➢ **Development of a public river port in GCR**

- Master Plan for 2020

35. It is forecasted that IWT can gain a 23 % share of the target cargo flow between GCR and Alexandria or Damietta ports in 2020, which is equivalent to a cargo volume of 6.4 mil. MT (4.2 mil. MT flows between Alex. and Cairo, and the remainder 2.2 million MT is carried between Damietta/Cairo)

36. Among others, **container cargo** and **general cargo** are estimated at **428 thousand TEUs** and **555 thousand ton** respectively. Both commodities should be handled at a public river port which should be constructed by RTA.

37. To meet the above demand for handling container and general cargo, it is proposed to implement the construction project of a public river port in GCR. The required facilities and equipment for 2020 are summarized in the following table.

Table C-2 Required facilities of public river port for 2020

Container Terminal (Terminal Area;14.5ha)
3 Berths (length of 345 m , depth of 1.8m), Movable Crane [4]
General Cargo Terminal (Terminal Area;2.5ha)
3 Berths (length of 345 m , depth of 1.8m), Truck Crane [4]

- Short-term Development Plan for 2010

38. In the year 2010, **container cargo** and **general cargo,** are estimated at **138 thousand TEUs** and **263 thousand tons** respectively will be handled at a public river port in GCR.

39. The short-term development plan is prepared as a first-phase plan for the construction of a public river port. To handle above volume of container and general cargo, the required facilities and equipment for 2010 are summarized in the following table.

Table C-3 Required facilities of public river port in 2010

Container Terminal (Terminal Area;5ha)
2 Berths (length of 230 m , depth of 1.8m), Movable Crane [2]
General Cargo Terminal (Terminal Area;1.5ha)
2 Berths (length of 230 m , depth of 1.8m), Truck Crane [4]

- Site Development

40. It is proposed that the public river port be developed at Ather El Nabi because this site has advantages in terms of access to main roads in the core of Cairo City, and ease of establishing a

customs area. In addition, the site area is owned by RTA.

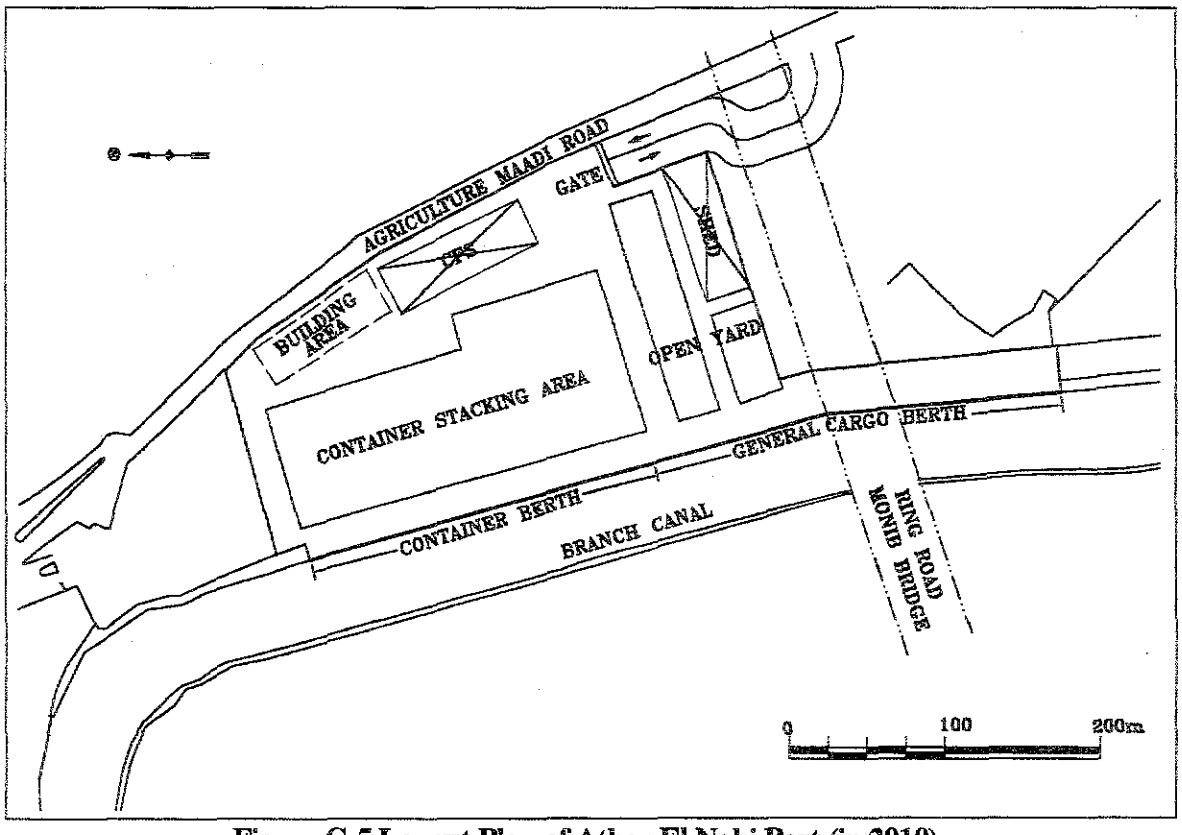


Figure C-5 Layout Plan of Ather El Nabi Port (in 2010)

- Terminal Operation

41. It is proposed that the "Concession method" is the best way for terminal operations to be conducted at Ather El Nabi Port.

42. The Study recommends the following role sharing for the facilities:

Table C-4 Role Sharing for River Port Facilities

Sector	Classification	Facilities
RTA	Infrastructure	Quay, Yard Pavement, Dredging Canal, Access Road, Utility Supply, Navigation Aids
Private Operator (Concessionaire)	Superstructure	Terminal Buildings, Fence and Gate, Cargo Handling Equipment

➢ **New Connection Canal at Bolin**

- Demand Forecast in the Short-term Development Plan

43. In the year of 2010, cargo volumes and barges (units) to pass through the proposed new Bolin lock in 2010 are estimated at 489 thousand MT, approx, 2,300 barges, respectively.

- Construction of New Connection Canal

44. Dimensions of required facilities are as follows:

Depth and width of a new canal; Water Depth is designed at 2.3 m under LWL.
Width of a new canal is designed at 35 m.

New Lock; It is proposed that designed chamber length to accommodate barges is more than 102 m, and its width is 17 m.

➢ **New Barge System**

45. The Study examined possible development of new barge system considering the present situation of barge system and potential future cargoes and transport routes by inland waterway. The following type and mode of transport are targeted:
   - Barge being capable of carrying larger unit load of containers or dry bulk per barge in view of transport economy
   - Coastal-going container cargo carrier barge for direct connection between Dikheila Port and Beheiry/Nobaria Canals

46. It is recommended that the single unit type of "self-propelled barge" is the most suitable for future type of barge to transport both container and bulk cargoes. It is proposed for the future to introduce a new type of barge under the following design concept:
   - Smaller design draft (d = 1.6 m) to suit all seasonable water draft available
   - Increase the length of barge unit (100 m) within the allowance of lock chamber size
   - Increase the beam of barge unit (B = 12 m) within the beam allowance for two way traffic under the proposed IW improvement of 36 m width

