO.org.

It will not come as a surprise that the statement related to '*privatisation in the industry*' is not supported by all stakeholders in the industry³⁶ and has been the topic of several conferences and seminars.

The Code is intended to be a concise set of recommendations based on good practices in the industry. The advice should be useful to all bodies and persons concerned with safety and health in port work. These include Governments, manufacturers and suppliers of equipment, and professional bodies dealing with occupational safety and health.

The topics of the Code are:

- Introduction, scope, implementation and definitions
- General provisions
- Port infrastructure, plant and equipment
- Lifting appliances and loose gear
- Safe use of lifting equipment and loose gear
- Operations on shore
- Operations afloat
- Dangerous goods
- Health
- Personal welfare facilities
- Emergency arrangements
- Other relevant safety matters, and
- References.

7.2. HIV/AIDS

Port areas and maritime transport present a challenging working environment where the risk of HIV infection is anticipated to be high. The paper '*HIV/AIDS and the Workplace*³⁷ is a good example of a paper that describes a particular situation. For instance in the following summary: '*The main economic activity in the ports is employment in the formal sector. Around this, many other informal economic activities are developed, largely dependent on the formal sector*'. '*Because of financial limitations relative to needs, most of the formal employees were reported to be involved in the informal economy, except for some of the elderly workers*'.

These informal economic activities were, for instance, food selling, tailoring, hawking and other small scale trade. Owners of such small businesses reportedly employ young girls to serve customers and some employers take advantage of this interaction to negotiate commercial sex transactions.

Combined with the existence of freight forwarders and truck drivers who often sleep in or under their truck, commercial sex was reported to have grown into a busy economic activity at night.

³⁶ At least not at the time of that the Convention was developed. Since that time, as follows from discussions with representatives of the ILO and the ITF, it has been accepted as a given fact that port reform is the only opportunity to improve port efficiency and the financial status of ports. But the requirement that only a contracted, non-casual workforce is working in the port which receives adequate occupational HSS training is maintained.

³⁷ HIV/AIDS and the Workplace: A Qualitative Assessment of the Ghana Port and Harbour Community for an HIV/AIDS Workplace Program (executed by Abt Associates and Commercial Market Strategies)

The research concluded that these factors, together with migration and social behaviour resulted in an increase risk of people being infected.

The paper concludes that large-scale community mobilization and sensitization on HIV/AIDS risk avoiding behaviours and preventive practices, although implemented, has not yet resulted in curbing the epidemic in this sector.

7.3. SECURITY

Security has always been an important issue in ports. Not only is a port an essential economic and financial asset for a country (its gateway and unique national import and export gate) that has to be protected from any harm, but it also is an essential point where illegal actions should be searched, investigated and hopefully prevented such as pilferage of cargo, wrong or incomplete declarations (which have a negative financial impact on the national economy) and where illegal actions such as the smuggling of contraband, of people and of weapons should be prevented. In this respect Customs and the policing or security force(s) play an important role.

It is obvious that the events of 9/11 have accelerated the attention for security and have resulted in very far-reaching safety and security rules, regulations and laws that are in force today. These new rules have had a considerable impact on ports and terminals.

Taking a somewhat distant view, one may conclude that the impact of the 9/11 events has shocked the world at large and showed that the global economy and the global supply chains were more vulnerable than realized.

7.3.1. ISPS Code

The first global action that was introduced was the International Ship and Port (Facility) Security Code (ISPS) of the IMO that was implemented in July 2004.

“The ISPS Code is a comprehensive set of measures adopted by the International Maritime Organization to enhance the security of ships and port facilities. The purpose of the Code is to provide a standardized, consistent framework for evaluating risk, enabling Governments to offset changes in threat with changes in vulnerability for ships and port facilities through determination of appropriate security levels and corresponding security measures. The ISPS Code is mandatory for the 148 countries which are party to SOLAS (Safety of Life At Sea) Convention.”

The Code has two Parts, one mandatory (Part A) and one recommendatory (Part B). Compliance is mandatory for the 148 contracting parties to SOLAS; detailed implementation of the Code is a matter for individual national Governments.

The purpose of the ISPS Code is to provide a standardized, consistent framework for evaluating risks, enabling Governments to offset changes in threat with changes in vulnerability for ships and port facilities through determination of appropriate security levels and corresponding security measures, taken either by the Government, the shipping companies, the ports or any other entity holding responsibility for maritime security. In this context a port has three main tasks, i.e.

- To carry out a Port Facility Security Assessment (PFSA)

- To set up a Port Facility Security Plan (PFSP) and
- To designate a Port Facility Security Officer (PFSO).

The first component (Part A) of the Code is mandatory for all port facilities that service cargo ships of 500 Gross Tons (GT) and above and that are sailing on international voyages.

The introduction of the ISPS Code in 2004 led to many questions and misunderstandings. The Code does **not**, as would have been useful, prescribe in exact terms and data what port facility and port managers have to do or provide to ensure that they are compliant. Part of the ISPS Code actually is a type of questionnaire that asks questions about security items, but then stops short of giving exact and uniform instructions as to how the specific measures can be established. A simple example is the fencing of the port facility. The ISPS Code describes that the port facility has to be fenced adequately so as to prevent illegal intruders from entering the facility.

But the Code does not describe the type of fence, its height and so on. This has led to situations in which a Port Authority considered its fence adequate, but found out later that other entities, such as security consultants or the US Coast Guard, did not fully agree with this, and sometimes even not at all. The ISO (International Organization for Standardisation) has made an attempt to ‘translate’ the ISPS Code in a type of handbook, but the result in fact was another questionnaire.

Before its implementation there was great concern in the international maritime and port environment. It was feared that the implementation of the ISPS would result in serious delays in transport flows and high costs for ports and terminals in order to become ISPS compliant.

It appeared, after July 2004, that most of the fears proved to be incorrect, although it must be stated that investment and running costs (including hiring and training of security personnel) in ports in developing countries that had hardly addressed the issue of security in some cases required large investments.

