NO.

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)
SUEZ CANAL AUTHORITY (SCA)

ANNEX IV FACTOR ANALYSIS ON SUEZ CANAL TRANSIT

FINAL

THE STUDY ON THE EFFECTIVE MANAGEMENT SYSTEM OF THE SUEZ CANAL IN THE ARAB REPUBLIC OF EGYPT

AUGUST 2001

THE OVERSEAS COASTAL AREA DEVELOPMENT INSTITUTE OF JAPAN (OCDI)
MITSUBISHI RESEARCH INSTITUTE, INC. (MRI)

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The following foreign exchange rates are applied in this study:

US$1.00=LE(Egyptian Pound)3.50=JP¥109.00

US$1.30= SDR1.00

as of August, 2000

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PREFACE

In response to a request from the Government of the Arab Republic of Egypt, the Government of Japan decided to conduct a study on the Effective Management System of the Suez Canal in the Arab Republic of Egypt and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA dispatched a study team to Egypt three times between August 2000 and June 2001, which was headed by Mr. Hidehiko Kuroda and was composed of members from the Overseas Coastal Area Development Institute of Japan (OCDI) and Mitsubishi Research Institute, Inc. (MRI).

The team held discussions with the officials concerned of the Government of the Arab Republic of Egypt and Suez Canal Authority (SCA) and conducted field surveys at the study area. Upon returning to Japan, the study team conducted further studies and prepared this final report.

I hope that this report will contribute to this project and to the enhancement of friendly relationship between our two countries.

Finally, I wish to express my sincere appreciation to the officials concerned of SCA and other authorities concerned for their close cooperation extended to the study team.

August 2001

Kunihiko Saito
President
Japan International Cooperation Agency

LETTER OF TRANSMITTAL

August 2001

Mr. Kunihiko Saito
President
Japan International Cooperation Agency

Dear Mr. Saito:

It is my great pleasure to submit herewith the Final Report of the Study on the Effective Management System of the Suez Canal in the Arab Republic of Egypt.

The study team of the Overseas Coastal Area Development Institute of Japan (OCDI) and Mitsubishi Research Institute, Inc. (MRI) conducted surveys in Egypt over the period between August 2000 and June 2001 as per the contract with the Japan International Cooperation Agency.

The study team compiled this report, which proposes the Effective Management System of the Suez Canal including the transit forecast model and the tariff setting system, through close consultations with officials of the Suez Canal Authority (SCA).

On behalf of the study team, I would like to express my heartfelt appreciation to SCA and other authorities concerned of the Government of the Arab Republic of Egypt for their diligent cooperation and assistance and for the heartfelt hospitality, which they extended to the study team.

I am also greatly indebted to your Agency, the Ministry of Foreign Affairs, the Ministry of Land, Infrastructure and Transport and the Embassy of Japan in Egypt for valuable suggestions and assistance through this study.

Yours faithfully,

Hidehiko Kuroda
Team Leader
The Study on the Effective Management System
of the Suez Canal in the Arab Republic of Egypt

ABBREVIATION LIST

APA	Alexandria Port Authority
BAF	Banker Adjusting Factor
BIMCO	Baltic and International Maritime Council
BOT	Build, Operate and Transfer
C/B	Charter Base
CBE	Central Bank of Egypt
CEU	Car Equivalent Unit
CFS	Container Freight Station
CHS	Container Handling Surcharge
CIF	Cost, Insurance and Freight
CRF	Capital Recovery Factor
CY	Container Yard
DEM/DES	Demurrage/Dispatch
DO	Diesel Oil
DPA	Damietta Port Authority
DST	Double Stack Train
DWT	Dead Weight Tonnage
ECSA	European Community Ship-owners' Association
EDI	Electronic Data Interchange
EMDB	Egyptian Maritime Data Bank
ENR	Egyptian National Railway
ETA	Estimated Time of Arrival
FAK	Freight All Kinds
FCL	Full Container Load Cargo
FIRR	Financial Internal Rate of Return
FO	Fuel Oil
FOB	Free on Board
GDP	Gross Domestic Product
GARE	Government of Arab Republic of Egypt
GOJ	Government of Japan
GT	Gross Tonnage
H/B	Hire Base
ICS	International Chamber of Shipping
INSROP	International Northern Sea Route Program
INTERCARGO	International Association of Dry Cargo Ship-owners
INTERTANKO	International Association of Independent Tanker Owners
JAMRI	Japan Maritime Research Institute
JICA	Japan International Cooperation Agency
JP¥	Japanese Yen
LB	Land Bridge
LCL	Less than Container Load Cargo
LE	Egyptian Pound
LNG	Liquefied Natural Gas

LOA	Length Overall
LOOP	Louisiana Offshore Oil Port
LPG	Liquefied Petroleum Gas
LUP	Laying-Up Point
MOMT	Ministry of Maritime Transport
MRI	Mitsubishi Research Institute, Inc.
MSL	Maersk-Sealand
MT	Metric Ton
N/P	Net Proceeds
NPV	Net Present Value
NWA	New World Alliance
OCDI	Overseas Coastal Area Development Institute of Japan
O-D	Origin and Destination
OSRA	Ocean Shipping Reform Act
PAE	Petroleum Authority of Egypt
PCC	Pure Car Carrier
P/L	Profit/Loss
PSPA	Port Said Port Authority
QGC	Quay-side Gantry Crane
RGT	Rubber-Tired Gantry
S/C	Service Contract
SCA	Suez Canal Authority
SCCT	Suez Canal Container Terminal
SCGT	Suez Canal Gross Tonnage
SCNT	Suez Canal Net Tonnage
SCVTMS	The Suez Canal Vessel Traffic Management System
SDR	Special Drawing Right
SSA	Stevedoring Services of America
SUMED	Arab Petroleum Pipelines Co.
S/W	Scope of Work
TEU	Twenty-foot Equivalent Unit
ULCC	Ultra Large Crude Carrier
US$	US Dollar
VLCC	Very Large Crude Carrier
WSF	World Scale Flat
WSR	World Scale Rate

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1.1 Container Ships

1.1.1 Earnings of Container Ships

(1) Ocean freight

The main source of revenue for a container operator (shipping line) is cargo freight. Freight level is usually agreed upon among member lines where a Freight Rate Agreement or Freight Conference are formulated. In case there is no Agreement or Conference, an individual line quotes rates at its own discretion. Traditionally, conferences established by British carriers were called "closed conference" and very exclusive, whereas conferences of US trade carriers were open to any carrier and called "open conference". Currently, to prevent monopolistic practices in world trade, almost all agreements and conferences are open for any shipping lines and free competition is encouraged.

Freight rates are fixed by conferences and are published in their tariff books. The general level of these rates is usually held unchanged for a minimum period of 6 months. When the conference announces a change in the level of rates, i.e. the general level of rates will be raised equally for all commodities. Tariff book contains different rates for 30-40 items, although in day to day transactions only a limited number of items such as Electrical Goods, Auto Parts are actually quoted since these cargoes move in big lots and represent the major portion of FCL containers. As a matter of fact, the conference tariff book is used only for LCL cargo, where consolidation operation is carried out, and ocean freight for small volumes of cargo is quoted according to the conference tariff. In other words, ocean freight for FCL cargo is essentially the FAK rate (Freight All Kinds) while tariff rates are applied to LCL cargo.

In most cases, FCL cargo is shipped on a Service Contract Cargo in which ocean freight rates are agreed upon bilaterally between a shipper and a shipping line. The contents of the Service Contract are kept confidential, but it is easily imagined that discounted rates from the tariff books are applied. On the other hand, most of the rates applied to LCL cargo reflect the tariff level because LCL cargo shippers are in a weaker negotiating position. As a result, the consolidation business is more profitable than FCL cargo forwarding. It is not rare that a total ocean freight for one 40' LCL container exceeds US$ 7,000, while an average box rate for a 40' FCL container is well below US$ 2,000.

Statistics on container freight are difficult to obtain nowadays because container operators do not wish to disclose contents of contract rates with their customers. In the past when main trades were governed by reliable and established conferences, it was easy to grasp the average freight level and cargo volume. One of the few sources available is the data from Containerization International. (see Table 1.1.1)

Table 1.1.1 Container Freight Rates Indicators (US$ per TEU)

	Asia/Europe		Asia/US		Europe/US	
	EB	WB	EB	WB	EB	WB
1994 Q1	1,057	1,651	1,758	1,246	1,408	1,298
Q2	1,087	1,622	1,718	1,255	1,395	1,305
Q3	1,142	1,596	1,727	1,315	1,374	1,333
Q4	1,181	1,581	1,726	1,302	1,382	1,377
1995 QI	1,217	1,544	1,698	1,323	1,403	1,434
Q2	1,320	1,532	1,826	1,356	1,412	1,388
Q3	1,309	1,493	1,870	1,571	1,386	1,374
Q4	1,257	1,455	1,865	1,473	1,442	1,349
1996 Q1	1,219	1,369	1,746	1,339	1,480	1,384
Q2	1,218	1,346	1,628	1,428	1,495	1,342
Q3	1,172	1,134	1,629	1,504	1,474	1,341
Q4	1,137	1,281	1,548	1,384	1,621	1,341
1997 Q1	995	1,112	1,473	1,280	1,456	1,302
Q2	1,036	1,156	1,407	1,277	1,441	1,246
Q3	1,067	1,187	1,370	1,428	1,600	1,308
Q4	1,056	1,155	1,362	1,182	1,471	1,288
1998 Q1	1,040	1,183	1,345	1,119	1,472	1,284
Q2	869	1,227	1,459	1,015	1,477	1,210
Q3	873	1,353	1,561	999	1,397	1,221
Q4	807	1,465	1,614	842	1,308	1,188
1999 Q1	716	1,512	1,619	832	1,165	1,100
Q2	723	1,525	2,018	871	1,111	1,045
Q3	730	1,568	2,203	818	1,040	1,054
Q4	775	1,612	2,195	733	1,033	1,129
2000 Q1	664	1,594	2,125	751	939	1,148
Q2	829	1,597	1,953	852	1,008	1,148

Source) Containerization International Data processed by MOL Research Co -Operation Office.

It is observed that the freight level of Asia/US EB is generally higher than those rates of the other three trades. Especially for the period from 1999 Q1 to 2000 Q1, rates are US$ 500 – 750 higher. This reflects supply and demand of space in the Trans-Pacific container trade due to a booming US economy. On the other hand, the average freight level of Asia/US WB shows a steep decline during the same period because of the Asian economic crisis. The freight trends of Asia/Europe trade generally follow those of Asia/US.

Table 1.1.2 shows the earning power of a container ship per voyage by size on assumption that an average turn round of onboard containers is five times per leg of one round voyage (= 2.5 times for one way) and an average loaded container parity is 70 percent all through one round.

Table 1.1.2 Total Earning Capacity of Container Ship in Asia/Europe Trade

Vessel Size Nominal TEU (GT)	Turn Round Containers (x 2.5) for One Way	Paying Containers (70%) for One Way	EB Total (@US800)	WB Total (@US1600)	SC Dues One Way	EB SC Dues %	WB SC Dues %
3,500 (40,000)	8,750	6,125	4,900,000	9,800,000	196,799	4.0	2.0
5,000 (50,000)	12,500	8,750	7,000,000	14,000,000	230,033	3.3	1.6
5,500 (60,000)	13,750	9,625	7,700,000	15,400,000	263,268	3.4	1.7
6,000 (80,000)	15,000	10,500	8,400,000	16,800,000	327,937	3.9	1.9
7,000 (100,000)	17,500	12,250	9,800,000	19,600,000	378,201	3.9	1.9
8,000 (110,000)	20,000	14,000	11,200,000	22,400,000	403,333	3.6	1.8
10,000 (120,000)	25,000	17,500	14,000,000	28,000,000	428,465	3.1	1.5

Notes) SCNT=GT x 0.9, On Deck Surcharge=9.7%, Other Charges=7%

Turn Round containers for one way = 2.5*(Nominal TEU of a Container Ship)

Source) JICA Study Team

(2) Various surcharges

Shipping lines quote various kids of surcharges at their discretion subject to an agreement with shippers. Those are:

Bunker surcharge — As bunker prices rise, many conferences and independent carrier introduce a surcharge.

Container handling surcharge (CHS) — At the beginning of containerization, it was a common understanding between shipping lines and shippers that container handling charges were included in ocean freight, but a CHS has now been introduced.

Currency surcharge — When any country’s currency becomes greatly unstable, this surcharge is introduced.

Out-port surcharge — Many shipping conferences classify ports as “Main Ports and Out-ports” and this surcharge is levied for containers destined to an Out-port.

Congestion surcharge — When any port is heavily congested and ships are forced to wait for berthing for many days, this surcharge is introduced.

These surcharges are levied separately or in combination; for example, container handling surcharge and bunker surcharge can be requested at one time. These surcharges are typed on the face of bills of lading. These are basically not earnings of shipping lines but are included in earning items according to accounting rules.

(3) On carrier freight and transshipment charge

In the case of transshipment service, an ocean freight for the second carrier and transshipment charge is chargeable. These freight and charges are typed on the face of bills of lading.

(4) Container per diem charges

Generally, a container is considered as a small ship according in a shipping line's accounting system. Capital cost of each container is calculated at time of purchase and charged as "Per Diem Charge" according to the time (days) of using. Because this charge is levied and collected from shippers, it is classified as an earnings item.

1.1.2 Disbursements of Container Ships (shipping cost)

Shipping costs are traditionally called "disbursements" in the shipping industry. They are basically comprised of the following items regardless of the type of ship; namely "Managing cost" ("Indirect cost" such as depreciation and interest and "Direct cost" such as manning cost) and "Operation cost" (bunker charge, dues at ports/canals). The disbursements of container vessel are the most complicated of all.

(1) Managing cost

1) Indirect managing cost

(a) Capital cost for Container Ships

Annual capital cost can be assessed by calculating the sum of interest and depreciation costs as fixed life-long expenses based on an economic lifetime of 18 or 20 years and an interest rate of planned percentage. In case of lifetime of 20 years and interest rate of 8 percent, for example, the capital recovery factor (CRF) is 0.1019. Thus the fixed annual capital charge arrives at 10.19 percent of the vessel's value.

CRF is assessed on annuity basis according to the agreed formula. Prices of ships of the same size and same quality vary according to time of building.

(b) Capital cost for Containers

In container transportation system accounting, each container itself is treated as a small ship. Capital cost for each container is calculated in "US$ per day" when each container is registered with container number into container fleet immediately after the purchase. It varies according to the purchase price, kind of containers and sizes. The cost for a 20' standard box is usually about US$ 2.00 to 2.50 per day and is to be recovered from the shippers/consignees.

(c) Direct managing cost

a)	Manning	to be budgeted according to Company Contract or Private Contract with crew and other charges such as pension plan payment, welfare fund
b)	Repair & mainte.	to be budgeted by a fixed percentage
c)	Insurance	to be budgeted according to insurance contract
d)	Lubrication oils	to be budgeted according to lubrication oil kind
e)	Overhead	to be budgeted according to in-house rates

According to Howe Robinson, an international maritime consultant, fully cellular container ship operating costs, excluding finance costs, are as follows:

Table 1.1.3 Operation cost

TEU	Operating Costs per day (US$)	Operating Costs per TEU (US$)
1,000	3,250	3.25
2,900	4,400	1.52
4,500	5,100	1.13
6,000	5,500	0.92

Source) Howe Robinson

(2) Operation Cost

1) General items, regardless of leg of a voyage

Any ship's voyage consists of an outward and inward (or homeward) legs and most cost are classified by each leg. However it is convenient to have a group of general items which apply to the whole voyage.