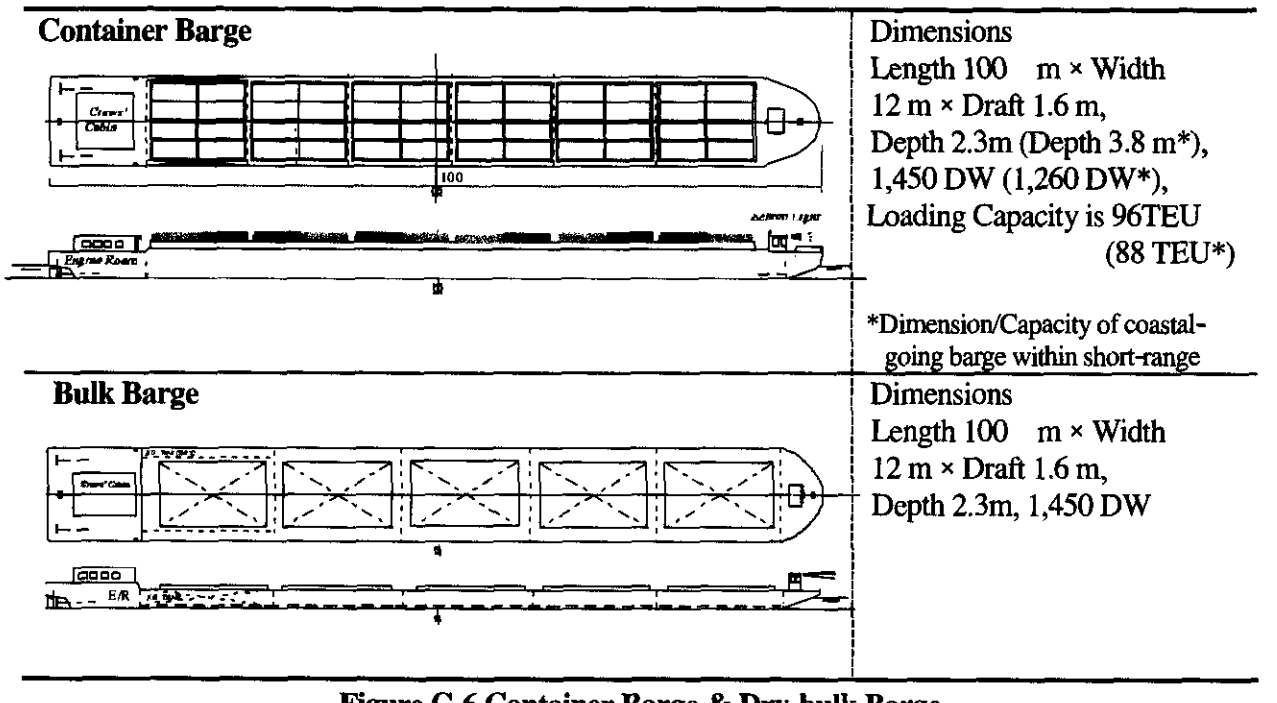


Figure C-6 Container Barge & Dry-bulk Barge

➢ **Improvement of Managerial and Operational System of RTA**

47. In the prioritized IWs viz. Nobaria, Beheiry Canal and Damietta Branch, there are 13 locks including those under construction, among them MWRI (Ministry of Water Resources and Irrigation) manages 3 Locks.
    To control these IWs in a uniform manner, it is recommended that the 3 locks now operated by MWRI should be placed under control of RTA.

48. It is also essential that all locks be equipped with communication systems to enable communication with passing barges.

49. To facilitate 24-hour lock operation, it is recommended that RTA should organize a three-shift system. It is also recommended that Headquarters' staff should be transferred to the lock offices of local branches in order that an additional 140 workers for a three-shift system could be assigned.

➢ **Project Cost**

50. The total project cost for the short-term development plan is estimated at 295 million LE as follows:

Table C-5 Project Cost (Unit:1,000 LE)

Project Component	Total Cost
A. Alexandria/Cairo IW Project	116,614
A1.Dredging & Bank Protection	31,636
A2.Procurement of Navigation Aids	21,497
A3.Alexandria Lock Extension	63,481
B. Cairo Public River Port Project	97,464
B1.River Port Construction	37,899
B2.Procurement of Equipment	59,565
C. New Bolin Connection Canal Project	81,218
Grand Total	295,296

51. The annual cost requirement for construction and equipment procurement with sub-divided costs is as follows:

Table C-6 Annual Cost Requirements

(Unit: 1,000L.E)

	Project Component	Total Cost	1st Year	2nd Year	3rd Year	4th Year	5th Year
A	**Alexandria/Cairo IW Project**						
	A1 Dreding & Bank Protection	31,636	1,406	856	27,884	1,490	0
	A2 Navigation Aids	21,497	0	219	20,197	1,081	0
	A3 Alexandria Maritime Lock Extention	63,481	1,619	141	58,547	3,174	0
B	**Public River Port Project**	97,464	2,081	22,775	67,848	4,760	0
	B1 River Port Terminal Construction	37,899	1,572	140	34,375	1,811	0
	B2 Procurement of Cargo Handling Equipme	59,565	509	22,635	33,473	2,949	0
C	**New Bolin Connection Canal Project**	81,218	3,001	333	31,320	42,669	3,894

Economic Evaluation and Financial Evaluation

➢ Economic Evaluation

52. Major benefits expected from proposed projects are described below.

a) Cost reduction by mass transportation and energy saving
b) Reduction of NO_2 exhaust by waterway transportation
c) Waterway transportation including those at night will prevent cargo theft, etc.
d) Less vibration during transport will prevent cargo damage, etc.

In the economic analysis, items from "a)" are considered to be countable in monetary benefits. Differences in the costs of other land transportation and IWT were sought and the result was deemed as benefits.

53. Results of Economic evaluation

Result of the calculation for EIRR, B/C ratio and NPV for each project are shown in the following table.

Table C-7 Results of Economic Analysis

Project	EIRR	B/C Ratio	NPV
(1) Alexandria-Cairo IWT Project	19.0	2.25	24,114
(2) Ather El Nabi Public Port	10.5	1.09	1,570
(3) New Bolin Canal Project	17.7	1.23	2,010

A project of which EIRR is more than 10% is generally considered economically feasible by considering the capital opportunity cost. The results of analysis for three projects all exceed 10% for EIRR and B/C ratio is larger than 1. Therefore, all projects in the Short Term Development Plan are considered feasible from the viewpoint of the national economy.

➢ Financial Evaluation

54. The Study conducted the financial analysis only in respect of the Public River Port Project.

The result of the calculations of FIRR of RTA is 6.2 %. FIRR of RTA exceeds the average rate of 4.9 % under a soft loan and the projects are thus financially feasible.

Environmental Consideration

➢ Beneficial Effects of the Projects

55. The most significant long-term environmental benefit of IWT with barges is its higher energy (fuel) efficiency associated with the reduction in the emission of GHG (greenhouse gases) and other air pollutants.

56. The unit emissions is defined as the quantity of GHG and other air pollutants emitted while carrying unit load of cargo to unit distance. The comparison of such unit emissions between all of the three modes are shown in Figure C-7.

