NO.

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

ANNEX V TOLL POLICY AND ISSUES
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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Chapter 1 Influence of Toll

1.1 Outlook on the Suez Canal

Since its opening, the Suez Canal has been playing an important role both in the world economy and in Egyptian economy by connecting the economies of the east and west.

The Canal connects the Mediterranean Sea with Red Sea over a distance of 162km and it is the world longest channel without locks. The channel has been widened and deepened to meet the demand of international shipping.

The Canal was closed from 1967 to 1974. This came at a time when the world economy was rapidly growing, in particular, there was an increasing demand for crude oil transport. Hence, the impact which the closure of the Canal had on the world economy was very severe.

Although the Canal's relative share in terms of cargo transiting the Canal versus world seaborne cargo and its economic contribution to the Egyptian economy have been decreasing, it is still playing an important role both in the Egyptian economy and in the world economy.

About 6% of the world's seaborne cargo is now transiting the Canal compared to 3-4% for the Panama Canal.

As to the short cut effect, the distance via Suez Canal route is 29% of distance via the Cape route in traveling between the port of Mumbay and port of Ismir and 71% in case between Singapore and Rotterdam. Considering the maritime shipping trunk line connecting the west and the east of the Canal, it can be said to constitute the artery of world economic activity.

The role the Canal plays in the Egyptian economy is also important. The importance of the Canal toll revenue in the national economy can be identified by looking at its share in the national government's current revenue and in the foreign currency earnings in the balance of payment.

In the national budget account, the contribution is allocated to tax revenue which the SCA pays in the form of industrial and commercial tax (42% of net profit) and to fees in the form of royalty (5% of toll revenue) and to profit transfer in terms of surplus. Tax and fees are not explicitly denoted in the statistics but the profit transfer is explicitly denoted as 2,914 million LE in 1998/99 (around 5% of the current revenue of the state budget). Although the share in the national budget is decreasing relative to that of tax revenue, the amount of transfer from SCA is still almost equivalent to that from other major authorities (Petroleum Authority of Egypt and Central Bank of Egypt).

Looking at the foreign currency earning in the balance of payment account, Suez Canal revenue account for 9% of the total, almost twice that of petroleum exports in 1998/99.

Considering the negative current account balance of Egypt, the Canal is still important source of foreign currency revenue.

Table 1.1.1 Suez Canal Toll as a GDP Share

(Lemn)

GDP at Factor Cost (1996/97 prices)	**97/98**	**share**	**growth rate**	**98/99**	**share**	**growth rate**
GDP	253,090	100%	5.7	268,398	100%	6
Commodity Sector	126,209	50%	6.5	133,335	50%	5.6
Productive Service Sector	81,242	32%	4.8	87,024	32%	7.1
Transport & Communication	17,300	7%	6.8	18,355	7%	6.1
Suez Canal	***6,502***	***3%***	***0.1***	***6,519***	***2%***	***0.3***
Trade	44,015	17%	6.2	46,670	17%	6
Finance	10,340	4%	10	11,550	4%	11.7
Insurance	202	0%	11	221	0%	9.4
Restaurants & Hotels	2,883	2%	-24.7	3,709	1%	28.7
Social Seervice Sectors	45,639	18%	5.1	48,039	18%	5.3

Table 1.1.2 Suez Canal Toll in the State Budget Revenue

(Lemn)

The State Budget Revenue	**96/97**	**97/98**	**98/99**	**share97**	**share98**	**share99**
total revenue	**64,498**	**67,963**	**71,295**			
current revenue	**60,753**	**63,889**	**66,626**			
central government	**57,179**	**60,035**	**62,449**			
tax revenue	***40,518***	***43,962***	***47,149***	***67%***	***69%***	***71%***
Non tax revenue	***16,661***	***16,073***	***15,300***	***27%***	***25%***	***23%***
profit transfers from;	11,423	10,780	9,802			
The petroleum authority	4,788	3,870	2,227	8%	6%	3%
Suez Canal authority	***2,828***	***2,940***	***2,914***	***5%***	***5%***	***4%***
Central Bank of Egypt	2,587	2,617	3,222	4%	4%	5%
Others	1,220	1,353	1,439			
Fees	1,427	1,483	1,532			
Miscellaneous	3,811	3,810	3,966			
Local Government	**2,354**	**2,426**	**2,601**	**4%**	**4%**	**4%**
Service Authorities	**1,220**	**1,428**	**1,576**	**2%**	**2%**	**2%**
Capital Revenue	**3,745**	**4,074**	**4,669**			

Table 1.1.3 Suez Canal Toll in the Foreign Currency Revenue

(Lemn)

	92/93	**93/94**	**94/95**	**95/96**	**96/97**	**97/98**	**98/99**
Transfers	19,127.8	13,651.7	14,251.4	11,957.0	14,070.3	15,613.4	16,541.7
share	32%	25%	22%	19%	20%	23%	24%
Suez Canal	**6,472.8**	**6,714.5**	**6,986.6**	**6,397.9**	**6,276.1**	**6,029.4**	**6,015.6**
share	**11%**	**12%**	**11%**	**10%**	**9%**	**9%**	**9%**
Travel	7,918.3	6,001.6	7,802.5	10,215.8	12,377.1	9,979.8	10,989.6
share	13%	11%	12%	16%	18%	15%	16%
Petroleum	7,040.8	5,977.3	7,383.2	7,555.0	8,749.8	5,866.2	3,396.0
share	12%	11%	12%	12%	12%	9%	5%
Others	18,767.2	21,792.8	27,065.6	27,580.2	28,899.4	31,015.7	32,117.0
total	**59,326.9**	**54,137.9**	**63,489.3**	**63,705.9**	**70,372.7**	**68,504.5**	**69,059.9**

It is therefore urgent to have a tool to forecast the toll revenue based on an accurate estimation of transit demand and more profitable toll structure as well as to diversify revenue sources both for SCA and the Egyptian Government.

1.2 Influence of the Canal Toll on the world shipping and economy

To grasp the influence of the Canal toll on the world shipping and economy, we can refer to the bitter experience of the closure of the Canal in the past.

The Suez Canal has been playing a very important role as a major maritime transport route between the countries east of the Canal and those west of the Canal for more than one century. The Canal offers amazing savings in transport distance when compared to the Cape route. For instance, the voyage distance between Tokyo and Rotterdam via Suez Canal is 1/4 shorter than via the Cape route and the distance between Bombay and Odessa is cut by 2/3.

Table 1.2.1 Shortening Effect of Maritime Distance by the Suez Canal

(nautical miles)

Journey	Maritime Distance		Shortening Effect	
	via Suez Canal (S)	round the Cape of Good Hope (C)	Difference	S/C
Rotterdam - Ras Tanura	6,436	11,169	4,733	57%
- Bombay	6,337	10,743	4,406	59%
- Singapore	8,288	11,755	3,467	71%
- Darwin	9,377	11,319	1,942	83%
New York - Ras Tanura	8,281	11,794	3,513	70%
- Darwin	11,222	11,954	732	94%
Ismir - Bombay	3,422	11,694	8,272	29%

Source) "World Shipping Encyclopaedia V.9.3", Oct.2000, Fairplay

Shortening of the transport distance will be reflected in the transport cost and time reduction and has a great influence on the various cost items of maritime transport. Through these effects, the Suez Canal has contributed to the development of maritime transport between the regions connected by the Canal.

The volume of cargo transiting the Canal once grew at a rate comparable to that of the total volume of world maritime transport. Seventy three million tons of cargo passed through the Canal in 1950 and 169 million tons of cargo (around twice that in 1950) was transported via the Canal ten years later. In 1966, one year before the closing of the Canal, 242 million tons of cargo (176 million tons of oil and 66 million tons of dry bulk cargo) transited the Canal, representing 14% of the world maritime transport volume. The Canal's share of the world maritime transport volume declined, however, due to the Canal's closure in 1967.

In 1990 the volume through the Canal recovered to its 1966 level. Although the share of tanker cargo had fallen, the total volume amounted to 272million tons, which was 7% of the world seaborne cargo. Moreover, the growth rate of Canal transit cargo was a

remarkable 7.9% per annum compared to an 0.8% growth rate for world seaborne cargo during the same period. From 1990 to 1999, average annual growth rate of total transit cargo (1.4%) was less than that of world seaborne cargo (2.9%), mainly due to the decreasing share of tanker cargo transiting the Canal (5% in 1990 and 1% in 1999).

Although the share of Canal transit cargo in the world seaborne cargo has decreased, the growth rate of dry cargo transit is still higher than that of world seaborne cargo. Between 1990 and 1999, the annual growth rate of dry cargo transiting the Canal was 4.4% while that of world seaborne cargo was 3.0%. On the other hand, tanker cargo transit has decreased since the opening of the SUMED pipeline running parallel with the Canal and Iraq-Turkey pipeline. As a result, total cargo transit has shown a lower growth rate than that of world seaborne cargo.

Table 1.2.2 Cargoes carried through the Suez Canal

(million metric tons)

Year	Cargo	Cargoes Carried through the Suez Canal			International Sea-born Trade (I)	S/I
		Southbound	Northbound	Total (S)		
1966	Tanker Cargo	9	167	176	950	19%
	Dry Cargo	39	27	66	820	8%
	Total	48	194	242	1,770	14%
1980	Tanker Cargo	14	28	42	1,871	2%
	Dry Cargo	26	59	85	1,883	5%
	Total	40	87	127	3,704	3%
1990	Tanker Cargo	14	66	80	1,755	5%
	Dry Cargo	103	89	192	2,253	9%
	Total	117	155	272	4,008	7%
1999	Tanker Cargo	5	18	23	2,223	1 %
	Dry Cargo	148	136	284	2,950	10 %
	Total	153	154	307	5,173	6 %

Notes) Tankers Cargo in this Table means Crude Oil and Petroleum Products.

Source) "Suez Canal Yearly Report", SCA and "Review of Maritime Transport", UNCTAD

The use of the Canal has traditionally played an important role for certain cargo and transport between certain regions. In 1966, for instance, 36% of oil loaded at the ports in the Arabian Gulf was transported via Suez route and 1/3 of the oil imported by the west European countries passed through the Canal.

In 1966, the volume of dry cargo passing through the Canal reached 66 million tons, equivalent to 1/4 of total transit cargo. Most of this dry cargo was handled in ports of Europe and America. However, this represented only 5% of the total dry cargo handled at the ports of both regions. On the contrary, dry cargo transported via the Suez route has great importance for the countries south and east of the Canal. For instance, 41% of the dry cargo handled in the ports of the Arabian Gulf and 32% of the dry cargo handled in the ports of the Red Sea and East Africa and 24% of that handled in the ports in South and South-East Asia passed through the Canal.

Table 1.2.3 O-D of Cargoes carried through the Suez Canal in 1999

(million metric tons)

Origin	Region	Destination	Total Share
Through SC		Through SC	
15	East & S.E. Mediterranean	31	15%
32	North Mediterranean	40	23%
12	West & S.W. Mediterranean	18	10%
23	Black Sea	5	9%
51	North, West Europe & U.K.	53	34%
7	Baltic Sea	1	3%
10	America	5	5%
3	Others	1	1%
153	(Southbound) - Total - (Northbound)	154	100%
25	Red Sea	43	22%
5	East Africa & Aden	2	2%
18	Arabian Gulf	19	12%
20	South Asia	25	15%
65	Southeast Asia & Far East	64	42%
22	Australia	1	7%
-	Others	-	-
154	(Northbound) - Total - (Southbound)	153	100%

Source) "Suez Canal Report December 1999", SCA

Table 1.2.3 shows regional distribution of cargo transited through the Canal in 1999. North of the Canal, North, West Europe and U.K. is the region with the largest share (34% of the total) followed by North Mediterranean (23%) and West, South West Mediterranean (15%). South of the Canal, South-east Asia and Far East has the largest share (41.9%) followed by Red Sea (22.1%), South Asia (14.6%) and Arabian Gulf (11.8%). At the time of this study, a comparison of shares of transited cargo by each region with that of world maritime cargo could not be made, however, it can be said that regions affected by a higher toll would be much wider than in 1966, because of the high growth of dry cargo, especially by container

carriers, in spite of the drastic decline in tanker cargo (compare with Table 1.2.4).

Table 1.2.4 O-D of Dry Cargoes carried through the Suez Canal in 1999

(million metric tons)

Origin	Region	Destination	Total Share
Through SC		Through SC	
15	East & S.E. Mediterranean	30	16%
31	North Mediterranean	35	23%
10	West & S.W. Mediterranean	14	8%
22	Black Sea	5	10%
50	North, West Europe & U.K.	47	34%
7	Baltic Sea	1	3%
10	America	3	5%
3	Others	1	1%
148	(Southbound) - Total - (Northbound)	136	100%
18	Red Sea	42	21%
5	East Africa & Aden	2	2%
7	Arabian Gulf	19	9%
20	South Asia	24	15%
65	Southeast Asia & Far East	61	44%
22	Australia	1	8%
-	Others	-	-
136	(Northbound) - Total - (Southbound)	148	100%

Source) "Suez Canal Report December 1999", SCA

The closure of the Canal in 1967 brought severe consequences to the world maritime transport, especially in the form of higher transport cost. The severest influence was on oil transport and the maritime foreign trade of the countries of East Africa and South and Southeast Asia. The influence on oil transport was especially great and that on oil transport from the Middle East to Europe was, inter-alia, immense. At the same time, it caused a sudden increase in the demand for the world tanker fleet. Additional supply of the oil tanker fleet to meet this increased demand was not so difficult, though it linked with the enlargement of vessel size.

Sudden change in the maritime transport condition for the countries south and east of the Canal made various trade relations messy. Additional increase in the trade cost such as transportation, insurance and other trade related cost items led to a loss in competitive power of export goods in the existing market and also to a price increase of the imported goods. Major industries of certain countries such as banana production in Somalia were seriously damaged. Moreover, the change in the maritime transport routes by the closure of the Canal affected various fields of economy and resulted in an economic slowdown in the countries of the related regions.

Total loss in the export to Europe incurred by East Africa and Southeast Asia was said to amount to 560 million US$ and the loss in 1969 and 1970 was estimated as around 13% of

total export from these regions to Europe.

The closure of the Canal resulted in oil exports being switched from the Middle East to regions closer to the consumption countries such as oil production areas in North Africa and West Africa. Total amount shifted was around 40 million tons per annum at a value of 500 million US$/year for the years up to 1970 and totaled around $2,000 million.

Other various economic impacts were felt with the closure of the Canal. Insurance and commercial credit costs were raised due to the longer delivery time of products and goods. The ports nearby the Canal such as Aden, Djibouti and Port Sudan experienced a severe decline in port activities.

If the project to deepen the Canal to 40ft by the end of the year 1967 could have been completed, fully laden 60,000 DWT vessels would have been able to transit the Canal and 200,000 DWT ballast vessels would have been able to transit the Canal. By 1967, 90% of the tankers and oil/bulk carriers in operation and/or under construction could transit the Canal at least in ballast. At the end of the year 1971, almost 1/2 of these vessels in operation and/or under construction were larger than 200,000 DWT. Therefore, these vessels could not transit the Canal whether in laden or ballast condition.

Thus the closure of the Canal added a new factor to be considered in the construction of the large tankers. Large tankers with rather low construction and operation costs such as the vessels which prevailed in the late 1960s showed scale merit in comparison with smaller vessels. As a result, in the case of oil transport from the Gulf of Persia to Europe, transport cost by large tanker via the Cape route, in spite of the much longer voyage distance, became less than when transported by smaller tanker via the Suez route before the closure.

Since 1970, however, both the construction cost and operation cost of vessels, especially for large tankers, increased to a large extent. Therefore the cost advantage of the large tanker had decreased and transport by large tankers over longer distances might have lost its advantage over transport by smaller tanker over shorter distances. It was reported that if it were realized, then oil transportation cost from the Gulf of Persia to Europe, especially to the ports in Mediterranean Sea would decrease after reopening of the Canal.

As a result of the Canal closure, capacity of the pipelines to transport Middle East oil to the east Mediterranean base (both under operation and planned) has largely increased. Since some of these pipelines ran or planned to run parallel to the Canal, large tanker can load and unload oil at the pipeline base without restriction by the Canal. If these pipelines are used in combination with the Canal, it will be possible to, (a) increase the oil transport capacity by decreasing the voyage distance of large tankers and (b) avoid the cost increase involved in long distance oil transportation.

Tendency to construct larger dry bulk carriers was observed both before and after the closure of the Canal. Transportation of dry bulk cargo and liner cargo would enjoy the benefit of reopening of the Canal to large extent, since all dry bulk carriers currently under

operation and under construction could transit the Canal.

Increase of transport cost must be borne by the traders and countries which enjoy the benefit of the Canal. The competitiveness of products should not be affected.

Thus the effects of the Canal toll can be roughly grasped through an analysis of its past closure. The composition of the transiting vessels has changed compared with the pre-closure composition. Number of oil tankers transiting the Canal has decreased with the appearance of VLCC and ULCC and also due to the pipelines. These days, the appearance of large container vessels has also changed the composition by decreasing the number of general cargo vessels. Hence, a new toll system will be necessary to meet these changing shipping circumstances. In devising the new toll system the effects experienced after the Canal closure had to be considered.

Higher toll will not always increase the revenue of SCA. It will cause the decrease in transit demand as vessels divert to the route via the Cape. And an extremely high toll would be similar in effect to the closure of the Canal, namely, it would result in a structural change in world trade and a decline in SCA revenue. Therefore, optimal toll should be carefully considered to balance the revenue maximizing motivations of SCA and the traders reflecting the possible trends in world trade patterns. In this context, timely restructuring of toll system is indispensable for the better management of the Canal.

Toll revenue is important not only for the SCA but also for the national economy of Egypt since it is one of the major sources of revenue for the central government, especially foreign currency. Toll revenue becomes the revenue of the central government through industrial and commercial tax (42% of net profit) and royalty fee (5% of toll revenue) and surplus transfer. In 1999 industrial and commercial tax paid is estimated as around US$ 770 million, royalty fee as US$ 89 million, and surplus is US$ 858 million (or LE 2,914 million).

In this context, toll system to maximize net profit rather than to maximize toll revenue is more important from the central government’s view. Therefore, expenditure by SCA for management and operation of the Canal including project investment cost and interest payment as well as the dividend from the affiliate company, all of which are the determinants of the profit of the SCA, are other important factors in deciding the optimal toll system.

Hence, investment in the development of the Canal such as widening and/or deepening should only be done after considering the factors which affect the world trade pattern including possible toll level as well as the necessary period of development within the foreseeable future time span in the world maritime market.

1.3 Macroscopic influence of toll - Theoretical explanations

The influence of toll on the change of transit demand and trade pattern can be theoretically explained as follows.

The shipper's short run transport demand for a trade to a certain foreign market is derived as a function of distance, freight rate of maritime transport. It enables us to construct a demand of transiting the Suez Canal as well as analyze the divergence of transport demand by the characteristics of cargo.

The assumptions made here are rather simple because the purpose of the analysis here is focused on the interaction between transport cost and the trade demand rather than on the demand structure itself.

The following set of assumptions is adopted.

A1. The firm/shipper operates under the condition of perfect competition.
A2. It is located in a certain region/country and sells all of its output of a single homogeneous product at a certain market at a given price outside the country.
A3. The firm purchases all of its inputs locally so that the only transport it requires is for shipping its product to the market.

Then firm's profit maximization behavior is expressed as following equation.

Max. $\pi = (P - Tm \cdot d - Pc - Ts)Q - f(Q)$

(Parameters)

P: price of the commodity at the market
Tm: maritime transport tariff exclusive of port charges and Canal toll and assumed to be proportional to the transport distance inclusive of inland transport
Pc: port charges inclusive of all the cost incurred in the port
Ts: Suez Canal toll
Q: quantity of shipment
f(Q): production cost function of the trade commodity

Then profit maximization conditions are;

$$f'(Q) = P - Tm \cdot d - Pc - Ts \quad (1)$$
$$f''(Q) > 0 \quad (2)$$

Equations (1) and (2) state the usual profit maximization condition that marginal cost f'(Q) equals marginal revenue (P - Tm • d - Pc - Ts), and that the marginal cost curve is rising. Hereafter, marginal revenue is referred to as the net price, denoted P^. With P constant and T = Tm • d + Pc + Ts variable, equation (1) also yields the firm's demand function for trade with respect to freight rate.

If its marginal cost curve is U-shaped, this function is truncated but has the ordinary negative slope (see Figure 1.3.1 and Figure 1.3.2). The truncation occurs because the firm will stop production if the transport cost rises to the point where P^ = P - T is less than the minimum average variable cost; that is, the shut down price Ps.

From this demand function, we can observe the followings;

Obs.1 Demand for trade tends to shrink with the increase of toll (increase of T in Figure 1.3.2).

Obs.2 Aggregated demand function can also be truncated and there might be a level of toll at which some group of transit demand will all disappear.

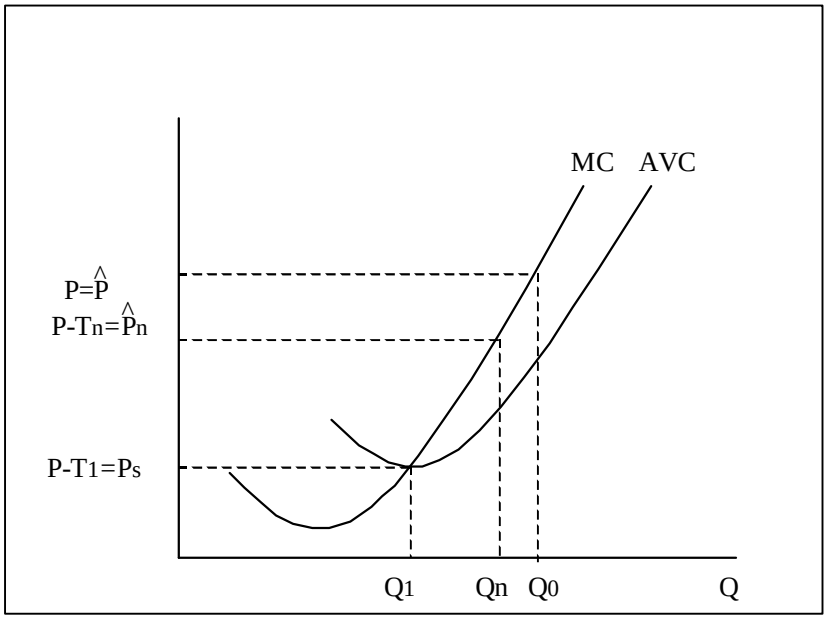


Figure 1.3.1 Relation between Price and Quantity of Shipment

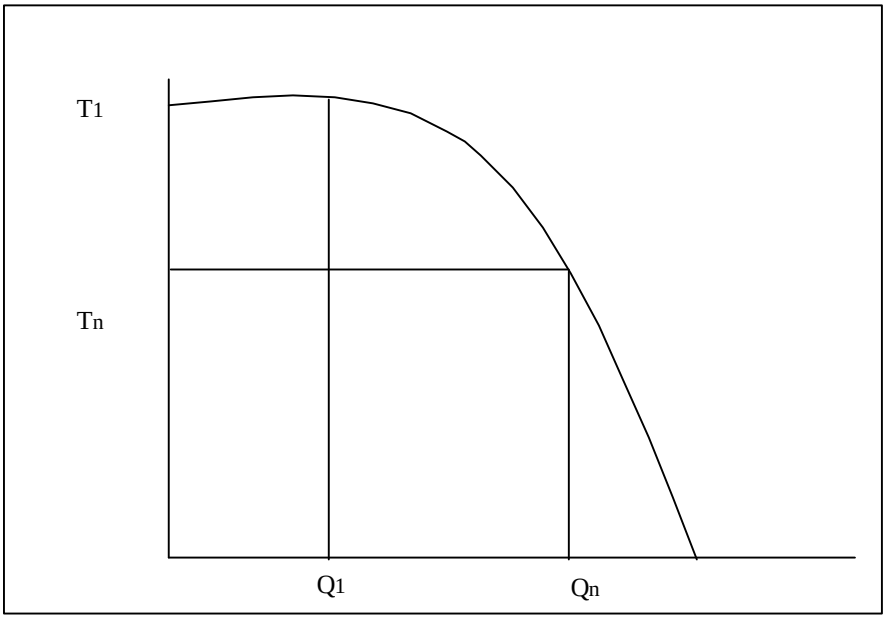


Figure 1.3.2 Relation between Toll and Demand for Trade

Then we can know the maximum distance for trade of this commodity from the following equation.

$$Ps = P - Tm \cdot d - Pc - Ts \quad (3)$$

or,

$$Ps = (1 - \beta)(P - Tm \cdot d - Pc - Ts) / (1+i)^{d/v} \quad (4)$$

In case that inventory cost is to be considered in calculation of net gain

Note) In the case where the transportation time is so long that the net discount price should be considered in the profit maximization behavior of the producers, we had better use the following derivation;

Net discount price is $[(1 - \beta)(P-T)]/(1+i)^t$

Where β : the damage, pilferage, loss or perish ability rate,

i : interest rate

t: the time required to ship the goods from of production to the point of market

Then, demand function is as follows;

$f'(Q)=[(1-\beta)(P-T)]/(1+i)^t$.

Then, maximum distance of trade dm is as follows;

$$dm = (P - Ps - Pc - Ts) / Tm \quad (5)$$

From equation (4) and (5), we can observe the following facts.

Obs.3 If the Canal toll is raised and ocean freight rate exclusive of port charges and toll is unchanged, then maximum distance of trade becomes shorter. Namely, the shipper will change its trade partner to nearer countries, or lose its market if there is not any nearby demand (such trade as of countries south and east of the Suez Canal which were seriously damaged during the closure of the Canal)

Obs.4 For the shipper that trades a higher valued commodity (higher value of P) and has a lower level of shut down price (lower value of Ps), higher toll can be tolerable (for such commodities as containerized cargo).

Obs.5 Time sensitive cargo will change to a more speedy mode or a trade partner will be found if the toll becomes higher than tolerable. (in case that net discounted revenue becomes less than its shut down price in (4))

Chapter 2 Behavior of Shipping Lines and Shippers/Consignees

2.1 Kind and definition of shipping operation

2.1.1 Industrial Carrier

Ocean going shipping activities are mainly carried out by commercial shipping lines. These shipping lines earn revenue in the form of freight charges or vessel charter charges by carrying the cargo of shippers. However, a limited portion of the world's international sea-borne trade is carried out by shippers themselves, using either their own or chartered vessels. This type of vessel is referred to as a "Private Carrier". Further, Private Carrier can be divided into two categories; a "Merchant Carrier" where a shipper owns/charters and operates a ship in order to carry its own goods to its market to sell at a destination, and an "Industrial Carrier" where a shipper owns/charters and operates a ship in order to carry raw material/energy resources to a destination.

In the early stages of shipping, employing Merchant Carriers was a common way of owning/operating ships. However, as the "Common Carrier" (commercial shipping lines) became popular, the Merchant Carrier quickly faded out and is now rarely seen in the international sea-borne trade. In its place, the Industrial Carrier emerged. Some major oil refineries, steel and coal companies were already using a self-transportation system (prototype of the Industrial Carrier) even before World War II. But it wasn't until the 1960s that the Industrial Carrier became an important player. Generally, the portion of ocean freight in the import value of a cargo such as a raw material or energy resource is substantial, especially when the cargo is produced at a remote area and must be transported via a long distance route. The Industrial Carrier became an important tool in securing a reliable sea-borne traffic route.

2.1.2 Commercial Industrial Carrier by shipping lines

Industrial Carrier activities by those ships owned and operated by industrial capital directly posed a challenge to the shipping industry. As a result, some shipping lines started offering their ships under the same conditions with foregoing Industrial Carriers around the mid 1960s, and succeeded in attracting a big part of the industrial cargo from shippers. Currently, the word Industrial Carrier means both the Prototype Industrial Carrier and Commercial Industrial Carrier.

In 1999, about 36% of the crude oil tankers were owned and operated by oil companies and the rest were owned and operated by shipping lines. And of the tankers owned and operated by shipping lines, many of them are under long-term contracts. According to JAMRI, the industrialized rate of the world tankers is about 70%.

It is difficult to grasp the industrialized rate of dry cargo world wide, but JAMRI estimates the figure at approximately 60% while the rest is open for market. Therefore there is fierce competition among shipping companies to capture the dry cargo market. In exceptional cases, some steel mills still operate their own ships to carry raw materials from production

points to mills, but a Commercial Industrial Carrier is employed in the majority of cases. Many of Prototype Industrial Carriers were spun out from organizations of mills and are now commercial shipping lines.

"Shipping Market" consists of shipping lines and cargo. Industrial Carriers and cargo carried by Industrial Carriers are not strictly part of the Shipping Market. It must be remembered that the Shipping Market can be divided into "Liner Market" and "Tramp Market". The Liner Market is not confined to the shipping industry but belongs to a broader trade industry between shipping lines and shippers/consignees of cargo, while Tramp Market exists only among shipping lines/brokers and shippers of tramp cargo, where cargo freights, charterage, voyage charter contracts, trip charter contracts, in various period of terms and volumes are negotiated and contracted.

2.1.3 Pure Car Carriers, LNG/LPG Carriers as Semi-Industrial Carrier

(1) Pure Car Carriers

Today, the transportation of motor vehicles by sea forms part of a complex logistics chain. This has taken the carriage of cars from its early origins in the Tramp Market through to its current position where the spot market has all but disappeared. There are a number of people in the shipping industry who see this trend as the way forward. What looks certainly true in the case of car carriers is that shipping has moved from being a secondary activity into an integral part of the global car business. In this sense, Pure Car Carriers are 100 % industrial carriers, but some of them can be trip or voyage chartered subject to some conditions in a certain group of car producers and shipping lines.

(2) LPG/LNG Carriers

There is no spot market in the LPG/LNG field, because they are project-oriented businesses. All LPG/LNG carriers are built as a part of each project to transport the output together with a pipeline system. Ship’s building cost is included in the total project cost for a whole period of 20 to 30 years. In very rare case, a charterer of LNG/LPG carriers (in most cases a project originator) will deploy ships for an extra voyage to utilize empty space. Strictly speaking, therefore, it is difficult to classify this category of ships as industrial carrier.

2.2 Tramp market and tanker market

2.2.1 Peculiarity of sea-transportation

Shipping Market can be divided into Liner Market, Tramp Market and also "Tanker Market" based on the kind of ships and cargoes. Tanker Market is rather independent from the other two markets due to the nature of liquid crude oil. Liner Market and Tramp Market both deal with dry cargo. The difference between the two lies in the characteristics of the cargo transported. Cargo which is cheap in value but or transported in large volumes (e.g. raw materials for energy, for many industrial products and for food) is generally referred to

as "Tramp Cargo". The first priority for this type of cargo is a "low freight rate", while "transport speed" or "care during transport" are not such important factors. "Liner Cargo", on the other hand, is time sensitive, market sensitive and interest sensitive. Transit time, regularity, frequency and freight rate level of sea-transportation are important factors for Liner Cargo.

2.2.2 Behavior of shipping lines in tramp/tanker market

"Low freight" is a prerequisite for both markets. If a shipping line can provide a low freight rate, it can play a role in the market. A new ship is not necessary; an older ship or a chartered ship is sufficient on condition that the ship is sea-worthy. Because of the openness of the two markets, number of buyers and sellers is numerous, thus the market share of an individual shipping line is quite limited. There is no dominant player in either market, which can event influence over the whole market.

Also, it is difficult for certain members to work together and control the market because size and nature of each shipping line widely differ. For these reasons, free competition is observed in these two markets. Freight rates and charterage are automatically decided in the markets through the so-called invisible hands of Adam Smith and those levels constantly change according to the balance of demand/supply of ships' space. For example, where there is an oversupply of space in one regional market, the freight level in that region will decrease.

However, a shipping line will generally not carry cargo if the freight level is insufficient to reach the break-even point of operation cost. As a result, after a certain period, the freight rate level will recover to a normal level. Both markets have an automatic adjusting function regarding freight level and ships' space. In these markets, cost/profit margins are rarely satisfied for the sake of competition. The range of these markets is worldwide but a level of freight rate at a given time for a given commodity of cargo can be applied to any voyage of any other route as far as they are applied to the same type of ship and same kind of cargo.

2.3 Liner market

2.3.1 Definition of liner market

Liner Market is completely different from Tramp Market and Tanker Market. The value per ton of liner cargo is high while the portion of freight charges in the CIF value is small, thus freight paying power is strong. Typical liner cargoes are: finished goods, semi-finished goods, fresh food, other high value cargo and postal goods. These cargoes are sensitive to transit time, commodity market changes and interest as already explained before. The transportation needs for these cargoes are, therefore, safety, speed, and frequency of shipping. Freight rate level itself is one of the most important concerns of shippers/consignees but the quality of services is as important as freight.

Higher operation cost is needed to transport "Liner Cargo" and naturally higher freight rate

is quoted to shippers/consignees who accept it as far as the quality of transportation service meets the level they request. General cargo of this kind (often called Break-bulk cargo) is traded usually in a smaller volume compared with Tramp Cargo but a stream of cargo flow and places of origin are comparatively fixed. Because the direction and volume of the cargo flow are stable, it is possible for shipping lines to maintain a regular liner route by consolidating a small amount of cargo.

2.3.2 Operation of liner service

Shipping lines in liner services make a public notice regarding "Sailing Schedule" and "Itemized Freight Rate (Freight Tariff)" to shippers/consignees. The service operated under these advertised schedules and freight rates by regular calling vessels are called "Liner Services". An abstract name of "Liner Market" is given to these liner operations between shipping lines and shippers/consignees. Liner vessels, once announced and deployed, are generally fixed to a particular service route and seldom changed. As a result, the service line itself becomes a market in the region, consisting of the shipping lines, the shippers and the consignees.

Further, to maintain a regular frequency and safe and speedy service, a fleet of ships, "Fleet Line", are needed. In addition, a large investment is required to set up a cargo canvassing network and cargo handling systems, especially in this era of containerization. Nowadays, there are only few liner operators and the Liner Market is a typical oligopoly.

2.3.3 Behavior of shipping line in liner market

Liner Market does not have an automatic space-adjusting function as in the Tramp Market and Tanker Market. It is a non-elastic market, although the basic nature of the Liner Market has been in a transition period since OSRA-Ocean Shipping Reform Act of 1998, USA. In this market, competition between shipping lines tends to become a very severe due to the lack of an automatic adjusting mechanism.

Generally, because of a sociological background as an old established company, liner operators are expected to maintain a once started service route and they usually find it extremely difficult to suspend their services or even reduce service frequency. Consequently, liner operators' final and only means to counter decreasing market shares is strengthening marketing and canvassing power. And the only way to achieve this is to draw business away from a competitor. Once a rate-war begins, rate levels fall drastically. As each player in the market is more or less similar in scale marketing power, a rate-war can be financially devastating to all included.

To modify this non-elastic market, the international trading world has traditionally put the market beyond the anti cartel regulations. The international cartel of liner operators is called "Shipping Conference". For more than one century, shipping conferences have played an important role in stabilizing trade. In 1990, there were 360 shipping conferences in the world. A careful observation is need on what changes will come after the OSRA.

2.4 Associations of shipping lines and shippers/consignees

Major associations of shipping lines and shippers/consignees listed below with a short explanation from the view point of marketing of the Suez Canal.

International Chamber of Shipping (ICS)

A non-governmental organization established in 1921. The members come from ship owners associations in 34 countries. The head office in London and should be consulted whenever a tariff revision is being contemplated regardless of the kind of ship

European Shippers' Council

A non-governmental organization established in 1963 as ENSC (European National Shippers' Council), then changed its name to the present name. Members come grom 16 shippers associations in 16 EU Countries. Specialized in a multi-modal transportation system.

European Community Ship-owners' Association (ECSA)

In 1965, CAACE (Comite des Associations d Armateurs des Communautes Europeeenes) was organized by 15 EU countries and Norway. Changed its names to ECSA in 1999. Governmental Organization. The head office is in Brussel. Should be consulted for any formal explanation on the Canal marketing policy.

Asian Shipowners' Forum

Established in 1992 with on the initiative of Japanese Government. Members come from 13 ship owners associations from ASEAN, Australia, China, Hong Kong, Japan , Korea and Taiwan. Should be consulted for any formal explanation on the Canal marketing policy

Baltic and International Maritime Council (BIMCO)

Established in 1905 as The Baltic and White Sea Conference, then changed its name to BIMCO. There are currently 2,745 members from 118 countries, including more than 1,000 shipping lines, 1,635 of shipping agents and brokers. Should be consulted for marketing of tramp and tanker owners and operators.

International Association of Dry Cargo Ship-owners (INTERCARGO)

Established in 1980; its head office is in London. Members comprize 150 shipping lines from 30 countries. The most influential association in dry cargo (including oil/dry carriers) business. Should be consulted for marketing of tramp all kinds.

International Association of Independent Tanker Owners (INTERTANKO)

Established in 1970. The head office is in London, with branch offices in Singapore and Washington. Members comprize 270 tanker owners and the total tonnage under control is 172m D/W, 2000 tankers. Should be consulted for marketing of tankers all kind.

Chapter 3 Relations between vessel profitability and costs at Suez

3.1 Shipping cost

The shipping cost consists of the managing cost and the operation cost.

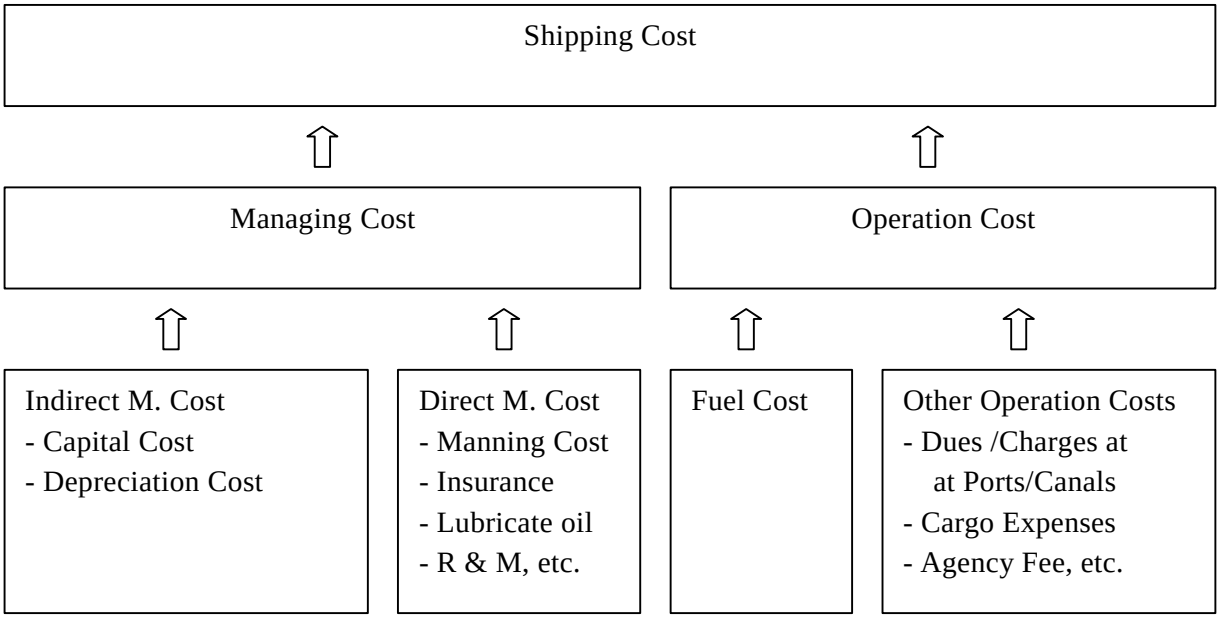


Figure 3.1.1 Components of Shipping Cost

The managing cost consists of the indirect managing cost (capital cost and depreciation cost) and the direct managing cost (manning, insurance, etc.). This managing cost occurs every day even if a vessel is not in service.

The operation cost consists of the fuel cost and the other operation cost (dues/charges at ports/canals, cargo expenses, etc.). The operation cost occurs only the days while a vessel is in service (voyage or calling at port for charging/discharging the cargoes).

In case of vessels not less than Panamax size, the managing cost accounts for more than 70% of shipping cost except container ships. As for container ships, the operation cost at ports and cargo expenses are higher than other vessel types since container transport services are built in the inter-modal transportation system.

3.2 Profitability of shipping lines and vessel deployments

Shipping lines grasp their profitability with the profit/loss figures derived from the freight earnings and the shipping cost. The profit/loss figures are analyzed by each activity segment (by a vessel or by a fleet lines, etc).

Shipping lines make their vessel deployments including the route choice and the fleet mix arrangement after comparing a voyage or an annual profit/loss figures that would result from the possible vessel deployments.

3.3 Relations between vessel profitability and costs at Suez

3.3.1 Basic relations

Shipping lines are considered to make their route choice after comparing the profit/loss figures that would result from using each of the possible routes.

(1) Case-1: annual profitability of a vessel

The Study Team would like to introduce here a simplified mathematical model based on certain assumptions in order to roughly grasp the relation between vessel profitability and costs at Suez. For example, annual profit/loss of a vessel via the Suez and that via the Cape can be expressed as Equation-1 and Equation-2.

$$\mathbf{Ps = (Fs - 2T' - 2ODs/S)Ns - (2MDs/S)Nsx} \quad \mathbf{(1)}$$

$$\mathbf{Pc = (Fc - 2ODc/S)Nc - (2MDc/S)Ncx} \quad \mathbf{(2)}$$

(Parameters)

Ps (US$/SCNT):	Annual profit/loss via the Suez
Pc (US$/SCNT):	Annual profit/loss via the Cape
Fs (US$/SCNT/voyage):	Freight revenue of round voyage via the Suez
Fc (US$/SCNT/voyage):	Freight revenue of round voyage via the Cape
T' (US$/SCNT/transit):	Costs (toll, other charges and loss) at the Suez
M (US$/SCNT/day):	Managing cost
O (US$/SCNT/day):	Operation cost (= fuel cost by Assumption-a.)
Ds (miles):	Distance of origin-destination pair via the Suez
Dc (miles):	Distance of origin-destination pair via the Cape
S (miles/day):	Speed
Ns:	Annual number of round voyages via the Suez
Nsx:	Maximum annual number of round voyages via the Suez
Nc:	Annual number of round voyages via the Cape
Ncx:	Maximum annual number of round voyages via the Cape
A:	Managing cost recovery ratio via the Cape
	Definition) Fc = 2(AM + O)Dc/S
	A<1 at recession
	A=1 at full cost recovery level
	A>1 at boom

(Assumptions)

a. Days and costs at Ports are assumed to be neglected.

b. Effect of costs at Suez on trade O-D and on its volume is assumed to be neglected.

c. Speeds are assumed to be constant regardless of laden or in ballast.

d. Costs at Suez of in-bound and out-bound are assumed to be the same.

e. Vessels are assumed to call only O-D ports.

Shipping lines choose the route via the Suez when profit/loss of a vessel via Suez is not less than that via the Cape, namely, Ps-Pc>=0. In this case, T' or costs at Suez can be

expressed as Equation-3.

T' =< (Fs - Fc)/2 + O(Dc - Ds)/S+ AM(1 - Nc/Ns)Dc/S
= (Freight dif.) + (Savings in fuel c.) + AM(1 - Nc/Ns)Dc/S (3)

(Proof)

(Fs - 2T' - 2ODs/S)Ns - (2MDs/S)Nsx >= (Fc - 2ODc/S)Nc - (2MDs/S)Nsx

(Fs - 2T' - 2ODs/S)Ns -350M >= (Fc - 2ODc/S)Nc -350M

T' =< Fs/2 - FcNc/Ns/2 + O(DcNc/Ns - Ds)/S

= (Fs - Fc)/2 + (Fc - FcNc/Ns)/2 + O(DcNc/Ns - Dc)/S + O(Dc - Ds)/S

= (Fs - Fc)/2 + (1 - Nc/Ns)Fc/2 - (1 - Nc/Ns)ODc/S + O(Dc - Ds)/S

= (Fs - Fc)/2 + (1 - Nc/Ns)(Fc/2 - ODc/S) + O(Dc - Ds)/S

= (Fs - Fc)/2 + O(Dc - Ds)/S + (1 - Nc/Ns)((AM + O)Dc/S - ODc/S)

= (Fs - Fc)/2 + O(Dc - Ds)/S + AM(1 - Nc/Ns)Dc/S

Note) New parameter A is introduced as Fc = 2(AM + O)Dc/S

First member of Equation-3 is the average freight difference per trip. Second member is the savings in fuel cost per trip. Third member is a function of managing cost recovery ratio via Cape, managing cost as well as annual number of round voyages via Suez and via Cape.

When a vessel is fully operated all year round with no waiting time, annual number of voyage will become maximum (Ns=Nsx and Nc=Ncx), and then maximum T' will be equal to freight difference plus savings in fuel cost plus savings in recovered managing cost as follows:

T' =< (Fs - Fc)/2 + O(Dc - Ds)/S + AM(Dc - Ds)/S
= (Freight dif.) + (Savings in fuel c.) + (Savings in recovered managing c.) (4)

Note) Ncx/Nsx=Ds/Dc

When a vessel is fully operated all year round with no waiting time (Ns=Nsx and Nc=Ncx) and, in addition, the freight via the Cape is at full cost recovery level (A=1), maximum T' will be equal to freight difference plus savings in shipping cost as follows.

T' =< (Fs - Fc)/2 + (M + O)(Dc - Ds)/S
= (Freight dif.) + (Savings in shipping c.) (5)

On the other hand, when a vessel is not fully operated (in other words, carrying capacity of fleet is over its demand), both annual numbers of voyage via the Suez and via the Cape will become the same (Ns=Nc=<Ncx), and then maximum T' will be equal to freight difference plus savings in only fuel cost.

T' =< (Fs - Fc)/2 + O(Dc - Ds)/S
= (Freight dif.) + (Savings in fuel c.) (6)

(2) Case-2: annual profitability of a vessel per annual number of round voyage

In case that annual cargo volume to be transported or annual number of round voyage are fixed, shipping lines choose the route via the Suez when annual profitability of a vessel per annual number of round voyage via Suez is not less than that via the Cape, namely, Ps/Ns-Pc/Nc>=0. In this case, T' or costs at Suez can be expressed as Equation-3.

T' =< (Fs - Fc)/2 + O(Dc - Ds)/S + M(DcNcx/Nc - DsNsx/Ns)/S
= (Freight dif.) + (Savings in fuel c.) + M(DcNcx/Nc - DsNsx/Ns)/S (7)

(Proof)

Ps/Ns = (Fs - 2T' - 2ODs/S) - (2MDs/S)Nsx/Ns

Pc/Nc = (Fc - 2ODc/S) - (2MDc/S)Ncx/Nc

(Fs - 2T' - 2ODs/S)Ns - (2MDs/S)Nsx/Ns >= (Fc - 2ODc/S)Nc - (2MDc/S)Ncx/Nc

T' =< (Fs - Fc)/2 + O(Dc - Ds)/S + M(DcNcx/Nc - DsNsx/Ns)/S

When a vessel is fully operated all year round with no waiting time, annual number of voyage will become maximum (Ns=Nsx and Nc=Ncx), and then maximum T' will be equal to freight difference plus savings in fuel cost plus savings in managing cost as follows:

T' =< (Fs - Fc)/2 + (M + O)(Dc - Ds)/S
= (Freight dif.) + (Savings in shipping c.) (8)

On the other hand, when a vessel is not fully operated (in other words, carrying capacity of fleet is over its demand), both annual numbers of voyage via the Suez and via the Cape will become the same (Ns=Nc=<Ncx), and then maximum T' will be equal to freight difference plus savings in only fuel cost.

T' =< (Fs - Fc)/2 + O(Dc - Ds)/S
= (Freight dif.) + (Savings in fuel c.) (9)

3.3.2 Common tramp carriers

In case of common tramp carriers, freight difference between both route can generally be neglected (Fs=Fc) since the cargo value is rather low.

Accordingly, when a vessel is fully operated all year round with no waiting time, annual number of voyage will become maximum (Ns=Nsx and Nc=Ncx), and then maximum T' will be equal to savings in fuel cost plus savings in recovered managing cost as follows:

T' =< (Savings in fuel c.) + (Savings in recovered managing c.) (7)

When a vessel is fully operated all year round with no waiting time (Ns=Nsx and Nc=Ncx) and, in addition, the freight via the Cape is at full cost recovery level (A=1), maximum T' will be equal to savings in shipping cost as follows.

T' =< (Savings in shipping c.) **(8)**

On the other hand, when a vessel is not fully operated (in other words, carrying capacity of fleet is over its demand), both annual numbers of voyage via the Suez and via the Cape will become the same (Ns=Nc=<Ncx), and then maximum T' will be equal to savings in only fuel cost.

T' =< (Savings in fuel c.) **(9)**

3.3.3 Liners

Liner services such as container transportation have generally following peculiarities:

- Annual number of round voyage by a group of vessels are fixed because of regular service.
- The vessels are fully operated all year round, namely, there is no waiting time or no time to spare because of regular service.
- Inventory cost can be perceived by shippers/consignees since cargo values are significantly higher than those of Tankers or Dry Bulk Carriers.

Shipping lines choose the route via the Suez when annual profitability of a vessel per annual number of round voyage via Suez is not less than that via the Cape, namely, Ps/Ns-Pc/Nc>=0. In addition, annual number of voyage will automatically become maximum (Ns=Nsx and Nc=Ncx). Accordingly, maximum T' will be equal to freight difference plus savings in shipping cost as follows:

T' =<(Fs - Fc)/2 + (M + O)(Dc - Ds)/S
= (Freight dif.) + (Savings in shipping c.) **(10)**

As mentioned above, inventory cost can be perceived by shippers/consignees, therefore difference of willingness to pay emerges. The difference of willingness to pay is reflected to freight difference. Accordingly, potential freight difference between both route can generally be equal to savings in inventory cost as follows:

(Freight dif.) = (Savings in inventory c.)
= (Cargo value) x (Interest rate) x (Saved days) **(11)**

In reality, SCA will be able to prevent the appearance of container service via the Cape by proper tariff-setting and by increasing the Canal's transit capacity.

3.3.4 Industrial carriers

Industrial carriers are said to extensively introduced in the 1960s in order that major companies greatly depending upon the seaborn trade avoid negative influences caused by changes in the shipping market. Industrial carriers have generally following peculiarities:

- Freight charges or in-house one are equal to or a little bit more than the shipping cost since the vessels are owned and operated by such major companies or by shipping lines under long-term contracts which are agreed at nearly full cost recovery level.
- The vessels are fully operated all year round, namely, there is no waiting time or no time to spare.

From the first point, vessel profitability is considered to always be zero or a little more regardless of route, and the least cost route are generally chosen. Accordingly, it is thought to be appropriate to set the toll level based on savings in shipping cost.

T' =< (M + O)(Dc - Ds)/S
= (Savings in shipping c.) **(12)**

(Proof)

(Cost via the Suez)/Ns = (2T' + 2ODs/S) + (2MDs/S)Nsx/Ns

(Cost via the Cape)/Nc = (2ODc/S) + (2MDc/S)Ncx/Nc

Note) Ns=Nsx, Nc=Ncx

(2T' + 2ODs/S) + (2MDs/S)Nsx/Nsx =< (2ODc/S)Nc + (2MDc/S)Ncx/Ncx

T' =< O(Dc - Ds)/S + M(Dc - Ds)/S

As to second point, in case that there is enough time to spare until next operation after transiting the Canal, savings perceived by shipping lines are only in fuel cost (variable cost). Savings in managing cost (nearly fixed cost) are not perceived. Full savings in managing cost are perceived only when shipping lines can fully utilize days saved by using the Canal for their next operation.

Chapter 4 Issues on the Currency Unit of Toll

From the view point of the foreign currency earning function of the canal, it is an important issue to which currency unit the toll should be pegged. Currently it is pegged to SDR and paid by US$ applying the exchange rate of US$ to SDR.

In the past, this issue was discussed from the viewpoint of purchasing power of US$ and SDR (refer to 2.2 of the Final Report Annex E on Development of the Suez Canal by Suez Canal Study Consortium). It developed, however, into a somewhat messy discussion.

The issue on currency to be pegged for the toll can be discussed in various way on the various basis for the discussion. Questions raised by the SCA staffs are as follows;

(1) Which currency is more favorable to purchase commodities in the foreign market?
(2) Which currency is more favorable in terms of getting stable revenue? For instance, this year's revenue decreased against that of last year in spite of the same level of transit volume. This would seem to suggest that the US$ is more favorable.
(3) Since most user's accounting based on the US$, wouldn't the US$ be more welcomed by users?
(4) Most expenditures of SCA are in US$. Does this again indicate that the US$ is preferable to SDR.

The Study Team's answers to these questions are as follows.

(1) The issue of charging currency can be discussed from the viewpoint of a risk hedge against changes in the US$/SDR exchange rate. There are 3 interested parties: 1) users who pay tolls, 2) SCA who sets tolls, 3) Egyptian national treasury (including SCA) who gets toll revenue.
(2) For users who pay tolls, US$ pegged toll is preferable since almost all transactions of international maritime transport are now conducted in US$.
(3) For SCA who sets tolls, US$ pegged toll is preferable since toll setting is now originally made in US$.
(4) For Egyptian national treasury (including SCA) who gets toll revenue, it depends upon the purpose of use: 1) payments for purchasing goods, 2) repayments of the foreign debt.
(5) Purchasing power of the currency solely depends on the exchange rates of SDR at the time of purchase and the fixed toll. There is no difference by the currency pegged as far as it is required to pay in respective currency after exchange of US$ currency SCA owns.
(6) Actual toll is paid in US$ currency even though the toll is pegged to SDR. Then, it is natural to have different revenue in US$ by the exchange rate change of SDR to US$. Then the issue should be discussed from the view point of the purpose of revenue, in other words, for what purpose will SCA use the revenue? Basically the answer to this question is the same as the answer to the 4th question: The US$ pegged toll is more favorable because the payments are directly linked with the US$ and there is no risk arising from the variation of exchange rate.
If the major purpose of getting revenue from the toll is to improve the debt service ratio of Egypt, in other words, to be used for repayment of the foreign

debt, then it is better to peg the toll to the currency which is more favorable from the view point of repayability of national debt.

In order to judge which currency is more repayable, we can introduce an index to evaluate the sensitivity of revenue and total debt of the nation evaluated in US$ to the fluctuation of SDR value against US$. If the sensitivity of the toll revenue ($value change of toll revenue by the change of SDR value in US$ compared with the value before SDR value change) is more/less than that of total national debt ($ value change of total national debt by the change of SDR value in US$ compared with the value before SDR value change), it can be said that repayability of the toll revenue is more sensitive. In other words, it is more risky. Then the optimal solution depends on the % share of the debt in US$. To find the break point which is more risky, evaluation table is shown in the following part.