(a) Port Charges including Canal toll

a)	Tonnage	to be paid according to public port tariff
b)	Port/light dues	- ditto-
c)	Wharfage	to be paid according to public tariff or private container terminal rates
d)	Pilotage	to be paid according to public port tariff or tariff of association of pilots (private)
e)	Towage	to be paid according to public port tariff or tariff of association of tugboat operators
f)	Handling lines	to be paid according to public port tariff or private container terminal rates

g) Tolls to be paid according to public tariff

h) Others custom fee, consular fee, quarantine fee, launch hire, car, bus hire

For a better picture of the total port charge, Table 1.1.4 shows the actual figure of a major Japanese line (4,700 TEU)

Table 1.1.4 Port Charges of Container Vessel (Round Voyage Basis, in JP¥)

Port	Port Charges	Net Suez Toll	Total Suez Charge
Tokyo	3,181,477		
Shimizu	1,499,197		
Nagoya	2,552,245		
Kobe	1,965,584		
Hong Kong	941,342		
Singapore	460,001		
Suez Canal	1,164,365	31,020,934	32,185,299
Antwerp	29,646		
Singapore	474,609		
Jeddah	767,252		
Suez Canal	1,133,659	31,630,512	32,764,171
Le Havre	4,169,437		
Antwerp	54,325		
Rotterdam	5,288,100		
Hamburg	5,014,177		
Southampton	4,356,151		
Total	95,703,013	62,651,446 (65%)	64,949,470 (68%)

Source) JICA Study Team (August 2000)

(b) General cargo expenses

a) Dunnage materials For lashing and securing cargo inside containers or securing containers/cargo on-deck when necessary

b) Hold cleaning to be paid according to private contract

c) Tax on freight to be paid according to Law or Regulation (generally a fixed percentage on Freight)

d) Others NOE (not otherwise enumerated)

(c) Petties

a) Communication charge Mail, e-mail, fax, phone etc

b) Others NOE

1) Leg-wise charges (within Operation cost)

(a) Total bunker cost

a) at Sea	FO US$ 148.54 / KT, DO US$ 216.97 / KT (at the end of 2000 for 4,700 TEU vessel of one major international alliance in Far East/North Europe Service
b) in Ports	------------- ditto -----------
c) at Suez	------------- ditto -----------

(b) Agency fee

a) Agency commission	to be paid according to private contract (generally an agreed percentage on freight)
b) Container handling fee (or charge)	to be paid according to private contract (generally, contracted rates per 20'/40'/45' or box, full or empty)
c) Other commission	special sales commission etc.

(c) CY charges

a) Container CY	to be paid according to Private or public contract (generally, contracted rates per 20'/40'/45'or box, full or empty)
b) Wharfage for container	to be paid according to port tariff in most cases (in case of private terminal, it is included in handling charge)
c) Others	NOE

(d) Charges for LB (Land Bridge)

a) DST (Double Stack Train) rail charge	to be paid according to the DST contracts with the rail companies
b) Other MLB (Mini Land Bridge)	to be paid according to the MLB contracts with the rail companies

(e) CFS charges

a) Stuffing/un-stuffing	to be paid according to private or public tariff (generally, contracted rates per w/m revenue ton)
b) Container handling	to be paid according to private or public tariff (generally, contracted rates per 20'/40'/45' carried to/from CFS)
c) Tally, survey measuring	to be paid according to private tariff of tally-men association, surveyers association, sworn measurers association
d) Others	NOE

(f) Container maintenance charge

a) M & R case by case (heavy or light damage)
b) Cleaning to be paid according to private tariff
c) Drayage to/from repair shop

(g) Equipment control charge

a) Drayage to be paid according to contracted rates with tracker or rail or other mode carrier
b) Van pool handling to be paid according to contracted rates with operator

(h) Feeder charge

a) Transshipment case of ship to ship, CY charge at both end
b) Ocean freight to be paid according to 2nd carrier's tariff rates
c) Other charges
as per Leg-wise charge

1.1.3 Earnings vs Disbursements of Container Ships

There are various ways of calculating a voyage account based on the above earnings and disbursement items. The most popular method of voyage accounting of the current Japanese shipping lines is called " N/P, C/B and H/B system ". Internationally, slight differences in voyage accounting methods are found in Britain, North Europe, and America.

(1) Net Proceed (N/P)

The total earnings minus cargo expenses including container expenses is called " cargo profit/loss " or N/P in shipping terminology.

(2) Charter Base (C/B)

Total operation costs of a particular vessel's voyage covering port charges, bunker charge and operation NOE is called " vessel operation profit/loss " or C/B.

(3) Hire Base (H/B)

Vessel cost , regardless of whether it is owned or long-term chartered , covering capital cost, crew manning cost including crew insurance and others, M&R is called H/B.

All N/P, C/B, and H/B are usually shown in US$ per ton, per day (sometimes per month of 30 days). It is easy to calculate whether a vessel's voyage is making a profit or running at a loss. N/P minus vessel's voyage cost is C/B and C/B minus H/B is the vessels P/L. (Further a vessel's P/L minus general overhead is sometimes called business P/L)

As these indexes are all functional expression of steaming time, it is convenient to use them in evaluating and selecting different service routes.

(4) Per box freight earnings

International ocean-going container freight is quickly being integrated in a box rate except for consolidated containers which contain variable cargo of different rates. Traditionally, each freight conference or agreement used to have an independent tariff containing item-wise rates. However as containerization develops, cargo item-wise tariffs have started to disappear and are being replaced by a small number of box rates.

(5) Per box P/L

In traditional shipping business accounting, vessel-wise P/L was the most important factor. In container business, however, a container is treated as a small ship and in every day business earnings/disbursement together with P/L of a container are critical. In other words, vessel-wise P/L has less meaning in container transportation.

1.2 Tankers

1.2.1 Earnings of Tankers

(1) Ocean freight

The ocean freight for tankers is decided according to the following formula in accordance with the commercial negotiation system which is standard throughout the world.

$$F = WSF \times WSE \times C \qquad (1)$$

Where F is Gross Freight, WSF is World Scale Flat, WSR is World Scale Rate, and C is cargo quantity in MT (Metric Ton).

Examples of ocean freight by tanker size are given in the following table:

Table 1.2.1 Ocean Freight of Tanker

Size	WSF (US$/MT)	WSR	Cargo (MT)	Gross Freight (US$)
VLCC	9.86	75	255,000	1,885,725
SUEZMAX	9.00	120	130,000	1,404,000
SUEZMAX	8.55	155	130,000	1,722,825
AFRAMAX	3.86	195	80,000	602,160
AFRAMAX	4.10	240	80,000	787,200

Notes) (1) A. Gulf - Far East, 2000, (2) W. Africa - N. America (E. Coast), May 2000

(3) W. Africa - NW. Med., September. 2000, (4) UK - NW. Med., June 2000

(5) SW. Med. - NW. Med., November 2000

Source) JICA Study Team

(2) Demurrage/Dispatch (DEM/DES)

Demurrage is a kind of penalty paid by cargo shipper or consignee to shipping line for failure to load/discharge cargo within the allowed time. Demurrage is calculated on a per day basis in US$. On the other hand, Dispatch is a kind of bonus payment from ship operator to ship owner for the case of chartered vessel when the ship is dispatched quickly according to the stipulation of charter contract. DEM/DES are to be regarded as plus or minus factors to the ocean freight.

1.2.2 Disbursement of Tanker (Shipping Cost)

(1) Fuel cost

1) at Sea FO US$ 86.50 / KT, DO US$ 190.00 / KT (at the end of 2000 for a VLCC of a Japanese major shipping line) FO US$ 180.00 / KT, DO US$ 250.00 / KT (at the end of 2000 for SUEZMAX, AFRAMAX of a major Japanese shipping lines)

2) in Ports ------------- ditto ------------
3) at Suez ------------- ditto ------------

(2) Port charges

Basically same with container ships.

(3) Others

1) Brokerage varies according to business, usually 1.5 to 5.0 % of a gross freight
2) Insurance according to an in-office rule

1.2.3 Earnings vs Disbursements

For reference, the actual figures for each size of tankers are as follows:

(1) VLCC (from Jebel Dhanna/Ras Tanura to Yosu, Korea, total 40.3 Days)

1) N/P	US$ 1,414,306		
		Gross Freight	US$ 1,885,725
		Operation Cost	US$ 471,419
		Estimated Tonnage	341,325 DWT
2) C/B	US$ 4.14/Day/DWT		
3) H/B	US$ 3.85/Day/DWT		
4) P/L	US$ 0.29/Day/DWT,	US$ 3,989,065	

(2) SUEZMAX (from Abidjan to Palanca, then to Philadelphia, total 30.17 Days)

1) N/P	US$ 1,067,440		
		Gross Freight	US$ 1,404,000
		Operation Cost	US$ 336,559
		Estimated Tonnage	146,602 DWT
2) C/B	US$ 0.24/Day/DWT		
3) H/B	not available		
4) P/L	not available		

(3) AFRAMAX (from Coryton to Fredericia and Leixoes)

1) N/P	US$ 491,818		
		Gross Freight	US$ 666,521
		Operation Cost	US$ 174,703
		Estimated Tonnage	43,894 DWT
2) C/B	US$ 0.80/Day/DWT		
3) H/B	not available		
4) P/L	not available		

1.3 Car Carriers

1.3.1 Earnings of Car Carriers

(1) Ocean freight

Generally, ocean freight of a car carrier is charged for the space of one unit (passenger car). Unlike the tanker business, carrier types are classified according to capacity of loadable numbers of passenger cars. For example, 6,000 CEU (Car Equivalent Unit) type means 6,000 passenger car loadable type ship. Car carrier market is rather closed and freight rate level is not always available, but according to some major Japanese and European car carrier operators, the market has been bullish for 1999 and 2000. For these two years the main line runs have been full ,which at US$750 per car on a full 6,000 CEU vessel equates to a very substantial revenue of US$4.5m for a one way voyage.

(2) Other freight

Occasionally, car carriers transport bulky cargo such as bulldozers, heavy trucks, over-sized construction vehicles etc. Those cargoes are subject to ocean freight (other freight).

1.3.2 Disbursements of Car Carriers (Shipping Cost)

Basically, the shipping cost items of car carriers are the same with those of tankers and various bulk carriers. The specific cost item which may need some explanation is “stevedorage”.

(1) Stevedorage

All cars must be driven by stevedore-drivers to load/unload at ports. This cost item is particular to car carriers.

(2) Fuel cost

1) at Sea	FO US$ 63.94/KT, DO US$ 77.94/KT (at the end of November 2000 for a 4,000 CEU Carrier of a Japanese major shipping line)
2) in Ports	------------- ditto -----------------
3) at Suez	-------------- ditto -----------------

(3) Port charges

Port charges are basically the same as with container ships. Table 1.3.1 shows the details of the port charges for a 4,000 CEU car carrier of a major Japanese shipping line.

Table 1.3.1 Port Charges of 4,000 CEU Car Carrier (Round Voyage Basis, in ¥)

Port	Port Charges	Net Suez Toll	Total Suez Charge
Yokohama	4,387,916		
Nagoya	3,247,862		
Toyohashi	1,829,449		
Jeddah	630,752		
Alexandria	1,769,717		
Suez Canal	1,872,787	43,508,434	45,381,221
Beirut	586,736		
Tartous	959,265		
Larnaca	316,752		
Istanbul	3,742,180		
Piraeus	541,051		
Laghorn	2,258,402		
Valletta	451,374		
Tunis	1,716,501		
Total	67,819,178	43,508,434 (64%)	45,381,221 (67%)

Source) JICA Study Team

(4) Others

Refer to Section 1.2.2.

1.3.3 Earnings vs Disbursements of Car Carriers

Refer to Section 1.2.3.

1.4 Bulk Carriers

1.4.1 Earnings of Bulk Carriers

(1) Ocean freight

The three major cargoes of bulk carrier are "iron ore", "coal" and "grain". The ocean freight for bulk carrier is decided according to the kind of cargo, size of ship, service route (including numbers of loading/discharging ports) and market level, but generally grain is highest of the three, coal next and iron ore is the lowest.

1) Demmurage/Dispatch (DEM/DES)

These additional charges are same as the case for tanker.

2) Bunker Adjusting Factor (BAF)

This is the same item as bunker surcharge for Container Ships and usually negotiated simultaneously with base rate.

1.4.2 Disbursements of Bulk Carriers (Shipping Cost)

Fuel cost is basically same with the other types of ship.

As to port charges, ocean freight level is low compared with that of Container Ships and the percentage of port charges to the total freight is larger than the case of Container Ship.

Other charges of bulk carriers are negligible.

1.4.3 Earnings vs Disbursements of Bulk Carriers

The following is one example of a iron ore carrier of a Japanese major shipping line for transportation of about 139,000 MT of ore from East Australia to North Europe via Suez.

Table 1.4.1 Example of Iron Ore Carrier

Ocean Freight	US$ 1,096,000
Bunkerage	336,000
Port Charges	123,000
Suez Tollage	127,000
DEM/DES	-68,000
Other Expenses	2,700
N/P	575,000
Daily C/B	11,000
Daily H/B	14,000
P/L	-177,000

Chapter 2 Vessel Fleet

2.1 Fleet-mix in the world

There is a trend towards larger vessels, indicative of ship operators' finding opportunities to maximize their cargo loads and to achieve better economies of scale.

2.1.1 Tanker (excluding LPG/LNG tanker)

The world tanker vessel fleet-mix distribution (excluding LPG/LNG tankers) shows that about 57 percent of vessels are smaller than 200,000 DWT in 2000. This is commensurate with the global distribution of supply and demand for crude oil that is on routes that are potentially through the Suez Canal. The Suez Canal restriction does not allow for larger ships to pass through the Canal. The existence of the SUMED Pipeline provides route alternatives for supplying Europe from the Arabian Gulf.

Table 2.1.1 is the trend of tankers fleet-mix of delivery (excluding LPG/LNG tankers), and Table 2.1.2 is the trend of tankers fleet-mix (excluding LPG/LNG tankers). Larger vessels over 300,000 DWT have been decreasing and this trend will continue in the future. The reason of this decrease is to avoid risks of accidents. Once an accident occurs, the operator of the tanker has to owe a big amount of compensation.
Therefore it is estimated that the distribution of the tankers larger than 300,000 DWT will become 0% in 2020.
Small size tankers are used for local transport. The production of this size will remain.
The distribution of the other tanker size range was be calculated based on the recent and planned delivery (1997-2001) of tankers. The distribution of the tankers between 250,000 DWT and 300,000 DWT were set to be 24.2% that is the trend of recent delivery. The distribution for the other size ranges (total 75.8%) were set distribute proportionally to the recent delivery.

Table 2.1.1 Tanker Delivery (excluding LPG/LNG Tanker)

(DWT)

Year of Delivery	10-24,999	25-49,999	50-74,999	75-99,999	100-124,999	125-149,999	150-199,999	200-249,999	250-299,999	300,000+	Total
1980	398,775	938,048	1,155,875	1,939,655	495,221	166,305	101,793	13,893	299,220	327,292	5,836,077
1981	529,260	1,244,991	1,379,874	2,060,193	481,955	81,143	49,667	18,295	394,029	430,996	6,670,402
1982	674,585	1,586,843	1,208,054	605,372	168,479	162,266	99,321	6,394	137,713	150,632	4,799,660
1983	455,419	1,071,293	494,030	483,749	206,417	254,780	155,948	20,293	437,071	478,076	4,057,076
1984	227,797	535,852	971,398	397,014	138,515	206,628	126,475	5,553	119,606	130,827	2,859,664
1985	343,869	808,892	522,497	927,145	208,780	0	0	10,801	232,622	254,446	3,309,053
1986	349,163	821,345	453,590	1,067,364	271,599	61,718	37,777	47,390	1,020,682	1,116,439	5,247,069
1987	313,427	737,282	352,146	1,275,104	332,663	76,111	46,587	31,720	683,178	747,271	4,595,489
1988	334,809	787,579	374,363	962,220	330,652	262,660	160,772	54,790	1,180,056	1,290,764	5,738,665
1989	206,618	486,032	309,299	1,125,638	462,040	486,208	297,603	85,741	1,846,680	2,019,929	7,325,789
1990	168,379	396,083	397,463	1,816,768	690,760	644,247	394,338	75,160	1,618,779	1,770,647	7,972,623
1991	307,888	724,252	290,056	1,367,570	826,066	1,232,084	754,147	104,718	2,255,396	2,466,990	10,329,167
1992	395,883	931,244	542,851	2,030,518	1,175,063	1,718,320	1,051,768	146,113	3,146,958	3,442,194	14,580,911
1993	339,084	797,636	820,092	2,075,779	815,953	839,011	513,551	212,866	4,584,665	5,014,782	16,013,420
1994	279,578	657,657	271,560	1,653,872	668,326	667,670	408,675	125,409	2,701,045	2,954,448	10,388,241
1995	400,060	941,070	267,332	1,003,793	472,833	573,105	350,792	160,567	3,458,255	3,782,696	11,410,504
1996	659,984	1,552,497	364,556	1,199,682	550,530	646,096	395,469	144,004	3,101,532	3,392,507	12,006,857
1997	463,319	1,089,876	234,023	1,476,653	675,489	780,157	477,527	63,424	1,366,019	1,494,174	8,120,660
1998	686,790	1,615,552	320,759	2,812,998	1,315,548	1,551,189	949,468	85,224	1,835,549	2,007,754	13,180,832
1999	844,499	1,986,535	787,812	4,087,269	1,456,165	1,173,931	718,552	191,658	4,127,896	4,515,161	19,889,479
2000	636,983	2,068,520	1,187,346	2,246,359	1,227,340	1,780,063	1,089,560	347,108	7,475,947	4,806,708	22,865,934
2001	202,406	1,292,485	326,278	848,616	662,752	1,151,714	704,953	151,981	3,273,342	2,104,617	10,719,143
2002	20,000	247,300	0	155,916	190,547	376,246	230,296	123,887	2,668,247	2,595,567	6,608,005
2003	0	80,000	0	0	0	0	0	16,463	354,567	227,971	679,000
1997-2001	2,833,996	8,052,966	2,856,218	11,471,896	5,337,294	6,437,054	3,940,060	839,395	18,078,753	14,928,414	74,776,048
1997-2001	3.8%	10.8%	3.8%	15.3%	7.1%	8.6%	5.3%	1.1%	24.2%	20.0%	100.0%

Table 2.1.2 Fleet-mix of Tankers

(DWT)

DWT / Year	10-24,999	25-49,999	50-74,999	75-99,999	100-124,999	125-149,999	150-199,999	200-249,999	250-299,999	300,000+	Total
1980	4.4%	9.5%	6.1%	8.8%	4.2%	5.6%	3.4%	1.3%	28.7%	28.0%	100%
1985	5.1%	11.9%	6.5%	10.2%	4.8%	6.3%	3.8%	1.1%	24.0%	26.2%	100%
1990	5.6%	13.5%	6.7%	12.3%	5.5%	6.7%	4.1%	1.0%	21.8%	23.0%	100%
1995	4.9%	12.9%	6.0%	13.3%	5.9%	7.1%	4.4%	1.0%	22.3%	22.2%	100%
2000	5.0%	13.8%	6.2%	14.7%	6.2%	6.9%	4.2%	1.0%	21.7%	20.3%	100%
2020	5.1%	14.6%	5.2%	20.8%	9.7%	11.7%	7.2%	1.5%	24.2%	0.0%	100%

Source) 1980-2000: Clarkson Tanker Register

2020 : JICA Study Team estimation

2.1.2 LPG/LNG Tanker

The world LPG/LNG tankers fleet-mix distribution has been stable for recent 20 years.