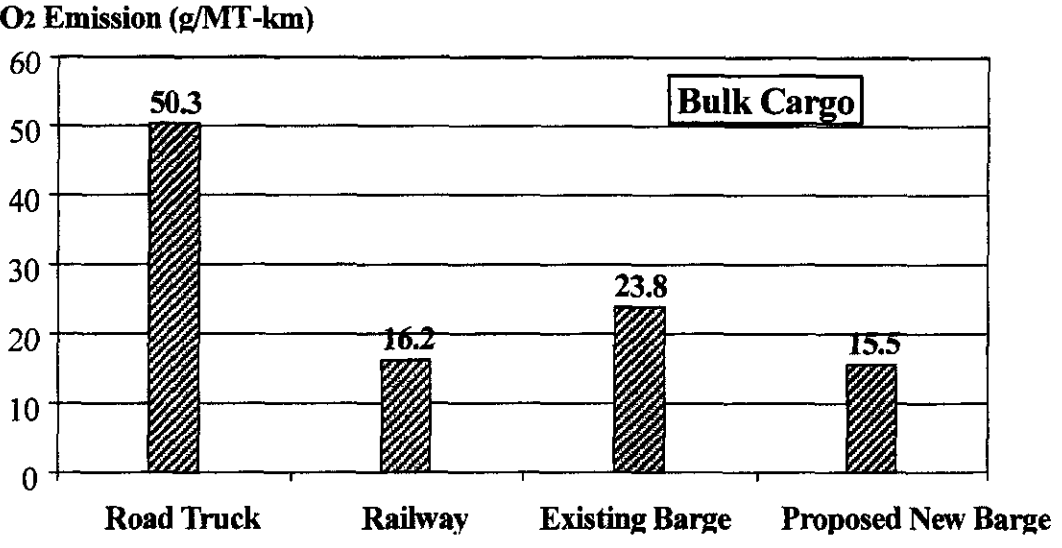


Figure C-7 Unit Emissions of GHG -Bulk Cargo Transportation-

As for bulk cargo transportation, above figure suggests that modal shift from trucks to a barge results in the decrease of CO_2 emissions by 1/2 to 2/3. The modal shift of container cargo will result in about the same effect.

57. Another beneficial effect of the projects is the decrease in the road traffic volume. In the demand forecast, IWT sector will have over 20 % share of the target cargo transportation between Alexandria/Cairo or Damietta/Cairo. Thus, there is a possibility of the decrease by 20 % in the land transportation, a greater part of which is the decrease in truck transportation of target cargo between above routes.

➢ **Adverse Effects of the Projects**

58. Nile River as well as IW network are the lifeline of Egypt providing the water for every beneficial use. The risk of dangerous cargo spillage and bilge waste (waste oil) from barges are considered as adverse effects on above water resources. Such potential adverse effects are evaluated as manageable due to the enhancement measures of navigational safety, the restriction on transport of dangerous cargo and other required measures.

Recommendations

Timely and Comprehensive Implementation

59. To materialize modal shift from road to IWT, the Study concluded that it is vital to improve time-competitiveness, cost-competitiveness against road (trucks) as well as to enhance its reliability . It is considered that all the measures will combine to facilitate a drastic modal shift from trucks to barges, thus the Study recommends to timely implement all the proposed projects/measures.

60. In case of implementing all the projects in Alexandria/Cairo IW, the Study recommends the following practical process:

- The dredging & bank protection works in Nobaria/Beheiry canal

To make transport by existing barges safer and more reliable, it is recommended to dredge and improve unsafe spots in Alexandra/Cairo IW immediately.

- The installation of navigation aids in Alexandra/Cairo IW

To enhance the time-competitiveness of IWT, it is recommended to provide navigation aids for assisting night navigation along this IW as soon as possible.

- The construction of Ather El Nabi river port

To make IWT more active, it is necessary to cultivate new markets such as container and general cargo. It is recommended to construct a new public river port for handling both commodities at Ather El Nabi.

- The extension work of the Small Maritime Lock at Alexandria Port

To further enhance the transportation efficiency, cost competitiveness of IWT, the study proposed the introduction of "large-sized single-unit" barges. It is also recommended to extend the Small Maritime Lock, in order that new barges will pass the lock safely.

Above infrastructure projects will be implemented by public sector such as RTA, on the other hand, "large-sized single-unit" barges will be introduced by private barge operators. Therefore, it is vital for both public and private sectors to coordinate with each other; for instance, building of new barges by private operators should be accompanied by the provision of required infrastructures and institutional programs to assist the private sectors.

61. As for New Bolin Connection Canal project, it is recommended that it be conducted concurrently with the improvements in the Nile mainstream such as dredging, navigation aids projects in the Middle/Upper Nile, because half of target cargo through this new canal is forecasted to be transported from Aswan to Bolin area.

Periodical Review of Development Plan

62. It is considered that a modal shift (choice) strongly depends on needs of customers/transport market, which are changing continuously and rapidly. Thus, the Study recommends to monitor IWT activities as well as demands/trend of the market. It is recommended that the development plan be reviewed and adjusted periodically on the basis of such monitoring.

To Secure Safety of Navigation

63. The Study proposed the minimum navigable width of 36 m in Alexandria/ Cairo IW.
Although the greater part of this IW is a man-made canal which has different natural conditions from river, proposed IW requirements (min. width=36 m, min. depth=2.0 m) are not necessarily sufficient for safe navigation as compared with the international standards.
Thus, it is vital for above IW improvements to combine with other measures to secure safe navigation

64. To recommend larger-sized barge at first trial in Egyptian IWT, the Study carefully examined measures to secure safety of navigation. The Study stressed that the introduction of a new larger-sized barge can only be successfully achieved if the Egyptian side makes every effort to overcome the particularity of the Egyptian IWs.
It is recommended to implement the following measures to overcome the physical constraints of the IWs.
    - To amend the existing sailing rules/regulations to cope with the commencement of night navigation, the introduction of larger-sized barges and other reforms of IWT sector.
      To strictly observe above amended rules/regulations
    - To improve or expand vocational training for barges' crews
    - To equip required devices on barges/locks such as communication tools, night navigation devices
    - To strengthen inspection of barges including hull/engine/equipment, qualifications and the complement of crews
    - To maintain IW facilities in a timely and comprehensively manner

Engineering Recommendations

65. In the preparatory stage of improvements of Alexandria/Cairo IW, it is recommended to conduct the following hydraulic studies or sounding survey
    - Survey and Sounding for at least 30 km long upstream section of Nahda Lock
    - Hydrological and Hydraulic Studies of Nobaria Canal

    It is also recommended to conduct above studies or survey in collaboration with the MWRI.

66. In the implementation stage of the extension of Small Maritime Lock, it is recommended to shorten the construction period as much as possible to avoid hindering barges traffic.
The study proposed the following procedure:
All the site works for extension of lock will be done within the dry-up area by temporary shield wall. Site construction work will decisively hamper the barge navigation at the adjacent Big Maritime lock and therefore due traffic control must be exercised during construction activities. It is estimated that a one year period will be required to complete the lock extension work.

67. In the implementation stage of the Bolin new canal project, it is recommended to maintain existing water discharge from Beheiry canal to Rosetta Branch during whole construction work period.
The study proposed the following procedure:
The new barrage will first be constructed. After completion of the new barrage, existing spillway facilities will be demolished and the present spillway will be diverted into a new waterway for the use of new barrage. New navigation lock construction will succeed after completion of the new barrage and will be carried out under a dry-up condition. Dry up work is also applied to the bank protection work and canal excavation as well.

Recommendations of EIA

68. The potentially contaminated dredged material of about 5000m^3 derived from the surface seabed layer of the maritime lock area (Alexandria Project) is recommended to be stored permanently in a designated nearby desert area. Beneficial use is recommended for the remainder of dredged and surplus excavated material. In particular, the surplus material derived in the Bolin area (Bolin Project) is amenable for brick making and new agricultural land development

Government's Inducement Measures for Promotion of Modal-shift

69. It is recommended that the government set up **"IWT Promotion Fund"** and offer soft loans (low-interest loans) to operators who wish to build new barges. When this fund is established, there is a strong possibility that barge operators will invest in shipbuilding even under the recession of the IWT market.
This requires a considerable sum of money at the beginning. However, loans provided from the fund will be repaid by borrowers in the long run, and the fund can be continuously operated.
It might also be possible to obtain funding from overseas countries or international aid agencies.