The theoretical explanations of the above mentioned answers are derived as follows. In order to discuss about the purchasing power of the currency, let's consider following two cases:

(1) toll is pegged to SDR denoting Ts(SDR) as a toll/SCNT in SDR.
(2) toll is pegged to USD denoting Td($) as a toll/SCNT in dollar.

Comparison of Purchasing Power between SDR-pegged toll and USD-pegged toll

Denote TRs and TRd as toll revenue pegged to SDR and that pegged to USD respectively.

TRsi=Ts・SCNTi (SDR), dTRsi=Ts・SCNTi・Rsi ($) (1)
TRdi=Td・SCNTi ($) (2)
As Td=Ts・Rs, then dTRsi=Td・SCNTi・(Rsi/Rs) ($) (3)

Denote price index in the Euro, Yen, Pound and USD market as PIu, PIy, PIp and PId respectively.

The purchasing power of toll revenue in the respective market can be expressed as follows denoting PPDn (n=d, u, y, p) as purchasing power of USD pegged toll in the respective currency market and PPSn (n=d, u, y, p) as that of SDR pegged toll;

USD pegged toll TRdi,

PPDdi = TRdi/PIdi = Td・SCNTi/PIdi
PPDui = TRdi/Rui/PIui
PPDyi = TRdi/Ryi/PIyi
PPDpi = TRdi/Rpi/PIpi

SDR pegged toll revenue

PPSdi = dTRsi/PIdi=Td・SCNTi・(Rsi/Rs)/PIdi
PPSui = dTRsi/Rui/PIui=Td・SCNTi・(Rsi/Rs)/Rui/PIui
PPSyi = dTRsi/Ryi/PIyi=Td・SCNTi・(Rsi/Rs)/Ryi/PIyi
PPSpi = dTRsi/Rpi/PIyi=Td・SCNTi・(Rsi/Rs)/Rpi/PIpi

Therefore, relative purchasing power of SDR pegged toll to USD pegged toll in each currency market (PPSni/PPDni) is expressed as follows;

In USD market; Td・SCNTi・(Rsi/Rs)/PIdi／Td・SCNTi/PIdi=Rsi/Rs

In Euro market; Td・SCNTi・(Rsi/Rs)/Rui/PIui／Td・SCNTi/Rui/PIui=Rsi/Rs
for the other currency the results are the same as Rsi/Rs

Hence, it can be said that relative purchasing power of SDR-pegged toll to USD-pegged toll is Rsi/Rs in all currency markets as far as toll is paid by USD currency.

Comparison of Repayment Ability of the Debt between SDR-pegged Toll and USD-pegged Toll

Let's consider first the variation of the debt amount in USD by value change of USD to SDR.

The dollar value of SDR is calculated as follows by it's definition.

$$SDR=(0.3519Ru+27.2Ry+0.105Rp+0.5821)\$=Rs\$ \quad (1)$$

where Ru, Ry, Rp, Rs denote $ value of each currency, ie. Euro, Yen, Pound-starling and SDR.

Consider the condition that total debt amount is D$ at the $value of SDR equals to Rs and its composition of each currency in terms of $ are Su, Sy, Sp, Sd.
Then,

$$D=Su・D+Sy・D+Sp・D+Sd・D\ (\$) \quad (2)$$

$$\text{and} \quad Su+Sy+Sp+Sd=1 \quad (3)$$

Consider the case that $ value of 1SDR(Rs) increases or decreases (if γ is negative) by γ %, namely, by denoting suffix i as the state after change of the $value of SDR,

$$Rsi = (1+\gamma)Rs \quad (4)$$

and $ value of each currency other than USD increases or decreases by same χ %. Namely,

$$Rui = Ru(1+\chi),\ Ryi=Ry(1+\chi),\ Rpi=Rp(1+\chi) \quad (5)$$

Then,

$$Rsi = 0.3519Rui+27.2Ryi+0.105Rpi+0.5821$$
$$= (0.3519Ru+27.2Ry+0.105Rp)(1+\chi)+0.5821 \quad (6)$$

Denote P =(0.3519Ru+27.2Ry+0.105Rp),
Then from (1) and (4),

$$Rsi = P(1+\chi)+0.5821 = (P+0.5821)(1+\gamma) \quad (7)$$

$$\text{Hence,}\ \chi = \{(P+0.5821)/P\}・\gamma \quad (8)$$

Therefore, $value of debt of each currency becomes as follows;

$$\text{Euro:}(Su・D/Ru)・Rui=(Su・D/Ru)(1+((P+0.5821)/P)・\gamma)Ru$$
$$=Su・D(1+((P+0.5821)/P)\gamma) \quad (9)$$

$$\text{Yen : } Sy・D(1+((P+0.5821)/P)\gamma \quad (10)$$

$$\text{Pound: } Sp・D(1+((P+0.5821)/P)\gamma) \quad (11)$$

Hence, current total amount of debt in USD (Di) is, by denoting a=(P+0.5821)/P,

$$Di=(Su+Sy+SP)・D・(1+a・\gamma)+Sd・D \quad (12)$$

Therefore, increase/decrease of debt becomes as follows;

$$\triangle D = Di - D = ((Su+Sy+Sp)(1+a\gamma)+Sd)D-(Su+Sy+Sp+Sd)D$$
$$=(Su+Sy+Sp)a \cdot \gamma \cdot D$$

Then, increase/decrease rate is

$$\triangle D/D=(Su+Sy+Sp)a \cdot \gamma$$
$$=(1-Sd)a \cdot \gamma \quad (13)$$

Hence, we can say that **γ % (Rsi=(1+γ)Rs) increase/decrease of $value of SDR leads to the increase/decrease of total amount of debt in USD by (1-Sd)aγx100%.**
Namely, it can be found that the degree of change of the total debt amount in terms of USD by the variation of the $ value of SDR depends on the share of USD debt in total amount of debt in terms of USD and the share of USD in the calculation of SDR.

Consider the variation of toll revenue by the change of $value of SDR.
Denote TRs as toll revenue pegged to SDR, TRd as that pegged to USD, Ts (SDR) as toll in SDR/SCNT when it is pegged to USD and Td ($) as toll in USD/SCNT when it is pegged to USD.
Then,

TRs = Ts・SCNT (SDR)
dTRs=Ts・SCNT・Rs ($)
TRd = Td・SCNT ($)
where Td = Ts・Rs

Consider the case where $value of 1SDR increases by γ % (Rsi=Rs(1+γ))
Then,

TRdi = Td・SCNT ($)
TRsi = Ts・SCNT (SDR)
dTRsi=Ts・SCNT・Rsi ($)
= Ts・SCNT・(1+γ)Rs = Td・SCNT (1+γ) ($) (14)
where dTRsi is the $ value of TRsi.
ΔTR = dTRsi – TRdi = Td・SCNT・γ

Namely**, SDR-pegged toll revenue is ΔTR= Td・SCNTi・γ more than USD-pegged toll revenue when $ value of 1SDR increases γ% compared with the case where the $value of 1SDR does not change.**

In order to compare the repayment ability of SDR pegged toll revenue and USD pegged toll revenue, introduce the idea of elasticity of toll revenue increase to debt amount increase **ε = TRi/TR／Di/D**, in other word, rate of relative change in the $value of toll revenue to change in $value of debt amount.

Denote **εs** as the elasticity of change in $value of SDR-pegged toll revenue to change in $value of debt amount, and **εd** as the elasticity of change in the $value of USD-pegged toll revenue to the change in $value of debt amount.

Then,

ε s=dTRsi/dTRs／Di/D (15)

ε d=TRdi/TRd／Di/D (16)

From (14)

dTRsi/dTRs=Ts・SCNT(1+γ)Rs/Ts・SCNT・Rs=1+γ

From (12)

Di=(1-Sd)D(1+a・γ)+Sd・D

=(1+a・γ(1-Sd))D

Therefore,

Di/D=(1+a・γ (1-Sd))D/D=1+a・γ(1-Sd)

Hence,

ε s=dTRsi/dTRs／Di/D

=(1+γ)/(1+a・γ(1-Sd)) (17)

ε d=TRdi/TRd／Di/D

=1/(1+a・γ(1-Sd)) (18)

since TRdi=TRd (indifferent with SDR)

Hence, we can say that **when ε>1, repayability of toll revenue is strengthened (ε<1, weakened), and when εs>εd at the same condition, i.e. at the same revel of $value of SDR and same share of debt of USD in the $value amount of total debt, then SDR-pegged toll revenue is more repayable than USD-pegged toll revenue in case of ε>1.** (in case of ε<1, situation is said to be that SDR-pegged toll revenue is less payable)

Now let's find out the condition (share of USD currency debt in the total amount of debt evaluated by USD) that SDR-pegged toll and USD-pegged toll have the same level of repayability (εs=1/εd). In other word, this situation is said to be that SDR-pegged toll and USD-pegged toll are in complete complimentary situation.
This is the situation equivalent to the situation that εd・εs=1.

From (17) and (18),

(1+γ)/(1+a・γ(1-Sd))・(1/(1+a・γ(1-Sd))=1

Since a=(P+0.5821)/P, and P=0.3519Ru+27.2Ry+0.105Rp
At the time of Oct.18th, P=0.711464

Therefore, by searching the share Sd which have almost same value indifferent to the change of γ, we can see with the current composition of each currency in SDR, it is around 70～80 %.

Table 4.1 shows the variation of ε in accordance with the level of $value change of SDR and % share of USD debt in total amount of $value debt.

This table shows that non-shadowed zone is less elastic to the $ value change of SDR and darker shadowed zone is more elastic, in other word, more risky to the value change of SDR. As a whole, we can say that in case of the share of USD currency debt is more than 80%, USD-pegged toll is more favorable than SDR-pegged toll against the fluctuation of USD value to SDR.

Table 4.1 Comparison of Elasticity

Sd	0		0.2		0.4		0.445		0.5		0.6		0.8		1	
r	Es	Ed	Es	Ed	Es	Ed	Es	Ed	Es	Ed	Es	Ed	Es	Ed	Es	Ed
0.5	**0.789**	**0.526**	**0.872**	**0.581**	**0.974**	**0.649**	1.000	**0.667**	1.034	**0.689**	1.103	**0.735**	1.271	**0.847**	1.500	1.000
0.4	**0.814**	**0.581**	**0.888**	**0.634**	**0.977**	**0.698**	1.000	**0.714**	1.029	**0.735**	1.087	**0.776**	1.224	**0.874**	1.400	1.000
0.3	**0.844**	**0.649**	**0.908**	**0.698**	**0.982**	**0.755**	1.000	**0.769**	1.023	**0.787**	1.069	**0.822**	1.173	**0.902**	1.300	1.000
0.2	**0.882**	**0.735**	**0.931**	**0.776**	**0.987**	**0.822**	1.000	**0.833**	1.017	**0.847**	1.049	**0.874**	1.119	**0.933**	1.200	1.000
0.1	**0.932**	**0.847**	**0.961**	**0.874**	**0.993**	**0.902**	1.000	**0.909**	1.009	**0.917**	1.026	**0.933**	1.062	**0.965**	1.100	1.000
0	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
-0.1	1.098	1.220	1.052	1.168	1.009	1.121	1.000	1.111	**0.989**	1.099	**0.970**	1.078	**0.934**	1.037	**0.900**	1.000
-0.2	1.251	1.563	1.124	1.405	1.021	1.276	1.000	1.250	**0.976**	1.220	**0.935**	1.168	**0.862**	1.078	**0.800**	1.000
-0.3	1.524	2.176	1.233	1.762	1.036	1.480	1.000	1.429	**0.959**	1.370	**0.893**	1.276	**0.785**	1.121	**0.700**	1.000
-0.4	2.148	3.581	1.417	2.362	1.057	1.762	1.000	1.667	**0.938**	1.563	**0.843**	1.405	**0.701**	1.168	**0.600**	1.000
-0.5	5.045	10.091	1.790	3.581	1.088	2.176	1.000	2.000	**0.910**	1.820	**0.782**	1.563	**0.610**	1.220	**0.500**	1.000

Es=(1+r)/(1+(1-Sd)*(1+0.5821/P)*r)
Ed=1/(1+(1-Sd)*(1+0.5821/P)*r)
E=△TR/TR／△D/D

From the analysis above, it is more important to consider the issue from the view point of balance of payment of the Egyptian economy. The issue whether the toll is pegged to US$ or not should be judged based on the amount of external debt to be paid by US$.

Hence it is recommended that this issue be deeply discussed within the Egyptian Government.

Chapter 5 Toll Structure and Rates

5.1 Basic toll level

5.1.1 Current basic toll level

Current basic toll level of the Suez Canal is considered to be set, in principle, based on the savings by using the Canal taking account of peculiarities by vessel type. On the other hand, that of the Panama Canal has been set based on the cost in providing the canal services.

5.1.2 Evaluation

The economic benefit of the Canal can be expressed by deducting the cost in providing the canal services from the savings by using the Canal. The savings by using the Canal, in principle, can basically be measured by the savings in shipping cost. The benefit will increase by increasing the canal transit.

The benefit will be enjoyed by both users and the Egyptian Government. The users' surplus will be divided among shipping lines as a direct users of the Canal and shippers/consignees, and then indirectly contribute to the world economy.

If the canal dues (tolls and other charges) were not to exceed the cost incurred by SCA in providing the canal services, all the benefit would belong to the world economy. When the canal dues are higher than the cost incurred by SCA as at present, the Egyptian Government also enjoys a part of the benefit.

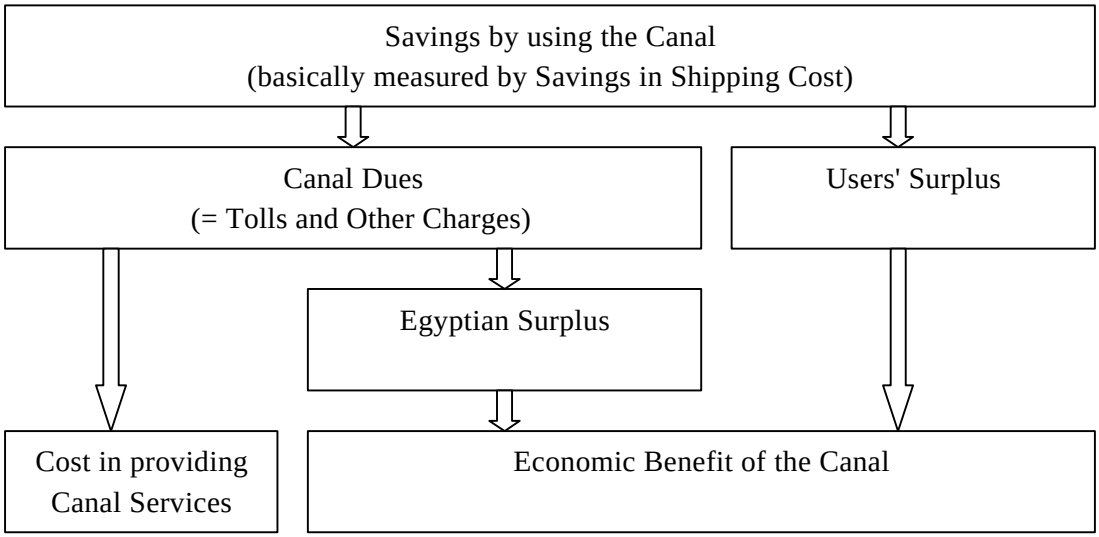


Figure 5.1.1 Relation between Economic Benefit of the Canal and Toll

If canal dues were to exceed savings by using the Canal, shipping lines would not use the Canal at all. In order to prevent vessels from diverting to other routes and to increase the canal transit, it is necessary to set the canal dues for each user at a level that is below the savings by using the Canal.

It should be noted that while setting the canal dues at a level which slightly undercuts the savings may theoretically maximize toll revenue in the short-term, shipping lines may rearrange their fleet mix into a more profitable configuration based on their freight earnings and the shipping cost in the long-term.

The Study Team proposed the following toll setting principle (see section (iii) C V of the Main Report).

- Maximizing the net profit to SCA under the conditions that world trade shall not be adversely affected and that trade in the region surrounding the Suez Canal shall be promoted.

In other words, tolls should be set at the maximum tolerable level without risk of vessels diverting to other routes under the conditions mentioned above.

To conform with this toll setting principle, the basic toll level of the Suez Canal should not be set based on the cost in providing the canal services like the Panama Canal, but be set based on the savings by using the Canal.

Accordingly, the current basic toll level of the Suez Canal can be basically judged appropriate.

5.1.3 Proposition

It is advisable to set the basic toll at a level sufficiently below the savings by using the Canal to attract users. Then, the standard toll level could be expressed as Equation-1.

$$\mathbf{Ts = S \times Rs = (B \times Ds - Esc) \times Rs} \qquad \mathbf{(1)}$$

(Parameters)

Ts (US$/SCNT):	Standard Toll Level
S (US$/SCNT):	Saved Cost by using the Suez Canal
Rs:	Ratio of Supplier's Receipt (deducting Users' Surplus)
B (US$/SCNT/mile):	Shipping Cost at sea per mile
Ds (mile):	Saved Distance
Esc (US$/SCNT):	Excess Cost at the Suez Canal Esc = Escmo + Escoc Escmo: Managing Cost & Fuel Cost by time loss Escoc: Other Charges

(Note)

It is necessary to take account of Excess Cost (Panama Canal toll for example) at other route.

The ratio of the users' surplus must be high enough for users to perceive it. If users perceive an obvious cost advantage in the route via the Canal, they will be much more likely to choose that route.

Japanese shipping lines generally adopt the following rational in choosing a route.

- If users' surplus is less than 10%, shipping lines do not perceive an obvious cost advantage in the route via the Canal by taking account of various uncertainty (unexpected delay or fluctuations in exchange rate of US$/SDR, for example). In this case, other factors besides cost are considered in route choice.
- If users' surplus is more than 20% (at least 10%), shipping lines perceive an obvious cost advantage in the route via the Canal and are much more likely to choose it.

Accordingly, the Study Team would like to propose to set the rate of the users' surplus at 20% (Rs = 0.8).

5.1.4 Conclusion

Current basic toll level of the Suez Canal is considered to be set, in principle, based on the savings by using the Canal taking account of peculiarities by vessel type. This way of toll setting is consistent with the following toll setting principle:

- Maximizing the net profit to SCA under the conditions that world trade shall not be adversely affected and that trade in the region surrounding the Suez Canal shall be promoted.

Accordingly, the current basic toll level of the Suez Canal can be basically judged appropriate.

The Study Team would like to propose to set the rate of the users' surplus at 20% (Rs = 0.8) in order to make shipping lines perceive an obvious cost advantage in the route via the Canal.

5.2 Tariff system

5.2.1 Current tariff system

The Canal tolls are calculated by vessel type and size based on the tariff announced yearly by SCA.

5.2.2 Evaluation

Current basic toll level of the Suez Canal is considered to be set, in principle, based on the savings by using the Canal taking account of peculiarities by vessel type. On the other hand, that of the Panama Canal has been set based on the cost in providing the canal services.

Savings by using the Canal vary mainly according to the following items of each trip;

- Vessel type and size
- Saved distance by O-D pair
- Shipping market conditions
  (Tanker's World Scale, Bulk Carrier's Charter Rate, fuel price, etc.)

Even though the above items are more or less constant, savings can still vary according to the vessel acquisition price, vessel age, speed and fuel consumption. Namely, savings by using the Canal vary by each trip.

Accordingly, perfect price discrimination for each trip is needed to maximize toll revenue.

However, the following procedure would have to be followed to calculate perfect price discrimination for each trip.

- The users submit the cost calculation (including detailed data) to SCA.
- SCA checks the submitted cost calculation based on it's own data and recalculates it.
- The users submit certifications of calling ports and so forth to SCA.

Such a process is accompanied by the following problems;

- Complexity of cost calculation for users
- Complexity of checking the submitted cost calculation and making necessary adjustments for SCA
- Delay of toll settlement timing
- Absence of fixed tariff with actual figures which is convenient for shipping lines' business management and for dealing with shippers/consignees
- Lack of administrative simplicity

Current tariff system can therefore basically be judged appropriate since it shows toll rates with actual figures and generally avoids the problems associated with perfect price discrimination for each trip.

It should be noted that the tariff by vessel type and size at present is based on the following premises:

- Saved distance and the shipping market conditions are set at a certain or standard level.
- Savings of same vessel type and size are the same in spite of the vessel acquisition price, vessel age, speed and fuel consumption.

5.2.3 Conclusion

Current tariff can basically be judged appropriate since it shows toll rates with actual figures and generally avoids the problems associated with perfect price discrimination for each trip.

5.3 Vessel size classification in tariff

5.3.1 Current vessel size classification

Current vessel size classification is as follows;

- First 5,000SCNT
- Next 5,000SCNT
- Next 10,000SCNT
- Next 20,000SCNT
- Next 30,000SCNT
- Rest

5.3.2 Evaluation

(1) Classifying vessel size

Savings by using the Canal of a larger vessel are higher than those of a smaller vessel on condition that other factors are the same, but savings per SCNT of a larger vessel is lower. Accordingly, it is rational that toll rates per SCNT decline as the vessel size gets larger.

Current vessel size classification is basically judged appropriate since toll rates per SCNT decline as vessel size increases. The tariff of the Panama Canal cannot reflect the tendency mentioned above since there is no vessel size classification.

(2) Format of vessel size classification

Current format of vessel size classification are like "First xxx SCNT", "Next xxx SCNT" and "Rest". Two alternatives as to format of vessel size classification can be set as follows:

Alternative-1: Setting constant toll rate within same vessel size class
Alternative-2: Setting constant toll within same vessel size class

Table 5.3.1 through Table 5.3.3 show the tariff under each format for laden Tankers of Crude Oil on condition that six vessel size classes are used as at present.

Table 5.3.1 Current Tariff Format

(SDR/SCNT)

Vessel Type	SCNT					
	First 5000	Next 5000	Next 10000	Next 20000	Next 30000	Rest
1 (L)	6.49	3.62	3.25	1.40	1.40	1.21

Table 5.3.2 Tariff Format Alternative-1

(SDR/SCNT)

Vessel Type	SCNT					
	300-500	5001-10000	10001-20000	20001-40000	40001-70000	70001-110000
1 (L)	6.49	5.53	4.45	3.24	2.40	1.97

Table 5.3.3 Tariff Format Alternative-2

(SDR)

Vessel Type	SCNT					
	300-5000	5001-10000	10001-20000	20001-40000	40001-70000	70001-110000
1 (L)	16,225	41,500	66,800	97,050	132,050	177,250

Figure 5.3.1 through Figure 5.3.3 show tolls and theoretical toll curves of each format. Merits and demerits of each format are as follows. This theoretical toll curves are drawn by smoothly linking the current toll of 5,000SCNT, 10,000SCNT, 20,000SCNT, 40,000SCNT, 70,000SCNT and 110,000SCNT.

Current: "First xxx SCNT", "Next xxx SCNT" and "Rest"

Merit: Differences between tolls and theoretical toll curves are quite small compared with the alternative formats.

Demerit: Toll calculation is slightly complicated compared with the alternative formats. This demerit, however, is not considered to be fatal, since the calculation consists only of additions and multiplications.

Alternative-1: Setting constant toll rate within same vessel size class

Merit: Toll calculation is only a multiplication which is easier than that of current format.

Demerit: Differences between tolls and theoretical toll curves are larger than those of current format. It is necessary to greatly increase the number of classes to decrease the differences.

Alternative-2: Setting constant toll within same vessel size class

Merit: Toll calculation is not necessary.

Demerit: Differences between tolls and theoretical toll curves are larger than those of current format. It is necessary to greatly increase the number of classes to decrease the differences.

The merit of the current vessel size format, that the differences between tolls and theoretical toll curves are quite small, is an important one. Even though toll calculation is slightly complicated compared with the alternative formats, this demerit is not considered to be fatal since the calculation consists only of additions and multiplications.

Accordingly, the current vessel size format can be judged appropriate, since it is superior than alternative formats.

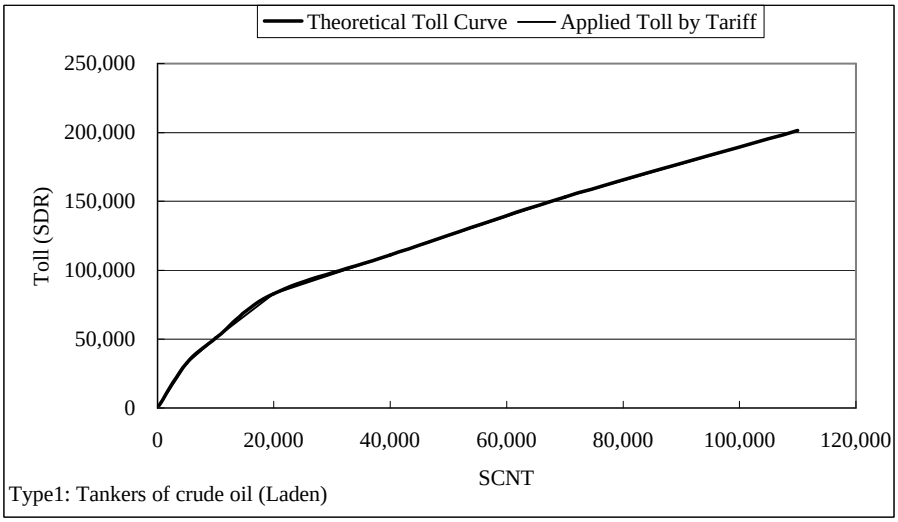


Figure 5.3.1 Applied Toll and Theoretical Toll (Current Tariff Format)

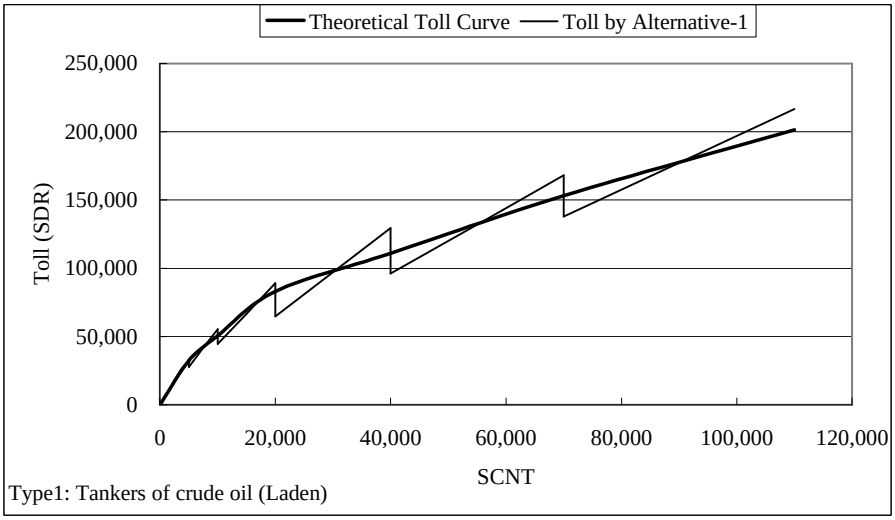


Figure 5.3.2 Applied Toll and Theoretical Toll (Tariff Format Alternative-1)

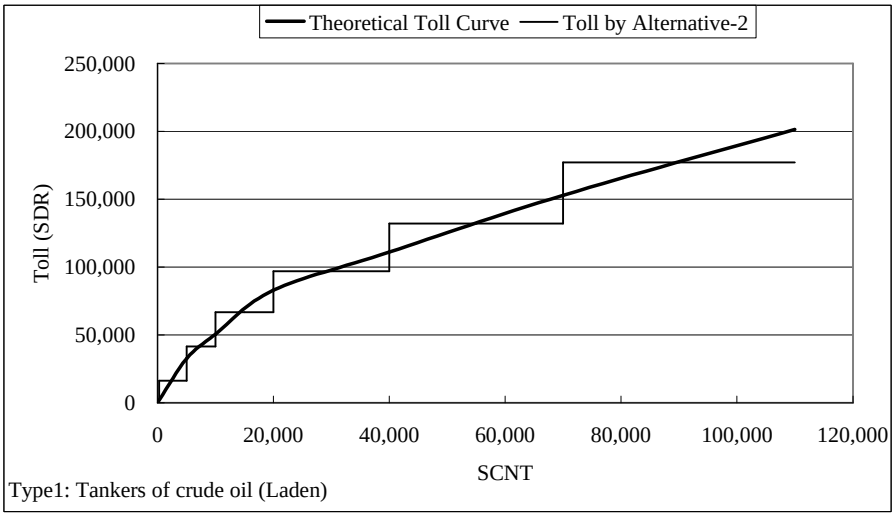


Figure 5.3.3 Applied Toll and Theoretical Toll (Tariff Format Alternative-2)

(3) Interval of vessel size classification

Figure 5.3.4 through Figure 5.3.11 show tolls and theoretical toll curves by vessel type. It is observed that the bend of the theoretical curve decreases as the vessel size gets larger. Accordingly, it is rational to set the width of smaller vessel classes closer in order to decrease the differences between tolls and theoretical toll curves.

Current interval of vessel size classification can be judged appropriate since it has the rationality mentioned above.

On the other hand, current interval of vessel size classification has no difference by vessel type. A alternative is setting interval of vessel size classification by vessel type. Table 5.3.4 shows vessel size distribution transiting the Canal by vessel type.

Table 5.3.4 Vessel Size Distribution Transiting the Canal

Vessel Type	Vessel Size Distribution
Tankers of Crude Oil	over 40,000SCNT up to 220,000SCNT
Tankers of Petroleum Products	up to 70,000SCNT
Chemical Carriers	up to 30,000SCNT
LNG Carriers	over 40,000SCNT up to 110,000SCNT
LPG Carriers	up to 50,000SCNT
Dry Bulk Carriers	up to 110,000SCNT
Container Ships	up to 90,000SCNT
Vehicle Carriers	up to 70,000SCNT
General Cargo Ships	up to 30,000SCNT
Other Vessels	up to 90,000SCNT

Note) Refer to Table A.2.2 of Appendix A.

However, even though current interval of vessel size classification has no difference by vessel type, differences between tolls and theoretical toll curves are quite small. Moreover, current width of vessel size classification is superior from the point of view of simplicity, which is one of the toll setting principles.

Accordingly, current width of vessel size classification can be judged appropriate.

It should be noted, however, that differences between tolls and theoretical toll curves could arise in the "Rest" class, where vessel size ranges widely from 70,000SCNT to over 200,000SCNT.

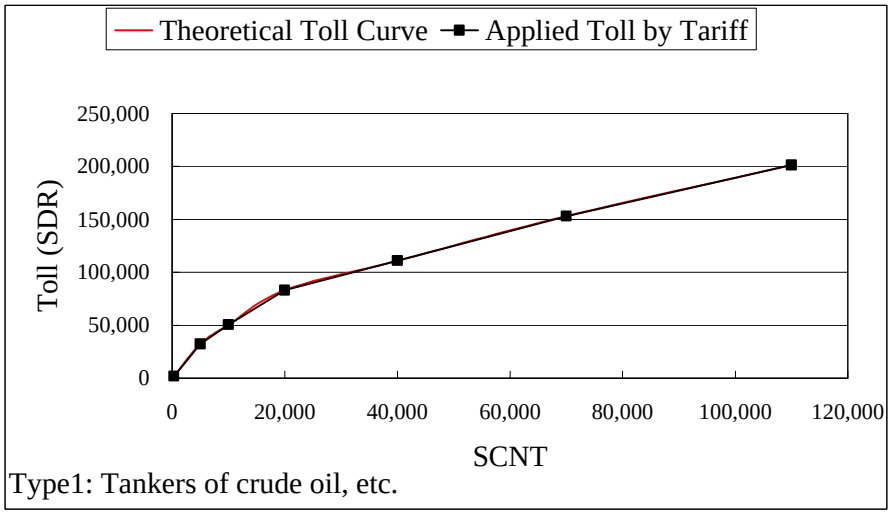


Figure 5.3.4 Applied Toll and Theoretical Toll (Type1)

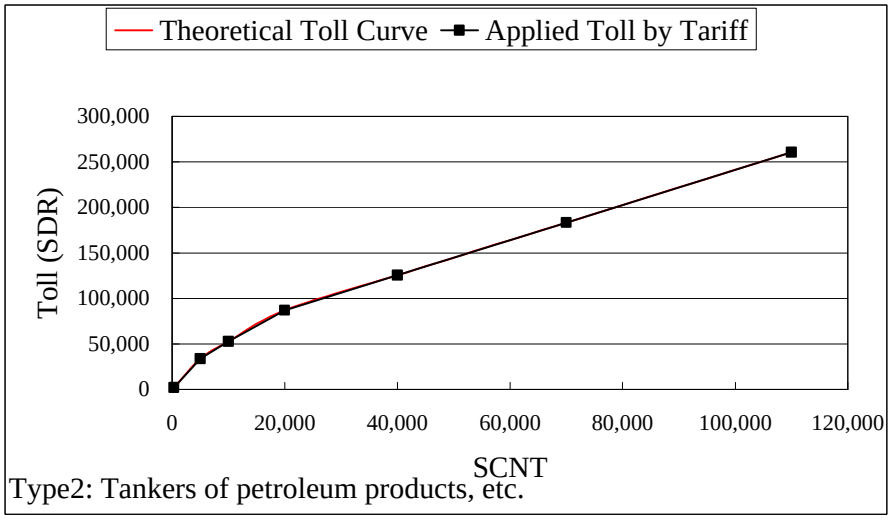


Figure 5.3.5 Applied Toll and Theoretical Toll (Type2)

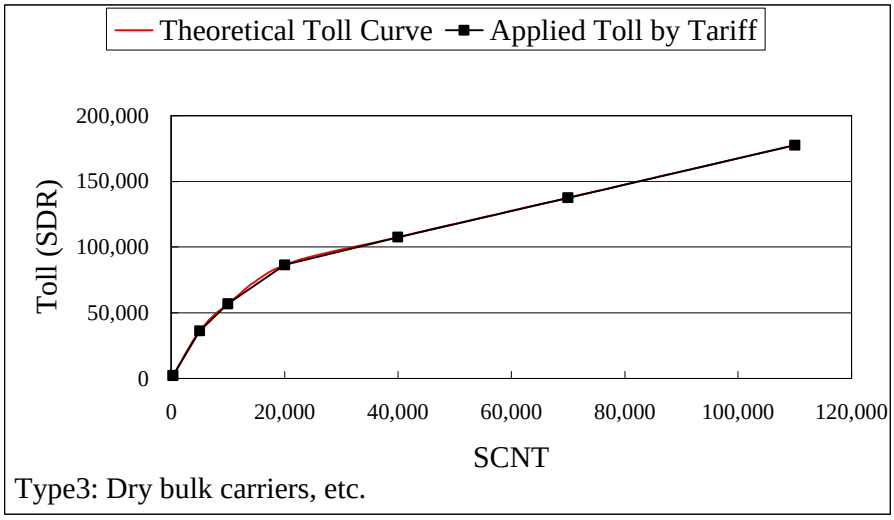


Figure 5.3.6 Applied Toll and Theoretical Toll (Type3)

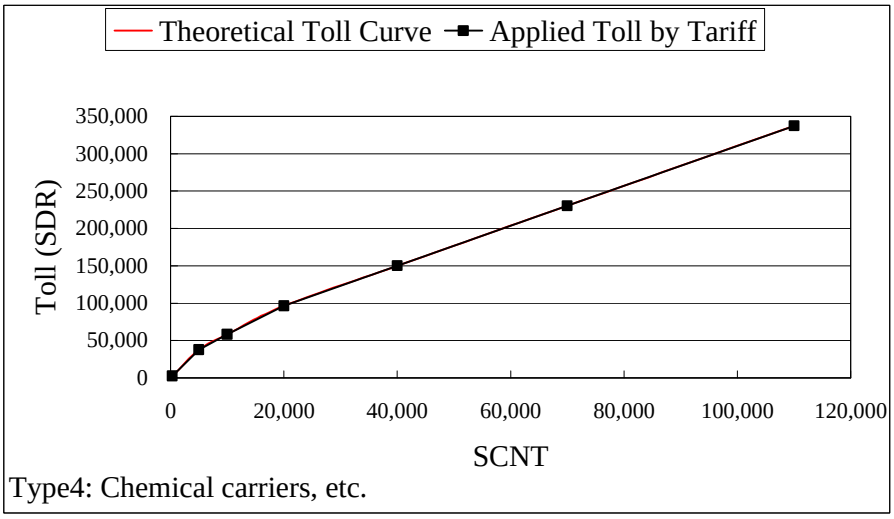


Figure 5.3.7 Applied Toll and Theoretical Toll (Type4)

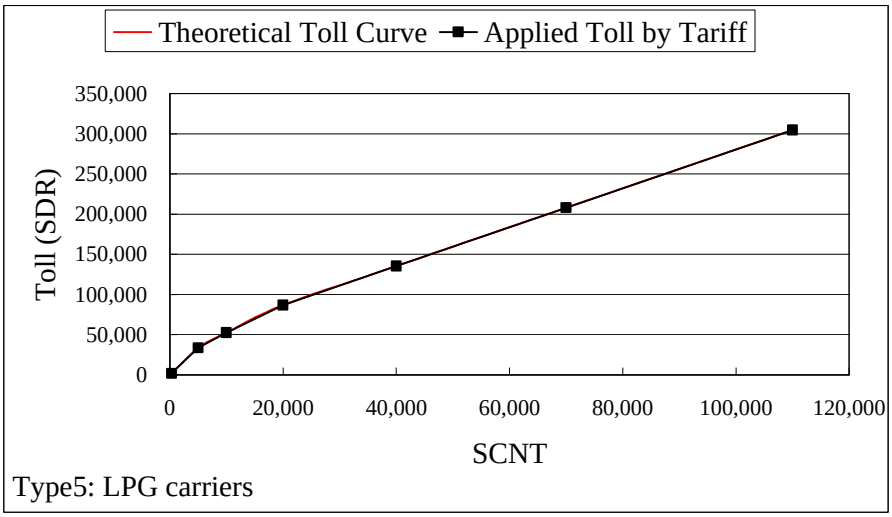


Figure 5.3.8 Applied Toll and Theoretical Toll (Type5)

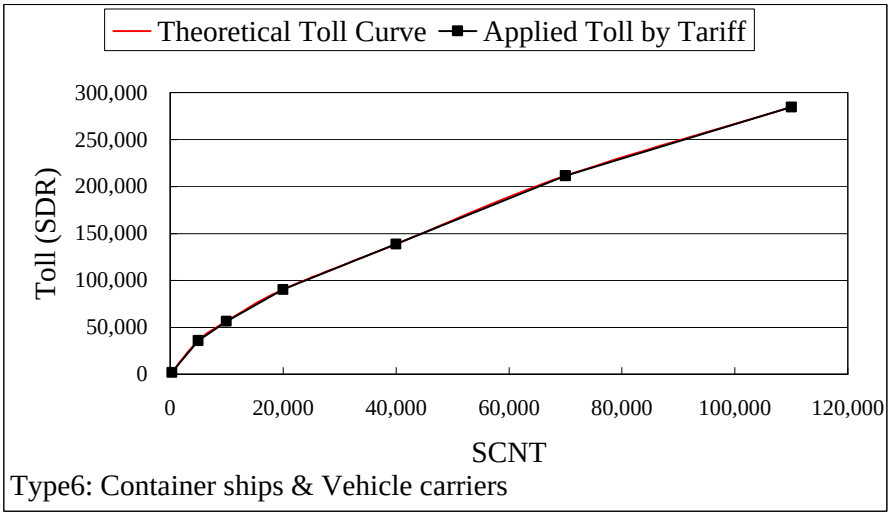


Figure 5.3.9 Applied Toll and Theoretical Toll (Type6)

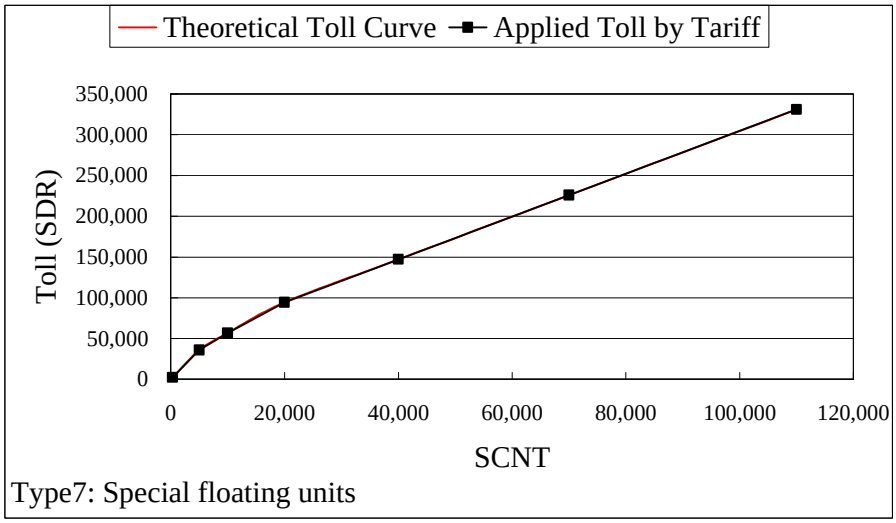


Figure 5.3.10 Applied Toll and Theoretical Toll (Type7)

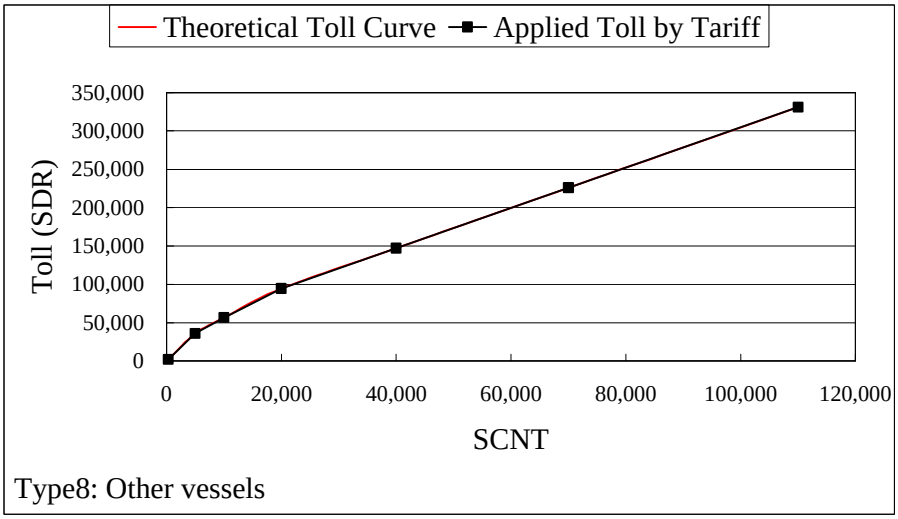


Figure 5.3.11 Applied Toll and Theoretical Toll (Type8)

5.3.3 Proposition

The Study Team would like to propose the following additional two classes to eliminate the possibility of differences arising between tolls and theoretical toll curves in "Rest" class, where vessel size ranges widely from 70,000SCNT to over 200,000SCNT.

- First 5,000SCNT
- Next 5,000SCNT
- Next 10,000SCNT
- Next 20,000SCNT
- Next 30,000SCNT
- Next 40,000SCNT additional
- Next 50,000SCNT additional
- Rest

Merits and demerits of this proposition are as follows;

Merit: No fear of differences between tolls and theoretical toll curves in the "Rest" class which has wide range from 70,000SCNT to over 200,000SCNT.

Demerit: Number of steps in toll calculation increases. This demerit, however, is not considered to be fatal since the calculation consists only of additions and multiplications.

5.3.4 Conclusion

Current vessel size classification can be basically judged appropriate from the view point of format and interval of vessel size classification.

The Study Team would like to propose the following additional two classes to eliminate the possibility of differences arising between tolls and theoretical toll curves in "Rest" class, where vessel size ranges widely from 70,000SCNT to over 200,000SCNT.

- First 5,000SCNT
- Next 5,000SCNT
- Next 10,000SCNT
- Next 20,000SCNT
- Next 30,000SCNT
- Next 40,000SCNT additional
- Next 50,000SCNT additional
- Rest

5.4 Vessel type classification in tariff

5.4.1 Current vessel type classification

Current vessel type classification are as follows;

- Tankers of Crude Oil, etc.
- Tankers of Petroleum Products, etc.
- Dry Bulk Carriers, etc.
- Chemical Carriers, LNG Carriers, etc.
- LPG Carriers
- Container Ships, Vehicle Carriers
- Special Floating Units
- Other Vessels

5.4.2 Evaluation

(1) Classifying vessel type

Savings by using the Canal differ according to the type of vessel, even though other factors are the same. Accordingly, it is rational to set toll rates by vessel type.

Current vessel type classification is basically judged appropriate, since toll rates are set by vessel type. The tariff of the Panama Canal cannot reflect the tendency mentioned above since there is no vessel type classification.

(2) Classified vessel types

By comparing current classified vessel types and shipping cost per unit by vessel type (see Table 5.4.1 and Figure 5.4.1), the following points are observed;

- Chemical Carriers and LNG Carriers are in the same class in spite of the fact that there is a significant difference in shipping cost per unit between these types.
- Container Ships and Vehicle Carriers are in the same class in spite of the fact that there is a significant difference in shipping cost per unit between these types.

The following minor points are also observed.

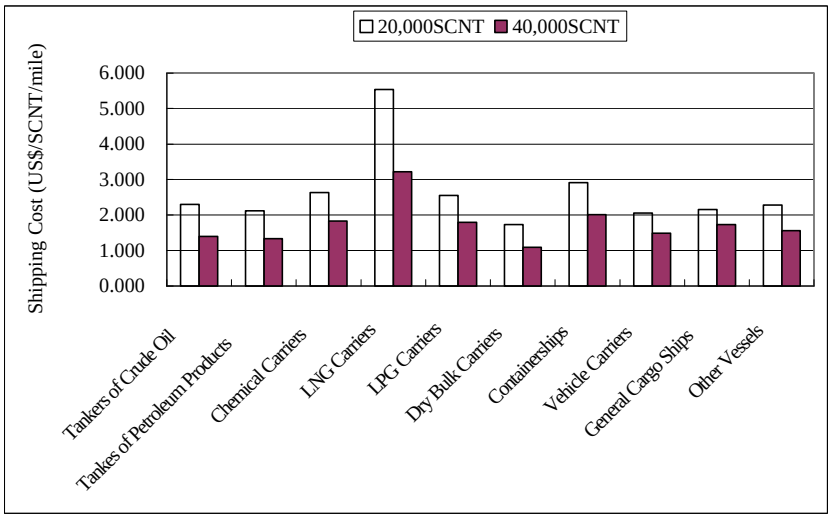
- Tankers of Crude Oil and Tankers of Petroleum Products are in a different class although the shipping cost per unit of those types is similar.
- Chemical Carriers and LPG Carriers are in a different class although the shipping cost per unit of those types is similar.

Table 5.4.1 Shipping Cost by Vessel Type

(US$/SCNT/1000mile)

Vessel Type	Vessel Size	
	20,000SCNT	40,000SCNT
Tankers of Crude Oil	2.304	1.401
Tankes of Petroleum Products	2.118	1.339
Chemical Carriers	2.633	1.836
LNG Carriers	5.537	3.220
LPG Carriers	2.556	1.796
Dry Bulk Carriers	1.735	1.091
Containerships	2.917	2.008
Vehicle Carriers	2.056	1.485
General Cargo Ships	2.154	1.729
Other Vessels	2.280	1.562

Note) See Appendix B.
Container Ships: with container box capital cost and commodity inventory cost.
Vehicle Carriers: with commodity inventory cost.
Shipping cost of Other Vessels is the average of other vessel types (excluding LNG Carriers).
Source) The Study Team



Source) The Study Team

Figure 5.4.1 Shipping Cost by Vessel Type

5.4.3 Proposition

The Study Team would like to propose that Chemical Carriers and LNG Carriers and Container Ships and Vehicle Carriers be classified into different categories, since the difference in shipping cost per unit of these types is not negligible. Even though the actual tolls for these four vessel types are not same after surcharge or discount is applied, it is better to discriminate these vessel types even in the tariff.

5.4.4 Conclusion

Current vessel type classification is basically judged appropriate, since toll rates are set by vessel type.

The Study Team would like to propose that Chemical Carriers and LNG Carriers and Container Ships and Vehicle Carriers be classified into different categories, since the difference in shipping cost per unit of these types is not negligible.

5.5 Classification by laden/ballast in tariff

5.5.1 Current classification by laden/ballast

In the current tariff, toll rates for vessels in ballast are set at 85% of laden vessels in principle.

5.5.2 Evaluation

The speed of a vessel in ballast is said to be 10% to 20% greater than that of a laden vessel, since the draught of a vessel in ballast is shallower than that of a laden vessel and water resistance decreases significantly. Managing cost of a vessel in ballast decreases proportionately with the increased velocity, since the voyage period decreases. Accordingly, it is appropriate to set the toll rate for a vessel in ballast lower proportionately with the increased velocity than that of a laden vessel.

Current classification by laden/ballast can be judged appropriate since the toll rates for vessels in ballast are set at 85% of laden vessels which is lower proportionately with the increased velocity than that of a laden vessel.

On the other hand, in case that there is enough time to spare until next operation after transiting the Canal, savings perceived by shipping lines are only in fuel cost (variable cost). Savings in managing cost (basically fixed cost) are not perceived. Full savings in managing cost are perceived only when shipping lines can fully utilize days saved by using the Canal for their next operation.

It is considered that most vessels in ballast using the route via the Cape have enough time to spare until next operation after transiting the Canal. On the other hand, it is considered that there is no time to spare until next operation after transiting the Canal for most vessels in ballast using the Canal.

5.5.3 Proposition

In case that there is enough time to spare until next operation after transiting the Canal, savings perceived by shipping lines are only in fuel cost (variable cost). Savings in managing cost (basically fixed cost) are not perceived.

Accordingly, as to applying the Long Haul Rebate for vessels in ballast, the Study Team would like to propose to set the rebate rates based on savings only in fuel cost in case that there is enough time to spare until next operation after transiting the Canal, while on savings in shipping cost including managing cost in case that there is no time to spare until next operation after transiting the Canal. SCA can verify this by requiring users to submit certificates proving that there was enough time to spare until next operation after transiting the Canal, in case of setting the rebate rates based on savings only in fuel cost.

5.5.4 Conclusion

Current classification by laden/ballast can be judged appropriate since the toll rates for vessels in ballast are set at 85% of laden vessels which is lower proportionately with the increased velocity than that of a laden vessel.

As to applying the Long Haul Rebate for vessels in ballast, the Study Team would like to propose to set the rebate rates based on savings only in fuel cost in case that there is enough time to spare until next operation after transiting the Canal, while on savings in shipping cost including managing cost in case that there is no time to spare until next operation after transiting the Canal. SCA can verify this by requiring users to submit certificates proving that there was enough time to spare until next operation after transiting the Canal, in case of setting the rebate rates based on savings only in fuel cost.

5.6 Standard saved distance and Long Haul Rebate

5.6.1 Current standard saved distance and Long Haul Rebate

SCA seems to set the tariff by taking account of standard O-D and its saved distance by vessel type, even though SCA does not directly use the term "standard saved distance". Standard saved distances are set at around 4,700 miles for Tankers of Crude Oil and at around 3,500 miles for Dry Bulk Carriers. Standard saved distances for other vessel types are unknown.

On the other hand, SCA provides the Long Haul Rebate in order to prevent vessels, whose canal dues exceed savings by using the Canal, from diverting to other routes such as the Cape of Good Hope. The Long Haul Rebate rates are set by each trip after examining applications of users.

In case of Tankers of Crude Oil, standard O-D for tariff is set at the Arabian Gulf - NW. Europe, where the saved distance is around 4,700 miles, while SCA provides the reduction for VLCC in ballast coming from America to Arabian Gulf where the saved distance is less than standard one.

5.6.2 Evaluation

Saved distances by O-D pairs are key variables in deciding savings by using the Canal, and basic toll level is nearly in proportion to saved distance (see Equation-1 of the section 5.1.3).

It is theoretically possible to classify the tariff by saved distance. Classifying the tariff by saved distance, however, is almost equivalent to setting the toll for each trip which may be accompanied by problems as mentioned in section 5.2.2.

To avoid those problems, setting standard saved distance is thought to be effective.

However, in case of trips where the saved distance is less than standard one, the vessels may divert to other routes because the canal dues including toll exceed savings by using the Canal. To prevent vessels from diverting to other routes, a complementary discount system is needed.

Current tariff can basically be judged appropriate since the tariff is set based on the idea of standard saved distance and complemented by discount systems such as Long Haul Rebate for trips where saved distance are less than standard one.

Table5.6.1 and Table5.6.2 show potential cargo O-D by vessel type. Table5.6.3, Table5.6.4, Figure5.6.1 through Figure5.6.9 show "relative toll revenue" by vessel type estimated based on potential cargo O-D by vessel type.

Relative toll revenue is an index introduced by the Study Team to observe relative changes

of toll revenue by changes in standard saved distance. Relative toll revenue becomes 100% if standard saved distance is set at 8,767 miles and no vessels divert to the other routes, namely, all vessels transit the Canal.

By substituting standard saved distance at maximum relative toll revenue for Ds of Equation-1 of section 5.1.3, toll rate realizing maximum toll revenue in case that there is no discount system can be obtained.

Peaks (*: remarkable peak) of relative toll revenue by vessel type are as follows. It should be noted that Container Ships, General Cargo Ships and Vehicle Carriers have peculiarity of calling plural ports.

Tankers of Crude Oil
* 2,600 miles (Arabian Gulf - N. America)
* 4,500 - 4,700 miles (Arabian Gulf - NW. Europe & N. Africa, etc)
* 5,900 miles (Arabian Gulf - W. Mediterranean)

Tankers of Petroleum Products
3,200 - 3,800 miles
4,600 - 4,700 miles (Arabian Gulf - NW. Europe, etc)
6,500 - 6,700 miles

Chemical Carriers
3,200 - 3,500 miles
4,500 - 4,700 miles
2,000 - 2,300 miles

LNG/LPG Carriers
* 5,900 miles (Arabian Gulf - W. Mediterranean)
* 8,000 miles (Arabian Gulf - E. Mediterranean)
2,000 miles (Arabian Gulf - CS. America)

Dry Bulk Carriers
* 2,300 miles (Oceania - NW. Europe, etc.)
* 3,500 miles (SE. Asia - NW. Europe, etc.)
4,600 miles (SE. Asia - W. Mediterranean, etc.)