Table 2.1.3 and Table 2.1.4 are the trends of LPG/LNG tankers' delivery. The delivery distribution has remained unchanged. Therefore, the future fleet-mix will be the same as the recent fleet-mix distribution (1997-99).

Table 2.1.3 LPG Tanker Delivery

Year of Delivery	Up to 5,000		5-20,000		20-60,000		60,000+		Total	
	No.	Cu.m	No.	Cu.m	No.	Cu.m	No.	Cu.m	No.	Cu.m
1980	32	51,832	3	17,924	4	175,330	5	381,896	44	626,982
1981	28	61,863	12	103,012			2	146,473	42	311,348
1982	15	34,416	14	114,696	5	217,340	3	223,707	37	590,159
1983	11	22,614	9	98,661	4	129,885	3	245,100	27	496,260
1984	9	18,391	9	80,508	2	63,150	1	81,600	21	243,649
1985	15	23,734	5	43,445	2	55,200	3	239,780	25	362,159
1986	16	23,896	3	22,680			2	164,113	21	210,689
1987	9	15,509	6	57,198			1	77,749	16	150,456
1988	8	22,726	1	8,315					9	31,041
1989	20	54,924	4	46,697	2	55,906	1	78,508	27	236,035
1990	31	75,444	6	77,257	3	97,328	6	457,883	46	707,912
1991	32	92,320	8	84,816	8	289,710	6	467,836	54	934,682
1992	29	78,211	5	44,228	1	57,214	9	705,398	44	885,051
1993	13	31,010	3	28,059	4	133,114	6	463,917	26	656,100
1994	8	13,748	5	30,227	3	75,900	1	75,386	17	195,261
1995	25	67,853	11	76,798	1	37,450	2	156,941	39	339,042
1996	29	86,477	13	79,328	3	113,764	3	241,222	48	520,791
1997	11	29,244	10	87,521	5	147,312	2	157,989	28	422,066
1998	23	62,116	8	81,001	2	45,928			33	189,045
1999	14	40,397	11	98,740	1	38,961	3	240,000	29	418,098
1997-99		12.8%		26.0%		22.6%		38.7%		100.0%
2020		12.8%		26.0%		22.6%		38.7%		100.0%

Source) 1980-1999: Clarkson Liquid Gas Carrier Register
2020 : JICA Study Team estimation

Table 2.1.4 LNG Tanker Delivery

Year of Delivery	Up to 2,000		20-60,000		60-100,000		100,000+		Total	
	No.	Cu.m	No.	Cu.m	No.	Cu.m	No.	Cu.m	No.	Cu.m
1980							5	639,190	5	639,190
1981							6	778,130	6	778,130
1982									0	0
1983							3	376,110	3	376,110
1984							4	508,199	4	508,199
1985							1	125,000	1	125,000
1986									0	0
1987									0	0
1988	1	1,517							1	1,517
1989							3	382,823	3	382,823
1990							2	264,147	2	264,147
1991							1	127,500	1	127,500
1992							1	127,452	1	127,452
1993	1	18,928			2	179,760	2	255,205	5	453,893
1994							9	1,166,648	9	1,166,648
1995							5	673,059	5	673,059
1996	1	19,474			1	65,000	6	804,332	8	888,806
1997	1	18,928					4	540,117	5	559,045
1998	1	18,800			1	65,000	3	407,887	5	491,687
1999							7	959,662	7	959,662
1997-99		1.9%		0.0%		3.2%		94.9%		100.0%
2020		1.9%		0.0%		3.2%		94.9%		100.0%

Source) 1980-1999: Clarkson Liquid Gas Carrier Register
2020 : JICA Study Team estimation

2.1.3 Bulk Carrier

The two major commodities that move on large bulk carriers are coal and iron ore, primarily sourced in Australia, South Africa and Brazil. All three countries benefit from deep-water access channels and ports. Most of the other countries that serve as marginal suppliers of these products do not have deep-water access and are themselves restricted to loading smaller “Panamax” vessels (approximately 60,000-70,000 DWT). In order to analyze potential world bulk vessel routings, such as between South America and South Asia, vessel size has to be considered. For most of the routes, only the Suez Canal and the Cape route, and not the Panama Canal, can be considered viable alternatives for these vessels.

Table 2.1.5 is the trend of bulk carriers’ delivery, and Table 2.1.6 is the trend of fleet-mix

of bulk carriers. The ratio of over-150,000DWT has been increasing and this trend will continue in the future. The bulk carrier pursues economies of scale. The large size vessels are used in a long-haul voyage of major bulk commodity.
The future fleet-mix was calculated based on the recent and planned delivery (1997-2001) of bulk carriers.

In order to reflect the enlargement tendency of the bulk carriers, the future (2020) distribution of the vessels over 100,000 DWT was estimated by the regression analysis of the past distribution data from 1974 to 2001.
And from the point of view that smaller carriers would remain in certain volume, the distribution of vessels smaller than 50,000 DWT was set to equal to the recent (1997-2001) delivery.
The distribution of the remaining size ranges (total 36.1%), that is from 50,000 DWT to 100,000 DWT, were distributed proportionally to the distribution ratios of the recent (1997-2001) delivery.

Table 2.1.5 Bulk Carrier Delivery

Year of Delivery	10-24,999	25-49,999	50-74,999	75-99,999	100-124,999	125-149,999	150-199,999	200-249,999	250,000+	Total
1980	424,194	2,377,980	951,640	74,235	20,701	91,756	177,921	3,811	0	4,122,237
1981	606,652	3,437,224	3,210,369	340,897	247,860	1,098,624	2,130,296	45,633	0	11,117,556
1982	643,249	4,599,792	3,754,346	373,130	258,314	1,144,957	2,220,140	47,558	0	13,041,486
1983	630,136	4,422,368	3,331,146	285,106	132,439	587,028	1,138,281	24,383	0	10,550,887
1984	1,192,777	8,181,282	3,707,858	300,705	134,283	595,202	1,154,131	24,723	0	15,290,961
1985	1,079,371	8,196,930	1,553,376	168,351	196,694	871,831	1,690,532	36,213	0	13,793,297
1986	471,460	4,426,934	1,720,924	225,296	271,509	1,203,446	2,333,552	49,987	0	10,703,107
1987	222,031	1,959,281	1,878,028	211,024	184,849	819,329	1,588,726	34,032	0	6,897,300
1988	57,701	776,601	1,047,591	105,570	77,296	342,611	664,343	14,231	0	3,085,946
1989	146,223	1,591,352	2,249,707	228,625	165,377	733,022	1,421,372	30,447	0	6,566,124
1990	143,430	1,734,230	2,116,481	318,648	381,968	1,693,047	3,282,918	70,323	0	9,741,047
1991	107,671	1,710,574	1,172,952	134,218	136,847	606,564	1,176,163	25,195	0	5,070,183
1992	126,642	1,184,808	418,439	105,240	175,011	775,723	1,504,173	32,221	0	4,322,257
1993	121,230	954,873	2,233,608	298,260	303,360	1,344,622	2,607,302	55,851	0	7,919,106
1994	159,849	3,051,564	4,193,669	411,647	293,339	1,300,207	2,521,178	54,006	0	11,985,458
1995	354,277	4,770,522	4,448,341	469,575	397,726	1,762,894	3,418,355	73,225	0	15,694,915
1996	386,658	5,247,698	3,443,741	461,854	543,534	2,409,177	4,671,536	100,069	0	17,264,268
1997	429,494	5,019,588	5,468,550	569,082	450,679	1,997,602	3,873,468	82,974	0	17,891,436
1998	310,312	4,449,248	4,469,301	355,872	149,038	660,601	1,280,945	27,439	0	11,702,757
1999	304,734	3,104,801	4,761,121	455,037	282,379	1,251,626	2,426,976	51,988	0	12,638,663
2000	228,200	3,069,098	5,112,437	1,057,855	83,719	371,081	5,007,572	107,267		15,037,229
2001	186,800	2,669,318	7,699,310	771,399	0	0	3,674,900	78,720		15,080,447
2002	0	671,400	2,654,236	149,512	0	0	1,864,034	39,930		5,379,112
1997-2001	1,459,541	18,312,052	27,510,719	3,209,246	965,815	4,280,910	16,263,860	348,389	0	72,350,532
1997-2001	2.0%	25.3%	38.0%	4.4%	1.3%	5.9%	22.5%	0.5%	0.0%	100.0%

Table 2.1.6 Fleet-mix of Bulk Carriers

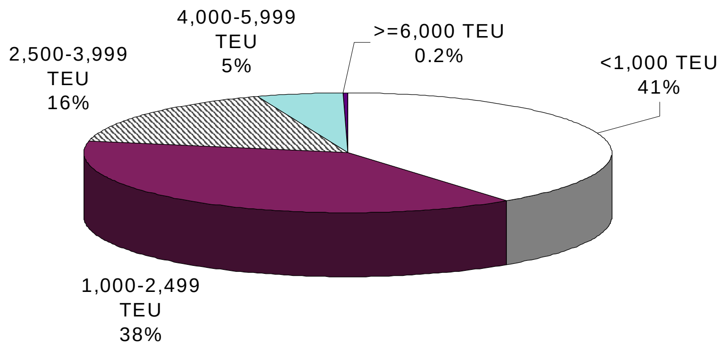
DWT / Year	10-24,999	25-49,999	50-74,999	75-99,999	100-124,999	125-149,999	150-199,999	200-249,999	250,000+	Total
1980	23.3%	49.3%	14.8%	2.4%	1.8%	7.9%	0.6%	0.0%	0%	100%
1985	17.1%	45.9%	19.2%	2.9%	2.2%	9.8%	2.8%	0.1%	0%	100%
1990	13.3%	43.0%	20.0%	2.7%	2.3%	10.1%	8.4%	0.2%	0%	100%
1995	11.3%	40.0%	21.6%	2.8%	2.7%	12.0%	9.4%	0.2%	0%	100%
2000	9.1%	36.0%	24.4%	2.7%	2.3%	10.2%	14.8%	0.3%	0%	100%
2020	2.0%	25.3%	32.3%	3.8%	2.1%	9.5%	24.5%	0.5%	0.0%	100%

Source) 1980-2000: Clarkson Bulk Carrier Register
2020 : JICA Study Team estimation

2.1.4 Containership

The world container vessel fleet is predominantly below 50,000 DWT. It has been only in recent years that the vessel sizes have moved beyond the 50,000 DWT size markers.

The trend toward increasing vessel sizes continues apace as international trade volumes grow in an environment of globalization and liberalization while ship operators want to achieve better economies of scale and improved financial results.



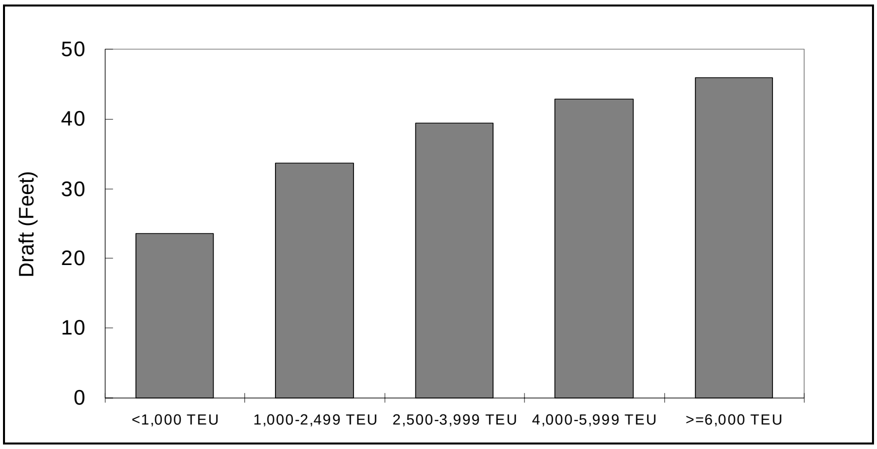
Source) Clarklson Liner Register

Figure2.1.1 Number of Container Vessels

Today, only slightly more than five percent of the container fleet is above 4,000 TEU(that is approximately 57,000DWT) capacities. The very large vessel sizes are active only on those routes (Europe-Asia and Asia-North America) that provide sufficiently large volumes of cargo over a fairly narrow range of ports. Part of the size configuration is also driven by the nature of the goods moving, with predominantly light, volumetric (high TEU requirement) cargo originating in Asia.

The design draft of the container vessels has kept pace with the increase in TEU capacity. There is a strong relationship between DWT and draft, but this is mitigated by both length and beam. For example, a relatively large TEU size vessel, such as those operated by Hapag Lloyd, may still be Panamax, but their beam will be comparatively narrow, creating a deeper draft requirement compared to a larger ship with a broader beam.

The introduction of the vessel, Regina Maersk, began the second phase of post-Panamax container ships operating in world trade. The most important functional characteristics of these Post II vessels, is their ability to accommodate 14 rows of containers under deck with 17 rows across on-deck. In comparison, Post I vessels, with capacities of 4,500 - 5,500 TEUs accommodate 15 rows, and a Panamax container ship accommodates only 13 rows. Along with the larger vessels' greatly expanded carrying capacity, their draft requirements are greater than current operating depths of the smaller vessels. There are no existing container vessels or ordered container ships of draft greater than the Suez already, however.



Source) JICA Study Team from Clarkson Liner Register

Figure2.1.2 Average Container Ship Design Draft

Table 2.1.7 is the trend of containerships delivery, and Table 2.1.8 is the trend of fleet-mix of containerships. The ratio of Post Panamax has been increasing rapidly and this trend will continue in the future. These large containerships are used in Asia-Europe route, and directly influence the transits through the Suez Canal.

The future fleet-mix was calculated based on the recent and planned delivery (1997-2001) of containerships.