70. The Study concluded that GHG (greenhouse gases) emissions by road transport is about three times more than that by river transport.
To further protect the environment, it is vital for the government to take further countermeasures to control the increasing number of vehicles. For example the government could strengthen the current system as follows; ●Inspecting automobiles ●Certification system for garages for

automobiles ●Regulations against overloading of trucks ●Prohibition of transport of dangerous cargo

71. It is recommended that the government establish some kind of committee to coordinate the interests of related organizations. An "**IWT Promotion Coordination Committee**" is expected to adjust both navigational use and other utilization of water resources at the stages of policy/planning, decision making and implementation

    This committee should include the following members; **RTA** (River Transport Authority), **MOT** (Ministry of Transport), **MWRI** (Ministry of Water Resources and Irrigation), **MWRC** (National Water Research Center), **NRI** (Nile Research Institute) and **Ministry of Tourism** –

72. It is recommended to set up **"IWT Promotion Association"** composed of IWT related business groups. This association is expected to assist in public relations, finding a new market and other business promotion activities.

Improvement Plan of Managerial and Operational System of RTA

73. It is proposed that partial authority be transferred from Headquarter to Branch offices step by step in order to strengthen Branch functions.

74. It is proposed to introduce "MIS" system which will be necessary for RTA to record and analyses data of IW facilities, statistics of arrival/departure of barge.

75. It is desirable that RTA secure enough revenue to at least cover ordinary expenses. It is recommended that RTA examine the following tariff system to increase their revenue:
    -Land lease tariff-, -Canal entrance dues- and **-Navigation aids charge** –

76. RTA does not have enough capability to manage the proposed projects successfully. It is recommended to make up a capability building program for RTA immediately. Its program will indicate which of the field of IWT system is being aimed by the assistance, how the technical assistance is being implemented for RTA including Regional Institute for River Transport.

Establishment of an appropriate Maintenance & Repair Program

77. All the regular maintenance and repair works should be implemented based on defined work program. As regards maintenance of safe waterway in particular, regular sounding programs should be set up and carried out in bottleneck sections in order to check available water depths and to make plans of navigation aids/dredging works. Necessary spare parts for normally used equipment and machinery should be kept in sufficient number for periodical breakdown or replacement.

Chapter 1 Introduction

Egypt has been the economic center of Mediterranean Arab countries from ancient times. To achieve future economic growth, the Egyptian government is making an attempt to promote trade liberalization and expansion by fully utilizing its strategic location.

In the Nile Delta area, major seaports are playing paramount roles in coping with such growth in overseas trade. Under these circumstances, the most important task of inland transport is to provide economical and efficient accessibility from/to major seaports. Therefore, it is vitally important for the government of Egypt to prepare and implement appropriate strategies for improving the IWs (Inland Waterways) connecting the GCR (Greater Cairo Region) and major seaports to make use of these IWs for cargo transportation.

Inland waterway transport (IWT) is one part of the inland transport system. In general, IWT by river barges is more economical than road transport and also is friendlier to the environment. Therefore, Egyptian government has gradually strengthened IWT sector by utilizing its advantages. In spite of these advantages, cargo volumes and modal share of IWT have been declining.

Under these circumstances, the study team examined the primary factors in the underutilization of the IWT sector, and aimed at proposing ways to promote IWT.

Chapter 2 Socio-economic Conditions in Egypt

2.1 Population

The population of Egypt in 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 during the last two decades from 2.6% in 1981 to 1.8% in 2000.

Among the current total population of 63.8 million, the shares of population in Lower Egypt, Middle Egypt, Upper Egypt and Frontier account for 62.15%, 20.20%, 16.30% and 1.40%, respectively.

Population by Area in 2000

	('000)	(%)
Lower Egypt	39,652	62.15%
Middle Egypt	12,888	20.20%
Upper Egypt	10,399	16.30%
Frontier Total	893	1.40%
Grand Total	63,800	100.00%

2.2 Gross Domestic Product (GDP)

In the last decade from 1991-2000, the economy of Egypt showed steady growth with an average annual growth rate of 4.8% in GDP as a whole. As to GDPs by sector, services sector indicated the largest growth of 5.1% per annum in the same period, followed by industry (4.1%) and agriculture (3.2%). Among the industrial sector, the manufacturing sector showed a high growth of 6.4% in the same period.

2.3 Industrial Activities

The agriculture in Egypt highly depends on the River Nile. Owing to the Aswan High Dam and irrigation network, Egypt produces various crops throughout the year. The crops are categorized into so-called winter crops and summer crops differentiated in harvest season. In the year 2000, 6.6 million tons of wheat and 5.6 million tons of maize were produced respectively in Egypt, totaling 12.2 million tons, while approximately the same amount of wheat (7.1 million tons) and maize (5.2 million tons) were imported, indicating their self-sufficiency rate of around 50%.

Along with economic growth of Egypt in the last decade achieving annual growth rate of 4.8%, production of such manufacturing goods as cement, iron and steel products, fertilizer, foodstuffs, etc. has been increasing in the same period, indicating annual growth rates of 4.6% in cement, 5.7% in fertilizer and 5.9% in iron and steel products. On the other hand, being proportional to an increase in population and upgrading a living standard, the production of foodstuffs has been increasing, indicating annual growth rates of 3.7% in flour, and 5.1% in refined sugar. Those goods are also major imports or exports as a result of the balance of a large amount in demand and supply of each item; cement is major import cargo and fertilizer is major export cargo. In 1999/2000, the production of iron

ore reached 2.9 million tons, and fuel oil, butane gas and natural gas are reached 11.8 million tons, 0.5 million tons, 14.5 million tons in 1999/2000 respectively.

2.4 Foreign Trade

Major imported agricultural products are wheat and maize that amounted to 12.3 million tons in the year 2000 and were almost the same amount of their local productions in the same year in Egypt. On the other hand, major exported agricultural products are rice, potatoes, oranges and onion, totaling to 857,000 tons in 2000.

Major imported manufacturing products and raw materials for their manufacturing are cement, iron pellets, sawn timber, coal, iron/steel products, fertilizer, petroleum etc. On the other hand, major exported manufacturing products are petroleum and fertilizer. Among them, iron pellets are provided for the ironworks equipped with direct reduction furnaces located behind Dikheila Port. On the other hand, coal landed at the ports of Alexandria and Dikheila is provided for the ironworks equipped with blast furnaces located in Helwan.

As for the import trading partners of Egypt, European Union (EU) accounted for 1.78 billion US$, followed by United States (0.97 billion US$) and Asian countries (0.75 billion US$) in 2000/2001. As for the export partners, United States accounted for 0.67 billion US$, followed by European Union (0.35 billion US$) and Asian countries (0.21 billion US$) in 2000/2001.

Chapter 3 Natural Conditions

3.1 General

In order to provide the Study Team with study-related information, the data and information on natural conditions were collected in the 1st Field Work in Egypt. The required data and information were collected to the satisfaction in covering the area focused in this study and obtaining general understanding on natural conditions. These data and information are used to facilitate assigned tasks of the Study Team for developing master plan and short-term plan.

In addition, a series of site surveys such as topographic and bathymetric surveys along Upper River Nile and Beheiry/Nobaria Canals, and other survey including subsoil investigation, water and riverbed quality analysis at the proposed project sites was executed during the 1st Field Work in Egypt during a period from December 2001 to March 2002.

3.2 Geographical Conditions

The geographical region of Egypt may be divided into three major areas, i.e. Nile Valley and Delta, Eastern Desert and Western Desert areas. The areas focused in this study are Nile Valley and Delta, both areas geographically include the following regions.

1) Upper Egypt, the south of Aswan, which is a mountainous region in the weather regime of Sahara Desert,
2) Lower Egypt in the River Nile Delta where the River Nile forks into two major branches,
3) Suez Canal Zone that is extended from Suez Gulf to the Mediterranean Sea

3.3 Meteorological Conditions

Upper Nile and Nile Delta areas are characterized with hot desert climate with little raining while the north coastal area is mild and experienced a little rain in winter owing to the Mediterranean Sea weather regime. Unlike those changes recorded in Upper Nile and Nile Delta, the monthly humidity at coastal area is very high.