Container Ships
* 3,300 miles (E. Asia - NW. Europe)
4,500 - 4,700 miles
5,600 miles (E. Asia - W. Mediterranean)

Vehicle Carriers
* 3,300 miles (E. Asia - NW Europe)
* 2,100 miles (E. Asia - N. America)
4,500 - 4,700 miles

General Cargo Ships
3,200 - 3,800 miles
4,500 - 4,700 miles

Table 5.6.1 Potential Cargo O-D by Vessel Type (1998)

1998 (MT)

O-D Pair				Saved Distance (mile)	Vessel Type												Total
Zone		Zone			Crude Oil	Oil Products	LNG LPG	Chemicals	Others Tankers	Bulk Carriers	Combined Carriers	General Cargo Ships	Container Ships	LASH	Ro/Ro	Car Carriers	Others	
	Port		Port															
				0														
E. Africa	Durban	W. Med.	Barcelona	244	0	0	0	0	0	18,834	0	0	0	0	0	0	0	18,834
SE. Asia	Singapore	N. America	New Orleans	470	0	0	0	0	0	12,764	0	0	0	0	0	0	0	12,764
E. Asia	Pusan	CS. America	Aruba	566	3,053	318	0	867	0	0	9	3	0	0	0	0	4	4,255
E. Africa	Durban	N. Africa	Annaba	676	0	0	0	0	0	26	0	0	0	0	0	0	0	26
SE. Asia	Singapore	CS. America	Aruba	712	865	1,536	28	1,111	0	0	62	3	0	0	0	0	6	3,612
				713														
Oceania	Melbourne	N. Africa	Casablanca	1,061	0	0	0	0	0	0	0	43	40	0	0	0	1	84
Oceania	Weipa	N. America	New York	1,082	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Oceania	Melbourne	NW. Europe	Rotterdam	1,137	0	0	0	0	0	0	1	56	1,347	2	12	124	4	1,546
E. Africa	Mombasa	N. America	New York	1,170	0	0	0	3	0	0	0	4	149	0	1	2	0	160
				1,171														
S. Asia	Karachi	CS. America	Aruba	1,927	0	0	0	32	0	0	0	0	0	0	0	0	0	33
A. Gulf	Bandar Abbas	CS. America	Aruba	1,978	3,722	1,291	1,456	883	0	0	85	3	0	0	0	0	5	7,444
E. Asia	Pusan	N. America	New York	2,101	46	871	85	2,182	22	0	52	51	3,511	4	26	915	33	7,799
E. Asia	Pusan	NW. Europe	Rotterdam	2,123	0	0	0	0	0	2,803	0	0	0	0	0	0	0	2,803
Oceania	Weipa	N. Africa	Casablanca	2,226	0	0	11	18	0	0	1	55	0	1	1	0	2	89
SE. Asia	Singapore	N. America	New York	2,247	447	1,386	21	2,944	3	0	182	919	5,949	15	45	21	61	11,991
Oceania	Weipa	NW. Europe	Rotterdam	2,302	42	19	2	208	1	31,490	105	768	1,923	4	9	1	3	34,575
E. Africa	Mombasa	N. Africa	Casablanca	2,314	0	0	0	4	0	0	0	20	29	1	1	1	1	57
E. Africa	Durban	E. Med.	Istanbul	2,331	0	0	0	0	0	19,858	0	0	0	0	0	0	0	19,858
E. Africa	Mombasa	NW. Europe	Rotterdam	2,390	0	51	0	44	1	0	3	108	118	4	4	16	6	355
S. Asia	Colombo	N. America	New York	2,531	0	0	0	0	0	0	44	187	643	1	7	3	10	896
S. Asia	Karachi	N. America	New Orleans	2,603	0	0	0	0	0	3,310	0	0	0	0	0	0	0	3,310
A. Gulf	Bandar Abbas	N. America	New Orleans	2,654	49,941	0	0	0	0	2,730	0	0	0	0	0	0	0	52,671
				2,655														
E. Asia	Pusan	N. Africa	Casablanca	3,245	0	445	42	92	4	0	25	267	5,404	12	35	83	12	6,421
E. Asia	Pusan	NW. Europe	Rotterdam	3,321	1,356	115	0	991	42	0	105	1,180	13,337	34	105	1,599	66	18,932
SE. Asia	Singapore	N. Africa	Casablanca	3,391	130	20	11	312	5	0	11	526	1,816	19	20	3	28	2,901
Oceania	Melbourne	W. Med.	Marsaxlokk	3,400	0	0	0	0	0	0	0	9	220	0	2	13	0	244
Oceania	Weipa	W. Med.	Barcelona	3,432	0	0	11	6	0	8,536	28	195	216	1	1	0	1	8,995
S. Asia	Karachi	N. America	New York	3,462	0	379	0	335	1	0	0	160	798	4	6	0	5	1,689
SE. Asia	Singapore	NW. Europe	Rotterdam	3,467	1,995	644	1	1,897	20	16,531	185	2,528	26,132	88	181	174	127	50,503
A. Gulf	Dubai	N. America	New York	3,513	0	0	0	0	0	0	46	678	1,123	13	30	118	41	2,048
E. Africa	Mombasa	W. Med.	Barcelona	3,520	0	30	0	6	1	0	29	148	628	2	4	0	2	850
S. Asia	Colombo	N. Africa	Casablanca	3,675	0	0	0	0	0	0	3	56	134	1	2	0	41	236
S. Asia	Colombo	NW. Europe	Rotterdam	3,751	0	0	0	0	0	0	14	513	1,598	10	24	6	31	2,197
A. Gulf	Bandar Abbas	N. America	New York	3,783	2,628	2,220	249	1,985	7	0	225	150	480	2	4	0	17	7,969
E.Asia	Pusan	W.Med	Barcelona	3,848	0	0	0	0	0	695	0	0	0	0	0	0	0	695
Oceania	Weipa	N.Africa	Annaba	3,864	0	0	0	0	0	1,135	0	0	0	0	0	0	0	1,135
E.Asia	Pusan	N.Africa	Annaba	4,280	0	0	0	0	0	610	0	0	0	0	0	0	0	610
E.Asia	Pusan	W.Med	Barcelona	4,451	0	27	1	279	7	0	1	198	1,938	8	13	136	11	2,620
SE.Asia	Singapore	W.Med	Barcelona	4,597	0	475	2	1,176	9	10,278	43	731	1,193	25	20	3	34	13,989
S.Asia	Karachi	N.Africa	Casablanca	4,606	0	3	0	2,517	1	0	0	95	130	3	3	2	4	2,758
E.Africa	Monbasa	W.Med	Marsaxlokk	4,653	0	0	0	0	0	0	3	31	624	1	5	1	2	667
A.Gulf	Bandar Abbas	N.Africa	Casablanca	4,657	4,798	13	45	248	8	0	16	783	326	24	23	1	46	6,330
S.Asia	Karachi	NW.Europe	Rotterdam	4,682	0	38	1	289	6	3,285	9	223	2,330	5	12	8	5	6,212
A.Gulf	Bandar Abbas	NW.Europe	Rotterdam	4,733	16,100	2,008	158	1,746	20	4,977	208	1,956	4,081	39	82	194	123	31,692
				4,734														
SE.Asia	Singapore	N.Africa	Annaba	5,029	0	0	0	0	0	1,736	0	0	0	0	0	0	0	1,736
Oceania	Melbourne	E.Med	Haifa	5,171	0	0	0	0	0	0	0	43	621	1	4	3	2	674
Oceania	Weipa	E.Med	Istanbul	5,519	0	0	18	83	0	10,216	26	224	757	2	4	0	2	11,332
E.Asia	Pusan	W.Med	Marsaxlokk	5,584	0	0	0	0	0	0	5	305	13,321	17	87	18	11	13,765
E.Africa	Mombasa	E.Med	Istanbul	5,607	0	16	4	10	1	0	41	241	191	2	2	0	2	510
SE.Asia	Singapore	W.Med	Marsaxlokk	5,730	0	0	0	0	0	0	9	271	302	5	10	5	27	628
S.Asia	Karachi	W.Med	Barcelona	5,812	0	71	0	328	5	1,279	3	279	110	10	7	2	13	2,106
A.Gulf	Bandar Abbas	W.Med	Barcelona	5,863	12,298	262	1,287	442	15	1,784	38	252	234	10	7	0	14	16,644
E.Asia	Pusan	E.Med	Istanbul	5,935	0	0	0	0	0	4,417	0	0	0	0	0	0	0	4,417
S.Asia	Colombo	W.Med	Marsaxlokk	6,014	0	0	0	0	0	0	9	229	90	4	7	5	18	363
S.Asia	Karachi	N.Africa	Annaba	6,244	0	0	0	0	0	511	0	0	0	0	0	0	0	511
A.Gulf	Bandar Abbas	N.Africa	Annaba	6,295	0	0	0	0	0	964	0	0	0	0	0	0	0	964
E.Africa	Monbasa	E.Med	Haifa	6,424	0	0	0	0	0	0	3	66	403	1	4	5	3	486
E.Asia	Pusan	E.Med	Istanbul	6,538	1,085	709	1	385	20	0	9	253	7,779	10	39	653	6	10,948
SE.Asia	Singapore	E.Med	Istanbul	6,684	920	3,208	15	2,071	6	15,285	130	549	5,408	16	31	24	26	27,689
A.Gulf	Dubai	W.Med	Marsaxlokk	6,996	0	0	0	0	0	0	27	1,086	801	22	37	15	70	2,057
E.Asia	Pusan	E.Med	Haifa	7,355	0	0	0	0	0	0	130	465	3,111	8	29	15	22	3,781
SE.Asia	Singapore	E.Med	Haifa	7,501	0	0	0	0	0	0	136	1,056	4,941	9	45	8	30	6,225
S.Asia	Colombo	E.Med	Haifa	7,785	0	0	0	0	0	0	10	481	858	7	16	9	23	1,404
S.Asia	Karachi	E.Med	Istanbul	7,899	0	19	3	173	5	4,735	8	239	1,186	5	8	6	6	6,392
A.Gulf	Bandar Abbas	E.Med	Istanbul	7,950	10,607	221	1,406	479	15	3,853	35	273	681	9	9	2	15	17,604
				7,951														
A.Gulf	Dubai	E.Med	Haifa	8,767	0	0	0	0	0	0	29	1,255	2,681	24	51	12	71	4,124
				Total	110,033	16,398	4,858	24,146	223	182,645	2,143	20,213	119,693	485	1,072	4,207	1,095	487,210

Source) The Study Team

Table 5.6.2 Potential Cargo O-D by Vessel Type (2020)

2020 (MT)

O-D Pair				Saved Distance (mile)	Vessel Type												Total
Zone		Zone			Crude Oil	Oil Products	LNG LPG	Chemicals	Others Tankers	Bulk Carriers	Combined Carriers	General Cargo Ships	Container Ships	LASH	Ro/Ro	Car Carriers	Others	
	Port		Port															
				0														
E.Africa	Durban	W.Med	Barcelona	244	0	0	0	0		19,066		0	0		0	0		19,066
SE.Asia	Singapore	N.Amrica	New Orleans	470	0	0	0	0		26,738		0	0		0	0		26,738
E.Asia	Pusan	CS.America	Aruba	566	7,899	629	0	3,200		0		0	0		0	0		11,729
E.Africa	Durban	N.Africa	Annaba	676	0	0	0	0		53		0	0		0	0		53
SE.Asia	Singapore	CS.America	Aruba	712	2,395	7,086	31	7,438		0		0	0		0	0		16,950
				713														
Oceania	Melbourne	N.Africa	Casablanca	1,061	0	0	0	0		0		0	94		0	0		94
Oceania	Weipa	N.Amrica	New York	1,082	0	0	0	0		0		0	0		0	0		0
Oceania	Melbourne	NW.Europe	Rotterdam	1,137	0	0	0	0		0		0	8,527		1	287		8,815
E.Africa	Mombasa	N.Amrica	New York	1,170	0	0	0	4		0		0	551		0	3		558
				1,171														
S.Asia	Karachi	CS.America	Aruba	1,927	0	0	0	196		0		0	0		0	0		197
A.Gulf	Bandar Abbas	CS.America	Aruba	1,978	6,531	1,615	1,266	1,221		0		0	0		0	0		10,633
E.Asia	Pusan	N.Amrica	New York	2,101	23	786	59	4,981		0		0	7,555		0	1,855		15,260
E.Asia	Pusan	NW.Europe	Rotterdam	2,123	0	0	0	0		5,798		0	0		0	0		5,798
Oceania	Weipa	N.Africa	Casablanca	2,226	0	0	4	49		0		0	0		0	0		53
SE.Asia	Singapore	N.Amrica	New York	2,247	2,224	3,728	30	11,185		0		0	29,199		0	135		46,503
Oceania	Weipa	NW.Europe	Rotterdam	2,302	52	12	1	377		41,923		0	0		0	0		42,364
E.Africa	Mombasa	N.Africa	Casablanca	2,314	0	0	0	7		0		32	88		4	1		132
E.Africa	Durban	E.Med	Istanbul	2,331	0	0	0	0		20,419		0	0		0	0		20,419
E.Africa	Mombasa	NW.Europe	Rotterdam	2,390	0	36	0	66		0		296	419		4	18		840
S.Asia	Colombo	N.Amrica	New York	2,531	0	0	0	0		0		0	7,363		3	16		7,383
S.Asia	Karachi	N.Amrica	New Orleans	2,603	0	0	0	0		7,478		0	0		0	0		7,478
A.Gulf	Bandar Abbas	N.Amrica	New Orleans	2,654	65,990	0	0	0		5,208		0	0		0	0		71,198
				2,655														
E.Asia	Pusan	N.Africa	Casablanca	3,245	0	491	47	393		0		0	12,355		8	120		13,412
E.Asia	Pusan	NW.Europe	Rotterdam	3,321	615	75	0	1,692		0		0	27,116		10	2,700		32,207
SE.Asia	Singapore	N.Africa	Casablanca	3,391	220	61	10	1,370		0		0	9,759		7	9		11,436
Oceania	Melbourne	W.Med	Marsaxlokk	3,400	0	0	0	0		0		0	946		0	49		996
Oceania	Weipa	W.Med	Barcelona	3,432	0	0	4	17		10,912		0	0		0	0		10,933
S.Asia	Karachi	N.Amrica	New York	3,462	0	662	0	710		0		0	0		0	0		1,373
SE.Asia	Singapore	NW.Europe	Rotterdam	3,467	1,966	698	1	6,793		54,486		0	122,981		100	872		187,896
A.Gulf	Dubai	N.Amrica	New York	3,513	0	0	0	0		0		0	3,960		126	316		4,401
E.Africa	Mombasa	W.Med	Barcelona	3,520	0	22	0	21		0		0	0		0	0		43
S.Asia	Colombo	N.Africa	Casablanca	3,675	0	0	0	0		0		283	1,128		8	10		1,430
S.Asia	Colombo	NW.Europe	Rotterdam	3,751	0	0	0	0		0		1,101	16,143		6	71		17,321
A.Gulf	Bandar Abbas	N.Amrica	New York	3,783	3,473	2,810	422	2,776		0		0	0		0	0		9,481
E.Asia	Pusan	W.Med	Barcelona	3,848	0	0	0	0		1,743		0	0		0	0		1,743
Oceania	Weipa	N.Africa	Annaba	3,864	0	0	0	0		1,721		0	0		0	0		1,721
E.Asia	Pusan	N.Africa	Annaba	4,280	0	0	0	0		1,198		0	0		0	0		1,198
E.Asia	Pusan	W.Med	Barcelona	4,451	0	21	1	361		0		0	0		0	0		384
SE.Asia	Singapore	W.Med	Barcelona	4,597	0	751	2	3,865		33,212		0	0		0	0		37,830
S.Asia	Karachi	N.Africa	Casablanca	4,606	0	4	0	14,434		0		0	0		0	0		14,438
E.Africa	Monbasa	W.Med	Marsaxlokk	4,653	0	0	0	0		0		156	4,550		33	1		4,740
A.Gulf	Bandar Abbas	N.Africa	Casablanca	4,657	3,463	16	51	571		0		1,050	572		162	3		5,889
S.Asia	Karachi	NW.Europe	Rotterdam	4,682	0	42	1	637		12,410		0	0		0	0		13,091
A.Gulf	Bandar Abbas	NW.Europe	Rotterdam	4,733	19,842	1,651	144	1,860		6,893		2,746	7,543		53	501		41,233
				4,734														
SE.Asia	Singapore	N.Africa	Annaba	5,029	0	0	0	0		10,235		0	0		0	0		10,235
Oceania	Melbourne	E.Med	Haifa	5,171	0	0	0	0		0		0	2,440		0	8		2,448
Oceania	Weipa	E.Med	Istanbul	5,519	0	0	7	105		12,327		0	0		0	0		12,439
E.Asia	Pusan	W.Med	Marsaxlokk	5,584	0	0	0	0		0		0	35,959		5	260		36,224
E.Africa	Mombasa	E.Med	Istanbul	5,607	0	14	3	19		0		0	0		0	0		36
SE.Asia	Singapore	W.Med	Marsaxlokk	5,730	0	0	0	0		0		0	7,980		24	51		8,056
S.Asia	Karachi	W.Med	Barcelona	5,812	0	69	0	1,220		4,417		0	0		0	0		5,706
A.Gulf	Bandar Abbas	W.Med	Barcelona	5,863	12,333	236	1,421	687		2,700		0	0		0	0		17,377
E.Asia	Pusan	E.Med	Istanbul	5,935	0	0	0	0		6,096		0	0		0	0		6,096
S.Asia	Colombo	W.Med	Marsaxlokk	6,014	0	0	0	0		0		1,135	817		62	22		2,036
S.Asia	Karachi	N.Africa	Annaba	6,244	0	0	0	0		1,243		0	0		0	0		1,243
A.Gulf	Bandar Abbas	N.Africa	Annaba	6,295	0	0	0	0		1,574		0	0		0	0		1,574
E.Africa	Monbasa	E.Med	Haifa	6,424	0	0	0	0		0		237	1,866		0	5		2,108
E.Asia	Pusan	E.Med	Istanbul	6,538	1,108	366	0	504		0		0	0		0	0		1,978
SE.Asia	Singapore	E.Med	Istanbul	6,684	644	2,917	30	4,395		77,112		0	0		0	0		85,098
A.Gulf	Dubai	W.Med	Marsaxlokk	6,996	0	0	0	0		0		1,893	1,297		920	23		4,133
E.Asia	Pusan	E.Med	Haifa	7,355	0	0	0	0		0		0	20,881		6	608		21,495
SE.Asia	Singapore	E.Med	Haifa	7,501	0	0	0	0		0		0	48,229		29	134		48,393
S.Asia	Colombo	E.Med	Haifa	7,785	0	0	0	0		0		1,014	7,629		22	85		8,750
S.Asia	Karachi	E.Med	Istanbul	7,899	0	38	2	332		14,487		0	0		0	0		14,859
A.Gulf	Bandar Abbas	E.Med	Istanbul	7,950	11,192	294	1,404	689		8,955		0	0		0	0		22,534
				7,951														
A.Gulf	Dubai	E.Med	Haifa	8,767	0	0	0	0		0		2,146	6,680		312	57		9,195
				Total	139,971	25,132	4,939	72,178		388,404		12,089	394,629		1,904	8,221		1,047,467

Source) The Study Team

Table 5.6.3 Relative Toll Revenue by Vessel Type (1998)

1998 (MT)

O-D Pair				Saved Distance (mile)	Vessel Type												Total
Zone		Zone			Crude Oil	Oil Products	LNG LPG	Chemicals	Others Tankers	Bulk Carriers	Combined Carriers	General Cargo Ships	Container Ships	LASH	Ro/Ro	Car Carriers	Others	
	Port		Port															
				0														
E. Africa	Durban	W. Med.	Barcelona	244	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
SE. Asia	Singapore	N. America	New Orleans	470	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%
E. Asia	Pusan	CS. America	Aruba	566	6%	6%	6%	6%	6%	5%	6%	6%	6%	6%	6%	6%	6%	6%
E. Africa	Durban	N. Africa	Annaba	676	7%	8%	8%	7%	8%	6%	8%	8%	8%	8%	8%	8%	8%	7%
SE. Asia	Singapore	CS. America	Aruba	712	8%	8%	8%	8%	8%	7%	8%	8%	8%	8%	8%	8%	8%	8%
				713	8%	7%	8%	7%	8%	7%	8%	8%	8%	8%	8%	8%	8%	7%
Oceania	Melbourne	N. Africa	Casablanca	1,061	12%	11%	12%	11%	12%	10%	12%	12%	12%	12%	12%	12%	12%	11%
Oceania	Weipa	N. America	New York	1,082	12%	11%	12%	11%	12%	10%	12%	12%	12%	12%	12%	12%	12%	11%
Oceania	Melbourne	NW. Europe	Rotterdam	1,137	13%	12%	13%	12%	13%	11%	13%	13%	13%	13%	13%	13%	13%	12%
E. Africa	Mombasa	N. America	New York	1,170	13%	12%	13%	12%	13%	11%	13%	13%	13%	13%	13%	13%	13%	12%
				1,171	13%	12%	13%	12%	13%	11%	13%	13%	13%	13%	13%	13%	13%	12%
S. Asia	Karachi	CS. America	Aruba	1,927	21%	19%	22%	20%	22%	18%	21%	22%	22%	22%	22%	21%	22%	20%
A. Gulf	Bandar Abbas	CS. America	Aruba	1,978	22%	20%	22%	21%	23%	19%	22%	22%	22%	22%	22%	22%	22%	21%
E. Asia	Pusan	N. America	New York	2,101	22%	19%	17%	21%	24%	20%	22%	24%	24%	24%	24%	23%	24%	22%
E. Asia	Pusan	NW. Europe	Rotterdam	2,123	23%	18%	16%	19%	22%	20%	22%	24%	23%	24%	23%	18%	23%	21%
Oceania	Weipa	N. Africa	Casablanca	2,226	24%	19%	17%	20%	23%	21%	23%	25%	24%	25%	24%	19%	24%	22%
SE. Asia	Singapore	N. America	New York	2,247	24%	19%	17%	20%	23%	21%	23%	25%	25%	25%	25%	19%	24%	23%
Oceania	Weipa	NW. Europe	Rotterdam	2,302	24%	18%	18%	18%	23%	21%	21%	25%	24%	25%	24%	20%	23%	22%
E. Africa	Mombasa	N. Africa	Casablanca	2,314	24%	18%	18%	17%	23%	17%	20%	24%	24%	25%	24%	20%	24%	21%
E. Africa	Durban	E. Med.	Istanbul	2,331	25%	18%	18%	18%	24%	17%	20%	24%	24%	25%	24%	20%	24%	21%
E. Africa	Mombasa	NW. Europe	Rotterdam	2,390	25%	18%	18%	18%	24%	14%	21%	25%	24%	26%	25%	20%	24%	20%
S. Asia	Colombo	N. America	New York	2,531	27%	19%	19%	19%	25%	15%	22%	26%	26%	27%	26%	21%	26%	21%
S. Asia	Karachi	N. America	New Orleans	2,603	27%	20%	20%	19%	26%	16%	22%	26%	26%	28%	27%	22%	26%	22%
A. Gulf	Bandar Abbas	N. America	New Orleans	2,654	28%	20%	20%	20%	27%	16%	23%	27%	27%	28%	27%	22%	26%	22%
				2,655	14%	20%	20%	20%	27%	11%	23%	27%	27%	28%	27%	22%	26%	19%
E. Asia	Pusan	N. Africa	Casablanca	3,245	17%	25%	25%	24%	33%	18%	28%	33%	33%	35%	33%	27%	32%	23%
E. Asia	Pusan	NW. Europe	Rotterdam	3,321	18%	24%	25%	25%	33%	19%	28%	33%	32%	35%	33%	27%	33%	23%
SE. Asia	Singapore	N. Africa	Casablanca	3,391	18%	24%	26%	24%	26%	19%	26%	32%	28%	33%	30%	13%	31%	22%
Oceania	Melbourne	W. Med.	Marsaxlokk	3,400	18%	24%	26%	23%	25%	19%	26%	31%	28%	31%	29%	13%	30%	22%
Oceania	Weipa	W. Med.	Barcelona	3,432	18%	25%	26%	23%	26%	19%	27%	31%	28%	31%	29%	13%	30%	22%
S. Asia	Karachi	N. America	New York	3,462	18%	25%	26%	24%	26%	18%	26%	31%	28%	32%	30%	13%	31%	22%
SE. Asia	Singapore	NW. Europe	Rotterdam	3,467	18%	24%	26%	23%	26%	18%	26%	31%	28%	31%	29%	13%	31%	21%
A. Gulf	Dubai	N. America	New York	3,513	18%	23%	26%	20%	22%	14%	23%	26%	19%	24%	23%	12%	26%	18%
E. Africa	Mombasa	W. Med.	Barcelona	3,520	18%	23%	26%	20%	22%	14%	22%	25%	19%	23%	22%	11%	25%	17%
S. Asia	Colombo	N. Africa	Casablanca	3,675	18%	24%	28%	21%	23%	15%	23%	26%	20%	24%	23%	11%	26%	18%
S. Asia	Colombo	NW. Europe	Rotterdam	3,751	19%	24%	28%	22%	24%	15%	23%	26%	20%	25%	23%	12%	25%	19%
A. Gulf	Bandar Abbas	N. America	New York	3,783	19%	24%	28%	22%	24%	16%	23%	25%	20%	24%	22%	12%	24%	19%
E.Asia	Pusan	W.Med	Barcelona	3,848	18%	19%	27%	19%	24%	16%	24%	25%	20%	24%	23%	12%	24%	18%
Oceania	Weipa	N.Africa	Annaba	3,864	18%	19%	27%	19%	23%	16%	19%	25%	20%	24%	23%	12%	24%	18%
E.Asia	Pusan	N.Africa	Annaba	4,280	20%	21%	30%	21%	25%	17%	21%	28%	22%	27%	25%	13%	26%	20%
E.Asia	Pusan	W.Med	Barcelona	4,451	21%	22%	31%	22%	26%	18%	22%	29%	23%	28%	26%	14%	27%	21%
SE.Asia	Singapore	W.Med	Barcelona	4,597	22%	23%	32%	22%	26%	18%	23%	30%	23%	28%	26%	12%	28%	21%
S.Asia	Karachi	N.Africa	Casablanca	4,606	22%	21%	32%	19%	24%	15%	22%	28%	22%	25%	25%	12%	26%	20%
E.Africa	Monbasa	W.Med	Marsaxlokk	4,653	22%	21%	32%	14%	24%	15%	22%	28%	23%	25%	26%	12%	26%	20%
A.Gulf	Bandar Abbas	N.Africa	Casablanca	4,657	22%	21%	32%	14%	24%	15%	22%	28%	22%	25%	25%	12%	26%	19%
S.Asia	Karachi	NW.Europe	Rotterdam	4,682	20%	21%	32%	13%	22%	16%	22%	26%	22%	23%	24%	12%	24%	19%
A.Gulf	Bandar Abbas	NW.Europe	Rotterdam	4,733	20%	21%	32%	13%	21%	15%	22%	25%	21%	22%	24%	13%	24%	18%
				4,734	12%	15%	30%	9%	16%	13%	16%	20%	20%	18%	20%	10%	18%	15%
SE.Asia	Singapore	N.Africa	Annaba	5,029	13%	16%	32%	9%	17%	14%	17%	21%	21%	19%	21%	11%	19%	16%
Oceania	Melbourne	E.Med	Haifa	5,171	13%	16%	33%	10%	17%	14%	18%	22%	21%	20%	22%	11%	19%	16%
Oceania	Weipa	E.Med	Istanbul	5,519	14%	17%	35%	10%	18%	15%	19%	23%	23%	21%	23%	12%	21%	17%
E.Asia	Pusan	W.Med	Marsaxlokk	5,584	14%	18%	36%	10%	19%	11%	18%	23%	22%	21%	23%	12%	21%	16%
E.Africa	Mombasa	E.Med	Istanbul	5,607	14%	18%	36%	10%	19%	11%	18%	22%	15%	19%	18%	12%	20%	14%
SE.Asia	Singapore	W.Med	Marsaxlokk	5,730	15%	18%	36%	10%	19%	12%	18%	22%	16%	19%	18%	12%	21%	14%
S.Asia	Karachi	W.Med	Barcelona	5,812	15%	18%	37%	11%	19%	12%	18%	21%	16%	19%	18%	12%	19%	14%
A.Gulf	Bandar Abbas	W.Med	Barcelona	5,863	15%	18%	37%	10%	18%	12%	18%	21%	16%	17%	18%	12%	19%	14%
E.Asia	Pusan	E.Med	Istanbul	5,935	8%	17%	20%	9%	14%	11%	17%	20%	16%	16%	17%	12%	18%	12%
S.Asia	Colombo	W.Med	Marsaxlokk	6,014	8%	17%	20%	9%	14%	10%	17%	20%	16%	16%	18%	12%	18%	12%
S.Asia	Karachi	N.Africa	Annaba	6,244	8%	18%	21%	9%	14%	10%	17%	20%	17%	16%	18%	13%	18%	12%
A.Gulf	Bandar Abbas	N.Africa	Annaba	6,295	8%	18%	21%	9%	14%	10%	17%	20%	17%	17%	18%	13%	18%	12%
E.Africa	Monbasa	E.Med	Haifa	6,424	8%	19%	21%	9%	15%	10%	18%	21%	17%	17%	18%	13%	18%	12%
E.Asia	Pusan	E.Med	Istanbul	6,538	9%	19%	22%	10%	15%	10%	18%	21%	17%	17%	18%	13%	18%	12%
SE.Asia	Singapore	E.Med	Istanbul	6,684	8%	16%	22%	9%	9%	10%	18%	20%	13%	16%	16%	2%	18%	11%
A.Gulf	Dubai	W.Med	Marsaxlokk	6,996	8%	1%	23%	2%	7%	4%	14%	19%	10%	14%	14%	1%	17%	7%
E.Asia	Pusan	E.Med	Haifa	7,355	8%	1%	24%	2%	7%	4%	14%	16%	9%	11%	12%	1%	13%	7%
SE.Asia	Singapore	E.Med	Haifa	7,501	8%	1%	25%	2%	7%	4%	9%	14%	7%	10%	10%	1%	11%	6%
S.Asia	Colombo	E.Med	Haifa	7,785	9%	1%	26%	2%	8%	4%	3%	10%	4%	8%	7%	1%	9%	5%
S.Asia	Karachi	E.Med	Istanbul	7,899	9%	1%	26%	2%	8%	4%	3%	8%	3%	7%	6%	0%	8%	5%
A.Gulf	Bandar Abbas	E.Med	Istanbul	7,950	9%	1%	26%	2%	6%	2%	3%	7%	3%	6%	5%	0%	7%	4%
				7,951	0%	0%	0%	0%	0%	0%	1%	6%	2%	4%	4%	0%	6%	1%
A.Gulf	Dubai	E.Med	Haifa	8,767	0%	0%	0%	0%	0%	0%	1%	6%	2%	5%	5%	0%	7%	1%

Note) (Relative Toll Revenue by Vessel Type) = (Standard Saved Distance Ratio i) x (1 - (Divert Ratio i))
(Standard Saved Distance Ratio i) = (Standard Saved Distance i) / (8,767miles)
(Divert Ratio i) = (Summation of Cargoes up to i-1) / (Total Cargoes by Vessel Type)
Relative Toll Revenue will be 100%, if Standard Saved Distance is 8,767miles and no divert.

Source) The Study Team

Table 5.6.4 Relative Toll Revenue by Vessel Type (2020)

2020 (MT)

O-D Pair				Saved Distance (mile)	Vessel Type												Total
Zone		Zone			Crude Oil	Oil Products	LNG LPG	Chemicals	Others Tankers	Bulk Carriers	Combined Carriers	General Cargo Ships	Container Ships	LASH	Ro/Ro	Car Carriers	Others	
	Port		Port															
				0														
E. Africa	Durban	W. Med.	Barcelona	244	3%	3%	3%	3%		3%		3%	3%		3%	3%		3%
SE. Asia	Singapore	N. America	New Orleans	470	5%	5%	5%	5%		5%		5%	5%		5%	5%		5%
E. Asia	Pusan	CS. America	Aruba	566	6%	6%	6%	6%		6%		6%	6%		6%	6%		6%
E. Africa	Durban	N. Africa	Annaba	676	7%	8%	8%	7%		7%		8%	8%		8%	8%		7%
SE. Asia	Singapore	CS. America	Aruba	712	8%	8%	8%	8%		7%		8%	8%		8%	8%		8%
				713	8%	6%	8%	7%		7%		8%	8%		8%	8%		8%
Oceania	Melbourne	N. Africa	Casablanca	1,061	11%	8%	12%	10%		11%		12%	12%		12%	12%		11%
Oceania	Weipa	N. America	New York	1,082	11%	9%	12%	11%		11%		12%	12%		12%	12%		11%
Oceania	Melbourne	NW. Europe	Rotterdam	1,137	12%	9%	13%	11%		11%		13%	13%		13%	13%		12%
E. Africa	Mombasa	N. America	New York	1,170	12%	9%	13%	11%		12%		13%	13%		13%	13%		12%
				1,171	12%	9%	13%	11%		12%		13%	13%		13%	13%		12%
S. Asia	Karachi	CS. America	Aruba	1,927	20%	15%	22%	19%		19%		22%	21%		22%	21%		20%
A. Gulf	Bandar Abbas	CS. America	Aruba	1,978	21%	16%	22%	19%		20%		23%	22%		23%	22%		21%
E. Asia	Pusan	N. America	New York	2,101	21%	15%	18%	20%		21%		24%	23%		24%	23%		22%
E. Asia	Pusan	NW. Europe	Rotterdam	2,123	21%	14%	18%	18%		21%		24%	23%		24%	18%		22%
Oceania	Weipa	N. Africa	Casablanca	2,226	22%	15%	18%	19%		22%		25%	24%		25%	19%		23%
SE. Asia	Singapore	N. America	New York	2,247	23%	15%	19%	20%		22%		26%	25%		26%	19%		23%
Oceania	Weipa	NW. Europe	Rotterdam	2,302	23%	12%	19%	16%		23%		26%	23%		26%	19%		22%
E. Africa	Mombasa	N. Africa	Casablanca	2,314	23%	12%	19%	16%		20%		26%	23%		26%	19%		21%
E. Africa	Durban	E. Med.	Istanbul	2,331	23%	12%	19%	16%		20%		27%	23%		27%	19%		21%
E. Africa	Mombasa	NW. Europe	Rotterdam	2,390	24%	12%	20%	16%		19%		27%	24%		27%	20%		21%
S. Asia	Colombo	N. America	New York	2,531	25%	13%	21%	17%		20%		28%	25%		29%	21%		23%
S. Asia	Karachi	N. America	New Orleans	2,603	26%	13%	21%	18%		21%		29%	26%		29%	21%		23%
A. Gulf	Bandar Abbas	N. America	New Orleans	2,654	26%	14%	22%	18%		21%		29%	26%		30%	22%		23%
				2,655	12%	14%	22%	18%		15%		29%	26%		30%	22%		21%
E. Asia	Pusan	N. Africa	Casablanca	3,245	15%	17%	27%	22%		25%		36%	32%		37%	27%		26%
E. Asia	Pusan	NW. Europe	Rotterdam	3,321	15%	16%	27%	23%		26%		37%	32%		37%	27%		26%
SE. Asia	Singapore	N. Africa	Casablanca	3,391	15%	16%	27%	22%		26%		38%	30%		38%	15%		25%
Oceania	Melbourne	W. Med.	Marsaxlokk	3,400	15%	16%	27%	21%		26%		38%	29%		38%	15%		25%
Oceania	Weipa	W. Med.	Barcelona	3,432	15%	17%	28%	22%		26%		38%	29%		38%	14%		25%
S. Asia	Karachi	N. America	New York	3,462	15%	17%	28%	22%		25%		38%	29%		39%	15%		25%
SE. Asia	Singapore	NW. Europe	Rotterdam	3,467	15%	16%	28%	22%		26%		38%	29%		39%	15%		25%
A. Gulf	Dubai	N. America	New York	3,513	15%	15%	28%	18%		20%		39%	17%		37%	11%		18%
E. Africa	Mombasa	W. Med.	Barcelona	3,520	15%	15%	28%	18%		20%		39%	17%		35%	9%		18%
S. Asia	Colombo	N. Africa	Casablanca	3,675	16%	15%	30%	19%		21%		41%	17%		36%	9%		19%
S. Asia	Colombo	NW. Europe	Rotterdam	3,751	16%	16%	30%	19%		22%		41%	18%		37%	10%		19%
A. Gulf	Bandar Abbas	N. America	New York	3,783	16%	16%	30%	19%		22%		37%	16%		37%	9%		19%
E.Asia	Pusan	W.Med	Barcelona	3,848	15%	11%	27%	18%		22%		38%	16%		38%	9%		19%
Oceania	Weipa	N.Africa	Annaba	3,864	15%	11%	27%	18%		22%		38%	16%		38%	9%		19%
E.Asia	Pusan	N.Africa	Annaba	4,280	17%	12%	30%	20%		24%		42%	18%		42%	10%		21%
E.Asia	Pusan	W.Med	Barcelona	4,451	18%	13%	31%	21%		25%		44%	19%		43%	11%		21%
SE.Asia	Singapore	W.Med	Barcelona	4,597	18%	13%	33%	21%		26%		45%	19%		45%	11%		22%
S.Asia	Karachi	N.Africa	Casablanca	4,606	18%	12%	33%	19%		21%		45%	19%		45%	11%		20%
E.Africa	Monbasa	W.Med	Marsaxlokk	4,653	18%	12%	33%	8%		22%		46%	20%		45%	11%		20%
A.Gulf	Bandar Abbas	N.Africa	Casablanca	4,657	18%	12%	33%	8%		22%		45%	19%		45%	11%		19%
S.Asia	Karachi	NW.Europe	Rotterdam	4,682	17%	12%	33%	8%		22%		41%	19%		40%	11%		19%
A.Gulf	Bandar Abbas	NW.Europe	Rotterdam	4,733	17%	12%	33%	7%		20%		41%	19%		41%	12%		19%
				4,734	10%	8%	31%	6%		19%		29%	18%		39%	8%		17%
SE.Asia	Singapore	N.Africa	Annaba	5,029	10%	9%	33%	6%		21%		30%	19%		42%	9%		18%
Oceania	Melbourne	E.Med	Haifa	5,171	11%	9%	34%	6%		20%		31%	20%		43%	9%		18%
Oceania	Weipa	E.Med	Istanbul	5,519	11%	10%	37%	7%		21%		33%	21%		46%	10%		19%
E.Asia	Pusan	W.Med	Marsaxlokk	5,584	12%	10%	37%	7%		19%		34%	21%		46%	10%		18%
E.Africa	Mombasa	E.Med	Istanbul	5,607	12%	10%	37%	7%		19%		34%	15%		46%	8%		16%
SE.Asia	Singapore	W.Med	Marsaxlokk	5,730	12%	10%	38%	7%		20%		35%	16%		47%	8%		16%
S.Asia	Karachi	W.Med	Barcelona	5,812	12%	10%	38%	7%		20%		35%	15%		47%	8%		16%
A.Gulf	Bandar Abbas	W.Med	Barcelona	5,863	12%	10%	39%	6%		19%		36%	15%		47%	8%		16%
E.Asia	Pusan	E.Med	Istanbul	5,935	6%	10%	20%	6%		19%		36%	15%		48%	8%		15%
S.Asia	Colombo	W.Med	Marsaxlokk	6,014	6%	10%	20%	6%		18%		36%	15%		49%	8%		15%
S.Asia	Karachi	N.Africa	Annaba	6,244	7%	10%	21%	6%		19%		31%	16%		48%	8%		15%
A.Gulf	Bandar Abbas	N.Africa	Annaba	6,295	7%	10%	21%	6%		19%		31%	16%		49%	8%		15%
E.Africa	Monbasa	E.Med	Haifa	6,424	7%	11%	21%	6%		19%		32%	16%		50%	8%		15%
E.Asia	Pusan	E.Med	Istanbul	6,538	7%	11%	22%	6%		19%		31%	16%		50%	8%		15%
SE.Asia	Singapore	E.Med	Istanbul	6,684	6%	10%	22%	6%		20%		32%	16%		52%	8%		16%
A.Gulf	Dubai	W.Med	Marsaxlokk	6,996	6%	1%	23%	1%		5%		33%	17%		54%	9%		10%
E.Asia	Pusan	E.Med	Haifa	7,355	7%	1%	24%	1%		5%		22%	18%		16%	9%		10%
SE.Asia	Singapore	E.Med	Haifa	7,501	7%	1%	24%	1%		5%		22%	14%		16%	3%		8%
S.Asia	Colombo	E.Med	Haifa	7,785	7%	1%	25%	1%		5%		23%	3%		16%	2%		5%
S.Asia	Karachi	E.Med	Istanbul	7,899	7%	1%	26%	1%		5%		16%	2%		15%	1%		4%
A.Gulf	Bandar Abbas	E.Med	Istanbul	7,950	7%	1%	26%	1%		2%		16%	2%		15%	1%		3%
				7,951	0%	0%	0%	0%		0%		16%	2%		15%	1%		1%
A.Gulf	Dubai	E.Med	Haifa	8,767	0%	0%	0%	0%		0%		18%	2%		16%	1%		1%

Note) (Relative Toll Revenue by Vessel Type) = (Standard Saved Distance Ratio i) x (1 - (Divert Ratio i))
(Standard Saved Distance Ratio i) = (Standard Saved Distance i) / (8,767miles)
(Divert Ratio i) = (Summation of Cargoes up to i-1) / (Total Cargoes by Vessel Type)
Relative Toll Revenue will be 100%, if Standard Saved Distance is 8,767miles and no divert.

Source) The Study Team

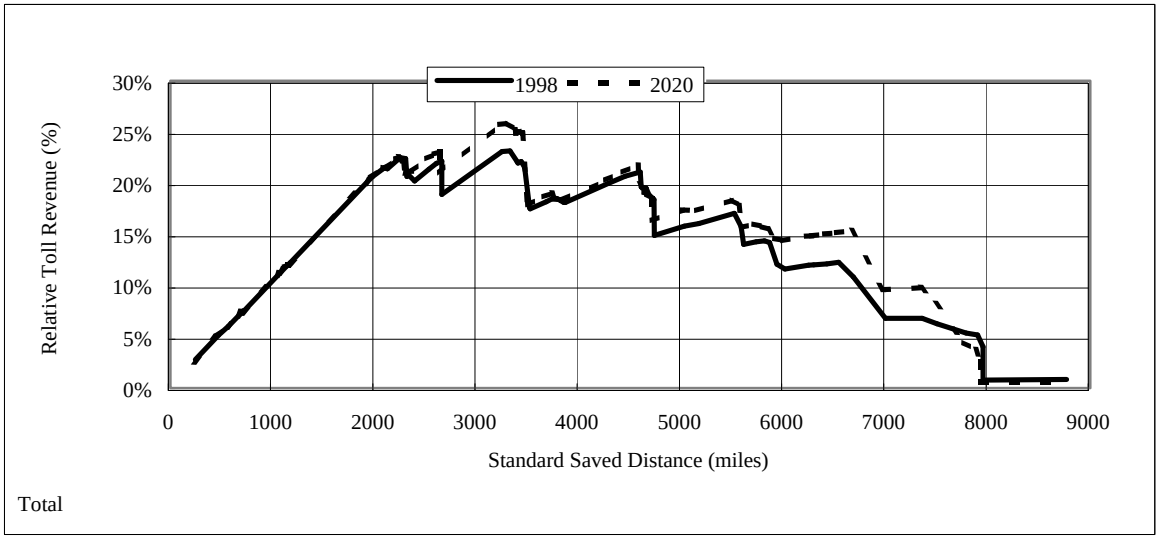


Figure 5.6.1 Relative Toll Revenue (Total)

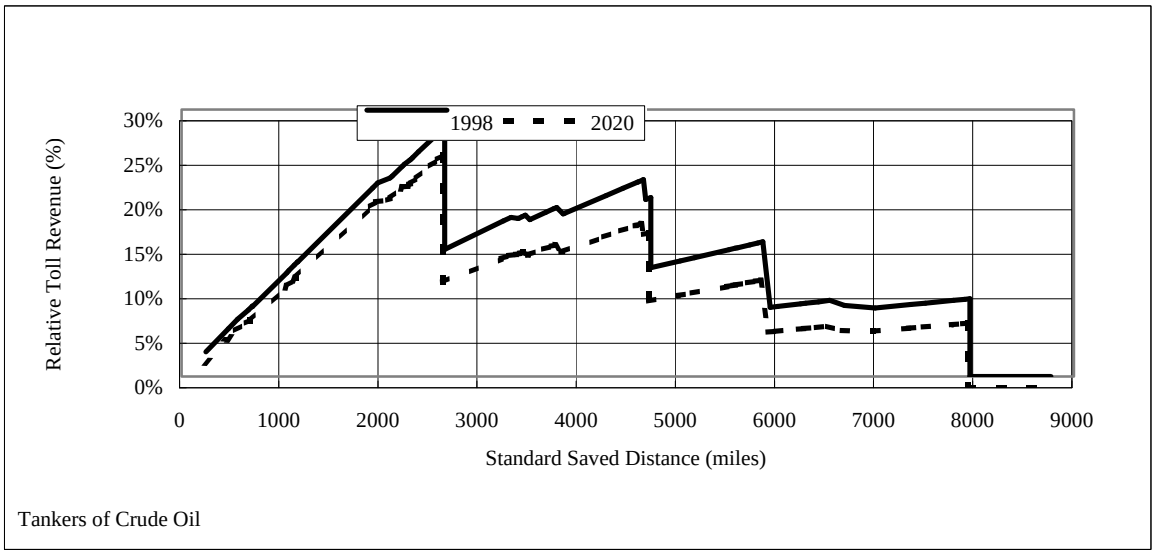


Figure 5.6.2 Relative Toll Revenue (Tankers of Crude Oil)

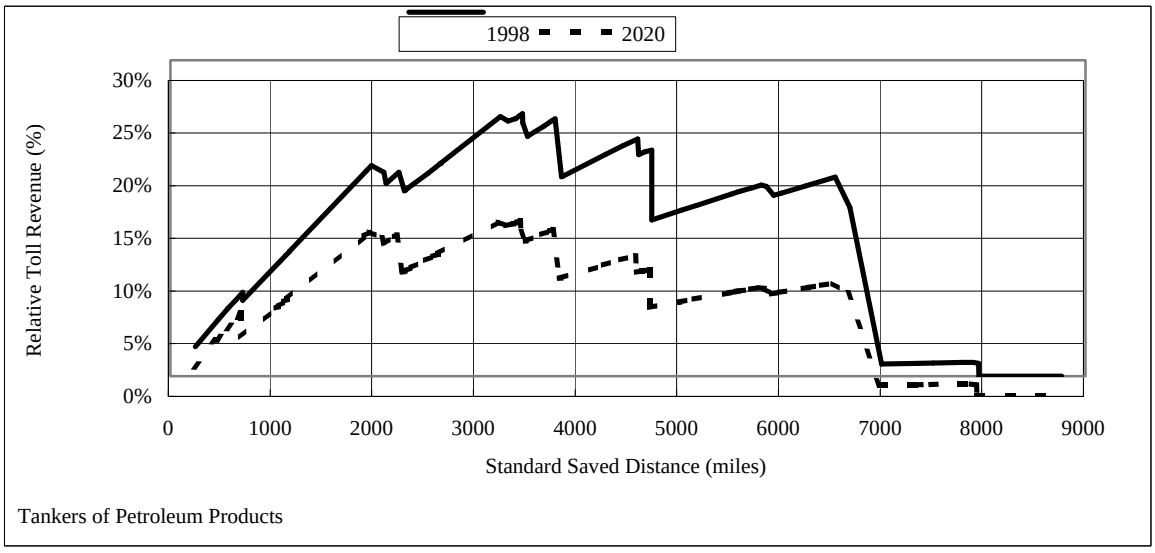


Figure 5.6.3 Relative Toll Revenue (Tankers of Petroleum Products)

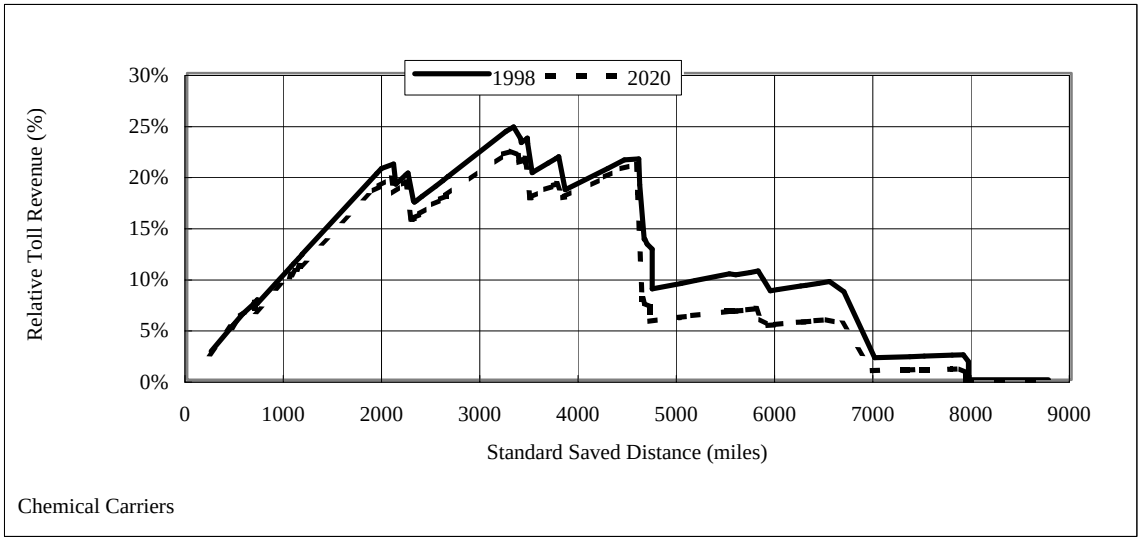


Figure 5.6.4 Relative Toll Revenue (Chemical Carriers)

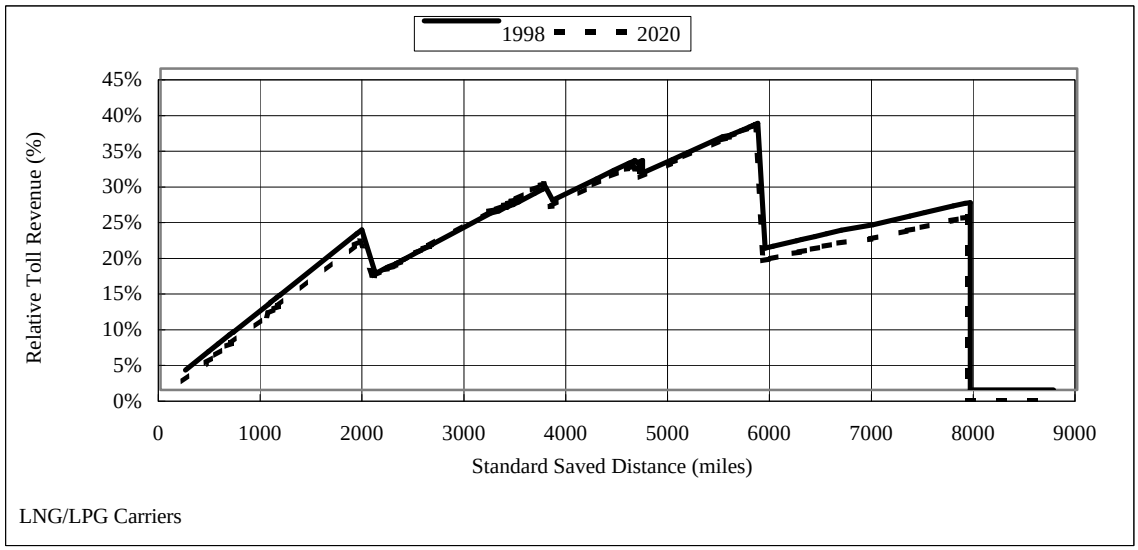


Figure 5.6.5 Relative Toll Revenue (LNG/LPG Carriers)

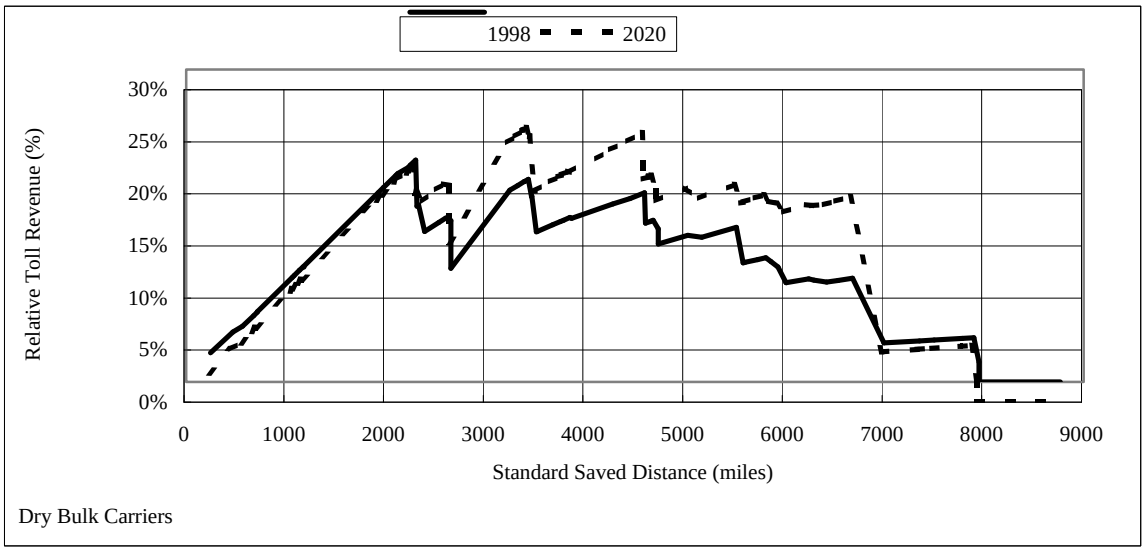


Figure 5.6.6 Relative Toll Revenue (Dry Bulk Carriers)

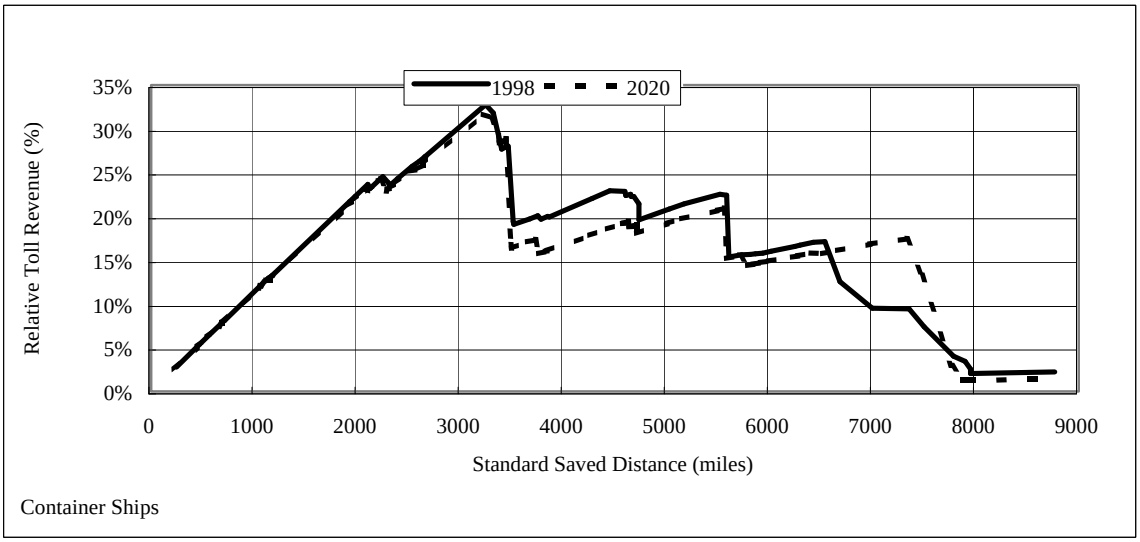


Figure 5.6.7 Relative Toll Revenue (Container Ships)

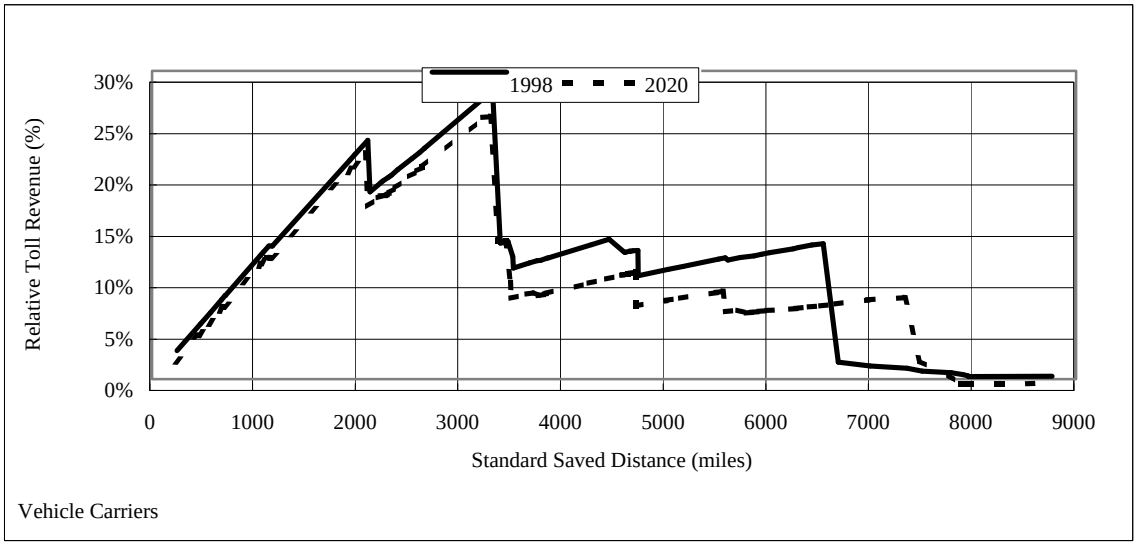


Figure 5.6.8 Relative Toll Revenue (Vehicle Carriers)

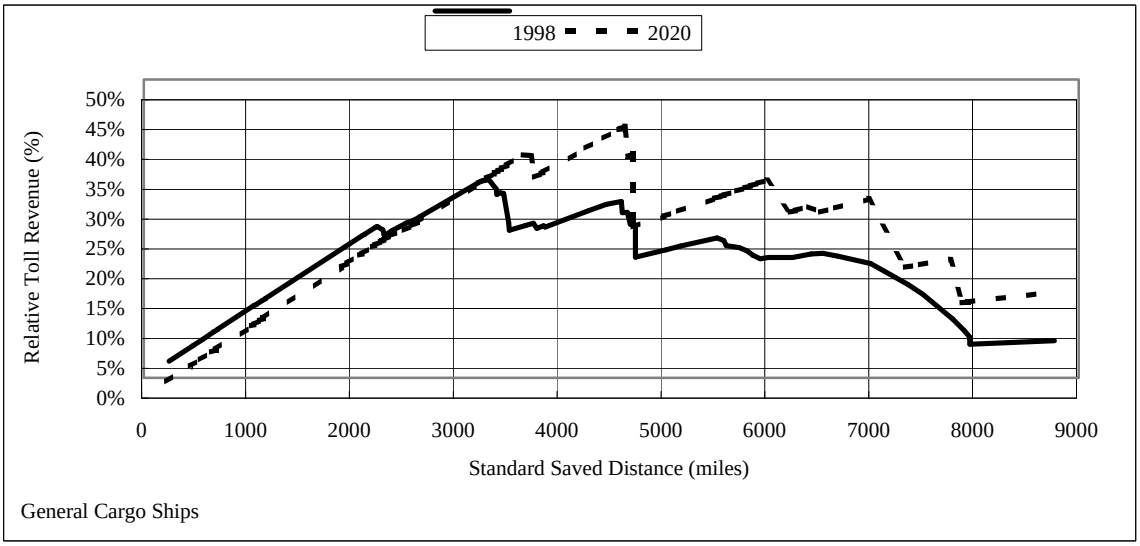


Figure 5.6.9 Relative Toll Revenue (General Cargo Ships)

Some shipping lines operating Dry Bulk Carriers are using the route via the Cape, even though they are well aware of the Long Haul Rebate provided by SCA. These shipping lines' rationale is thought to be as follows;

- A shipping line calculates the shipping cost of one voyage or one term (for example one year) to propose a freight rate to a shipper/consignee.
- In the calculation, the shipping line sets the Long Haul Rebate rate lower than the actual level, because they do not want to undertake a risk.
- As a result, since the full rebate that could be expected is not applied in this calculation, calculated shipping cost via the Cape becomes lower than that via the Canal.
- After the freight rate and route (via the Cape) are fixed by contract between the shipping line and the shipper/consignee, the shipping line cannot change the route from via the Cape to via the Canal without the consent of the consignee because this would possibly generate additional inventory cost for the consignee.