Table 2.1.7 Containership Delivery

Dwt(m)

Year of Delivery	10-24,999	25-49,999	50-74,999	75-99,999	100-124,999	125,000+	Total
1980	331,756	1,146,998	28,444	0	0		1,507,199
1981	182,961	239,443	48,504	0	0		470,909
1982	414,697	434,876	47,495	0	0		897,068
1983	573,305	786,705	42,770	0	0		1,402,780
1984	403,250	1,198,452	147,569	0	0		1,749,272
1985	529,292	1,024,591	193,056	0	0		1,746,938
1986	346,873	1,370,683	223,905	0	0		1,941,462
1987	228,477	827,948	227,027	0	0		1,283,452
1988	173,873	841,940	524,147	42,966	16,940		1,599,865
1989	270,738	930,999	213,880	0	0		1,415,617
1990	487,392	1,167,880	213,540	0	0		1,868,812
1991	392,841	1,283,658	358,105	8,765	3,456		2,046,825
1992	509,339	1,085,924	634,201	52,955	20,878		2,303,296
1993	737,676	1,567,905	491,415	0	0		2,796,997
1994	1,017,113	1,865,798	730,557	26,403	10,410		3,650,280
1995	968,049	1,851,763	1,422,197	160,127	63,131		4,465,268
1996	1,196,534	2,238,332	1,771,767	230,151	90,739		5,527,523
1997	1,487,665	3,404,972	1,931,764	219,706	86,621		7,130,729
1998	1,478,635	3,493,744	1,919,885	207,456	81,791		7,181,512
1999	818,278	1,344,628	1,208,066	178,879	70,525		3,620,377
2000	657,156	1,768,279	2,204,703	322,531	127,161		5,079,829
2001	0	0	0	0	0		0
1997-2001	4,954,688	12,223,549	10,959,235	1,514,742	597,200	0	30,249,414
1997-2001	16.4%	40.4%	36.2%	5.0%	2.0%	0.0%	100.0%

Table 2.1.8 Fleet-mix of Containerships

DWT Year	10-24,999	25-49,999	50-74,999	75-99,999	100-124,999	125,000+	Total
1980	48.9%	49.9%	1.1%	0.0%	0.0%		100%
1985	41.9%	55.7%	2.4%	0.0%	0.0%		100%
1990	33.2%	59.0%	7.6%	0.2%	0.1%		100%
1995	30.2%	57.9%	11.3%	0.4%	0.2%		100%
2000	24.7%	51.7%	21.0%	1.9%	0.8%		100%
2020	16.4%	40.4%	36.2%	5.0%	2.0%		100%

Source) 1980-2000: Clarkson Liner Register

2020 : JICA Study Team estimation

2.1.5 General Cargo Carrier

The world general cargo carrier is entirely less than 25,000 DWT in recent 20 years. Table 2.1.9 is the general carrier fleet's delivery. This table shows that there has been no general carrier larger than 25,000 DWT, and this trend will continue in the future. Therefore, the future fleet-mix will be the same as the present fleet-mix distribution.

Table 2.1.9 General Cargo Carrier Delivery

Year of Delivery	-24,999	25,000+	Total
1980	720,302	0	720,302
1985	378,319	0	378,319
1990	106,424	0	106,424
1991	97,802	0	97,802
1992	50,327	0	50,327
1993	18,357	0	18,357
1994	140,434	0	140,434
1995	189,337	0	189,337
1996	194,158	0	194,158
1997	310,543	0	310,543
1998	246,590	0	246,590
1999	211,469	0	211,469
2000	58,300	0	58,300
1997-00	100.0%	0.0%	100.0%
2020	100.0%	0.0%	100.0%

Source) 1980-2000: Clarkson Liner Register
2020 : JICA Study Team estimation

2.1.6 Car Carrier

The world car carrier fleet is predominantly less than 25,000 DWT. Still, there have been some carriers that are larger than 25,000 DWT. Table 2.1.10 is the trend of the world pure car carriers' delivery. This table indicates that the trend of the fleet-mix shows no tendency to scale up or down. Therefore, the future fleet-mix was calculated based on the recent and planned delivery (1997-2001) of pure car carriers.

Table 2.1.10 Pure Car Carrier Delivery

Year of Delivery	-24,999	25,000+	Total
1980	100.0%	0.0%	100.0%
1985	78.2%	21.8%	100.0%
1990	100.0%	0.0%	100.0%
1991	35.4%	64.6%	100.0%
1992	75.5%	24.5%	100.0%
1993	100.0%	0.0%	100.0%
1994	100.0%	0.0%	100.0%
1995	100.0%	0.0%	100.0%
1996	100.0%	0.0%	100.0%
1997	85.5%	14.5%	100.0%
1998	86.4%	13.6%	100.0%
1999	95.3%	4.7%	100.0%
2000	90.3%	9.7%	100.0%
2020	91.1%	8.9%	100.0%

Source) 1980-2000: Clarkson Liner Register
2020 : JICA Study Team estimation

2.2 Fleet-mix in the Suez Canal

2.2.1 Outlook

Average vessel size through the Suez Canal becomes constantly larger from 1980 to 1999. The size increase was especially prominent in Containerships, Bulk Carriers, and Car Carriers.

Table 2.2.1 Average Vessel Size in SCNT

(1000SCNT)

	(a)1980	(b)1999	(b)/(a)
Tankers	30.4	34.2	1.13
Bulk Carriers	15.5	26.2	1.69
Combined Carriers	40.6	53.8	1.33
General Carriers	6.9	8.8	1.28
Containerships	19.8	38.5	1.94
Lash	29.1	28.2	0.97
Ro/Ro	14.4	17.8	1.24
Car Carriers	30.8	46.5	1.51
Passenger Ships	12.3	15.0	1.22
War Ships	6.2	9.1	1.47
Others	2.7	4.0	1.48

Source) JICA Study Team from SCA Yearly Reports

The speed of enlargement has been slow down except Bulk Carriers, Containership, and Car Carrier. (Table 2.2.2)

Table 2.2.2 Historical Data of Vessel Size

(1000SCNT)

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
Tanker	36.2	30.3	28.8	29.7	32.0	30.4	39.3	37.7	37.9	36.7	36.4	37.9
Bulk Carrier	14.5	14.5	14.4	14.6	15.2	15.5	15.8	16.4	16.8	18.0	18.4	19.0
Combined Carrier	21.3	43.3	38.9	38.3	39.8	40.6	41.0	45.9	45.1	44.9	48.1	56.4
General Carrier	6.8	6.1	6.1	6.4	6.6	6.9	7.0	7.1	7.1	7.2	7.1	7.3
Containership	12.8	10.9	19.1	19.9	20.3	19.8	20.3	20.5	21.1	21.3	21.2	22.7
Lash	32.3	32.9	31.0	30.7	29.0	29.1	29.4	28.5	28.8	27.1	27.5	29.3
Ro/Ro	8.3	6.7	7.6	8.3	12.6	14.4	15.3	14.6	16.0	16.8	16.1	16.5
Car Carrier		21.0	23.8	26.3	27.7	30.8	32.9	34.0	34.4	33.8	35.7	36.9
Passenger Ship	9.6	12.9	12.7	11.3	12.1	12.3	12.7	11.5	11.9	13.4	11.7	11.8
Warship		3.7	6.0	3.3	3.4	6.2	5.5	6.1	5.9	5.4	5.5	5.4
Others	4.1	2.2	2.9	3.2	3.1	2.7	3.3	3.5	3.1	3.1	3.6	3.9
Total	9.6	11.2	11.2	11.7	13.1	13.5	15.9	16.1	17.0	17.4	17.8	19.9

1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	
37.1	36.9	39.4	43.1	44.2	37.5	43.2	39.3	39.2	35.0	34.6	42.1	34.2	Tanker
19.6	19.6	20.4	20.3	20.0	19.8	19.7	20.9	22.9	23.1	24.4	25.6	26.2	Bulk Carrier
53.5	48.9	46.8	51.0	50.3	52.0	49.0	51.1	51.1	52.3	54.6	52.3	53.8	Combined Carrier
7.5	7.6	7.7	7.9	7.8	7.5	7.2	6.7	7.6	7.7	7.9	8.4	8.8	General Carrier
23.1	24.3	25.7	26.6	27.6	26.8	27.6	29.1	30.9	31.9	34.6	38.1	38.5	Containership
29.3	26.9	29.9	31.3	32.4	32.8	32.2	30.5	31.1	29.5	29.7	29.1	28.2	Lash
16.2	15.7	17.6	17.9	19.1	20.8	20.7	23.3	22.3	23.0	23.4	17.9	17.8	Ro/Ro
38.3	39.3	40.8	41.6	42.2	42.0	41.6	43.1	43.9	44.7	44.3	44.7	46.5	Car Carrier
12.3	11.7	10.4	10.2	11.3	11.5	12.1	11.8	11.3	12.7	13.1	13.8	15.0	Passenger Ship
4.0	4.6	4.7	15.9	14.4	8.9	10.9	8.9	6.4	8.1	7.0	10.8	9.1	Warship
4.2	3.2	3.3	3.3	3.5	3.9	3.9	3.9	3.6	3.7	4.0	3.8	4.0	Others
19.8	19.6	21.2	23.2	23.3	22.2	22.9	22.3	23.9	24.1	25.6	28.7	28.5	Total

Source) JICA Study Team from SCA Yearly Reports

2.2.2 Tanker

Table 2.2.3 is the fleet-mix of Tanker via the Suez Canal.
The northbound Tankers exceed southbound ones except VLCC Tankers

Table 2.2.3 Fleet-mix of Tankers (Ave. 1997-1999)

(1000DWT)

	0-24,999	25-49,999	50-74,999	75-99,999	100-124,999	125-149,999	150-199,999	200-249,999	250-299,999	300,000+	Total
Southbound	5,709	8,985	3,714	3,944	2,319	2,197	1,533	1,410	32,480	38,611	100,902
Northbound	6,410	14,091	3,929	4,564	2,161	4,142	2,011	315	4,388	2,091	44,102
Total	12,119	23,076	7,642	8,509	4,479	6,340	3,544	1,725	36,869	40,702	145,005
Share	8.4%	15.9%	5.3%	5.9%	3.1%	4.4%	2.4%	1.2%	25.4%	28.1%	100.0%

Source) JICA Study Team from SCA Transit Database

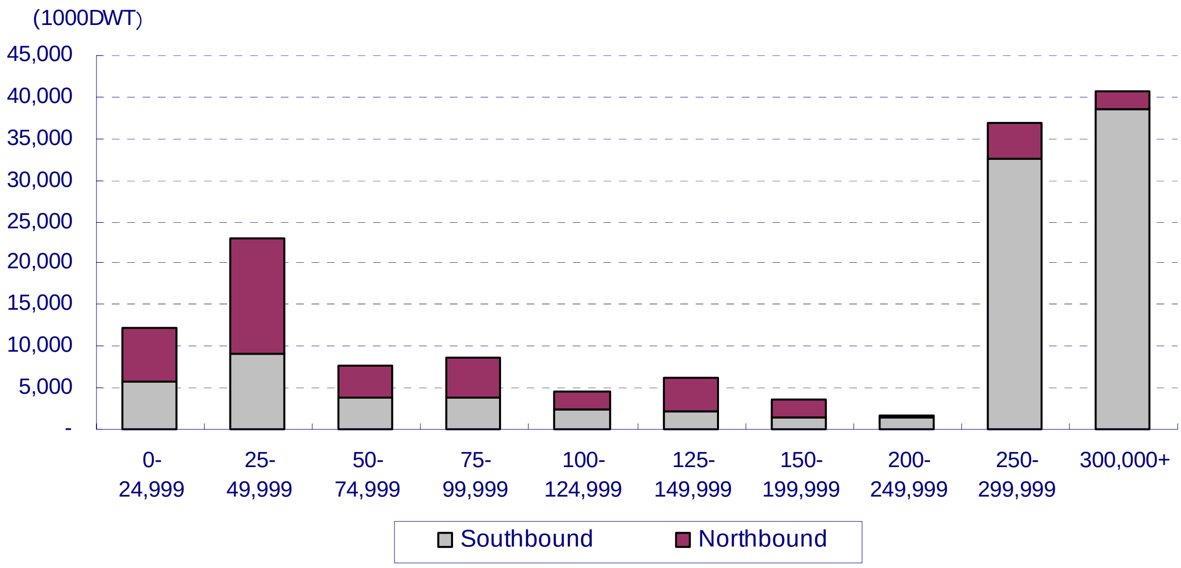


Figure 2.2.1 DWT Distribution by Tanker Size

2.2.3 Bulk Carrier

Table 2.2.4 is the fleet-mix of the Bulk Carrier via the Suez Canal.
There are 2 peaks of DWT in Figure 2.2.2. The first peak (25,000-49,999 and 50,000-74,999 DWT) has northbound vessels and southbound vessels in balance. But most of vessels in the second peak (125-149,999 and 150-199,999 DWT) are the northbound ones.

Table 2.2.4 Fleet-mix of Bulk Carrier (Ave. 1997-1999)

(1000DWT)

	0-24,999	25-49,999	50-74,999	75-99,999	100-124,999	125-149,999	150-199,999	200-249,999	250-299,999	300,000 +	Total
Southbound	4,801	41,145	21,458	2,387	1,447	2,821	2,136	-	-	-	76,195
Northbound	3,129	26,512	23,153	1,532	831	7,276	17,443	419	-	-	80,296
Total	7,930	67,658	44,610	3,919	2,278	10,097	19,579	419	-	-	156,491
Share	5.1%	43.2%	28.5%	2.5%	1.5%	6.5%	12.5%	0.3%	0.0%	0.0%	100.0%

Source) JICA Study Team from SCA Transit Database

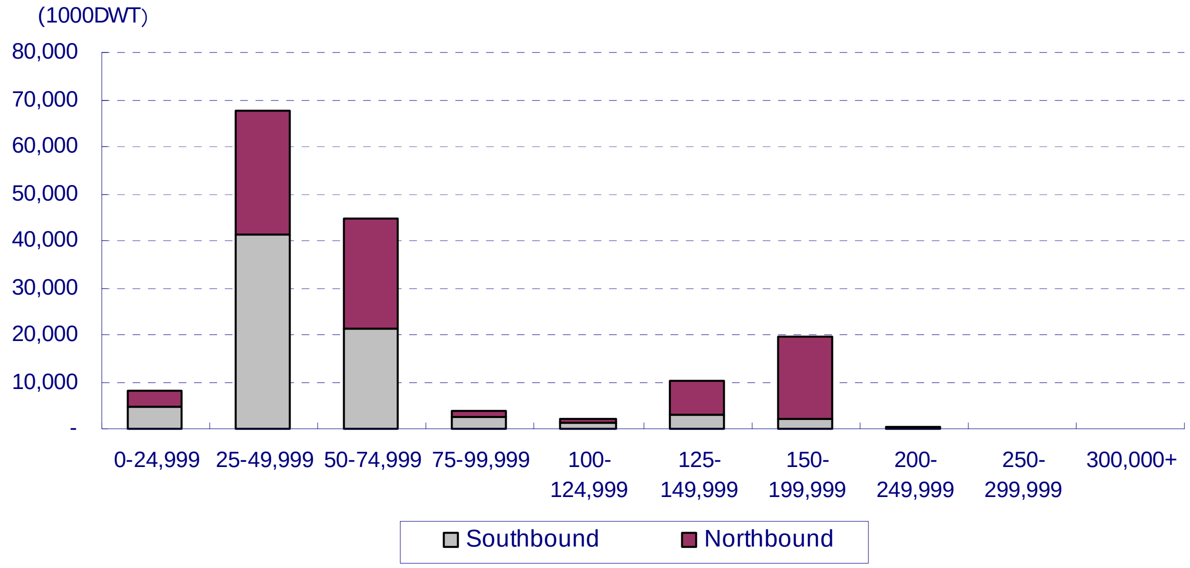


Figure 2.2.2 DWT Distribution by Bulk Carrier Size

2.2.4 Containership

Table 2.2.5 is the fleet-mix of Containership via the Suez Canal.
Most of vessels exist in the size between 25-74,999 DWT.
Northbound and Southbound are balanced.

Table 2.2.5 Fleet-mix of Containership (Ave. 1997-1999)

(1000DWT)

	0-24,999	25-49,999	50-74,999	75-99,999	100-124,999	125-149,999	150-199,999	200-249,999	250-299,999	300,000+	Total
Southbound	3,474	50,241	51,792	6,630	2,795	-	-	-	-	-	114,931
Northbound	3,270	51,608	52,163	6,743	2,478	-	-	-	-	-	116,262
Total	6,745	101,849	103,954	13,373	5,272	-	-	-	-	-	231,193
Share	2.9%	44.1%	45.0%	5.8%	2.3%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%

Source) JICA Study Team from SCA Transit Database

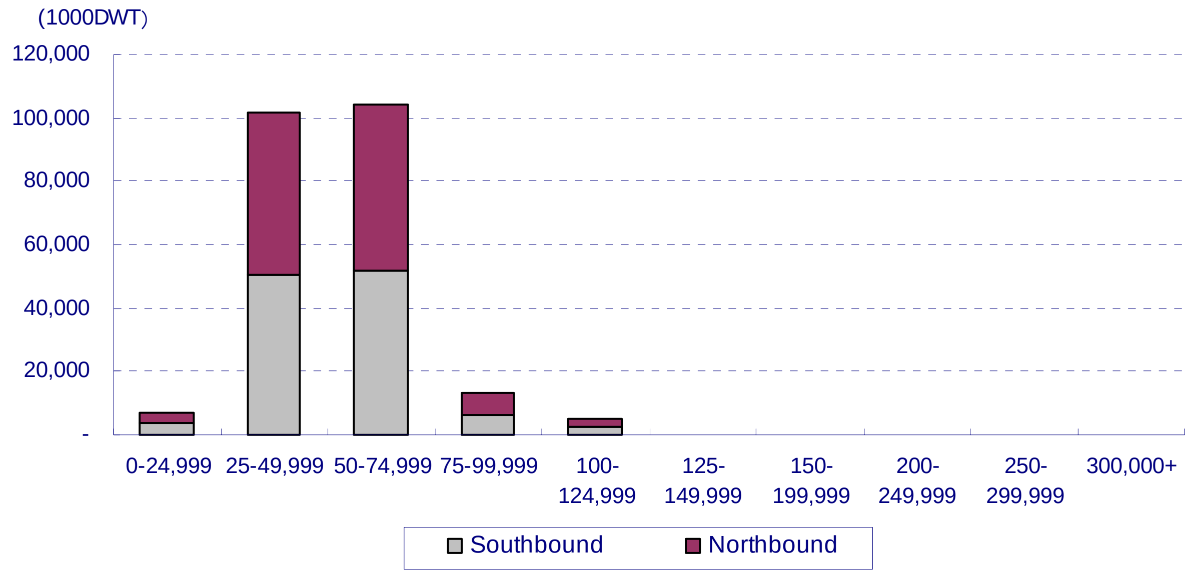


Figure 2.2.3 DWT Distribution by Containership Size

2.2.5 General Cargo Carrier

Table 2.2.6 is the fleet-mix of General Cargo Carrier.
Most of vessels are small and are categorized to the size under 25,000 DWT.