Data on fog occurrence were obtained at Meteorological Institute observation centers. The following are the record on fog occurrence at the area near existing canals in Nile Delta area.

Monthly Average Days of Fog Occurrence

Location	Jan	Feb	Mar	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Period
Khatatba	1.3	1.1	0.8	0.4	0.2	0.1	0	0	0	1.1	1.9	2.3	~1972
Damanhur	0.3	0.2	0.2	0.1	0.1	0	0	0	0	0.3	0.4	0.8	~1963
Damietta	0.2	0.1	0.1	0	0	0	0	0	0	0	0.2	0.1	~1961

Source: Meteorological Authority of Egypt Unit: Day

3.4 Oceanographic Conditions

According to the tide levels referred to Chart Datum Level (equal to Port Datum Level : DL ±0.00) in the Port of Alexandria, the tide characteristics in the port of Alexandria show a notable pattern of semi-diurnal tide variations with about 0.3 meters range of difference between mean high and low water levels as being generally most cases in the Mediterranean Sea as follows.

Tide Levels recorded in past 5 years in Alexandria Port (Jan 1994 – May 1998)

Highest Water Level for past 5 years period	+0.96 m
Mean Monthly Highest Water Level	+0.77 m
Mean High Water Level	+0.61 m
Mean Sea Water Level	+0.48 m
Mean Low Water Level	+0.34 m
Mean Monthly Lowest Water Level	+0.21 m
Lowest Water Level for past 5 years period	+0.04 m
Chart Datum Level (=Port Datum Level)	±0.00 m

The deepwater climate at the port of Alexandria is presented in the following Table. According to Harris in 1979, it has concluded that the influence of shoaling deduction on wave direction was not so much.

Deepwater Wave Height and Direction at Alexandria Port

Wave Height (m)	N-NE 339-069	E-SE 069-159	S-SW 159-249	W-NW 249-339	Total	%	Accumulated (%)
0.0-0.3	113	73	59	234	479	15.4	15.4
0.3-0.6	269	152	126	683	1230	39.6	55.0
0.6-1.2	132	120	80	530	862	27.7	82.7
1.2-1.8	48	42	46	181	317	10.2	92.9
1.8-2.1	19	11	24	86	140	4.5	97.4
2.1-2.7	3	3	7	27	40	1.3	98.7
2.7-3.3	2	0	2	18	22	0.7	99.4
3.3-3.6	0	0	1	7	8	0.3	99.6
3.6-4.8				3	3	0.1	99.7
4.8-5.7				2	2	0.1	99.8
5.7-6.6				0	0	0.0	99.8
6.6-7.5				1	1	0.0	99.8
7.5-9.6				5	5	0.2	100.0
TOTAL	586	401	345	1777	3109		
%	18.8	12.9	11.1	57.2	100.0		

Source: Transit of Inland Waterway Barges from El Dikheila to Alexandria prepared by Delft Hydraulics, May 1989

Further reference is made on wave height distribution on monthly, seasonally and yearly basis which was measured at the west of Alexandria Port during the period from 1992 to 1995 using an S4DW wave/current meters. This study indicates that:

- predominant wave directions are from N-W sector,
- waves from NNE and NE are limited in magnitude and occur primarily during summer season,
- maximum wave heights are 2.62m, 1.53m and 1.96m in winter, spring and summer-seasons respectively, and
- design wave characteristics are as follows:

Design Wave Characteristics at Alexandria Port

Return Period (year)	1	10	20	50
Ho (m)	3.4	5	6	6.8
T (sec)	6	8.5	10	15

3.5 Site Surveys conducted by the JICA Study Team

The Study Team carried out the following field surveys.

- Cross Sectional Sounding Survey at Upper River Nile between Asyut and Cairo
- Site Survey at Nobaria and Beheiry Canal Junction
- Site Survey along Nobaria and Beheiry Canals from Cairo to Alexandria
- Site Survey at & around Maritime Lock in the Port of Alexandria

(1) Cross Sectional Sounding Survey at the Upper River Nile

The cross sectional sounding survey was conducted at 30 locations within 330km in Upper River Nile between Cairo and Asyut. The 30 locations to be surveyed in this work were selected in cooperation with RTA based on identification of sites for deepening shallow water area by dredging in future in order to eliminate bottlenecks in waterways for navigation.

(2) Site Survey at Nobaria and Beheiry Canal Junction

A series of site investigation works was conducted along existing spillway at Bolin where the junction of Nobaria and Beheiry Canals is located. Topographic survey at the conjunction area of Nobaria and Beheiry Canals was carried out to obtain a topographic feature to cover the area of 250 m width and 2,000m length along 1.2 km long possible future canal which connects the existing canals with Rasheed Branch. Along future connection canal alignment, the subsoil investigation was carried out at three (3) onshore locations at the site.

(3) Field Survey along Nobaria and Beheiry Canals from Cairo to Alexandria

A series of site investigation works was conducted along Noboria and Beheiry Canals for about 200 km long from the entrance Delta Lock located on the outskirt of Cairo till the end of canals in

Alexandria. Canal cross sectional survey and water depth sounding along Nobaria and Beheiry Canals was carried out to obtain a 120 m wide cross sectional feature of canal with water depth measurements at 200 locations in an approximately 1 km interval for the whole area of 200 km long canal.

(4) Site Survey at & around Maritime Lock in the Port of Alexandria

A series of site investigation works was conducted at the maritime lock in Alexandria Port. Topographic survey at and around Maritime Lock in the port of Alexandria was carried out to obtain a topographic feature along existing Maritime Lock to cover the area of 200 m wide and 500m long. The subsoil investigation was also carried out at one (1) onshore and two (2) offshore locations near existing maritime lock.

Chapter 4 Present Conditions of Transportation in Egypt

4.1 Waterborne Cargo Traffic

4.1.1 Sea Port Cargo Traffic

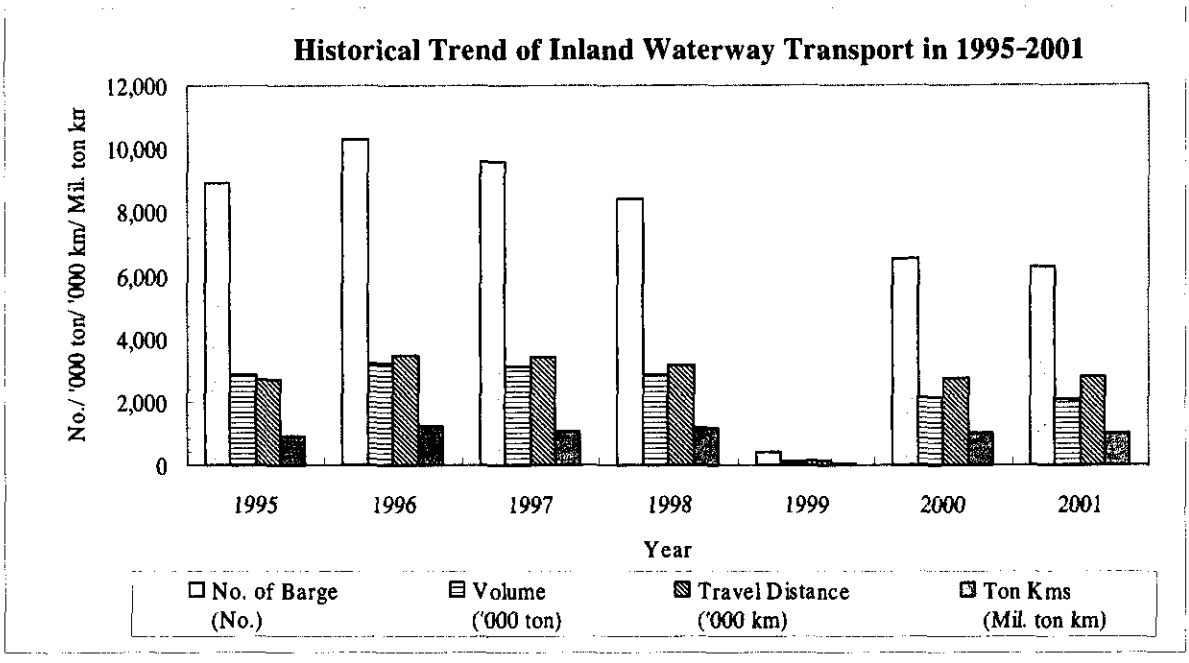
There are five principal ports in Egypt, viz. Alexandria Port (including Dekheila Port), Damietta Port, Port Said Port, Suez Port and Safaga Port. In 2000, 48.0 million tons of local cargo passed through those ports in total, indicating an annual increase rate of 4.4% on average in the last decade. In the same year, the volume of dry bulk cargo including cereals accounted for 46.9%, followed by general cargoes including container (38.2%) and liquid bulk (14.9%). The volume of cereals, mostly wheat and maize, is 12.3 million tons in the same year, approximately one fourth of the total port cargo in Egypt, indicating an annual highest increase rate of 8.5% in the last decade. In the same period, container cargo achieved the highest annual increase rate of 12.2% on average among individual cargo items.