It is thought to be possible to prevent the vessels from diverting to the route via the Cape, if shipping lines or shippers/consignees could know in advance the fixed figure of the Long Haul Rebate rates of the O-D pairs.

5.6.3 Proposition

The Study Team would like to propose setting the standard saved distance for tariff at 4,700 miles (or between saved distance at maximum relative toll revenue and 4,700 miles) on condition that SCA continues discount systems such as Long Haul Rebate. This is consistent with one of the key toll setting principles:

- Maximizing the net profit to SCA under the conditions that world trade shall not be adversely affected and that trade in the region surrounding the Suez Canal shall be promoted.

Setting standard saved distance over 4,700 miles may have a negative impact on the trade in the region surrounding the Suez Canal. This region was the most affected region by the Suez Canal closure, since sensitivity of the region to changes in trade patterns is relatively high. Conversely, the region can theoretically enjoy the benefit of the Canal more than other regions if the standard saved distance is set at 4,700 miles.

The Study Team would also like to propose that a fixed rebate rate system regarding saved distance be introduced. Although shipping lines are well aware of the Long Haul Rebate, some opt for the route via the Cape because the rebate rates are not fixed.

It should be noted, however, that such a fixed rebate rate system should not apply for Container Vessels and Tankers of Crude Oil. This is because Container Ships have no possibility of changing their route, and the reduction for VLCC in ballast coming from America to Arabian Gulf which are main O-D pairs and SUMED integration are already exist for Tankers of Crude Oil.

Two alternatives for applying the fixed rebate rate system regarding saved distance can be set as follows;

Alternative-1: Fixing rebate rates by main O-D pairs

Outline of the system:

SCA fixes and announces rebate rates by main O-D pairs like current reduction for VLCC in ballast coming from America to Arabian Gulf. SCA can revise the rebate rates every six months to reflect changes in fuel price. Revising the rebate rates is considered to be easier than revising the tariff.

Users can apply current Long Haul Rebate instead of the fixed rebate system, since managing cost for common carriers are also affected by fluctuations in the shipping market.

Merit:

Shipping lines or shippers/consignees can know in advance the rebate rates of the main O-D pairs. This is expected to attract vessels which are well aware of the Long Haul Rebate but using the route via the Cape because the rebate rates are not fixed.

Demerit:

This system is not for minor O-D pairs, but only for main O-D pairs.

Alternative-2: Using ratio of saved distance for standard one

Outline of the system:

Rebate rates are calculated using the following equation by each trip.

(Saved distance rebate) = (Toll by tariff) x (1 - Saved distance ratio)

(Saved distance ratio) = (Actual saved distance) / (Standard saved distance)

Users can apply current Long Haul Rebate instead of the fixed rebate system, since managing cost for common carriers are also affected by fluctuations in the shipping market.

Merit:

Shipping lines or shippers/consignees can calculate in advance the rebate rates of the O-D pairs.

Demerit:

Alternative-2 is more complicate than alternative-1.

Above equation does not reflect other charges at the Canal.

It is possible that opinions of SCA and users regarding saved distance are different.

Alternative-2 cannot reflect changes in fuel price.

As a result, the Study Team recommends Alternative-1: fixing rebate rates by main O-D pairs.

5.6.4 Conclusion

Current tariff can basically be judged appropriate since the tariff is set based on the idea of

standard saved distance and complemented by discount systems such as Long Haul Rebate for trips where saved distance are less than standard one.

The Study Team would like to propose setting the standard saved distance for tariff at 4,700 miles (or between saved distance at maximum relative toll revenue and 4,700 miles) on condition that SCA continues discount systems such as Long Haul Rebate. This is consistent with one of the key toll setting principles:

- Maximizing the net profit to SCA under the conditions that world trade shall not be adversely affected and that trade in the region surrounding the Suez Canal shall be promoted.

The Study Team would also like to propose that fixed rebate rate system regarding saved distance be introduced. Although shipping lines are well aware of the Long Haul Rebate, some opt for the route via the Cape because the rebate rates are not fixed. Such a fixed rebate rate system should not apply for Container Vessels and Tankers of Crude Oil. In applying the fixed rebate system, the Study Team recommends a method in which rebate rates are fixed by main O-D pairs.

5.7 Toll for Tankers of Crude Oil

5.7.1 Current toll for Tankers of Crude Oil

For Tankers of Crude Oil, following discount systems are applied in addition to the basic toll as shown in Table 5.7.1.

- Reduction for VLCC in ballast coming from America to Arabian Gulf
- Tolls for tankers that lighten part of crude oil in SUMED terminal at Sukhna
- Tolls for supertanker (mother) with Suez-max (daughter)
- SBT reduction
- Volume incentives for crude oil tankers

Table 5.7.1 Current Tariff (Tankers of Crude Oil)

(SDR/SCNT)

Vessel Type	SCNT					
	First 5000	Next 5000	Next 10000	Next 20000	Next 30000	Rest
1 (L)	6.49	3.62	3.25	1.40	1.40	1.21
1 (B)	5.52	3.08	2.77	1.19	1.19	1.03

Source) SCA

Current basic toll level is set based on the "World Scale" which shows market conditions of tanker freight. Standard O-D for tariff of Tankers of Crude Oil is set at the Arabian Gulf - NW. Europe.

5.7.2 Evaluation

World Scale obtained by multiplying World Scale Flat (or WS100) and World Scale Rate (WSR) together shows tanker freight per MT of crude oil or petroleum products by O-D and route.

World Scale Flat is announced every year (1st January) by Worldscale Association (London) Limited and Worldscale Association (NYC) Inc whose members are tanker brokers. World Scale Flat is obtained on the premise of parameters as shown in Table 5.7.2.

World Scale Rate is a percentage agreed upon between a charterer and a shipowner considering market conditions of tanker freight at that time.

For common carriers, current basic toll level can basically be judged appropriate, since it is set based on the World Scale.

Table 5.7.2 Main Parameters of World Scale Flat

Item	Assumption
Standard Vessel	Total Capacity: 75,000MT
	Speed: 14.5knots
	Daily Bunker Consumption: 55MT
Fixed Daily Hire Element	US$ 12,000
Bunker Price	Average during the 1st Oct. to 30th Sept. of the previous year
Voyage Distance	Round voyage distance
Suez Canal	Treated as Fixed Rate Differentials

Source) Worldscale, 1st January 2001

Table 5.7.2 and Table 5.7.4 show shippers/consignees payment for crude oil transport which common carriers receive from them. Observations are as follows;

WSR is high level (case-2)

In case that the destination is Europe, using the Canal has great advantages and there may be room to raise the toll, since savings of S/S or S/S+SUMED for C/C exceed 20%.

In case that the destination is America, using the Canal still has some advantages, but savings of S/S or S/S+SUMED for C/C are less than 10%.

WSR is low level (case-2)

Advantages of using the Canal are less than case-1.

In case that destination is America, in particular, there is no advantage to using the Canal.

It is necessary to apply the Long Haul Rebate in this case.

On the other hand, common carriers which participate in spot tanker market are said to represent only 20% - 30% of the world fleet, and the remaining 70% - 80% are said to be industrial carriers which are seldom affected by the market conditions of tanker freight in case of Tankers of Crude Oil.

For industrial carriers, it is thought to be appropriate to set basic toll level based on savings in shipping cost. Lately, however, some shippers/consignees seem to insist on reflecting the market conditions of tanker freight in long term contracts.

Table 5.7.3 Shippers'/Consignees' Payment for Crude Oil Transport (Common Carriers)

(Case-1: WSR is low level)

Unloading Port	O-D Distance (single way)			Vessel Size		Cargo	Route				Ratio for C/C			Least Payment Route
	via Cape	via Suez	Savings	SCNT	DWT	MT	C/C	C/S	S/S	S/S+ SUMED	C/S	S/S	S/S+ SUMED	
Lavera (France)	10,783	4,684	6,099	40,000	79,840	72,335	1,392,455	1,184,306	997,671		85%	72%		S/S
				70,000	139,721	126,587	2,436,796	2,023,432	1,648,354		83%	68%		S/S
				110,000	219,561	198,922	1,531,701	1,398,551		1,390,113	91%		91%	S/S + SUMED
				160,000	319,361	289,341	2,227,928	2,006,459		1,940,595	90%		87%	S/S + SUMED
				220,000	439,122	397,844	3,063,401	2,725,653		2,536,367	89%		83%	S/S + SUMED
Rotterdam (Netherland)	11,169	6,436	4,733	40,000	79,840	72,335	1,388,838	1,258,811	1,149,575		91%	83%		S/S
				70,000	139,721	126,587	2,430,467	2,153,817	1,914,186		89%	79%		S/S
				110,000	219,561	198,922	1,527,722	1,480,507		1,557,208	97%		102%	C/S
				160,000	319,361	289,341	2,222,141	2,125,668		2,183,641	96%		98%	C/S
				220,000	439,122	397,844	3,055,444	2,889,564		2,870,556	95%		94%	S/S + SUMED
New Orleans (USA)	12,299	9,645	2,654	40,000	79,840	72,335	1,493,725	1,484,497	1,496,062		99%	100%		C/S
				70,000	139,721	126,587	2,614,018	2,548,768	2,520,537		98%	96%		S/S
				110,000	219,561	198,922	1,643,097	1,628,493		1,838,074	99%		112%	C/S
				160,000	319,361	289,341	2,389,959	2,356,369		2,607,623	99%		109%	C/S
				220,000	439,122	397,844	3,286,194	3,219,525		3,520,786	98%		107%	C/S
Aruba Island (Aruba)	10,792	8,814	1,978	40,000	79,840	72,335	1,351,224	1,382,504	1,434,577		102%	106%		C/C
				70,000	139,721	126,587	2,364,642	2,370,280	2,412,938		100%	102%		C/C
				110,000	219,561	198,922	1,486,346	1,494,019		1,748,158	101%		118%	C/C
				160,000	319,361	289,341	2,161,958	2,164,204		2,480,270	100%		115%	C/C
				220,000	439,122	397,844	2,972,693	2,958,129		3,348,508	100%		113%	C/S

(Case-2: WSR is high level)

Unloading Port	O-D Distance (single way)			Vessel Size		Cargo	Route				Ratio for C/C			Least Payment Route
	via Cape	via Suez	Savings	SCNT	DWT	MT	C/C	C/S	S/S	S/S+ SUMED	C/S	S/S	S/S+ SUMED	
Lavera (France)	10,783	4,684	6,099	40,000	79,840	72,335	2,784,910	2,236,061	1,708,728		80%	61%		S/S
				70,000	139,721	126,587	4,873,593	3,864,005	2,892,702		79%	59%		S/S
				110,000	219,561	198,922	3,829,251	3,133,948		2,563,356	82%		67%	S/S + SUMED
				160,000	319,361	289,341	5,569,820	4,530,673		3,647,130	81%		65%	S/S + SUMED
				220,000	439,122	397,844	7,658,503	6,196,446		4,882,852	81%		64%	S/S + SUMED
Rotterdam (Netherland)	11,169	6,436	4,733	40,000	79,840	72,335	2,777,677	2,385,072	2,012,536		86%	72%		S/S
				70,000	139,721	126,587	4,860,934	4,124,774	3,424,367		85%	70%		S/S
				110,000	219,561	198,922	3,819,305	3,338,838		2,981,093	87%		78%	S/S + SUMED
				160,000	319,361	289,341	5,555,353	4,828,694		4,254,747	87%		77%	S/S + SUMED
				220,000	439,122	397,844	7,638,611	6,606,226		5,718,325	86%		75%	S/S + SUMED
New Orleans (USA)	12,299	9,645	2,654	40,000	79,840	72,335	2,987,449	2,836,445	2,705,508		95%	91%		S/S
				70,000	139,721	126,587	5,228,036	4,914,676	4,637,068		94%	89%		S/S
				110,000	219,561	198,922	4,107,743	3,859,206		3,833,661	94%		93%	S/S + SUMED
				160,000	319,361	289,341	5,974,898	5,601,043		5,510,295	94%		92%	S/S + SUMED
				220,000	439,122	397,844	8,215,485	7,680,951		7,511,960	93%		91%	S/S + SUMED
Aruba Island (Aruba)	10,792	8,814	1,978	40,000	79,840	72,335	2,702,448	2,632,459	2,582,538		97%	96%		S/S
				70,000	139,721	126,587	4,729,284	4,557,701	4,421,871		96%	93%		S/S
				110,000	219,561	198,922	3,715,866	3,556,444		3,642,295	96%		98%	C/S
				160,000	319,361	289,341	5,404,896	5,164,094		5,235,378	96%		97%	C/S
				220,000	439,122	397,844	7,431,732	7,082,979		7,136,781	95%		96%	C/S

Notes) Assumed parameters

Loading port = Ras Tanura (Saudi Arabia, Arabian Gulf))

SCNT/DWT = 0.501

Load Factor = 0.906

SUMED Charges (US$) = Cargo(MT) x 1.07 (US$/MT) x 1.1

SC toll in case of SUMED integration = 0.63 (US$/MT)

(Other charges) = (Port dues) + (Agency fee, etc.) + (Escort tug paied by user)

(Port dues) = 0.13US$/SCNT

(Agency fee, etc.) = 4,500US$

(Escort tug paied by user) = 6,600SDR*1.30US$/SCNT*(No. of Tug paied by user)

1 tug for a vessel from 70,000SCNT laden to 90,000SCNT laden

2 tugs for over 90,000SCNT laden

1 tug for a vessel over 130,000SCNT ballast

1 tug for a LNG/LPG over 25,000SCNT (except GF)

Table 5.7.4 Shippers'/Consignees' Payment Calculation for Crude Oil Transport (Common Carriers)

(Case-1: WSR is low level)

Unloading Port	O-D Distance (single way)			Vessel Size		Cargo	Route																					
	via Cape	via Suez	Savings	SCNT	DWT	MT	C/C			C/S							S/S							S/S + SUMED Integration						
							World Scale			World Scale			Suez Canal Dues			Total	World Scale			Suez Canal Dues			Total	World Scale			Suez Canal Dues			SUMED	Total
							WS Flat	WS Rate	Freight	WS Flat	WS Rate	Freight	Toll (B)	O. Carges	Total		WS Flat	WS Rate	Freight	Toll(L+B)	O. Carges	Total		WS Flat	WS Rate	Freight	Toll(L+B)	O. Carges	Total	Charges	
							US$/MT	%	US$	US$/MT	%	US$	US$	US$	US$		US$/MT	%	US$	US$	US$	US$		US$/MT	%	US$	US$	US$	US$	US$	
Lavera (France)	10,783	4,684	6,099	40,000	79,840	72,335	19.25	100%	1,392,455	14.54	100%	1,051,756	122,850	9,700	132,550	1,184,306	9.83	100%	711,056	267,215	19,400	286,615	997,671							
				70,000	139,721	126,587	19.25	100%	2,436,796	14.54	100%	1,840,572	169,260	13,600	182,860	2,023,432	9.83	100%	1,244,349	368,225	35,780	404,005	1,648,354							
				110,000	219,561	198,922	19.25	40%	1,531,701	14.54	40%	1,156,931	222,820	18,800	241,620	1,398,551								9.83	40%	782,162	336,220	37,600	373,820	234,131	1,390,113
				160,000	319,361	289,341	19.25	40%	2,227,928	14.54	40%	1,682,809	289,770	33,880	323,650	2,006,459								9.83	40%	1,137,690	403,170	59,180	462,350	340,555	1,940,595
				220,000	439,122	397,844	19.25	40%	3,063,401	14.54	40%	2,313,863	370,110	41,680	411,790	2,725,653								9.83	40%	1,564,324	429,000	74,780	503,780	468,263	2,536,367
Rotterdam (Netherland)	11,169	6,436	4,733	40,000	79,840	72,335	19.20	100%	1,388,838	15.57	100%	1,126,261	122,850	9,700	132,550	1,258,811	11.93	100%	862,960	267,215	19,400	286,615	1,149,575							
				70,000	139,721	126,587	19.20	100%	2,430,467	15.57	100%	1,970,957	169,260	13,600	182,860	2,153,817	11.93	100%	1,510,181	368,225	35,780	404,005	1,914,186							
				110,000	219,561	198,922	19.20	40%	1,527,722	15.57	40%	1,238,887	222,820	18,800	241,620	1,480,507								11.93	40%	949,257	336,220	37,600	373,820	234,131	1,557,208
				160,000	319,361	289,341	19.20	40%	2,222,141	15.57	40%	1,802,018	289,770	33,880	323,650	2,125,668								11.93	40%	1,380,737	403,170	59,180	462,350	340,555	2,183,641
				220,000	439,122	397,844	19.20	40%	3,055,444	15.57	40%	2,477,774	370,110	41,680	411,790	2,889,564								11.93	40%	1,898,513	429,000	74,780	503,780	468,263	2,870,556
New Orleans (USA)	12,299	9,645	2,654	40,000	79,840	72,335	20.65	100%	1,493,725	18.69	100%	1,351,947	122,850	9,700	132,550	1,484,497	16.72	100%	1,209,447	267,215	19,400	286,615	1,496,062							
				70,000	139,721	126,587	20.65	100%	2,614,018	18.69	100%	2,365,908	169,260	13,600	182,860	2,548,768	16.72	100%	2,116,532	368,225	35,780	404,005	2,520,537							
				110,000	219,561	198,922	20.65	40%	1,643,097	18.69	40%	1,487,142	122,551	18,800	141,351	1,628,493								16.72	40%	1,330,391	235,951	37,600	273,551	234,131	1,838,074
				160,000	319,361	289,341	20.65	40%	2,389,959	18.69	40%	2,163,116	159,374	33,880	193,254	2,356,369								16.72	40%	1,935,115	272,774	59,180	331,954	340,555	2,607,623
				220,000	439,122	397,844	20.65	40%	3,286,194	18.69	40%	2,974,284	203,561	41,680	245,241	3,219,525								16.72	40%	2,660,783	316,961	74,780	391,741	468,263	3,520,786
Aruba Island (Aruba)	10,792	8,814	1,978	40,000	79,840	72,335	18.68	100%	1,351,224	17.28	100%	1,249,954	122,850	9,700	132,550	1,382,504	15.87	100%	1,147,962	267,215	19,400	286,615	1,434,577							
				70,000	139,721	126,587	18.68	100%	2,364,642	17.28	100%	2,187,420	169,260	13,600	182,860	2,370,280	15.87	100%	2,008,933	368,225	35,780	404,005	2,412,938							
				110,000	219,561	198,922	18.68	40%	1,486,346	17.28	40%	1,374,950	100,269	18,800	119,069	1,494,019								15.87	40%	1,262,758	213,669	37,600	251,269	234,131	1,748,158
				160,000	319,361	289,341	18.68	40%	2,161,958	17.28	40%	1,999,927	130,397	33,880	164,277	2,164,204								15.87	40%	1,836,739	243,797	59,180	302,977	340,555	2,480,270
				220,000	439,122	397,844	18.68	40%	2,972,693	17.28	40%	2,749,900	166,550	41,680	208,230	2,958,129								15.87	40%	2,525,516	279,950	74,780	354,730	468,263	3,348,508

(Case-2: WSR is high level)

Unloading Port	O-D Distance (single way)			Vessel Size		Cargo	Route																					
	via Cape	via Suez	Savings	SCNT	DWT	MT	C/C			C/S							S/S							S/S + SUMED Integration						
							World Scale			World Scale			Suez Canal Dues			Total	World Scale			Suez Canal Dues			Total	World Scale			Suez Canal Dues			SUMED	Total
							WS Flat	WS Rate	Freight	WS Flat	WS Rate	Freight	Toll (B)	O. Carges	Total		WS Flat	WS Rate	Freight	Toll(L+B)	O. Carges	Total		WS Flat	WS Rate	Freight	Toll(L+B)	O. Carges	Total	Charges	
							US$/MT	%	US$	US$/MT	%	US$	US$	US$	US$		US$/MT	%	US$	US$	US$	US$		US$/MT	%	US$	US$	US$	US$	US$	
Lavera (France)	10,783	4,684	6,099	40,000	79,840	72,335	19.25	200%	2,784,910	14.54	200%	2,103,511	122,850	9,700	132,550	2,236,061	9.83	200%	1,422,113	267,215	19,400	286,615	1,708,728							
				70,000	139,721	126,587	19.25	200%	4,873,593	14.54	200%	3,681,145	169,260	13,600	182,860	3,864,005	9.83	200%	2,488,697	368,225	35,780	404,005	2,892,702							
				110,000	219,561	198,922	19.25	100%	3,829,251	14.54	100%	2,892,328	222,820	18,800	241,620	3,133,948								9.83	100%	1,955,405	336,220	37,600	373,820	234,131	2,563,356
				160,000	319,361	289,341	19.25	100%	5,569,820	14.54	100%	4,207,023	289,770	33,880	323,650	4,530,673								9.83	100%	2,844,225	403,170	59,180	462,350	340,555	3,647,130
				220,000	439,122	397,844	19.25	100%	7,658,503	14.54	100%	5,784,656	370,110	41,680	411,790	6,196,446								9.83	100%	3,910,810	429,000	74,780	503,780	468,263	4,882,852
Rotterdam (Netherland)	11,169	6,436	4,733	40,000	79,840	72,335	19.20	200%	2,777,677	15.57	200%	2,252,522	122,850	9,700	132,550	2,385,072	11.93	200%	1,725,921	267,215	19,400	286,615	2,012,536							
				70,000	139,721	126,587	19.20	200%	4,860,934	15.57	200%	3,941,914	169,260	13,600	182,860	4,124,774	11.93	200%	3,020,362	368,225	35,780	404,005	3,424,367							
				110,000	219,561	198,922	19.20	100%	3,819,305	15.57	100%	3,097,218	222,820	18,800	241,620	3,338,838								11.93	100%	2,373,141	336,220	37,600	373,820	234,131	2,981,093
				160,000	319,361	289,341	19.20	100%	5,555,353	15.57	100%	4,505,044	289,770	33,880	323,650	4,828,694								11.93	100%	3,451,842	403,170	59,180	462,350	340,555	4,254,747
				220,000	439,122	397,844	19.20	100%	7,638,611	15.57	100%	6,194,436	370,110	41,680	411,790	6,606,226								11.93	100%	4,746,283	429,000	74,780	503,780	468,263	5,718,325
New Orleans (USA)	12,299	9,645	2,654	40,000	79,840	72,335	20.65	200%	2,987,449	18.69	200%	2,703,895	122,850	9,700	132,550	2,836,445	16.72	200%	2,418,893	267,215	19,400	286,615	2,705,508							
				70,000	139,721	126,587	20.65	200%	5,228,036	18.69	200%	4,731,816	169,260	13,600	182,860	4,914,676	16.72	200%	4,233,063	368,225	35,780	404,005	4,637,068							
				110,000	219,561	198,922	20.65	100%	4,107,743	18.69	100%	3,717,855	122,551	18,800	141,351	3,859,206								16.72	100%	3,325,978	235,951	37,600	273,551	234,131	3,833,661
				160,000	319,361	289,341	20.65	100%	5,974,898	18.69	100%	5,407,789	159,374	33,880	193,254	5,601,043								16.72	100%	4,837,787	272,774	59,180	331,954	340,555	5,510,295
				220,000	439,122	397,844	20.65	100%	8,215,485	18.69	100%	7,435,710	203,561	41,680	245,241	7,680,951								16.72	100%	6,651,957	316,961	74,780	391,741	468,263	7,511,960
Aruba Island (Aruba)	10,792	8,814	1,978	40,000	79,840	72,335	18.68	200%	2,702,448	17.28	200%	2,499,909	122,850	9,700	132,550	2,632,459	15.87	200%	2,295,923	267,215	19,400	286,615	2,582,538							
				70,000	139,721	126,587	18.68	200%	4,729,284	17.28	200%	4,374,841	169,260	13,600	182,860	4,557,701	15.87	200%	4,017,866	368,225	35,780	404,005	4,421,871							
				110,000	219,561	198,922	18.68	100%	3,715,866	17.28	100%	3,437,375	100,269	18,800	119,069	3,556,444								15.87	100%	3,156,895	213,669	37,600	251,269	234,131	3,642,295
				160,000	319,361	289,341	18.68	100%	5,404,896	17.28	100%	4,999,818	130,397	33,880	164,277	5,164,094								15.87	100%	4,591,847	243,797	59,180	302,977	340,555	5,235,378
				220,000	439,122	397,844	18.68	100%	7,431,732	17.28	100%	6,874,750	166,550	41,680	208,230	7,082,979								15.87	100%	6,313,789	279,950	74,780	354,730	468,263	7,136,781

Notes) Assumed parameters

Loading port = Ras Tanura (Saudi Arabia, Arabian Gulf))

SCNT/DWT = 0.501

Load Factor = 0.906

SUMED Charges (US$) = Cargo(MT) x 1.07 (US$/MT) x 1.1

SC toll in case of SUMED integration = 0.63 (US$/MT)

(Other charges) = (Port dues) + (Agency fee, etc.) + (Escort tug paied by user)

(Port dues) = 0.13US$/SCNT

(Agency fee, etc.) = 4,500US$

(Escort tug paied by user) = 6,600SDR*1.30US$/SCNT*(No. of Tug paied by user)

1 tug for a vessel from 70,000SCNT laden to 90,000SCNT laden

2 tugs for over 90,000SCNT laden

1 tug for a vessel over 130,000SCNT ballast

1 tug for a LNG/LPG over 25,000SCNT (except GF)

Main O-D pairs for Tankers of Crude Oil transiting the Canal are from the Arabian Gulf for Mediterranean (vessel size: 40,000SCNT - 80,000SCNT) and for NW. Europe (vessel size: VLCC by using SUMED integration). In case of ballast, main O-D pairs are from America, NW. Europe and Mediterranean (vessel size: VLCC) to the Arabian Gulf. (see section A.4 of Appendix A)

Table 5.7.5 Number of Vessel Transiting the Canal (Tankers of Crude Oil)

Direction	Laden	Ballast	Total
Northbound	71	2	73
Southbound	4	213	217
Total	75	215	290

Source) Analyzed by the Study Team based on the SC transit database of 1999

On the other hand, main O-D pairs for Tankers of Crude Oil using the route via the Cape are from the Arabian Gulf for America and for NW. Europe (vessel size: VLCC)

Table 5.7.6 Crude Oil Transport from Arabian Gulf to America and Europe via Cape

Vessel Size (1000DWT)	Destination					
(up to)	US Gulf	Carrebian	N. Europe & UK	S. Europe $ N Africa	Others	Total
25	0	0	0	0	0	0
50	0	0	0	0	1	1
75	1	0	0	0	0	1
100	4	0	0	1	1	6
125	1	0	1	0	0	2
150	6	0	0	0	1	7
175	6	0	1	1	0	8
200	0	0	0	0	0	0
225	0	0	0	0	0	0
250	6	1	0	0	1	8
275	39	8	10	0	5	62
300	67	4	77	21	15	184
325	107	11	15	0	22	155
350	8	1	3	0	0	12
375	23	5	5	0	0	33
400	3	0	3	0	0	6
425	28	1	4	0	0	33
450	0	0	0	0	0	0
475	14	1	0	0	0	15
500	0	0	1	0	0	1
Rest	7	2	0	0	1	10
Total Number of Vessels	320	34	120	23	47	544
Total Cargo (1000MT)	94,340	10,404	30,723	3,541	12,500	151,508

Source) JAMRI, based on Lloyd's data of 1999

Laden VLCC at full draught cannot transit the Canal because its maximum permissible draught is 62ft (from 2001).

Ratio of the canal transit can roughly be estimated at 40% (=213/544) based on the above two Tables. The ratio of 40% is felt to be low, since VLCC in ballast can physically transit the Canal.

Current basic toll level for Tankers of Crude Oil can basically be judged appropriate since standard O-D for tariff of Tankers of Crude Oil is set at the Arabian Gulf - NW. Europe, while SCA provides the reduction for VLCC in ballast coming from America to Arabian Gulf where saved distance is less than standard one.

Comparing with calculation based on Equation-1 of section 5.1.3 and on certain assumptions (e.g. fuel cost = 100US$/ton, exchange rate = 1.30US$/SDR), the following observations can be made (threshold criteria: plus or minus 10%).

> Current toll levels for Tankers of Crude Oil are a little lower for the vessels greater than 10,000SCNT than the calculated level when using standard saved distance of 4,700 miles and almost the same level for the vessels of 5,000SCNT.

Saved distance at maximum relative toll revenue is 2,600 miles. (see section 5.6.2)

Table 5.7.7 Toll Comparison (Tankers of Crude Oil, Laden)

(US$)

Toll	Standard Saved Distance (miles)		Vessel Size (SCNT)								Average
			5,000	10,000	20,000	40,000	70,000	110,000	160,000	220,000	
Current Toll		a	42,185	65,715	107,965	144,365	198,965	261,885	340,535	434,915	
Calculation	4,700	b	44,863	91,405	159,013	192,328	242,300	295,200	378,486	478,428	
	2,600	c	19,816	45,106	81,590	98,188	123,082	142,547	184,037	233,826	
	2,000	d	12,660	31,877	59,469	71,290	89,020	98,931	128,481	163,940	
Comparison		b/a	1.06	1.39	1.47	1.33	1.22	1.13	1.11	1.10	1.23
		c/a	0.47	0.69	0.76	0.68	0.62	0.54	0.54	0.54	0.60
		d/a	0.30	0.49	0.55	0.49	0.45	0.38	0.38	0.38	0.43
		c/b	0.44	0.49	0.51	0.51	0.51	0.48	0.49	0.49	0.49
		d/b	0.28	0.35	0.37	0.37	0.37	0.34	0.34	0.34	0.35

Note) Exchange rate = 1.30 US$/SDR
Source) The Study Team

As to the reduction for VLCC in ballast coming from America to Arabian Gulf, current discount rates of 45% for the Mexican Guff and 55% for the Caribbean Zone should be raised since saved cost ratios to standard saved distance of 4,700 miles are calculated as 49% for the Mexican Gulf (saved distance: 2,600 miles) and 35% for the Caribbean Zone (saved distance: 2,000 miles).

It should be noted that a limited number of tankers whose size is less than VLCC are also deployed at the O-D of the Arabian Gulf - America, while the target of the current reduction is only VLCC in ballast.

5.7.3 Proposition

Current toll levels for Tankers of Crude Oil are a little lower for the vessels greater than 10,000SCNT than the calculated level when using standard saved distance of 4,700 miles and almost the same level for the vessels of 5,000SCNT.

Accordingly, it is thought to be possible to increase toll revenue by raising tolls for the vessels more than 10,000SCNT.

However, the calculation is based on certain assumptions, so it is thought to be necessary to carefully monitor the shipping market and world trade before and after the revision is made in order to verify whether these assumptions are appropriate or not.

The Study Team would like to propose that the tolls for Tankers of Crude Oil be raised by

3% as the first step. A step-by-step approach to revising the tolls will make it possible to observe the reactions of the shipping market.

As to the reduction for VLCC in ballast coming from America to Arabian Gulf, the Study Team would like to propose that discount rates be raised to 51% (=100%-49%) for the Mexican Guff and 65% (=100%-35%) for the Caribbean Zone based on comparison of the cases when the standard saved distance of 4,700 miles, 2,600 miles and 2,000 miles are applied. In addition, discounts should not be limited to VLCC in ballast.

5.7.4 Conclusion

Current basic toll level for Tankers of Crude Oil can basically be judged appropriate since standard O-D for tariff of Tankers of Crude Oil is set at the Arabian Gulf - NW. Europe, while SCA provides the reduction for VLCC in ballast coming from America to Arabian Gulf where saved distance is less than standard one.

Current toll levels for Tankers of Crude Oil are a little lower for the vessels greater than 10,000SCNT than the calculated level when using standard saved distance of 4,700 miles and almost the same level for the vessels of 5,000SCNT.

Accordingly, it is thought to be possible to increase toll revenue by raising tolls for the vessels more than 10,000SCNT.

The Study Team would like to propose that the tolls for Tankers of Crude Oil be raised by 3% as the first step. A step-by-step approach to revising the tolls will make it possible to observe the reactions of the shipping market.

As to the reduction for VLCC in ballast coming from America to Arabian Gulf, the Study Team would like to propose that discount rates be raised to 51% (=100%-49%) for the Mexican Guff and 65% (=100%-35%) for the Caribbean Zone based on comparison of the cases when the standard saved distance of 4,700 miles, 2,600 miles and 2,000 miles are applied. In addition, discounts should not be limited to VLCC in ballast.

5.8 Toll for Tankers of Petroleum Products

5.8.1 Current toll for Tankers of Petroleum Products

Table 5.8.1 shows the current tariff for Tankers of Petroleum Products.

Table 5.8.1 Current Tariff (Tankers of Petroleum Products)

(SDR/SCNT)

Vessel Type	SCNT					
	First 5000	Next 5000	Next 10000	Next 20000	Next 30000	Rest
2 (L)	6.75	3.77	3.43	1.93	1.93	1.93
2 (B)	5.52	3.08	2.77	1.19	1.19	1.03

Source) SCA

Current basic toll level is set based on the "World Scale" which shows market conditions of tanker freight.

5.8.2 Evaluation

For common carriers, current basic toll level can basically be judged appropriate since it is set based on World Scale.

On the other hand, common carriers (except VLCC) which participate in spot tanker market are said to represent only 30% of the world fleet, while the remaining 70% are said to be industrial carriers which are seldom affected by market conditions of tanker freight in case of Tankers of Petroleum Products.

For industrial carriers, it is thought to be appropriate to set the basic toll level based on savings in shipping cost.

As to vessel size of Tankers of Petroleum Products transiting the Canal, vessels under 70,000SCNT and under 40,000SCNT represent 98% and 82% of the total.

Main O-D pairs for Tankers of Petroleum Products transiting the Canal are from the Arabian Gulf or SE. Asia for NW. Europe, and southbound from N. Mediterranean. There is no remarkable concentration in O-D pairs. (see section A.4 of Appendix A)

On the other hand, according to JAMRI (Japan Maritime Research Institute), there are some Tankers of Petroleum Products using the route via the Cape, but their main O-D pair is from the Arabian Gulf to S. America and thus the cargo on this route is not considered to be potential Canal cargo.

Table 5.8.2 Accumulation of Number of Vessels (Tankers of Petroleum Products)

SCNT	DWT	SC Transit 1999	World Fleet
5,000	9,452	16%	25%
10,000	18,904	35%	37%
20,000	37,807	60%	59%
40,000	75,614	82%	93%
70,000	132,325	98%	100%

Source) World fleet: Fairplay World Shipping Encyclopaedia (delivered 1981-2000)

Table 5.8.3 Number of Vessel Transiting the Canal (Tankers of Petroleum Products)

Direction	Laden	Ballast	Total
Northbound	274	96	370
Southbound	129	59	188
Total	403	155	558

Source) Analyzed by the Study Team based on the SC transit database of 1999

Comparing with calculation based on Equation-1 of section 5.1.3 and on certain assumptions (e.g. fuel cost = 100US$/ton, exchange rate = 1.30US$/SDR), the following observations can be made (threshold criteria: plus or minus 10%).

Current toll levels for Tankers of Petroleum Products are a little lower for the vessels of 10,000 - 40,000SCNT than the calculated level when using standard saved distance of 4,700 miles, a little higher for the vessels of 5,000SCNT and 110,000SCNT and almost the same level for vessels of 70,000SCNT.

Saved distance at maximum relative toll revenue is 3,200-3,800 miles. (see section 5.6.2)

Table 5.8.4 Toll Comparison (Tankers of Petroleum Products, Laden)

(US$)

Toll	Standard Saved Distance (miles)		Vessel Size (SCNT)								Average
			5,000	10,000	20,000	40,000	70,000	110,000	160,000	220,000	
Current Toll		a	43,875	68,380	112,970	163,150	238,420	338,780			
Calculation	4,700	b	39,591	81,938	144,673	182,302	239,780	302,200			
	3,800	c	29,863	63,884	114,171	143,725	188,893	234,992			
	2,200	d	12,569	31,787	59,945	75,143	98,426	115,512			
Comparison		b/a	0.90	1.20	1.28	1.12	1.01	0.89			1.07
		c/a	0.68	0.93	1.01	0.88	0.79	0.69			0.83
		d/a	0.29	0.46	0.53	0.46	0.41	0.34			0.42
		c/b	0.75	0.78	0.79	0.79	0.79	0.78			0.78
		d/b	0.32	0.39	0.41	0.41	0.41	0.38			0.39

Note) Exchange rate = 1.30 US$/SDR
Source) The Study Team

5.8.3 Proposition

Current toll levels for Tankers of Petroleum Products are a little lower for the vessels of 10,000 - 40,000SCNT than the calculated level when using standard saved distance of 4,700 miles, a little higher for the vessels of 5,000SCNT and 110,000SCNT and almost the same level for vessels of 70,000SCNT.

Accordingly, it is thought to be possible to increase toll revenue by raising tolls for the vessels of 10,000 - 40,000SCNT.

The Study Team would like to propose that the tolls for 10,000 - 40,000SCNT of Tankers of Petroleum Products be raised by 3% as the first step. A step-by-step approach to revising the tolls will make it possible to observe the reactions of the shipping market.

As to the vessels of 5,000SCNT and 110,000SCNT of Tankers of Petroleum Products, it is thought to be appropriate to leave the toll as it is since there is no firm evidence that reducing the toll would increase toll revenues, although current toll level is a little higher than the calculated one.

5.8.4 Conclusion

Current toll levels for Tankers of Petroleum Products are a little lower for the vessels of 10,000 - 40,000SCNT than the calculated level when using standard saved distance of 4,700 miles, a little higher for the vessels of 5,000SCNT and 110,000SCNT and almost the same level for vessels of 70,000SCNT.

Accordingly, it is thought to be possible to increase toll revenue by raising tolls for the vessels of 10,000 - 40,000SCNT.

The Study Team would like to propose that the tolls for 10,000 - 40,000SCNT of Tankers of Petroleum Products be raised by 3% as the first step. A step-by-step approach to revising the tolls will make it possible to observe the reactions of the shipping market.

As to the vessels of 5,000SCNT and 110,000SCNT of Tankers of Petroleum Products, it is thought to be appropriate to leave the toll as it is since there is no firm evidence that reducing the toll would increase toll revenues.

5.9 Toll for Chemical Carriers

5.9.1 Current toll for Chemical Carriers

Table 5.9.1 shows the current tariff for Chemical Carriers.

Table 5.9.1 Current Tariff (Chemical Carriers)

(SDR/SCNT)

Vessel Type	SCNT					
	First 5000	Next 5000	Next 10000	Next 20000	Next 30000	Rest
4 (L)	7.50	4.14	3.81	2.68	2.68	2.68
4 (B)	6.38	3.56	3.24	2.28	2.28	2.28

Source) SCA

5.9.2 Evaluation

Ninety percent of Chemical Carriers are said to be industrial carriers which are seldom affected by market conditions. For industrial carriers, it is thought to be appropriate to set basic toll level based on savings in shipping cost.

Maximum vessel size of Chemical Carriers transiting the Canal is 30,000SCNT. There are few Chemical Carriers less than 5,000SCNT transiting the Canal.

Main O-D pairs for Chemical Carriers transiting the Canal are from W. SW. Mediterranean for S. Asia, but there is no remarkable concentration in O-D pairs. (see section A.4 of Appendix A)

Table 5.9.2 Accumulation of Number of Vessels (Chemical Carriers)

SCNT	DWT	SC Transit 1999	World Fleet
5,000	9,488	14%	59%
10,000	18,975	45%	78%
20,000	37,951	91%	92%
40,000	75,901	100%	100%

Source) World fleet: Fairplay World Shipping Encyclopaedia (delivered 1981-2000)

Table 5.9.3 Number of Vessel Transiting the Canal (Chemical Carriers)

Direction	Laden	Ballast	Total
Northbound	326	69	395
Southbound	410	4	414
Total	736	73	809

Source) Analyzed by the Study Team based on the SC transit database of 1999

Comparing with calculation based on Equation-1 of section 5.1.3 and on certain assumptions (e.g. fuel cost = 100US$/ton, exchange rate = 1.30US$/SDR), the following observations can be made (threshold criteria: plus or minus 10%).

Current toll levels for Chemical Carriers are a little lower for the vessels greater than 10,000SCNT than the calculated level when using standard saved distance of 4,700 miles and almost the same level for the vessels of 5,000SCNT.

Saved distance at maximum relative toll revenue is 3,200-3,500 miles. (see section 5.6.2)

Table 5.9.4 Toll Comparison (Chemical Carriers, Laden)

(US$)

Toll	Standard Saved Distance (miles)		Vessel Size (SCNT)								Average
			5,000	10,000	20,000	40,000	70,000	110,000	160,000	220,000	
Current Toll		a	48,750	75,660	125,190	194,870	299,390	438,750			
Calculation	4,700	b	48,692	100,293	181,014	252,531	358,873	484,296			
	3,300	c	30,597	66,335	122,028	170,274	241,989	322,028			
	2,100	d	15,087	37,229	71,468	99,767	141,802	182,942			
Comparison		b/a	1.00	1.33	1.45	1.30	1.20	1.10			1.23
		c/a	0.63	0.88	0.97	0.87	0.81	0.73			0.82
		d/a	0.31	0.49	0.57	0.51	0.47	0.42			0.46
		c/b	0.63	0.66	0.67	0.67	0.67	0.66			0.66
		d/b	0.31	0.37	0.39	0.40	0.40	0.38			0.37

Note) Exchange rate = 1.30 US$/SDR
Source) The Study Team

5.9.3 Proposition

Current toll levels for Chemical Carriers are a little lower for the vessels greater than 10,000SCNT than the calculated level when using standard saved distance of 4,700 miles and almost the same level for the vessels of 5,000SCNT.

Accordingly, it is thought to be possible to increase toll revenue by raising tolls for the vessels greater than 10,000SCNT.

The Study Team would like to propose that the tolls for the vessels greater than 10,000SCNT of Chemical Carriers be raised by 3% as the first step. A step-by-step approach to revising the tolls will make it possible to observe the reactions of the shipping market.

5.9.4 Conclusion

Current toll levels for Chemical Carriers are a little lower for the vessels greater than 10,000SCNT than the calculated level when using standard saved distance of 4,700 miles and almost the same level for the vessels of 5,000SCNT.

Accordingly, it is thought to be possible to increase toll revenue by raising tolls for the vessels greater than 10,000SCNT.

The Study Team would like to propose that the tolls for the vessels greater than 10,000SCNT of Chemical Carriers be raised by 3% as the first step. A step-by-step approach to revising the tolls will make it possible to observe the reactions of the shipping market.

5.10 Toll for LNG Carriers

5.10.1 Current toll for LNG Carriers

For LNG Carriers, following discount system is applied in addition to the basic tolls as shown in Table 5.10.1

- Reduction of 35% regardless of destination for ballast and loaded carrier
- Volume incentives for LNG Carriers

Table 5.10.1 Current Tariff (LNG Carriers)

(SDR/SCNT)

Vessel Type	SCNT					
	First 5000	Next 5000	Next 10000	Next 20000	Next 30000	Rest
4 (L)	7.50	4.14	3.81	2.68	2.68	2.68
4 (B)	6.38	3.56	3.24	2.28	2.28	2.28

Source) SCA

Current tolls including the generous discount of 35% are set to bolster the price competitiveness of Arabian LNG against Algerian LNG in EU market.

5.10.2 Evaluation

Vessel size of LNG Carriers transiting the Canal ranges from 40,000SCNT to 80,000SCNT.

Main O-D pairs for LNG Carriers transiting the Canal are from the Arabian Gulf for W. Mediterranean (mainly for Spain) and back in ballast. (see section A.4 of Appendix A)

Table 5.10.2 Number of Vessel Transiting the Canal (LNG Carriers)

Direction	Laden	Ballast	Total
Northbound	29	3	32
Southbound	0	31	31
Total	29	34	63

Source) Analyzed by the Study Team based on the SC transit database of 1999

Almost 100% of LNG Carriers are said to be industrial carriers which are seldom affected by market conditions. There is no market for common carriers since LNG trade itself is conducted based on long-term purchase contracts in order to ensure a long-term stable supply.

Table 5.10.3 shows LNG Prices at exporting and importing countries. The exporting price FOB of Qatar LNG tends to be higher than importing price CIF in Spain. This is thought to be caused by lower exporting price FOB of Algerian LNG..

Accordingly, it would be difficult to realize long-term and large quantity contracts between Qatar and Spain, even though the toll is free.

LNG Carriers currently transiting the Canal should be seen as exceptional transport in order to partially adjust the balance of LNG trade. In this case, the price of LNG and also the transport cost including the canal toll are to be negotiated among interested parties.

Current toll for LNG Carriers can be thought to be appropriate since it is necessary to bolster the price competitiveness of Arabian LNG against Algerian LNG in EU market, and it is set through negotiations with interested parties.

Table 5.10.3 LNG Price at Exporting and Importing Countries

Country			Year						
			1992	1993	1994	1995	1996	1997	1998
Algeria (FOB)	Quantity	(million MT)	15.56	14.97	14.62	10.84	15.07	18.28	
	Value	(million US$)	1,899.5	1,690.0	1,314.6	1,096.7	1,624.9	2,428.3	
	Price	(US$/MT)	122.1	112.9	89.9	101.2	107.8	132.8	
Qatar (FOB)	Quantity	(million MT)	1.39	1.21					
	Value	(million US$)	242.6	178.8					
	Price	(US$/MT)	174.5	147.8					
Spain (CIF)	Quantity	(million MT)	4.58	4.45	5.05	5.64	5.82	4.85	4.67
	Value	(million US$)	617.4	572.1	600.0	690.1	778.1	733.0	577.1
	Price	(US$/MT)	134.8	128.6	118.8	122.4	133.7	151.1	123.6
Japan (CIF)	Quantity	(million MT)	39.06	40.35	41.63	42.92	45.89	47.66	49.15
	Value	(million US$)	7,297.5	7,163.80	6,940.30	7,679.2	8,643.0	9,560.8	7,783.8
	Price	(US$/MT)	186.8	177.6	166.7	178.9	188.3	200.6	158.4

Note) Quantities in 1993 & 1994 of Japan are inserted using data of 1992 & 1995 by the Study Team.

Source) International Trade Statistics, UN

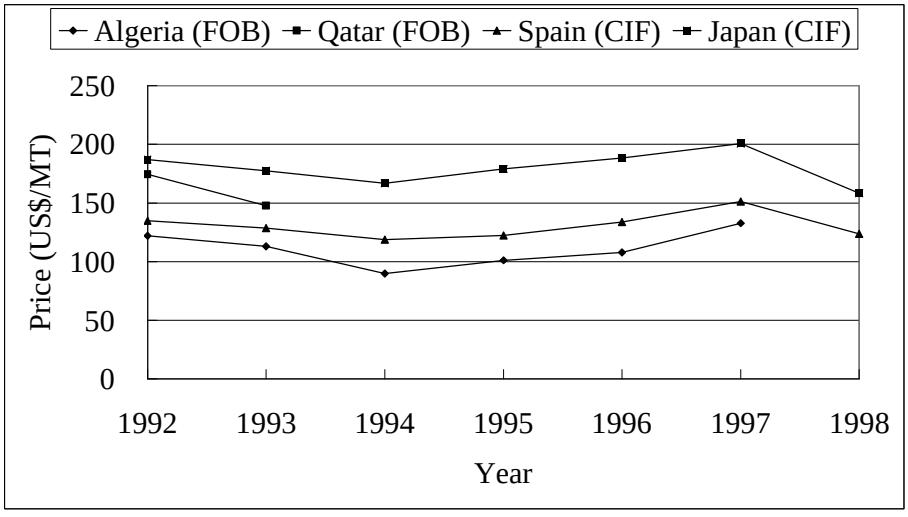


Figure 5.10.1 LNG Price at Exporting and Importing Countries

5.10.3 Conclusion

Current toll for LNG Carriers can be thought to be appropriate since it is necessary to bolster the price competitiveness of Arabian LNG against Algerian LNG in EU market, and it is set through negotiations with interested parties.

5.11 Toll for LPG Carriers

5.11.1 Current toll for LPG Carriers

Table 5.11.1 shows the current tariff for LPG Carriers.

Table 5.11.1 Current Tariff (LPG Carriers)

(SDR/SCNT)

Vessel Type	SCNT					
	First 5000	Next 5000	Next 10000	Next 20000	Next 30000	Rest
5 (L)	6.75	3.77	3.43	2.42	2.42	2.42
5 (B)	5.75	3.21	2.92	2.06	2.06	2.06

Source) SCA

5.11.2 Evaluation

Almost 100% of LPG Carriers are said to be industrial carriers which are seldom affected by market conditions. For industrial carriers, it is thought to be appropriate to set basic toll level based on savings in shipping cost.

Maximum vessel size of LPG Carriers transiting the Canal is 50,000SCNT. There are few LPG Carriers less than 5,000SCNT transiting the Canal.

