Chapter 8 Existing Development Plans of the Inland Water Transport System

8.1 Five-year Plan

In general, RTA has been made all possible effort to develop waterways network and annually carried out each project, basis for 5-year plan. This five years plan will be made taking account of long term national development policy such as "Egypt in the 21st Century", and it is necessary to coordinate with relevant sector plans such as other transport-sector plan, irrigation development plan.

This is the end year of existing 4th Plan (1997/98 - 2001/02), RTA is drawing up next 5-year plan with together relevant Ministries. In actual, it is not always that target projects would be achieved within a given period of 5-year plan, by main reason of the shortfall of budget. Therefore, next 5-year plan (2002/03 - 2006/07) tends to continuously put emphasis on several projects which should be carried out from existing 4th plan.

Target projects are indicated in Table 8.1.1, project list in this table are requested for next 5-year plan by RTA. This chapter summarizes major projects in Table 8.1.1, and Figure 8.1.1 illustrates major projects in the Nile Delta. Regarding next 5 year plan, the RTA's policy puts great emphasis on the strengthening of accessibilities to seaports. In addition, RTA's investment will be concentrated on the improvement or maintenance of existing major two axes (Aswan/Cairo and Cairo/Alexandria).

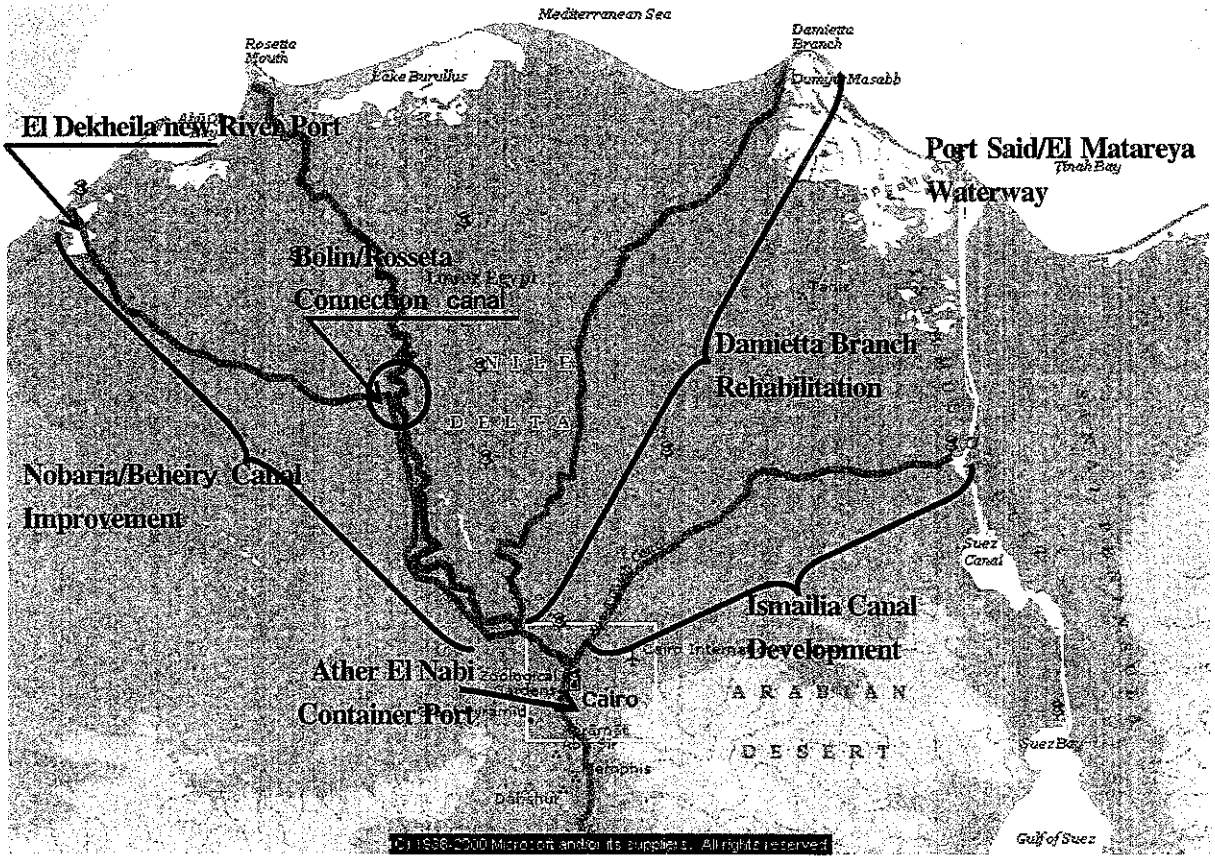


Figure 8.1.1 Sketch Map of 5th five year plan project in the Delta

In view of long-term management, RTA should give priority to not only investments for new projects to but also maintain/repair of existing extensive infrastructures.

The later projects on two axes includes Baheria/Noubaria Improvement, Aswan/Cairo Improvement,

Table 8.1.1 Next 5 Year Plan (Unit : Million L.E.)

	Project Name	Total Project Cost (Estimated)	Investment Cost (Estimated)	
			Next 5 year-plan (draft)	Investment until Existing 5-years plan
1	(Continuous Project) Beheiry/Nobaria Canal Improvement	100	30	15
2	Port Said/El Matareya Waterway Improvement	5	4	1
3	Aswan/Cairo Waterway Improvement	96.8	81.2	14
4	Ships/Boats (owned by RTA) Improvement	10	10	
5	Damietta Branch Improve-ment/Rehabilitation	182	100	75
6	(New Project) Ather El Nabi Container Port & Other River Ports Development	60	60	
7	El Dekhila new River Port Development	90	40	
8	Cairo/Ismailia Waterway Development	177	20	
9	Control Network System to Navigation	30	30	
10	Nasser Lake Waterway Development	7	7	
11	Bolin/Rosseta Connection Canal Development	75	75	
	Total	832.8	457.2	105

Source : RTA

Ather El Nabi and Bolin/Rosetta connection Canal, besides estimated total project cost of Next 5 year plan amounts to about 460 million L.E (see Table 8.1.1).

Chapter 9 Conceptual Development Plan of Inland Waterway Transport (IWT)

9.1 General

The main purpose of this conceptual plan is to determine roles/objectives of IWT in 2020 in light of the following factors such as national land structure, basic characteristics of each transport mode and relation between navigational use and irrigational one.

In the conceptual plan, it is concluded that the following major roles of IWT are taken up in the target year of 2020:

- Establishment of an economical and energy efficient transport system to cope with the increasing demand for cargo transport among major seaports, GCR (Greater Cairo Region) and inland industrial areas
- Establishment of a reliable and safe mass transport system all year round
- Establishment of a transport system that is attractive to private barge operators
- Easing of environmental problems

In addition, it is considered that key axes of IWT are connection of major seaports with the Cairo Region followed by that of the Nile mainstream in this conceptual plan.

9.2 Relation between National Land Structure in Egypt and Inland Transport Networks

9.2.1 National Land Structure in Egypt

(1) Geographical Conditions in Egypt

Egyptian government is making an attempt to promote trade liberalization and expansion by fully utilizing its strategic location. The increasing of such overseas trade has heightened the importance of seaports as international gateways in order to secure access to the world.
For Egyptian inland transport to play a part in such overseas trade, it is necessary to promote inter-modal transportation from/to major seaports.

(2) National Land Structure

The total area of Egypt is about 1 million square km. Among them, cultivated and residential areas occupy only 5.5 % which are mostly limited to the Nile Delta and the Nile Valley.
Inland transport system has a great importance for widespread activities in many sectors in such populated areas.

- **Future Land Use**

In recent years, there is an accelerated drive to newly develop land in order to further stimulate economic growth. "Egypt in the 21st Century", the government's long-term national development plan, one of strategies of this plan is to increase utilized land for agricultural, industrial, tourism and other purposes for the target year of 2017 and place great emphasis on the development of the

following areas:

- Western and Eastern Area adjacent to boundaries of the Delta
- Suez Gulf region
- Northern Area of Sinai Peninsula
- South-western Area adjacent to boundaries of the Old Valley

To step up efforts to develop such new areas and lands, the inland transport network is vital. In addition, the tourism sector will be developed as one of the key industries in the country and improvements in the inland transport network are also vital to the success of the tourism industry.

9.2.2 Present Conditions of Inland Transport Networks

(1) Road and (2) Railway

In the Nile Delta, road infrastructure consists of a radial network that connects the Greater Cairo Region (hereinafter referred to as "GCR") to the major seaport cities on the Mediterranean coast, and radial trunk lines link with major cities in the Delta. Middle / Upper Egypt areas have trunk roads which link each major city such as capitals of governorates along the Nile Valley from the GCR to Aswan.

Meanwhile, railway network has been basically developed almost parallel to road lines in the Delta, the Valley, the key routes are: "Cairo-Aswan (El Sad El Ali)", "Cairo-Alexandria" and "Cairo-Port Said (via Ismailia)" lines.

Both road and railway sectors are making efforts to improve existing trunk lines, and putting great emphasis on strengthening horizontal lines which connect the Red Sea region, Sinai Peninsula region with the Nile Delta / Valley. Moreover, both sectors have put great emphasis on coping with the increase in urban-traffic volume.

(3) Inland Waterway (IW)

Trunk routes of IW have been formed parallel to other modes' networks. However, only Aswan-Cairo and Alexandria-Cairo IWs currently play the role of trunk route of waterborne transportation as a 1st class IW. When the "Damietta Project" is completed, three (3) waterborne transport axes will be active in the Valley, West and East Delta.

As for 2nd or 3rd IWs, not all IWs are conveniently located for transport axes where a significant amount of cargo is generated/attracted. Similarly, physical requirements of these IWs are not necessarily adequate for navigational use since they were originally planned taking account of water requirements for agricultural purposes. An important feature of Egyptian IW is that irrigational use has priority over navigational use in terms of planning and designing.

9.3 Major Roles of Each Transport Mode

9.3.1 Roles of Egyptian Inland Transport

In the transport sector, private companies already play an important role in road transport while

privatization in the maritime sector is steadily progressing. In IWT sector, the drive for such reforms including the privatization of barge operators has just started. Railway sector is likely to face some reforms due to such privatization in the transport market.

Under these circumstances, competition will become increasingly severe among three modes, and users will demand greater cost savings in transport. Therefore, modal share (choice) by users basically depends on transport cost and other service level. In the demand forecast in Chapter 10, it is considered that modal share will be changed according to transport cost and time by each mode.

9.3.2 Major Roles of Each Transport Mode

Egypt is divided broadly into three (3) areas: the Nile Delta, the Valley and other regions. The roles of each transport mode are summarized according to these three areas.

(1) Nile Delta Area

The main scope of the Study is the Nile Delta, and three transport modes are almost parallel in structure in this region (see Figure 9.3.1) Therefore, in order to survive keen competition with one another, each mode will have to capitalize on its competitive advantages.

The roles of inland transport system in the Delta are summarized as follows:

- To efficiently link with overseas trade:
  To improve inter-modal transportation from/to major seaports
- To support widespread activities in populated areas:
  To cope with growth in inter-city freight (cargo) and passenger transport
  To ensure access to new development areas
  To meet the increase in urban traffic volume

Major roles of each mode in the Delta Area

- **Transportation from/to major seaports in the Mediterranean**

The volume of cargo is expected to further increase with the expansion of overseas trade in future. Therefore, it is most important for each transport mode to make a strategy for gaining its share in cargoes between GCR and seaports.

Meanwhile, transport-distances between GCR and seaports are approximately estimated at just over 200 km, which would seem to fall under the category of "short-range transportation".

Although it is no easy matter for IWT to compete with road or railway sectors where the transport distance is only 200 km, it is considered that IWT can gain some modal-share in transportation between GCR and seaports, on condition that IWT sector targets specific commodities and improves infrastructures, operational and managerial systems.
The Study aimed at proposing such improvement measures.