Among the above five principal ports in Egypt, Alexandria port is the largest port in cargo volume, accounting for 58.6% of the total of the five principal ports (excluding transit cargo) in 2000, followed by Damietta port (18.0%), Red Sea ports (Suez port and Safaga port: 17.5%) and Port Said port (5.8%). In Damietta port, the volume of cereals accounted for 45.5% of the total in the same year.

4.1.2 Inland Waterway Cargo Traffic

In 2001, 2.1 million MT of cargo was transported by the inland waterway in total. In the same year, the major cargoes transported by this mode are stones and molasses and their ratios are 25.29% and 19.77% respectively among all commodities. Petroleum products and phosphate follow these materials and their ratios are 14.01% and 13.01% respectively.

Total transport distance and average transport distance by inland waterway in the same year is 2.8 million km and 447 km respectively.



4.2 Railway and Road Cargo Traffic

In 2000, 11.8 million tons of cargo was transported by railway in total. In the same year, the volume of the cargo of manufacture materials accounted for 43.8%, and was composed of mostly dry bulk cargoes such as iron ore, coal, limestone and coke. The volume of agricultural cargo accounted for 17.0%, mostly cereals (wheat). Petroleum, construction materials and manufacture products accounted for 9.8%, 9.6% and 8.6%, respectively. Average transport distance by railway in the same year is 331km.

According to the data on annual average daily traffic by road in 2000, Totally 717 thousand tons of cargo was transported by road in average daily traffic. Considering the traffic through the permanent station, Cairo-Banha route is the most frequent route and it is 7.69% of all traffic.

Volume of Cargoes Transported by Railway in 2000

Unit: '000 MT

Cargo Item		Volume (MT)	Share	Ton-Km	Average Distance (Km)
Manufacture Materials	Iron Ore	1,957	16.6%	685,805,323	350
	Coal	1,568	13.3%	418,326,538	267
	Limestone	548	4.6%	147,526,175	269
	Coke	483	4.1%	126,850,928	263
	Clay	296	2.5%	278,910,000	942
	Raw Phosphate	319	2.7%	246,661,450	773
	Total	5,172	43.8%	1,904,080,413	368
Agricultural Products	Cereals (wheat)	1,573	13.3%	441,698,665	281
	Sugar Cane	231	2.0%	11,779,500	51
	Raw Sugar	209	1.8%	101,756,783	487
	Total	2,013	17.0%	555,234,948	276
Petroleum		1,162	9.8%	632,269,676	544
Construction Materials	Stone - Basalt	944	8.0%	93,994,500	100
	Gravel	189	1.6%	26,396,480	139
	Total	1,133	9.6%	120,390,980	106
Manufacture Products	Steel Sheets	356	3.0%	48,590,213	136
	Fertilizers (Kema-Quos)	324	2.7%	126,236,137	389
	Cement w/o Sale Tax	191	1.6%	41,252,950	216
	Railway Rails	146	1.2%	23,462,168	161
	Total	1,018	8.6%	239,541,467	235
Containers	Empty Containers, Caravans	323	2.7%	75,743,550	234
	Loaded Containers	243	2.1%	103,489,600	427
	Total	566	4.8%	179,233,150	317
Water		257	2.2%	66,900,935	260
Others		491	4.2%	206,800,911	421
Grand Total		11,812	100.0%	3,904,452,480	331

Source: Transport Planning Authority, Ministry of Transport

Annual Average Daily Traffic by Road in 2000

	Station No.	Location (From)	Location (To)	Annual Traffic	Ratio	Rank
Permanent Station	1	Cairo	Ismailia	20,290	2.83%	9
	2	Damanhour	Tanta	26,448	3.69%	4
	3	Giza	Beni Suef	10,349	1.44%	27
	4	Cairo	Suez	10,962	1.53%	25
	5	Ismailia	Abu Hammad	8,367	1.17%	33
	6	Tanta	Quweisna	25,156	3.51%	5
	7	Bilbeis	Abu Zaabal	10,109	1.41%	29
	9	Talkha	El Mahalla El Kubra	17,528	2.44%	12
	10	Cairo	Banha	55,163	7.69%	1
	11	Mansoura	Mit Ghamr	17,404	2.43%	13
	12	Cairo	Alexandria	17,886	2.49%	11
	13	Giza	Al Faiyum	7,416	1.03%	41
	14	El Minya	Assute	4,065	0.57%	49
	15	Alexandria	Damanhour	37,317	5.20%	3
Temporary Station	100	Sohag	Nag Hammadi	5,027	0.70%	46
	101	Isna	Idfu	3,353	0.47%	54
	102	Zagazig	Mit Ghamr	8,782	1.22%	32
	103	Ismailia	Suez	7,913	1.10%	38
	104	Belbes	Abbassa	5,526	0.77%	45
	105	Zagazig	Belbeis	13,234	1.84%	19
	106	Zagazig	Abu Hammad	10,473	1.46%	26
	107	Damietta	Port Said	7,854	1.09%	39
	108	Zagazig	El Sinbillawein	11,068	1.54%	24
	109	Benha	Minya El Qamh	7,947	1.11%	36
	110	Kafr Shukr	Mit Ghamr	19,411	2.71%	10
	111	Quweisna	Benha	42,193	5.88%	2
	112	Quweisna	Shibin El Koam	12,977	1.81%	20
	113	Tanta	Zefta	9,016	1.26%	30
	114	Tanta	Shibin El Koam	7,938	1.11%	37
	115	El Qanatir	El Bagour	11,284	1.57%	23
	116	Sinbillawein	Kafr Saqr	6,490	0.90%	44
	117	Aga	El Mansoura	17,045	2.38%	14
	118	Talkha	Sherbin	16,755	2.33%	16
	119	Bilqas	Biyala	4,805	0.67%	48
	120	Kafr El Sheikh	El Mahalla El Kubra	4,895	0.68%	47
	121	Tanta	El Mahalla El Kubra	22,634	3.15%	6
	122	Tanta	Kafr El Sheikh	6,938	0.97%	43
	123	Disouq	Damanhour	8,329	1.16%	34
	124	Giza	El Khatatba	17,036	2.37%	15
	125	Abu El Matameer	Alexandria	21,042	2.93%	8
	126	Giza	El Aiyat	21,532	3.00%	7
	127	Helwan	El Saff	12,047	1.68%	22
	128	El Fayoum	Beni Suef	3,631	0.51%	51
	129	Kuraimat	Ras Zafarana	655	0.09%	58
	130	Beni Suef	El Minya	8,914	1.24%	31
	131	Assute	El Kharga	7,254	1.01%	42
	132	Assute	Sohag	7,792	1.09%	40
	133	El Agamy	Marsa Matrouh	14,145	1.97%	18
	134	El Qattameya	Ras Zafarana	10,297	1.43%	28
	135	Qena	Safaga	2,329	0.32%	55
	136	El Khatatba	El Qanatir	7,999	1.11%	35
	137	El Qantara	El Areesh	3,963	0.55%	50
	138	Tunnel	El Qantara	1,110	0.15%	57
	139	Tunnel	Nuweiba	1,649	0.23%	56
	140	Tunnel	Sant Katrin	3,558	0.50%	52
	141	Beni Suef	Kuraimat	3,448	0.48%	53
	142	Damietta	Shirbin	16,595	2.31%	17
	143	Port Said	Ismailia	12,233	1.70%	21
Total				717,576	100.00%	