Main O-D pairs for LPG Carriers transiting the Canal are from the Arabian Gulf for E. SE. Mediterranean and from W. SW. Mediterranean for SE. Asia, but there is no remarkable concentration in O-D pairs. (see section A.4 of Appendix A)

Table 5.11.2 Accumulation of Number of Vessels (LPG Carriers)

SCNT	DWT	SC Transit 1999	World Fleet
5,000	6,766	5%	65%
10,000	13,532	35%	77%
20,000	27,064	63%	85%
40,000	54,127	87%	97%

Source) World fleet: Fairplay World Shipping Encyclopaedia (delivered 1981-2000)

Table 5.11.3 Number of Vessel Transiting the Canal (LPG Carriers)

Direction	Laden	Ballast	Total
Northbound	69	101	170
Southbound	81	35	116
Total	150	136	286

Source) Analyzed by the Study Team based on the SC transit database of 1999

Comparing with calculation based on Equation-1 of section 5.1.3 and on certain assumptions (e.g. fuel cost = 100US$/ton, exchange rate = 1.30US$/SDR), the following observations can be made (threshold criteria: plus or minus 10%).

Current toll levels for LPG Carriers are a little lower for the vessels greater than 10,000SCNT than the calculated level when using standard saved distance of 4,700 miles and almost the same level for the vessels of 5,000SCNT.

Saved distance at maximum relative toll revenue is 5,900 miles. (see section 5.6.2)

Table 5.11.4 Toll Comparison (LPG Carriers, Laden)

(US$)

Toll	Standard Saved Distance (miles)		Vessel Size (SCNT)								Average
			5,000	10,000	20,000	40,000	70,000	110,000	160,000	220,000	
Current Toll		a	43,875	68,380	112,970	175,890	270,270	396,110			
Calculation	4,700	b	46,489	96,218	174,260	237,812	342,247	478,566			
	2,600	c	20,236	46,903	88,388	117,106	169,820	238,487			
	2,000	d	12,736	32,813	63,854	82,618	120,555	169,894			
Comparison		b/a	1.06	1.41	1.54	1.35	1.27	1.21			1.31
		c/a	0.46	0.69	0.78	0.67	0.63	0.60			0.64
		d/a	0.29	0.48	0.57	0.47	0.45	0.43			0.45
		c/b	0.44	0.49	0.51	0.49	0.50	0.50			0.49
		d/b	0.27	0.34	0.37	0.35	0.35	0.36			0.34

Note) Exchange rate = 1.30 US$/SDR
Source) The Study Team

5.11.3 Proposition

Current toll levels for LPG Carriers are a little lower for the vessels greater than 10,000SCNT than the calculated level when using standard saved distance of 4,700 miles and almost the same level for the vessels of 5,000SCNT.

Accordingly, it is thought to be possible to increase toll revenue by raising tolls for the vessels greater than 10,000SCNT.

The Study Team would like to propose that the tolls for the vessels greater than 10,000SCNT of LPG Carriers be raised by 3% as the first step. A step-by-step approach to revising the tolls will make it possible to observe the reactions of the shipping market.

5.11.4 Conclusion

Current toll levels for LPG Carriers are a little lower for the vessels greater than 10,000SCNT than the calculated level when using standard saved distance of 4,700 miles and almost the same level for the vessels of 5,000SCNT.

Accordingly, it is thought to be possible to increase toll revenue by raising tolls for the vessels greater than 10,000SCNT.

The Study Team would like to propose that the tolls for the vessels greater than 10,000SCNT of LPG Carriers be raised by 3% as the first step. A step-by-step approach to revising the tolls will make it possible to observe the reactions of the shipping market.

5.12 Toll for Dry Bulk Carriers

5.12.1 Current toll for Dry Bulk Carriers

Table 5.12.1 shows the current tariff for Dry Bulk Carriers. Dry Bulk Carriers are the main vessel type using the Long Haul Rebate.

Table 5.12.1 Current Tariff (Dry Bulk Carriers)

(SDR/SCNT)

Vessel Type	SCNT					
	First 5000	Next 5000	Next 10000	Next 20000	Next 30000	Rest
3 (L)	7.21	4.14	2.97	1.05	1.00	1.00
3 (B)	6.13	3.52	2.53	0.90	0.85	0.85

Source) SCA

5.12.2 Evaluation

Sixty percent of Dry Bulk Carriers are said to be industrial carriers which are seldom affected by market conditions. For industrial carriers, it is thought to be appropriate to set basic toll level based on savings in shipping cost.

Almost maximum vessel size of Dry Bulk Carriers transiting the Canal is 110,000SCNT. There are few Dry Bulk Carriers less than 10,000SCNT transiting the Canal.

Main O-D pairs for Dry Bulk Carriers transiting the Canal are from Black Sea for Far East or SE. Asia, from SE. Asia or Oceania for NW. Europe and from E. Africa (south part) for E. Mediterranean. (see section A.4 of Appendix A)

Table 5.12.2 Accumulation of Number of Vessels (Dry Bulk Carriers)

SCNT	DWT	SC Transit 1999	World Fleet
5,000	9,814	0%	22%
10,000	19,627	3%	27%
20,000	39,254	38%	53%
40,000	78,508	93%	89%
70,000	137,390	95%	91%
110,000	215,898	100%	100%

Source) World fleet: Fairplay World Shipping Encyclopaedia (delivered 1981-2000)

Table 5.12.3 Number of Vessel Transiting the Canal (Dry Bulk Carriers)

Direction	Laden	Ballast	Total
Northbound	1,098	58	1,156
Southbound	1,633	39	1,672
Total	2,731	97	2,828

Source) Analyzed by the Study Team based on the SC transit database of 1999

Comparing with calculation based on Equation-1 of section 5.1.3 and on certain assumptions (e.g. fuel cost = 100US$/ton, exchange rate = 1.30US$/SDR), the following observations can be made (threshold criteria: plus or minus 10%).

Current toll levels for Dry Bulk Carriers are a little higher for the vessels of 5,000SCNT than the calculated one and almost the same level for the vessels greater than 10,000SCNT.

Saved distance at maximum relative toll revenue is 2,300 miles. (see section 5.6.2)

Table 5.12.4 Toll Comparison (Dry Bulk Carriers, Laden)

(US$)

Toll	Standard Saved Distance (miles)		Vessel Size (SCNT)								Average
			5,000	10,000	20,000	40,000	70,000	110,000	160,000	220,000	
Current Toll		a	46,865	73,775	112,385	139,685	178,685	230,685			
Calculation	4,700	b	32,204	66,965	118,323	148,385	193,478	239,876			
	3,500	c	21,557	47,218	85,013	106,498	138,725	167,968			
	2,300	d	10,911	27,472	51,703	64,611	83,972	96,061			
Comparison		b/a	0.69	0.91	1.05	1.06	1.08	1.04			0.97
		c/a	0.46	0.64	0.76	0.76	0.78	0.73			0.69
		d/a	0.23	0.37	0.46	0.46	0.47	0.42			0.40
		c/b	0.67	0.71	0.72	0.72	0.72	0.70			0.70
		d/b	0.34	0.41	0.44	0.44	0.43	0.40			0.41

Note) Exchange rate = 1.30 US$/SDR
Source) The Study Team

Dry Bulk Carriers are main vessel type using the Long Haul Rebate. Main O-D pairs where saved distances are less than 4,700 miles are as follows;

Oceania - NW. Europe (Saved distance = 2,300 miles)
SE. Asia - NW. Europe (Saved distance = 3,500 miles)
E. Africa(south) - Med. (Saved distance = 2,300 miles)

5.12.3 Proposition

Current toll levels for Dry Bulk Carriers are a little higher for the vessels of 5,000SCNT than the calculated one and almost the same level for the vessels greater than 10,000SCNT.

On the other hand, it is thought that there is little possibility of increasing toll revenues by reducing tolls for 5,000SCNT Dry Bulk Carriers since the share of the vessels less than 5,000SCNT transiting the Canal is small compared to the world fleet.

If there is no increase in transit even after reducing tolls for 5,000SCNT Dry Bulk Carriers by 30%, toll revenue would decrease by around 0.6 million SDR (relating toll revenue in 1999 is estimated 0.2 million SDR for up to 5,000SCNT and 3.5 million SDR for from 5,000SCNT up to 10,000SCNT).

However, it is thought to be appropriate to leave the toll for 5,000SCNT of Dry Bulk Carriers as it is since there is no firm evidence that reducing the toll would increase toll revenue, although current toll level is higher than calculated one and there is a little

possibility of increasing toll revenues by reducing tolls.

The Study Team would like to propose that a fixed rebate rate system (see section 5.6.3) be applied to Dry Bulk Carriers, since Dry Bulk Carriers are the main vessel type using the Long Haul Rebate. Fixed rebate rates are obtained by Table 5.12.3 as follows;

Oceania - NW. Europe (Saved distance = 2,300 miles)	59% discount
SE. Asia - NW. Europe (Saved distance = 3,500 miles)	30% discount
E. Africa(south) - Med. (Saved distance = 2,300 miles)	59% discount

5.12.4 Conclusion

Current toll levels for Dry Bulk Carriers are a little higher for the vessels of 5,000SCNT than the calculated one and almost the same level for the vessels greater than 10,000SCNT.

As to the vessels of 5,000SCNT, it is thought to be appropriate to leave the tolls as it is since there is no firm evidence that reducing the toll would increase toll revenue.

The Study Team would like to propose that a fixed rebate rate system (see section 5.6.3) be applied to Dry Bulk Carriers since Dry Bulk Carriers are the main vessel type using the Long Haul Rebate. Fixed rebate rates given in Table 5.14.4 are as follows:

Oceania - NW. Europe (Saved distance = 2,300 miles)	59% discount
SE. Asia - NW. Europe (Saved distance = 3,500 miles)	30% discount
E. Africa(south) - Med. (Saved distance = 2,300 miles)	59% discount

5.13 Toll for Container Ships

5.13.1 Current toll for Container Ships

Table 5.13.1 shows the current tariff for Container Ships. The Long Haul Rebate is not applied to Container Ships.

The weather deck surcharge is applied to Container Ships as follows. Average weighted surcharge rate in 1999 was 9.7% based on the data provided by SCA.

6%: up to 3 tiers of containers
8%: 4 tiers of containers
10%: 5 tiers of containers
14%: more than 5 tiers of containers

Table 5.13.1 Current Tariff (Container Ships)

(SDR/SCNT)

Vessel Type	SCNT					
	First 5000	Next 5000	Next 10000	Next 20000	Next 30000	Rest
6 (L)	7.21	4.10	3.37	2.42	2.42	1.83
6 (B)	6.13	3.49	2.87	2.06	2.06	1.56

Source) SCA

5.13.2 Evaluation

Container transportation system has the following peculiarities:

- Regular service on specific liner route
- Using container boxes
- High value cargoes per ton

For Container Ships, it is thought to be appropriate to set basic toll level based on savings in shipping cost since there is almost no time to spare in operation because of regular service. In case that there is enough time to spare until next operation after transiting the Canal, savings perceived by shipping lines are only in fuel cost (variable cost). Savings in managing cost (basically fixed cost) are not perceived. Full savings in managing cost are perceived only when shipping lines can fully utilize days saved by using the Canal for their next operation.

In container transportation system accounting, capital cost for each container box is calculated in "US$/day" when each container box is registered with container number into container fleet immediately after the purchase. (see section 1.1.2 (b) of ANNEX 4) Accordingly, the container box capital cost can be counted in the estimation of savings in shipping cost.

Although the container box capital cost varies according to the purchase price and so forth, "Per Diem Charge" is said to be US$ 2 - 2.5 per day. This Per Diem Charge is levied and collected from shippers when they use container boxes over the free use period included in the freight charge. Capital cost of container box in the shipping lines' accounting is thought to be lower than the Per Diem Charge. Accordingly, container box capital cost to be counted in the estimation of savings in shipping cost can be set at around US$ 1.

Savings in inventory cost can also be counted in the estimation of savings by using the Canal since commodity value per ton of container cargoes is significantly higher than that transported by Tankers or Dry Bulk Carriers.

According to a survey conducted in October 1999 by the Japanese Ministry of Transport, average FOB price of exporting container cargoes was 2,887US$/ton (minimum: Grains & Cereals: 479US$/ton, maximum: Medicines: 10,419US$/ton), and average CIF price of importing container cargoes was 1,663US$/ton (minimum: Crude Minerals: 316US$/ton, Maximum: Medicines: 7,350US$/ton). Average FOB price of exporting container cargoes in Japan is greatly higher than average CIF price of importing container cargoes, reflecting the peculiarity of industrial advanced countries.

Average value of container cargoes passing through the Canal is thought to be lower than that of Japanese container cargoes due to the variety of O-D pairs of cargoes passing through the Canal. Accordingly, the inventory cost to be counted in the estimation of savings can be set at around US$ 1,000. On the other hand, according to SCA, the time sensitive cargoes represent around 30% (westbound: 40%, eastbound: 20%) of the total container cargoes, although the definition of "time sensitive cargoes" and their average prices are unknown.

Table 5.13.2 Distribution of Commodity Value in Container

Exp/Imp	Commodity Items	Item No.	Commodity Value per Freight-ton (1000JP\)	Commodity Value per Freight-ton (US$)	Commodity Volume (Freight-ton)	Share	Accumulation	Commodity Value (1000US$)
Export	Grains & Cereals	102	56	479	37,729	1%	1%	18,058
Export	Fertilizer	112	83	709	2,649	0%	1%	1,879
Export	Gum Products	114	87	744	444,267	9%	10%	330,352
Export	Fibers	106	104	889	99,218	2%	12%	88,194
Export	Fossil Fuel	107	107	915	15,455	0%	12%	14,134
Export	Paper & Paper Products	115	117	1,000	149,787	3%	15%	149,787
Export	Plastics	113	130	1,111	521,305	10%	25%	579,228
Export	Fruits & Vegetables	103	136	1,162	8,030	0%	25%	9,334
Export	Crude Gum	105	136	1,162	56,173	1%	27%	65,295
Export	Glass etc.	117	136	1,162	176,019	4%	30%	204,603
Export	Drink & Cigarettes	104	175	1,496	22,249	0%	31%	33,278
Export	Oils & Fats	108	182	1,556	2,671	0%	31%	4,155
Export	Steel	118	191	1,632	96,914	2%	33%	158,210
Export	Chemical Compounds	109	219	1,872	261,286	5%	38%	489,074
Export	Transport Apparatus	123	260	2,222	946,926	19%	57%	2,104,280
Export	Nonferrous Metal	119	380	3,248	72,050	1%	58%	234,009
Export	Fishes & Shellfishes	101	381	3,256	12,313	0%	58%	40,096
Export	Reexport Cargo	127	395	3,376	52,817	1%	59%	178,314
Export	Textiles	116	412	3,521	118,692	2%	62%	417,958
Export	Metal Products	120	424	3,624	67,105	1%	63%	243,184
Export	Ordinary Machines	121	499	4,265	1,000,533	20%	83%	4,267,230
Export	Dyestuffs etc.	110	530	4,530	33,786	1%	84%	153,048
Export	Other Products	126	580	4,957	180,290	4%	87%	893,745
Export	Precision Instrument	125	627	5,359	152,708	3%	90%	818,358
Export	Clothes	124	636	5,436	2,796	0%	90%	15,199
Export	Electrical Products	122	703	6,009	478,131	10%	100%	2,872,873
Export	Medicines	111	1219	10,419	4,537	0%	100%	47,270
	Total Export				5,016,436			14,431,146
	Weighted Average			2,877				
Import	Crude Minerals	216	37	316	75,124	1%	1%	23,757
Import	Fertilizer	207	41	350	321,918	6%	8%	112,809
Import	Timber	213	58	496	271,523	5%	13%	134,601
Import	Pulp	214	58	496	68,259	1%	14%	33,838
Import	Fossil Fuel	219	58	496	27,196	1%	14%	13,482
Import	Seeds & Nuts for Oil	211	61	521	38,201	1%	15%	19,917
Import	Grains & Cereals	204	71	607	102,945	2%	17%	62,471
Import	Wooden Products	228	76	650	137,040	3%	20%	89,017
Import	Furniture	238	84	718	251,268	5%	25%	180,398
Import	Nonmetal Mineral Products	231	88	752	196,412	4%	28%	147,729
Import	Crude Gum	212	96	821	78,622	1%	30%	64,510
Import	Paper & Paper Products	229	110	940	94,887	2%	32%	89,210
Import	Fruits & Vegetables	205	117	1,000	352,965	7%	38%	352,965
Import	Gum Products	227	137	1,171	52,377	1%	39%	61,330
Import	Other Materials	218	147	1,256	68,909	1%	41%	86,578
Import	Plastics	225	151	1,291	126,183	2%	43%	162,852
Import	Oils & Fats	220	161	1,376	13,345	0%	43%	18,364
Import	Textiles	230	164	1,402	191,848	4%	47%	268,915
Import	Shoes	240	164	1,402	99,989	2%	49%	140,156
Import	Other Products	242	168	1,436	375,212	7%	56%	538,766
Import	Other Foods	208	175	1,496	44,566	1%	57%	66,659
Import	Metal Products	234	178	1,521	115,933	2%	59%	176,377
Import	Steel	232	181	1,547	44,472	1%	60%	68,799
Import	Metal Materials	217	182	1,556	44,713	1%	61%	69,554
Import	Fibers	215	193	1,650	48,502	1%	61%	80,008
Import	Other Chemical Products	226	200	1,709	84,879	2%	63%	145,092
Import	Coffee etc.	206	228	1,949	81,728	2%	65%	159,265
Import	Drink	209	231	1,974	94,556	2%	66%	186,687
Import	Transport Apparatus	237	234	2,000	114,519	2%	69%	229,038
Import	Chemical Compounds	221	276	2,359	167,144	3%	72%	394,288
Import	Dairy Products	202	282	2,410	17,883	0%	72%	43,103
Import	Clothes	239	288	2,462	361,381	7%	79%	889,553
Import	Electrical Products	236	301	2,573	352,386	7%	86%	906,566
Import	Nonferrous Metal	233	302	2,581	88,816	2%	87%	229,252
Import	Dyestuffs etc.	222	321	2,744	18,396	0%	88%	50,471
Import	Precision Instrument	241	335	2,863	45,735	1%	89%	130,951
Import	Cosmetics etc.	224	349	2,983	26,964	1%	89%	80,431
Import	Meats	201	375	3,205	175,357	3%	92%	562,042
Import	Ordinary Machines	235	461	3,940	174,274	3%	96%	686,669
Import	Reimport Cargo	243	461	3,940	26,874	1%	96%	105,888
Import	Fishes & Shellfishes	203	515	4,402	149,788	3%	99%	659,323
Import	Cigarettes	210	528	4,513	41,173	1%	100%	185,806
Import	Medicines	223	860	7,350	8,436	0%	100%	62,008
	Total Import				5,272,698			8,769,492
	Weighted Average			1,663				
	Total Export + Import				10,289,134			23,200,638
	Weighted Average			2,255				

Notes) 1. These data were collected in October 1998 for one month at major Japanese ports.
2. Commodity Values are expressed at FOB in export and CIF in import.
3. Currency exchange rate in October 1998: 117 JP\/US$

Source) Japanese Ministry of Transport

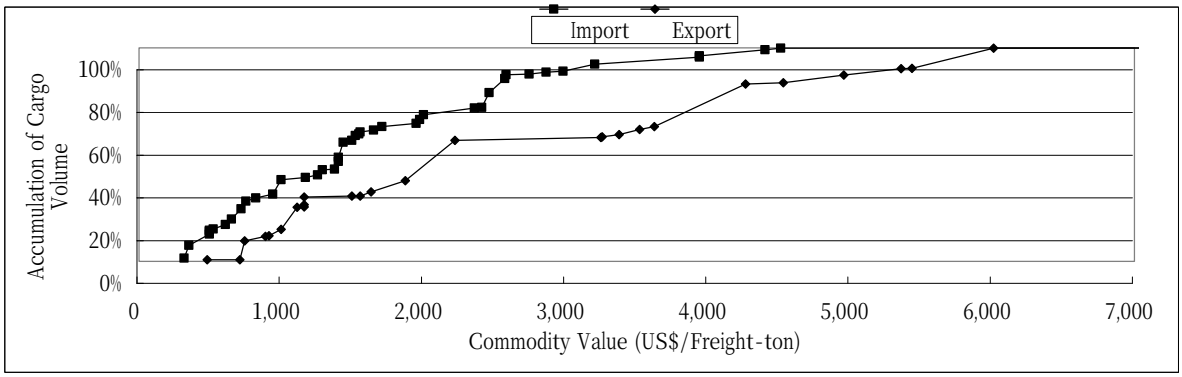


Figure 5.13.1 Distribution of Commodity Value in Container

Vessel size of Container Ships transiting the Canal is less than 90,000SCNT.

Main O-D pairs for Container Ships transiting the Canal are SE Asia - NW. Europe, but it should be noted that Container Ships have peculiarity of calling plural ports. (see section A.4 of Appendix A)

Table 5.13.3 Number of Vessel Transiting the Canal (Container Ships)

Direction	Laden	Ballast	Total
Northbound	2,183	9	2,192
Southbound	2,155	28	2,183
Total	4,338	37	4,375

Source) Analyzed by the Study Team based on the SC transit database of 1999

Comparing with calculation based on Equation-1 of section 5.1.3 and on certain assumptions (e.g. fuel cost = 100US$/ton, exchange rate = 1.30US$/SDR), the following observations can be made (threshold criteria: plus or minus 10%).

Case-1: without considering container box capital cost nor inventory cost

Current toll levels (after weather deck surcharge is applied) are a little lower for the vessels of 10,000 - 20,000SCNT than the calculated level when using standard saved distance of 4,700 miles, a little higher for the vessels greater than 70,000SCNT and almost the same level for the vessels of 5,000SCNT and 40,000SCNT.

Case-2: with considering container box capital only

Current toll levels (after weather deck surcharge is applied) are a little lower for the vessels of 10,000 - 40,000SCNT than the calculated level when using standard saved distance of 4,700 miles, a little higher for the vessels of 110,000SCNT and almost the same level for the vessels of 5,000SCNT and 70,000SCNT.

Case-3: with container box capital cost and inventory cost (cargo value: 300US$/ton)

Current toll levels (after weather deck surcharge is applied) are a little lower for the vessels of 10,000 - 40,000SCNT than the calculated level when using standard saved distance of 4,700 miles and almost the same level for the vessels of 5,000SCNT, 70,000SCNT and 110SCNT.

Case-4: with container box capital cost and inventory cost (cargo value: 1,000US$/ton)

Current toll levels (after weather deck surcharge is applied) are a little lower for the vessels of 10,000 - 70,000SCNT than the calculated level when using standard saved distance of 4,700 miles and almost the same level for the vessels of 5,000SCNT and 110,000SCNT.

Table 5.13.4 Toll Comparison (Container Ships, Laden, Case-1)

(US$)

Toll	Standard Saved Distance (miles)		Vessel Size (SCNT)								Average
			5,000	10,000	20,000	40,000	70,000	110,000	160,000	220,000	
Current Toll		a	46,865	73,515	117,325	180,245	274,625	369,785			
		b	51,411	80,646	128,706	197,729	301,264	405,654			
Calculation	4,700	c	47,227	94,605	165,989	215,099	272,105	312,543			
	3,500	d	32,484	67,130	119,087	153,484	193,105	216,484			
	3,200	e	28,798	60,261	107,361	138,080	173,355	192,469			
Comparison		c/a	1.01	1.29	1.41	1.19	0.99	0.85			1.12
		d/a	0.69	0.91	1.02	0.85	0.70	0.59			0.79
		e/a	0.61	0.82	0.92	0.77	0.63	0.52			0.71
		c/b	0.92	1.17	1.29	1.09	0.90	0.77			1.02
		d/b	0.63	0.83	0.93	0.78	0.64	0.53			0.72
		e/b	0.56	0.75	0.83	0.70	0.58	0.47			0.65
		d/c	0.69	0.71	0.72	0.71	0.71	0.69			0.71
		e/c	0.61	0.64	0.65	0.64	0.64	0.62			0.63

Note) Case-1: without condidering container box capital cost nor inventory cost
Current toll (b) show toll after weather-deck surcherge of 9.7%.
Exchange rate = 1.30 US$/SDR
Source) The Study Team

Table 5.13.5 Toll Comparison (Container Ships, Laden, Case-2)

(US$)

Toll	Standard Saved Distance (miles)		Vessel Size (SCNT)								Average
			5,000	10,000	20,000	40,000	70,000	110,000	160,000	220,000	
Current Toll		a	46,865	73,515	117,325	180,245	274,625	369,785			
		b	51,411	80,646	128,706	197,729	301,264	405,654			
Calculation	4,700	c	49,885	99,797	175,877	232,896	301,125	356,043			
	3,500	d	34,397	70,865	126,187	166,210	213,793	247,428			
	3,200	e	30,525	63,632	113,764	149,538	191,959	220,274			
Comparison		c/a	1.06	1.36	1.50	1.29	1.10	0.96			1.21
		d/a	0.73	0.96	1.08	0.92	0.78	0.67			0.86
		e/a	0.65	0.87	0.97	0.83	0.70	0.60			0.77
		c/b	0.97	1.24	1.37	1.18	1.00	0.88			1.10
		d/b	0.67	0.88	0.98	0.84	0.71	0.61			0.78
		e/b	0.59	0.79	0.88	0.76	0.64	0.54			0.70
		d/c	0.69	0.71	0.72	0.71	0.71	0.69			0.71
		e/c	0.61	0.64	0.65	0.64	0.64	0.62			0.63

Note) Case-2: with considering container box capital cost only
Current toll (b) show toll after weather-deck surcherge of 9.7%.
Exchange rate = 1.30 US$/SDR
Source) The Study Team

Table 5.13.6 Toll Comparison (Container Ships, Laden, Case-3)

(US$)

Toll	Standard Saved Distance (miles)		Vessel Size (SCNT)								Average
			5,000	10,000	20,000	40,000	70,000	110,000	160,000	220,000	
Current Toll		a	46,865	73,515	117,325	180,245	274,625	369,785			
		b	51,411	80,646	128,706	197,729	301,264	405,654			
Calculation	4,700	c	51,797	103,468	182,602	243,850	316,758	376,134			
	3,500	d	35,773	73,504	131,016	174,043	224,937	261,720			
	3,200	e	31,766	66,013	118,119	156,591	201,982	233,116			
Comparison		c/a	1.11	1.41	1.56	1.35	1.15	1.02			1.27
		d/a	0.76	1.00	1.12	0.97	0.82	0.71			0.90
		e/a	0.68	0.90	1.01	0.87	0.74	0.63			0.80
		c/b	1.01	1.28	1.42	1.23	1.05	0.93			1.15
		d/b	0.70	0.91	1.02	0.88	0.75	0.65			0.82
		e/b	0.62	0.82	0.92	0.79	0.67	0.57			0.73
		d/c	0.69	0.71	0.72	0.71	0.71	0.70			0.71
		e/c	0.61	0.64	0.65	0.64	0.64	0.62			0.63

Note) Case-3: with considering container box capital cost & inventory cost (cargo value: 300US$/ton)
Current toll (b) show toll after weather-deck surcherge of 9.7%.
Exchange rate = 1.30 US$/SDR
Source) The Study Team

Table 5.13.7 Toll Comparison (Container Ships, Laden, Case-4)

(US$)

Toll	Standard Saved Distance (miles)		Vessel Size (SCNT)								Average
			5,000	10,000	20,000	40,000	70,000	110,000	160,000	220,000	
Current Toll		a	46,865	73,515	117,325	180,245	274,625	369,785			
		b	51,411	80,646	128,706	197,729	301,264	405,654			
Calculation	4,700	c	56,261	112,036	198,294	269,409	353,235	423,014			
	3,500	d	38,983	79,664	142,283	192,319	250,941	295,067			
	3,200	e	34,663	71,571	128,280	173,046	225,367	263,080			
Comparison		c/a	1.20	1.52	1.69	1.49	1.29	1.14			1.39
		d/a	0.83	1.08	1.21	1.07	0.91	0.80			0.98
		e/a	0.74	0.97	1.09	0.96	0.82	0.71			0.88
		c/b	1.09	1.39	1.54	1.36	1.17	1.04			1.27
		d/b	0.76	0.99	1.11	0.97	0.83	0.73			0.90
		e/b	0.67	0.89	1.00	0.88	0.75	0.65			0.81
		d/c	0.69	0.71	0.72	0.71	0.71	0.70			0.71
		e/c	0.62	0.64	0.65	0.64	0.64	0.62			0.63

Note) Case-4: with considering container box capital cost & inventory cost (cargo value: 1,000US$/ton)
Current toll (b) show toll after weather-deck surcherge of 9.7%.
Exchange rate = 1.30 US$/SDR
Source) The Study Team

Earning capacity is considered to be appropriate for the denominator unit of toll rates for merchant vessels. And the earning capacity of a vessel is expressed in Net Tonnage (SCNT at the Canal) which is obtained by deducting the spaces directly for navigation from Gross Tonnage. As mentioned above, the container box capital cost can be counted in the estimation of savings in shipping cost. In other words, the earning capacity of Container Ships increases as the number of container boxes increases.

From this point of view, current weather deck surcharge is thought to be rational since SCNT is set as a basic earning capacity and complemented by an additional earning capacity of container boxes on the weather deck. However, the weather deck surcharge, which is levied based on number of tiers, sometimes forces shipping lines to perform unnecessary container handling for reducing the number of tiers. In addition, shipping lines operating Container Ships are given the impression that they are excessively charged since

the weather deck surcharge is applied to almost transits of Container Ships (see Table 5.13.8).

Table 5.13.8 Surcharge for Containers over Weather Deck

Tier	0	1	2	3	4	5	6	7	Total
Surcharge Rate	0%	6%	6%	6%	8%	10%	14%	14%	
Share of Loaded Vessels in 1999	0%	0%	1%	10%	29%	41%	15%	4%	100%

Source) Economic Unit of SCA

Distribution of ratio of carried containers (both loaded and empty) in TEUs to nominal capacity of a vessel in 1999 is shown in Table 5.13.9.

Table 5.13.9 Distribution of Ratio of Carried Containers to Nominal Capacity

Ratio of Carried Containers to Nominal Capacity	Number of Container Ships	Share
0	70	2%
up to 0.1	5	0%
up to 0.2	14	0%
up to 0.3	17	0%
up to 0.4	39	1%
up to 0.5	79	2%
up to 0.6	194	4%
up to 0.7	408	9%
up to 0.8	741	17%
up to 0.9	1,124	26%
up to 1.0	1,058	24%
up to 1.1	373	9%
up to 1.2	173	4%
over 1.2	80	2%
Total	4,375	100%

Note) Nominal Capacity (TEU) = 0.088 x SCNT, provided by SCA

Source) Analyzed by the Study Team based on the SC transit database of 1999.

5.13.3 Proposition

Current toll levels for Container Ships (after weather deck surcharge is applied) are a little lower for the vessels of 10,000 - 70,000SCNT than the calculated level (case-4) when using standard saved distance of 4,700 miles and almost the same level for the vessels of 5,000SCNT and 110,000SCNT.

Accordingly, it is thought to be possible to increase toll revenue by raising tolls for the vessels of 10,000 - 70,000SCNT.

The Study Team would like to propose that the tolls for 10,000 - 70,000SCNT of Container

Ships be raised by 3% as the first step. A step-by-step approach to revising the tolls will make it possible to observe the reactions of the shipping market.

It should be noted, however, that there are some direct services between Singapore and NW. Europe of which saved distance is 3,500 miles and careful attention should be paid to such services, though the Long Haul Rebate is not applied for Container Ships.

Current weather deck surcharge is thought to be rational since SCNT is set as a basic earning capacity and complemented by an additional earning capacity of container boxes on the weather deck. However, the weather deck surcharge, which is levied based on number of tiers, sometimes forces shipping lines to perform unnecessary container handling for reducing the number of tiers. In addition, shipping lines operating Container Ships are given the impression that they are excessively charged since the weather deck surcharge is applied to almost transits of Container Ships.

Two alternatives instead of current weather deck surcharge can be set as follows:

Current: surcharge based on number of tiers over weather deck

Merit: Checking number of tiers is easy.

Demerit: This system sometimes forces shipping lines to perform unnecessary container handling for reducing the number of tiers. In addition, shipping lines are given the impression that they are excessively charged.

Alternative-1: surcharge based on number of carried TEUs

Merit: This system could avoid unnecessary container handling by shipping lines.

Demerit: Shipping lines are given the impression that they are excessively charged. In addition, there is a problem in checking the number of carried TEUs which will be declared by shipping lines. SCA concerned about false declarations, although checking by the stowage plan is thought to be effective. SCA's concerns will disappear after EDI (electronic data interchange system) is introduced.

Alternative-2: discount based on number of carried TEUs on condition that the basic tolls be raised (see Table 5.13.10).

Table 5.13.10 Image of New Discount System on Container Ships

Discount rates	Carried Containers
15%	less than 40% of nominal capacity
10%	less than 60% of nominal capacity
5%	less than 80% of nominal capacity

The number of carried containers can be verified with the Stowage Plan issued at the previous port. This discount system on Container Ships are estimated to reduce toll revenue from Container Ships by 2% compared with that before discount. Then to maintain toll revenue from Container Ships as at present, the basic tolls should be raised by

12%.

Merit: This system could avoid unnecessary container handling by shipping lines. In addition, shipping lines would no longer feel that they are being excessively charged.

Demerit: There is a problem in checking the number of carried TEUs which will be declared by shipping lines. SCA concerned about false declarations, although checking by the stowage plan is thought to be effective. SCA's concerns will disappear after EDI (electronic data interchange system) is introduced.

As a result, although current weather deck surcharge is not ideal, it should be left as it is since there is no better alternative. However, a discount based on number of carried TEUs on condition that the basic tolls be raised (alternative-2) will be better than the current system after EDI (electronic data exchange system) is introduced.

5.13.4 Conclusion

The container box capital cost and also container cargo inventory cost can be counted in the estimation of savings by using the Canal.

Current toll levels for Container Ships (after weather deck surcharge is applied) are a little lower for the vessels of 10,000 - 70,000SCNT than the calculated level (case-4) when using standard saved distance of 4,700 miles and almost the same level for the vessels of 5,000SCNT and 110,000SCNT.

The Study Team would like to propose that the tolls for 10,000 - 70,000SCNT of Container Ships be raised by 3% as the first step. A step-by-step approach to revising the tolls will make it possible to observe the reactions of the shipping market.

It should be noted, however, that there are some direct services between Singapore and NW. Europe of which saved distance is 3,500 miles and careful attention should be paid to such services, though the Long Haul Rebate is not applied for Container Ships.

Although current weather deck surcharge is not ideal, it should be left as it is since there is no better alternative. However, a discount based on number of carried TEUs on condition that the basic tolls be raised (alternative-2) will be better than the current system after EDI (electronic data interchange) system is introduced.

5.14 Toll for Vehicle Carriers

5.14.1 Current toll for Vehicle Carriers

Table 5.14.1 shows the current tariff for Vehicle Carriers, which is the same as that for Container Ships.

Table 5.14.1 Current Tariff (Vehicle Carriers)

(SDR/SCNT)

Vessel Type	SCNT					
	First 5000	Next 5000	Next 10000	Next 20000	Next 30000	Rest
6 (L)	7.21	4.10	3.37	2.42	2.42	1.83
6 (B)	6.13	3.49	2.87	2.06	2.06	1.56

Source) SCA

5.14.2 Evaluation

Almost 100% of Vehicle Carriers are said to be industrial carriers which are seldom affected by market conditions. There is no market for common carriers since both car manufacturers and operators of Vehicle Carriers are under oligopolistic conditions. For industrial carriers, it is thought to be appropriate to set the basic toll level based on savings in shipping cost.

Savings in inventory cost can also be counted in the estimation of savings by using the Canal since car value per ton (average: US$10,000 in FOB per vehicle) is significantly higher than that transported by Tankers or Dry Bulk Carriers.

Vessel size of Vehicle Carriers transiting the Canal is less than 70,000SCNT, while vessls over 40,000SCNT represent 82% of the total.

Main O-D pairs for Vehicle Carriers is from Far East to N. Mediterranean and NW. Europe. (see section A.4 of Appendix A)

Table 5.14.2 Accumulation of Number of Vessels (Vehicle Carriers)

SCNT	DWT	SC Transit 1999	World Fleet
5,000	1,877	0%	3%
10,000	3,755	1%	16%
20,000	7,509	1%	26%
40,000	15,018	18%	61%
70,000	26,282	100%	97%

Source) World fleet: Fairplay World Shipping Encyclopaedia (delivered 1981-2000)

Table 5.14.3 Number of Vessel Transiting the Canal (Vehicle Carriers)

Direction	Laden	Ballast	Total
Northbound	540	4	544
Southbound	231	155	386
Total	771	159	930

Source) Analyzed by the Study Team based on the SC transit database of 1999

There are few southbound transits than northbound transits. According to the Japanese shipping lines, the predominant route other than the route via the Canal are as follows:

Case-1: Far East - (laden) - Europe - (laden) - America
- (ballast via the Panama Canal) - Far East
Case-2: Far East - (laden) - Europe - (laden) - S. Africa - (ballast) - Far East
Case-3: Far East - (laden) - Europe - (ballast via the Cape) - Far East

Ballast voyages via the Cape represent only 10% of the total ballast voyages from Europe to Far East. There is no laden voyage via the Cape.

In case that there is enough time to spare until next operation after transiting the Canal, savings perceived by shipping lines are only in fuel cost (variable cost). Savings in managing cost (basically fixed cost) are not perceived. Full savings in managing cost are perceived only when shipping lines can fully utilize days saved by using the Canal for their next operation.

It is considered that most vessels in ballast using the route via the Cape have enough time to spare until next operation after transiting the Canal. On the other hand, it is considered that there is no time to spare until next operation after transiting the Canal for most vessels in ballast using the Canal.

Comparing with calculation based on Equation-1 of section 5.1.3 and on certain assumptions (e.g. fuel cost = 100US$/ton, exchange rate = 1.30US$/SDR), the following observations can be made (threshold criteria: plus or minus 10%).

Case-1: without considering inventory cost

Current toll levels are a little lower than the calculated level when using standard saved distance of 4,700 miles.

Case-2: with considering inventory cost (car value: US$10,000 /car in FOB)

Current toll levels are a little lower for the vessels of 20,000 - 40,000SCNT than the calculated level when using standard saved distance of 4,700 miles, a little higher for the vessels of 5,000SCNT and almost the same level for the vessels greater than 70,000SCNT.

Table 5.14.3 Toll Comparison (Vehicle Carriers, Laden, Case-1)

(US$)

Toll	Standard Saved Distance (miles)		Vessel Size (SCNT)								Average
			5,000	10,000	20,000	40,000	70,000	110,000	160,000	220,000	
Current Toll		a	46,865	73,515	117,325	180,245	274,625				
Calculation	4,700	b	28,300	59,093	105,371	136,696	184,128				
	3,300	c	17,218	38,450	70,164	90,600	121,567				
	2,100	d	7,720	20,756	39,987	51,090	67,943				
Comparison		b/a	0.60	0.80	0.90	0.76	0.67				0.75
		c/a	0.37	0.52	0.60	0.50	0.44				0.49
		d/a	0.16	0.28	0.34	0.28	0.25				0.26
		c/b	0.61	0.65	0.67	0.66	0.66				0.65
		d/b	0.27	0.35	0.38	0.37	0.37				0.35

Note) Case-1: without considering inventory cost
Exchange rate = 1.30 US$/SDR
Source) The Study Team

Table 5.14.4 Toll Comparison (Vehicle Carriers, Laden, Case-2)

(US$)

Toll	Standard Saved Distance (miles)		Vessel Size (SCNT)								Average
			5,000	10,000	20,000	40,000	70,000	110,000	160,000	220,000	
Current Toll		a	46,865	73,515	117,325	180,245	274,625				
Calculation	4,700	b	37,054	76,338	138,800	199,313	288,428				
	3,300	c	23,143	50,113	92,745	132,785	191,683				
	2,100	d	11,218	27,634	53,270	75,761	108,758				
Comparison		b/a	0.79	1.04	1.18	1.11	1.05				1.03
		c/a	0.49	0.68	0.79	0.74	0.70				0.68
		d/a	0.24	0.38	0.45	0.42	0.40				0.38
		c/b	0.62	0.66	0.67	0.67	0.66				0.66
		d/b	0.30	0.36	0.38	0.38	0.38				0.36

Note) Case-2: with considering inventory cost
Exchange rate = 1.30 US$/SDR
Source) The Study Team

Saved distance at maximum relative toll revenue is 3,300 miles. (see section 5.6.2). Remarkable peak is observed at this saved distance which O-D is as follows:

Far East - N. Med. (Saved distance = 3,300 miles)

5.14.3 Proposition

Current toll levels are a little lower for the vessels of 20,000 - 40,000SCNT than the calculated level when using standard saved distance of 4,700 miles, a little higher for the vessels of 5,000SCNT and almost the same level for the vessels greater than 70,000SCNT.

Accordingly, it is thought to be possible to increase toll revenue by raising tolls for the vessels of 20,000 - 40,000SCNT.

The Study Team would like to propose that the tolls for 20,000 - 40,000SCNT of Vehicle Carriers be raised by 3% as the first step. A step-by-step approach to revising the tolls will make it possible to observe the reactions of the shipping market.

It may be effective to apply a fixed rebate rate system (see section 5.6.3) to Vehicle Carriers since a remarkable peak is observed when saved distance is at maximum relative

toll revenue. Fixed rebate rate given in Table 5.14.4 is as follows:

Far East - N. Med. (Saved distance = 3,300 miles) 34% discount

However, there is no laden voyage via the Cape according to Japanese shipping lines. In addition, vessels which claim 50% - 60% of rebate but only receive a discount of 5% still transit the Canal, according to SCA. Accordingly, applying fixed rebate rate system to Vehicle Carriers may decrease toll revenue.

It should be noted, however, that this strange behavior of Vehicle Carriers can be considered as a temporary phenomenon caused by the constraints of available capacity.

As to applying the Long Haul Rebate for vessels in ballast, the Study Team would like to propose that rebate rates be set based on savings only in fuel cost in case that there is enough time to spare until next operation after transiting the Canal, while on savings in shipping cost including managing cost in case that there is no time to spare until next operation after transiting the Canal. SCA can verify this by requiring users to submit certificates proving that there was enough time to spare until next operation after transiting the Canal, in case of setting the rebate rates based on savings only in fuel cost.

5.14.4 Conclusion

Current toll levels are a little lower for the vessels of 20,000 - 40,000SCNT than the calculated level when using standard saved distance of 4,700 miles, a little higher for the vessels of 5,000SCNT and almost the same level for the vessels greater than 70,000SCNT.

Accordingly, it is thought to be possible to increase toll revenue by raising tolls for the vessels of 20,000 - 40,000SCNT.

The Study Team would like to propose that the tolls for 20,000 - 40,000SCNT of Vehicle Carriers be raised by 3% as the first step. A step-by-step approach to revising the tolls will make it possible to observe the reactions of the shipping market.

5.15 Toll for General Cargo Ships

5.15.1 Current toll for General Cargo Ships

Table 5.15.1 shows the current tariff for General Cargo Ships.

Table 5.15.1 Current Tariff (General Cargo Ships)

(SDR/SCNT)

Vessel Type	SCNT					
	First 5000	Next 5000	Next 10000	Next 20000	Next 30000	Rest
8 (L)	7.21	4.14	3.77	2.63	2.63	2.63
8 (B)	6.13	3.52	3.21	2.24	2.24	2.24

Source) SCA

5.15.2 Evaluation

Vessel size of General Cargo Ships transiting the Canal is generally less than 30,000SCNT. There are few General Cargo Ships less than 5,000SCNT transiting the Canal compared to the world fleet.

Main O-D pairs for General Cargo Ships transiting the Canal are Red Sea - Mediterranean, but there is no remarkable concentration in O-D pairs. (see section A.4 of Appendix A)

Table 5.15.2 Accumulation of Number of Vessels (General Cargo Ships)

SCNT	DWT	SC Transit 1999	World Fleet
5,000	7,836	33%	87%
10,000	15,672	59%	96%
20,000	31,343	96%	98%
30,000	47,015	100%	99%

Source) World fleet: Fairplay World Shipping Encyclopaedia (delivered 1981-2000)

Table 5.15.3 Number of Vessel Transiting the Canal (General Cargo Ships)

Direction	Laden	Ballast	Total
Northbound	870	100	970
Southbound	1,136	47	1,183
Total	2,006	147	2,153

Source) Analyzed by the Study Team based on the SC transit database of 1999

Comparing with calculation based on Equation-1 of section 5.1.3 and on certain assumptions (e.g. fuel cost = 100US$/ton, exchange rate = 1.30US$/SDR), the following observations can be made (threshold criteria: plus or minus 10%).

Current toll levels are a little lower for the vessels greater than 20,000SCNT than the calculated level when using standard saved distance of 4,700 miles, a little higher for the vessels of 5,000SCNT and almost the same level for the vessels of

10,000SCNT.

Saved distance at maximum relative toll revenue is 3,300 miles. (see section 5.6.2)

Table 5.15.4 Toll Comparison (General Cargo Ships, Laden)

(US$)

Toll	Standard Saved Distance (miles)		Vessel Size (SCNT)								Average
			5,000	10,000	20,000	40,000	70,000	110,000	160,000	220,000	
Current Toll		a	46,865	73,775	122,785	191,165	293,735	430,495			
Calculation	4,700	b	38,165	79,144	149,115	241,110	374,686	533,740			
	3,300	c	24,317	52,638	100,866	163,657	254,744	358,732			
Comparison		b/a	0.81	1.07	1.21	1.26	1.28	1.24			1.15
		c/a	0.52	0.71	0.82	0.86	0.87	0.83			0.77
		c/b	0.64	0.67	0.68	0.68	0.68	0.67			0.67

Note) Exchange rate = 1.30 US$/SDR
Source) The Study Team

5.15.3 Proposition

Current toll levels of General Cargo Ships are a little lower for the vessels greater than 20,000SCNT than the calculated level when using standard saved distance of 4,700 miles, a little higher for the vessels of 5,000SCNT and almost the same level for the vessels of 10,000SCNT.

Accordingly, it is thought to be possible to increase toll revenue by raising tolls for the vessels greater than 20,000SCNT.

The Study Team would like to propose that the tolls for the vessels greater than 20,000SCNT of General Cargo Ships be raised by 3% as the first step. A step-by-step approach to revising the tolls will make it possible to observe the reactions of the shipping market.

On the other hand, it is thought that there is a little possibility of increasing toll revenues by reducing tolls for the vessels of 5,000SCNT since the share of vessels less than 5,000SCNT transiting the Canal is small compared to the world fleet.

If there is no increase in transit even after reducing tolls for 5,000SCNT General Cargo Ships by 20%, toll revenue would decrease by around 5 million SDR (relating toll revenue in 1999 is estimated 13 million SDR for up to 5,000SCNT and 27 million SDR for from 5,000SCNT up to 10,000SCNT).

However, it is thought to be appropriate to leave the toll as it is since there is no firm evidence that reducing the toll would increase toll revenues, although current toll level is a little higher for the vessels of 5,000SCNT than the calculated one and there is a little possibility of toll revenue increase by reducing tolls.

5.15.4 Conclusion

Current toll levels of General Cargo Ships are a little lower for the vessels greater than

20,000SCNT than the calculated level when using standard saved distance of 4,700 miles, a little higher for the vessels of 5,000SCNT and almost the same level for the vessels of 10,000SCNT.

Accordingly, it is thought to be possible to increase toll revenue by raising tolls for the vessels greater than 20,000SCNT.

The Study Team would like to propose that the tolls for the vessels greater than 20,000SCNT of General Cargo Ships be raised by 3% as the first step. A step-by-step approach to revising the tolls will make it possible to observe the reactions of the shipping market.

As to 5,000SCNT of General Cargo Ships, it is thought to be appropriate to leave the toll as it is since there is no firm evidence that reducing the toll would increase toll revenues.

5.16 Tariff-setting procedure

5.16.1 Current tariff-setting procedure

Tolls are to be revised and announced with SCA circular each year, while those have been remained almost unchanged since 1994. Prime Minister approves transit dues drafted by the Economic Unit and agreed by the tolls committee and board of directors within SCA.

5.16.2 Evaluation

Current tariff-setting procedure is thought to basically be conducted appropriate.

5.16.3 Proposition

The Study Team would like to proposed that SCA insert the following steps of "step-by-step revising", "public consultation and hearing process" and "monitoring market and trade reaction" into the current tariff-setting procedure. Figure 5.16.1 shows the whole image of proposed tariff-setting procedure

(1) "Step-by-step revising" and "monitoring market and trade reaction"

"Step-by-step revising" and "monitoring market and trade reaction" are indispensable in revising the tariff, since the "optimal toll calculation" is acquired based on certain assumptions and only "market and trade reaction" could judge whether these assumptions are appropriate or not. SCA should reflect the reaction to the next revising the tariff.

(2) Public consultation and hearing process

The article 79 of the (Panama) Canal Authority Organic Low prescribes that any revision of the tolls rate or of the admeasurement rules must be subject to a previous consultation and public hearing process, to afford the interested parties an opportunity to participate and to express their opinions and arguments on the subject. The extract of the Panama Canal's regulations are shown in Appendix C.

Such process as adopted by the Panama Canal Authority is thought to become more and more important, since securing the transparency and fairness in management and operation of the Canal to sustain the world trade to be in fair and free competitive condition for the consumers to enjoy cheaper consumption goods. And moreover, this process is thought to be one of the marketing process.

5.16.4 Conclusion

Current tariff-setting procedure is thought to basically be conducted appropriate. In addition, the Study Team would like to proposed that SCA insert steps of "step-by-step revising", "public consultation and hearing process" and "monitoring market and trade reaction" into the current tariff-setting procedure.

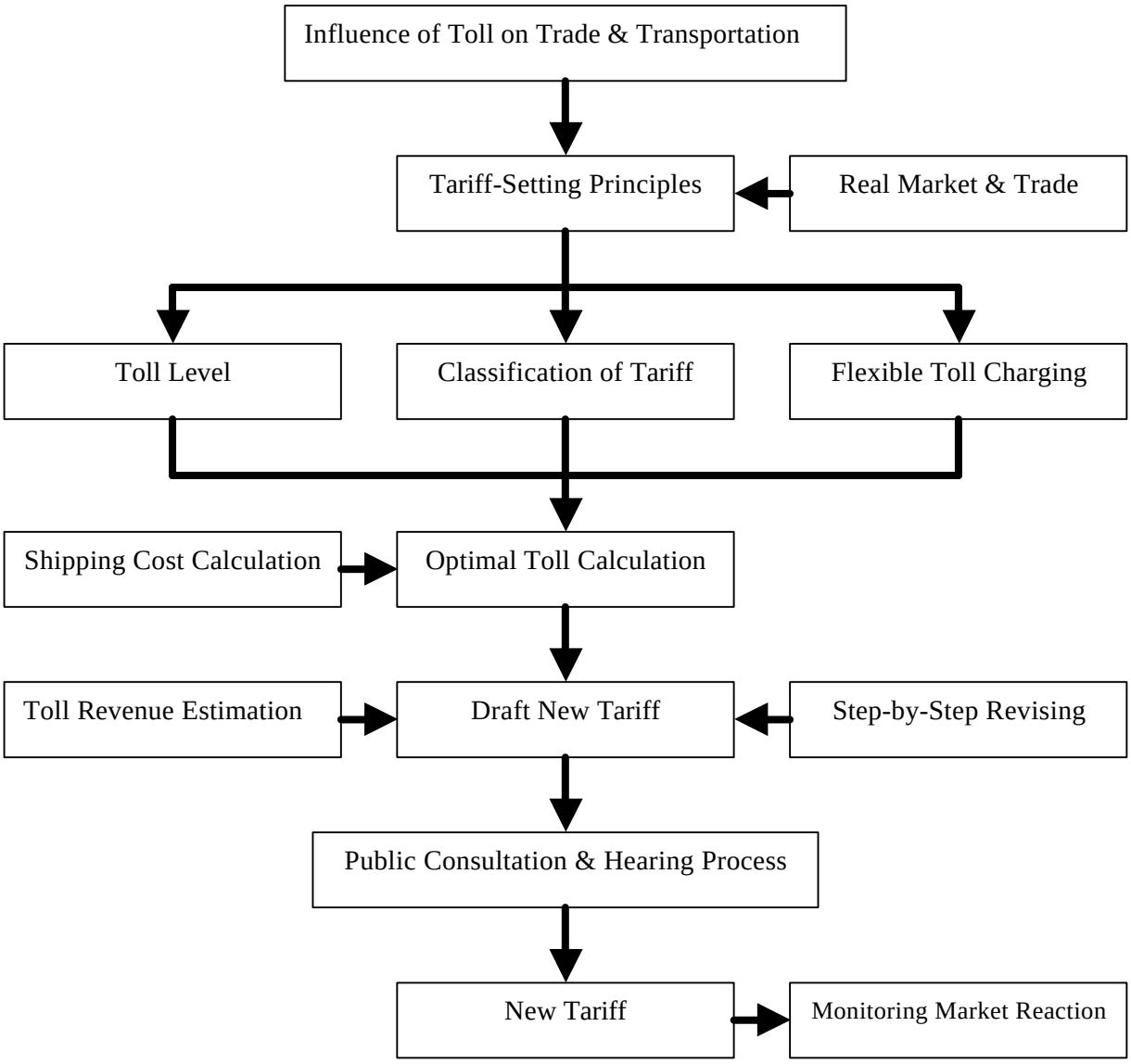


Figure 5.16.1 Proposed Tariff-Setting Procedure

Appendix A Analysis of the SC Transit Database for Tariff-Setting

A.1 Outline of the SC transit database

The Study Team was provided the SC transit database by SCA. The main contents of the database are as follows:

- Date of transit
- Vessel name
- Vessel type
- Origin
- Destination
- Cargo ton
- Cargo type
- DWT
- SCNT
- Laden or ballast
- TEU

Points of notice in analyzing the SC transit database provided by SCA are as follows:

- Vessel types of the SC transit database are different from those of the tariff.
- Tankers in the database consist of Tankers of crude oil, Tankers of petroleum products, Chemical Carriers, LNG and LPG.
- Applied tolls including surcharge/discount are not mentioned.
- Reliability of information on origin and destination is not high.

Vessel types, regions and countries, and cargo types of the SC transit database are as shown in Table A.1.1, Table A.1.2 and Table A.1.3.