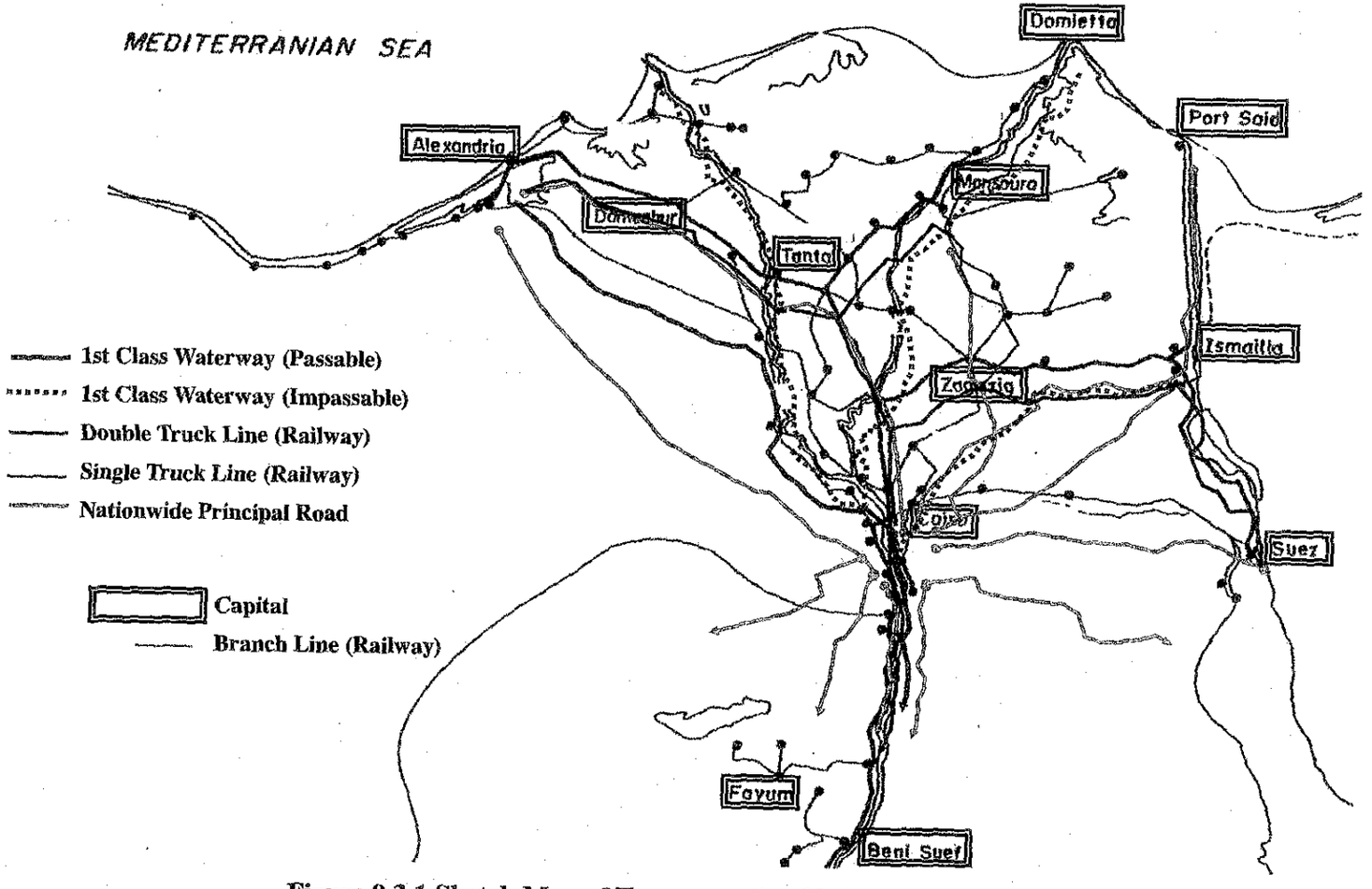


Figure 9.3.1 Sketch Map of Transportation Networks in the Nile Delta at 2001

➢ **Domestic Transportation in the Delta Area**

It is considered that inter-city freight (cargo) transport will be basically conducted by road and railway sectors. It would be difficult for the IWT sector to compete with trucks in inter-city transport. However, the IWT sector can compete with other modes on condition that IWT route adjacently locates to large cargo-centers such as industrial estates.

(2) Nile Valley Area

Major roles of each mode in the Valley Area

➢ **Long-haul Transportation along the Valley**

At present, some bulky cargoes which are raw materials or products of factories are carried to/from GCR or directly to/from seaports. Such long distance transport is the strength of IWT compared with truck transportation.

Therefore, IWT sector should continuously focus on strengthening its role in "long -haul transport" along the Valley.

➢ **Inter-city Transportation along the Valley**

Although both road and railway sectors will play a key role of cargo/passenger movements between major cities, IWT sector has room to transport bulky cargoes more efficiently.

➢ **Enhancement of Tourism Industry**

The Nile River is a very valuable tourism resource itself and the river cruise are likely to increase. For this reason, it will be important to control the movements cruise ships, oil barges and other bulk barges in an efficient and safe manner.

(3) Other Areas

The roles of inland transport sector in other areas such as the Red Sea area, Sinai Peninsula, etc. as follows:

Road and railway networks have superior links over IWs in the above development areas. Therefore, it is considered that IWT sector will basically leave transportation in these areas to other modes within the target period of this development plan. Because, in these areas, the realization of barge transportation will inevitably mean that large investment for IWs.

9.4 Major Roles of IWT in 2020

It is concluded that major four roles of IWT in 2020 are taken up in this section as follows:

- Establishment of an economical and energy efficient transport system to cope with the increasing demand for cargo transport among major seaports, GCR and inland industrial areas
- Establishment of a reliable and safe mass transport system all year round
- Establishment of a transport system that is attractive to private barge operators
- Easing of environmental problems

As for each role, its significance is outlined as follows:

9.4.1 Establishment of an Economical and Energy-Efficient Transport System for Cargo Transport among major seaports, GCR and Inland Industrial Areas

In the conceptual plan, the first task is the establishment of an economical and energy-efficient system. Because the savings in transport costs will become increasingly essential in order to survive competition with other modes.
Moreover, energy-efficient system has beneficial effects such as reductions of GHG (Green House Gases) and other air pollutants. These are benefits that can be enjoyed both by the transport sector and Egyptian society at large.

It is considered that strategies for achievement of cost-efficiency be formed on the basis of the following aspects.

- To focus on routes between major seaports and GCR as paramount IWT axes
- To target specific commodities which are appropriate for barge operations and for making barge business viable
- To enlarge the size of barges and to improve IW infrastructures to meet requirements of newly enlarged barges

Basic strategies based on above three (3) aspects are summarized as follows:

(1) To focus on routes between major seaports and GCR

To gain more "mass-transport" cargoes, IWT sector should focus on the larger inland transport axes which shape principal routes in the country, namely; "Alexandria – Cairo", "Damietta – Cairo" and "Port Said – Cairo".
It is considered that this IWT development plan gives first priority to the former two axes ("Alexandria-GCR", "Damietta-GCR" IWs) in view of current cargo volume at each seaport.
"Port Said-GCR" IW seems to rank lower than former IWs on the basis of demand forecast of handling volume at the port for the year 2020 (see Chapter 10 for detail).

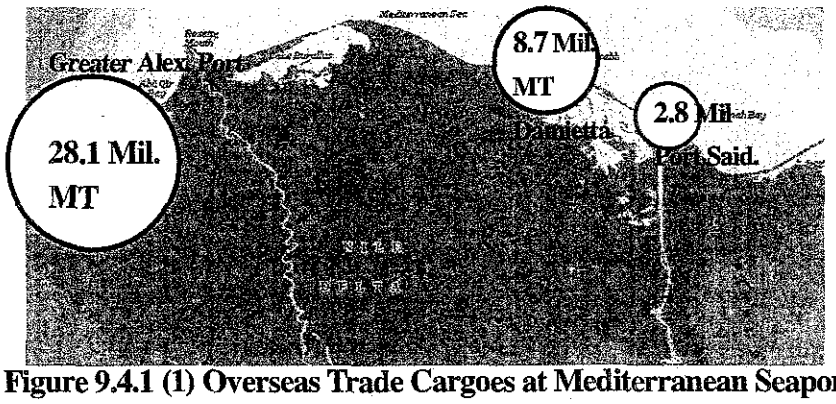


Figure 9.4.1 (1) Overseas Trade Cargoes at Mediterranean Seaports in 2000

Source: Estimated by the Study Team

(2) To target specific commodities

IWT is able to transport goods economically, though its shortcomings compared with other modes are lower-speed and necessity for double-handling/secondary distribution. Therefore, IWT sector should fully utilize its major advantage of cost-saving while overcoming its disadvantages as much as possible. For that purpose, IWT sector should concentrate on specific commodities in consideration of cargo characteristics and advantage / disadvantage of IWT. In the study, such commodities are identified as "target cargo"

(3) To enlarge the size of barges and to improve IW infrastructures

In general, one of the effective measures to save transport cost is to increase the transportation lot; in other words, enlarging the size of barges. However, the drive to introduce larger-sized barges seems to be stagnant in recent years. In the Study, one of basic strategies aims at proposing ways to enlarge river barges.

9.4.2 Establishment of a reliable and safe mass transport system all year round

The "mass transport" between seaports and GCR is playing the important role as the industrial arteries of the country. These "arteries" be expected to be utilized by main producers, factories and transporters. Such major users require safe and reliable transportation such as "regular service all year round" .

In the conceptual plan, strategies for a reliable/safe system are formed on the basis of the following aspects.

(1) To improve IW infrastructures to secure safe and smooth navigation

At present, IWT is not necessarily a reliable transport system, mainly due to the following reasons:

- Insufficient IW facilities and bottlenecks can hinder barges from smooth and safe navigation.
- IWs have been frequently closed to traffic due to the maintenance of related facilities such as locks, canals, bridges and irrigation facilities.

Thus, one of strategies is to improve insufficient facilities, and to remove bottlenecks and obstacles to navigation as soon as possible. Needless to say, such improvement plan should be formulated in consideration of future barge system.

Another strategy is to make an appropriate maintenance program of shortening such blockade's period as much as possible. In addition, it is essential for related organizations to coordinate with each other to draw up maintenance plans.

(2) To establish flexible system of adapting to seasonal fluctuation in water depth

Shallow depth during the low-discharge period can hinder river barge from stable and efficient transportation. However, it seems that there is no definitive solution to this issue as long as irrigational use has priority over navigational use.

Therefore, new river barge system with shallow draft is required in order to navigate during the low-

discharge period smoothly and efficiently. In addition, it is essential that RTA be able to collect and announce the water-depth conditions for barge operators and other related organizations. For that purpose, a close relationship between RTA and MWRI is vital.

9.4.3 Establishment of a transport system that is attractive to private barge operators

The strategies for attracting not only private barge operators but also IWT customers are summarized as follows:

(1) To improve IWT Operational and Managerial System

The Study proposes strategies that enable IWT to attract more customers and more cargoes.
Most of Egyptian transport activities have introduced night operation. However, IWT sector still has a daytime-based operational system that has only 10 hours from sunrise to sunset as working hours. Therefore, it is essential for IWT to introduce night operation to ensure more efficient transport and to compete with other modes.

(2) Roles of Other Governmental Organizations

It is important to clarify the roles and responsibilities of the central government such as MOT and RTA, and the private sector. Especially, support from MOT will be paramount to facilitate promotion of IWT, in other words, realization of a dramatic change in modal-shares.

9.4.4 Easing of Environmental Problems

The significant role of IWT is to ease environmental problems. It is likely that road traffic conditions in Egypt will grow more severe. Such traffic problems could hinder the country from sustainable development in the future.
For this reason, it is essential that strategies of traffic volume control be adopted from a long-term and comprehensive viewpoint. To that end, IWT development/ promotion plans can play an important role in controlling the road traffic volume.

Chapter 10 Demand Forecast

10.1 Socio-economic Framework for the Target Years in Egypt

10.1.1 Population

The population of Egypt in the year 2000 is estimated to be 63.8 million. The average annual growth rate is 2.0% for the period 1991-2000, indicating a gradual decline year by year 1.8% in 2000. It was assumed that such historical trend of the gradual decline of the annual population growth rate would continue.

On this assumption, the average figures of average annual growth rates towards the respective target years were estimated as follows (see Table 10.1.1):

- 1.5% in the period of 2001 - 2010
- 1.1% in the period of 2011 - 2020

Table 10.1.1 Forecast of Egyptian Population

(Unit:1,000)

	2000	2001-2010	2011-2020
Population	63,800	74,040	82,600
Annual Growth Rate	1.8%	1.5%	1.1%

"The National Strategy of National Economic and Social Development of the 21st Century" made by the Ministry of Planning estimates the population of around 80 million and an annual growth rate of 1.2% in the year 2017, indicating almost the similar figure as above estimation.

10.1.2 Gross Domestic Product (GDP)

The average annual growth rates of Egyptian GDP in the last ten years (1991 - 2000) and the five years (1996 - 2000) are 4.8% and 5.4%, respectively.