In order to provide more information, the World Bank executed a study in a number of ports in Africa, Europe and Latin America which concluded that the implementation of ISPS actually resulted in small increases of port/terminal handling costs.³⁸

Although today ISPS is accepted and implemented in most ports around the world, its problem is that the Code does not include concrete details of the actions that have to be taken in order to be declared compliant. In 2007 the IMO issued a statement that indeed there still is much confusion about the actual ISPS requirements.

7.3.2. Supply Chain Security

The threats to the Supply Chain

³⁸ World Bank publication: ‘Review of Cost of Compliance with New International Freight Transport Security Requirements’ ,

C. Bert Kruk, Lead Port Specialist, ETWTR and Marc Juhel, Sector Manager ETWTR, September 2007

As mentioned in the previous chapter, ISPS is a component of the much wider Supply Chain Security (SCS) concept. SCS concentrates on security issues in the entire chain from producer to consumer, inclusive of ports and terminals.

The term “Supply Chain Security” can be defined to encompass the programs, systems, procedures, technology and solutions applied to address threats to the supply chain and the related threats to the economic, social and physical well-being of citizens and organized society. There are many different threats to the supply chain which fall primarily into the categories of criminal activities and terrorist threats.

Criminal activities are by far the most important problem in international trade and transport. The criminal threats cover a wide range of aspects:

- Cargo theft
- Conveyance vehicle theft
- Contraband and smuggling of human beings
- Tax and duty evasion
- Attack on a transportation node.

The terrorist threats to SCS can be categorized as follows:

- Use of the cargo as a weapon
- Use of the container as a weapon
- Use of the container as a delivery mechanism or to move weapons, explosive, biological and radiological contaminants and their precursors
- Use of the conveyance vehicle as a weapon
- Use of the conveyance vehicle as a delivery mechanism.

With the goal of terrorist activities being:

- Damage, destroy, or exploit the supply chain, logistics systems, infrastructure and information management systems
- Cause victims and casualties
- Cause economic harm and cost
- Results of reduced freedoms and loss of the feeling of well-being in a Society.

In order to effectively counter these threats and their consequences there are 5 key pillars to SCS, visually:

- Awareness: Identify / understand threats, assess vulnerabilities, determine potential impacts and consequences
- Prevention: Detect, deter and mitigate threats
- Protection: Safeguard people, critical infrastructure, property from criminal acts
- Response: Manage and coordinate the response to criminal acts or other emergencies
- Recovery: Manage efforts to restore operations after criminal acts or other emergencies.

The layered approach to Supply Chain Security

The layered approach to Supply Chain Security comprises:

- Early detection of threats by timely acquisition and analysis of cargo information by the relevant Government Agencies, using a consistent risk management approach.
- The use of appropriate sustainable technology to achieve the above, enabling enforcement agencies to faster screen or examine a larger portion of the commercial flows, while facilitating legitimate trade flows.
- The certification of the actors of the supply chains, through Authorized Economic Operators (AEO) certification programs.
- The mutual recognition by governments of their respective certification programs

The above so-called layered approach enables Government Agencies to identify and target threats, and allocate resources accordingly.

The players and their interests and roles

Until date, 156 **governments** have signed the World Customs Organization (WCO) SAFE Framework of Standards which requires the implementation of a national SCS program. It includes elements such as technology and Advance Cargo Information (ACI), Authorized Economic Operators (AEO) certification and prepares for Mutual Recognition with other national AEO programs. This implies that most governments are committed to develop their own national SCS program.

Thus, for WCO signatory governments it is key to understand the pillars and requirements of the WCO SAFE FoS (Framework of Standards) and to start making the necessary plans to implement a national SCS program. The WCO offers many tools to accomplish this.

After the implementation of a national SCS program, Mutual Recognition with other existing AEO certification programs is the next “hot” issue. This requires a political effort on the part of the national bodies concerned and is often a matter of time and especially trust in the nation-to-nation relationship. Mutual Recognition is one of the as yet unresolved issues since only few states have signed agreements mutually recognizing the certification programs of one another. Despite such problems, there is however no need to reinvent the wheel from scratch, since, for example, the WCO SAFE FoS proposed tools offer an internationally, thus multilateral, accepted platform which will help to facilitate downstream mutual compatibility and recognition – if adequately implemented.

For the **private sector** the motivations are different. Competitive forces, industry demands, and an increasing number of incidents such as theft, piracy and natural disasters at outsourced locations have all caused a spike in the level of security awareness. This is especially true in the area of Risk Management.

Today the business case for investing in security is focused on two areas:

- Business continuity in the event of a catastrophe or other disruptive event causing a discontinuity in business operations, and
- The reduction of theft/crime. It is also important that the private sector weighs the costs against the benefits of participating or not in the various national and international programs.

For the private sector, more and more it is becoming: “If you are not “in”, you are “out” “, meaning that although SCS programs are voluntary in many cases, if you are not participating, your company runs the risk of

being left out of the international trade and transport process or may find itself at a competitive disadvantage compared to competitors who are “in”.

The present (2009) situation actually is that SCS compliance, today, is not compulsory on a **global** scale, as a whole. Bits and pieces of SCS are mandatory and others will soon be. Institutions such as the World Customs Organization (WCO), the European Community and several Governmental Organizations (in particular of the USA) have prepared, or are developing, rules that apply to SCS. But generally countries are offered the choice: it is advantageous to apply SCS principles in order not to be excluded from the Global Supply Chain.

Scanning

An important component of SCS is the scanning of cargo, in particular of containers. There is no official global (in the meaning of a world-wide agreement) regulation that makes scanning compulsory, but is seen as an advantage. Several developing countries have contracted private companies that provide scanning services and complaints about this have been heard in some ports.

The World Bank Supply Chain Security Guide addresses this issue³⁹.