Table A.1.1 Vessel Types of the SC Transit Database

Code	Vessel Type
1	Tankers
2	Bulk Carriers
3	Combined Carriers
4	General Cargo
5	Container Ships
6	LASH
7	Ro/Ro
8	Car Carriers
9	Passenger Ships
10	War Ships
11	Others

Source) SCA

Table A.1.2 Regions and Countries of the SC Transit Database

Region		Country	
Code	Name	Code	Name
N0	E., S.E. Med.	N01	Egypt (Med.)
		N02	Lebanon
		N03	Syria
		N04	Turkey
		N05	Cyprus
		N07	Israel (Med.)
		N09	Others
N1	N. Med.	N10	Greece
		N11	Albania
		N12	Solvenia/Croatia
		N13	Italy
		N14	France (Med.)
		N15	Malta
		N19	Others
N2	W., S.W. Med.	N20	Spain
		N21	Libya
		N22	Tunisia
		N23	Algeria
		N24	Morocco (Med.)
		N29	Others
N3	Black Sea	N30	Russia (Black S.)
		N31	Romania
		N32	Bulgaria
		N33	Ukrania
		N34	Gorgia
		N35	Athrbegan
		N39	Others
N4	N., W. Euorpe & U.K.	N40	Portugal
		N41	France (Atlantic)
		N42	Belgium
		N43	Netherlands
		N44	Germany
		N45	Denmark
		N46	U.K.
		N47	Norway
		N48	Sweden
		N49	Others
N5	Baltic Sea	N50	Poland
		N51	Ireland
		N52	Russia (Baltic)
		N54	Finland
		N55	Letwania
		N56	Latevia
		N57	Estonia
		N58	Icelands
		N59	Others
N6	America	N60	United States
		N61	Canada
		N62	Mexico
		N63	Cuba
		N64	Panama
		N65	Venezuela
		N66	Brazil
		N67	Ecuador
		N68	El Salvador
		N69	Others
N7	Others	N70	Morocco (Atlantic)
		N71	Canary Is.
		N72	Mauritania
		N73	Guinea Bissau
		N74	Senegal
		N75	Nigeria
		N79	Others

Region		Country	
Code	Name	Code	Name
S0	Red Sea	S01	Egypt (R.S.)
		S02	Jordan
		S03	Saudi Arabia (R.S.)
		S04	Sudan
		S05	Ethiopia
		S06	Yemen
		S07	Israel (R.S.)
		S08	Dgipouti
		S09	Others
S1	E. Africa & Aden	S11	Somalia
		S12	Kenya
		S13	Tanzania
		S14	Mocambique
		S15	Madagascar
		S16	South Africa
		S17	Mauritius
		S18	Seychelles
		S19	Others
S2	Arabian Gulf	S20	Iran
		S21	Kuwait
		S22	Iraq
		S23	Saudi Arabia (A.G.)
		S24	Bahrain
		S25	United Arab Emirates
		S26	Qatar
		S28	Oman
		S29	Others
S3	S. Asia	S30	India
		S31	Pakistan
		S32	Bangladesh
		S33	Burma
		S34	Srilanka
		S35	Maldive
		S39	Others
S4	S.E. Asia	S40	Malaysia
		S41	Thailand
		S42	Campodia
		S43	Indonesia
		S44	Vietnam
		S45	Singapore
		S49	Others
S5	Far East	S50	Taiwan
		S51	Philippines
		S52	China
		S53	Japan
		S54	North Korea
		S55	Russia (Sib.)
		S56	South Korea
		S57	New Guinea
		S58	Hong Kong
		S59	Others
S6	Australia	S60	Australia
		S61	New Zealand
		S62	Pacific Islands
		S69	Others
S7	Others	S70	America
		S79	Others

Source) SCA

Table A.1.3 Cargo Types of the SC Transit Database

Code	Cargo Type	Code	Cargo Type	Code	Cargo Type
02_99	Drinks	42_	Oil & Products	49_	Minerals & Rocks
03_99	Potatoes	42_02	Crude Oil	49_04	Asbestos
04_99	Milk powder	42_03	Motor Spirit (Gasoline)	49_18	Kyanite
05_99	Honey	42_04	Kerosene	49_44	Mica
06_	Cereals	42_05	Gas Oil & Diesel Oil	49_56	Plumbago
06_02	Barley	42_06	Fuel Oils	49_99	Minerals, Rocks (Others)
06_04	Durra	42_07	Naphta	50_99	Railway Materials
06_10	Maize (corn)	42_08	LPG	52_99	Scrap Iron
06_11	Millet	42_09	LNG	54_99	Paper & Cardboard
06_12	Milo & sorghum	42_99	Mineral Oils (Others)	55_99	Woodpulp
06_14	Oats	43_	Oil Seeds	56_99	Paints & Dyestuffs
06_18	Rice	43_02	Castor Seeds	60_	Rubber
06_19	Rice (meal,bran)	43_04	Coprah	60_02	Rubber
06_24	Wheat (unmilled)	43_06	Cotton Seeds	60_99	Latex,Latex Concentrates,..
06_25	Wheat (flour,bran etc.)	43_08	Groundnuts	66_99	Salt
06_99	Cereals (others)	43_10	Soya Beens	68_	Gum & Reslins
07_99	Sugar	43_14	Hemp Seeds	68_18	Shellac (Stick,Seedlac,..)
08_99	Molasses	43_18	Illipi Seeds	68_22	Lac
09_99	Foodstuffs (others)	43_20	Llin Seeds	68_99	Gum, Reslins (Others)
10_01	Chemical (sulphur)	43_22	Palm Nuts, Palm Kernels	82_	Textils & Fibers
10_99	Chemical (others)	43_28	Sesame Seeds	82_04	Coir Fibres
14_99	Cement	43_99	Oil Seeds (Others)	82_06	Cotton & Fotton Waste
22_99	Eggs & egg products	44_	Veg. Oils	82_14	Hemp
24_99	Fish & shellfish	44_02	Castor Oil	82_15	Jute
25_02	Peas, beans (not soya)	44_04	Coconut Oil	82_18	Kapok
25_08	Lentils	44_06	Cotton Seed Oil	82_20	Raffia
25_99	Pulses (others)	44_08	Groundnut Oil	82_22	Mats & Malting
26_08	Bananas	44_10	Soya Bean Oil	82_24	Silk & Silk Waste
26_10	Dates	44_22	Palm Oil	82_26	Sisal
26_18	Cashew nuts	44_27	Wood Oil	82_28	Wool & Wool Waste
26_20	Coconuts	44_99	Vegetable Oils (Others)	82_99	Textiles, Fibers (Others)
26_22	Pine-apples	45_	Oil Seed Cakes	83_06	Cotton Goods
26_99	Fruits (Others)	45_04	Coprah Cakes (Poonac)	83_15	Gunnies (Hessiaus, Cotton)
27_99	Meat	45_06	Cotton Seed Cakes	83_99	Text Fabrics (Others)
28_99	Glass & glassware	45_08	Groundnut Cakes	84_99	Wood, Timber & Lumber
29_04	Cinnamon	45_18	Soya Bean Cakes	85_99	Hides & Skins
29_10	Cloves	45_20	Linseed Cakes	86_99	Tanning Substances Extracts
29_18	Pepper	45_99	Oil Seed Cakes (Others)	88_	Drus & Medicines
29_20	Nutmeg & mace	46_02	Motor Vehicles (& Parts)	88_02	Cassia
29_22	Vanillia	46_99	Machinery (Others)	88_18	Liquorice
29_99	Spices,Condiments (Others)	47_	Fabricated Metals	88_20	Nux Vomica
30_20	Tea	47_01	Iron & Steel	88_22	Senna
30_30	Coffee	47_02	Plates & Sheets	88_99	Drugs, Medicines (Others)
30_40	Cocoa & Cocoa Beans	47_03	Pig Iron	90_99	Tabacco
31_99	Starch & Farinas	47_04	Aluminium	96_99	Military Stores
33_02	Butter	47_99	Manufactured Metals	98_99	Containerize Cargo
33_04	Fish Oil	48_	Ores & Metals	99_99	General Cargo
33_05	Whale Oil	48_02	Antimony		
33_18	Lard	48_05	Bauxite		
33_22	Tallow	48_08	Chrome Ore		
33_99	Animal Oils,Fats (Others)	48_09	Chrome Metal		
36_	Fertilizers	48_10	Copper Ore		
36_04	Bones & Horns	48_11	Copper Metal		
36_20	Phosphates	48_19	Iron Ore		
36_22	Ammonium Sulphate	48_22	Illmenite & Rutile		
36_24	Potassic Fertilizers	48_34	Lead Ore		
36_26	Ammonium Nitrate	48_35	Lead Metal		
36_28	Urea	48_42	Manganese Ore		
36_99	Fertilisers (Others)	48_60	Tin Ore		
40_99	Coal & Coke	48_61	Tin Metal		
41_	Petroleum Res.	48_65	Zinc Ore		
41_03	Petroleum Coke	48_66	Zinc Metal		
41_04	Paraffin Wax	48_67	Tungsten		
41_05	Lubricating Oils	48_69	Ore (Others)		
41_06	Asphalt	48_99	Metal (Others)		
41_99	Petrol Residues (Others)				

Source) SCA

A.2 Number and total SCNT of vessels by new vessel types

To study the tariff-setting deeply, the Study Team tried to convert vessel types of the SC transit database into new vessel types as shown in Table A.2.1.

Table A.2.1 Relation between New Vessel Types and those of the Database

New Vessel Types		SC Transit Database of 1999		Remarks
		Vessel Types	Cargo Types	
1	＊Tankers of Crude Oil Only	1	42_02	
	＊Combined Carriers of Crude Oil Only	3	42_02	
2	＊Tankes of Petroleum Products	1	42_03-07, other Tankers	
	＊Combined Carriers carrying petroleum products	3	42_03-07	
	＊Combined Carriers carrying more than one kind of			neglect
3	＊Chemical Carriers (1)	1	10_01, 99	
	＊Other Bulk Liquid Carriers	1	08_99, 44_99	
	＊Combined Carriers carrying other bulk liquid			neglect
4	＊LNG Carriers	1	42_09	
5	＊Liquified Petroleum Gas LPG Carriers	1	42_08	
6	＊Dry Bulk Carriers	2		
	＊Combined Carriers carrying dry bulk cargo only	3	other Combined Carr.	
7	＊Containerships	5		
8	＊Vehicle Carriers	8		
9	＊General Cargo Ships	4		
10	＊Other Vessels	6, 7, 9, 10, 11		

Source) The Study Team

Table A.2.2 and Table A.2.3 show number and total SCNT of vessels transiting the Canal in 1999 by new vessel types.

Table A.2.2 Number of Vessels Transiting the Canal

(Number)

Ship Size (up to) (1000 SCNT)	1L: Tankers of Crude Oil	2L: Tankers of Petro. Prod.	3L: Chemical Carriers	4L: LNG Carriers	5L: LPG Carriers	6L: Dry Bulk Carriers	7L: Container Ships	8L: Vehicle Carriers	9A: General Cargo Ships	10A: Other Vessels	1B: Tankers of Crude Oil	2B: Tankers of Petro. Prod.	3B: Chemical Carriers	4B: LNG Carriers	5B: LPG Carriers	6B: Dry Bulk Carriers	7B: Container Ships	8B: Vehicle Carriers	9B: General Cargo Ships	10B: Other Vessels	Total	Total Accumulation
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20		
5		55	101		10	3	27		620	520		32	13		4	4	2		93	106	1,590	11.8%
10	1	92	238		46	66	33	3	515	196		16	14	2	40	4	10	4	37	40	1,357	21.8%
15		32	157		24	376	193	1	642	81	1	16	23		23	9	9	1	13	34	1,635	34.0%
20	1	64	173		16	586	215	2	142	27	1	28	21		18	20	4		1	6	1,325	43.8%
25		50	62		10	643	223	3	43	38		7		1	7	17	7	3	1	3	1,118	52.1%
30		22	4		1	229	581	34	36	81		7			2	11		11		1	1,020	59.6%
35		3			8	332	593	23	7	14		5			9	8	1	5		2	1,010	67.1%
40	1	23			18	317	341	50	1	35	1	6			14	5	2	24	2	1	841	73.4%
45	4	22		5	17	17	710	149			1	11		5	18	2	2	32			995	80.7%
50	9	17	1	7		1	910	241		2	3	2		5				53			1,251	90.0%
55	5	9				6	67	90				4	1			4		12			198	91.5%
60		9				4	139	160		1		8				3		12			336	94.0%
65	11	4				11	76	15		1	10	4				1		2			135	95.0%
70	6			6		11	35			2		1		6							67	95.5%
75	6			1		47	123				3	1		1		1				1	184	96.8%
80	11	1		8		28				1	1			8							58	97.3%
85	1					33	72			5						3					114	98.1%
90						14						1		1		1					17	98.2%
95						4						2		2		1					9	98.3%
100				2		2								1	1						6	98.3%
105																					0	98.3%
110						1								2							3	98.4%
115	2										7										9	98.4%
120											1										1	98.4%
125	2										10										12	98.5%
130	1										6										7	98.6%
135											1										1	98.6%
140	2										3										5	98.6%
145	1										1					2					4	98.7%
150	7										12										19	98.8%
155	2										73	1									76	99.4%
160	1										33	1	1								36	99.6%
165	1										20	2									23	99.8%
170											3					1					4	99.8%
175											3										3	99.8%
180											5										5	99.9%
185																					0	99.9%
190											6										6	99.9%
195											7										7	100.0%
200											1										1	100.0%
205																					0	100.0%
210											1										1	100.0%
215											1										1	100.0%
220																					0	100.0%
225																					0	100.0%
230																					0	100.0%
235																					0	100.0%
240																					0	100.0%
245																					0	100.0%
250																					0	100.0%
Total	75	403	736	29	150	2,731	4,338	771	2,006	1,004	215	155	73	34	136	97	37	159	147	194	13,490	
Share	0.6%	3.0%	5.5%	0.2%	1.1%	20.2%	32.2%	5.7%	14.9%	7.4%	1.6%	1.1%	0.5%	0.3%	1.0%	0.7%	0.3%	1.2%	1.1%	1.4%	100.0%	

Note) Special floating units are included in Other vessels.

Source) Analyzed by the Study Team based on the SC transit database of 1999.

Table A.2.3 Total SCNT of Vessels Transiting the Canal

(1000 SCNT)

Ship Size (up to) (1000 SCNT)	1L: Tankers of Crude Oil	2L: Tankers of Petro. Prod.	3L: Chemical Carriers	4L: LNG Carriers	5L: LPG Carriers	6L: Dry Bulk Carriers	7L: Container Ships	8L: Vehicle Carriers	9A: General Cargo Ships	10A: Other Vessels	1B: Tankers of Crude Oil	2B: Tankers of Petro. Prod.	3B: Chemical Carriers	4B: LNG Carriers	5B: LPG Carriers	6B: Dry Bulk Carriers	7B: Container Ships	8B: Vehicle Carriers	9B: General Cargo Ships	10B: Other Vessels	Total	Total Accumulation
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20		
5		182	361		38	10	84		1,703	943		81	40		15	12	7		166	182	3,825	1.0%
10	9	700	1,767		319	584	261	28	4,198	1,426		108	122	16	281	36	80	30	242	282	10,488	3.7%
15		402	2,042		281	4,968	2,672	11	7,797	986	12	202	280		271	113	123	15	151	432	20,758	9.1%
20	15	1,121	2,999		281	10,289	3,964	32	2,314	467	15	484	346		318	370	69		15	103	23,205	15.1%
25		1,129	1,321		214	14,481	4,877	66	959	865		155		25	147	390	154	68	24	69	24,944	21.6%
30		591	106		29	6,100	15,792	929	974	2,311		188			58	297		297		30	27,701	28.8%
35		97			253	10,976	19,543	757	222	448		162			284	267	32	157		64	33,263	37.5%
40	38	898			694	11,621	12,707	1,929	36	1,303	38	234			538	188	77	932	71	35	31,340	45.6%
45	173	911		200	707	702	30,926	6,353			43	453		200	762	87	86	1,341			42,943	56.7%
50	430	797	48	320		45	43,084	11,481		92	142	96		229				2,501			59,266	72.1%
55	262	471				321	3,578	4,720				215	53			210		624			10,454	74.9%
60		507				232	8,074	9,280		58		460				174		703			19,488	79.9%
65	674	243				677	4,635	908		62	610	245				60		121			8,235	82.1%
70	399			419		744	2,442			133		66		420							4,623	83.3%
75	440			71		3,393	8,956				223	70		71		74				75	13,372	86.7%
80	846	80		636		2,151				79	75			636							4,502	87.9%
85	83					2,734	6,023			405						252					9,496	90.4%
90						1,220						90		90		86					1,486	90.8%
95						370						185		188		92					835	91.0%
100				190		191								95	95						571	91.1%
105																					0	91.1%
110						107								216							323	91.2%
115	221										788										1,009	91.5%
120											120										120	91.5%
125	249										1,221										1,470	91.9%
130	128										767										895	92.1%
135											131										131	92.1%
140	278										413										691	92.3%
145	144										144					288					576	92.5%
150	1,043										1,793										2,836	93.2%
155	306										11,107	151									11,563	96.2%
160	157										5,194	159	157								5,666	97.7%
165	162										3,260	325									3,747	98.7%
170											507					168					675	98.8%
175											511										511	99.0%
180											882										882	99.2%
185																					0	99.2%
190											1,128										1,128	99.5%
195											1,358										1,358	99.8%
200											197										197	99.9%
205																					0	99.9%
210											210										210	99.9%
215											211										211	100.0%
220																					0	100.0%
225																					0	100.0%
230																					0	100.0%
235																					0	100.0%
240																					0	100.0%
245																					0	100.0%
250																					0	100.0%
Total	6,054	8,128	8,644	1,837	2,816	71,917	167,615	36,494	18,204	9,579	31,101	4,130	997	2,184	2,770	3,164	630	6,789	670	1,271	384,994	
Share	1.6%	2.1%	2.2%	0.5%	0.7%	18.7%	43.5%	9.5%	4.7%	2.5%	8.1%	1.1%	0.3%	0.6%	0.7%	0.8%	0.2%	1.8%	0.2%	0.3%	100.0%	

Note) Special floating units are included in Other vessels.

Source) Analyzed by the Study Team based on the SC transit database of 1999.

A.3 Toll revenue estimation by vessel type and size

The Study Team was provided the toll revenue by vessel type by SCA as shown in Table A.3.1. Total toll revenue is 1,813 million US$ or 1,325 million SDR in 1999.

Main vessel types are Container Ships (revenue:884 million US$, share:49%), Bulk Carriers (revenue:292 million US$, share:16%), Tankers (revenue:223 million US$, share:12%), Car Carriers (revenue:190 million US$, share:10%) and General Cargo Ships (revenue:142 million US$, share:8%), and the shares of other vessel types are 1% or below in 1999.

Table A.3.1 Toll Revenue by Vessel Type

(1000 US$)

Vessel Type	Jan.-Dec. 1998		Jan.-Dec. 1999		99/98
	Revenue	Share	Revenue	Share	
Tankers	261,369	15%	223,429	12%	85%
Bulk Carriers	242,548	14%	291,944	16%	120%
Combined Carriers	11,587	1%	6,412	0%	55%
General Cargo Ships	157,449	9%	141,673	8%	90%
Container Ships	806,569	46%	883,730	49%	110%
LASH	4,662	0%	5,540	0%	119%
RoRo	32,377	2%	24,810	1%	77%
Car Carriers	187,343	11%	189,616	10%	101%
Passenger Ships	10,282	1%	10,904	1%	106%
War Ships	13,061	1%	10,743	1%	82%
Other Vessels	22,323	1%	23,817	1%	107%
Total (US$)	1,749,570	100%	1,812,618	100%	104%
Daily Average	4,793		4,966		

Total (SDR)	1,289,221		1,325,099		103%
SDR Rate (US$)	1.3571		1.3679		

Source) SCA

To study the tariff-setting deeply, the Study Team tried to estimate toll revenue by new vessel type and size. Flowchart of toll estimation, input data on surcharge and discount, and comparison of estimated revenue to real revenue in 1999 (reproduction) are shown in Figure A.3.1, Table A.3.2 and Table A.3.3.

This toll revenue estimation can generally be judged to accurately reproduce the real revenue in 1999.

Figure A.3.4 shows the estimated toll revenue by vessel type and size in 1999.

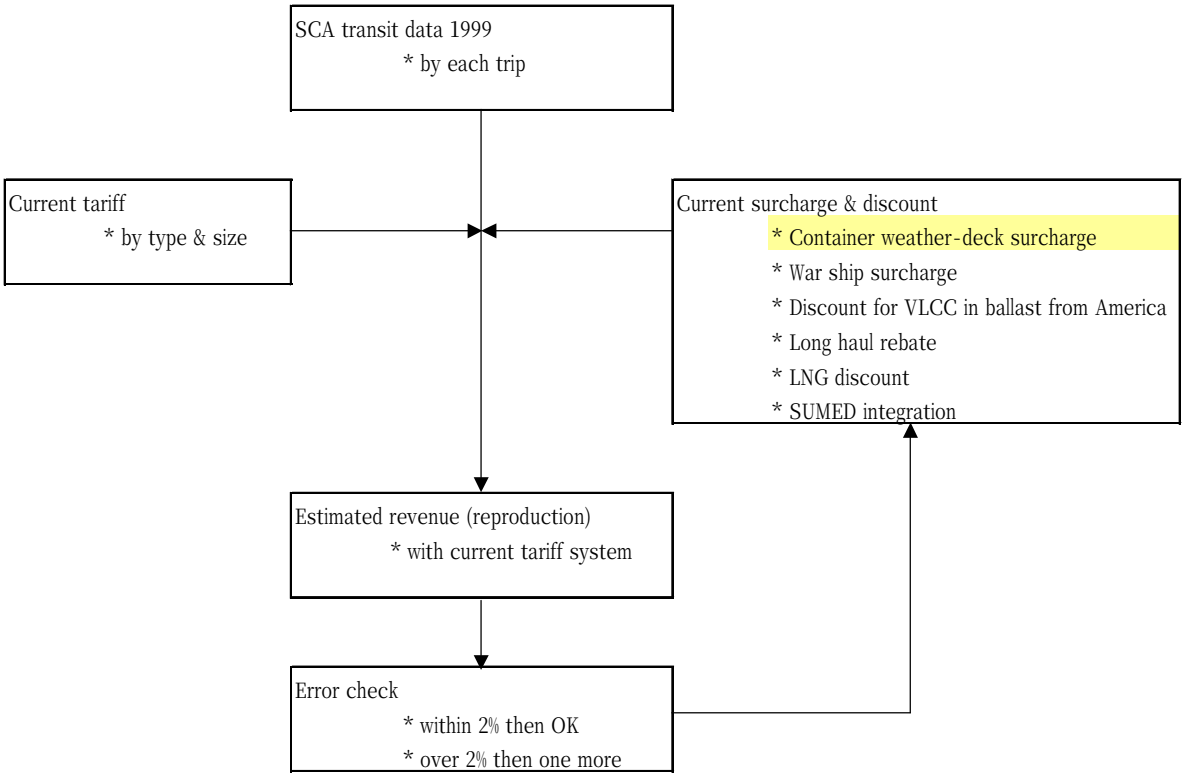


Figure A.3.1 Flowchart of Toll Revenue Estimation

Table A.3.2 Input Data on Surcharge & Discount

Item	Inputting Method
* Container weather-deck surcharge	+9.7% = for each trip
* War ship surcharge	+25% = for each trip
* Discount for VLCC in ballast from America	-45% = from N60(USA) -55% = from N63(Cuba) & N65(Venezuera)
* Long haul rebate	for Bulk carriers of main O-D -80% = N4(NW Europe) & N5(Baltic Sea) from/to S6(Australia) -50% = N4 & N5 from/to S4(SE Asia) & S5(Far East) -50% = S16(S Africa) from to N0(E&SE Med.) & N1(N Med.)
* LNG discount	-35% = for each trip
* SUMED integration	0.63US$/MT = for VLCC laden from Ain-Sukhna assumed to be 180,000MT

Table A.3.3 Comparison of Estimated Revenue to Real Revenue in 1999 (Reproduction)

		Tankers 1	Bulk Carr. 2	Combined Carr. 3	General Cargo 4	Container Carr. 5	Lash 6	Ro/Ro 7	Car Carr. 8	Pass. Ship 9	War Ship 10	Others 11	Total
SDR($) in 1999= 1.3679	Real Revenue in million US$ (R$)	223	292	6	142	884	6	25	190	11	11	24	1,813
	Estimated Revenue in million SDR	163	216	5	103	643	5	17	140	8	8	16	1,324
	Estimated Revenue in million US$ (E$)	223	295	7	142	879	6	23	192	11	11	22	1,811
	E$-R$ in million US$	0	3	1	0	-4	1	-1	2	0	0	-2	-1
	(E$-R$)/R$	0.0%	1.1%	9.6%	-0.1%	-0.5%	13.0%	-5.7%	1.1%	-1.3%	-0.7%	-8.0%	-0.1%
													within 2% OK

Figure A.3.4 Estimated Toll Revenue by Vessel Type and Size in 1999

(in million SDR)

Ship Size (up to) (1000 SCNT)	1L: Tankers of Crude Oil	2L: Tankers of Petro. Prod.	3L: Chemical Carriers	4L: LNG Carriers	5L: LPG Carriers	6L: Dry Bulk Carriers	7L: Container Ships	8L: Vehicle Carriers	9L: General Cargo Ships	10L: Other Vessels	1B: Tankers of Crude Oil	2B: Tankers of Petro. Prod.	3B: Chemical Carriers	4B: LNG Carriers	5B: LPG Carriers	6B: Dry Bulk Carriers	7B: Container Ships	8B: Vehicle Carriers	9B: General Cargo Ships	10B: Other Vessels	Total	Total Accumulation
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20		
5		1.2	2.7		0.3	0.1	0.7		12.3	7.1		0.4	0.3		0.1	0.1	0.0		1.0	1.1	27.4	2.1%
10	0.0	4.0	11.3		1.9	3.3	1.7	0.2	25.3	9.1		0.5	0.6	0.1	1.4	0.2	0.4	0.2	1.3	1.5	63.1	6.8%
15		2.0	10.9		1.4	23.2	14.7	0.1	41.6	5.3	0.0	0.8	1.3		1.1	0.5	0.5	0.1	0.7	1.9	106.2	14.9%
20	0.1	5.0	14.9		1.3	41.8	20.0	0.2	11.4	2.4	0.1	1.8	1.5		1.2	1.3	0.3		0.1	0.4	103.7	22.7%
25		4.6	6.2		0.9	49.6	23.2	0.3	4.3	4.0		0.5		0.1	0.5	1.3	0.6	0.2	0.1	0.3	96.7	30.0%
30		2.2	0.5		0.1	18.2	68.6	3.7	4.1	9.7		0.6			0.2	0.9		1.0		0.1	109.7	38.3%
35		0.3			0.9	28.9	79.1	2.8	0.9	1.8		0.4			0.9	0.7	0.1	0.5		0.2	117.6	47.2%
40	0.1	2.8			2.4	27.4	49.4	6.8	0.1	4.9	0.1	0.6			1.6	0.4	0.2	2.8	0.2	0.1	99.9	54.7%
45	0.5	2.8		0.5	2.4	1.6	114.7	21.6			0.1	1.1		0.4	2.2	0.2	0.2	3.9			152.1	66.2%
50	1.1	2.4	0.2	0.8		0.1	156.2	37.9		0.3	0.3	0.2		0.5				7.0			206.9	81.8%
55	0.6	1.3				0.7	12.6	15.2				0.4	0.2			0.4		1.7			33.2	84.3%
60		1.4				0.5	27.8	29.2		0.2		0.9				0.3		1.9			62.2	89.0%
65	1.5	0.7				1.4	15.8	2.8		0.2	1.2	0.5				0.1		0.3			24.6	90.9%
70	0.9			0.9		1.4	8.1			0.4		0.1		0.8							12.5	91.8%
75	0.9			0.2		5.2	29.2				0.4	0.1		0.1		0.1				0.2	36.5	94.6%
80	1.8	0.2		1.3		3.0				0.3	0.1			1.1							7.9	95.2%
85	0.2					2.8	18.7			1.6						0.3					23.5	96.9%
90						1.0						0.2		0.2		0.1					1.4	97.0%
95						0.4						0.3		0.3		0.1					1.1	97.1%
100				0.4		0.3								0.2	0.2						1.1	97.2%
105																					0.0	97.2%
110						0.1								0.4							0.5	97.3%
115	0.3										0.9										1.2	97.3%
120											0.2										0.2	97.4%
125	0.2										1.3										1.4	97.5%
130	0.1										1.1										1.1	97.6%
135											0.2										0.2	97.6%
140	0.2										0.4										0.6	97.6%
145	0.1										0.2					0.4					0.7	97.7%
150	0.6										1.9										2.5	97.8%
155	0.2										13.7	0.1									13.9	98.9%
160	0.3										5.2	0.2	0.2								5.9	99.3%
165	0.1										3.3	0.2									3.6	99.6%
170											0.7					0.2					0.9	99.7%
175											0.4										0.4	99.7%
180											1.2										1.2	99.8%
185																					0.0	99.8%
190											0.9										0.9	99.9%
195											1.2										1.2	100.0%
200											0.1										0.1	100.0%
205																					0.0	100.0%
210											0.2										0.2	100.0%
215											0.2										0.2	100.0%
220																					0.0	100.0%
225																					0.0	100.0%
230																					0.0	100.0%
235																					0.0	100.0%
240																					0.0	100.0%
245																					0.0	100.0%
250																					0.0	100.0%
Total	9.7	31.0	46.7	4.0	11.5	211.0	640.4	120.5	100.0	47.5	35.4	10.0	4.0	4.0	9.4	7.5	2.4	19.6	3.4	5.9	1,324	
Share	0.7%	2.3%	3.5%	0.3%	0.9%	15.9%	48.4%	9.1%	7.6%	3.6%	2.7%	0.8%	0.3%	0.3%	0.7%	0.6%	0.2%	1.5%	0.3%	0.4%	100.0%	

Note) Special floating units are included in Other vessels.

Source) Analyzed by the Study Team based on the SC transit database of 1999.

A.4 Number of vessels transiting the Canal by O-D pairs

Table A.4.1 through Table A.4.20 show number of vessels transiting the Canal by O-D pairs.

Table A.4.1 Number of Vessels Transiting the Canal

1L: Tankers of Crude Oil (Laden)

	Vessel Size (up to) (1000 SCNT)																								Total	Share		
O-D	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180	190	200	210	220	230	240	250		SN	NS	Total
S0N0		1																								1	1%		1%
S0N1				1	4	3																				8	11%		11%
S0N2																										0	0%		0%
S0N3					1																					1	1%		1%
S0N4												1	3	2	8	2	1									17	24%		23%
S0N5																										0	0%		0%
S0N6																										0	0%		0%
S0N7																										0	0%		0%
S1N0																										0	0%		0%
S1N1																										0	0%		0%
S1N2																										0	0%		0%
S1N3																										0	0%		0%
S1N4																										0	0%		0%
S1N5																										0	0%		0%
S1N6																										0	0%		0%
S1N7																										0	0%		0%
S2N0																										0	0%		0%
S2N1					6	2	9	7	1			1														26	37%		35%
S2N2					1		8	7																		16	23%		21%
S2N3																										0	0%		0%
S2N4								1																		1	1%		1%
S2N5																										0	0%		0%
S2N6																										0	0%		0%
S2N7																										0	0%		0%
S3N0																										0	0%		0%
S3N1																										0	0%		0%
S3N2																										0	0%		0%
S3N3																										0	0%		0%
S3N4																										0	0%		0%
S3N5																										0	0%		0%
S3N6																										0	0%		0%
S3N7																										0	0%		0%
S4N0																										0	0%		0%
S4N1																										0	0%		0%
S4N2																										0	0%		0%
S4N3																										0	0%		0%
S4N4	1																									1	1%		1%
S4N5																										0	0%		0%
S4N6																										0	0%		0%
S4N7																										0	0%		0%
S5N0																										0	0%		0%
S5N1																										0	0%		0%
S5N2																										0	0%		0%
S5N3																										0	0%		0%
S5N4																										0	0%		0%
S5N5																										0	0%		0%
S5N6																										0	0%		0%
S5N7																										0	0%		0%
S6N0																										0	0%		0%
S6N1																										0	0%		0%
S6N2																										0	0%		0%
S6N3																										0	0%		0%
S6N4																										0	0%		0%
S6N5																										0	0%		0%
S6N6																										0	0%		0%
S6N7																										0	0%		0%
S7N0																										0	0%		0%
S7N1																										0	0%		0%
S7N2																										0	0%		0%
S7N3																										0	0%		0%
S7N4																										0	0%		0%
S7N5																										0	0%		0%
S7N6																										0	0%		0%
S7N7																										0	0%		0%
N0S0																										0		0%	0%
N1S0																										0		0%	0%
N2S0																										0		0%	0%
N3S0																										0		0%	0%
N4S0																										0		0%	0%
N5S0																										0		0%	0%
N6S0																										0		0%	0%
N7S0																										0		0%	0%
N0S1																										0		0%	0%
N1S1																										0		0%	0%
N2S1																										0		0%	0%
N3S1																										0		0%	0%
N4S1																										0		0%	0%
N5S1																										0		0%	0%
N6S1																										0		0%	0%
N7S1																										0		0%	0%
N0S2																										0		0%	0%
N1S2																										0		0%	0%
N2S2																										0		0%	0%
N3S2																										0		0%	0%
N4S2																										0		0%	0%
N5S2																										0		0%	0%
N6S2																1										1		25%	1%
N7S2																										0		0%	0%
N0S3																										0		0%	0%
N1S3																										0		0%	0%
N2S3																										0		0%	0%
N3S3																										0		0%	0%
N4S3																										0		0%	0%
N5S3																										0		0%	0%
N6S3																										0		0%	0%
N7S3																										0		0%	0%
N0S4																										0		0%	0%
N1S4																										0		0%	0%
N2S4																										0		0%	0%
N3S4																										0		0%	0%
N4S4																										0		0%	0%
N5S4																										0		0%	0%
N6S4					1																					1		25%	1%
N7S4																										0		0%	0%
N0S5																										0		0%	0%
N1S5																										0		0%	0%
N2S5								2																		2		50%	3%
N3S5																										0		0%	0%
N4S5																										0		0%	0%
N5S5																										0		0%	0%
N6S5																										0		0%	0%
N7S5																										0		0%	0%
N0S6																										0		0%	0%
N1S6																										0		0%	0%
N2S6																										0		0%	0%
N3S6																										0		0%	0%
N4S6																										0		0%	0%
N5S6																										0		0%	0%
N6S6																										0		0%	0%
N7S6																										0		0%	0%
N0S7																										0		0%	0%
N1S7																										0		0%	0%
N2S7																										0		0%	0%
N3S7																										0		0%	0%
N4S7																										0		0%	0%
N5S7																										0		0%	0%
N6S7																										0		0%	0%
N7S7																										0		0%	0%
SN Total	1	1	0	1	12	5	17	15	1	0	0	2	3	2	8	2	1	0	0	0	0	0	0	0	0	71			
NS Total	0	0	0	0	1	0	0	2	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	4			
Total	1	1	0	1	13	5	17	17	1	0	0	2	3	2	8	3	1	0	0	0	0	0	0	0	0	75			

Source) Analyzed by the Study Team based on the SC transit database of 1999.

Table A.4.2 Number of Vessels Transiting the Canal

2L: Tankers of Petro. Prod. (Laden)

	Vessel Size (up to) (1000 SCNT)																								Total	Share		
O-D	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180	190	200	210	220	230	240	250		SN	NS	Total
S0N0	4	13	2	1																						20	7%		5%
S0N1	2		4		3	1																				10	4%		2%
S0N2		5	3		1																					9	3%		2%
S0N3		2																								2	1%		0%
S0N4	2	6	3	3	6																					20	7%		5%
S0N5																										0	0%		0%
S0N6		5	17	2	1	1																				26	9%		6%
S0N7																										0	0%		0%
S1N0																										0	0%		0%
S1N1																										0	0%		0%
S1N2																										0	0%		0%
S1N3																										0	0%		0%
S1N4	3																									3	1%		1%
S1N5																										0	0%		0%
S1N6																										0	0%		0%
S1N7																										0	0%		0%
S2N0	2	6	5				1																			14	5%		3%
S2N1	2		3		2																					7	3%		2%
S2N2	2	3	2	1	1	2																				11	4%		3%
S2N3																										0	0%		0%
S2N4	7	3	11	6	4	5	1																			37	14%		9%
S2N5	1																									1	0%		0%
S2N6		1	1			1																				3	1%		1%
S2N7	1	1			1																					3	1%		1%
S3N0																										0	0%		0%
S3N1	6																									6	2%		1%
S3N2	2	1																								3	1%		1%
S3N3																										0	0%		0%
S3N4	3																									3	1%		1%
S3N5																										0	0%		0%
S3N6	2																									2	1%		0%
S3N7																										0	0%		0%
S4N0	13	6																								19	7%		5%
S4N1	6	4	3																							13	5%		3%
S4N2	4	9	1																							14	5%		3%
S4N3	4																									4	1%		1%
S4N4	20	14	4																							38	14%		9%
S4N5																										0	0%		0%
S4N6	2																									2	1%		0%
S4N7																										0	0%		0%
S5N0																										0	0%		0%
S5N1	1																									1	0%		0%
S5N2																										0	0%		0%
S5N3																										0	0%		0%
S5N4	2																									2	1%		0%
S5N5																										0	0%		0%
S5N6																										0	0%		0%
S5N7																										0	0%		0%
S6N0																										0	0%		0%
S6N1																										0	0%		0%
S6N2																										0	0%		0%
S6N3																										0	0%		0%
S6N4																										0	0%		0%
S6N5																										0	0%		0%
S6N6	1																									1	0%		0%
S6N7																										0	0%		0%
S7N0																										0	0%		0%
S7N1																										0	0%		0%
S7N2																										0	0%		0%
S7N3																										0	0%		0%
S7N4																										0	0%		0%
S7N5																										0	0%		0%
S7N6																										0	0%		0%
S7N7																										0	0%		0%
N0S0	1	2	1		1																					5		4%	1%
N1S0	3	2			2																					7		5%	2%
N2S0	2	2	1			1																				6		5%	1%
N3S0	1	1																								2		2%	0%
N4S0			1			1																				2		2%	0%
N5S0																										0		0%	0%
N6S0		2	2	1																						5		4%	1%
N7S0																										0		0%	0%
N0S1																										0		0%	0%
N1S1	5																									5		4%	1%
N2S1	1																									1		1%	0%
N3S1																										0		0%	0%
N4S1																										0		0%	0%
N5S1																										0		0%	0%
N6S1																										0		0%	0%
N7S1																										0		0%	0%
N0S2	3	1																								4		3%	1%
N1S2	9	1	1																							11		9%	3%
N2S2	4	1																								5		4%	1%
N3S2		1																								1		1%	0%
N4S2																										0		0%	0%
N5S2																										0		0%	0%
N6S2																										0		0%	0%
N7S2																										0		0%	0%
N0S3	1																									1		1%	0%
N1S3	9		1																							10		8%	2%
N2S3	3	1	2		1																					7		5%	2%
N3S3																										0		0%	0%
N4S3	6	1																								7		5%	2%
N5S3																										0		0%	0%
N6S3		1	1	2																						4		3%	1%
N7S3																										0		0%	0%
N0S4				2	2																					4		3%	1%
N1S4	6				3	1	1																			11		9%	3%
N2S4				3	3	1																				7		5%	2%
N3S4																										0		0%	0%
N4S4				2	2	1		1																		6		5%	1%
N5S4																										0		0%	0%
N6S4																										0		0%	0%
N7S4																										0		0%	0%
N0S5																										0		0%	0%
N1S5			2			1																				3		2%	1%
N2S5	1	1		3	4		1																			10		8%	2%
N3S5																										0		0%	0%
N4S5					2	2																				4		3%	1%
N5S5																										0		0%	0%
N6S5																										0		0%	0%
N7S5																										0		0%	0%
N0S6																										0		0%	0%
N1S6			1																							1		1%	0%
N2S6																										0		0%	0%
N3S6																										0		0%	0%
N4S6																										0		0%	0%
N5S6																										0		0%	0%
N6S6																										0		0%	0%
N7S6																										0		0%	0%
N0S7																										0		0%	0%
N1S7																										0		0%	0%
N2S7																										0		0%	0%
N3S7																										0		0%	0%
N4S7																										0		0%	0%
N5S7																										0		0%	0%
N6S7																										0		0%	0%
N7S7																										0		0%	0%
SN Total	92	79	59	13	19	10	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	274	100%	100%	100%
NS Total	55	17	13	13	20	8	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	129			
Total	147	96	72	26	39	18	4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	403			

Source) Analyzed by the Study Team based on the SC transit database of 1999.

Table A.4.3 Number of Vessels Transiting the Canal

3L: Chemical Carriers (Laden)

	Vessel Size (up to) (1000 SCNT)																									Total	Share		
O-D	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180	190	200	210	220	230	240	250		SN	NS	Total
S0N0	12	2																								14	4%		2%
S0N1	10	9	3																							22	7%		3%
S0N2	6	4	1																							11	3%		1%
S0N3																										0	0%		0%
S0N4	7	12	4																							23	7%		3%
S0N5																										0	0%		0%
S0N6		1																								1	0%		0%
S0N7																										0	0%		0%
S1N0	2																									2	1%		0%
S1N1		1																								1	0%		0%
S1N2																										0	0%		0%
S1N3																										0	0%		0%
S1N4																										0	0%		0%
S1N5																										0	0%		0%
S1N6																										0	0%		0%
S1N7																										0	0%		0%
S2N0	9	3	1																							13	4%		2%
S2N1	18	9	1																							28	9%		4%
S2N2	2	9																								11	3%		1%
S2N3																										0	0%		0%
S2N4	4	5	1																							10	3%		1%
S2N5																										0	0%		0%
S2N6	1	16	2																							19	6%		3%
S2N7																										0	0%		0%
S3N0	5																									5	2%		1%
S3N1	8	6																								14	4%		2%
S3N2	7	7	1																							15	5%		2%
S3N3																										0	0%		0%
S3N4	7	21	2																							30	9%		4%
S3N5	1	1																								2	1%		0%
S3N6	4																									4	1%		1%
S3N7																										0	0%		0%
S4N0	2	10																								12	4%		2%
S4N1	4	11	1																							16	5%		2%
S4N2	7	3																								10	3%		1%
S4N3	1																									1	0%		0%
S4N4	17	27	12																							56	17%		8%
S4N5																										0	0%		0%
S4N6	1	4																								5	2%		1%
S4N7																										0	0%		0%
S5N0																										0	0%		0%
S5N1																										0	0%		0%
S5N2																										0	0%		0%
S5N3																										0	0%		0%
S5N4																										0	0%		0%
S5N5																										0	0%		0%
S5N6	1																									1	0%		0%
S5N7																										0	0%		0%
S6N0																										0	0%		0%
S6N1																										0	0%		0%
S6N2																										0	0%		0%
S6N3																										0	0%		0%
S6N4																										0	0%		0%
S6N5																										0	0%		0%
S6N6																										0	0%		0%
S6N7																										0	0%		0%
S7N0																										0	0%		0%
S7N1																										0	0%		0%
S7N2																										0	0%		0%
S7N3																										0	0%		0%
S7N4																										0	0%		0%
S7N5																										0	0%		0%
S7N6																										0	0%		0%
S7N7																										0	0%		0%
N0S0	2	7																								9		2%	1%
N1S0	9	6	3																							18		4%	2%
N2S0	4	3	4																							11		3%	1%
N3S0	1	1																								2		0%	0%
N4S0	8	3	12																							23		6%	3%
N5S0																										0		0%	0%
N6S0	1	5																								6		1%	1%
N7S0		1																								1		0%	0%
N0S1																										0		0%	0%
N1S1		1																								1		0%	0%
N2S1																										0		0%	0%
N3S1																										0		0%	0%
N4S1	2	1																								3		1%	0%
N5S1																										0		0%	0%
N6S1																										0		0%	0%
N7S1																										0		0%	0%
N0S2	1	1																								2		0%	0%
N1S2	2	2			1																					5		1%	1%
N2S2	12	2																								14		3%	2%
N3S2																										0		0%	0%
N4S2	1	1	1																							3		1%	0%
N5S2																										0		0%	0%
N6S2																										0		0%	0%
N7S2	2	3	1																							6		1%	1%
N0S3	16	2																								18		4%	2%
N1S3	17	5																								22		5%	3%
N2S3	60	41	1																							102		25%	14%
N3S3	2																									2		0%	0%
N4S3	4	10																								14		3%	2%
N5S3																										0		0%	0%
N6S3		2	2																							4		1%	1%
N7S3	17	43	3																							63		15%	9%
N0S4	4	4																								8		2%	1%
N1S4	14	3	3																							20		5%	3%
N2S4	4	3																								7		2%	1%
N3S4		1																								1		0%	0%
N4S4	10	12	6																							28		7%	4%
N5S4	1																									1		0%	0%
N6S4																										0		0%	0%
N7S4																										0		0%	0%
N0S5	1	2																								3		1%	0%
N1S5	2																									2		0%	0%
N2S5	1	3																								4		1%	1%
N3S5	2	1																								3		1%	0%
N4S5	1																									1		0%	0%
N5S5	1																									1		0%	0%
N6S5																										0		0%	0%
N7S5	1		1																							2		0%	0%
N0S6																										0		0%	0%
N1S6																										0		0%	0%
N2S6																										0		0%	0%
N3S6																										0		0%	0%
N4S6																										0		0%	0%
N5S6																										0		0%	0%
N6S6																										0		0%	0%
N7S6																										0		0%	0%
N0S7																										0		0%	0%
N1S7																										0		0%	0%
N2S7																										0		0%	0%
N3S7																										0		0%	0%
N4S7																										0		0%	0%
N5S7																										0		0%	0%
N6S7																										0		0%	0%
N7S7																										0		0%	0%
SN Total	136	161	29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	326	100%	100%	100%
NS Total	203	169	37	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	410			
Total	339	330	66	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	736			

Source) Analyzed by the Study Team based on the SC transit database of 1999.

Table A.4.4 Number of Vessels Transiting the Canal

4L: LNG Carriers (Laden)

	Vessel Size (up to) (1000 SCNT)																								Total	Share		
O-D	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180	190	200	210	220	230	240	250		SN	NS	Total
S0N0																										0	0%		0%
S0N1																										0	0%		0%
S0N2																										0	0%		0%
S0N3																										0	0%		0%
S0N4																										0	0%		0%
S0N5																										0	0%		0%
S0N6																										0	0%		0%
S0N7																										0	0%		0%
S1N0																										0	0%		0%
S1N1																										0	0%		0%
S1N2																										0	0%		0%
S1N3																										0	0%		0%
S1N4																										0	0%		0%
S1N5																										0	0%		0%
S1N6																										0	0%		0%
S1N7																										0	0%		0%
S2N0																										0	0%		0%
S2N1					4			1																		5	17%		17%
S2N2					7		6	7																		20	69%		69%
S2N3					1																					1	3%		3%
S2N4								1																		1	3%		3%
S2N5																										0	0%		0%
S2N6										2																2	7%		7%
S2N7																										0	0%		0%
S3N0																										0	0%		0%
S3N1																										0	0%		0%
S3N2																										0	0%		0%
S3N3																										0	0%		0%
S3N4																										0	0%		0%
S3N5																										0	0%		0%
S3N6																										0	0%		0%
S3N7																										0	0%		0%
S4N0																										0	0%		0%
S4N1																										0	0%		0%
S4N2																										0	0%		0%
S4N3																										0	0%		0%
S4N4																										0	0%		0%
S4N5																										0	0%		0%
S4N6																										0	0%		0%
S4N7																										0	0%		0%
S5N0																										0	0%		0%
S5N1																										0	0%		0%
S5N2																										0	0%		0%
S5N3																										0	0%		0%
S5N4																										0	0%		0%
S5N5																										0	0%		0%
S5N6																										0	0%		0%
S5N7																										0	0%		0%
S6N0																										0	0%		0%
S6N1																										0	0%		0%
S6N2																										0	0%		0%
S6N3																										0	0%		0%
S6N4																										0	0%		0%
S6N5																										0	0%		0%
S6N6																										0	0%		0%
S6N7																										0	0%		0%
S7N0																										0	0%		0%
S7N1																										0	0%		0%
S7N2																										0	0%		0%
S7N3																										0	0%		0%
S7N4																										0	0%		0%
S7N5																										0	0%		0%
S7N6																										0	0%		0%
S7N7																										0	0%		0%
N0S0																										0			0%
N1S0																										0			0%
N2S0																										0			0%
N3S0																										0			0%
N4S0																										0			0%
N5S0																										0			0%
N6S0																										0			0%
N7S0																										0			0%
N0S1																										0			0%
N1S1																										0			0%
N2S1																										0			0%
N3S1																										0			0%
N4S1																										0			0%
N5S1																										0			0%
N6S1																										0			0%
N7S1																										0			0%
N0S2																										0			0%
N1S2																										0			0%
N2S2																										0			0%
N3S2																										0			0%
N4S2																										0			0%
N5S2																										0			0%
N6S2																										0			0%
N7S2																										0			0%
N0S3																										0			0%
N1S3																										0			0%
N2S3																										0			0%
N3S3																										0			0%
N4S3																										0			0%
N5S3																										0			0%
N6S3																										0			0%
N7S3																										0			0%
N0S4																										0			0%
N1S4																										0			0%
N2S4																										0			0%
N3S4																										0			0%
N4S4																										0			0%
N5S4																										0			0%
N6S4																										0			0%
N7S4																										0			0%
N0S5																										0			0%
N1S5																										0			0%
N2S5																										0			0%
N3S5																										0			0%
N4S5																										0			0%
N5S5																										0			0%
N6S5																										0			0%
N7S5																										0			0%
N0S6																										0			0%
N1S6																										0			0%
N2S6																										0			0%
N3S6																										0			0%
N4S6																										0			0%
N5S6																										0			0%
N6S6																										0			0%
N7S6																										0			0%
N0S7																										0			0%
N1S7																										0			0%
N2S7																										0			0%
N3S7																										0			0%
N4S7																										0			0%
N5S7																										0			0%
N6S7																										0			0%
N7S7																										0			0%
SN Total	0	0	0	0	12	0	6	9	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	29	100%		100%
NS Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
Total	0	0	0	0	12	0	6	9	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	29			

Source) Analyzed by the Study Team based on the SC transit database of 1999.

Table A.4.5 Number of Vessels Transiting the Canal

5L: LPG Carriers (Laden)

	Vessel Size (up to) (1000 SCNT)																								Total	Share		
O-D	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180	190	200	210	220	230	240	250		SN	NS	Total
S0N0	1	1			2																					4	6%		3%
S0N1		11		1																						12	17%		8%
S0N2				1																						1	1%		1%
S0N3																										0	0%		0%
S0N4	1																									1	1%		1%
S0N5																										0	0%		0%
S0N6				1	3																					4	6%		3%
S0N7																										0	0%		0%
S1N0																										0	0%		0%
S1N1																										0	0%		0%
S1N2																										0	0%		0%
S1N3																										0	0%		0%
S1N4																										0	0%		0%
S1N5																										0	0%		0%
S1N6																										0	0%		0%
S1N7																										0	0%		0%
S2N0	2		1	12	3																					18	26%		12%
S2N1	4																									4	6%		3%
S2N2	1				1																					2	3%		1%
S2N3	1																									1	1%		1%
S2N4	2																									2	3%		1%
S2N5																										0	0%		0%
S2N6	3	3			1																					7	10%		5%
S2N7																										0	0%		0%
S3N0																										0	0%		0%
S3N1																										0	0%		0%
S3N2																										0	0%		0%
S3N3																										0	0%		0%
S3N4																										0	0%		0%
S3N5																										0	0%		0%
S3N6																										0	0%		0%
S3N7																										0	0%		0%
S4N0																										0	0%		0%
S4N1	4			1																						5	7%		3%
S4N2	2																									2	3%		1%
S4N3																										0	0%		0%
S4N4	4																									4	6%		3%
S4N5																										0	0%		0%
S4N6																										0	0%		0%
S4N7																										0	0%		0%
S5N0																										0	0%		0%
S5N1		1																								1	1%		1%
S5N2																										0	0%		0%
S5N3																										0	0%		0%
S5N4	1																									1	1%		1%
S5N5																										0	0%		0%
S5N6																										0	0%		0%
S5N7																										0	0%		0%
S6N0																										0	0%		0%
S6N1																										0	0%		0%
S6N2																										0	0%		0%
S6N3																										0	0%		0%
S6N4																										0	0%		0%
S6N5																										0	0%		0%
S6N6																										0	0%		0%
S6N7																										0	0%		0%
S7N0																										0	0%		0%
S7N1																										0	0%		0%
S7N2																										0	0%		0%
S7N3																										0	0%		0%
S7N4																										0	0%		0%
S7N5																										0	0%		0%
S7N6																										0	0%		0%
S7N7																										0	0%		0%
N0S0	1																									1		1%	1%
N1S0	4	1	1																							6		7%	4%
N2S0					1																					1		1%	1%
N3S0		4	5																							9		11%	6%
N4S0																										0		0%	0%
N5S0																										0		0%	0%
N6S0				1																						1		1%	1%
N7S0																										0		0%	0%
N0S1																										0		0%	0%
N1S1																										0		0%	0%
N2S1																										0		0%	0%
N3S1																										0		0%	0%
N4S1																										0		0%	0%
N5S1																										0		0%	0%
N6S1																										0		0%	0%
N7S1																										0		0%	0%
N0S2		1																								1		1%	1%
N1S2																										0		0%	0%
N2S2																										0		0%	0%
N3S2																										0		0%	0%
N4S2	1		1																							2		2%	1%
N5S2																										0		0%	0%
N6S2																										0		0%	0%
N7S2																										0		0%	0%
N0S3																										0		0%	0%
N1S3		1																								1		1%	1%
N2S3	1	2		1																						4		5%	3%
N3S3		6	3	2																						11		14%	7%
N4S3	4	1																								5		6%	3%
N5S3																										0		0%	0%
N6S3	4																									4		5%	3%
N7S3																										0		0%	0%
N0S4																										0		0%	0%
N1S4	4	1																								5		6%	3%
N2S4	6	5		1	1																					13		16%	9%
N3S4	1																									1		1%	1%
N4S4																										0		0%	0%
N5S4																										0		0%	0%
N6S4																										0		0%	0%
N7S4																										0		0%	0%
N0S5																										0		0%	0%
N1S5	1																									1		1%	1%
N2S5		1			3																					4		5%	3%
N3S5		1		4																						5		6%	3%
N4S5	2			1	1																					4		5%	3%
N5S5																										0		0%	0%
N6S5					1																					1		1%	1%
N7S5																										0		0%	0%
N0S6																										0		0%	0%
N1S6																										0		0%	0%
N2S6																										0		0%	0%
N3S6																										0		0%	0%
N4S6	1																									1		1%	1%
N5S6																										0		0%	0%
N6S6																										0		0%	0%
N7S6																										0		0%	0%
N0S7																										0		0%	0%
N1S7																										0		0%	0%
N2S7																										0		0%	0%
N3S7																										0		0%	0%
N4S7																										0		0%	0%
N5S7																										0		0%	0%
N6S7																										0		0%	0%
N7S7																										0		0%	0%
SN Total	26	16	1	16	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	69	100%	100%	100%
NS Total	30	24	10	10	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	81			
Total	56	40	11	26	17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	150			

Source) Analyzed by the Study Team based on the SC transit database of 1999.