On the other hand, "Organization for Economic Co-operation and Development (OECD)" gave long-term GDP growth of 4.7% as a middle figure in 2001 – 2010 and 4.6% in 2011 – 2020, respectively in the Middle East and Northern Africa region including Egypt.

Table 10.1.2 Forecast of Egyptian GDP

(Unit: billion LE at 1995 constant price)

	1991	1996	2000	2001-2010	2011-2020
GDP	174.5	214.2	265.9	451.8	767.6
Annual Growth Rate	average 4.8% (from 91 to 2000)			5.4%	5.4%
		average 5.4% (from 96 to 2000)			

Referring to the above forecast figures made by OECD and the recent actual achievement of Egyptian GDP, 5.4% of annual growth rate was adopted towards the target years in this study (see Table 10.1.2).

10.2 Demand Forecast

The scope of the demand forecast in this study is to forecast the volume of cargo to be transported by inland waterways composed of the Nile and canals in Egypt in the target years, viz. 2010 and 2020.

10.2.1 *Methodological Procedure of Demand Forecast*

When forecasting the future cargo traffic by IWT in Egypt cargo traffic was divided into two categories, viz. overseas trade cargo and domestic trade cargo. The following methodological procedure was applied:

Forecast of the overseas trade cargo

- **First step:** The entire cargo volume through Egyptian major seaports, viz. the Greater Alexandria Port, Damietta Port, Port Said Port, and the Red Sea ports was estimated.
- **Second step:** The entire cargo volume was allocated to the major seaports.
- **Third step:** Inland O/D (origin and destination) traffic of the overseas trade cargo via seaports was estimated, and then, a portion of the entire inland O/D traffic was allocated to the IWT traffic.

Forecast of the domestic trade cargo

- **First step:** Inland O/D traffic by IWT in the future was estimated by taking account of the historical trend ("traditional pattern").
- **Second step:** The possibility of the conversion from land transport (railway and road) to IWT in the domestic trade was studied.

Integration of Forecast IWT traffic

- Finally, the above results were integrated into the entire cargo traffic by inland waterways covering both overseas trade and domestic trade cargo.

10.2.2 Forecast of the Volume of Cargo to be Transported by Inland Waterways

(1) Overseas Trade Cargo via the Seaports

1) Forecast by Cargo Item

The so-called "micro-forecast method" was used in this study, in which the cargo volume of each commodity was estimated individually. The following commodities were used in the forecast:

a) Containerizable General Cargo, b) Timber, c) Sugar, d) Paper, e) Flour, f) Iron and Steel Products, g) Scrap, h) Cars, i) Wheat, j) Maize, k) Iron Pellets, l) Coal, m) Cement, n) Sulfur, o) Fertilizer, p) Petroleum, q) Edible Oil, r) Coke s) Molasses, t) Other General Cargo, u) Livestock, v) Other Dry Bulk Cargo and w) Soybeans

In this study, an appropriate method to each commodity is used. The typical methods are as follows:

- Future cargo volumes are assumed to increase for the future in proportion to GDP growth with growth elasticity.
- The volumes of imported cargoes are estimated by subtracting local productions from

local demands in the future

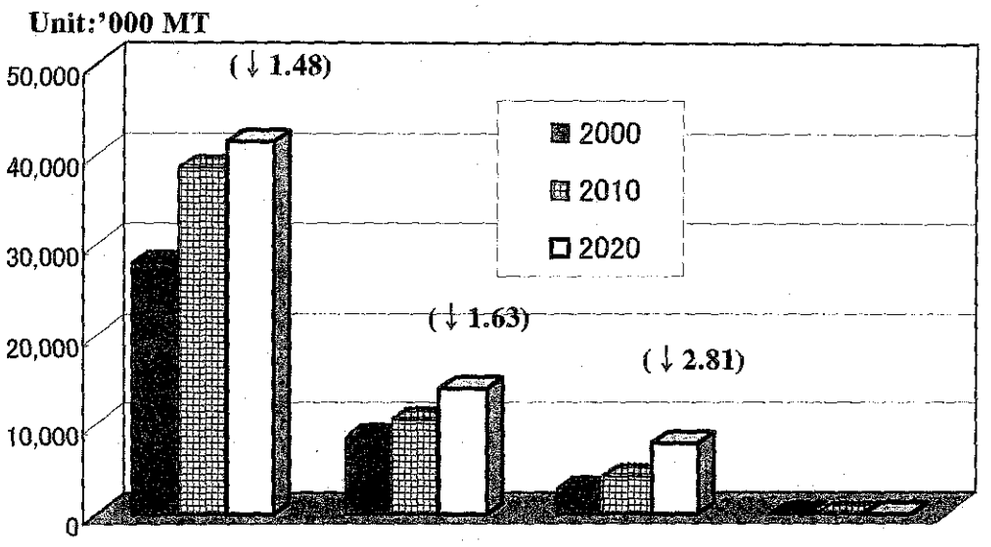
- The future volumes of several raw materials or products are estimated according to the interviews to major factories.

2) Containers

Future container cargo volume was estimated by multiplying "percentage of containerization" and "containerizable general cargo". In the estimation of "percentage of containerization", the progress of containerization in the future was estimated by using the logistic curve fitting.

3) Allocation of the Entire Overseas Trade Cargo to the Major Ports

The estimated entire volume of the overseas trade cargo were allocated to each of the major seaports containing the Greater Alexandria, Damietta, Port Said, East Port Said and the Red Sea ports (Suez and Safaga) by taking account of their historical shares. The resulting figures by port are shown in Fig. 10.2.1.



Note: Figures in parentheses indicate the ratio of cargo volume from 2000 to 2020

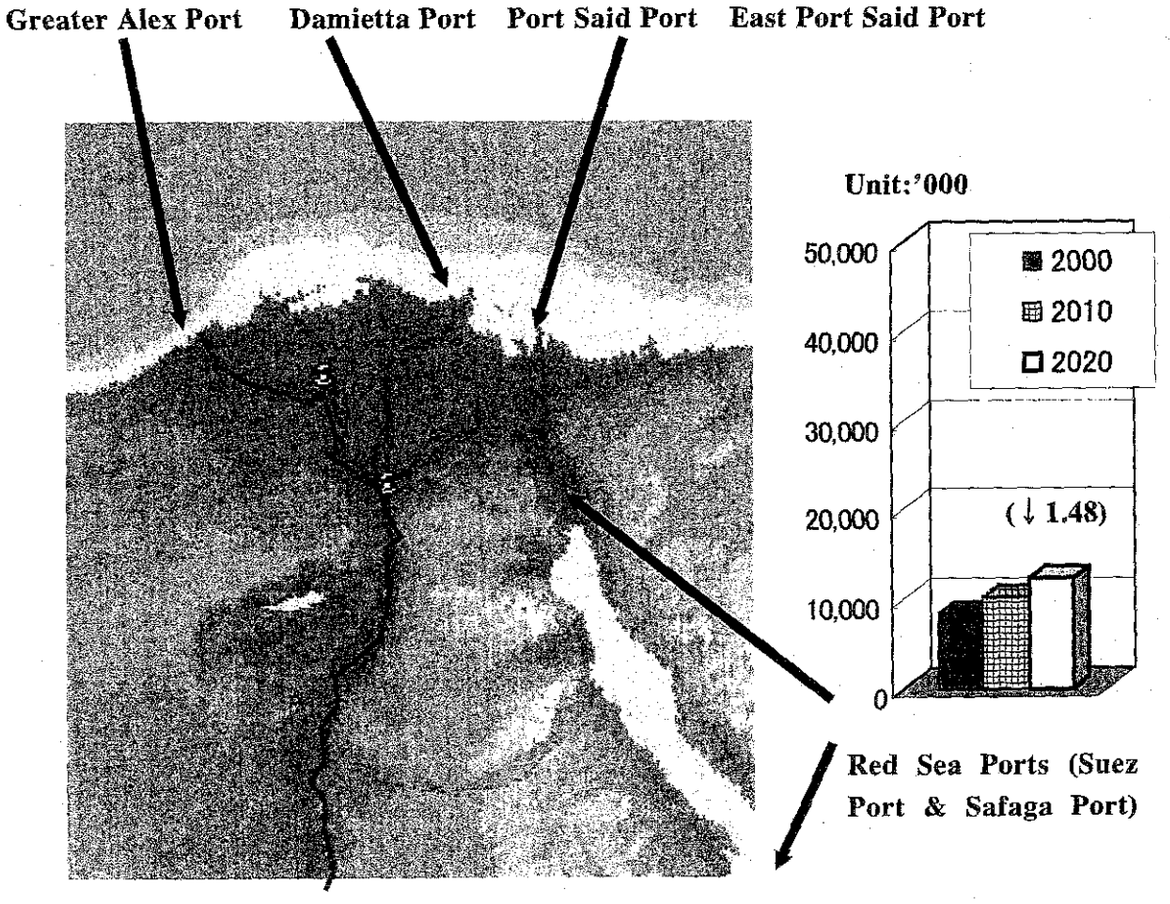


Fig. 10.2.1 Forecast Cargo Volume via Egyptian Seaport

4) Estimation of the Inland O/D Traffic in the Overseas Trade Cargo

The inland O/D traffic in the overseas trade cargo via each seaport was estimated by multiplying "the overseas trade cargo at the seaport" and "the percentage of inland O/D traffic by cargo item". The major O/D traffic routes are between the seaport and the Greater Cairo and between the seaport and the corresponding governorate where the seaport is located.

In the conceptual plan of this study, it is proposed that IWT sector should concentrate on specific commodities so as to promote IWT in consideration of advantage/disadvantage of IWT and cargo characteristics from the standpoint of IWT and. In this study, the commodities that meet the following conditions are denoted as "target cargo":

- Sufficient annual volume between a seaport and the Greater Cairo enabling to make barge business viable
- Mono-commodity cargo stackable on barge holds

Consequently, the commodities of "target cargo" among overseas trade cargoes are as follows: Maize, Wheat, Coal/Coke, Timber, Cement, Iron/Steel products, Sugar, Fertilizer, Molasses, Soybean and Containers

The traffic volumes of target cargo between the seaports and the Greater Cairo are shown in below Figures 10.2.2, 10.2.3 and Tables 10.2.1-10.3.

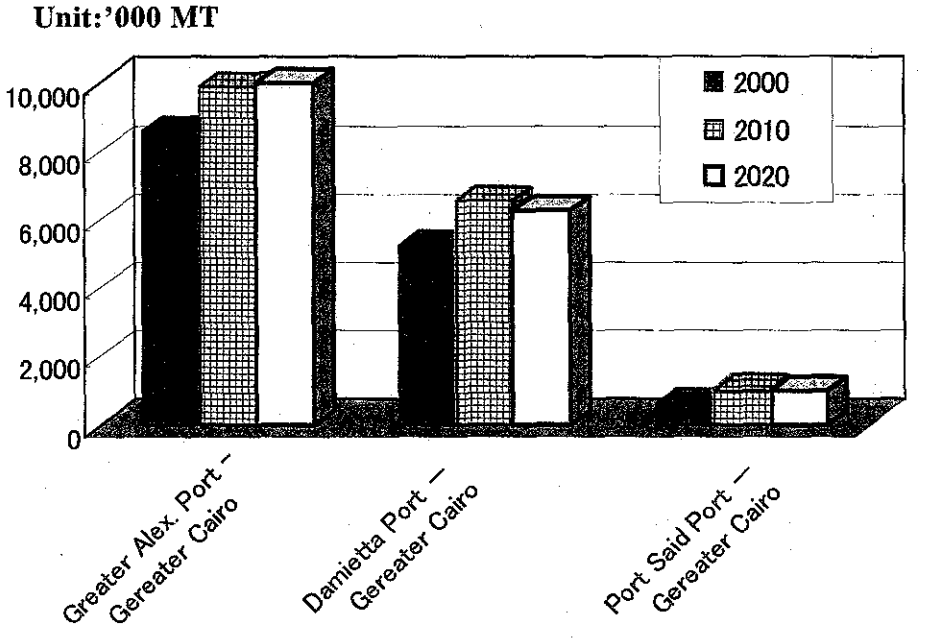


Fig. 10.2.2 Inland Traffic of the Target Cargo between Seaports and the Greater Cairo (Conventional Cargo)