Quote:

Scanning can serve two clearly distinct purposes:

- *Assist in detecting and counter illegal material movements by organized crime, be it contrabandist or terrorist in nature*
- *Assist Customs to protect and enhance tax collection against fraud and mis-declaration by the trade or their representatives.*

The two functions sometimes overlap, often through the use of the same technology, facilities and/or operating personnel. Having one scanner in one port to inspect imports to protect or enhance tax revenue should not normally be considered as fully addressing supply chain security per se. In fact, improved monitoring of possible smuggling of weapons, explosives and similar, an important objective of SCS, is actually a collateral benefit of tax-related scanning.

There are examples of tax collection-related import cargo scanning operations in developing countries, particularly Africa. One of the implantation models is the following: a provider is granted a Build, Operate, and Transfer (BOT) concession to install and run import scanning operations. The concession often encompasses physical installations, supply and operation of one or more scanners and a risk management system, capacity building, transfer of know-how and training of the local Customs officers.

While the tax-collection improvement objectives are reportedly achieved and even exceeded in some cases, the physical insertion of the scanning procedures and sites have not always been well thought of, and the necessary consultation with the port and trade communities, as well as between concerned government agencies have sometimes been lacking. Complaints have been heard in some ports about the high costs being recouped from the logistics operators and cargo interests, as well as about the delays and interferences sometimes caused on the cargo flows and port operations. The effectiveness of the capacity building and know-how transfer components has also been questioned in some cases.

³⁹ World Bank Supply Chain Security Guide, paragraph 3.5.4. The Dual Role of Scanning

It is not the purpose of this guide to analyze in depth these tax-collection scanning schemes, but practical lessons might be drawn from these experiences.”

The US Congress Decision of 100% scanning

The US Congress has decided that as from 2012 all containers that enter the USA must have gone through prior scanning processes in the last port before entering the USA, but in February 2009 it became clear that this norm cannot be achieved by that date. There is worldwide opposition against this unilateral decision.

The World Bank Supply Chain Security Guide

Field investigations and discussions with Port Community participants (world-wide) of World Bank experts led to the conclusion that in particular in developing countries there is very little knowledge about requirements and implications of SCS. Therefore the World Bank decided to contract a consultant for the production of a Supply Chain Security Guide.

The Guide explains the background of SCS, what it requires from supply chain participants and what, in the longer term, the benefits of being SCS compliant will provide. The Supply Chain Security (SCS) Guide is intended for Trade and Transport Government officials, Port and Airport Authorities and Cargo and Logistics Communities, in particular in developing countries.

The Guide describes all components of SCS and is preliminarily directed toward Port and Trading Communities at large (being the nodal points where Supply Chain Security is quite advanced), but making references to other modes and nodal points as well.

The purpose of the Guide is to make concerned trade-related officials, managers and personnel in developing countries acquainted with and aware of the many initiatives in the field of Supply Chain Security, what these will mean for their respective organizations, and how to tackle the inlaid challenges.

8. CITY-PORT RELATIONSHIP

Historically, many ports were developed in or near cities. This obviously was a logical development as a port has several components that require it to be located in or near a city: a market, port workers, administrative personnel and institutions such as banks, shipping agents and traders.

In many port cities the port was the main direct and indirect provider of employment opportunities. City, regional and national governments sometimes received considerable income from the port, transport and services activities.

There was, and actually still is, another side of this positive coin. In the course of time, as explained before, ships started to become larger, requiring more depth and when the cargo throughput increased and /or when industries and other value-added activities more land close to the port was required and / or when land transport flows through the cities increased, in many ports around the world, the city-port relation increasingly became more difficult.

In addition, when not well regulated, the environment impact of the port, industrial and transport function could be considerable. As indicated before, the port and transport environment may result in pollution increases in terms of air and soil pollution, noise, smell, and light.

As also indicated earlier, increased attention for the protection of the environment and the reduction of pollution have already resulted in measures taken by the principal players, and actually have resulted in reductions and improvements at ports.

The other aspect of the city-port relation is that many ports around the world had to expand in size, but also had to be located in deeper water as a consequence of larger and deeper draft ships. The 'old' port areas, not responding to the new requirements, not having efficient hinterland connections and forming a source of various types of pollution were returned to the city. In many cases these former port areas were successfully transformed into marinas, real estate development areas and recreational areas. Examples where such processes were successfully undertaken are for instance Baltimore, Hamburg, London and Lisbon.

The International Association of Cities and Ports (IACP)⁴⁰ is a useful forum where port city representatives, urban development specialists and other interested entities exchange views.

⁴⁰ www.aivp.org (Association internationale villes et ports)

9. THE IMPACT OF THE FINANCIAL CRISIS ON PORTS AND MARITIME TRANSPORT

9.1. INTRODUCTION

Similar to all other industrial and financial sectors, the impact of the Financial Crisis on ports and maritime transport has, until date (Autumn 2009), already shown to be of a magnitude that hardly any expert was able to predict.

The impact has had an effect on all sectors:

- World maritime transport
- Freight rates
- Charter rates
- New vessel orders
- Vessel deployment
- Container port throughput
- Empty containers
- Shipping Lines
- Port labor
- New port projects and concessions, and
- New shipping routes.

9.2. WORLD MARITIME TRANSPORT

From the moment that it became clear that the world-wide recession that resulted from the Financial Crisis was really taking place, it was feared that this would have an enormous impact on maritime transport and ports. And this, as we know today (May 2009) has become a reality.

A way to illustrate the impact on World Maritime Transport is to quote findings from a selection of newspaper and magazine clippings from the last six months of 2008 and the first months of 2009:

- Terminal congestion in US West Coast container terminals had decreased considerably due to sharp decline of imports
- Container vessels calls at Hong Kong were reported to have decreased drastically
- Iron ore and minerals are piling up in South American mines due to declined orders from China
- Shipping lines started to cancel charter contracts and / or to negotiate much lower rates
- Some data on container trades include the following:
 - *Westbound volumes between Asia and Europe decreased with 12% between October and November 2008*
 - *In February 2009 box volumes were down 32% compared to February 2008*
 - *Eastbound volumes between Europe and Asia decreased by 16% in the same period*
 - *In February 2009 Westbound Atlantic volumes decreased by 21% and Eastbound by 29% compared with February 2008.*

9.3. FREIGHT RATES

Freight Rates plunged in particular in Q3 and Q4 2008, as can be illustrated with the following examples for container Freight Rates quoted from the international maritime press.