Table 2.2.6 Fleet-mix of General Cargo Carrier (Ave. 1997-1999)

(1000DWT)

	0-24,999	25-49,999	50-74,999	75-99,999	100-124,999	125-149,999	150-199,999	200-249,999	250-299,999	300,000+	Total
Southbound	17,936	2,587	103	-	-	-	-	-	-	-	20,626
Northbound	13,835	2,255	52	-	-	-	-	-	-	-	16,142
Total	31,771	4,842	155	-	-	-	-	-	-	-	36,768
Share	86.4%	13.2%	0.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%

Source) JICA Study Team from SCA Transit Database

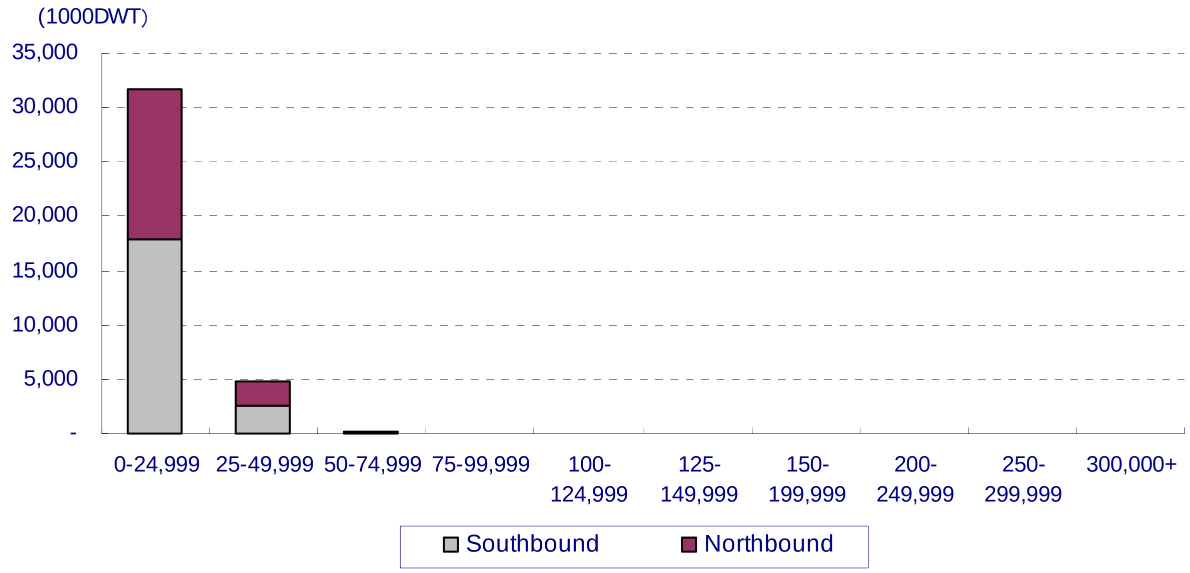


Figure 2.2.4 DWT Distribution by General Cargo Carrier Size

2.2.6 Car Carrier

Table 2.2.7 is the fleet-mix of Car Carrier via the Suez Canal.
Most of vessels are smaller than 24,999DWT.

Table 2.2.7 Fleet-mix of Car Carrier (Ave. 1997-1999)

(1000DWT)

	0-24,999	25-49,999	50-74,999	75-99,999	100-124,999	125-149,999	150-199,999	200-249,999	250-299,999	300,000+	Total
Southbound	7,231	267	-	-	-	-	-	-	-	-	7,498
Northbound	9,145	853	20	-	-	-	-	-	-	-	10,019
Total	16,376	1,120	20	-	-	-	-	-	-	-	17,516
Share	93.5%	6.4%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%

Source) JICA Study Team from SCA Transit Database

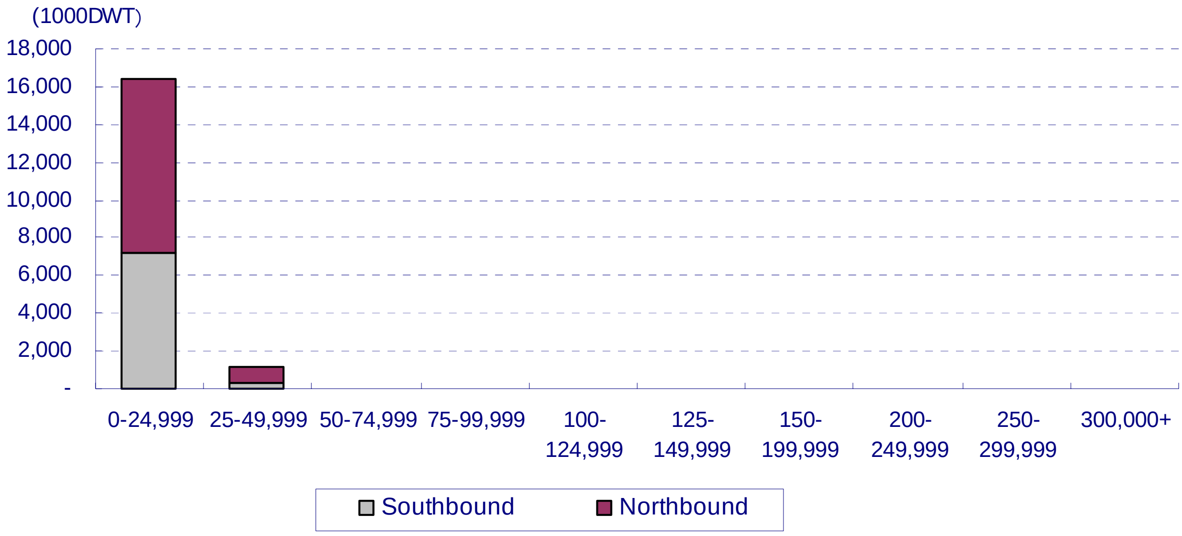


Figure 2.2.5 DWT Distribution by Car Carrier Size

2.3 Cargo movement and vessel size

To determine the scenario of the future fleet mix in the Suez Canal, present cargo movement on vessels of each size were analyzed.

2.3.1 Crude Oil Tanker

Table 2.3.1 is annual average volume of cargo on Crude Oil Tanker during 1997 to 1999.

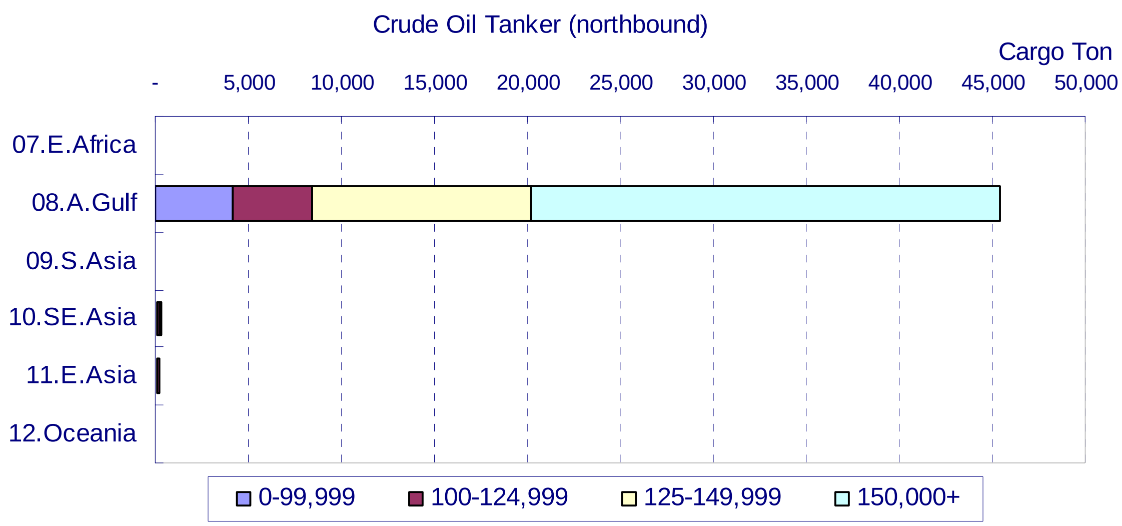
Most of Crude Oil came from Arabian Gulf. The major size was 125,000 – 150,000DWT. Some Crude Oil was carried over 150,000DWT Tankers. It was not fully loaded because the maximum vessel size of fully loaded Tanker is around 150,000DWT.

Table 2.3.1 Cargo Ton on Crude Oil Tanker (Ave. 1997-1999)

(1000DWT)

Origin	0-24,999	25-49,999	50-74,999	75-99,999	100-124,999	125-149,999	150-199,999	200-249,999	250-299,999	300+	Total
01.CS.America	-	-	-	89	-	-	-	-	-	-	89
02.N.AmericaE.C.	-	-	-	-	-	-	-	-	-	-	-
03.NW.Europe	-	-	-	-	-	-	-	-	-	-	-
04.W.Med	-	-	-	-	-	-	-	-	-	-	-
05.N.Africa	-	30	-	90	123	283	155	-	-	-	682
06.E.Med	-	-	-	-	-	-	-	-	-	-	-
Southbound Total	-	30	-	179	123	283	155	-	-	-	771
07.E.Africa	-	-	-	-	-	-	-	-	-	-	-
08.A.Gulf	6	106	239	3,839	4,294	11,735	5,098	946	12,897	6,273	45,433
09.S.Asia	-	-	-	-	-	-	150	-	-	-	150
10.SE.Asia	16	-	67	-	107	-	150	-	-	-	340
11.E.Asia	-	-	-	89	107	-	-	-	-	-	195
12.Oceania	-	-	-	-	-	130	-	-	-	-	130
Northbound Total	23	106	305	3,928	4,508	11,865	5,398	946	12,897	6,273	46,249
Grand Total	23	136	305	4,107	4,631	12,148	5,553	946	12,897	6,273	47,020

Source) JICA Study Team from SCA Transit Database



Source) JICA Study Team from SCA Transit Database

Figure 2.3.1 Cargo Ton on Crude Oil Tanker (Ave. 1997-1999)

2.3.2 Chemical Tanker

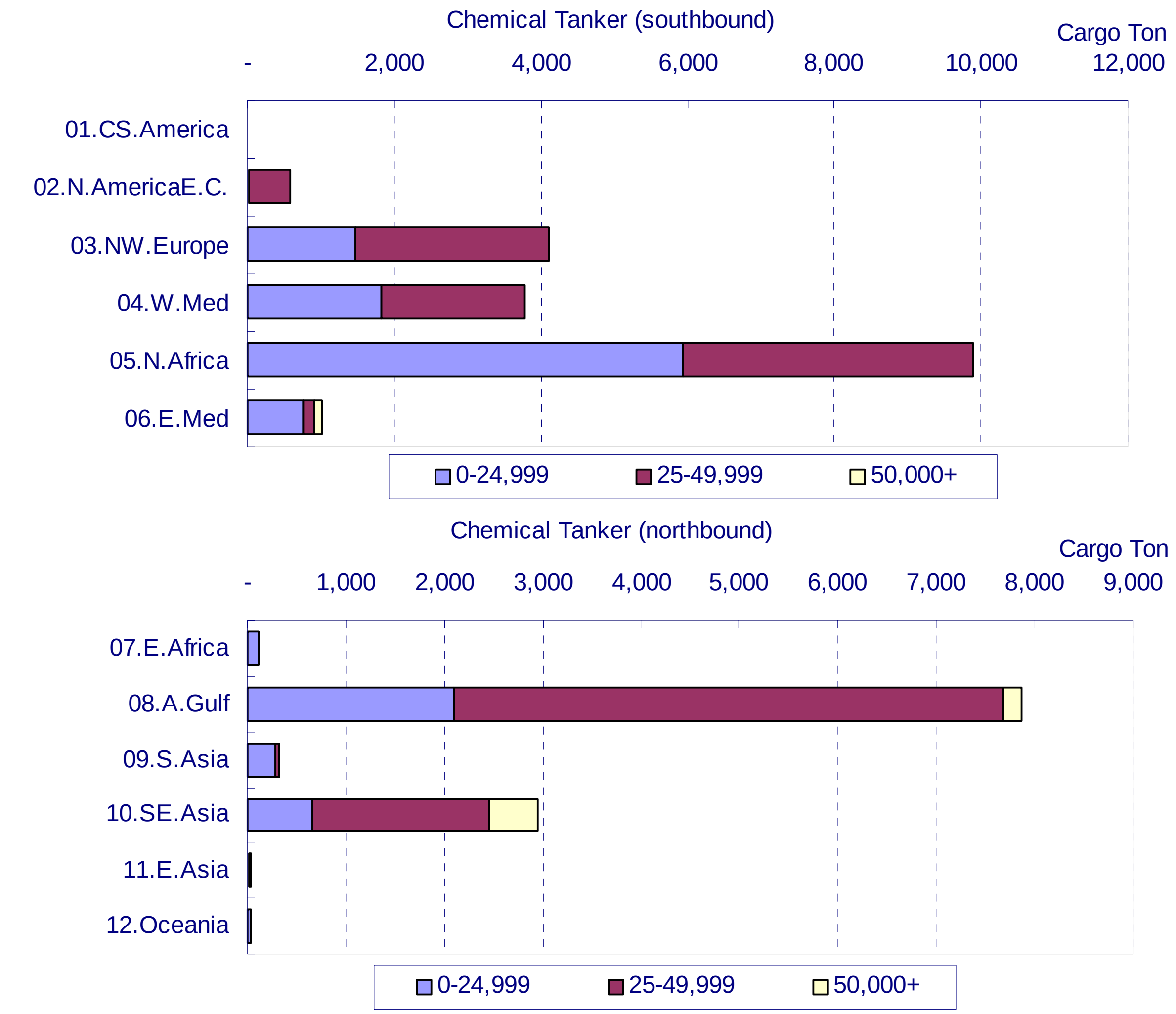
Table 2.3.2 is annual average volume of cargo on Chemical Tanker during 1997 to 1999.