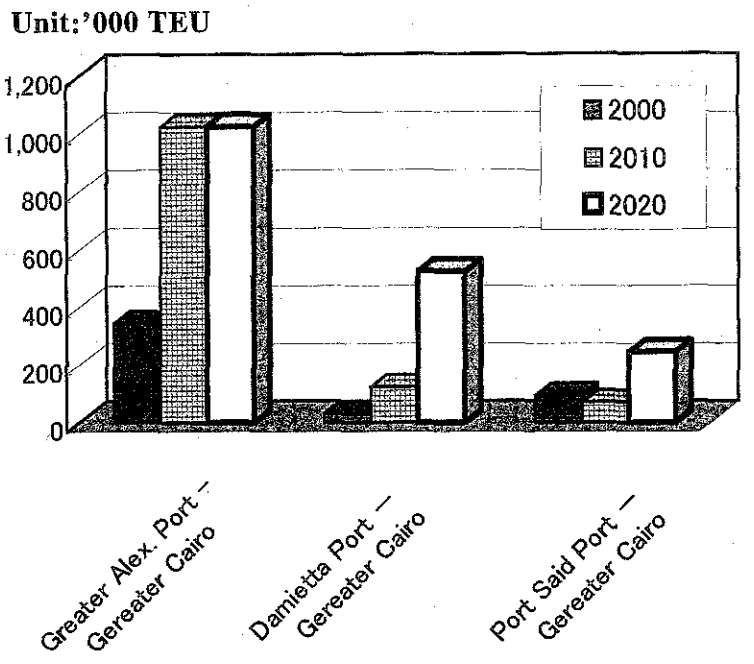


Fig. 10.2.3 Inland Traffic of the Target Cargo between Seaports and the Greater Cairo (Container Cargo)

Table 10.2.1 Inland Traffic of the Target Cargo for IWT between Alexandria Port and the Greater Cairo in Overseas Trade

Unit: '000MT

Cargo Item		From/To Alexandria Port (A)		To/From Greater Cairo (B)		B/A
		2010	2020	2010	2020	%
Import	Maize	4,186	4,722	**2,737**	**3,088**	65.4%
	Wheat	3,729	3,564	**2,439**	**2,331**	65.4%
	Coal	1,500	1,500	**1,500**	**1,500**	100.0%
	Timber	3,632	4,824	**948**	**1,259**	26.1%
	Cement	1,452	1,124	**1,089**	**843**	75.0%
	Iron/Steel Products	406	308	**304**	**231**	75.0%
	Sugar	228	310	**149**	**203**	65.4%
Export	Molasses	394	490	**188**	**233**	47.6%
	Coke	300	300	**300**	**300**	100.0%
	Fertilizer	307	213	**245**	**170**	80.0%
Conventional Cargo Total		16,133	17,354	**9,899**	**10,158**	
Local Containers ('000 TEUs)		1,500	1,500	**1,025**	**1,025**	68.3%

Table 10.2.2 Inland Traffic of the Target Cargo for IWT between Damietta Port and the Greater Cairo in Overseas Trade

Unit: '000MT

Cargo Item		From/To Damietta Port (A)		To/From Greater Cairo (B)		B/A
		2010	2020	2010	2020	%
Import	Wheat	2,814	2,690	**2,313**	**2,211**	82.2%
	Maize	2,053	2,316	**1,688**	**1,904**	82.2%
	Cement	2,219	1,718	**1,665**	**1,288**	75.0%
	Timber	843	1,120	**231**	**307**	27.4%
	Soybean	255	255	**210**	**210**	82.2%
	Iron/Steel Products	285	216	**204**	**155**	71.4%
Export	Fertilizer	321	223	**257**	**178**	80.0%
Conventional Cargo Total		8,791	8,538	**6,566**	**6,253**	
Local Containers ('000 TEUs)		159	680	**123**	**524**	77.1%

Table 10.2.3 Inland Traffic of the Target Cargo for IWT between Port Said Port and the Greater Cairo in Overseas Trade

Unit: '000MT

Cargo Item		From/To Port Said Port (A)		To/From Greater Cairo (B)		B/A
		2010	2020	2010	2020	%
Import	Wheat	1,243	1,188	**1,022**	**977**	82.2%
Local Containers ('000 TEUs)		198	700	**69**	**244**	34.9%

(2) Domestic Trade Cargo

1) General

In the forecast of domestic trade cargo, the current inland waterway traffic pattern is called as "the traditional inland waterway transport (IWT) pattern" in this study, and the future traffic of this pattern was estimated by taking account of the historical trend and the estimated economic and social indices.

On the other hand, in this study, the possibilities of conversion from "the current road and railway traffic" to IWT were studied.

2) Estimation of the Future Traffic of Local Products for the Local Consumption

a) Methodology

In this study, inter-regional transport in medium- and long-distance, where IWT has generally advantages over road transport, was put emphasized on rather than intra-regional transport in short-distance.

b) Inter-regional Traffic in the Traditional Pattern

Major cargoes currently transported by IWT and railways in inter-regional transport are listed in Table 10.2.4. As shown in the table, they are bulk cargoes or heavy/bulky break-bulk cargoes that are transported in long distance and are naturally considered to be suitable for IWT or railway. The result of the estimation of the future volumes in traditional pattern transport is shown in Table 10.2.4.

Table 10.2.4 Inter-regional Transport of Major Cargoes by IWT and Railway in the Future in Traditional Pattern

Unit: '000 MT

Mode	Cargo Item	From	To	Year		
				2000	2010	2020
IWT	Clay	Aswan in Upper Egypt	Tebbin/Shoubra in G. Cairo	55	108	108
	Stones	Samalout in Middle Egypt	Tebbin/Ather El Nabi in G. Cairo	510	625	625
	Molasses	Upper Egypt	Hawamdia in G. Cairo	318	418	519
Railway	Nitrogenous Fertilizer	Ab Queer in Alexandria	Upper/Middle Egypt	63	79	105
	Steel Sheets	Helwan in G. Cairo	Upper/Middle Egypt	33	33	33
	Raw Sugar	Upper Egypt	EL Hawamdeia in G. Cairo	111	146	181

There are major local products except for above cargo commodities, agricultural and some industrial products have large production volumes in the country. However, there is a remote possibility that such products be transported by IWT, main reasons are as follows:

Agricultural local products for local consumption:

There seems to no large disparity between the distributions of production and population. Most agricultural products presumably distributed by road in intra-regional transport (short-distance).

Cement and Fertilizer

Currently almost both products from factories are distributed to the local market by truck. The possibility of future modal shift from road transport to IWT with advantage in long-distant transport seems to be little, because these factories are placed geographically uniformly in Egypt.

Iron and Steel Products

Currently a large portion of iron and steel products from the local factories are distributed to the local market by truck, a lesser portion by railways. Although the above factories are not necessarily placed geographically uniformly in Egypt different from the factories of cement and fertilizer, modal shift from road transport to IWT seems to be little; Bulky and heavy iron/steel products are vulnerable in loading/unloading operations at river ports during transportation, and hence, IWT that needs twice operations (from a truck to a barge and vice

versa) is generally not considered to be preferable.

(3) Modal Split in Inland Cargo Transport

1) Modal Split Model

To allocate the future entire inland cargo traffic of the "target cargo" (see Section 10.2.2 (1) 4), the study used "logitmodel" known as the representative model in the "function model method". In this "logitmodel", two factors of transport cost and time are considered to mainly affect to modal split between different modes.

2) Categorization of Cargoes in the Application of Logitmodel

The items of cargoes that are currently transported by inland waterways or will be possibly transported by inland waterways in the future were grouped by the following six categories:

a) Containers,
b) Break-bulk cargo (sawn timber, steel products, bagged cement, etc.),
c) Bulk cargo (wheat),
d) Bulk cargo (coal from Alexandria Port),
e) Bulk cargo (coke to Alexandria Port),
f) Bulk cargo (molasses to Alexandria Port).

Out of the above six categories, the modal split model was applied for the former three categories a), b), c), viz. containers, break-bulk cargo and bulk cargo (wheat). The modal shares in above three categories were estimated on the following assumption:

- Improvement of the Maritime Lock as the entrance to Alexandria Port so as to increase air clearance
- Establishment of the new public terminals for handling containers and conventional cargoes at Ather El Nabi Port in Cairo
- Installation of navigation aids enabling day and night navigation throughput the waterways between the seaports of Alexandria and Damietta and the riverport of Ather El Nabi
- Inauguration of the operations of new barges enlarged
- Start of Operations of Renovated Grain Terminal at Alexandria Port

On the other hand, the latter three categories d), e), f), viz. coal, coke and molasses are currently transported by IWT predominantly over other modes. There seems to be no reason why modal shift from inland waterway to other modes. Hence, as to these categories, current pattern of inland waterway transport was assumed to be kept intact.

3) Future Modal Split in the Category of Currently Non-existent Cargo Traffic by Inland Waterway

The traffic by IWT of the first two categories a), b), viz. containers and break-bulk cargo, is currently non-existent. Therefore, future modal shares of IWT were estimated on the assumption that the improvement measures mentioned in Paragraph (3) 2) be executed.

i) Container Transport

Alexandria/Dekheila Ports– Ather El Nabi Port in Greater Cairo Route
Damietta Port – Ather El Nabi Port in Greater Cairo Route

Transport costs estimated by mode on the assumption indicated in Paragraph (3) 2, potential modal split shares between Ather El Nabi Port in the Greater Cairo and the three ports, viz. Alexandria Port, Dekheila Port and Damietta Port are summarized in Fig. 10.2.4 and Table 10.2.5. Comparing total transport cost (generalized cost) among three modes by each route, IWT in all the three routes will have an advantage over road and railway transport even adding the time cost and secondary transportation cost as shown Fig. 10.2.4 and Table 10.2.5. In the routes between Ather El Nabi Port and the three ports, viz. Alexandria Port, Dekheila Port and Damietta Port, the potential modal shares of IWT were estimated as 36 %, 35 % and 38 %, respectively.

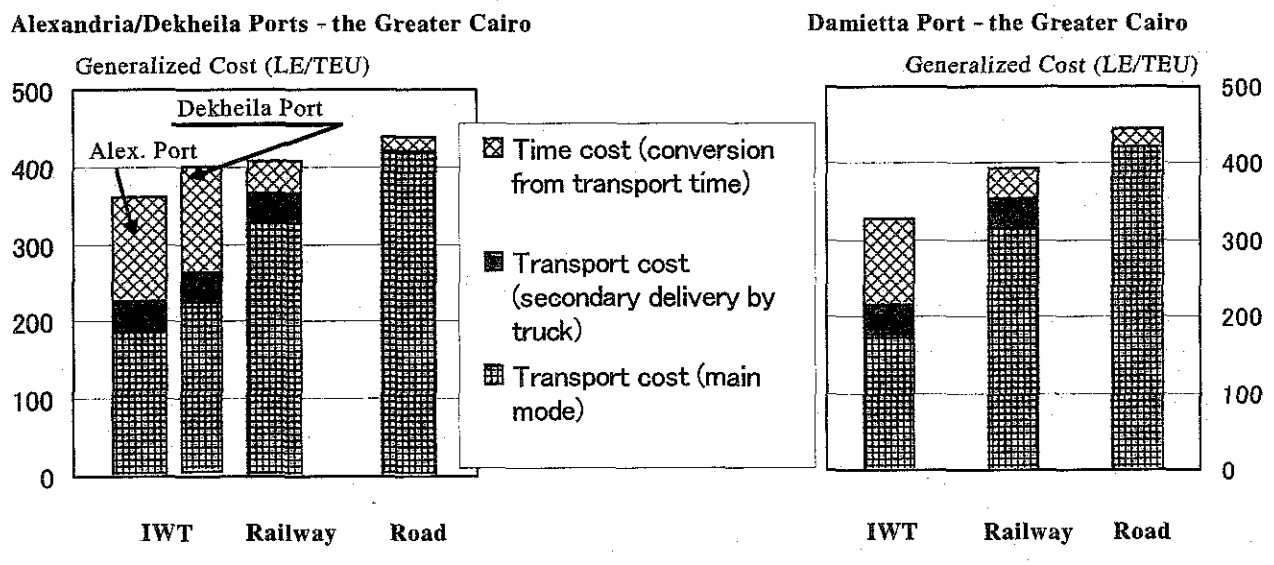


Fig. 10.2.4 Comparison of Total Transport Cost (Generalized Cost) for Container Transport by Mode

Table 10.2.5 Potential Modal Split Shares in Transport of Overseas Trade Containers Cargo between Alexandria Port and Greater Cairo in 2020

Item		Alexandria Port - Ather El Nabi Port IWT Distance (232 km)		
		IWT	Railway	Road
Transport cost (main mode)	LE/TEU	187	327	421
Transport cost (secondary delivery by truck)	LE/TEU	40	40	-
Time cost total (conversion from transport time)	LE/TEU	135	40	18
Generalized cost (Cg)	**LE/TEU**	**363**	**407**	**438**
Modal split share		**36%**	**33%**	**31%**

Possibility of Barge Transport between Port Said Port and Ather El Nabi Port

In this study, the possibility of container transport by barges on the route between Port Said Port (including East Port Said Port) and Ather El Nabi Port was examined. In the route via Mediterranean Sea Coast and Damietta Port, barge transport was considered to have no competitiveness against road and railway in terms of the total cost.

ii) Break-bulk Cargo Transport

Alexandria Port – Ather El Nabi Port in the Greater Cairo Route

Damietta Port – Ather El Nabi Port in the Greater Cairo Route

Break-bulk cargo transport between Ather El Nabi Port in the Greater Cairo and the two ports viz. Alexandria Port and Damietta Port, was considered to have an advantage over road and railway sectors (see Fig. 10.2.5). In the routes between Ather El Nabi Port and the two ports, viz. Alexandria Port and Damietta Port, the potential modal shares of IWT were estimated as 45 %, the same in both cases.