Container freight rates (data from clippings) started to plunge in particular in Q3 and Q4 2008.

Major shipping lines charged (spot rates):

- *In March 2008 the Rate for transporting a container from Asia to Europe was approximately US\$ 2,000 / TEU*
- *In December 2008 the Rate had decreased to US\$ 500 / TEU.*

From another source:

- *In December 2007: The Asia to Europe Rate was US\$ 1,400 / TEU*
- *In December 2008 the Rate had decreased to US\$ 250 / TEU (spot rates).*

In March 2009 Drewry reported that the all-in freight rate index for a 40 ft box for the route between South China and Europe had developed as follows:

- *January 2008: US\$ 2,629*
- *November 2008: US\$ 2,098, and*
- *January 2009: US\$ 1,681.*

9.4. CHARTER RATES

A Vessel Charter Rate is the sum of money a shipping line pays to a ship owner for the rent of a vessel per day. The following examples indicate the decline in charters rates for a number of vessels.

Container vessels

- *In March 2008 the Charter Rate for a 2,500 TEU capacity container vessel was US\$ 30,000 per day. In December 2008 the Rate has decreased to US\$ 12,000 per day*
- *In January 2008 the charter rate for a 2,000 TEU container vessel was US\$ 20,000 per day. In January 2009 the rate was down to US\$ 7,000*
- *In March the charter rate for a 5,762 TEU vessel was US\$ 8,000 per day, down from US\$ 39,000 per day in March 2008*
- *In March 2009 the charter rate for a 1,712 TEU vessel was US\$ 5,700 per day. In March 2005 the rate for this vessel was US\$ 30,000 per day, US\$ 17,000 per day in March 2008 and US\$ 6,200 per day in December 2008*
- *In April 2009, the charter rate for a 1,100 TEU vessel was about US\$ 4,100 per day, down from US\$ 12,800 per day in April 2008*

Dry Bulk Vessels

- *In the first months of 2008 the charter rate for a Cape Size dry bulk carrier (over 80,000 DWT) was \$250,000 per day, but declined to \$25,000 per day in November 2008 and was reported to be still falling*
- *In June 2008 the charter rate for a Panamax dry bulk carrier (approximately 60,000 DWT) was approximately US\$ 64,000 per day. December 2008 the Rate had declined to US\$ 11,000 per day.*
- *In May 2008 the charter rate for a Cape Size dry bulk carrier (over 80,000 DWT) was \$300,000 per day. The rate declined to \$3,000 per day in December 2008, but increased to \$30,000 in May 2009.*
-

9.5. NEW VESSEL ORDERS

The slump in demand for shipping capacity demand resulted in a cascade of announcements of container and dry bulk ships lay-ups in the second half of 2008 and was expected to result in doubt related to the need for demand for future deliveries of new buildings, in particular of container vessels. As presented in Figure 5, in December 2008 there were world-wide 1,811 container vessels on order, of which 295 vessels were of a capacity above 8,000 TEU.

To illustrate the uncertain situation in the latter half 2008, it is remarkable that, notwithstanding cancellations of new container vessel orders in the latter half of 2008, the world vessel capacity was still expected to grow with 13% in 2009, whereas the estimate is that container volumes will grow with maximum 5% in 2009. In the first months of 2009 these figures appeared to be too optimistic:

- The number of cancellations for new vessels had increased dramatically
- The world port container throughput was also declining very fast. Some ports report decreases of more than 20% in the first two months of 2009 compared to the same period in 2008 (in particular in Asia, and more particular in China).

A few random examples of clippings in the international maritime press in the last months of 2008 and the first months of 2009:

- Many of the shipbuilding orders announced over the past year do not (yet?) have the proper finance in place and could fail as the liquidity squeeze continues
- It was estimated (December 2008) that there is US\$500 billion(!) worth of ships on order of which half are mentioned to have no financing and banks are refusing to issue letters of credit
- Almost all shipping companies sent teams to the ship yards in China and Korea to discuss cancellations or postponements of orders
- Shipping companies were reported to forfeit advances up to 40% of the new ship price
- Estimates in March 2009 were that ultimately 10 to 15% of the container vessel orders would be cancelled
- In March 2009 the overcapacity in container vessels was expected to peak in 2011 as there were too many ships due for delivery in the period 2009-2011 and the decrease of the overcapacity is expected as from 2012.

9.6. VESSEL DEPLOYMENT

The decrease of international maritime transport that started to kick in the latter half of 2008, obviously also had an impact on vessel deployment. Ship owners were faced with considerably lower freight rates (as explained above) and far too much capacity compared to the cargo that was offered for transport. Ship owners had the choice to accept the lower rates and apply the system of slow sailing (as explained above) and ride out the storm, or to opt for laying up the fleet, and thereby suspending sailing certain trade routes. Laying-up means that the vessel is anchored in a safe place with a minimum crew (mainly for watch keeping and small maintenance).