Table A.4.6 Number of Vessels Transiting the Canal

6L: Dry Bulk Carriers (Laden)

	Vessel Size (up to) (1000 SCNT)																								Total	Share		
O-D	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180	190	200	210	220	230	240	250		SN	NS	Total
S0N0	2	31	7	1																						41	4%		2%
S0N1	5	13	3																							21	2%		1%
S0N2	2	4	5																							11	1%		0%
S0N3	1	2	2																							5	0%		0%
S0N4	2	10	6	2				1																		21	2%		1%
S0N5		1																								1	0%		0%
S0N6		1																								1	0%		0%
S0N7		1	1																							2	0%		0%
S1N0	1	12	10				1	9	7	1	1															42	4%		2%
S1N1	1	1	6																							8	1%		0%
S1N2																										0	0%		0%
S1N3			1																							1	0%		0%
S1N4		3																								3	0%		0%
S1N5																										0	0%		0%
S1N6																										0	0%		0%
S1N7																										0	0%		0%
S2N0		7		1																						8	1%		0%
S2N1			1	1																						2	0%		0%
S2N2		23	10	1																						34	3%		1%
S2N3																										0	0%		0%
S2N4		2																								2	0%		0%
S2N5																										0	0%		0%
S2N6		10	11																							21	2%		1%
S2N7		4	14																							18	2%		1%
S3N0		2	2	2		1		1																		8	1%		0%
S3N1	3	5		2	1			1																		12	1%		0%
S3N2	1	7	2																							10	1%		0%
S3N3	1	6	1				3	4																		15	1%		1%
S3N4	2	6		1				1	1																	11	1%		0%
S3N5		1																								1	0%		0%
S3N6		7	3																							10	1%		0%
S3N7																										0	0%		0%
S4N0	4	23	26	4				2	2																	61	6%		2%
S4N1		11	19	22	2			6	1																	61	6%		2%
S4N2	1	9	14	27	1																					52	5%		2%
S4N3		9	11	5																						25	2%		1%
S4N4	1	51	31	28	1			1																		113	10%		4%
S4N5	1	6		1																						8	1%		0%
S4N6		2	2																							4	0%		0%
S4N7		1																								1	0%		0%
S5N0	1	4	25	6																						36	3%		1%
S5N1		9	3	10				1																		23	2%		1%
S5N2		8	13	4																						25	2%		1%
S5N3		6	6	4																						16	1%		1%
S5N4	2	16	34	49	3		1																			105	10%		4%
S5N5		1	2																							3	0%		0%
S5N6			1	1																						2	0%		0%
S5N7				1																						1	0%		0%
S6N0		2	3	23		1	6	12	5	1																53	5%		2%
S6N1		8	5	41				7	3	3																67	6%		2%
S6N2		1	3	9					2																	15	1%		1%
S6N3		1	1	15				6																		23	2%		1%
S6N4		5	23	22				15	23	1																89	8%		3%
S6N5				1																						1	0%		0%
S6N6				4					1																	5	0%		0%
S6N7																										0	0%		0%
S7N0																										0	0%		0%
S7N1																										0	0%		0%
S7N2																										0	0%		0%
S7N3																										0	0%		0%
S7N4																										0	0%		0%
S7N5																										0	0%		0%
S7N6																										0	0%		0%
S7N7																										0	0%		0%
N0S0	2	12	1																							15		1%	1%
N1S0	7	17	7	11	1	1	2	1																		47		3%	2%
N2S0	1	5	1	4																						11		1%	0%
N3S0	1	43	6	5		1																				56		3%	2%
N4S0	2	18	5	52	1	1	4	2																		85		5%	3%
N5S0		11	2	1	1	1																				16		1%	1%
N6S0	1	18	8	19	2	2																				50		3%	2%
N7S0		3	1																							4		0%	0%
N0S1		3																								3		0%	0%
N1S1		3																								3		0%	0%
N2S1	1	1																								2		0%	0%
N3S1		3																								3		0%	0%
N4S1		1	1																							2		0%	0%
N5S1			1																							1		0%	0%
N6S1			1																							1		0%	0%
N7S1																										0		0%	0%
N0S2	1	20	17	4																						42		3%	2%
N1S2		6	2	14	1																					23		1%	1%
N2S2		7	6	1																						14		1%	1%
N3S2	1	25	5	6																						37		2%	1%
N4S2	1	7	5	31	2	1	3	4	1																	55		3%	2%
N5S2			1																							1		0%	0%
N6S2		3	1	25	1	1	2																			33		2%	1%
N7S2		4	2	1																						7		0%	0%
N0S3	4	34	3	4																						45		3%	2%
N1S3	1	12	5	2																						20		1%	1%
N2S3	1	7	3																							11		1%	0%
N3S3	2	66	18	4																						90		6%	3%
N4S3	1	30	7	4																						42		3%	2%
N5S3		16	5	1																						22		1%	1%
N6S3		20	45	10																						75		5%	3%
N7S3		10	7	4																						21		1%	1%
N0S4		13	10																							23		1%	1%
N1S4	3	9	2																							14		1%	1%
N2S4		9	7																							16		1%	1%
N3S4	4	65	99	9																						177		11%	6%
N4S4		30	50	1																						81		5%	3%
N5S4	1	15	14	2																						32		2%	1%
N6S4		2	12	4				1																		19		1%	1%
N7S4		2																								2		0%	0%
N0S5		8	2	2																						12		1%	0%
N1S5		4	5	13																						22		1%	1%
N2S5				2																						2		0%	0%
N3S5	1	25	128	42	1																					197		12%	7%
N4S5	1	21	27	20																						69		4%	3%
N5S5	1	11	31	56																						99		6%	4%
N6S5		2	8	2																						12		1%	0%
N7S5		7	3	5																						15		1%	1%
N0S6																										0		0%	0%
N1S6																										0		0%	0%
N2S6		1																								1		0%	0%
N3S6		1																								1		0%	0%
N4S6			1																							1		0%	0%
N5S6																										0		0%	0%
N6S6									1																	1		0%	0%
N7S6																										0		0%	0%
N0S7																										0		0%	0%
N1S7																										0		0%	0%
N2S7																										0		0%	0%
N3S7																										0		0%	0%
N4S7																										0		0%	0%
N5S7																										0		0%	0%
N6S7																										0		0%	0%
N7S7																										0		0%	0%
SN Total	31	332	307	288	8	2	11	67	45	6	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,098	100%	100%	100%
NS Total	38	630	565	361	10	8	11	8	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,633			
Total	69	962	872	649	18	10	22	75	47	6	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2,731			

Source) Analyzed by the Study Team based on the SC transit database of 1999.

Table A.4.7 Number of Vessels Transiting the Canal

7L: Container Ships (Laden)

	Vessel Size (up to) (1000 SCNT)																								Total	Share		
O-D	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180	190	200	210	220	230	240	250		SN	NS	Total
S0N0	1	27	109	1																						138	6%		3%
S0N1	1	17	44	48	108			2																		220	10%		5%
S0N2		31	3	36	6				3																	79	4%		2%
S0N3																										0	0%		0%
S0N4	1	6	2	1	48																					58	3%		1%
S0N5																										0	0%		0%
S0N6				1																						1	0%		0%
S0N7																										0	0%		0%
S1N0		19	1																							20	1%		0%
S1N1		17																								17	1%		0%
S1N2		1	1																							2	0%		0%
S1N3																										0	0%		0%
S1N4																										0	0%		0%
S1N5																										0	0%		0%
S1N6																										0	0%		0%
S1N7																										0	0%		0%
S2N0	2				1																					3	0%		0%
S2N1		1		3	38			4																		46	2%		1%
S2N2	9	2		10																						21	1%		0%
S2N3																										0	0%		0%
S2N4		1																								1	0%		0%
S2N5																										0	0%		0%
S2N6			1																							1	0%		0%
S2N7																										0	0%		0%
S3N0	1	4	73	39																						117	5%		3%
S3N1	3		23	92	28	4	1																			151	7%		3%
S3N2		13	36	2																						51	2%		1%
S3N3																										0	0%		0%
S3N4				1	126		31																			158	7%		4%
S3N5																										0	0%		0%
S3N6			1																							1	0%		0%
S3N7																										0	0%		0%
S4N0	4	27	42	53	94																					220	10%		5%
S4N1		7	12	157	89	12		4																		281	13%		6%
S4N2	1		1		1			17	31																	51	2%		1%
S4N3																										0	0%		0%
S4N4	2	11	67	23	272	85	30	28																		518	24%		12%
S4N5																										0	0%		0%
S4N6																										0	0%		0%
S4N7																										0	0%		0%
S5N0	1	4	2																							7	0%		0%
S5N1		3	2	1	1	1																				8	0%		0%
S5N2																										0	0%		0%
S5N3																										0	0%		0%
S5N4		5	2		1																					8	0%		0%
S5N5																										0	0%		0%
S5N6																										0	0%		0%
S5N7																										0	0%		0%
S6N0																										0	0%		0%
S6N1	1				3																					4	0%		0%
S6N2				1																						1	0%		0%
S6N3																										0	0%		0%
S6N4																										0	0%		0%
S6N5																										0	0%		0%
S6N6																										0	0%		0%
S6N7																										0	0%		0%
S7N0																										0	0%		0%
S7N1																										0	0%		0%
S7N2																										0	0%		0%
S7N3																										0	0%		0%
S7N4																										0	0%		0%
S7N5																										0	0%		0%
S7N6																										0	0%		0%
S7N7																										0	0%		0%
N0S0		27	53	44	12																					136		6%	3%
N1S0	3	45	124	136	206	5		7																		526		24%	12%
N2S0		1	6	1	2																					10		0%	0%
N3S0	1	3																								4		0%	0%
N4S0	5	11	10	3	23	46																				98		5%	2%
N5S0																										0		0%	0%
N6S0			1		1																					2		0%	0%
N7S0																										0		0%	0%
N0S1				1																						1		0%	0%
N1S1	3	46																								49		2%	1%
N2S1		1																								1		0%	0%
N3S1																										0		0%	0%
N4S1	2	2																								4		0%	0%
N5S1																										0		0%	0%
N6S1																										0		0%	0%
N7S1																										0		0%	0%
N0S2	1	1	2																							4		0%	0%
N1S2		2	1	44	15																					62		3%	1%
N2S2	11	1		11	2			10	23																	58		3%	1%
N3S2			1					1																		2		0%	0%
N4S2				32	7	1		2																		42		2%	1%
N5S2																										0		0%	0%
N6S2			1																							1		0%	0%
N7S2																										0		0%	0%
N0S3		2	12	37	1																					52		2%	1%
N1S3		9	1																							10		0%	0%
N2S3																										0		0%	0%
N3S3					1																					1		0%	0%
N4S3		15	33	1	159	18	2																			228		11%	5%
N5S3																										0		0%	0%
N6S3																										0		0%	0%
N7S3																										0		0%	0%
N0S4	1	2	6	67	71																					147		7%	3%
N1S4		21	12	53	9			2																		97		5%	2%
N2S4	1	1	3				1	4	13																	23		1%	1%
N3S4	1						1																			2		0%	0%
N4S4	2	9	64	32	290	34	45	42	2																	520		24%	12%
N5S4																										0		0%	0%
N6S4					1																					1		0%	0%
N7S4																										0		0%	0%
N0S5		4																								4		0%	0%
N1S5	1	2	5																							8		0%	0%
N2S5					1																					1		0%	0%
N3S5																										0		0%	0%
N4S5	1	4	1	1	3																					10		0%	0%
N5S5																										0		0%	0%
N6S5																										0		0%	0%
N7S5																										0		0%	0%
N0S6		1	8																							9		0%	0%
N1S6		1	38																							39		2%	1%
N2S6		1		2																						3		0%	0%
N3S6																										0		0%	0%
N4S6																										0		0%	0%
N5S6																										0		0%	0%
N6S6																										0		0%	0%
N7S6																										0		0%	0%
N0S7																										0		0%	0%
N1S7																										0		0%	0%
N2S7																										0		0%	0%
N3S7																										0		0%	0%
N4S7																										0		0%	0%
N5S7																										0		0%	0%
N6S7																										0		0%	0%
N7S7																										0		0%	0%
SN Total	27	196	422	469	816	102	62	55	34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2,183	100%	100%	100%
NS Total	33	212	382	465	804	104	49	68	38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2,155			
Total	60	408	804	934	1620	206	111	123	72	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4,338			

Source) Analyzed by the Study Team based on the SC transit database of 1999.

Table A.4.8 Number of Vessels Transiting the Canal

8L: Vehicle Carriers (Laden)

	Vessel Size (up to) (1000 SCNT)																								Total	Share		
O-D	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180	190	200	210	220	230	240	250		SN	NS	Total
S0N0			1	3	16	12																				32	6%		4%
S0N1			3	9	20	8																				40	7%		5%
S0N2				1	13	3																				17	3%		2%
S0N3					1																					1	0%		0%
S0N4	1				5	1																				7	1%		1%
S0N5						2																				2	0%		0%
S0N6																										0	0%		0%
S0N7																										0	0%		0%
S1N0																										0	0%		0%
S1N1																										0	0%		0%
S1N2																										0	0%		0%
S1N3																										0	0%		0%
S1N4																										0	0%		0%
S1N5																										0	0%		0%
S1N6																										0	0%		0%
S1N7																										0	0%		0%
S2N0																										0	0%		0%
S2N1																										0	0%		0%
S2N2																										0	0%		0%
S2N3																										0	0%		0%
S2N4																										0	0%		0%
S2N5																										0	0%		0%
S2N6																										0	0%		0%
S2N7																										0	0%		0%
S3N0				1	1	2																				4	1%		1%
S3N1		1		1	8	1																				11	2%		1%
S3N2																										0	0%		0%
S3N3																										0	0%		0%
S3N4																										0	0%		0%
S3N5																										0	0%		0%
S3N6																										0	0%		0%
S3N7																										0	0%		0%
S4N0	1			4	16	12																				33	6%		4%
S4N1		1	1	6	16	4	3																			31	6%		4%
S4N2	1			1	9	7	1																			19	4%		2%
S4N3				1																						1	0%		0%
S4N4			3		7	4																				14	3%		2%
S4N5					3	2																				5	1%		1%
S4N6																										0	0%		0%
S4N7																										0	0%		0%
S5N0			5	5	27	34	1																			72	13%		9%
S5N1			8	11	44	25	1																			89	16%		12%
S5N2				6	33	17	2																			58	11%		8%
S5N3																										0	0%		0%
S5N4		1	7	2	43	18	1																			72	13%		9%
S5N5			2	1	18	9																				30	6%		4%
S5N6					1	1																				2	0%		0%
S5N7																										0	0%		0%
S6N0																										0	0%		0%
S6N1																										0	0%		0%
S6N2																										0	0%		0%
S6N3																										0	0%		0%
S6N4																										0	0%		0%
S6N5																										0	0%		0%
S6N6																										0	0%		0%
S6N7																										0	0%		0%
S7N0																										0	0%		0%
S7N1																										0	0%		0%
S7N2																										0	0%		0%
S7N3																										0	0%		0%
S7N4																										0	0%		0%
S7N5																										0	0%		0%
S7N6																										0	0%		0%
S7N7																										0	0%		0%
N0S0				3	3	7																				13		6%	2%
N1S0				2	7	15	4																			28		12%	4%
N2S0				2	11	9																				22		10%	3%
N3S0																										0		0%	0%
N4S0				3	21	31																				55		24%	7%
N5S0																										0		0%	0%
N6S0				4	12	1	1																			18		8%	2%
N7S0																										0		0%	0%
N0S1																										0		0%	0%
N1S1																										0		0%	0%
N2S1																										0		0%	0%
N3S1																										0		0%	0%
N4S1					1																					1		0%	0%
N5S1																										0		0%	0%
N6S1																										0		0%	0%
N7S1																										0		0%	0%
N0S2																										0		0%	0%
N1S2						2																				2		1%	0%
N2S2					1	3																				4		2%	1%
N3S2																										0		0%	0%
N4S2						6																				6		3%	1%
N5S2																										0		0%	0%
N6S2																										0		0%	0%
N7S2																										0		0%	0%
N0S3																										0		0%	0%
N1S3																										0		0%	0%
N2S3					1																					1		0%	0%
N3S3																										0		0%	0%
N4S3						1																				1		0%	0%
N5S3																										0		0%	0%
N6S3																										0		0%	0%
N7S3																										0		0%	0%
N0S4																										0		0%	0%
N1S4					6	2	1																			9		4%	1%
N2S4					9																					9		4%	1%
N3S4																										0		0%	0%
N4S4					13	3																				16		7%	2%
N5S4																										0		0%	0%
N6S4																										0		0%	0%
N7S4																										0		0%	0%
N0S5				1	1																					2		1%	0%
N1S5				2		2																				4		2%	1%
N2S5			2	1	13	4																				20		9%	3%
N3S5																										0		0%	0%
N4S5			5	3	10	2																				20		9%	3%
N5S5																										0		0%	0%
N6S5																										0		0%	0%
N7S5																										0		0%	0%
N0S6																										0		0%	0%
N1S6																										0		0%	0%
N2S6																										0		0%	0%
N3S6																										0		0%	0%
N4S6																										0		0%	0%
N5S6																										0		0%	0%
N6S6																										0		0%	0%
N7S6																										0		0%	0%
N0S7																										0		0%	0%
N1S7																										0		0%	0%
N2S7																										0		0%	0%
N3S7																										0		0%	0%
N4S7																										0		0%	0%
N5S7																										0		0%	0%
N6S7																										0		0%	0%
N7S7																										0		0%	0%
SN Total	3	3	30	52	281	162	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	540	100%	100%	100%
NS Total	0	0	7	21	109	88	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	231			
Total	3	3	37	73	390	250	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	771			

Source) Analyzed by the Study Team based on the SC transit database of 1999.

Table A.4.9 Number of Vessels Transiting the Canal

9L: General Cargo Ships (Laden)

	Vessel Size (up to) (1000 SCNT)																								Total	Share		
O-D	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180	190	200	210	220	230	240	250		SN	NS	Total
S0N0	104	34	3																							141	16%		7%
S0N1	86	15																								101	12%		5%
S0N2	26	26																								52	6%		3%
S0N3	11	2	1																							14	2%		1%
S0N4	27	9																								36	4%		2%
S0N5																										0	0%		0%
S0N6	3	1	1																							5	1%		0%
S0N7	3																									3	0%		0%
S1N0	2	7																								9	1%		0%
S1N1	5	3																								8	1%		0%
S1N2																										0	0%		0%
S1N3																										0	0%		0%
S1N4																										0	0%		0%
S1N5																										0	0%		0%
S1N6																										0	0%		0%
S1N7																										0	0%		0%
S2N0	12	15																								27	3%		1%
S2N1	5	10	2																							17	2%		1%
S2N2	42	33																								75	9%		4%
S2N3																										0	0%		0%
S2N4		4																								4	0%		0%
S2N5																										0	0%		0%
S2N6	1	2	1																							4	0%		0%
S2N7																										0	0%		0%
S3N0	14	7																								21	2%		1%
S3N1	24	29	1																							54	6%		3%
S3N2	6	8																								14	2%		1%
S3N3	14																									14	2%		1%
S3N4	5	10																								15	2%		1%
S3N5																										0	0%		0%
S3N6		1	14																							15	2%		1%
S3N7		1																								1	0%		0%
S4N0	30	35	3																							68	8%		3%
S4N1	10	13	7	5																						35	4%		2%
S4N2	10	13																								23	3%		1%
S4N3	11	1																								12	1%		1%
S4N4	4	24																								28	3%		1%
S4N5	2	1																								3	0%		0%
S4N6	2	12																								14	2%		1%
S4N7																										0	0%		0%
S5N0	10	10																								20	2%		1%
S5N1	1	3																								4	0%		0%
S5N2	3	7																								10	1%		0%
S5N3																										0	0%		0%
S5N4	7	5	1																							13	1%		1%
S5N5		1																								1	0%		0%
S5N6	1																									1	0%		0%
S5N7																										0	0%		0%
S6N0																										0	0%		0%
S6N1	2																									2	0%		0%
S6N2	4			1																						5	1%		0%
S6N3																										0	0%		0%
S6N4	1																									1	0%		0%
S6N5																										0	0%		0%
S6N6																										0	0%		0%
S6N7																										0	0%		0%
S7N0																										0	0%		0%
S7N1																										0	0%		0%
S7N2																										0	0%		0%
S7N3																										0	0%		0%
S7N4																										0	0%		0%
S7N5																										0	0%		0%
S7N6																										0	0%		0%
S7N7																										0	0%		0%
N0S0	66	24																								90		8%	4%
N1S0	99	44	2																							145		13%	7%
N2S0	20	18		1																						39		3%	2%
N3S0	107	20	1																							128		11%	6%
N4S0	30	60	15	1																						106		9%	5%
N5S0	12	4																								16		1%	1%
N6S0	9	15	14																							38		3%	2%
N7S0	3																									3		0%	0%
N0S1	7	2																								9		1%	0%
N1S1	7	3																								10		1%	0%
N2S1	2																									2		0%	0%
N3S1	9																									9		1%	0%
N4S1	1	2																								3		0%	0%
N5S1		2																								2		0%	0%
N6S1																										0		0%	0%
N7S1																										0		0%	0%
N0S2	11	6	1																							18		2%	1%
N1S2	30	29																								59		5%	3%
N2S2	15	22																								37		3%	2%
N3S2	22	1																								23		2%	1%
N4S2	16	23	4																							43		4%	2%
N5S2	2																									2		0%	0%
N6S2	5	5																								10		1%	0%
N7S2	1																									1		0%	0%
N0S3	15	16																								31		3%	2%
N1S3	22	17																								39		3%	2%
N2S3	3	5																								8		1%	0%
N3S3	22	15	1																							38		3%	2%
N4S3	9	13																								22		2%	1%
N5S3	7	1																								8		1%	0%
N6S3		4																								4		0%	0%
N7S3	2																									2		0%	0%
N0S4	5	7																								12		1%	1%
N1S4	11	13	2																							26		2%	1%
N2S4	5	6																								11		1%	1%
N3S4	20	11	1																							32		3%	2%
N4S4	8	9	2																							19		2%	1%
N5S4	6	2																								8		1%	0%
N6S4																										0		0%	0%
N7S4		3																								3		0%	0%
N0S5	1	9																								10		1%	0%
N1S5	9	8																								17		1%	1%
N2S5	5	2																								7		1%	0%
N3S5	3	7	1																							11		1%	1%
N4S5	10	10	1																							21		2%	1%
N5S5	1	3																								4		0%	0%
N6S5																										0		0%	0%
N7S5																										0		0%	0%
N0S6	1	1																								2		0%	0%
N1S6	2																									2		0%	0%
N2S6	1																									1		0%	0%
N3S6																										0		0%	0%
N4S6	3																									3		0%	0%
N5S6																										0		0%	0%
N6S6	1																									1		0%	0%
N7S6																										0		0%	0%
N0S7																										0		0%	0%
N1S7	1																									1		0%	0%
N2S7																										0		0%	0%
N3S7																										0		0%	0%
N4S7																										0		0%	0%
N5S7																										0		0%	0%
N6S7																										0		0%	0%
N7S7																										0		0%	0%
SN Total	488	342	34	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	870	100%	100%	100%
NS Total	647	442	45	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,136			
Total	1135	784	79	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2,006			

Source) Analyzed by the Study Team based on the SC transit database of 1999.

Table A.4.10 Number of Vessels Transiting the Canal

10L: Other Vessels (Laden)

	Vessel Size (up to) (1000 SCNT)																								Total	Share		
O-D	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180	190	200	210	220	230	240	250		SN	NS	Total
S0N0	79	14	13	1	1	1	2		3																	114	25%		11%
S0N1	49	8	24	17																						98	21%		10%
S0N2	12	9																								21	5%		2%
S0N3																										0	0%		0%
S0N4	7																									7	2%		1%
S0N5																										0	0%		0%
S0N6	2		1	1																						4	1%		0%
S0N7	4																									4	1%		0%
S1N0	9	1																								10	2%		1%
S1N1	9	1																								10	2%		1%
S1N2	17																									17	4%		2%
S1N3																										0	0%		0%
S1N4	2																									2	0%		0%
S1N5																										0	0%		0%
S1N6																										0	0%		0%
S1N7																										0	0%		0%
S2N0	9	2																								11	2%		1%
S2N1	16	1	1																							18	4%		2%
S2N2	13																									13	3%		1%
S2N3	1																									1	0%		0%
S2N4	11		1																							12	3%		1%
S2N5																										0	0%		0%
S2N6	1																									1	0%		0%
S2N7																										0	0%		0%
S3N0	2	1	1																							4	1%		0%
S3N1	2	1	1																							4	1%		0%
S3N2	5																									5	1%		0%
S3N3	1																									1	0%		0%
S3N4	1		3																							4	1%		0%
S3N5																										0	0%		0%
S3N6	1		1																							2	0%		0%
S3N7																										0	0%		0%
S4N0	10	2	1																							13	3%		1%
S4N1	12			3																						15	3%		1%
S4N2	6	1	1																							8	2%		1%
S4N3	3	1																								4	1%		0%
S4N4	11	2		1																						14	3%		1%
S4N5	1																									1	0%		0%
S4N6			14	1																						15	3%		1%
S4N7	2																									2	0%		0%
S5N0	3	1		1																						5	1%		0%
S5N1	1																									1	0%		0%
S5N2	6																									6	1%		1%
S5N3	2																									2	0%		0%
S5N4	1																									1	0%		0%
S5N5																										0	0%		0%
S5N6			2																							2	0%		0%
S5N7	2																									2	0%		0%
S6N0	1																									1	0%		0%
S6N1	3																									3	1%		0%
S6N2	2																									2	0%		0%
S6N3																										0	0%		0%
S6N4	1																									1	0%		0%
S6N5																										0	0%		0%
S6N6																										0	0%		0%
S6N7																										0	0%		0%
S7N0																										0	0%		0%
S7N1																										0	0%		0%
S7N2																										0	0%		0%
S7N3																										0	0%		0%
S7N4																										0	0%		0%
S7N5																										0	0%		0%
S7N6																										0	0%		0%
S7N7																										0	0%		0%
N0S0	70	6	19	1	1		1	1	2																	101		19%	10%
N1S0	111	9	24	17																						161		30%	16%
N2S0	14	13	1																							28		5%	3%
N3S0	8	4	1																							13		2%	1%
N4S0	11	2																								13		2%	1%
N5S0																										0		0%	0%
N6S0	34	2	5	5																						46		8%	5%
N7S0	3																									3		1%	0%
N0S1	1																									1		0%	0%
N1S1	3	4																								7		1%	1%
N2S1	11																									11		2%	1%
N3S1																										0		0%	0%
N4S1	1																									1		0%	0%
N5S1																										0		0%	0%
N6S1																										0		0%	0%
N7S1																										0		0%	0%
N0S2	7	3																								10		2%	1%
N1S2	23	1																								24		4%	2%
N2S2	8																									8		1%	1%
N3S2	2	1																								3		1%	0%
N4S2	6	1																								7		1%	1%
N5S2																										0		0%	0%
N6S2	3																									3		1%	0%
N7S2	1		1																							2		0%	0%
N0S3	4	2	1																							7		1%	1%
N1S3	2	1																								3		1%	0%
N2S3	2	1	1																							4		1%	0%
N3S3	3	1																								4		1%	0%
N4S3	5	2																								7		1%	1%
N5S3																										0		0%	0%
N6S3		2																								2		0%	0%
N7S3	1																									1		0%	0%
N0S4	2		1																							3		1%	0%
N1S4	13	1																								14		3%	1%
N2S4	6																									6		1%	1%
N3S4	3	3		1																						7		1%	1%
N4S4	5	2																								7		1%	1%
N5S4			1																							1		0%	0%
N6S4																										0		0%	0%
N7S4	1																									1		0%	0%
N0S5	8																									8		1%	1%
N1S5	2	1																								3		1%	0%
N2S5	5																									5		1%	0%
N3S5	2																									2		0%	0%
N4S5	4	1																								5		1%	0%
N5S5	2																									2		0%	0%
N6S5	1																									1		0%	0%
N7S5	1																									1		0%	0%
N0S6																										0		0%	0%
N1S6	1																									1		0%	0%
N2S6	3																									3		1%	0%
N3S6																										0		0%	0%
N4S6	2																									2		0%	0%
N5S6																										0		0%	0%
N6S6	1																									1		0%	0%
N7S6																										0		0%	0%
N0S7																										0		0%	0%
N1S7																										0		0%	0%
N2S7																										0		0%	0%
N3S7																										0		0%	0%
N4S7																										0		0%	0%
N5S7																										0		0%	0%
N6S7																										0		0%	0%
N7S7																										0		0%	0%
SN Total	320	45	64	25	1	1	2	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	461	100%	100%	100%
NS Total	396	63	55	24	1	0	1	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	543			
Total	716	108	119	49	2	1	3	1	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,004			

Source) Analyzed by the Study Team based on the SC transit database of 1999.

Table A.4.11 Number of Vessels Transiting the Canal

1B: Tankers of Crude Oil (Ballast)

	Vessel Size (up to) (1000 SCNT)																								Total	Share		
O-D	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180	190	200	210	220	230	240	250		SN	NS	Total
S0N0																										0	0%		0%
S0N1																										0	0%		0%
S0N2		1																								1	50%		0%
S0N3																										0	0%		0%
S0N4																										0	0%		0%
S0N5																										0	0%		0%
S0N6																										0	0%		0%
S0N7																										0	0%		0%
S1N0																										0	0%		0%
S1N1																										0	0%		0%
S1N2																										0	0%		0%
S1N3																										0	0%		0%
S1N4																										0	0%		0%
S1N5																										0	0%		0%
S1N6																										0	0%		0%
S1N7																										0	0%		0%
S2N0																										0	0%		0%
S2N1																										0	0%		0%
S2N2																										0	0%		0%
S2N3																										0	0%		0%
S2N4																										0	0%		0%
S2N5																										0	0%		0%
S2N6																										0	0%		0%
S2N7																										0	0%		0%
S3N0																										0	0%		0%
S3N1																										0	0%		0%
S3N2																										0	0%		0%
S3N3																										0	0%		0%
S3N4																										0	0%		0%
S3N5																										0	0%		0%
S3N6																										0	0%		0%
S3N7																										0	0%		0%
S4N0																										0	0%		0%
S4N1																										0	0%		0%
S4N2																										0	0%		0%
S4N3																										0	0%		0%
S4N4																										0	0%		0%
S4N5																										0	0%		0%
S4N6																										0	0%		0%
S4N7																										0	0%		0%
S5N0																										0	0%		0%
S5N1																										0	0%		0%
S5N2																										0	0%		0%
S5N3				1																						1	50%		0%
S5N4																										0	0%		0%
S5N5																										0	0%		0%
S5N6																										0	0%		0%
S5N7																										0	0%		0%
S6N0																										0	0%		0%
S6N1																										0	0%		0%
S6N2																										0	0%		0%
S6N3																										0	0%		0%
S6N4																										0	0%		0%
S6N5																										0	0%		0%
S6N6																										0	0%		0%
S6N7																										0	0%		0%
S7N0																										0	0%		0%
S7N1																										0	0%		0%
S7N2																										0	0%		0%
S7N3																										0	0%		0%
S7N4																										0	0%		0%
S7N5																										0	0%		0%
S7N6																										0	0%		0%
S7N7																										0	0%		0%
N0S0		1														1										1		0%	0%
N1S0					4									1	1			1								6		3%	3%
N2S0							1																			3		1%	1%
N3S0																										0		0%	0%
N4S0												1	1		1	5	4									12		6%	6%
N5S0																										0		0%	0%
N6S0																7	2									9		4%	4%
N7S0																										0		0%	0%
N0S1																										0		0%	0%
N1S1																										0		0%	0%
N2S1																										0		0%	0%
N3S1																										0		0%	0%
N4S1																										0		0%	0%
N5S1																										0		0%	0%
N6S1																										0		0%	0%
N7S1																										0		0%	0%
N0S2																1										1		0%	0%
N1S2							9	3				1	1	1	1	19	3	1								39		18%	18%
N2S2								1																		1		0%	0%
N3S2																										0		0%	0%
N4S2												2	6		1	32	4	1		2						48		23%	22%
N5S2																										0		0%	0%
N6S2												4	8	2	9	41	10	5	6	6	1	1				93		44%	43%
N7S2																										0		0%	0%
N0S3																										0		0%	0%
N1S3																										0		0%	0%
N2S3																										0		0%	0%
N3S3																										0		0%	0%
N4S3																										0		0%	0%
N5S3																										0		0%	0%
N6S3																										0		0%	0%
N7S3																										0		0%	0%
N0S4																										0		0%	0%
N1S4																										0		0%	0%
N2S4																										0		0%	0%
N3S4																										0		0%	0%
N4S4																										0		0%	0%
N5S4																										0		0%	0%
N6S4																										0		0%	0%
N7S4																										0		0%	0%
N0S5																										0		0%	0%
N1S5																										0		0%	0%
N2S5																										0		0%	0%
N3S5																										0		0%	0%
N4S5																										0		0%	0%
N5S5																										0		0%	0%
N6S5																										0		0%	0%
N7S5																										0		0%	0%
N0S6																										0		0%	0%
N1S6																										0		0%	0%
N2S6																										0		0%	0%
N3S6																										0		0%	0%
N4S6																										0		0%	0%
N5S6																										0		0%	0%
N6S6																										0		0%	0%
N7S6																										0		0%	0%
N0S7																										0		0%	0%
N1S7																										0		0%	0%
N2S7																										0		0%	0%
N3S7																										0		0%	0%
N4S7																										0		0%	0%
N5S7																										0		0%	0%
N6S7																										0		0%	0%
N7S7																										0		0%	0%
SN Total	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	100%	100%	100%
NS Total	0	1	0	0	4	0	10	4	0	0	0	8	16	4	13	106	23	8	6	8	1	1	0	0	0	213			
Total	0	2	0	1	4	0	10	4	0	0	0	8	16	4	13	106	23	8	6	8	1	1	0	0	0	215			

Source) Analyzed by the Study Team based on the SC transit database of 1999.

Table A.4.12 Number of Vessels Transiting the Canal

2B: Tankers of Petro. Prod. (Ballast)

	Vessel Size (up to) (1000 SCNT)																								Total	Share		
O-D	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180	190	200	210	220	230	240	250		SN	NS	Total
S0N0	8	3																								11	11%		7%
S0N1	2	1																								3	3%		2%
S0N2			1	1																						2	2%		1%
S0N3		2																								2	2%		1%
S0N4	3																									3	3%		2%
S0N5																										0	0%		0%
S0N6		1		1																						2	2%		1%
S0N7																										0	0%		0%
S1N0		1	1																							2	2%		1%
S1N1		2																								2	2%		1%
S1N2																										0	0%		0%
S1N3																										0	0%		0%
S1N4																										0	0%		0%
S1N5																										0	0%		0%
S1N6																										0	0%		0%
S1N7																										0	0%		0%
S2N0		1	1		1	1																				4	4%		3%
S2N1	2		1																							3	3%		2%
S2N2					1																					1	1%		1%
S2N3		1																								1	1%		1%
S2N4	1																									1	1%		1%
S2N5																										0	0%		0%
S2N6																										0	0%		0%
S2N7																										0	0%		0%
S3N0	3				1																					4	4%		3%
S3N1	1		1		1	1																				4	4%		3%
S3N2	5	6			1																					12	13%		8%
S3N3		1	1																							2	2%		1%
S3N4	1	2																								3	3%		2%
S3N5																										0	0%		0%
S3N6				2																						2	2%		1%
S3N7		3																								3	3%		2%
S4N0	1	3	1			2		1																		8	8%		5%
S4N1	5	2																								7	7%		5%
S4N2		1				1				1																3	3%		2%
S4N3	1																									1	1%		1%
S4N4	2			1		1	1																			5	5%		3%
S4N5																										0	0%		0%
S4N6				1																						1	1%		1%
S4N7	1																									1	1%		1%
S5N0																										0	0%		0%
S5N1	2																									2	2%		1%
S5N2		1																								1	1%		1%
S5N3																										0	0%		0%
S5N4																										0	0%		0%
S5N5																										0	0%		0%
S5N6																										0	0%		0%
S5N7																										0	0%		0%
S6N0																										0	0%		0%
S6N1																										0	0%		0%
S6N2																										0	0%		0%
S6N3																										0	0%		0%
S6N4																										0	0%		0%
S6N5																										0	0%		0%
S6N6																										0	0%		0%
S6N7																										0	0%		0%
S7N0																										0	0%		0%
S7N1																										0	0%		0%
S7N2																										0	0%		0%
S7N3																										0	0%		0%
S7N4																										0	0%		0%
S7N5																										0	0%		0%
S7N6																										0	0%		0%
S7N7																										0	0%		0%
N0S0	1	5	1	1	1																					9		15%	6%
N1S0			2	2																						4		7%	3%
N2S0			1				1																			2		3%	1%
N3S0	2		1																							3		5%	2%
N4S0				1	1																					2		3%	1%
N5S0																										0		0%	0%
N6S0						1											1									2		3%	1%
N7S0																										0		0%	0%
N0S1																										0		0%	0%
N1S1																										0		0%	0%
N2S1																										0		0%	0%
N3S1																										0		0%	0%
N4S1																										0		0%	0%
N5S1																										0		0%	0%
N6S1																										0		0%	0%
N7S1																										0		0%	0%
N0S2	1	2	1																							4		7%	3%
N1S2	4					1	1																			6		10%	4%
N2S2		1					1																			2		3%	1%
N3S2	1																									1		2%	1%
N4S2				1		1										1										3		5%	2%
N5S2																										0		0%	0%
N6S2					1				1							1	1									4		7%	3%
N7S2																										0		0%	0%
N0S3						1																				1		2%	1%
N1S3		4	1		2	2	1																			10		17%	6%
N2S3					1																					1		2%	1%
N3S3																										0		0%	0%
N4S3		1																								1		2%	1%
N5S3																										0		0%	0%
N6S3																										0		0%	0%
N7S3																										0		0%	0%
N0S4																										0		0%	0%
N1S4	1									1																2		3%	1%
N2S4					1																					1		2%	1%
N3S4																										0		0%	0%
N4S4																										0		0%	0%
N5S4																										0		0%	0%
N6S4																										0		0%	0%
N7S4																										0		0%	0%
N0S5																										0		0%	0%
N1S5																										0		0%	0%
N2S5																										0		0%	0%
N3S5																										0		0%	0%
N4S5					1																					1		2%	1%
N5S5																										0		0%	0%
N6S5																										0		0%	0%
N7S5																										0		0%	0%
N0S6																										0		0%	0%
N1S6																										0		0%	0%
N2S6																										0		0%	0%
N3S6																										0		0%	0%
N4S6																										0		0%	0%
N5S6																										0		0%	0%
N6S6																										0		0%	0%
N7S6																										0		0%	0%
N0S7																										0		0%	0%
N1S7																										0		0%	0%
N2S7																										0		0%	0%
N3S7																										0		0%	0%
N4S7																										0		0%	0%
N5S7																										0		0%	0%
N6S7																										0		0%	0%
N7S7																										0		0%	0%
SN Total	38	31	7	6	5	6	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	96	100%	100%	100%
NS Total	10	13	7	5	8	6	4	0	1	1	0	0	0	0	0	2	2	0	0	0	0	0	0	0	0	59			
Total	48	44	14	11	13	12	5	1	1	2	0	0	0	0	0	2	2	0	0	0	0	0	0	0	0	155			

Source) Analyzed by the Study Team based on the SC transit database of 1999.

Table A.4.13 Number of Vessels Transiting the Canal

3B: Chemical Carriers (Ballast)

	Vessel Size (up to) (1000 SCNT)																								Total	Share		
O-D	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180	190	200	210	220	230	240	250		SN	NS	Total
S0N0	2																									2	3%		3%
S0N1	2																									2	3%		3%
S0N2	1	2																								3	4%		4%
S0N3																										0	0%		0%
S0N4	1																									1	1%		1%
S0N5																										0	0%		0%
S0N6																										0	0%		0%
S0N7																										0	0%		0%
S1N0																										0	0%		0%
S1N1																										0	0%		0%
S1N2																										0	0%		0%
S1N3																										0	0%		0%
S1N4																										0	0%		0%
S1N5																										0	0%		0%
S1N6																										0	0%		0%
S1N7																										0	0%		0%
S2N0																										0	0%		0%
S2N1																										0	0%		0%
S2N2		1																								1	1%		1%
S2N3																										0	0%		0%
S2N4	1	1																								2	3%		3%
S2N5																										0	0%		0%
S2N6																										0	0%		0%
S2N7																										0	0%		0%
S3N0	1	2																								3	4%		4%
S3N1	2	1																								3	4%		4%
S3N2	16	31																								47	68%		64%
S3N3																										0	0%		0%
S3N4																										0	0%		0%
S3N5																										0	0%		0%
S3N6																										0	0%		0%
S3N7		2																								2	3%		3%
S4N0																										0	0%		0%
S4N1																										0	0%		0%
S4N2		1																								1	1%		1%
S4N3																										0	0%		0%
S4N4		1																								1	1%		1%
S4N5																										0	0%		0%
S4N6																										0	0%		0%
S4N7		1																								1	1%		1%
S5N0																										0	0%		0%
S5N1																										0	0%		0%
S5N2																										0	0%		0%
S5N3																										0	0%		0%
S5N4																										0	0%		0%
S5N5																										0	0%		0%
S5N6																										0	0%		0%
S5N7																										0	0%		0%
S6N0																										0	0%		0%
S6N1																										0	0%		0%
S6N2																										0	0%		0%
S6N3																										0	0%		0%
S6N4																										0	0%		0%
S6N5																										0	0%		0%
S6N6																										0	0%		0%
S6N7																										0	0%		0%
S7N0																										0	0%		0%
S7N1																										0	0%		0%
S7N2																										0	0%		0%
S7N3																										0	0%		0%
S7N4																										0	0%		0%
S7N5																										0	0%		0%
S7N6																										0	0%		0%
S7N7																										0	0%		0%
N0S0	1	1																								2		50%	3%
N1S0						1																				1		25%	1%
N2S0																										0		0%	0%
N3S0																										0		0%	0%
N4S0																										0		0%	0%
N5S0																										0		0%	0%
N6S0																										0		0%	0%
N7S0																										0		0%	0%
N0S1																										0		0%	0%
N1S1																										0		0%	0%
N2S1																										0		0%	0%
N3S1																										0		0%	0%
N4S1																										0		0%	0%
N5S1																										0		0%	0%
N6S1																										0		0%	0%
N7S1																										0		0%	0%
N0S2																										0		0%	0%
N1S2																										0		0%	0%
N2S2																										0		0%	0%
N3S2																										0		0%	0%
N4S2																										0		0%	0%
N5S2																										0		0%	0%
N6S2																1										1		25%	1%
N7S2																										0		0%	0%
N0S3																										0		0%	0%
N1S3																										0		0%	0%
N2S3																										0		0%	0%
N3S3																										0		0%	0%
N4S3																										0		0%	0%
N5S3																										0		0%	0%
N6S3																										0		0%	0%
N7S3																										0		0%	0%
N0S4																										0		0%	0%
N1S4																										0		0%	0%
N2S4																										0		0%	0%
N3S4																										0		0%	0%
N4S4																										0		0%	0%
N5S4																										0		0%	0%
N6S4																										0		0%	0%
N7S4																										0		0%	0%
N0S5																										0		0%	0%
N1S5																										0		0%	0%
N2S5																										0		0%	0%
N3S5																										0		0%	0%
N4S5																										0		0%	0%
N5S5																										0		0%	0%
N6S5																										0		0%	0%
N7S5																										0		0%	0%
N0S6																										0		0%	0%
N1S6																										0		0%	0%
N2S6																										0		0%	0%
N3S6																										0		0%	0%
N4S6																										0		0%	0%
N5S6																										0		0%	0%
N6S6																										0		0%	0%
N7S6																										0		0%	0%
N0S7																										0		0%	0%
N1S7																										0		0%	0%
N2S7																										0		0%	0%
N3S7																										0		0%	0%
N4S7																										0		0%	0%
N5S7																										0		0%	0%
N6S7																										0		0%	0%
N7S7																										0		0%	0%
SN Total	26	43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	69	100%	100%	100%
NS Total	1	1	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	4			
Total	27	44	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	73			

Source) Analyzed by the Study Team based on the SC transit database of 1999.

Table A.4.14 Number of Vessels Transiting the Canal

4B: LNG Carriers (Ballast)

	Vessel Size (up to) (1000 SCNT)																								Total	Share		
O-D	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180	190	200	210	220	230	240	250		SN	NS	Total
S0N0																										0	0%		0%
S0N1																										0	0%		0%
S0N2																										0	0%		0%
S0N3																										0	0%		0%
S0N4																										0	0%		0%
S0N5																										0	0%		0%
S0N6																										0	0%		0%
S0N7																										0	0%		0%
S1N0																										0	0%		0%
S1N1																										0	0%		0%
S1N2																										0	0%		0%
S1N3																										0	0%		0%
S1N4																										0	0%		0%
S1N5																										0	0%		0%
S1N6																										0	0%		0%
S1N7																										0	0%		0%
S2N0																										0	0%		0%
S2N1																										0	0%		0%
S2N2			1																							1	33%		3%
S2N3																										0	0%		0%
S2N4																										0	0%		0%
S2N5																										0	0%		0%
S2N6																										0	0%		0%
S2N7																										0	0%		0%
S3N0																										0	0%		0%
S3N1																										0	0%		0%
S3N2																										0	0%		0%
S3N3																										0	0%		0%
S3N4																										0	0%		0%
S3N5																										0	0%		0%
S3N6																										0	0%		0%
S3N7																										0	0%		0%
S4N0																										0	0%		0%
S4N1																										0	0%		0%
S4N2																										0	0%		0%
S4N3																										0	0%		0%
S4N4	2																									2	67%		6%
S4N5																										0	0%		0%
S4N6																										0	0%		0%
S4N7																										0	0%		0%
S5N0																										0	0%		0%
S5N1																										0	0%		0%
S5N2																										0	0%		0%
S5N3																										0	0%		0%
S5N4																										0	0%		0%
S5N5																										0	0%		0%
S5N6																										0	0%		0%
S5N7																										0	0%		0%
S6N0																										0	0%		0%
S6N1																										0	0%		0%
S6N2																										0	0%		0%
S6N3																										0	0%		0%
S6N4																										0	0%		0%
S6N5																										0	0%		0%
S6N6																										0	0%		0%
S6N7																										0	0%		0%
S7N0																										0	0%		0%
S7N1																										0	0%		0%
S7N2																										0	0%		0%
S7N3																										0	0%		0%
S7N4																										0	0%		0%
S7N5																										0	0%		0%
S7N6																										0	0%		0%
S7N7																										0	0%		0%
N0S0																										0		0%	0%
N1S0																										0		0%	0%
N2S0																										0		0%	0%
N3S0																										0		0%	0%
N4S0																										0		0%	0%
N5S0																										0		0%	0%
N6S0																										0		0%	0%
N7S0																										0		0%	0%
N0S1																										0		0%	0%
N1S1																										0		0%	0%
N2S1																										0		0%	0%
N3S1																										0		0%	0%
N4S1																										0		0%	0%
N5S1																										0		0%	0%
N6S1																										0		0%	0%
N7S1																										0		0%	0%
N0S2																										0		0%	0%
N1S2					5			1																		6		19%	18%
N2S2					5		6	8	1	1																21		68%	62%
N3S2																										0		0%	0%
N4S2																										0		0%	0%
N5S2																										0		0%	0%
N6S2										1	2															3		10%	9%
N7S2																										0		0%	0%
N0S3																										0		0%	0%
N1S3																										0		0%	0%
N2S3																										0		0%	0%
N3S3																										0		0%	0%
N4S3																										0		0%	0%
N5S3																										0		0%	0%
N6S3																										0		0%	0%
N7S3																										0		0%	0%
N0S4																										0		0%	0%
N1S4																										0		0%	0%
N2S4																										0		0%	0%
N3S4																										0		0%	0%
N4S4																										0		0%	0%
N5S4																										0		0%	0%
N6S4																										0		0%	0%
N7S4																										0		0%	0%
N0S5																										0		0%	0%
N1S5																										0		0%	0%
N2S5																										0		0%	0%
N3S5																										0		0%	0%
N4S5																										0		0%	0%
N5S5																										0		0%	0%
N6S5																										0		0%	0%
N7S5																										0		0%	0%
N0S6																										0		0%	0%
N1S6																										0		0%	0%
N2S6										1																1		3%	3%
N3S6																										0		0%	0%
N4S6																										0		0%	0%
N5S6																										0		0%	0%
N6S6																										0		0%	0%
N7S6																										0		0%	0%
N0S7																										0		0%	0%
N1S7																										0		0%	0%
N2S7																										0		0%	0%
N3S7																										0		0%	0%
N4S7																										0		0%	0%
N5S7																										0		0%	0%
N6S7																										0		0%	0%
N7S7																										0		0%	0%
SN Total	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	100%	100%	100%
NS Total	0	0	0	0	10	0	6	9	1	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	31			
Total	2	0	1	0	10	0	6	9	1	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	34			

Source) Analyzed by the Study Team based on the SC transit database of 1999.

Table A.4.15 Number of Vessels Transiting the Canal

5B: LPG Carriers (Ballast)

	Vessel Size (up to) (1000 SCNT)																								Total	Share		
O-D	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180	190	200	210	220	230	240	250		SN	NS	Total
S0N0	1	1																								2	2%		1%
S0N1	2	1																								3	3%		2%
S0N2	2		2	1																						5	5%		4%
S0N3		5	2																							7	7%		5%
S0N4	1	2	1																							4	4%		3%
S0N5																										0	0%		0%
S0N6																										0	0%		0%
S0N7																										0	0%		0%
S1N0																										0	0%		0%
S1N1		1																								1	1%		1%
S1N2																										0	0%		0%
S1N3			1	1																						2	2%		1%
S1N4																										0	0%		0%
S1N5																										0	0%		0%
S1N6																										0	0%		0%
S1N7																										0	0%		0%
S2N0			1																							1	1%		1%
S2N1																										0	0%		0%
S2N2				1																						1	1%		1%
S2N3		2	1																							3	3%		2%
S2N4	1																									1	1%		1%
S2N5																										0	0%		0%
S2N6																										0	0%		0%
S2N7																										0	0%		0%
S3N0	1																									1	1%		1%
S3N1		6																								6	6%		4%
S3N2	2	2																								4	4%		3%
S3N3		1	1																							2	2%		1%
S3N4	5	2																								7	7%		5%
S3N5																										0	0%		0%
S3N6																										0	0%		0%
S3N7																										0	0%		0%
S4N0	1	1		1																						3	3%		2%
S4N1	4	3																								7	7%		5%
S4N2	10	6		1	2																					19	19%		14%
S4N3				1																						1	1%		1%
S4N4	4	1		2																						7	7%		5%
S4N5																										0	0%		0%
S4N6		1																								1	1%		1%
S4N7																										0	0%		0%
S5N0		1																								1	1%		1%
S5N1	1																									1	1%		1%
S5N2		1		1	3																					5	5%		4%
S5N3				1																						1	1%		1%
S5N4				1	2																					3	3%		2%
S5N5																										0	0%		0%
S5N6																										0	0%		0%
S5N7																										0	0%		0%
S6N0																										0	0%		0%
S6N1		1																								1	1%		1%
S6N2	1																									1	1%		1%
S6N3																										0	0%		0%
S6N4																										0	0%		0%
S6N5																										0	0%		0%
S6N6																										0	0%		0%
S6N7																										0	0%		0%
S7N0																										0	0%		0%
S7N1																										0	0%		0%
S7N2																										0	0%		0%
S7N3																										0	0%		0%
S7N4																										0	0%		0%
S7N5																										0	0%		0%
S7N6																										0	0%		0%
S7N7																										0	0%		0%
N0S0	2			2	4																					8		23%	6%
N1S0	1	2																								3		9%	2%
N2S0				1																						1		3%	1%
N3S0																										0		0%	0%
N4S0		1																								1		3%	1%
N5S0																										0		0%	0%
N6S0																										0		0%	0%
N7S0																										0		0%	0%
N0S1																										0		0%	0%
N1S1																										0		0%	0%
N2S1																										0		0%	0%
N3S1																										0		0%	0%
N4S1																										0		0%	0%
N5S1																										0		0%	0%
N6S1																										0		0%	0%
N7S1																										0		0%	0%
N0S2	1			9	4																					14		40%	10%
N1S2	2				1																					3		9%	2%
N2S2																										0		0%	0%
N3S2																										0		0%	0%
N4S2					1																					1		3%	1%
N5S2																										0		0%	0%
N6S2					1					1																2		6%	1%
N7S2																										0		0%	0%
N0S3																										0		0%	0%
N1S3																										0		0%	0%
N2S3																										0		0%	0%
N3S3																										0		0%	0%
N4S3																										0		0%	0%
N5S3																										0		0%	0%
N6S3																										0		0%	0%
N7S3																										0		0%	0%
N0S4	1																									1		3%	1%
N1S4	1																									1		3%	1%
N2S4																										0		0%	0%
N3S4																										0		0%	0%
N4S4																										0		0%	0%
N5S4																										0		0%	0%
N6S4																										0		0%	0%
N7S4																										0		0%	0%
N0S5																										0		0%	0%
N1S5																										0		0%	0%
N2S5																										0		0%	0%
N3S5																										0		0%	0%
N4S5																										0		0%	0%
N5S5																										0		0%	0%
N6S5																										0		0%	0%
N7S5																										0		0%	0%
N0S6																										0		0%	0%
N1S6																										0		0%	0%
N2S6																										0		0%	0%
N3S6																										0		0%	0%
N4S6																										0		0%	0%
N5S6																										0		0%	0%
N6S6																										0		0%	0%
N7S6																										0		0%	0%
N0S7																										0		0%	0%
N1S7																										0		0%	0%
N2S7																										0		0%	0%
N3S7																										0		0%	0%
N4S7																										0		0%	0%
N5S7																										0		0%	0%
N6S7																										0		0%	0%
N7S7																										0		0%	0%
SN Total	36	38	9	11	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	101	100%	100%	100%
NS Total	8	3	0	12	11	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	35			
Total	44	41	9	23	18	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	136			

Source) Analyzed by the Study Team based on the SC transit database of 1999.