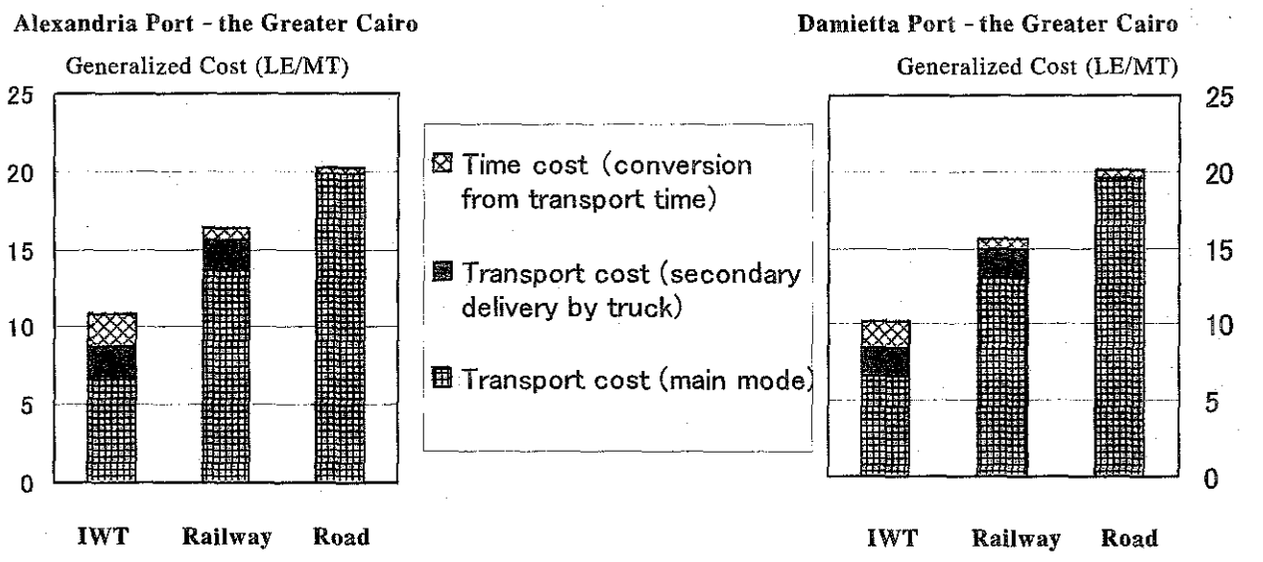


Fig. 10.2.5 Comparison of Total Transport Cost (Generalized Cost) for Break-Bulk Transport by Mode

4) Category of Currently Narrowly Existent Cargo Traffic by Inland Waterway

The category c) in Paragraph (3) 2), viz. bulk cargo (wheat) is narrowly found with almost negligibly small amount between Alexandria and Imbaba Grain Terminal within the Greater Cairo.

i) Bulk Cargo (Wheat) Transport

Alexandria Port – Imbaba Port in Greater Cairo Route
Damietta Port – Imbaba Port in Greater Cairo Route

In this category, future modal shares of IWT is expected to largely increase on the assumption that the following improvement measures be executed:

- Completion of Damietta Rehabilitation Project
- Start of Operations of Renovated Grain Terminal at Alexandria Port
- Other improvement measures which will be explained in a later chapter

On the above assumption, in 2020, bulk cargo transport between the Greater Cairo and the two seaports, viz. Alexandria Port and Damietta Port, IWT was considered to have a great advantage over road and railway sectors (see Fig. 10.2.6). In the routes between Ather El Nabi Port and the two ports, viz. Alexandria Port and Damietta Port, the potential modal shares of IWT were estimated as 55 % and 56%, respectively.

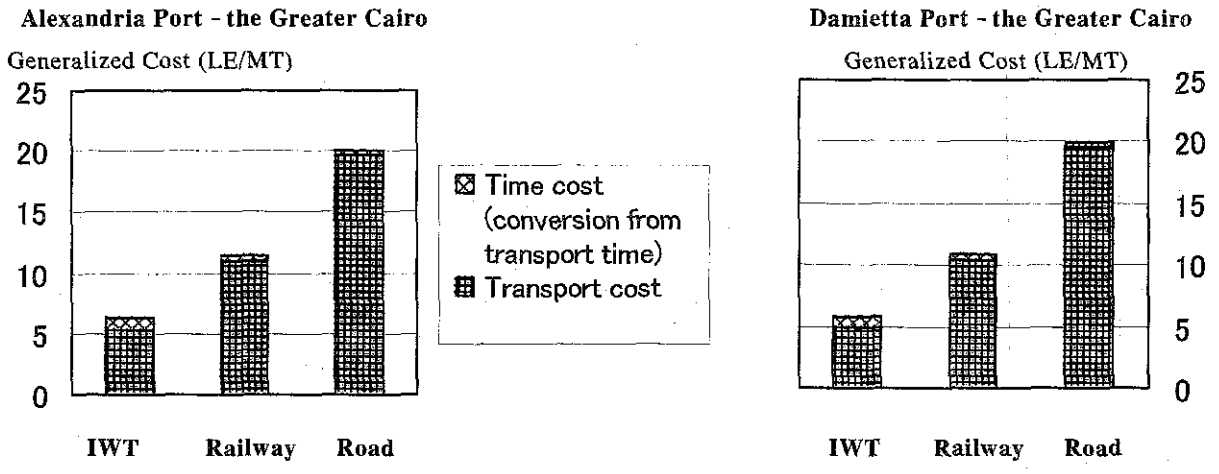


Fig. 10.2.6 Comparison of Total Transport Cost (Generalized Cost) for Bulk Cargo (Wheat) Transport by Mode

Possibility of Barge Transport between Dekheila Port and Imbaba Port

In this study, the possibility of bulk cargo (grains) transport by barges between Dekheila Port and Imbaba Port was examined by considering barge basins required at Dekheila Port and the inauguration of river-coastal barges. As a result, if suitable barge basins would be prepared within Dekheila Port, the said barge transport for grains was considered to be competitive against railway and road transport even using costly river-coastal barges.

Possibility of Barge Transport between Port Said Port and Imbaba Port

The possibility of bulk cargo (grains) transport by barges between Port Said Port and Imbaba Port was studied. In the route via Mediterranean Sea Coast and Damietta Port, barge transport was considered to have no competitiveness against road and railway as well as the container transport case.

5) Currently Existent Cargo Traffic Predominantly by IWT (Traditional Pattern)

As mentioned above, the categories d), e) and f) in Paragraph (3) 2), viz. coal, coke and molasses from/to Alexandria Port are currently transported predominantly by IWT. There seems to be no reason why modal shift from inland waterway to other modes. Hence, as to these categories, current pattern of inland waterway transport was assumed to be kept intact, and the future cargo traffic of these categories was estimated by referring to the historical trend.

(4) Traffic Allocation to IWT

1) Allocation of Overseas Trade Cargo via the Mediterranean Seaports in Egypt to IWT

Future cargo traffic of the former three categories a), b) and c) in Paragraph (3) 2) in the years 2010 and 2020 that is currently non-existent or narrowly existent in IWT was estimated

by multiplying the estimated modal split shares of IWT and increment from the traffic in the year 2000 aiming at conservative estimation. The resulting IWT traffic by route is shown in the Tables 10.2.6 and 10.2.7.

Table 10.2.6 Traffic Allocated to IWT between Alexandria Port and River Ports in the Greater Cairo in the Overseas Trade Cargo

Unit: '000 MT

Cargo Item		Total Cargo of All Transport Modes			Cargo Volume Allocated to IWT (2010)	Allocation Share to IWT for the Total (2010)	Total Cargo of All Transport Modes		Cargo Volume Allocated to IWT (2020)	Allocation Share to IWT for the Total (2020)	Allocation Share to IWT for Increment
		2000	2010	Increment from 2000 to 2010			2020	Increment from 2000 to 2020			
Up-stream	Maize	2,204	2,737	533	192	14%	3,088	884	432	14%	-
	Wheat	2,346	2,439	-	171	14%	2,331	-	326	14%	-
	Coal	1,691	1,500	-	675	45%	1,500	-	675	45%	-
	Timber	498	948	449	101	11%	1,259	761	342	27%	45%
	Cement	704	1,089	385	87	8%	843	139	62	7%	45%
	Iron/Steel Products	80	304	225	51	17%	231	151	68	29%	45%
	Containers (TEUs)	172	512	340	60	12%	512	340	120	23%	36%
Down-stream	Molasses	176	188	-	188	100%	233	-	233	100%	-
	Coke	523	300	-	300	100%	300	-	300	100%	-
	Containers ('000TEUs)	172	512	340	60	12%	512	340	120	23%	36%

Table 10.2.7 Traffic Allocated to IWT between Damietta Port and River Ports in the Greater Cairo in the Overseas Trade Cargo

Unit: '000 MT

Cargo Item		Total Cargo of All Transport Modes			Cargo Volume Allocated to IWT (2010)	Allocation Share to IWT for the Total (2010)	Total Cargo of All Transport Modes		Cargo Volume Allocated to IWT (2020)	Allocation Share to IWT for the Total (2020)	Allocation Share to IWT for Increment
		2000	2010	Increment from 2000 to 2010			2020	Increment from 2000 to 2020			
Up-stream	Wheat	1,479	2,313	834	229	10%	2,211	732	403	18%	55%
	Maize	1,403	1,688	285	78	5%	1,904	501	275	14%	55%
	Timber	123	231	108	24	11%	307	184	83	27%	45%
	Containers (TEUs)	14	61	47	9	14%	262	248	94	36%	38%
Down	Containers (TEUs)	14	61	47	9	14%	262	248	94	36%	38%

The traffic allocated to IWT on the routes between the Egyptian Mediterranean seaports and the river ports in the Greater Cairo in the overseas trade cargo is summarized in Table 10.2.8. Total of 6.4 million MT was estimated IWT cargo in 2020 with IWT shares of 17% for all the transport modes and 21 % on both the routes between Alexandria Port - the Greater Cairo and Damietta Port – the Greater Cairo (see Fig. 10.2.7).