Some examples from the international maritime press are provided below:

As from November 2008 there were many reports that (container) shipping lines were laying-up vessels, laying off the work force (for example NOL 10%) and / or suspending routes

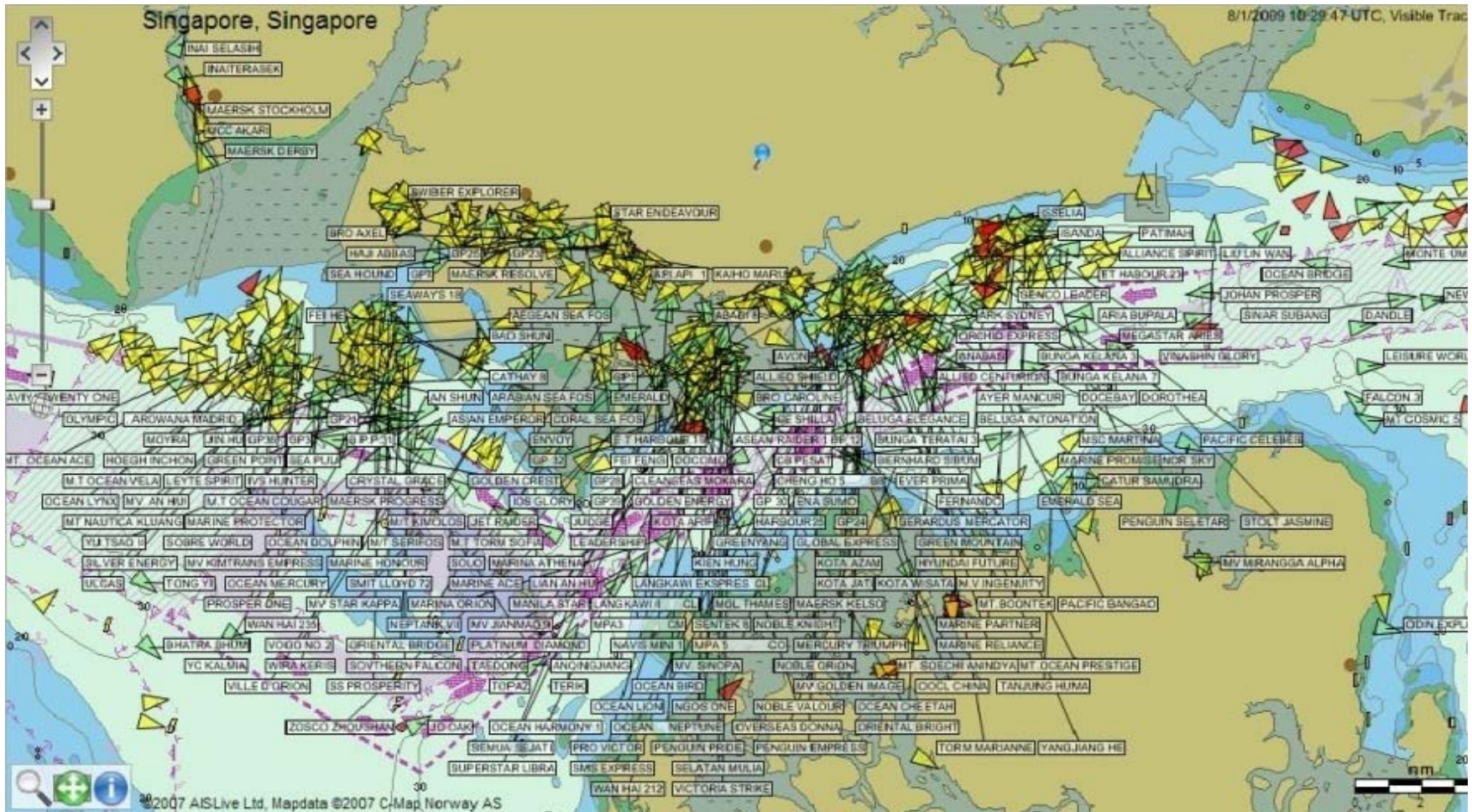
On February 20, 2009 392 vessels had been laid up which were divided as follows:

- 83 vessels of 500 to 1,000 TEU capacity
- 123 of 1,000 to 2,000 TEU
- 77 of 2,000 to 3,000 TEU
- 89 of 3,000 to 5,000 TEU
- 58 of 5,000 to 7,500 TEU and
- 23 of 7,500 to 10,000 TEU (!)

- *On March 15, 2009 in total 484 container vessels (representing about 11.3% of the total world container fleet) had been taken out of service. Out of this total 243 vessels were awaiting new employment and the remainder (241 vessels) had entered a so-called 'Cold Lay-up). This means that the vessel is taken to a quiet location (such as Singapore or Subic Bay (The Philippines) where the vessel is laid at anchors with a minimum of crew for safety and security and small maintenance.*

- *At the end of April 2009 the number of vessels taken out of service had increased to 506 vessels with a total capacity of 1.31 million TEU.*

The following picture page shows the vessels laid up near Singapore in February 2009.



9.7. CONTAINER PORT THROUGHPUT

As from November 2008 reports started to appear that indicated that container throughputs were declining and that many (larger) ports were getting clogged up with empty boxes for which there was no cargo. It was expected that in particular the (very) large ports in East Asia would be experiencing this problem. In March 2009 the first data on container port throughput data were published.

Figure 14 shows the ‘Top 10 Big Fallers’ published by Containerisation International comparing the throughputs of January 2008 and 2009.

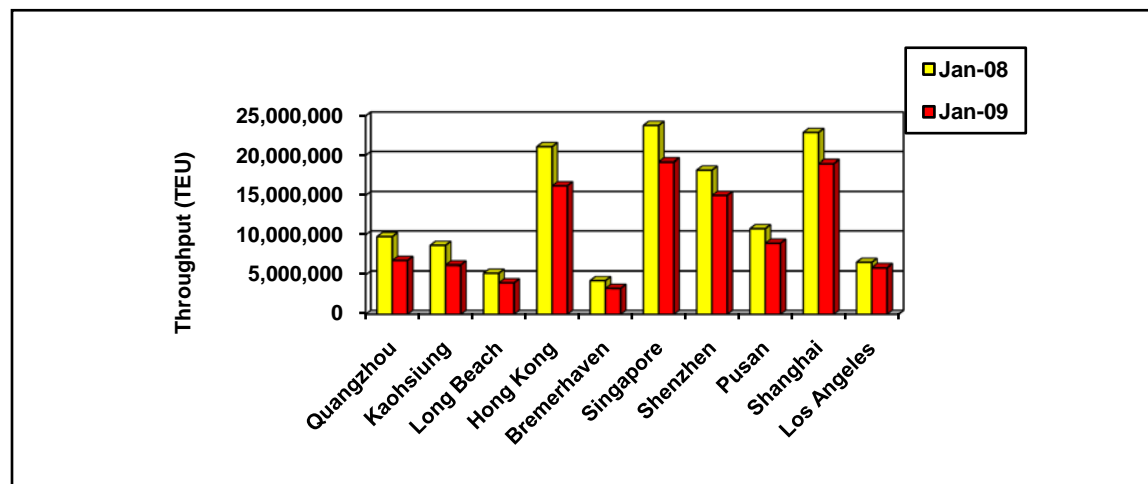


Fig. 14 - Largest Container Throughput Decline comparing January 2008 and January 2009 in TEU (Source: Containerisation International)

The decline in maritime container traffic and terminal throughput is also leading to other problems for container terminals:

- Terminals are clogged with empty containers (for which there is less or no cargo)
- Less income from cargo handling fees
- Less manpower requirement.