Table 2.3.2 Cargo Ton on Chemical Tanker (Ave. 1997-1999)

(1000DWT)

Origin	0-24,999	25-49,999	50-74,999	75-99,999	100-124,999	125-149,999	150-199,999	200-249,999	250-299,999	300+	Total
01.CS.America	-	-	-	-	-	-	-	-	-	-	-
02.N.AmericaE.C.	36	538	-	-	-	-	-	-	-	-	573
03.NW.Europe	1,465	2,634	-	-	-	-	-	-	-	-	4,099
04.W.Med	1,829	1,963	-	-	-	-	-	-	-	-	3,793
05.N.Africa	5,947	3,947	-	-	-	-	-	-	-	-	9,894
06.E.Med	753	163	-	92	-	-	-	-	-	-	1,007
Southbound Total	10,030	9,245	-	92	-	-	-	-	-	-	19,367
07.E.Africa	107	-	-	-	-	-	-	-	-	-	107
08.A.Gulf	2,100	5,578	-	181	-	-	-	-	-	-	7,859
09.S.Asia	287	31	-	-	-	-	-	-	-	-	319
10.SE.Asia	664	1,799	-	375	105	-	-	-	-	-	2,943
11.E.Asia	13	32	-	-	-	-	-	-	-	-	45
12.Oceania	33	-	-	-	-	-	-	-	-	-	33
Northbound Total	3,204	7,441	-	556	105	-	-	-	-	-	11,305
Grand Total	13,234	16,685	-	648	105	-	-	-	-	-	30,673

Source) JICA Study Team from SCA Transit Database



Source) JICA Study Team from SCA Transit Database

Figure 2.3.2 Cargo Ton on Chemical Tanker (Ave. 1997-1999)

2.3.3 LNG/LPG Tanker

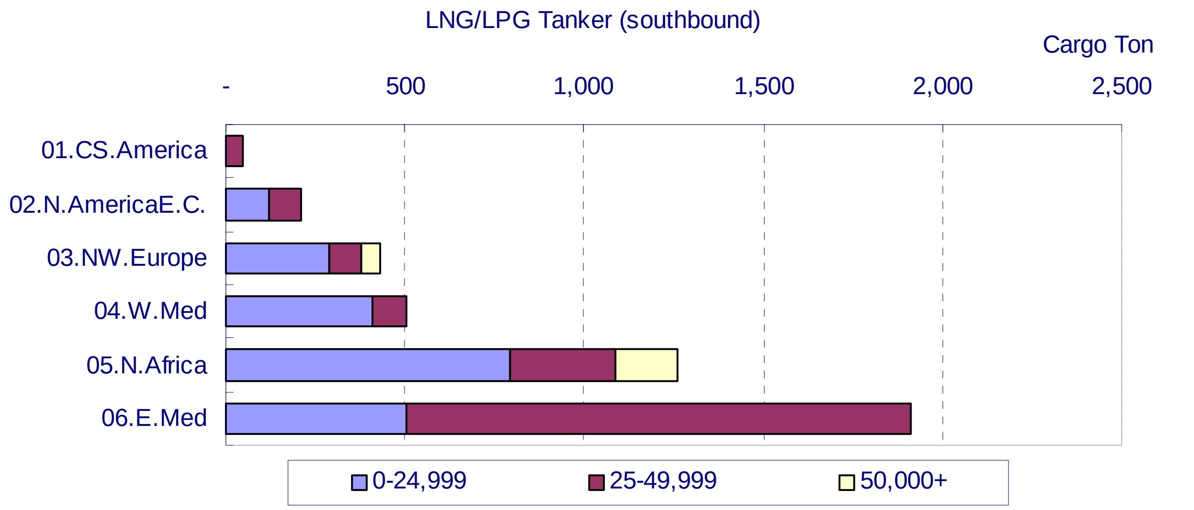
Figure 2.2.3 is annual average volume of cargo on LNG/LPG Tanker during 1997 to 1999.

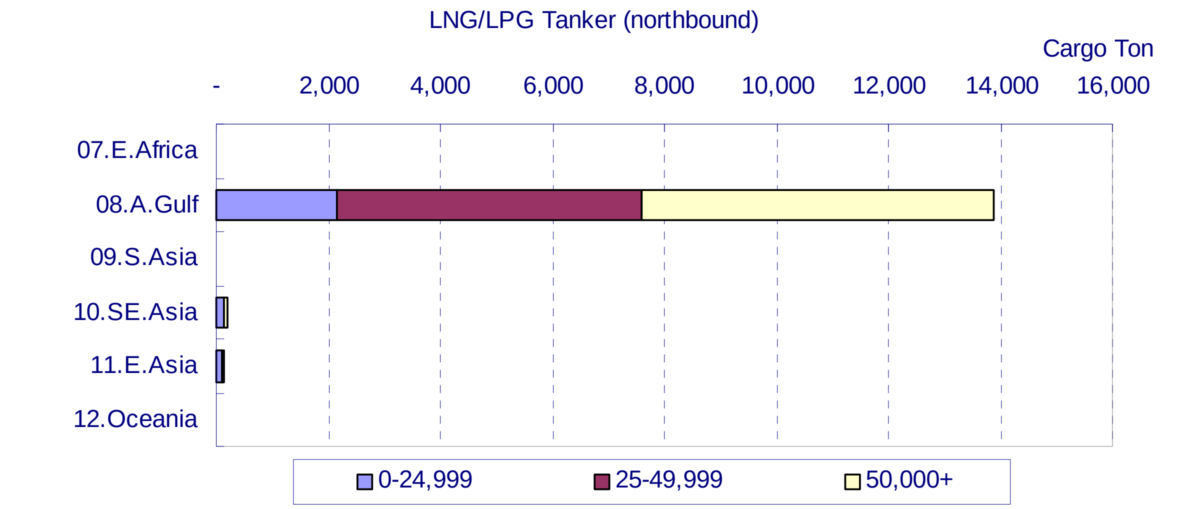
Table 2.3.3 Cargo Ton on LNG/LPG Tanker (Ave. 1997-1999)

(1000DWT)

Origin	0-24,999	25-49,999	50-74,999	75-99,999	100-124,999	125-149,999	150-199,999	200-249,999	250-299,999	300+	Total
01.CS.America	-	46	-	-	-	-	-	-	-	-	46
02.N.AmericaE.C.	121	88	-	-	-	-	-	-	-	-	209
03.NW.Europe	289	91	51	-	-	-	-	-	-	-	432
04.W.Med	412	91	-	-	-	-	-	-	-	-	503
05.N.Africa	795	294	170	-	-	-	-	-	-	-	1,259
06.E.Med	505	1,407	-	-	-	-	-	-	-	-	1,912
Southbound Total	2,122	2,017	221	-	-	-	-	-	-	-	4,360
07.E.Africa	-	37	-	-	-	-	-	-	-	-	37
08.A.Gulf	2,142	5,444	6,015	-	-	140	156	-	-	-	13,897
09.S.Asia	-	45	-	-	-	-	-	-	-	-	45
10.SE.Asia	139	-	67	-	-	-	-	-	-	-	206
11.E.Asia	95	-	52	-	-	-	-	-	-	-	147
12.Oceania	-	-	-	-	-	-	-	-	-	-	-
Northbound Total	2,377	5,526	6,134	-	-	140	156	-	-	-	14,332
Grand Total	4,499	7,542	6,355	-	-	140	156	-	-	-	18,692

Source) JICA Study Team from SCA Transit Database





Source) JICA Study Team from SCA Transit Database

Figure 2.3.3 Cargo Ton on LNG/LPG Tanker (Ave. 1997-1999)

2.3.4 Product Tanker

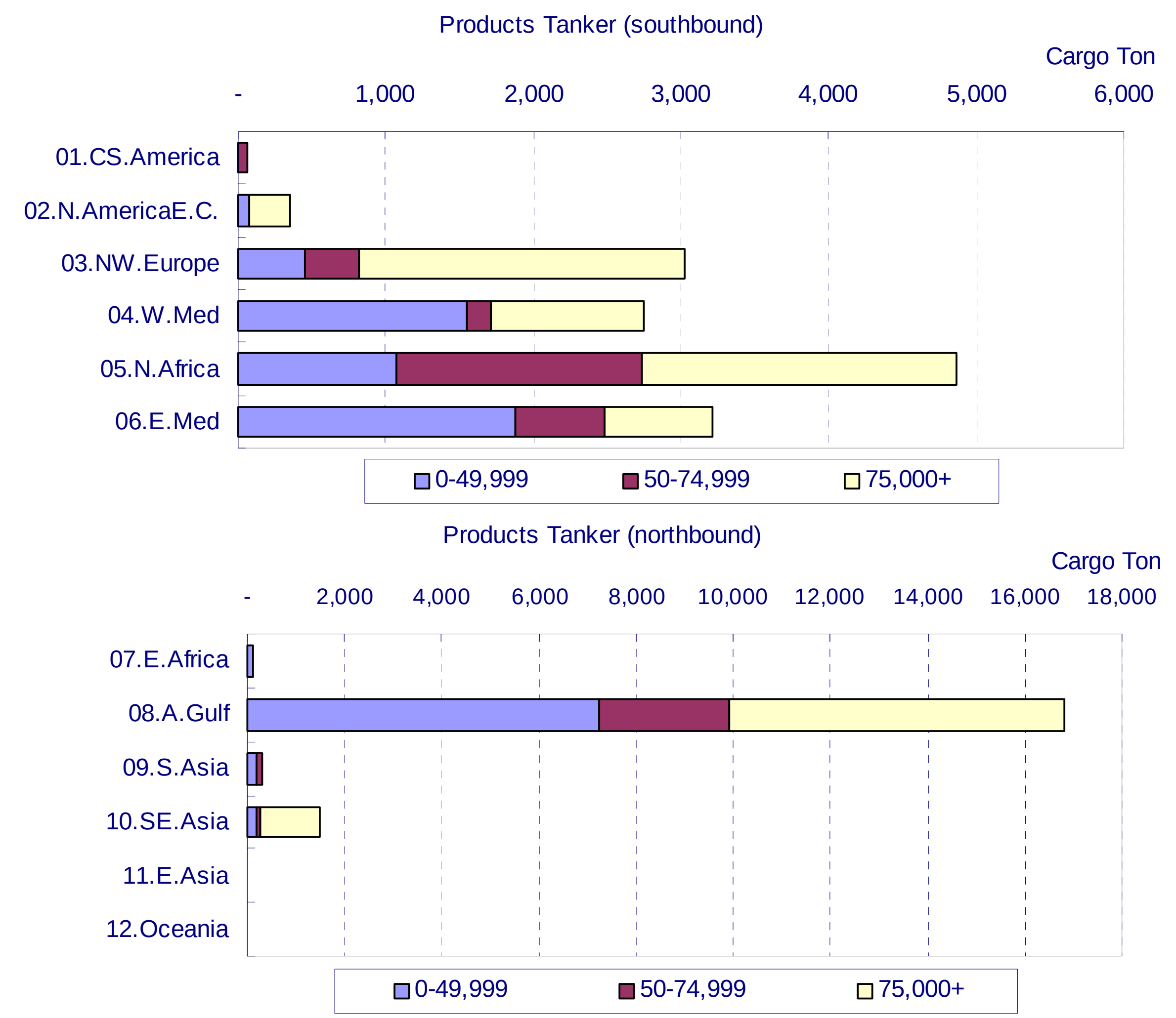
Figure 2.3.4 is annual average volume of cargo on Product Tanker during 1997 to 1999.

Table 2.3.4 Cargo Ton on Product Tanker (Ave. 1997-1999)

(1000DWT)

Origin	0-24,999	25-49,999	50-74,999	75-99,999	100-124,999	125-149,999	150-199,999	200-249,999	250-299,999	300+	Total
01.CS.America	-	-	57	-	-	-	-	-	-	-	57
02.N.AmericaE.C.	-	78	-	278	-	-	-	-	-	-	356
03.NW.Europe	27	426	366	1,420	479	-	307	-	-	-	3,025
04.W.Med	182	1,374	165	789	236	-	-	-	-	-	2,746
05.N.Africa	31	1,039	1,665	1,924	205	-	-	-	-	-	4,864
06.E.Med	97	1,779	614	512	218	-	-	-	-	-	3,219
Southbound Total	336	4,697	2,868	4,923	1,137	-	307	-	-	-	14,267
07.E.Africa	27	103	-	-	-	-	-	-	-	-	130
08.A.Gulf	385	6,858	2,662	5,561	882	147	312	-	-	-	16,807
09.S.Asia	30	177	118	-	-	-	-	-	-	-	325
10.SE.Asia	-	198	55	1,041	213	-	-	-	-	-	1,508
11.E.Asia	9	-	-	-	-	-	-	-	-	-	9
12.Oceania	6	40	-	-	-	-	-	-	-	-	45
Northbound Total	456	7,376	2,835	6,602	1,095	147	312	-	-	-	18,825
Grand Total	792	12,073	5,703	11,525	2,232	147	618	-	-	-	33,091

Source) JICA Study Team from SCA Transit Database



Source) JICA Study Team from SCA Transit Database

Figure 2.3.4 Cargo Ton on Product Tanker (Ave. 1997-1999)

2.3.5 Bulk Carrier

Table 2.3.5 is annual average volume of cargo on Bulk Carriers during 1997 to 1999.

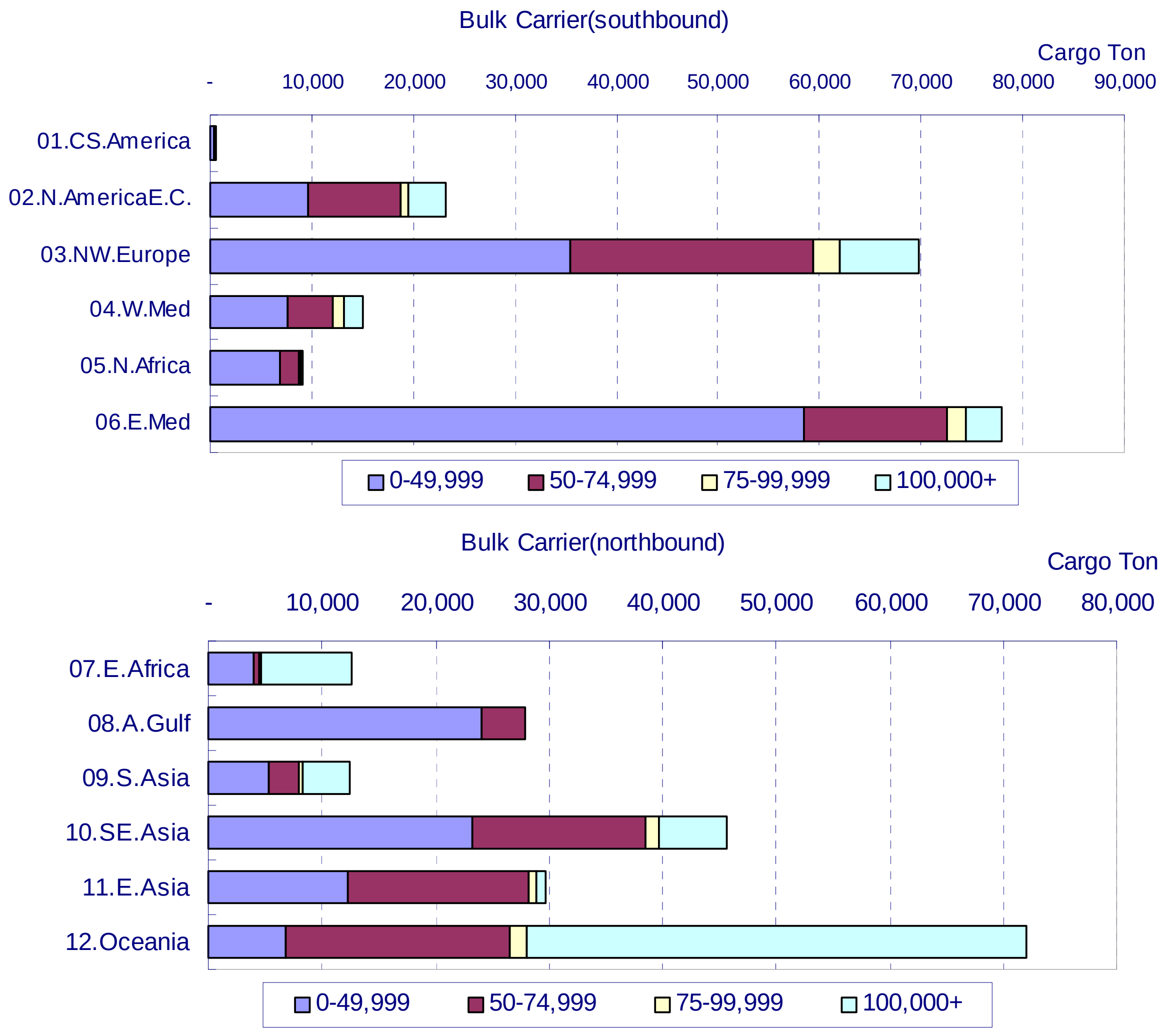
Most of the southbound cargo is loaded in East Med. and NW Europe on relatively small vessels.

Most of the northbound cargo comes from Oceania and Asia regions. Over 150,000DWT class was used for this transport.