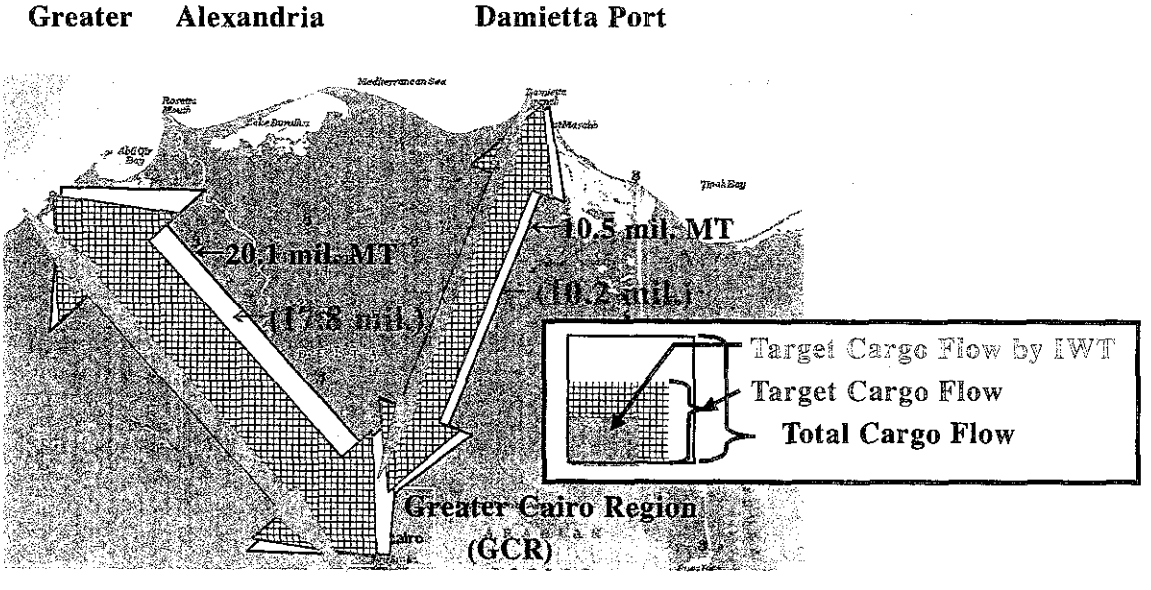


Fig. 10.2.7 Cargo Flows between Alex. and GCR, Damietta and GCR in 2020)

Table 10.2.8 Summary of the Traffic Allocated to IWT between the Egyptian Mediterranean Seaports and the River Ports in the Greater Cairo in the Overseas Trade Cargo

'000 MT

Cargo Item		Total Cargo of All Transport Modes		Cargo Volume Allocated to IWT (2010)	Allocation Share to IWTfor the Total (2010)	Total Cargo of All Transport Modes	Cargo Volume Allocated to IWT (2020)	Allocation Share to IWTfor the Total (2020)
		2000	2010			2020		
Alexandria Port	Conventional Cargo	8,703	9,899	1,763	18%	10,158	2,440	24%
	Containers (TEUs)	345	1,025	120	12%	1,025	240	23%
	Target Cargo Total	11,268	17,515	2,656	15%	17,774	4,225	24%
	Non-target Cargo Total	2,107	2,372	0	-	2,319	0	-
	Total	13,375	19,888	2,656	13%	20,094	4,225	21%
Damietta Port	Conventional Cargo	5,240	6,566	332	5%	6,253	761	12%
	Containers (TEUs)	29	123	18	15%	524	188	36%
	Target Cargo Total	5,454	7,479	465	6%	10,150	2,161	21%
	Non-target Cargo Total	822	367	0	-	363	0	-
	Total	6,277	7,846	465	6%	10,513	2,161	21%
Port Said Port	Conventional Cargo	625	1,022	0	0%	977	0	0%
	Containers (TEUs)	93	125	0	0%	482	0	0%
	Target Cargo Total	1,313	1,948	0	0%	4,557	0	0%
	Non-target Cargo Total	1,108	1,211	0	-	1,203	0	-
	Total	2,421	3,159	0	0%	5,760	0	0%
Total	Conventional Cargo	14,569	17,488	2,095	12%	17,388	3,200	18%
	Containers (TEUs)	466	1,272	138	11%	2,030	428	21%
	Target Cargo Total	18,035	26,943	3,120	12%	32,482	6,385	20%
	Non-target Cargo Total	4,037	3,950	0	-	3,885	0	-
	Total	22,072	30,893	3,120	10%	36,367	6,385	17%

2) Allocation of the Domestic Trade Cargo to IWT

The traffic of raw phosphate from Sibaya in the Upper Egypt to the fertilizer factories at Kafr El Zayat and Abu Zaabal Industrial Estates was considered to have the possibility of the modal shift to IWT from road or railway transport on the assumption that the following projects be implemented:

- Creation of the New Boulin Canal connected with Rasheed Branch
- Capital and maintenance dredging in the IW for the industrial estate at Kafr El Zayat
- Completion of the new lock currently under construction in Ismalia Canal located in

the middle from the canal entrance to fertilizer factory along the canal at Abu Zaabal.

- Installation of Navigation Aids enabling day and night navigation throughput the waterways including the Upper Nile

Under the above assumption, the share of IWT in the target years in raw phosphate transport and the traffic allocated to IWT were estimated. The estimated traffic of raw phosphate and other domestic trade cargo in the traditional pattern by route and commodity is shown in Table 10.2.9.

Table 10.2.9 Major Domestic Trade Cargoes Transported by IWT

Unit: '000 MT

Pattern	Cargo Item	From	To	Year		
				2000	2010	2020
Modal Shift	Raw Phosphate	Sibaya	Abu Zaabal	137	251	319
Modal Shift	Raw Phosphate	Sibaya	Kafr El Zayat	0	280	356
Traditional	Clay	Aswan in Upper Egypt	Tebbin/Shoubra in G. Cairo	55	108	108
Traditional	Stones	Samalout in Middle Egypt	Tebbin/Ather El Nabi in G. Cairo	510	625	625
Traditional	Molasses	Upper Egypt	Hawamdia in G. Cairo	318	418	519

3) Allocation of Cargoes Relating to the New Boulin Canal Project

In addition to the above-mentioned raw phosphate traffic (see the second row of Table 10.2.9), IWT cargo from/to factories at the Kafr El Zayat industrial estate on the assumption of the implementation of the New Boulin Canal Project (see Table 10.2.10).

Table 10.2.10 IWT Cargoes Generated form the New Boulin Canal Project

Unit: '000 MT

Cargo Item and Route	Modal Shift	2010	2020
Raw Phosphate from Sibaya	from Railway to IWT	280	356
Sulfur imported via Alexandria Port	from Road to IWT	103	131
Super Phosphate exported via Alexandria. Port	from Road to IWT	102	130
Grease imported via Alexandria. Port	from Road to IWT	26	30
Total		512	647

Chapter 11 Master Plan on Inland Waterway System in the Nile Delta for the year 2020

11.1 General

To achieve four objectives in the conceptual plan, the master plan identified existing problems of IWT system and individually examined the solutions or approaches for each problem.
Such improvement measures are considered according to basic strategies and major premises from the long term viewpoint.

The introduction of new-type barges and night navigation together with other measures are expected to facilitate a steady modal shift from road transport to IWT.

11.2 Basic Strategy and Major Premises

11.2.1 Existing Problem in IWT Sector

(1) Change in the Modal Shares of each Mode

It is presumed that the modal shares in Egypt have changed from 1980s to 2000 as follows:

Table 11.21 Change in the Modal Shares in Egypt

(Unit: 1,000 MT)

Year	Road	Railway	IWT	Total
1979	73,700 (88.7 %)	5,000 (6.1 %)	4,300 (5.2 %)	83,000 (100.0
1992	165,495 (92.8 %)	9,642 (5.4 %)	3,214 (1.8 %)	178,351 (100%)
2000	242,000 (94.5 %)	11,812 (4.6 %)	2,161 (0.8%)	256,000 (100%)

The total cargo net-flow by three modes (road, railway and IWT) increased by 3.1 times from 1979 to 2000, although the volume trans- ported by IWT fell by 50 % in the same period

(2) Existing Problems in the Present IWT sector

In the recent years, modal share of IWT sector has decreased during recent 20 years, so the Study identified the following five (5) problems of its depression in barge transport:

1) Insufficient Accessibility to Major Seaports

Handling cargo volumes at two major seaports (Greater Alexandria and Damietta Ports) have rapidly increased during 90s. However, IWT sector is behind road and railway sectors in the strengthening of accessibilities to such seaport as follows:

- Damietta/Cairo IW is the process of rehabilitation project even now.
- Alexandria/Cairo IW has not been improved except for some minor maintenance works.
- River transport between El Dekheila and Cairo is not possible.

2) Hindrance from Efficient-Transport and Transport Cost-Saving

At present, barge navigation is operated according to the daytime-based operational system. Therefore, it is considered that IWT has two major problems against other transport modes as follows:

- Time-competitiveness of IWT is seriously inferior to road and railway sectors.
- IWT can hinder the Egyptian whole transport system from efficient activities and smooth inter-modal transportation.

3) Shortcoming to Participate in Transport of Containers

Both public and private sectors attending to IWT have the following two disadvantages/ shortcomings in the field of the inland transport of containers from/to seaports:

- There are no public river port facilities to accommodate IWT of containers in GCR although its capital region generate and attract much of local containers in Egypt.
- A container barge has not yet been commissioned in the Delta area between seaports and GCR.

4) Coordination with Relevant Organization & Role-sharing between Public and Private Sectors

The following problems seem to hinder the advance of IWT sector from timely and efficient actions although Egyptian transport sector is changing in every aspect so rapidly:

- **Coordination and Close Connection with Relevant Organizations**

A significant feature of Egyptian IW is coping with both navigational use and utilization of water resources. To achieve both purposes, a good coordination with relevant organizations such as MWRI (Ministry of Water Resources & Irrigation) is vital.

- **Insufficient Framework for Timely Responds to Needs and Demands of IWT Market**

There are insufficient systems or framework to catch up needs of market, and insufficient public relations which announce achievements / advantages of IWT to the society.

5) Participations and Investment by Private Sector in IWT market

As described in above item 4), it is essential to encourage private sector in order to promote IWT market. It is vital for private operators to modernize and renovate an overage barge system, in order that cost-competitiveness should be improved by the saving in the transport-cost.

However, the drive to introduce larger-sized barges seems to be stagnant since 1960s. Prime reasons are as follows:

- Barge operators seem to hesitate to invest in barge building under the recession of the IWT market
- There are some physical constraints of IW infrastructures which can hinder larger-sized barges from safe navigation.

11.2.2 Basic Strategies in the Master Plan

In the master plan, the following strategies are formed to solve the existing problems of IWT.

No. 1	To avoid excessive investment in the improvement of IW facilities –To prioritize IWs (inland waterways)–
No. 2	To target specific commodities as the cargo to be transported by barges
No. 3	To improve related infrastructures by public sector
(1)	To strengthen accessibility to seaports: -To improve IWs' facilities-, -To establish the night navigation system-
(2)	To develop a new connection IW
(3)	To develop a public river port in GCR
No. 4	To enlarge the size of barges to the maximum extent that the physical conditions of improved IW facilities will permit -To increase the loading capacity-, -To enable barges navigate in the open sea area between El Dekh and Alexandria Port -
No. 5	To improve management and operation in IWT
(1)	To provide government programs to support IWT
(2)	To improve the managerial and operational system of RTA

11.2.3 Prioritized IWs

(1) Prioritized IWs by the year 2020

Among the first class IW connecting major seaports and Cairo Capital Region (GCR), the master plan will focus on the following two IWs.

These two IWs shape major water-borne transport axes in Egypt, and can be effectively used for mass-transport of specific cargoes.

- **Alexandria / Cairo IW (Beheiry and Nobaria Canals)**
- **Damietta / Cairo IW (Damietta Branch)**

In addition, the following new connection IW is also prioritized to supplement functions of Alex./Cairo IW.

- **A new canal** to connect Beheiry canal and Rosetta Branch **at Bolin**

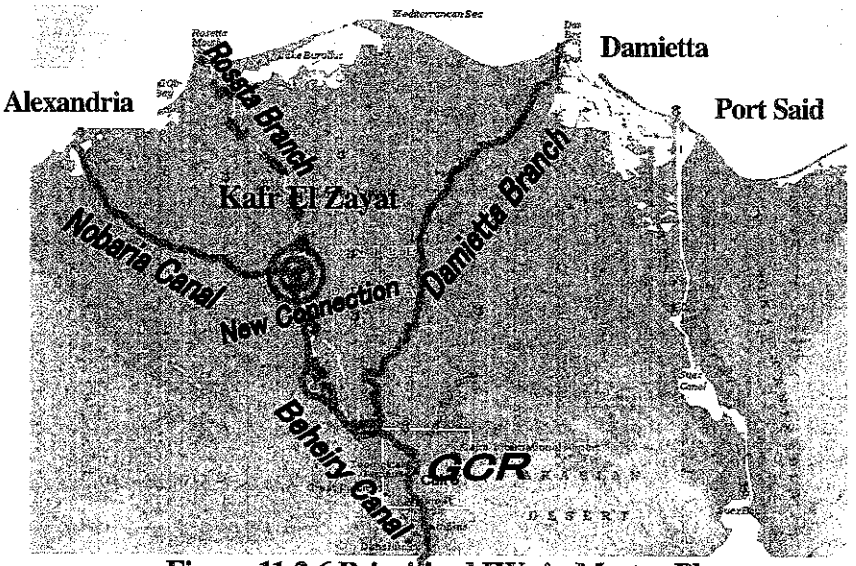


Figure 11.2.6 Prioritized IWs in Master Plan

(2) Consideration of Approaches to Promote IWT in the East Delta
- IWT Route between Port Said and GCR -

There are following reasons that it is still early to tackle the promotion of IWT in the East Delta until the target year of 2020.