Examples of declines in container throughput of selected ports in February 2009 (compared to February 2008):

- Hong Kong: 20.6%
- Los Angeles: 32.6%
- Saint Petersburg: 27.3%, and
- Singapore: 19.8%.

In February 2009 it was estimated that excess capacity at China’s container ports will be in the range of 35% by 2010.

In April 2009 it was reported that the box throughputs in Hong Kong and Singapore in March 2009 were down 18.9% and 14.6% respectively, compared to March 2008. This could be explained as a very slight positive trend. In May 2009 a number of Chinese ports reported a positive development of their container

throughputs. For example: In March 2009 Shanghai handled 2.18 million TEU (or 10% less than the throughput in March 2008), but much higher than the 1.53 million TEU handled in February 2009 (Hong Kong Gazette)

9.8. EMPTY CONTAINERS

As a consequence of lesser demand of maritime container transport many terminals were flooded with empty containers. For example: In April 2009 it was reported that some 200,000 empty containers were idling in the Port of Shanghai. Simultaneously shipping lines started to use laid-up vessels for the storage of empties to avoid high storage charges in terminals.

9.9. SHIPPING LINES

It is obvious that the decline in maritime transport, in particular in the container trade, as discussed in the previous chapters had a considerable impact on the (container) shipping lines; in the numbers of containers transported as in the financial result. The following examples appeared in the maritime press in 2009:

- Maersk container line loses \$555 million in the first quarter of 2009 (Financial Times May 2009). In October 2009 an estimated deficit over 2009 of close to US\$ 1 billion were reported in the maritime press
- Evergreen Marine Corporation reported a net deficit of \$83 million in the first quarter of 2009 (Tradewinds May 2009)
- China Shipping Container Lines income plummets 337% (a net loss of \$178 million) in the first quarter of 2009 (Lloyds' List April 2009).

9.10. PORT LABOR

In March 2009 the port labor pool workers in Bremen and Bremerhaven (Germany) were informed that 1,400 of the 2,500 workers would be made redundant. In the same month the management of the German port of Rostock introduced short time working and in the Korean Port of Busan the 7,800 port workers were only working about 3 days per month due to lack of business.

In March the stevedoring pool in the Spanish Port of Barcelona took measures to temporarily cut working hours for its 1,200 port workers due to slowdown in cargo volumes.

In April 2009, the Terminal Operator Eurogate (Hamburg and Bremerhaven) introduced flexible working hours and will cut work hours as of May 2, 2009, in order to save jobs.

9.11. NEW PORT PROJECTS AND CONCESSIONS

As seen in the last few months of 2008, articles in the maritime press indicated that the Global (Container) Terminal Operators were intending to slow down their investment programs.

Examples of statements:

- DP World January 2009: "DPW is reviewing its expansion strategy, cutting costs and freezing recruitment"
- DP World in March 2009: "DPW will defer half of its planned expansion"

- APM Terminals March 2009: “Port projects will return to realistic levels and APMT had taken a time out to review the investment portfolio”
- ICTSI in April 2009: “ICTSI is not contemplating any expansion (of its global terminals) in the next two years”
- COSCO Pacific in April 2009: “New port investments are too risky in the current market”
- Eurogate in April 2009: “Eurogate has suspended non-essential investments”.

In February 2009 it was estimated that in the Middle East region some US\$100 billion worth of new port developments were underway or being prepared to begin construction. The question was to continue with these projects or to delay or cancel them due to sharply falling throughputs in the region.

9.12. NEW SHIPPING ROUTES

In January 2009 the Suez Canal Authority announced a freeze on its transit fees, as it saw transits declining due to the recessions and the piracy threat off the Somalia coast. Yet, in the same month CMA CGM announced that it was considering diverting all appropriate sailings around Cape Hope because of high costs savings.

It was reported that re-routing a 9,400 TEU vessel of the Europe-Asia service would save around \$350,000 per sailing (additional fuel \$250,000 (slow sailing) but no Suez Canal transit would save \$600,000!) plus savings in insurance costs due to piracy in the Gulf in Aden. The Cape Route (additional sailing distance 3,400 miles) requires 4 to 6 days additional days of sailing, requiring 1 or 2 vessels to be added to the services to maintain a weekly service. Due to the over-capacity of container vessels this did not create a problem. It is considered more attractive to employ vessels for this route than to lay them up. Maersk soon followed the CMA CGM initiative and other lines were expected to follow. This development was watched very closely, as it might lead to considerable changes in the transshipment pattern in the Middle East.

Reported attempts of Maersk in the beginning of 2009 to have the Canal Dues reduced were not successful. In February 2009 the Suez Canal Authority reported that its revenue and traffic levels had fallen by about 25% compared with February 2008. The Suez Canal revenue was down to US\$302 million compared to US\$408 million in February 2008 and transits declined to 1,272 from 1,676.

In March 2009 the situation was as follows:

- Maersk, CMA CGM, CSCL, Hapag-Lloyd, NYK, OOCL and MSC had introduced the Cape Route on the Asia-Europe route
- Some services used this route on the Asia-Europe stretch, some on the Europe-Asia stretch and some both ways
- The majority was the Europe-Asia route (less cargo time constraints than in the other direction).