Table 2.3.5 Cargo Ton on Bulk Carrier (Ave. 1997-1999)

Origin	0-24,999	25-49,999	50-74,999	75-99,999	100-124,999	125-149,999	150-199,999	200-249,999	250-299,999	300+	Total
01.CS.America	64	398	124	-	-	-	-	-	-	-	586
02.N.AmericaE.C.	598	8,964	9,106	855	1,187	1,240	1,299	-	-	-	23,249
03.NW.Europe	3,808	31,579	24,045	2,500	1,764	3,581	2,526	-	-	-	69,803
04.W.Med	1,874	5,738	4,380	1,110	366	1,331	178	-	-	-	14,979
05.N.Africa	580	6,373	1,844	159	103	-	-	-	-	-	9,060
06.E.Med	6,136	52,356	14,137	1,840	689	837	1,932	-	-	-	77,927
Southbound Total	13,061	105,408	53,638	6,464	4,109	6,989	5,936	-	-	-	195,604
07.E.Africa	346	3,706	443	82	-	1,596	6,159	206	-	-	12,539
08.A.Gulf	2,651	21,359	3,802	-	-	-	151	-	-	-	27,964
09.S.Asia	1,311	3,979	2,622	465	1,174	2,176	655	-	-	-	12,382
10.SE.Asia	3,020	20,180	15,265	1,262	-	1,441	4,202	211	-	-	45,582
11.E.Asia	1,206	11,113	15,864	635	-	686	151	-	-	-	29,655
12.Oceania	142	6,741	19,714	1,471	482	12,252	30,560	634	-	-	71,998
Northbound Total	8,676	67,078	57,710	3,916	1,656	18,152	41,879	1,052	-	-	200,120
Grand Total	21,737	172,486	111,348	10,380	5,765	25,141	47,815	1,052	-	-	395,724

Source) JICA Study Team from SCA Transit Database



Source) JICA Study Team from SCA Transit Database

Figure 2.3.5 Cargo Ton on Bulk Carrier (Ave. 1997-1999)

2.3.6 Containership

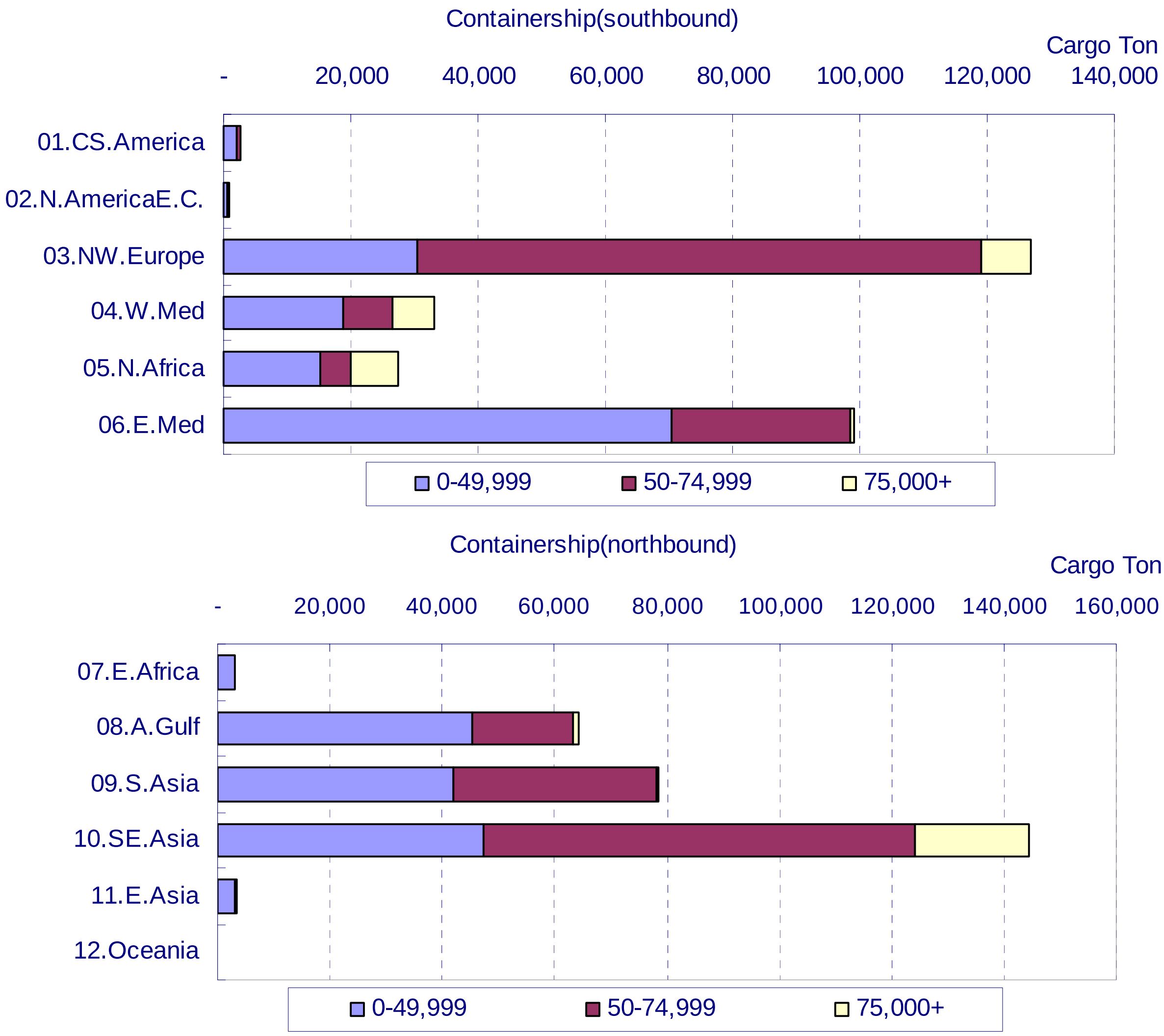
Table 2.3.6 is annual average volume of cargo on Containerships during 1997 to 1999. It should be noted that the origins and the destinations of the cargo are what the captains of vessels declared. This declaration may be different from the actual movement of cargo, especially the movement of containers.

The southbound cargo comes from NW Europe and W. Med. Most of large containerships are moving between Europe and Asia.
Most of the northbound cargo is loaded in Asia. Some are coming from Arabian Gulf, but this cargo will be originated in Asia. Most of containerships drop in a port in Arabian Gulf and comes from this region in SCA database.

Table 2.3.6 Cargo Ton on Containership (Ave. 1997-1999)

Origin	0-24,999	25-49,999	50-74,999	75-99,999	100-124,999	125-149,999	150-199,999	200-249,999	250-299,999	300+	Total
01.CS.America	-	2,158	616	-	-	-	-	-	-	-	2,774
02.N.AmericaE.C.	24	489	234	-	-	-	-	-	-	-	747
03.NW.Europe	918	29,501	88,608	7,657	217	-	-	-	-	-	126,901
04.W.Med	1,677	17,213	7,583	2,726	3,928	-	-	-	-	-	33,126
05.N.Africa	1,195	14,014	4,917	5,173	2,132	-	-	-	-	-	27,432
06.E.Med	5,090	65,357	28,029	536	-	-	-	-	-	-	99,013
Southbound Total	8,904	128,732	129,987	16,092	6,277	-	-	-	-	-	289,993
07.E.Africa	1,410	1,580	-	-	-	-	-	-	-	-	2,990
08.A.Gulf	2,971	42,519	17,643	891	213	-	-	-	-	-	64,237
09.S.Asia	1,275	40,642	36,343	167	-	-	-	-	-	-	78,427
10.SE.Asia	2,371	44,818	76,953	15,121	5,211	-	-	-	-	-	144,475
11.E.Asia	556	2,520	193	-	-	-	-	-	-	-	3,270
12.Oceania	13	85	244	-	-	-	-	-	-	-	342
Northbound Total	8,597	132,164	131,378	16,179	5,424	-	-	-	-	-	293,741
Grand Total	17,501	260,896	261,364	32,271	11,702	-	-	-	-	-	583,734

Source) JICA Study Team from SCA Transit Database



Source) JICA Study Team from SCA Transit Database

Figure 2.3.6 Cargo Ton on Containership (Ave. 1997-1999)

2.3.7 General Cargo Carrier

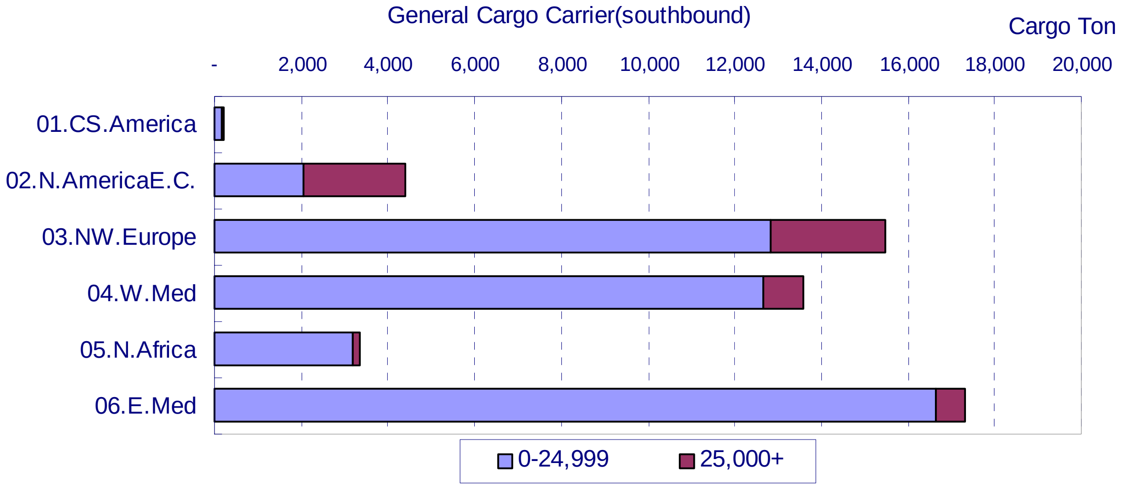
Table 2.3.7 is annual average volume of cargo on General Cargo Carriers during 1997 to 1999.

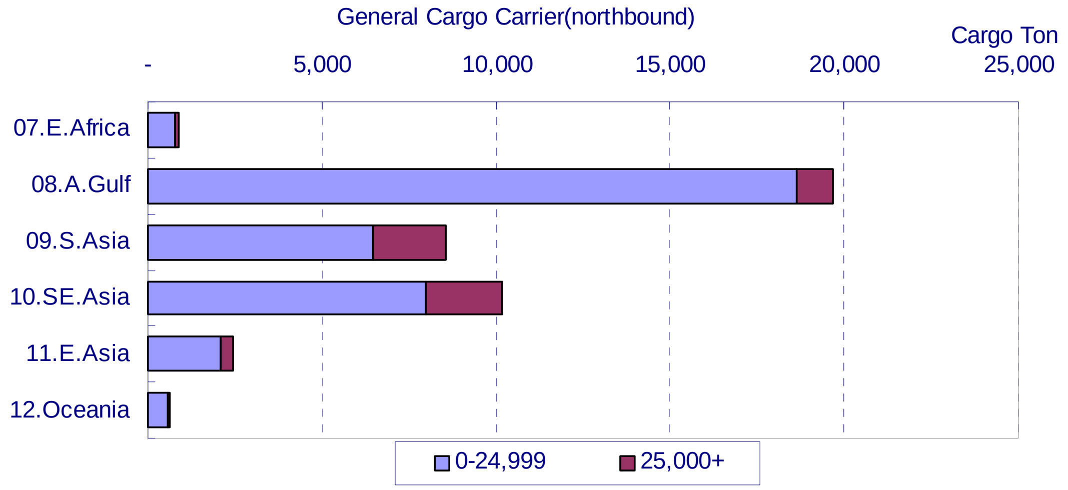
Table 2.3.7 Cargo Ton on Product General Cargo Carrier (Ave. 1997-1999)

(1000DWT)

Origin	0-24,999	25-49,999	50-74,999	75-99,999	100-124,999	125-149,999	150-199,999	200-249,999	250-299,999	300+	Total
01.CS.America	182	43	-	-	-	-	-	-	-	-	225
02.N.AmericaE.C.	2,059	2,326	-	-	-	-	-	-	-	-	4,385
03.NW.Europe	12,826	2,433	207	-	-	-	-	-	-	-	15,467
04.W.Med	12,642	842	103	-	-	-	-	-	-	-	13,587
05.N.Africa	3,179	163	-	-	-	-	-	-	-	-	3,342
06.E.Med	16,626	701	-	-	-	-	-	-	-	-	17,327
Southbound Total	47,514	6,508	310	-	-	-	-	-	-	-	54,333
07.E.Africa	784	113	-	-	-	-	-	-	-	-	897
08.A.Gulf	18,622	1,078	-	-	-	-	-	-	-	-	19,699
09.S.Asia	6,454	2,090	-	-	-	-	-	-	-	-	8,544
10.SE.Asia	7,985	2,170	-	-	-	-	-	-	-	-	10,155
11.E.Asia	2,090	215	155	-	-	-	-	-	-	-	2,460
12.Oceania	571	32	-	-	-	-	-	-	-	-	603
Northbound Total	36,506	5,698	155	-	-	-	-	-	-	-	42,359
Grand Total	84,021	12,206	465	-	-	-	-	-	-	-	96,692

Source) JICA Study Team from SCA Transit Database





Source) JICA Study Team from SCA Transit Database

Figure 2.3.7 Cargo Ton on Product General Cargo Carrier (Ave. 1997-1999)

2.3.8 Car Carrier

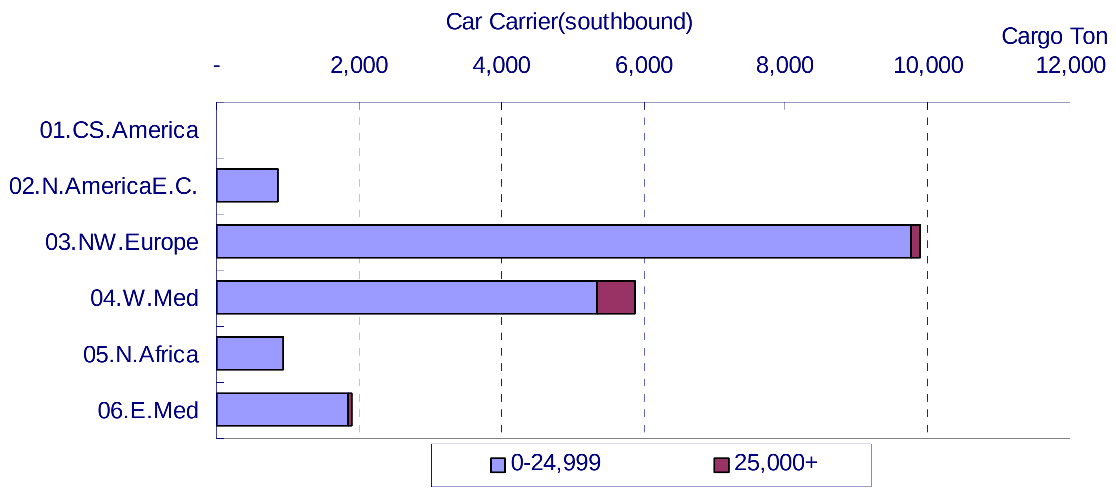
Table 2.3.8 is annual average volume of cargo on Pure Car Carriers during 1997 to 1999.

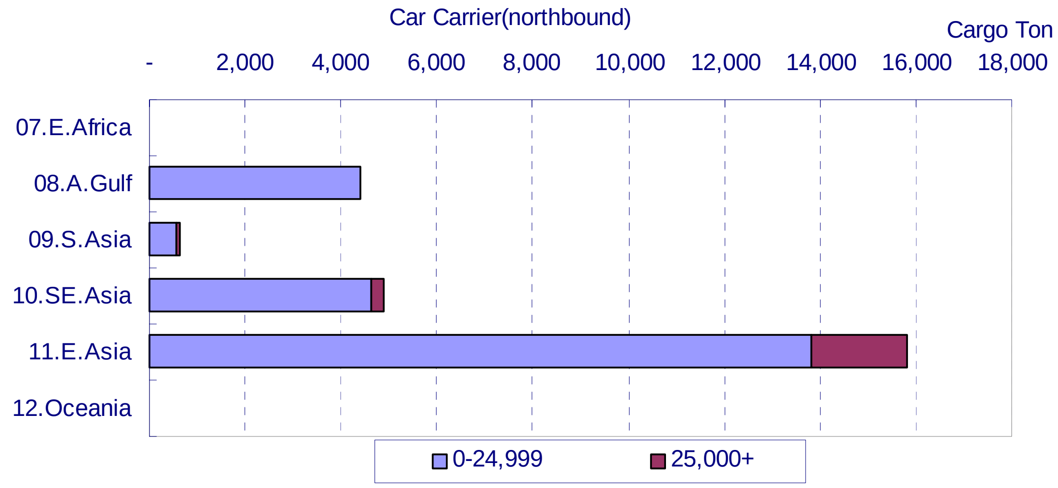
Table 2.3.8 Cargo Ton on Product Car Carrier (Ave. 1997-1999)

(1000DWT)

Origin	0-24,999	25-49,999	50-74,999	75-99,999	100-124,999	125-149,999	150-199,999	200-249,999	250-299,999	300+	Total
01.CS.America	14	-	-	-	-	-	-	-	-	-	14
02.N.AmericaE.C.	869	-	-	-	-	-	-	-	-	-	869
03.NW.Europe	9,767	138	-	-	-	-	-	-	-	-	9,905
04.W.Med	5,345	537	-	-	-	-	-	-	-	-	5,882
05.N.Africa	938	-	-	-	-	-	-	-	-	-	938
06.E.Med	1,852	41	-	-	-	-	-	-	-	-	1,893
Southbound Total	18,785	716	-	-	-	-	-	-	-	-	19,501
07.E.Africa	22	-	-	-	-	-	-	-	-	-	22
08.A.Gulf	4,414	-	-	-	-	-	-	-	-	-	4,414
09.S.Asia	558	67	-	-	-	-	-	-	-	-	626
10.SE.Asia	4,640	239	-	-	-	-	-	-	-	-	4,879
11.E.Asia	13,827	1,934	61	-	-	-	-	-	-	-	15,822
12.Oceania	21	-	-	-	-	-	-	-	-	-	21
Northbound Total	23,483	2,240	61	-	-	-	-	-	-	-	25,784
Grand Total	42,268	2,956	61	-	-	-	-	-	-	-	45,285

Source) JICA Study Team from SCA Transit Database





Source) JICA Study Team from SCA Transit Database

Figure 2.3.8 Cargo Ton on Product Car Carrier (Ave. 1997-1999)

Chapter 3 Port Development

3.1 El Sokhna Port Development

In March 1998, the Government of the Egypt initiated the project of development of the area located north west of the Gulf of Suez near Alsukhna based on the economical studies presented during the previous five years. The Government decided to operate the Port in BOT (Build, Operate and Transfer) basis for the first time in Egypt. The concession negotiation between the Red Sea Ports Authority (underneath of MOT) and SSA (Stevedoring Services of America), a Seattle based American company came to an agreement for a 25 years leasing contract which was signed in May 1999.