- By 2020, the cargo via Port Said is forecasted to increase, however its cargo volume still expected to amounts to below one-five of that at Greater Alexandria Port.
  In terms of the viability of barge business, the IWT route between Port Said and GCR compare unfavorably with the other modes in the Eastern part of the Delta.
- IWT route between Port Said and GCR has some unsolved problems such as "less-competitiveness with other modes", "questionable cost-benefit effectiveness due to considerable investment and small traffic demand" and "barge navigation through the Suez Canal".

The Study recommended that further examination will be conducted to find out the desirable solutions for above problems. In the long-term beyond 2020, such further examination will include government policies on the use of the Suez Canal, the irrigation plan in the eastern part of the Delta, and the investment program of the nation as a whole.

11.2.4 Major Premises of the Master Plan

The master plan was formulated based on the following premises.

(1) Water Supply to IWs in the Delta Area

Present pattern of seasonal fluctuation in water depth would not appreciably change in future.

(2) Policies of the Egyptian Government

It was assumed that the government of Egypt places great emphasis on environmental preservation and energy conservation and is prepared to adopt the necessary policies to improve the present situation.

11.3.1 Infrastructure Improvements on Alexandria/Cairo IW

(1) General

The master plan focuses on Alexandria/Cairo IW as one of major river-borne transport axes in Egypt, however it has some problems to be solved in order to promote IWT activities. Among its problems, the first half of this section summarizes the following physical issues in view of barge navigation.

- Waterway such as cross-sections and alignment
- Locks
- Navigation aids
- Bridges and Ferry passing
- Obstacles on navigation

(2) Issues to be resolved

(2)-1Waterway (Cross-Sections and Alignment)

Water depths in this IW depend on water discharges and intakes with the pattern of seasonal fluctuation. In the master plan, its pattern would not appreciably change in future. Existing water depth conditions are estimated based on the past 60 monthly records of LWL and the sounding survey by the Study.

As a result, minimum water-depth is estimated at 1.8 m which is measured in a lot of cross-sections from Janakless Lock to Maritime (End) Lock, namely downstream stretches of Nobaria Canal can not meet the standard of 1st class IW. These stretches can hinder barges from smooth and safe navigation. Typical cross-sections in above 6 stretches are shown in Figure 11.3.1

➢ **Alignment of Alexandria/Cairo IW**

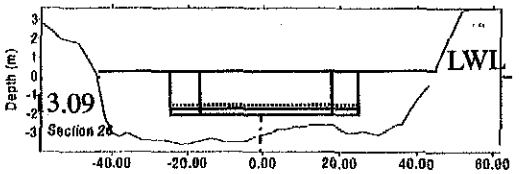
It is estimated that there are no hindrances of this IW's alignment such as bend radii except for a few points, because this IW is man-made canal and almost straight.

➢ **Bank Erosion in Alexandria/Cairo IW**

In this IW, it is pointed out that bank erosion/scouring is likely to occur due to navigation waves by barges. One of reasons for such erosions is insufficiency of width and depth of IW: narrower and shallower cross-sections are more affected by navigation wave.

- Stretch from Kanater (Entrance) Lock to Khataba Lock

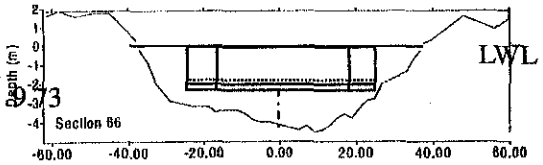
(Example of cross-section)



25 km from Kanater Lock

- Stretch from Khataba Lock to Bolin Lock

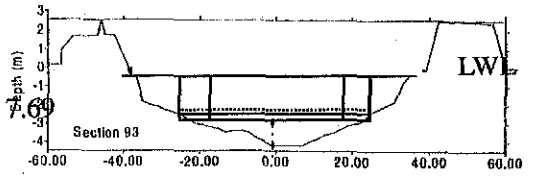
(Example of cross-section)



66 km from Kanater Lock

- Stretch from Bolin Lock to Busstan Lock

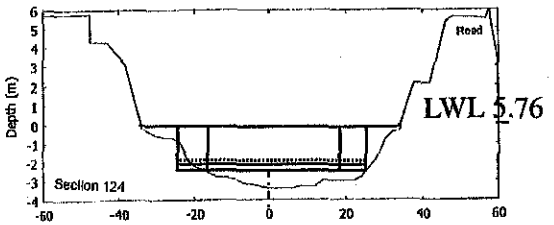
(Example of cross-section)



93 km from Kanater Lock

- Stretch from Busstan Lock to Janakless Lock

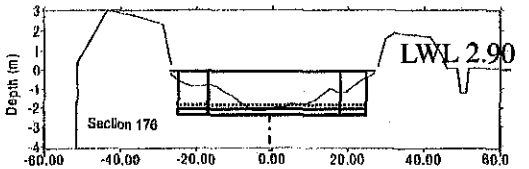
(Example of cross-section)



124 km from Kanater Lock

- Stretch from Janakless Lock to Nahda Lock

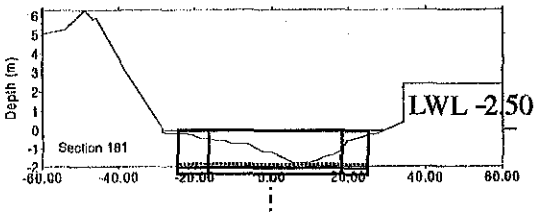
(Example of cross-section)



176 km from Kanater Lock

- Stretch from Nahda Lock to Maritime (End) Lock

(Example of cross-section)



181 km from Kanater Lock

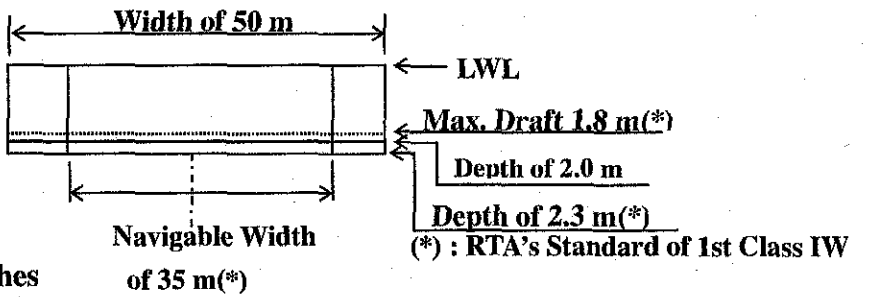


Figure 11.3.1 Examples of Typical Cross-Sections in each Stretches

(2)-2 Lock

- **Operation time of locks and the time needed for a barge's round trip**

Nowadays, the daytime-based operational system of IW is responsible for the long round-trip time of barge transport. Transport by barges can not match road transport due to its much longer transport-time.

- **Size (dimension) of locks**

All locks in this IW except of Alexandria Small Maritime Lock have basic dimensions of 16 m x 116m, which allow simultaneous accommodating two existing twin-units of barge or a new-type unit. To be accurate, the utilizable length of lock chamber to accommodate barges is limited to 102 m and its width is 16 m in this IW.

- **Maintenance and Repair of locks**

Inadequate maintenance and repair on lock gate may impose longer time of turn-around or serious interruption of barge transport operation. Most of the locks in the Cairo-Alexandria waterway have an electrical installation for their operation. But, in some cases, the locks gates can not be fully opened because of an existence of silt deposits, stones or debris which are not removed from the gates recesses properly and regularly..

(2)-3 Navigation Aids

At present, there are no navigation aids for assisting smooth and safe navigation in this IW. This circumstance hinders barges from safe navigation on bottlenecks such as shallow and narrow water areas, and obstructs night navigation in order to shorten transportation time by barges.

(2)-4 Bridges & Ferry Passing

The most of bridges along the Beheiry and Nobaria Canal are an overhead type having sufficient air clearance of 5 to 6 m. Alexandria port railway and road bridge which have only about 3.5 m of air clearance.

The navigable open space is limited to approximately 14 or 14.5 m because concrete fender structures are constructed around piers.

(3) Infrastructure Improvements on Alexandria/Cairo IW

(3)-1 Waterway (Cross-Sections and alignment)

- **The first consideration for dredging works**

In general, dredging works is effective measures for improvements of navigation way. However, in case of this Alexandria/Cairo IW, it is necessary to consider different factors from general navigation ways.

There is a strong possibility that large amount of dredging will have some effects on water-level control, and dredging work is not necessarily effective without increase in water flow into this IW.

As for dredging of Nobaria Canal, another issue is land acquisition which is required with large amount of excavation because along on this IW are variously used for cultivated land, road and

railway.

Therefore, the priorities of its dredging works are only given as follows:

- To remove existing bottlenecks on navigation by maintenance/rehabilitation dredging
- To secure safe and smooth navigation of new-type barge by dredging

➢ **Requirements for waterway facility (width, depth)**

In the master plan, requirements for IWs were examined based on the various standards, and determined taking account of natural conditions of IWs, barges operation methods and size of new-type barge.

As a result, the master plan proposes that required minimum width is 36 m in this IW (Alexandria/ Cairo IW).

- **Required Minimum Width of IW** : 3 or 4 times width of barge, namely 36 or 48meters in case of new-type barge

Here, this standard is applied with the following conditionality: one barge should slow-down and stop to enable barges to smoothly and safely navigate, when facing oncoming barges (see figure below). Barge operation methods as shown in below figure that are described in later section for detail.

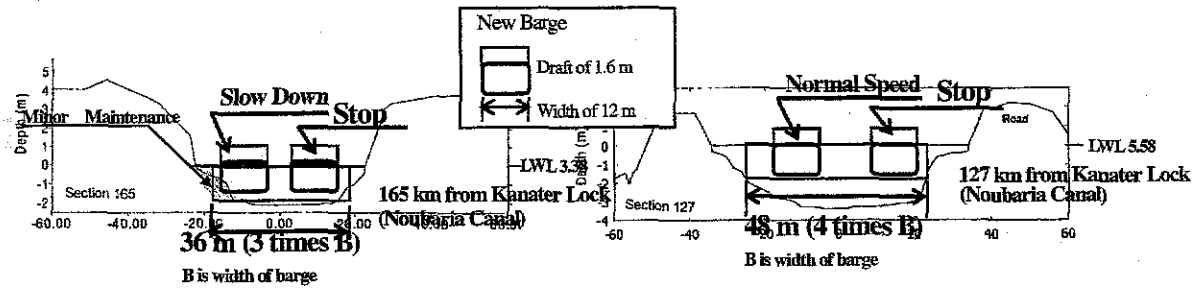


Figure 11.3.2. Required Minimum Width of Alex./Cairo IW and Barge Operation

- **Required Minimum Depth of IW** : 2.0 m, namely keel clearance is 40 cm in case of new type barge

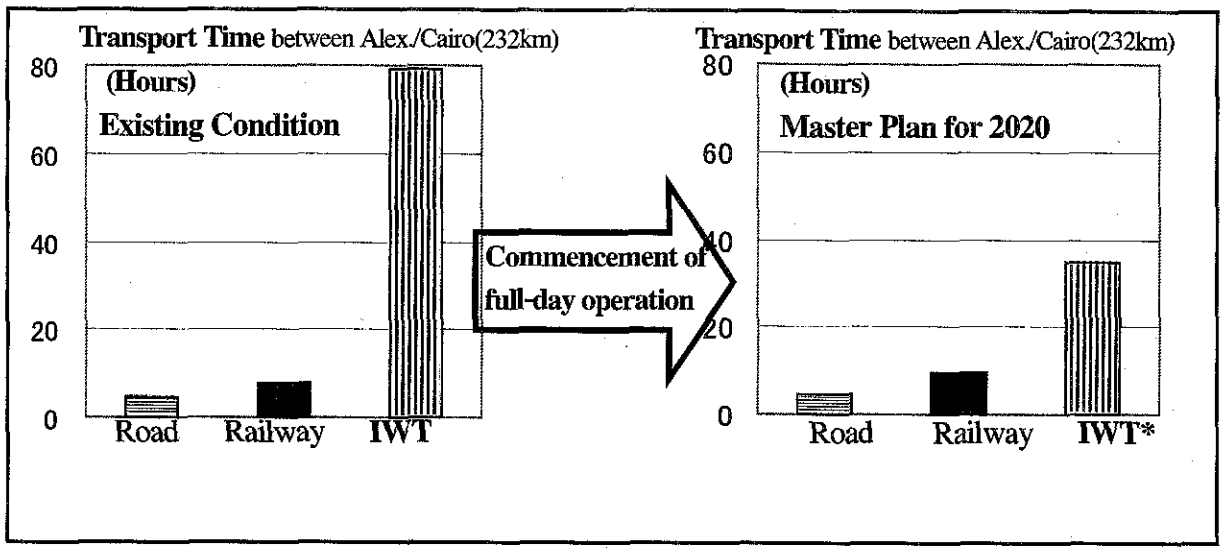
Namely, the master plan proposes that KC = 40 cm, target depth = 2.0 m and draft of new barge = 1.6 m, namely Depth/Draft Ratio = 1.25.