The high Suez Canal tolls also resulted in re-routing of some services between Asia and the East Coast of Latin America, also resulting in changes in transshipment hubs in the Mediterranean (such as Algeciras).

Early 2009 the Panama Canal Authority (ACP) shrugged off calls from the shipping lines to cut rates. Instead, the intention is to increase the rates by 14% in May 2009. Container lines will then pay US\$72 per TEU compared to the present US\$63 per TEU.

However, in the beginning of April 2009 both the Suez Canal Authority and the Panama Canal Authority indicated that they were considering adjusting (lowering) their transit tariffs.

When fuel prices started to increase mid-2009, most of the above mentioned shipping lines discontinued the use of the Cape Route, as the higher fuel costs outbalanced the savings.

9.13. IS THE FINANCIAL CRISIS ONLY LEADING TO PROBLEMS?

The answer to this question, according to MOL President Ashida in an interview with World Port Development in January/February 2009 was: “No: there are Disadvantages and Advantages”.

Mr. Ashida explained this as follows:

Of course, his shipping company suffered from the Recession. But he also sees a number of bright sides of this global event, such as:

- The over-tonnage anticipated in the near future may be prevented from happening
- The scrapping of aged vessels (not fuel efficient and polluting) will be accelerated
- Modern vessels are cheaper in maintenance (computerized systems)
- The shortage of seafarers will decrease, and
- There will be better capacity of repair docks.

Finally, he mentioned that the restructuring of his company, due to the Financial Crisis, resulted in a much more efficient company.

In April and May 2009 some clippings in the maritime press reported a small number of positive trends in the world container transport and an increase in the container throughput in a number of ports (mainly in East Asia). This positive trend continued in the third Quarter of 2009, so, similar to messages from other sectors, it appears that the worst is over. Yet, despite a number of positive trends, most analysts were of the opinion that it may take until 2011 before the container market recovers and is profitable again.

10. FINAL REMARKS

10.1. THE WORLD BANK TRANSPORT BUSINESS STRATEGY 2008-2012

The World Bank Transport Business Strategy 2008-2012: ‘Safe, Clean, and Affordable Transport for Development’ addresses

- Safe Transport (for Health and for Safety);
- Clean Transport (for Air Quality and Climate), and
- Affordable Transport (for Businesses and Individuals).

If the term ‘transport’ is translated into ‘ports and maritime transport’ it is obvious that all issues apply. Maritime transport on a world scale is very important: more than 80% of the world trade measured in tons is transported by sea.

But maritime transport, to use that famous expression once again, is only one chain in the transport link from producer to consumer. Ports and inland transport, including logistics and trade facilitation, are as important. This overview of Ports and Waterborne Transport addresses most, if not all, aspects of all the chain.

Safe Transport: In today’s world the term ‘secure’ should be added. This overview not only discusses the details of the International Port Facility and Ship Security (ISPS) Code, but also the importance as well as the lack of awareness in many parts of the world of Supply Chain Security (SCS). In an attempt to increase the awareness, in particular in the developing world, the World Bank Transport Sector has taken the initiative to produce the SCS Guide.

Clean Transport: This topic is given much attention in this report. Once it became clear that maritime transport and port operations combined is one of the major sources of Green House Gas (GHG) emissions, the industry has taken actions, either forced by legislation or at its own initiative. The Note provides an overview of the actions undertaken by the various stakeholders in the maritime and port sectors.

Affordable Transport: Boundary conditions of affordable transport that were valid until two years ago have, of course, been impacted by the Financial Crisis that started in the second half of 2008. The consequences have been considerable. When world trade started to decrease as a consequence of the Financial Crisis, it soon became clear that the impact on maritime and ports was going to be enormous as has been described in this overview.

10.2. TOP QUESTIONS

The Top Questions presented in the Introduction are repeated with reference to the respective Chapter or Chapters that address the issue, including useful other references if applicable.

- What design capacities are appropriate in port expansion planning processes?
 - Vessel characteristics and specifications/Container/Port Performance Indicators/City-Port Relationship
 - Various UNCTAD documents (see UNCTAD web site)/Port Reform Toolkit
- What financing models are available for port extension / developments of new facilities?

- Port Reform
 - World Bank Port Reform Toolkit/PPI database and publications
- Which human resource efficiency methods are available?
 - Safety, Security and Health
 - Various ILO publications (see ILO website)
- Which are the most applied port labor redundancy policies?
 - Port Reform
 - World Bank Port Reform Toolkit/Various ILO publications
- How to measure port efficiency?
 - Port Performance Indicators
 - World Bank Port Reform Toolkit
- How to introduce effective commercialization of a port?
 - Port Reform
 - World Bank Port Reform Toolkit
- Which are the modalities and tools used in Port Reform processes?
 - Port Reform
 - World Bank Port Reform Toolkit
- How to rationalize port access modalities with environmental and social factors included?
 - Ports and Climate Change/Safety, Security and Health
 - Various ILO publications (see ILO website)
- How should planning take into account the security of the passage of freight?
 - Safety, Security and Health
 - World Bank Supply Security Guide
- What issues are involved in planning a national port strategy?
 - Ports/Port Reform/City-Port Relationship
 - World Bank Port Reform Toolkit
- How can port efficiency be improved?
 - Port Performance Indicators
 - World Bank Port Reform Toolkit
- What are shipping lines considerations when identifying ports of call?

- Port Performance Indicators
 - World Bank Port Reform Toolkit
- How to establish appropriate and enforceable port regulation?
 - Port Reform
 - World Bank Port Reform Toolkit
- How to produce an effective port business plan?
 - Port Reform
 - World Bank Port Reform Toolkit
- What will be the impact of the Financial Crisis, and, more specifically, what will be the longer term effects in the global port and maritime sectors?
 - The Impact of the Financial Crisis
 - Port and Maritime magazines and periodicals⁴¹.