SSA, the successful bidder was officially nominated as the operator of the new port. The port operator will be responsible for:
Container Terminal Facilities Construction on the land reclaimed
Surface Building Construction
Bulk Terminal Facilities Construction
Port Operation for both Container and Bulk
Administration of Utilities within the Boundary of the Berths

In May 1998, one year prior to the concession agreement of port operator, the construction of the quay wall was tendered out between 13 international constructors specialized in the construction of quay walls using diaphragm wall technique. Six bids were submitted and the winning bid was from Archirodon Co., a Greek constructor, who is currently working in the construction of the quay wall. The construction works are almost at the final stage at the time of the end October 2000.

The port is designed to accommodate ships with dimensions up to 350m length, 50m beam and 15m draught (actual draught is 17m). The Government has started the extension of ENR railway network from Adabya down south to the port. This rail siding will be at the terminal around June 2001. SSA is going to order two super Panamax gantry (possibly 22 across) cranes by the end of 2000, and if ordered they will be installed within 18 months. Main container handling equipment in the yard will be two tire-mounted-yard-cranes and some reach-stackers for the first phase with the projected yearly throughput of 150,000TEU and yard stacking capacity of 45,000 TEU. All those boxes are domestic containers or for export. Without any doubt the new port, together with one container terminal and two bulk terminals, is Egypt's most advanced port and will contribute to the economic development of the Gulf of Suez and Egypt as a whole.

According to SSA, the marketing people are approaching to some prospective shipping lines including APL and UASC (United Arab Shipping Corporation). APL has a long tradition in the trade between Egypt and Indian Subcontinent/Asia. Their container ships are maintaining shuttle service connecting those areas, thus it is observed that if conditions are satisfied for passing Suez, they are ready at any moment to start serving Mediterranean ports.

3.2 Port Said East Port

JICA Study Team is maintaining a close communication with SCCT (Suez Canal Terminal S.A.E.) administration office in Cairo. SCCT is a young organization, just newly established in January 2000 based on the contract signed at the end of 1999. Their Cairo office is opened in May 2000 and quite limited numbers of people, mainly administration, are working. The managing director is from MSL and the general manger in charge of container terminal planning is from P&O Ports. Their civil consultant is a three nationalities joint venture (Egypt/Holland/British).

According to SCCT, the first phase of the project will be only for container terminal although some comments regarding the industrial zone are found in the brochure of the project, which will be realized in a long-term plan. Also according to the explanation by SCCT, the dredging operation at the site is, by and large, going on schedule up to the turning basin beyond which dredging is SCA's responsibility.

SCCT is aiming at the grand opening of the new terminal on January 1st 2002 and anxious about substantial delays in quay construction which is one year behind the original schedule.

Regarding marketing of the new terminal, although SCCT is not MSL itself, they are working at some prospective shipping lines. Their marketing efforts are classified the following two points:

Working at some minor Mediterranean shipping lines that have plans to extend their service routes to Red Sea ports and further through Suez.

Working at some major lines such as MOL, APL and Hyundai whose service networks to Mediterranean ports are weaker than that of their competitors.

It is observed that if SCCT succeeds in inducing some major lines to use the new terminal as their hub for feeder service dedicated to Mediterranean feeder, the expected numbers of containers will be substantial and the numbers of container ships through Suez will surely increase. However the marketing efforts have just started and further because SCCT is not MSL itself, although MSL holds 30 percent of the capital, their marketing is not so direct as some other container terminal owned and operated directly by owner shipping lines.

About the throughput capacity of the new terminal will easily become around one million TEU judging from the performance in the case of Salalah of Oman. In case a half of the total handling containers are transship via Suez connecting Mediterranean and Red Sea, the numbers of container ships calling East Port Said will be around 250 x 1000 TEU ships (500,000 TEU divided by 2 because of transshipment operation)

In conclusion, SCCT in East Port Said will have a possibility of influence on Suez Canal subject to a careful charging policy to encourage the feeder activities of the prospective user lines.

Chapter 4 Possibility of alternative routes

4.1 Panama Canal

The Panama Canal is an alternative route to some of the east-west international sea trade that transits the Suez Canal. Because there is a portion of the potential cargo handled by the Suez Canal that can also be routed across the American continent, via the Panama Canal, the potential future development of this route is important to analyze. This route can be considered to be both a direct or indirect competitor to the Suez Canal, depending on whether exporters are making route choices or importers are considering shifting supply source countries due to lower delivered transportation prices or higher quality transportation services.

4.1.1 The Panama Canal at present

(1) Cargo

During Fiscal Year 1999, the primary growth in cargo tonnage through the Panama Canal was recorded in shipments of grain and containerized traffic predominantly on Asian routes. Cargo originating in Asia went up by 16.2% to 66.8 million tons, although cargo to Asia declined slightly by 2.5% to 27.4 million tons.

The largest single commodity through the Panama Canal for the past thirteen years has been grain, which reached an all time high of 44.2 million tons during Fiscal Year 1999, up by over 23% on the previous year. Within this category, the main commodity is corn, which moves primarily from the U.S. Gulf coast to Japan (12.9 million long tons). US soybean shipments also increased significantly with exports increasing to Japan, Taiwan, Philippines and Thailand.

Panama Canal containerized cargo increased by 3.6% to an all-time high of 29.5 million long tons, with the main route being the Asia to U.S. East Coast (up 3.9% to 11.8 million tons). Volumes of crude oil continued to decline, with a 24% drop, mainly from Ecuador. The drop in phosphate shipments from the U.S. to Asia was 28.1% to 5.4 million tons.

Significant growth was registered in the shipment of automobiles through the Panama Canal on their important Asia to US East Coast trade route. Reflecting the high value per ton of automobiles, this commodity category represents some 6.8% of Panama Canal revenue despite the small share of Panama Canal tonnage.

Five major trade routes, or origin-destination pairs, account for 76% of Panama Canal cargo tonnage, with just one, between East Coast North America and Asia, makes up 44% of Panama Canal cargo tonnage. The other major routes link the East Coast of North America with other Pacific locations and Europe with the West Coast of the Americas. The Panama Canal is particularly important to trade in the Western hemisphere. About 64% of Panama Canal business originates or is bound for the US and about 14% of total US trade makes use of the Panama Canal. The Panama Canal is the major trade route also for some countries in Latin America, where the Suez Canal is not an alternative route.

(2) Panama Canal Ship Size

In order to provide a better understanding of the Panama Canal as an alternative to the Suez Canal, it is important to acknowledge the influence of vessel size. As with the Suez Canal, there is a draft restriction on vessels transiting the Panama Canal. However, the draft limitation of the Panama Canal is fixed from the depth of the lock chambers rather than the dredged canal channel depth. The operating draft limitation is 38.5 feet in times of normal water conditions in the Panama Canal. The only way to deepen is to come up with the funding to build new lock chambers. The lock chamber dimensions also limit the beam of vessels to 106 feet and the length to about 950 feet. For most of the last fifty years, only a limited number of tankers and bulkers were commonly built in the world vessel fleet with dimensions that exceeded those of the Panama Canal. However, the continued competitive pressure for economies of scale in shipping have led to ship owner decisions to build and operate newer vessels that will not fit through the Canal. Every year now, these post-Panamax size vessels are increasing their share of the world vessel fleet. This means that with the current lock dimensions, the proportion of world sea-borne cargo that the Panama Canal can handle declines. From this perspective alone, the Panama Canal is less and less a viable alternative to the Suez Canal.

Within that portion of world vessels that can transit the Panama Canal, the average size of the vessels transiting the Panama Canal has been increasing over time. An ever-greater percentage of the vessels transiting the Panama Canal each year are of Panamax size, the largest that can fit through the locks. Obviously the worldwide trend in vessel size ultimately works against the Panama Canal with the dimensional limits on the existing locks. Over time, a smaller and smaller percentage of the world vessel fleet capacity is able to transit the Panama Canal, which works to the advantage of the Suez Canal for competitive route traffic during the next twenty years. The introduction in 2000 of new all-water container services using the Panama Canal between Asia and North America's East Coast should not be viewed with alarm by the Suez Canal. This situation is an exception to the larger trend in use of Post-Panamax size container vessels on pendulum services between the West Coast of North America, Asia, the Middle East, Europe, and the East Coast of North America. As increasing numbers of Post-Panamax size container vessels are entered into service, the share of container traffic using the Panama Canal will continue to decrease on these trade routes.

(3) Revenue Structure

For most of the Panama Canal's history, Panama Canal tolls were set by the Panama Canal Commission and approved by the US government. This led to a very simplistic rate structure with little management flexibility left to Panama Canal management. With the end of US control of Panama Canal Authority toll policy with the hand over, the future of Panama Canal's toll rates will likely be a more complex and secretive. This is good for Panama Canal Authority management and for the maximization of revenues but makes planning decisions by Panama Canal competitors more difficult.

The distribution of traffic across Panama Canal market segments is different than that observed for the Suez Canal, in terms of both number of canal transits and toll revenue. The largest Panama Canal market segment is dry bulk, accounting for 25% of transits and 35% of toll revenue. Other important segments are full container ships and tankers, especially when considered in terms of toll revenue. The combination of dry bulk, containerships, tankers and vehicle carriers account for 75% of Panama toll revenues versus only 50% of Panama Canal transits. This reflects the larger carrying capacity of these vessel types. Reefers, general cargo vessels, break bulk and other smaller cargo vessels represent 33% of transits and just 22% of Panama Canal revenues.

4.1.2 Perspective of the Panama Canal

It is important to note that manufacturing and assembly operations in Far East Asia have, over the last 20 years, shifted toward Southeast Asia, representing a move from Japan, Hong Kong and South Korea to the West and South, including Southern China. From these locations, some containers shipped to the U.S. East Coast are now moving via the Suez Canal, thereby bypassing both the Panama Canal and the U.S. land bridge. The reason for this is that there are significant timesavings by shipping from, Singapore, for example, to the U.S. East Coast ports in comparison with the Panama Canal route.

The Panama Canal serves primarily east-west sea-trade routes with the largest Panama Canal trade volume being agricultural exports from United States to Asia. There is also some north-south trade activity between North and South America that uses the Canal, but it is less of a potential for affecting the Suez Canal. The most significant characteristic of the Panama Canal is the restriction on ship size due to the dimensions of the Panama Canal locks. There are studies underway by the Panamanians that are considering the construction of new locks that could potentially alter the affect of the traditional dimension restriction on Panama Canal shipping.

One reason for the consideration of new lock construction in Panama is that the Panama Canal has been operating at historically high rates of utilization in terms of total canal transits for the last several years. For perspective on the operations of the Panama Canal it is noted that there are about currently about 13,000 commercial ocean-going vessel transits of the Panama Canal annually and total annual cargo tonnage handled is about 200 million long tons. Key commodities handled include grain, petro-chemicals, bananas, containerized cargoes, crude oil, phosphates, and manufactures of iron and steel. From these operations the Panama Canal is earning toll revenues and other associated transit revenues (including pilotage) of about $US 700 Million.

The current capacity of the Panama Canal is approximately 15,000 transits, including those made by non-commercial ocean-going vessels. This equates to approximately 42-45 maximum sustainable canal transits per day. The quality of service provided by the Panama Canal is directly related to the capacity for meeting transit demand. As such, the ideal number of transits at the moment is closer to 38-39 transits per day. As the number goes above this level, operational problems begin to surface, including an increase in Canal Waters Time (CWT) which is measured as the period a ship is at the waterway and ready for transit until the transit is complete. The Panama Canal Authority has stated that they have an operating policy objective to have maximum CWT of 24 hours, yet in 1999 the average CWT rose to over 32 hours per transit.

The Panama Canal Authority has taken significant steps in recent years to provide increased transit capacity. This has included the widening of the Gaillard Cut, the augmentation of the tugboat fleet, design and procurement of additional locomotives for the locks, modernization of the vessel traffic management system, hydraulic conversion of miter gates and rising stem valves moving machinery and automation of locks machinery controls. This program it taking several years and is costing approximately $US 1 billion to complete. They intend to complete all of these steps by the end of 2002. The result of this major capital program will be an increase in the throughput capacity of the Panama Canal to a maximum sustainable level of about 48-50 transits per day. In order to have an average CWT of about 24 hours, the operating capacity will be approximately 43-44 transits per day, which translates to an annual level of about 17,000 Canal transits.

Additional capacity increases for the Panama Canal beyond this level would require the huge capital expenditures associated with the construction of new locks, with costs in the billions of dollars. This would be an enormous step for the Panama Canal, especially as it is now owned and operated solely by the Panamanian government. There are both considerable financial and environmental obstacles to the construction of new Panama Canal locks, which calls into question the real potential for further capacity increases.

The long-term choice for the Panama Canal is to try to assemble the international funding for the huge investment required to build new locks or to manage operations at maximum capacity within the constraints of the existing locks. Though the Panama Canal Authority has stated that its current management has already decided for new locks, the financial and political obstacles to realizing this goal are many. There are those in Panama who advocate managing the existing Panama Canal system for maximum profit instead of risking creation of international political opposition from the environmental impacts of building new locks. There are Panamanians who desire a new focus instead on tourism as an alternative source of income to the country. Panama has not exploited their country's tourism potential nearly as much as Egypt has been able to do in the world tourism market. Finally, the potential for obtaining the billions of dollars in international financing required to pay for a new Panama Canal lock system is also in doubt, because traditional international infrastructure lenders such as the World Bank recently have become much more concerned with the environmental consequences of their lending decisions. Therefore it is expected that the long-term position of the Panama Canal route as an important alternative to Suez Canal routing will decline. The risk to the Suez Canal is if Panama succeeds in obtaining funding and construction of new locks, then new transit capacity in Panama could increase the share of potential world cargo using this alternative route.

4.2 Arctic Ocean

4.2.1 The Arctic Ocean at present

The Arctic Ocean route is one of the sea-borne routes from Europe (e.g. Hamburg) to East Asia (e.g. Yokohama). It is approximately 10,400km long, which is shorter than the route via the Suez Canal. It takes about 20 days to go via the Arctic Ocean from Hamburg to Yokohama, while it takes 30 days through the Suez Canal. For a long time, however, the route remained merely as a dream among quite a limited number of people in the world-shipping circle and in fact has been inaccessible particularly to commercial ships, due to the harsh natural conditions of the Arctic Ocean. Navigation is possible only for a short period of a year and even in summer season; ships must be lead by an icebreaker. An opening of the Arctic Ocean Route would greatly facilitate international shipping because that would make it possible to use two big routes, a northbound through the Arctic Ocean, and a southbound through the Suez Canal all the year round. The Arctic Ocean Route will also help economic development through increased traffic over the region.

INSROP (International Northern Sea Route Program) was started in 1993 as a joint international project with Fridtjof Nansen Institute of Norway, the Central Marine Research and Design Institute of Russia, and the Ship and Ocean Foundation of Japan. The project spanned a period of six years, with some 390 researchers from 14 countries working to overcome the numerous technological difficulties. Data obtained from the research were analyzed and integrated into a navigation simulation for specific routes. The purpose of the data analysis is to identify problems that need to be addressed including economic efficiency and to propose the feasible solutions.

4.2.2 Perspective of the Arctic Ocean Route

INSROP is now at the phase of data evaluation and will proceed to the next phase of making some feasible service plans through the Arctic Ocean. The Russian Government is expected to play a main role in the next stage and exact time schedule has not been fixed. This project could be a reality within a long time. If it is realized, the transit distance between Europe and Far East will be shortened by about 40%. It is hoped that SCA staff will carefully watch the development of this project.

However, even in the future, the Arctic Ocean route will be in limited use. It will be hard to overcome the freezing in winter season and the severe circumstances through a year.