Therefore, maximum draft is 1.6 m corresponding to target depth of 2.0 m and afore-mentioned maximum beam of barges is 12 m comparing to canal width of 36 m.

(3)-2 Lock

➢ **24-hours operation of locks**

In the master plan, 24-hours operation of all locks in this IW is proposed.
This measure can drastically reduce the time needed for barge's round trip which will strengthen its competitiveness with road transport (see Figure below).



➢ **Extension of the End (Maritime) Lock at Alexandria Port**

"Big Maritime Lock" can hinder a high stacked barge from entering, due to the air clearance of only 3.5 m under bridge when the lock is filled with water. Meanwhile, Small Lock can not accommodate a large-sized barge, at present.

Therefore, offshore extension of Small Maleh (Small Maritime) lock should be envisaged so as to have the same standard size of lock. Big Maleh (Big Maritime) lock with insufficient length for open space of lock chamber.

(3)-3 Navigation Aids

To facilitate modal-shift to IWT, the installation of navigation aids should be adopted to cope with increase in barge traffic night and day from the point of view of navigational operation.
Summary of proposed number of navigational aids is listed in the later Chapter 13.

(3)-4 Bridge

If the nature or demand of future cargo necessitates more frequent barge passing or introducing new types of barges such as those of higher air draft or wider beam may require possible replacement of movable type of bridge to fixed overhead type with sufficient air clearance (6 m min.) and navigable width of opening (not less than 12 m navigable width) so that, from the point of view to cope with this future possible demand, bridges will never present any major problems for navigation.

11.3.2 New Connection Canal at Bolin

(1) General

Based on the Master Plan, the opening of waterway connections between Kafr El Zayet and the Beheiry-Nobaria canals near Bolin and rehabilitation of a part of the Nile Rosetta Branch should be taken into consideration in view of necessity in supply of material and delivery of product at Kafr El Zayet factory complex by means of possible inland waterway transportation. In the master plan, the regional transport demand forecast for this new canal is estimated at 0.6 million tons for 2020.

(2) Proposed Measure to be undertaken

The proposed project for this new connection between Beheiry/Nobaria canals junction at Bolin with Kafr El Zayat will compose of the following facilities:

- Opening navigable new canal between Beheiry/Nobaria canals junction and Rosetta Branch by deepening and widening existing spillway
- One (1) number of navigable lock together with aids for navigation
- One (1) number of barrage for water discharge
- Dredging for about 20 km stretch of Nile Rosetta branch till Kafr El Zayat

Simultaneously, it will be mandatory that, in line with opening new connection canal, a navigational channel dredging work is to be carried out along Rosetta Branch from the downstream end of new canal to Kafr El Zayat where industrial complex has developed. The proposed dredging should be executed to provide safe navigable fairway during the whole year, have a minimum dimension of:

Fairway Width: 35 m wide
Water Depth: 2.3 m water depth from LWL

11.3.3 Infrastructure Improvements on Damietta/Cairo IW

(1) General

The master plan places Damietta/Cairo IW as second major water-borne transport axis in Egypt, Egyptian government also put great emphasis on this IW. "Damietta Branch Rehabilitation Project" is presently being executed by RTA, to enable barges to navigate the Branch between Damietta Port and GCR.

(2) Issues to be considered

(2)-1 Waterway (Cross-Sections and alignment) and Obstacles on navigation

In Damietta Project, dredging of IW is designed at width of minimum 40 m, depth of 2.3 m. Consequently, it is estimated that width and water-depth are adequate for navigation of existing twin-units.

(2)-2 Locks

- **Operation time of locks and the time needed for a barge's round trip**

When RTA applies only the daytime-based operational system to new locks, it is almost certain that transport by barges can not match road transport due to its much longer transport-time

- **Size (dimension) of locks**

Damietta project for the construction of 2 new locks at Delta and Zifta on the Damietta branch is currently underway by the Ministry of Transport, River Transport Authority.
All locks can accommodate a new-type twin-unit or a new-type twin-unit, which represent neither obstacles nor constraints for inland waterway barge transportation.

- **Operational cycle-time of locks**

Introducing new system such as water filling system, operational cycle-time is assumed at ranging 0.5 to 0.75 hours.

(2)-3 Navigation Aids

Damietta Project includes installation of navigation aids and a part of installation has been made a contract. Therefore, appreciate facilities will be provided to cope with night navigation in future.

(2)-4 Bridges

It is reported that there are 13 bridges to cross the Branch with exclusion of two old bridges at Shirbin road and old Damietta road, both of which have a minimum span width of 9 m and are reported to be removed once short notice is given. Among others, 9 bridges are movable type including 4 bridges for railway lines. The minimum vertical clearance of fixed overhead type bridges is 8 m at new Damietta road bridge.

(3) Infrastructure Improvement on Damietta/Cairo Waterway (Damietta Branch)

(3)-1 Waterway (Cross-Sections and alignment)

It is estimated that minimum width of 40 m is appropriate to navigation of new wider barge.
Similarly, depth of 2.3 m is also sufficient for navigation of existing twin-units and new large-sized barge.

(3)-2 Locks

- **24-hours operation of locks**

In the master plan, 24-hours operation of all locks in this IW is proposed.
This measure can drastically reduce the time needed for barge's round trip which will strengthen its competitiveness with road transport.

(3)-3 Bridges

Unlike the Behiery-Nobaria Canals, the Damietta Branch waterway have many obsolete swing

bridges and sometime lifting bridges in railway lines. In particular, the railway bridges can be opened only during short periods, which prevent any efficient use of such canals as a transport connection.

If the nature or demand of future cargo necessitates more frequent barge passing or introducing new types of barges such as those of wider beam or higher air draft may require possible replacement of these movable type of bridge to fixed overhead type with sufficient air clearance (6 m min.) and navigable width of opening (2 openings of not less than 12 m wide) so that, from the point of view to cope with this future possible demand, bridges could never present any major problems for navigation.

11.3.4 River Port and Sea Port Facilities

(1) River Port

1) Scope of River Port in Master Plan

A public river port development plan is formulated in this study.

2) Constraints and Countermeasures

There are no public river port facilities in operation to accommodate IWT of general cargoes including containers. It is essential for the improvement of IWT to introduce other cargoes than private industrial cargoes. For IWT of containers and general conventional cargoes, the development of public river ports is strongly required. In particular, a new public river port in Greater Cairo should be developed urgently.

3) Required Public River Port Facilities for 2020

a) Functional Allotment between the Private River Ports and the Public River Ports

At present most IWT cargoes are dry and liquid bulk cargoes which are materials and products of the factories located along the Nile river and canals. These cargoes are unloaded and loaded at private river ports developed adjacent to the factories. Even in future, all IWT bulk cargoes are assumed to be handled basically at private river ports the same as the present.

Meanwhile, general cargoes, such as timber, cement, iron/steel products and container cargoes, are handled at public river ports, because these cargoes have many consignors and consignees. To realize IWT of containers and other general cargoes, a public river port in Greater Cairo should be developed by RTA.

Table 11.3.1 Functional Allotment between the Private River Ports and Public River Ports

	Present	2020	
	Private Port	Private Port	Public Port
Bulk Cargo (Dry Bulk, Liquid Bulk)	○	○	—
General Cargo (Timber, Cement, Iron/Steel Product)	—	—	○
Container Cargo	—	—	○

b) Cargo Throughput and Calling Barges of Public River Port in Greater Cairo

Cargo volumes and number of calling barges to be handled at a new public river port are shown in Table 11.3.2 -3.

Table 11.3.2 Cargo Throughput at New Public River Port in Greater Cairo in 2020

Unit: 000MT

		Alexandria	Dekheila	Damietta	Total
Total	General Cargo	484			570
	Containers (000 TEUs)	80	160	183	423

Table 11.3.3 Number of Calling Barges at New Public River Port in Greater Cairo in 2020

Cargo Item \ Sea Port		Cargo Volume per Barge	Greater Alexandria		Damietta	Total
			Alexandria	Dekheila		
Total	General Cargo	1,378 (MT/barge)	352	—	63	415
	Containers	96 (TEU/barge) (88 for Dekheila)	417	910	959	2,286

c) Port Facilities for Container Cargo

The required dimensions of the container berth are 115m in length and 1.8m in depth.

- **Handling Productivity**

The productivity target of the quay side crane at the new river port should be 15 boxes / hr / crane in 2020.

Productivity	15 boxes / crane / hour
Number of Cranes per Berth	2 cranes

- **Required Number of Berths**

Based on the above mentioned assumptions and other cargo handling conditions, the required number of container berths in 2020 is calculated to be two (2)

In addition to the loading/unloading berths, a berth for a waiting barge is required for navigation safety and efficient cargo handling. Therefore three (3) berths, whose total quay length is 345m, are required in 2020.

- Required Number of Container Stacking Ground Slots

Total required number of ground slots is shown in Table 11.3.4

Table 11.3.4 Total Required Number of Ground Slots

Container Status	Required Number of Ground Slots (TEU)
Inbound Container Stacking Slots	982
Outbound Container Stacking Slots	618
Empty Container Stacking Slots	485
Total Required Number of Ground Slots	2,085

- **Required Container Terminal Area**

The average required terminal area for one TEU ground slot is assumed to be 70 m2 and required container terminal area for 2,085 TEUs ground slots is estimated to be around 14.5 ha.

d) Port Facilities for General Cargo

The required dimensions of the general cargo berth are 115m in length and 1.8m in depth.

- **Handling Productivity**

Target handling productivities for each commodity are shown in Table 11.3.5.

Table 11.3.5 Commodity-wise Productivity of General Cargo Operation

Commodity	Package Style	Future Productivity (MT/hr/vessel)	Present Productivity at Alexandria Port (1997) (MT/hr/vessel)
Timber	Bundle	110	47
Cement	Bag	30	20
Iron/Steel Products	Bundle	70	39

- **Required Number of Berths**

Total required number of general cargo berths is calculated to be two (2)

In addition to the loading/unloading berths, a berth for a waiting barge is required for navigation safety and efficient cargo handling. Therefore three (3) berths, whose total quay length is 345m, are required in 2020.

- **Required Areas of Sheds and Open Yard**

Required areas of sheds and open yard are calculated at 2,000 m2 and 16,000 m2 respectively.

e) Cargo Handling Equipment for Container Cargoes

- **Quay Side Crane**

The required number of quay side movable cranes for handling containers is calculated at four (4) .

- **Rubber Tire Mounted Gantry Crane (RTGs)**

  Considering handling container volume and efficient use of land area, RTG system is proposed as the container handling system at the port.

  For quayside operation, one unit of RTGs will be adequate to work in combination with one quay side crane.

The total required number of RTGs is calculated at 11 units on the assumption that containers loading/unloading will be stacked once in the marshalling yard .

- **Prime Mover (Tractor / Trailer)**

The required number of yard tractor-trailers is calculated at 12 units.

f) Cargo Handling Equipment for General Cargo

- **Quay Side Crane**

The required number of truck cranes in total is 4 units (2 cranes x 2 berths).

- **Forklifts**

The required number of forklifts is calculated at 8 units.

g) Summary of required facilities and equipment in 2020

The required facilities and equipment for a public river port are summarized in the following table.

Table 11.3.6 Summary of required facilities and equipment in 2020

Container Terminal (Terminal Area : 14.5ha)	
Berth	3 Berths (Length 345m ; Depth 1.8m)
Container Yard (TEUs)	Ground Slots 2,085 TEUs (Inbound / Outbound 1,600 ; Empty 485)
Quay Side Equipment	Movable Crane [4]
Cargo Handling Equipment	RTG [11], Tractor and Trailer [12], etc
Other Facilities	CFS, Administration Building, Maintenance Shop, Gate, etc.
General Cargo Terminal (Terminal Area : 2.5ha)	
Berth	3 Berths (Length 345m ; Depth 1.8m)
Storage Facilities	Shed (2,000m2), Open Yard (16,000m2)
Quay Side Equipment	Truck Crane [4]
Cargo Handling Equipment	Forklift [8] etc.

Note: [number]