Source: General Authority for Roads & Bridges and land Transport

4.3 Inter-modal and Multi-modal Transport by Major Commodity in Egypt

4.3.1 Inter-modal Transport and Modal Split in Inland Transport in Overseas Trade Cargo

Among five principal port in Egypt, Alexandria Port is the largest port in the volume of cargo followed by Damietta. The volume of cargo handled by the two ports accounted for over three quarters (76.6%) of the total in Egyptian seaports in 2000. Both Alexandria Port and Damietta Port have barge basins connected with canals having accesses to the River Nile. Barge transport by inland waterway from/to Damietta Port, however, has not been operated since the opening of the port in the mid of 1980s due to the shallowness in the Damietta Branch.

The overseas trade cargo that passed through Alexandria Port (including Dekheila Port) in the same year is 28.7 million tons in volume adding up 23.4 million tons in imports and 5.3 million tons in exports. As to modal split in the inland transport, 435,000 tons was transported by inland waterway (by barges).

Modal Split in Inland Transport of Overseas Trade Cargo via Alexandria Port in 2000

Unit: '000 MT

	Cargo Item	Volume		Railway		IWT		Road	
Import	Container	3,781	16.2%	0	0.0%	0	0.0%	3,781	100.0%
	Wheat	3,587	15.4%	64	1.8%	10	0.3%	3,513	97.9%
	Maize	3,370	14.4%	0	0.0%	0	0.0%	3,370	100.0%
	Iron Pellets	3,222	13.8%	-	-	-	-	-	-
	Timber	1,946	8.3%	0	0.0%	0	0.0%	1,946	100.0%
	Coal	1,691	7.2%	1,619	95.7%	72	4.3%	0	0.0%
	Petroleum	1,397	6.0%	-	-	-	-	-	-
	Cement	939	4.0%	0	0.0%	0	0.0%	939	100.0%
	Oil and grease	546	2.3%	-	-	-	-	-	-
	Others	2,879	12.3%	-	-	104	-	-	-
	Total	23,357	100.0%	-	-	186	-	-	-
Export	Petroleum	2,533	47.7%	-	-	-	-	-	-
	Container	1,254	23.6%	0	0.0%	0	0.0%	1,254	100.0%
	Molasses	370	7.0%	0	0.0%	154	41.6%	216	58.4%
	Fertilizer	311	5.9%	0	0.0%	-	0.0%	311	100.0%
	Coke	523	9.8%	429	82.1%	94	17.9%	0	0.0%
	Others	316	15.8%	-	-	0	-	-	-
	Total	5,306	100.0%	-	-	248	-	-	-
Grand Total		28,663	-	-	-	434	1.7%	-	-

Source: Analyzed by the JICA Study Team based on data from the Ministry of Transport and RTA

Modal Split in Inland Transport of Overseas Trade Cargo via Damietta Port in 2000

Unit: '000 MT

	Cargo Item	Volume		Railway		IWT		Road	
Import	Cement	1,891	25.1%	0	0.0%	0	0.0%	1,891	100.0%
	Wheat	1,799	23.9%	1,150	63.9%	0	0.0%	649	36.1%
	Maize	1,707	22.7%	0	0.0%	0	0.0%	1,707	100.0%
	Timber	457	6.1%	0	0.0%	0	0.0%	457	100.0%
	Container	439	5.8%	0	0.0%	0	0.0%	439	100.0%
	Iron/Steel	312	4.2%	0	0.0%	0	0.0%	312	100.0%
	Petroleum	131	1.7%	-	-	-	-	-	-
	Others	785	10.4%	-	-	-	-	-	-
	Total	7,521	100.0%	-	-	-	-	-	-
Export	Container	278	22.4%	0	0.0%	0	0.0%	278	100.0%
	Fertilizer	371	30.0%	0	0.0%	0	0.0%	371	100.0%
	Molasses	53	4.3%	0	0.0%	0	0.0%	53	100.0%
	Iron/Steel	141	11.4%	-	-	-	-	-	-
	Others	396	31.9%	-	-	-	-	-	-
	Total	1,240	100.0%	-	-	0	0.0%	-	-
Grand Total		8,761				0	0.0%		

Source: Analyzed by the JICA Study Team based on data from the Ministry of Transport and RTA

4.3.2 Inter-regional and Intra-regional Traffic in Domestic Trade Cargo

There is no statistics of commodity-wise origins-destinations traffic by road in domestic trade cargo different from railways or inland waterways.

Excluding rice, major agriculture production distributions are mostly proportional to the population distribution expressed in percentage by governorate. Thus, supply of these local products to the local market seems to generate intra-regional traffic and the shortage or excess to local demand is balanced by import or export via seaports. But, such intra-regional cargo traffic is likely to be mostly by road traffic.

As to major local manufacturing products such as cement, fertilizer and iron/steel products, O/D characteristics of intra-regional cargo traffic for individual cargoes are determined by the respective factories location. Modal split indicates predominant road transport except for iron ore transport by railway and much less transport by inland waterway.

In railway transport, stones are major cargo, totaling 1.5 million tons in 2000 while stones are ranked the first in the volume of inter-regional traffic by IWT in 2000, accounting for 612,660 tons (28.35% of IWT total).

Chapter 5 Environmental Condition in and around Inland Water Transport

5.1 General

The inland waterway transport (IWT) area and its vicinity in Egypt is confined to the fertile Nile riverine area to the south of the (Nile) Delta area and its two branches, the Rosetta and Damietta, and the network of irrigation and navigation canals crisscrossing the Delta area. Since Nile River is the principal water source and hence the lifeline of Egypt almost the entire population centers, including the greater Cairo Metropolitan area and the port city of Alexandria, as well as agricultural, commercial, industrial and institutional developments are concentrated in the IWT area and its vicinity.

Moreover, in addition to the fresh waters of the Nile River and its irrigation/navigation canals, the Delta area boasts a number of saline coastal lakes and wetlands. Major coastal lakes cum wetlands are Lake Maryut, Lake Idku, Lake Burullus and Lake Manzala, all located along the Mediterranean coast. Accordingly the Nile Delta area has a diverse and peculiar aquatic ecology composed of intrinsic network of lotic and lentic water systems of both fresh and saline waters.

5.2 Environmental Laws and Regulations

(1) General laws and regulations

A comprehensive national environmental law known as Law for the Environment was enacted by Presidential Decree in 1994, which is also referred to as Law No.4/1994. A detailed executive regulations for this Law No.4/1994 was promulgated by the Prime Ministers` Decree in 1995 (Prime Ministers` Decree No.338/1995).