Table A.4.16 Number of Vessels Transiting the Canal

6B: Dry Bulk Carriers (Ballast)

	Vessel Size (up to) (1000 SCNT)																								Total	Share		
O-D	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180	190	200	210	220	230	240	250		SN	NS	Total
S0N0		3	1																							4	7%		4%
S0N1		2	2																							4	7%		4%
S0N2		2	1																							3	5%		3%
S0N3		4	6	1																						11	19%		11%
S0N4		2	6	1																						9	16%		9%
S0N5	1																									1	2%		1%
S0N6			1	1																						2	3%		2%
S0N7		1																								1	2%		1%
S1N0																										0	0%		0%
S1N1		1																								1	2%		1%
S1N2																										0	0%		0%
S1N3																										0	0%		0%
S1N4																										0	0%		0%
S1N5																										0	0%		0%
S1N6																										0	0%		0%
S1N7																										0	0%		0%
S2N0																										0	0%		0%
S2N1			1																							1	2%		1%
S2N2		2	2																							4	7%		4%
S2N3		3																								3	5%		3%
S2N4		3	2																							5	9%		5%
S2N5			1																							1	2%		1%
S2N6				1																						1	2%		1%
S2N7			1																							1	2%		1%
S3N0																										0	0%		0%
S3N1																										0	0%		0%
S3N2																										0	0%		0%
S3N3																										0	0%		0%
S3N4																										0	0%		0%
S3N5																										0	0%		0%
S3N6				1																						1	2%		1%
S3N7																										0	0%		0%
S4N0																										0	0%		0%
S4N1	1																									1	2%		1%
S4N2																										0	0%		0%
S4N3																										0	0%		0%
S4N4		2																								2	3%		2%
S4N5																										0	0%		0%
S4N6																										0	0%		0%
S4N7																										0	0%		0%
S5N0	1																									1	2%		1%
S5N1																										0	0%		0%
S5N2																										0	0%		0%
S5N3			1																							1	2%		1%
S5N4																										0	0%		0%
S5N5																										0	0%		0%
S5N6																										0	0%		0%
S5N7																										0	0%		0%
S6N0																										0	0%		0%
S6N1																										0	0%		0%
S6N2																										0	0%		0%
S6N3																										0	0%		0%
S6N4																										0	0%		0%
S6N5																										0	0%		0%
S6N6																										0	0%		0%
S6N7																										0	0%		0%
S7N0																										0	0%		0%
S7N1																										0	0%		0%
S7N2																										0	0%		0%
S7N3																										0	0%		0%
S7N4																										0	0%		0%
S7N5																										0	0%		0%
S7N6																										0	0%		0%
S7N7																										0	0%		0%
N0S0		2																								2		5%	2%
N1S0	2					1																				3		8%	3%
N2S0																										0		0%	0%
N3S0																										0		0%	0%
N4S0				2																						2		5%	2%
N5S0																										0		0%	0%
N6S0	1																									1		3%	1%
N7S0																										0		0%	0%
N0S1									2	1																3		8%	3%
N1S1																										0		0%	0%
N2S1																										0		0%	0%
N3S1																										0		0%	0%
N4S1																										0		0%	0%
N5S1																										0		0%	0%
N6S1																										0		0%	0%
N7S1																										0		0%	0%
N0S2				1																						1		3%	1%
N1S2						1																				1		3%	1%
N2S2									1						1											2		5%	2%
N3S2																										0		0%	0%
N4S2																										0		0%	0%
N5S2																										0		0%	0%
N6S2															1											1		3%	1%
N7S2																										0		0%	0%
N0S3		1		1				1																		3		8%	3%
N1S3		1		2	2	4	1		1																	11		28%	11%
N2S3						1																				1		3%	1%
N3S3			1																							1		3%	1%
N4S3																										0		0%	0%
N5S3																										0		0%	0%
N6S3																										0		0%	0%
N7S3																										0		0%	0%
N0S4	1																									1		3%	1%
N1S4	1																									1		3%	1%
N2S4																										0		0%	0%
N3S4			1																							1		3%	1%
N4S4																										0		0%	0%
N5S4																										0		0%	0%
N6S4																	1									1		3%	1%
N7S4																										0		0%	0%
N0S5				1																						1		3%	1%
N1S5			1																							1		3%	1%
N2S5				1																						1		3%	1%
N3S5																										0		0%	0%
N4S5																										0		0%	0%
N5S5																										0		0%	0%
N6S5																										0		0%	0%
N7S5																										0		0%	0%
N0S6																										0		0%	0%
N1S6																										0		0%	0%
N2S6																										0		0%	0%
N3S6																										0		0%	0%
N4S6																										0		0%	0%
N5S6																										0		0%	0%
N6S6																										0		0%	0%
N7S6																										0		0%	0%
N0S7																										0		0%	0%
N1S7																										0		0%	0%
N2S7																										0		0%	0%
N3S7																										0		0%	0%
N4S7																										0		0%	0%
N5S7																										0		0%	0%
N6S7																										0		0%	0%
N7S7																										0		0%	0%
SN Total	3	25	25	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	58	100%	100%	100%
NS Total	5	4	3	8	2	7	1	1	4	1	0	0	0	0	2	0	1	0	0	0	0	0	0	0	0	39			
Total	8	29	28	13	2	7	1	1	4	1	0	0	0	0	2	0	1	0	0	0	0	0	0	0	0	97			

Source) Analyzed by the Study Team based on the SC transit database of 1999.

Table A.4.17 Number of Vessels Transiting the Canal

7B: Container Ships (Ballast)

	Vessel Size (up to) (1000 SCNT)																									Total	Share		
O-D	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180	190	200	210	220	230	240	250		SN	NS	Total
S0N0																										0	0%		0%
S0N1	1																									1	11%		3%
S0N2																										0	0%		0%
S0N3																										0	0%		0%
S0N4																										0	0%		0%
S0N5																										0	0%		0%
S0N6																										0	0%		0%
S0N7																										0	0%		0%
S1N0																										0	0%		0%
S1N1																										0	0%		0%
S1N2																										0	0%		0%
S1N3																										0	0%		0%
S1N4																										0	0%		0%
S1N5																										0	0%		0%
S1N6																										0	0%		0%
S1N7																										0	0%		0%
S2N0																										0	0%		0%
S2N1																										0	0%		0%
S2N2	1																									1	11%		3%
S2N3																										0	0%		0%
S2N4		1		1																						2	22%		5%
S2N5																										0	0%		0%
S2N6																										0	0%		0%
S2N7																										0	0%		0%
S3N0	1																									1	11%		3%
S3N1		1																								1	11%		3%
S3N2																										0	0%		0%
S3N3																										0	0%		0%
S3N4																										0	0%		0%
S3N5																										0	0%		0%
S3N6																										0	0%		0%
S3N7																										0	0%		0%
S4N0		1																								1	11%		3%
S4N1		2																								2	22%		5%
S4N2																										0	0%		0%
S4N3																										0	0%		0%
S4N4																										0	0%		0%
S4N5																										0	0%		0%
S4N6																										0	0%		0%
S4N7																										0	0%		0%
S5N0																										0	0%		0%
S5N1																										0	0%		0%
S5N2																										0	0%		0%
S5N3																										0	0%		0%
S5N4																										0	0%		0%
S5N5																										0	0%		0%
S5N6																										0	0%		0%
S5N7																										0	0%		0%
S6N0																										0	0%		0%
S6N1																										0	0%		0%
S6N2																										0	0%		0%
S6N3																										0	0%		0%
S6N4																										0	0%		0%
S6N5																										0	0%		0%
S6N6																										0	0%		0%
S6N7																										0	0%		0%
S7N0																										0	0%		0%
S7N1																										0	0%		0%
S7N2																										0	0%		0%
S7N3																										0	0%		0%
S7N4																										0	0%		0%
S7N5																										0	0%		0%
S7N6																										0	0%		0%
S7N7																										0	0%		0%
N0S0	1		1																							2		7%	5%
N1S0	1																									1		4%	3%
N2S0																										0		0%	0%
N3S0																										0		0%	0%
N4S0																										0		0%	0%
N5S0																										0		0%	0%
N6S0																										0		0%	0%
N7S0																										0		0%	0%
N0S1																										0		0%	0%
N1S1																										0		0%	0%
N2S1																										0		0%	0%
N3S1																										0		0%	0%
N4S1																										0		0%	0%
N5S1																										0		0%	0%
N6S1																										0		0%	0%
N7S1																										0		0%	0%
N0S2				1																						1		4%	3%
N1S2		1																								1		4%	3%
N2S2																										0		0%	0%
N3S2	1																									1		4%	3%
N4S2		2																								2		7%	5%
N5S2																										0		0%	0%
N6S2																										0		0%	0%
N7S2																										0		0%	0%
N0S3	1																									1		4%	3%
N1S3	1	1																								2		7%	5%
N2S3	1																									1		4%	3%
N3S3																										0		0%	0%
N4S3																										0		0%	0%
N5S3																										0		0%	0%
N6S3																										0		0%	0%
N7S3																										0		0%	0%
N0S4	1																									1		4%	3%
N1S4	1		1																							2		7%	5%
N2S4					1																					1		4%	3%
N3S4			1																							1		4%	3%
N4S4		1	1																							2		7%	5%
N5S4																										0		0%	0%
N6S4																										0		0%	0%
N7S4																										0		0%	0%
N0S5																										0		0%	0%
N1S5		3																								3		11%	8%
N2S5	1																									1		4%	3%
N3S5																										0		0%	0%
N4S5			3	1	1																					5		18%	14%
N5S5																										0		0%	0%
N6S5																										0		0%	0%
N7S5																										0		0%	0%
N0S6																										0		0%	0%
N1S6																										0		0%	0%
N2S6																										0		0%	0%
N3S6																										0		0%	0%
N4S6																										0		0%	0%
N5S6																										0		0%	0%
N6S6																										0		0%	0%
N7S6																										0		0%	0%
N0S7																										0		0%	0%
N1S7																										0		0%	0%
N2S7																										0		0%	0%
N3S7																										0		0%	0%
N4S7																										0		0%	0%
N5S7																										0		0%	0%
N6S7																										0		0%	0%
N7S7																										0		0%	0%
SN Total	3	5	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9	100%	100%	100%
NS Total	9	8	7	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	28			
Total	12	13	7	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	37			

Source) Analyzed by the Study Team based on the SC transit database of 1999.

Table A.4.18 Number of Vessels Transiting the Canal

8B: Vehicle Carriers (Ballast)

	Vessel Size (up to) (1000 SCNT)																									Total	Share		
O-D	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180	190	200	210	220	230	240	250		SN	NS	Total
S0N0																										0	0%		0%
S0N1																										0	0%		0%
S0N2	1																									1	25%		1%
S0N3																										0	0%		0%
S0N4																										0	0%		0%
S0N5																										0	0%		0%
S0N6																										0	0%		0%
S0N7																										0	0%		0%
S1N0																										0	0%		0%
S1N1	1																									1	25%		1%
S1N2																										0	0%		0%
S1N3																										0	0%		0%
S1N4																										0	0%		0%
S1N5																										0	0%		0%
S1N6																										0	0%		0%
S1N7																										0	0%		0%
S2N0																										0	0%		0%
S2N1																										0	0%		0%
S2N2																										0	0%		0%
S2N3																										0	0%		0%
S2N4																										0	0%		0%
S2N5																										0	0%		0%
S2N6																										0	0%		0%
S2N7																										0	0%		0%
S3N0																										0	0%		0%
S3N1																										0	0%		0%
S3N2																										0	0%		0%
S3N3																										0	0%		0%
S3N4																										0	0%		0%
S3N5																										0	0%		0%
S3N6																										0	0%		0%
S3N7																										0	0%		0%
S4N0																										0	0%		0%
S4N1	1																									1	25%		1%
S4N2																										0	0%		0%
S4N3																										0	0%		0%
S4N4																										0	0%		0%
S4N5																										0	0%		0%
S4N6																										0	0%		0%
S4N7																										0	0%		0%
S5N0																										0	0%		0%
S5N1		1																								1	25%		1%
S5N2																										0	0%		0%
S5N3																										0	0%		0%
S5N4																										0	0%		0%
S5N5																										0	0%		0%
S5N6																										0	0%		0%
S5N7																										0	0%		0%
S6N0																										0	0%		0%
S6N1																										0	0%		0%
S6N2																										0	0%		0%
S6N3																										0	0%		0%
S6N4																										0	0%		0%
S6N5																										0	0%		0%
S6N6																										0	0%		0%
S6N7																										0	0%		0%
S7N0																										0	0%		0%
S7N1																										0	0%		0%
S7N2																										0	0%		0%
S7N3																										0	0%		0%
S7N4																										0	0%		0%
S7N5																										0	0%		0%
S7N6																										0	0%		0%
S7N7																										0	0%		0%
N0S0																										0		0%	0%
N1S0						1																				1		1%	1%
N2S0				1																						1		1%	1%
N3S0																										0		0%	0%
N4S0				1																						1		1%	1%
N5S0																										0		0%	0%
N6S0																										0		0%	0%
N7S0																										0		0%	0%
N0S1																										0		0%	0%
N1S1																										0		0%	0%
N2S1																										0		0%	0%
N3S1																										0		0%	0%
N4S1																										0		0%	0%
N5S1																										0		0%	0%
N6S1																										0		0%	0%
N7S1																										0		0%	0%
N0S2																										0		0%	0%
N1S2																										0		0%	0%
N2S2																										0		0%	0%
N3S2																										0		0%	0%
N4S2																										0		0%	0%
N5S2																										0		0%	0%
N6S2																										0		0%	0%
N7S2																										0		0%	0%
N0S3																										0		0%	0%
N1S3																										0		0%	0%
N2S3																										0		0%	0%
N3S3																										0		0%	0%
N4S3																										0		0%	0%
N5S3																										0		0%	0%
N6S3																										0		0%	0%
N7S3																										0		0%	0%
N0S4	1		2																							3		2%	2%
N1S4				4	2	1																				7		5%	4%
N2S4			1																							1		1%	1%
N3S4																										0		0%	0%
N4S4			3		2																					5		3%	3%
N5S4																										0		0%	0%
N6S4																										0		0%	0%
N7S4																										0		0%	0%
N0S5				2	3	2																				7		5%	4%
N1S5			4	3	22	9																				38		25%	24%
N2S5			2	6	9	7																				24		15%	15%
N3S5																										0		0%	0%
N4S5			2	11	44	4	2																			63		41%	40%
N5S5					1																					1		1%	1%
N6S5				1	2																					3		2%	2%
N7S5																										0		0%	0%
N0S6																										0		0%	0%
N1S6																										0		0%	0%
N2S6																										0		0%	0%
N3S6																										0		0%	0%
N4S6																										0		0%	0%
N5S6																										0		0%	0%
N6S6																										0		0%	0%
N7S6																										0		0%	0%
N0S7																										0		0%	0%
N1S7																										0		0%	0%
N2S7																										0		0%	0%
N3S7																										0		0%	0%
N4S7																										0		0%	0%
N5S7																										0		0%	0%
N6S7																										0		0%	0%
N7S7																										0		0%	0%
SN Total	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	100%	100%	100%
NS Total	1	0	14	29	85	24	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	155			
Total	4	1	14	29	85	24	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	159			

Source) Analyzed by the Study Team based on the SC transit database of 1999.

Table A.4.19 Number of Vessels Transiting the Canal

9B: General Cargo Ships (Ballast)

	Vessel Size (up to) (1000 SCNT)																									Total	Share		
O-D	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180	190	200	210	220	230	240	250		SN	NS	Total
S0N0	18																									18	18%		12%
S0N1	16	3																								19	19%		13%
S0N2	10	1																								11	11%		7%
S0N3	8	1																								9	9%		6%
S0N4	16																									16	16%		11%
S0N5	1																									1	1%		1%
S0N6	2																									2	2%		1%
S0N7																										0	0%		0%
S1N0																										0	0%		0%
S1N1		1																								1	1%		1%
S1N2																										0	0%		0%
S1N3																										0	0%		0%
S1N4																										0	0%		0%
S1N5																										0	0%		0%
S1N6																										0	0%		0%
S1N7																										0	0%		0%
S2N0	1																									1	1%		1%
S2N1	4																									4	4%		3%
S2N2	1																									1	1%		1%
S2N3	2	2																								4	4%		3%
S2N4		2	1																							3	3%		2%
S2N5																										0	0%		0%
S2N6																										0	0%		0%
S2N7																										0	0%		0%
S3N0		1																								1	1%		1%
S3N1	1																									1	1%		1%
S3N2																										0	0%		0%
S3N3																										0	0%		0%
S3N4	3	1																								4	4%		3%
S3N5																										0	0%		0%
S3N6																										0	0%		0%
S3N7																										0	0%		0%
S4N0																										0	0%		0%
S4N1	2																									2	2%		1%
S4N2																										0	0%		0%
S4N3																										0	0%		0%
S4N4	1																									1	1%		1%
S4N5																										0	0%		0%
S4N6																										0	0%		0%
S4N7																										0	0%		0%
S5N0																										0	0%		0%
S5N1																										0	0%		0%
S5N2																										0	0%		0%
S5N3																										0	0%		0%
S5N4	1																									1	1%		1%
S5N5																										0	0%		0%
S5N6																										0	0%		0%
S5N7																										0	0%		0%
S6N0																										0	0%		0%
S6N1																										0	0%		0%
S6N2																										0	0%		0%
S6N3																										0	0%		0%
S6N4																										0	0%		0%
S6N5																										0	0%		0%
S6N6																										0	0%		0%
S6N7																										0	0%		0%
S7N0																										0	0%		0%
S7N1																										0	0%		0%
S7N2																										0	0%		0%
S7N3																										0	0%		0%
S7N4																										0	0%		0%
S7N5																										0	0%		0%
S7N6																										0	0%		0%
S7N7																										0	0%		0%
N0S0	12	1																								13		28%	9%
N1S0	4																									4		9%	3%
N2S0	3																									3		6%	2%
N3S0																										0		0%	0%
N4S0	2																									2		4%	1%
N5S0																										0		0%	0%
N6S0																										0		0%	0%
N7S0																										0		0%	0%
N0S1	7																									7		15%	5%
N1S1																										0		0%	0%
N2S1																										0		0%	0%
N3S1																										0		0%	0%
N4S1																										0		0%	0%
N5S1																										0		0%	0%
N6S1																										0		0%	0%
N7S1																										0		0%	0%
N0S2	1																									1		2%	1%
N1S2																										0		0%	0%
N2S2																										0		0%	0%
N3S2																										0		0%	0%
N4S2																										0		0%	0%
N5S2																										0		0%	0%
N6S2																										0		0%	0%
N7S2																										0		0%	0%
N0S3																										0		0%	0%
N1S3	3																									3		6%	2%
N2S3																										0		0%	0%
N3S3																										0		0%	0%
N4S3		1																								1		2%	1%
N5S3	1																									1		2%	1%
N6S3																										0		0%	0%
N7S3																										0		0%	0%
N0S4																										0		0%	0%
N1S4	1																									1		2%	1%
N2S4																										0		0%	0%
N3S4																										0		0%	0%
N4S4	1																									1		2%	1%
N5S4																										0		0%	0%
N6S4																										0		0%	0%
N7S4																										0		0%	0%
N0S5																										0		0%	0%
N1S5																										0		0%	0%
N2S5	2																									2		4%	1%
N3S5																										0		0%	0%
N4S5																										0		0%	0%
N5S5																										0		0%	0%
N6S5																										0		0%	0%
N7S5																										0		0%	0%
N0S6	2			1																						3		6%	2%
N1S6																										0		0%	0%
N2S6	4			1																						5		11%	3%
N3S6																										0		0%	0%
N4S6																										0		0%	0%
N5S6																										0		0%	0%
N6S6																										0		0%	0%
N7S6																										0		0%	0%
N0S7																										0		0%	0%
N1S7																										0		0%	0%
N2S7																										0		0%	0%
N3S7																										0		0%	0%
N4S7																										0		0%	0%
N5S7																										0		0%	0%
N6S7																										0		0%	0%
N7S7																										0		0%	0%
SN Total	87	12	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	100%	100%	100%
NS Total	43	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	47			
Total	130	14	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	147			

Source) Analyzed by the Study Team based on the SC transit database of 1999.

Table A.4.20 Number of Vessels Transiting the Canal

10B: Other Vessels (Ballast)

	Vessel Size (up to) (1000 SCNT)																									Total	Share		
O-D	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180	190	200	210	220	230	240	250		SN	NS	Total
S0N0	22																									22	23%		11%
S0N1	27	1																								28	29%		14%
S0N2	4	8																								12	13%		6%
S0N3	1																									1	1%		1%
S0N4	5	1																								6	6%		3%
S0N5																										0	0%		0%
S0N6		1																								1	1%		1%
S0N7																										0	0%		0%
S1N0																										0	0%		0%
S1N1																										0	0%		0%
S1N2																										0	0%		0%
S1N3																										0	0%		0%
S1N4																										0	0%		0%
S1N5																										0	0%		0%
S1N6																										0	0%		0%
S1N7																										0	0%		0%
S2N0																										0	0%		0%
S2N1	3																									3	3%		2%
S2N2	2	1																								3	3%		2%
S2N3																										0	0%		0%
S2N4		1																								1	1%		1%
S2N5																										0	0%		0%
S2N6	1																									1	1%		1%
S2N7																										0	0%		0%
S3N0																										0	0%		0%
S3N1																										0	0%		0%
S3N2																										0	0%		0%
S3N3																										0	0%		0%
S3N4																										0	0%		0%
S3N5				1																						1	1%		1%
S3N6																										0	0%		0%
S3N7																										0	0%		0%
S4N0																										0	0%		0%
S4N1	6		1																							7	7%		4%
S4N2	3																									3	3%		2%
S4N3																										0	0%		0%
S4N4	1																									1	1%		1%
S4N5																										0	0%		0%
S4N6	1																									1	1%		1%
S4N7																										0	0%		0%
S5N0																										0	0%		0%
S5N1	1		1																							2	2%		1%
S5N2	2																									2	2%		1%
S5N3																										0	0%		0%
S5N4	1																									1	1%		1%
S5N5																										0	0%		0%
S5N6																										0	0%		0%
S5N7																										0	0%		0%
S6N0																										0	0%		0%
S6N1																										0	0%		0%
S6N2																										0	0%		0%
S6N3																										0	0%		0%
S6N4																										0	0%		0%
S6N5																										0	0%		0%
S6N6																										0	0%		0%
S6N7																										0	0%		0%
S7N0																										0	0%		0%
S7N1																										0	0%		0%
S7N2																										0	0%		0%
S7N3																										0	0%		0%
S7N4																										0	0%		0%
S7N5																										0	0%		0%
S7N6																										0	0%		0%
S7N7																										0	0%		0%
N0S0	13	2																								15		15%	8%
N1S0	9	6	2																							17		17%	9%
N2S0	1	7																								8		8%	4%
N3S0																										0		0%	0%
N4S0	1																									1		1%	1%
N5S0	1																									1		1%	1%
N6S0																										0		0%	0%
N7S0																										0		0%	0%
N0S1	2	1																								3		3%	2%
N1S1	1	1																								2		2%	1%
N2S1	1																									1		1%	1%
N3S1																										0		0%	0%
N4S1																										0		0%	0%
N5S1																										0		0%	0%
N6S1																										0		0%	0%
N7S1																										0		0%	0%
N0S2	2																									2		2%	1%
N1S2	5	1																								6		6%	3%
N2S2																										0		0%	0%
N3S2	1																									1		1%	1%
N4S2	1																									1		1%	1%
N5S2																										0		0%	0%
N6S2																										0		0%	0%
N7S2																										0		0%	0%
N0S3	4																									4		4%	2%
N1S3	6	1																								7		7%	4%
N2S3																										0		0%	0%
N3S3	1	1		1																						3		3%	2%
N4S3	1	1																								2		2%	1%
N5S3	4																									4		4%	2%
N6S3																										0		0%	0%
N7S3																										0		0%	0%
N0S4	1																									1		1%	1%
N1S4	1	1																								2		2%	1%
N2S4																										0		0%	0%
N3S4		1																								1		1%	1%
N4S4	2	1		1				1																		5		5%	3%
N5S4	2																									2		2%	1%
N6S4																										0		0%	0%
N7S4																										0		0%	0%
N0S5																										0		0%	0%
N1S5		1																								1		1%	1%
N2S5		1																								1		1%	1%
N3S5	1																									1		1%	1%
N4S5	1																									1		1%	1%
N5S5	1																									1		1%	1%
N6S5		1																								1		1%	1%
N7S5	1																									1		1%	1%
N0S6																										0		0%	0%
N1S6	2																									2		2%	1%
N2S6																										0		0%	0%
N3S6																										0		0%	0%
N4S6																										0		0%	0%
N5S6																										0		0%	0%
N6S6																										0		0%	0%
N7S6																										0		0%	0%
N0S7																										0		0%	0%
N1S7																										0		0%	0%
N2S7																										0		0%	0%
N3S7																										0		0%	0%
N4S7																										0		0%	0%
N5S7																										0		0%	0%
N6S7																										0		0%	0%
N7S7																										0		0%	0%
SN Total	80	13	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	96	100%	100%	100%
NS Total	66	27	2	2	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	98			
Total	146	40	4	3	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	194			

Source) Analyzed by the Study Team based on the SC transit database of 1999.

Appendix B Standard Toll Level Calculation and Draft New Tariff

Table B.1.1 shows the calculation method getting standard toll level which is proposed in section 5.1.3 of Chapter 5.

Table B.1.2 and Table B.1.3 show the shipping cost at sea per mile and the excess cost at the Suez Canal which are obtained by the shipping cost model which is a key part of the Transit Forecast Model.

The shipping cost per mile of 5,000 SCNT and 10,000 SCNT are complemented using those of 20,000 SCNT and 40,000 SCNT. This adjustment is conducted in order to protect the trade by smaller vessels since calculated toll level would become greatly higher than the current level. These smaller vessels were greatly affected by the Suez Canal closure.

Table B.1.4 and Table B.1.5 show calculated toll rates and tolls when using the standard saved distance of 4,700 miles.

Table B.1.6 and Table B.1.7 show the current toll and the current toll with weather deck surcharge for Container Ships.

Table B.1.8 shows the ratio of the calculated toll to the current toll with weather deck surcharge.

Table B.1.9 shows the revising ratio for draft new tariff. The revising ratio is set 1.03 (3% increase) when the ratio of the calculated toll to the current toll with weather deck surcharge is equal to or more than 1.1 (threshold criteria: the calculated toll is greater than the current toll by 10%). The revising ratio is set based on following reasons:

- The calculation is based on certain assumptions, so it is thought to be necessary to carefully monitor the shipping market and world trade before and after the revision is made in order to verify whether these assumptions are appropriate or not.
- As to raising tolls, the Study Team would like to propose that the tolls be raised by 3% as the first step. A step-by-step approach to revising the tolls will make it possible to observe the reactions of the shipping market.
- As to reducing tolls, it is thought to be appropriate to leave the toll as it is since there is no firm evidence that reducing the toll would increase toll revenues.
- Tolls for LNG Carriers are kept unchanged. This is because that the current tolls for LNG Carriers can be thought to be appropriate since it is necessary to bolster the price competitiveness of Arabian LNG against Algerian LNG in EU market, and it is set through negotiations with interested parties.

Table B.1.10 through Table B.1.13 show the tolls or rates of the draft new tariff obtained through the above calculations. It should be noted that the draft new tariff depends greatly on the exchange rate of US$/SDR. In this calculation, 1.30US$/SDR is assumed.

Table B.1.1 Calculation Method getting Standard Toll Level

Equation	Ts = S x Rs = (B x Ds - Esc) x Rs	
Parameters	Ts (US$/SCNT)	Standard Toll Level
	S (US$/SCNT)	Saved Cost by using the Suez Canal
	Rt	Ratio of Supplier's Receipt (= 0.8, deducting Users' Surplus)
	B (US$/SCNT/mile)	Shipping Cost at sea per mile
	Ds (mile)	Saved Distance
		(=4,700 miles at Standard Saved Distance for Tariff)
	Esc (US$/SCNT)	Excess Cost at the Suez Canal (=Escmo + Escoc)
		Escmo= Managing Cost & Bunker Cost by witing
		Escoc= Other Charges at the Suez Canal

Table B.1.2 Shipping Cost at sea per mile (B)

(US$/SCNT/1000mile)

	Vessel Size (SCNT)							
Vessel Type	5,000	10,000	20,000	40,000	70,000	110,000	160,000	220,000
＊Tankers of Crude Oil	2.982	2.756	2.304	1.401	1.014	0.826	0.723	0.662
＊Tankes of Petroleum Products	2.702	2.508	2.118	1.339	1.010	0.849		
＊Chemical Carriers	3.231	3.032	2.633	1.836	1.491	1.317		
＊LNG Carriers	7.276	6.696	5.537	3.220	2.168	1.606		
＊LPG Carriers	3.125	2.935	2.556	1.796	1.466	1.299		
＊Dry Bulk Carriers	2.218	2.057	1.735	1.091	0.815	0.681		
＊Containerships (case-1)	3.072	2.862	2.443	1.605	1.176	0.910		
＊Containerships (case-2)	3.227	3.014	2.588	1.737	1.300	1.029		
＊Containerships (case-3)	3.338	3.121	2.687	1.818	1.366	1.083		
＊Containerships (case-4)	3.600	3.372	2.917	2.008	1.522	1.212		
＊Vehicle Carriers (case-1)	1.979	1.843	1.572	1.029	0.798			
＊Vehicle Carriers (case-2)	2.484	2.342	2.056	1.485	1.234			
＊General Cargo Ships	2.473	2.367	2.154	1.729	1.530	1.421		
＊Other Vessels	2.819	2.640	2.280	1.562	1.241	1.068		

Note) 1. B of 5,000 and 10,000 SCNT are complemented using B of 20,000 and 40,000 SCNT to protect smaller vessels.

2. Container Ships
case-1: without container box capital cost nor commodity inventory cost
case-2: with container box capital cost only
case-3: with container box capital cost and commodity inventory cost (300US$/ton)
case-4: with container box capital cost and commodity inventory cost (1,000US$/ton)

3. Vehicle Carriers
case-1: without inventory cost
case-2: with inventory cost

4. B of "Other Vessels" are average of other vessel typs (Container Ships: case-3, Vehicle Carriers: case-2) excluding "LNG Carriers".

5. For laden voyage

Table B.1.3 Excess Cost at the Suez Canal (Esc)

(US$/SCNT)

	Vessel Size (SCNT)							
Vessel Type	5,000	10,000	20,000	40,000	70,000	110,000	160,000	220,000
＊Tankers of Crude Oil	2.799	1.527	0.892	0.574	0.438	0.528	0.443	0.392
＊Tankes of Petroleum Products	2.803	1.543	0.914	0.599	0.464	0.554		
＊Chemical Carriers	3.014	1.713	1.063	0.738	0.599	0.687		
＊LNG Carriers	6.664	3.564	2.014	1.453	1.029	0.823		
＊LPG Carriers	3.067	1.769	1.121	1.011	0.780	0.668		
＊Dry Bulk Carriers	2.373	1.297	0.759	0.490	0.374	0.475		
＊Containerships (case-1)	2.629	1.626	1.107	0.820	0.666	0.724		
＊Containerships (case-2)	2.694	1.690	1.171	0.884	0.731	0.788		
＊Containerships (case-3)	2.742	1.736	1.215	0.924	0.766	0.818		
＊Containerships (case-4)	2.853	1.844	1.318	1.017	0.847	0.888		
＊Vehicle Carriers (case-1)	2.226	1.276	0.801	0.564	0.462			
＊Vehicle Carriers (case-2)	2.412	1.463	0.988	0.751	0.649			
＊General Cargo Ships	2.081	1.230	0.804	0.591	0.500	0.611		
＊Other Vessels	2.661	1.535	0.969	0.710	0.571	0.620		

note) 1. B of "Other Vessels" are average of other vessel typs (Container Ships: case-3, Vehicle Carriers: case-2) excluding "LNG Carriers".

2. For laden transit

Table B.1.4 Calculated Toll Rate (Standard Saved Distance: 4,700 miles)

(US$/SCNT)

	Vessel Size (SCNT)							
Vessel Type	5,000	10,000	20,000	40,000	70,000	110,000	160,000	220,000
∗Tankers of Crude Oil	8.97	9.14	7.95	4.81	3.46	2.68	2.37	2.17
∗Tankes of Petroleum Products	7.92	8.19	7.23	4.56	3.43	2.75		
∗Chemical Carriers	9.74	10.03	9.05	6.31	5.13	4.40		
∗LNG Carriers	22.03	22.33	19.21	10.94	7.33	5.38		
∗LPG Carriers	9.30	9.62	8.71	5.95	4.89	4.35		
∗Dry Bulk Carriers	6.44	6.70	5.92	3.71	2.76	2.18		
∗Containerships (case-1)	9.45	9.46	8.30	5.38	3.89	2.84		
∗Containerships (case-2)	9.98	9.98	8.79	5.82	4.30	3.24		
∗Containerships (case-3)	10.36	10.35	9.13	6.10	4.53	3.42		
∗Containerships (case-4)	11.25	11.20	9.91	6.74	5.05	3.85		
∗Vehicle Carriers (case-1)	5.66	5.91	5.27	3.42	2.63			
∗Vehicle Carriers (case-2)	7.41	7.63	6.94	4.98	4.12			
∗General Cargo Ships	7.63	7.91	7.46	6.03	5.35	4.85		
∗Other Vessels	8.47	8.70	7.80	5.31	4.21	3.52		

Note) Rt: Rate of Toll Enjoy 0.8

Note) For laden transit

Table B.1.5 Calculated Toll (Standard Saved Distance: 4,700 miles)

(US$)

	Vessel Size (SCNT)							
Vessel Type	5,000	10,000	20,000	40,000	70,000	110,000	160,000	220,000
∗Tankers of Crude Oil	44,863	91,405	159,013	192,328	242,300	295,200	378,486	478,428
∗Tankes of Petroleum Products	39,591	81,938	144,673	182,302	239,780	302,200		
∗Chemical Carriers	48,692	100,293	181,014	252,531	358,873	484,296		
∗LNG Carriers	110,130	223,276	384,202	437,732	513,080	591,943		
∗LPG Carriers	46,489	96,218	174,260	237,812	342,247	478,566		
∗Dry Bulk Carriers	32,204	66,965	118,323	148,385	193,478	239,876		
∗Containerships (case-1)	47,227	94,605	165,989	215,099	272,105	312,543		
∗Containerships (case-2)	49,885	99,797	175,877	232,896	301,125	356,043		
∗Containerships (case-3)	51,797	103,468	182,602	243,850	316,758	376,134		
∗Containerships (case-4)	56,261	112,036	198,294	269,409	353,235	423,014		
∗Vehicle Carriers (case-1)	28,300	59,093	105,371	136,696	184,128			
∗Vehicle Carriers (case-2)	37,054	76,338	138,800	199,313	288,428			
∗General Cargo Ships	38,165	79,144	149,115	241,110	374,686	533,740		
∗Other Vessels	42,357	86,971	155,975	212,204	294,569	387,145		

Note) For laden transit

Table B.1.6 Current Toll

(US$)

	Vessel Size (SCNT)							
Vessel Type	5,000	10,000	20,000	40,000	70,000	110,000	160,000	220,000
∗Tankers of Crude Oil	42,185	65,715	107,965	144,365	198,965	261,885	340,535	434,915
∗Tankes of Petroleum Products	43,875	68,380	112,970	163,150	238,420	338,780		
∗Chemical Carriers	48,750	75,660	125,190	194,870	299,390	438,750		
∗LNG Carriers	31,720	49,205	81,445	126,685	194,545	285,025		
∗LPG Carriers	43,875	68,380	112,970	175,890	270,270	396,110		
∗Dry Bulk Carriers	46,865	73,775	112,385	139,685	178,685	230,685		
∗Containerships (case-1)	46,865	73,515	117,325	180,245	274,625	369,785		
∗Containerships (case-2)	46,865	73,515	117,325	180,245	274,625	369,785		
∗Containerships (case-3)	46,865	73,515	117,325	180,245	274,625	369,785		
∗Containerships (case-4)	46,865	73,515	117,325	180,245	274,625	369,785		
∗Vehicle Carriers (case-1)	46,865	73,515	117,325	180,245	274,625	369,785		
∗Vehicle Carriers (case-2)	46,865	73,515	117,325	180,245	274,625	369,785		
∗General Cargo Ships	46,865	73,775	122,785	191,165	293,735	430,495		
∗Other Vessels	46,865	73,775	122,785	191,165	293,735	430,495		

Note) Echange Rate = 1.30 US$/SDR

Note) For laden transit

Table B.1.7 Current Toll with Weather Deck Surcharge

(US$)

	Vessel Size (SCNT)							
Vessel Type	5,000	10,000	20,000	40,000	70,000	110,000	160,000	220,000
＊Tankers of Crude Oil	42,185	65,715	107,965	144,365	198,965	261,885	340,535	434,915
＊Tankes of Petroleum Products	43,875	68,380	112,970	163,150	238,420	338,780		
＊Chemical Carriers	48,750	75,660	125,190	194,870	299,390	438,750		
＊LNG Carriers	31,720	49,205	81,445	126,685	194,545	285,025		
＊LPG Carriers	43,875	68,380	112,970	175,890	270,270	396,110		
＊Dry Bulk Carriers	46,865	73,775	112,385	139,685	178,685	230,685		
＊Containerships (case-1)	51,411	80,646	128,706	197,729	301,264	405,654		
＊Containerships (case-2)	51,411	80,646	128,706	197,729	301,264	405,654		
＊Containerships (case-3)	51,411	80,646	128,706	197,729	301,264	405,654		
＊Containerships (case-4)	51,411	80,646	128,706	197,729	301,264	405,654		
＊Vehicle Carriers (case-1)	46,865	73,515	117,325	180,245	274,625	369,785		
＊Vehicle Carriers (case-2)	46,865	73,515	117,325	180,245	274,625	369,785		
＊General Cargo Ships	46,865	73,775	122,785	191,165	293,735	430,495		
＊Other Vessels	46,865	73,775	122,785	191,165	293,735	430,495		

Note) Current tolls for Container Ships are applied the weather deck surcharge of 9.7%

Note) For laden transit

Table B.1.8 Ratio of Calculated Toll to Current Toll with Weather Deck Surcharge

	Vessel Size (SCNT)							
Vessel Type	5,000	10,000	20,000	40,000	70,000	110,000	160,000	220,000
＊Tankers of Crude Oil	1.06	1.39	1.47	1.33	1.22	1.13	1.11	1.10
＊Tankes of Petroleum Products	0.90	1.20	1.28	1.12	1.01	0.89		
＊Chemical Carriers	1.00	1.33	1.45	1.30	1.20	1.10		
＊LNG Carriers	3.47	4.54	4.72	3.46	2.64	2.08		
＊LPG Carriers	1.06	1.41	1.54	1.35	1.27	1.21		
＊Dry Bulk Carriers	0.69	0.91	1.05	1.06	1.08	1.04		
＊Containerships (case-1)	0.92	1.17	1.29	1.09	0.90	0.77		
＊Containerships (case-2)	0.97	1.24	1.37	1.18	1.00	0.88		
＊Containerships (case-3)	1.01	1.28	1.42	1.23	1.05	0.93		
＊Containerships (case-4)	1.09	1.39	1.54	1.36	1.17	1.04		
＊Vehicle Carriers (case-1)	0.60	0.80	0.90	0.76	0.67			
＊Vehicle Carriers (case-2)	0.79	1.04	1.18	1.11	1.05			
＊General Cargo Ships	0.81	1.07	1.21	1.26	1.28	1.24		
＊Other Vessels	0.90	1.18	1.27	1.11	1.00	0.90		

Note) For laden transit

Table B.1.9 Revising Ratio for Draft New Tariff

(US$)

	Vessel Size (SCNT)							
Vessel Type	5,000	10,000	20,000	40,000	70,000	110,000	160,000	220,000
＊Tankers of Crude Oil	1.00	1.03	1.03	1.03	1.03	1.03	1.03	1.03
＊Tankes of Petroleum Products	1.00	1.03	1.03	1.03	1.00	1.00		
＊Chemical Carriers	1.00	1.03	1.03	1.03	1.03	1.03		
＊LNG Carriers	1.00	1.00	1.00	1.00	1.00	1.00		
＊LPG Carriers	1.00	1.03	1.03	1.03	1.03	1.03		
＊Dry Bulk Carriers	1.00	1.00	1.00	1.00	1.00	1.00		
＊Containerships (case-1)	1.00	1.03	1.03	1.00	1.00	1.00		
＊Containerships (case-2)	1.00	1.03	1.03	1.03	1.00	1.00		
＊Containerships (case-3)	1.00	1.03	1.03	1.03	1.00	1.00		
＊Containerships (case-4)	1.00	1.03	1.03	1.03	1.03	1.00		
＊Vehicle Carriers (case-1)	1.00	1.00	1.00	1.00	1.00			
＊Vehicle Carriers (case-2)	1.00	1.00	1.03	1.03	1.00			
＊General Cargo Ships	1.00	1.00	1.03	1.03	1.03	1.03		
＊Other Vessels	1.00	1.03	1.03	1.03	1.00	1.00		

Note) Maximum increase 1.03

Note) LNG Carriers remain unchanged

Note) For laden transit

Table B.1.10 Toll for Draft New Tariff

(US$)

	Vessel Size (SCNT)							
Vessel Type	5,000	10,000	20,000	40,000	70,000	110,000	160,000	220,000
∗Tankers of Crude Oil	42,185	67,686	111,204	148,696	204,934	269,742	350,751	447,962
∗Tankes of Petroleum Products	43,875	70,431	116,359	168,045	238,420	338,780		
∗Chemical Carriers	48,750	77,930	128,946	200,716	308,372	451,913		
∗LNG Carriers	31,720	49,205	81,445	126,685	194,545	285,025		
∗LPG Carriers	43,875	70,431	116,359	181,167	278,378	407,993		
∗Dry Bulk Carriers	46,865	73,775	112,385	139,685	178,685	230,685		
∗Containerships (case-1)	46,865	75,720	120,845	180,245	274,625	369,785		
∗Containerships (case-2)	46,865	75,720	120,845	185,652	274,625	369,785		
∗Containerships (case-3)	46,865	75,720	120,845	185,652	274,625	369,785		
∗Containerships (case-4)	46,865	75,720	120,845	185,652	282,864	369,785		
∗Vehicle Carriers (case-1)	46,865	73,515	117,325	180,245	274,625			
∗Vehicle Carriers (case-2)	46,865	73,515	120,845	185,652	274,625			
∗General Cargo Ships	46,865	73,775	126,469	196,900	302,547	443,410		
∗Other Vessels	46,865	75,988	126,469	196,900	293,735	430,495		

Note) Maximum increase 1.03

Note) LNG Carriers remain unchanged

Note) For laden transit

Table B.1.11 Draft New Tariff in US$

(US$/SCNT)

	Vessel Size (SCNT)							
Vessel Type	First 5000	Next 5000	Next 10000	Next 20000	Next 30000	Next 40000	Next 50000	Rest
∗Tankers of Crude Oil	8.44	5.10	4.35	1.87	1.87	1.62	1.62	1.62
∗Tankes of Petroleum Products	8.78	5.31	4.59	2.58	2.35	2.51		
∗Chemical Carriers	9.75	5.84	5.10	3.59	3.59	3.59		
∗LNG Carriers	6.34	3.50	3.22	2.26	2.26	2.26		
∗LPG Carriers	8.78	5.31	4.59	3.24	3.24	3.24		
∗Dry Bulk Carriers	9.37	5.38	3.86	1.37	1.30	1.30		
∗Containerships (case-1)	9.37	5.77	4.51	2.97	3.15	2.38		
∗Containerships (case-2)	9.37	5.77	4.51	3.24	2.97	2.38		
∗Containerships (case-3)	9.37	5.77	4.51	3.24	2.97	2.38		
∗Containerships (case-4)	9.37	5.77	4.51	3.24	3.24	2.17		
∗Vehicle Carriers (case-1)	9.37	5.33	4.38	3.15	3.15			
∗Vehicle Carriers (case-2)	9.37	5.33	4.73	3.24	2.97			
∗General Cargo Ships	9.37	5.38	5.27	3.52	3.52	3.52		
∗Other Vessels	9.37	5.82	5.05	3.52	3.23	3.42		

Note) For laden transit

Table B.1.12 Draft New Tariff in SDR

(SDR/SCNT)

	Vessel Size (SCNT)							
Vessel Type	First 5000	Next 5000	Next 10000	Next 20000	Next 30000	Next 40000	Next 50000	Rest
∗Tankers of Crude Oil	6.49	3.92	3.35	1.44	1.44	1.25	1.25	1.25
∗Tankes of Petroleum Products	6.75	4.09	3.53	1.99	1.80	1.93		
∗Chemical Carriers	7.50	4.49	3.92	2.76	2.76	2.76		
∗LNG Carriers	4.88	2.69	2.48	1.74	1.74	1.74		
∗LPG Carriers	6.75	4.09	3.53	2.49	2.49	2.49		
∗Dry Bulk Carriers	7.21	4.14	2.97	1.05	1.00	1.00		
∗Containerships (case-1)	7.21	4.44	3.47	2.28	2.42	1.83		
∗Containerships (case-2)	7.21	4.44	3.47	2.49	2.28	1.83		
∗Containerships (case-3)	7.21	4.44	3.47	2.49	2.28	1.83		
∗Containerships (case-4)	7.21	4.44	3.47	2.49	2.49	1.67		
∗Vehicle Carriers (case-1)	7.21	4.10	3.37	2.42	2.42			
∗Vehicle Carriers (case-2)	7.21	4.10	3.64	2.49	2.28			
∗General Cargo Ships	7.21	4.14	4.05	2.71	2.71	2.71		
∗Other Vessels	7.21	4.48	3.88	2.71	2.48	2.63		

Note) Echange Rate = 1.30 US$/SDR

Note) For laden transit

Table B.1.13 Draft New Tariff (exchange rate: 1.30 US$/SCNT)

(SDR/SCNT)

	Vessel Type	SC Net Tonnage															
		First 5000		Next 5000		Next 10000		Next 20000		Next 30000		Next 40000		Next 50000		Rest	
		L	B	L	B	L	B	L	B	L	B	L	B	L	B	L	B
1	∗Tankers of Crude Oil ∗Combined Carriers carrying Crude Oil	6.49	5.52	3.92	3.33	3.35	2.85	1.44	1.23	1.44	1.23	1.25	1.06	1.25	1.06	1.25	1.06
2	∗Tankes of Petroleum Products ∗Combined Carriers carrying petroleum products ∗Combined Carriers carrying more than one kind of cargo	6.75	5.52	4.09	3.33	3.53	2.85	1.99	1.23	1.80	1.23	1.93	1.06				
3	∗Chemical Carriers (1) ∗Other Liquid Bulk Carriers ∗Combined Carriers carrying other liquid bulk	7.50	6.38	4.49	3.82	3.92	3.34	2.76	2.35	2.76	2.35	2.76	2.35				
4	∗LNG Carriers	4.88	4.15	2.69	2.29	2.48	2.11	1.74	1.48	1.74	1.48	1.74	1.48				
5	∗LPG Carriers	6.75	5.74	4.09	3.47	3.53	3.00	2.49	2.12	2.49	2.12	2.49	2.12				
6	∗Dry Bulk Carriers ∗Combined Carriers carrying dry bulk cargo	7.21	6.13	4.14	3.52	2.97	2.52	1.05	0.89	1.00	0.85	1.00	0.85				
7	∗Containerships	7.21	6.13	4.44	3.77	3.47	2.95	2.49	2.12	2.49	2.12	1.67	1.42				
8	∗Vehicle Carriers	7.21	6.13	4.10	3.49	3.64	3.09	2.49	2.12	2.28	1.94						
9	∗General Cargo Ships	7.21	6.13	4.14	3.52	4.05	3.45	2.71	2.30	2.71	2.30	2.71	2.30				
10	∗Other Vessels (2)	7.21	6.13	4.48	3.81	3.88	3.30	2.71	2.30	2.48	2.11	2.63	2.24				

Notes) (1) If in ballast, chemical/oil tankers are to be charged at the same rate of oil tankers.
(2) Special Floating Units are to be charged at laden rates only.

Source) The Study Team

Appendix C Extract of the Panama Canal's regulations

C.1 Organic Law of the Panama Canal Authority (article 75 to 80)

ORGANIC LAW PANAMA CANAL AUTHORITY
PANAMA LEGISLATIVE ASSEMBLY LAW No. 19 (of June 11, 1997)
"WHEREBY THE PANAMA CANAL AUTHORITY IS ORGANIZED"
Chapter IV - Vessels and Navigation
Section Three - Tolls for use of the Canal and Rates for Services

Article 75. Tolls shall be set at rates estimated to cover the costs of operation and modernization of the Canal, and will include at least:

1. The costs of operating the Canal, including depreciation costs, support for water resources protection, working capital, and the required reserves.
2. Payments to the National Treasury, as stipulated in the National Constitution and this Law, estimated according to the bases established in the regulation for this purpose.
3. Capital for plant replacement, expansion, improvements, and modernization of the Canal.
4. Interest on the assessed value of the Canal.
5. Losses carried over from previous years.

The tolls and rates established by the Authority shall take into consideration the conditions of safe, uninterrupted, efficient, competitive, and profitable Canal service.

Article 76. Neither the Government nor the Authority may authorize exemption from the payment of tolls, fees, or tariffs for Canal services. Notwithstanding, vessels exempted by virtue of international treaties in effect, ratified by the Republic of Panama, shall not pay tolls for transiting the Canal.

Article 77. All Canal users subject to tolls, fees, and tariffs shall make the payment in cash, in the legal currency of the Republic of Panama or the currency established by the Authority before the service requested is rendered, in an amount equivalent to the cost of the service.
The above-mentioned payment may be substituted by a surety posted by a bank that meets the requirements of the Authority for such purpose.

Article 78. The Authority may require, as a previous condition for transit, that vessels clearly establish the financial responsibility and guarantees for payment of a reasonable and adequate amount, consistent with the rules of international practice, to cover any damages that may result from their transit through the Canal.
In the case of a government-owned or government-operated vessel, or for which the government of a country has accepted responsibility, it shall suffice to guarantee such financial responsibility by means of a certification by the respective country stating that it shall comply with its obligations, in accordance with International Law, to pay any damages arising from actions or omissions of such ships during their passage through the Canal.

The exception set forth in the previous paragraph will not be applicable when the vessel, property of a State or operated by the same, is engaged in maritime trade.

Article 79. The Authority shall give interested parties an opportunity to participate in the consultation processes for the purpose of revising tolls and admeasurement rules by submitting, in writing, data, opinions, or arguments, and participating in a public hearing to be held at least 30 days after the date of publication of a notice in the official publication of the Authority in which said hearing is called.

Article 80. The fees and rates established for the rendering of other services will take into consideration at least the corresponding cost of such services, as determined by the Regulations.

C.2 Regulation on the Procedure to Revise the Panama Canal Tolls Rate

AGREEMENT No. 3 (of November 12, l998)
"Whereby the Regulation on the Procedure to Revise the Panama Canal Tolls Rate and Admeasurement Rules is approved"
THE BOARD OF DIRECTORS OF THE PANAMA CANAL AUTHORITY
WHEREAS:

In accordance with article 18.3 of the Canal Authority Organic Law, one of the functions of the Board of Directors is to establish tolls for the use of the Canal, with the approval of the Cabinet Council;

Article 79 of the aforementioned law prescribes that any revision of the tolls rate or of the admeasurement rules must be subject to a previous consultation and public hearing process, to afford the interested parties an opportunity to participate and to express their opinions and arguments on the Subject;

We have received from the Administrator of the Authority the proposed regulation of the procedure to revise the Panama Canal admeasurement rules and tolls rate.

RESOLVES:
ARTICLE : To approve the following regulation on the procedure to revise the Panama Canal tolls rate and admeasurement rules:

" REGULATION ON THE PROCEDURE TO REVISE
THE PANAMA CANAL TOLLS RATE AND ADMEASUREMENT RULES"

Article 1. Modifications to the Panama Canal admeasurement rules and the tolls rate shall be subject to a previous consultation and public hearing process, pursuant to this regulation.

Article 2. The proposal to revise [the tolls rate and the admeasurement rules] shall be opened to public consultation, and all interested parties may participate. Any proposal must be explained, with the inclusion of all the factors that would have been object of the

revision by the Authority, for the effects of its issuance.

Article 3. The Authority shall make an official announcement of the proposal by means of its publication in the Panama Canal Register, with at least thirty (30) days in anticipation of the date of the public hearing.

Article 4. This Announcement shall contain:
1. The essence of the proposed change;
2. The date, place and procedures for receiving information and opinions, and participation in the hearing;
3. The date in which the interested parties must submit their notice of attendance to the public hearing.

Article 5. Following publication of the announcement, the Authority shall make available to the public the explained proposal referred to in Article 2 of this regulation.

Article 6. The Board of Directors shall designate a minimum of three of its members to form part of the Committee that shall conduct the process of consultation and hearings, and shall appoint one of its members to chair this Committee.

Article 7. The Committee shall apply this regulation, and its functions shall include the following:
1. Conduct the process of consultation and bearings;
2. Request or receive opinions, presentations or additional information;
3. Decide on procedural or similar matters;
4. Dispense with any irrelevant, irrmateria1, or excessively repetitive material expounded by the parties;
5. Dispense with any participant whose behavior interferes with the process of the hearing.

The Committee should submit to the Board of Directors the complete file of its activities, with the pertinent recommendation.

Article 8. The interested parties shall have the opportunity to participate in the process of the admeasurement rules and tolls rate revision by submitting information, opinions, or statements in writing to the Chairman of the Committee, within the time limits established in the announcement.

The opinions, information and oral expositions that this regulation refers to may be in Spanish or English.

Article 9. The interested parties that have participated in the process of consultation shall also have the opportunity to participate in the public hearing. The hearing shall be held on the date and place prescribed by the announcement, and the parties in attendance may present additional information in writing on any material they have already incorporated, as well as make any statements or oral presentations concerning the admeasurement rules or the tons rate, as appropriate.

Article 10. The hearing may be attended by the interested parties in person or by their representatives. They must give notice of their attendance in writing to the Chairman of the Committee within the time limits prescribed in the announcement of the hearing, and they must include the following information:

1. The names and addresses of the parties, and the condition under which they attend.
2. The place where they wish to make their presentation, if the hearings are scheduled to be held in more than one place.

Article 11. After considering the Committee's conclusions and recommendations, the Authority shall analyze the proposed admeasurement rules or tolls rate, as appropriate. However, in the case of tolls, if the rates proposed during the analysis are higher than the original proposal, the process shall be repeated. This requirement shall apply to any subsequent revision in which higher rates than those contemplated in the previous proposal are proposed.

Article 12. Any interested party may have access to the transcript of the presentations made in the hearing, provided they submit previous request thereto, and pay the costs established by the Authority.

Article 13. Changes to the tolls rate and admeasurement rules shall become effective on the date determined by the Board of Directors.

Given in the city of Panama, on November 12, 1998.
TO BE PUBLISHED AND ENFORCED

Jorge E. Ritter, Minister for Canal Affairs
Tomas Paredes, Secretary Ad Hoc