10.3. A VIEW TO THE FUTURE

Under normal conditions this is already a formidable task, but under the present impact of the Financial Crisis almost impossible.

Yet, an attempt can be made taking these aspects into account:

Status and outlook of the Impact of the Financial Crisis

- At this moment, autumn 2009, experts following the indicators related to the port and maritime sectors see indications that the downward process is still continuing, be it that there also are some indications that some trends are showing a slight upward trend, or rather, in most cases, a less negative trend. There also seems to be consensus that it may take about two years before the maritime and port sector show signs of a firm return to profitability.
- All large container shipping lines have forecasted losses of hundreds of millions of US dollars in 2009.
- In order to limit the losses, most shipping lines started rate increase (foremost to compensate the higher fuel prices) in the autumn of 2009 and it is expected that this trend will continue.
- The general expectation is that a number of shipping lines will go bankrupt and that many port extension and improvement projects will be postponed or cancelled.
- The largest private Container Terminal Operators have indicated that major new projects will, in the foreseeable future, not be undertaken.

World Fleet

- The over-capacity of the container and dry bulk fleet are expected to continue for at least another two years
- Maximum container vessel capacity is not expected, certainly not in the near future, to grow further

⁴¹ See Annex 2

- Many more older vessels will be scrapped.

Terminals

- Pressure of shipping lines for better performance will continue and this will require large investments in more automation
- The lack of container terminal capacity in a number of regions in the world, as forecasted by Drewry a few years ago is not going to take place in the coming years, but may re-appear later if timely extensions are not materialized.

Environment

- Pressure on ports to limit all sorts of pollution will increase further and this may increase the number of ports that will be forced to shift to a new location (Greenfield sites).

Port Reform and concessions

- The shift of public service ports towards the landlord port management structure will continue
- Despite the Financial Crisis, Port Reform processes (new concessions) in regions like West Africa and Latin America is continuing although it at a slower lesser pace than before the Crisis. If the impact of the Financial Crisis will indeed continue to decrease as expected, the process will continue.
- It appears that the preferred Concession Agreement is the Shared Revenue type.
- The competition between the Global Terminal Operators will continue.

Supply Chain Security

- There will be increasing awareness of Supply Chain Security (SCS)
- Applying SCS principles will in the future favor ports, terminals and traders (Authorized Economic Operators).
- The general business opinion is that the US intention to introduce 1005 scanning of all containers entering the USA cannot be implemented in 2012. And when it will be introduced there may be counteractions from trading blocks such as Europe and Asia.

The World Bank Transport Sector (Ports and Waterborne Transport) will continue to monitor all effects and distribute the information through the usual channels.

ANNEX 1 – SHIPS' CHARACTERISTICS

Tonnage of the vessels can be expressed in

- GT: Gross Tonnage
- NT: Nett Tonnage
- DWT: Dead Weight Tonnage

Definitions

GT: Total volume of all permanently enclosed space above and below decks, with certain exceptions, such as wheelhouse, chart room, radio room and other specified space above deck, expressed in tons, in which one ton equal to 100 ft³ = 2.83 m³.

NT: Total of all space destined for cargo, also expressed in units of 100 ft³ or 2.83 m³. NRT equal to GRT minus crew's accommodation, workshops, engine room, etc

DWT: Difference between Light and Load Displacement (Light Displacement is mass (in metric tons) of ship's hull, engines, spares and all other items necessary for her normal working performance, Load Displacement is ship's mass when fully loaded, so including hull, engines, cargo, crew, etc. Load Displacement is sum of total weight of ship and cargo she carries or total weight of water displaced by ship when sailing (Archimedes' Law)

Other ship capacity expressions

- **TEU** is used to the express capacity of container storage on board of a ship. One TEU = Twenty Foot Equivalent Unit or space taken by a 20 ft long standard container
- **M³** (Cubic meters). This unit is used to express the carrying capacity of liquefied gas tankers
- **Street length** (meters); used for so-called roll-on/roll-off vessels. It expresses the total loading length in meters of standardised width of 2.80 m available on board vessel

Draught

Draught is the distance (in meters or feet) between the water-line and keel of ship. (The maximum draught of a vessel is the distance between the upper water-line and the keel that provides safety to ship, cargo, crew and passengers. The maximum draught is indicated mid-ships of the vessel on both sides of the hull).

Length

The length of a vessel can be expressed in:

- **LBP**: Length Between Perpendiculars (horizontal distance (m) between points of intersection of ship's bow and summer salt water line when fully loaded and vertical line through rudder axis)
- **LOA**: Length Over All (horizontal distance (m) between two perpendiculars; one tangent to ship's bow and one to ship's stern)

Beam

The Beam (or breadth) B is the maximum distance (m) between the two sides of ship. There are two important beam sizes:

- Maximum beam to allow ships to pass locks of St. Lawrence Seaway, or $B = 23.2$ m, and
- Panama Canal (Panamax): $B = 32.3$ m.

Annex 2 - Recommended port and maritime transport magazines and periodicals

- Statistical Department Rotterdam Municipal Management
- Cargo Systems International, CS Publications Ltd., Surrey, UK
- Containerisation International, The National Magazine Company Limited, London, UK
- Maritime Asia, Mar Intec Press (Pte) Ltd., Singapore
- Port Strategy, www.portstrategy.com
- The Motor Ship, IPOC Industrial Press Limited, Sutton, UK
- Ports and Harbours, International Association of Ports and Harbours, Tokyo, Japan
- Fairplay, Fairplay Publications Ltd., Coulson, UK
- Port Development International, Mundy Perry Ltd., London, UK
- Terminal Operations Conferences
- Statistical Tables, Lloyds Register of Shipping, London, UK
- Review of Maritime Transport, UNCTAD, Geneva, Switzerland
- Shipping Statistics Yearbook, Institute of Shipping Economics and Logistics (ISL), Bremen, Germany



Transport Division
Energy, Transport and
Water Department
The World Bank
1818 H Street NW
Washington DC 20433
USA

www.worldbank.org/TRS