The Law No.4/1994 established the basic frame for national environmental conservation and management. Moreover, this law (No.4/1994) established EEAA (Egyptian Environmental Affairs Agency) as the principal governmental authority for national environmental protection and management under the Prime Ministers` cabinet.

(2) Environmental impact assessment (EIA) regulations

The Article 19 of Law No.4/1994 stipulates the conduct of EIA by the competent authority or licensing authority concerned to the project development. Moreover the subsequent Article 20 mandates the submission of EIA reports to EEAA for evaluation.

The Prime Ministers` Decree No.338/1995 specifies the project activities subjected to EIA, which include development projects located along the Nile River, its branches and main canals. Accordingly EIA studies were conducted for the two significant projects of this master plan that could be referred to in Chapter 15.

5.3 Environmental Quality

5.3.1 Nile River Water Quality

The Nile river water quality has been monitored so far two times in February 1999 and in November 1999-February 2000 under the Environmental Monitoring Training Project (EMTP) of JICA that was initiated as 5-year cooperation project with EEAA in 1997.

In overall, the water quality monitoring results indicated no severe pollution in Nile River in its reaches in Greater Cairo area. Still, progressing water quality deterioration in the Nile Delta reaches of Rosetta and Damietta was noted. The cause of significant pollution level in these Delta reaches is attributed to disposal of improperly treated wastewater consequent to a variety of anthropogenic uses including intense agriculture.

5.3.2 Ambient Air Quality

Two long-term ambient air quality monitoring programs, one that targets the whole country while the other Greater Cairo area are ongoing by EEAA since 1997. The whole country program has established the ambient air quality monitoring system for the industrial and population centers of the whole country. The other program has, as one of its components, ambient air quality monitoring stations in the Greater Cairo area that also included monitoring of lead in airborne particulate matter (PM).

Based on the recent air quality monitoring results of both of the above programs, in overall, it became evident that there is very significant air pollution in Greater Cairo area, in particular with respect to CO (carbon monoxide) and NO_2 (nitrogen dioxide), attributed principally to vehicular traffic. Moreover, lead in PM is identified as the other significant air pollutant attributed to smelter industry. In fact PM itself is identified as a very significant air pollutant, though its high prevalence should be at least partly attributed to natural arid climatic condition.

5.4 Field Survey on Environmental Condition

5.4.1 Introduction

The field survey on environmental condition was conducted two times, once each during the master plan and short-term development plan study stages. Both field surveys targeted water quality including waterbed material (sediments) aspects. Major target areas of both field surveys were the Nubaria Canal Martime Lock reaches of Alexandria Port, including the coastal waters of the port, and the fresh waters of Boulin area in the Nile Delta area. The fresh waters of Boulin area covered the Beheri canal,

Nubaria canal, Boulin canal and Rosetta-Nile River, all located around the trilateral junction of these three canals of Beheri, Nubaria and Boulin.

In fact these two major target areas are project areas and their vicinity of the short-term development plan of the master plan, namely, Alexandria Project Area and Boulin Project Area. The water and sediment quality of these two project areas as determined by these two field survey results are summarized below.

5.4.2 Water Quality

The water quality analysis results clearly indicated significant water pollution in and around the Alexandria Project area, in particular Maryut Lake. Water quality deterioration of Maryut Lake is attributed principally to the discharge of domestic, industrial and other wastes of Alexandria City. In fact this Alexandria city originated waste is a very significant cause of overall water environmental degradation of the entire project area, including the coastal waters of the port.

Unlike the Alexandria Project area, on a comparative basis, there is no significant water quality deterioration in all of the fresh water bodies around the Boulin Project area. Nevertheless, considering the high dilution potential of Nile River and the river and its major canals being the lifeline of Egypt, the water quality results still indicated significant pollution for a fresh water body having multiple beneficial uses. Accordingly, it is important to limit any further increase in pollution load runoff into the fresh water bodies of Nile River and its canals so as to ensure their continued beneficial uses.

5.4.3 Sediment Quality

Based on the analysis results of sediment quality, the coastal seabed material of the Alexandria Project Area is assessed as significantly contaminated with respect to some heavy metallic elements. Accordingly, the seabed surface layer of dredged material consequent to the execution of the Alexandria Project shall be subjected to controlled management measures.

Nevertheless, the river and canal bed material of the fresh water bodies of Rosetta-Nile and the associated canals of Bolin Project Area is assessed as not contaminated and hence dredged material consequent to the execution of the project need not requires any specific controlled management measures. In fact the dredged material is assessed as amenable for beneficial uses of brick making and new agricultural land development.

Chapter 6 Present Conditions of the Inland Water Transport System

6.1 General

RTA has been made all possible effort to develop waterways network. In Section 6.2, the present situation of Inland Waterway Network is summarized. Section 6.3 summarizes physical conditions including engineering aspects.

Needless to say, it is river ports and river transport fleet that inevitably sustain the Inland Waterway Transport (IWT). Concerning river ports (inland ports), the ports are divided into public ports which are developed and owned by RTA, and private ports. Facilities of these ports and the present situation of cargo handling operation are summarized in Section 6.4. With regard to river transport fleet, in Section 6.5, existing barge system in Egyptian inland waterways is outlined.

6.2 Inland Waterway Network

RTA has jurisdiction over the designation of the navigable waterways stipulated in laws. As for the designation, the following classification will be applied and are categorized into 1st, 2nd and 3rd class navigation waterway (see below table).

Classification	Requirements of physical aspects
1st class waterway	1) The River Nile and it's two branches (Damietta and Rosetta Branch) ● The air clearness on the lowest water level under bridges not less than 13 m ● The width of the navigable cross-section not less than 35 m or two navigable lanes with each one width is 12 m. ● The maximum draft 1.8 m ● The minimum water depth 2.5 m 2) The navigational waterways which are as following: 2)-1 El BEheiry/El Nobaria canal (Cairo to Alexandria) 2)-2 Ismaelia canal ● The air clearness on the water level under bridges not lessthan 6 m (excluding movable bridges) ● The width of the navigable cross-section not less than 35 m or two navigable lanes with each one width is 12 m. ● The maximum draft 1.8 m ● The minimum water depth 2.5 m
2nd class waterway	● The air clearness on the water level under bridges not less than 3.5 m ● The width of the navigable cross-section not less than 12 m ● The maximum draft 1.5 m ● The minimum water depth 1.8 m
3rd class waterway	● The air clearness on the water level under bridges not less than 3.5 m ● The width of the navigable cross-section not less than 8 m ● The maximum draft 1 m ● The minimum water depth 1.25 m

First class waterways are composed of the Nile mainstream, its two major branches and major canals which connect Greater Cairo Region (GCR) with major seaports at the Mediterranean Sea.

6.3 Existing Waterway Facilities and Their Physical Conditions

6.3.1 General

As described in afore-mentioned section, it is extensive waterways infrastructure that RTA should control and manage in order to secure efficient river transportation. In this network of great length, each IW (inland waterway) has served various purposes such as irrigation, water supply for drinking/industry and navigational uses.

In Egyptian IW, water level control is essential to efficient irrigational and other water-uses. Barrages and navigational locks have controlled such water level.

A typical layout of a barrage (or a weir) and a navigational lock is illustrated in Figure 6.3.1. The differences in water level between up- and down-stream are controlled by water discharge from each barrage, so that a navigational lock is also indispensable in order to keep such differences in water level

Along Alexandria/Cairo IW, cross-sectional profile is mostly trapezoidal with the bank of natural soil surfacing (clay or silty sand). In a certain part of its bank, just up- and down-stream side of each lock or bridge where the sloped masonry bank protection is neatly provided, and a small part of bank has other type protection with sheet-pile (see photos below).

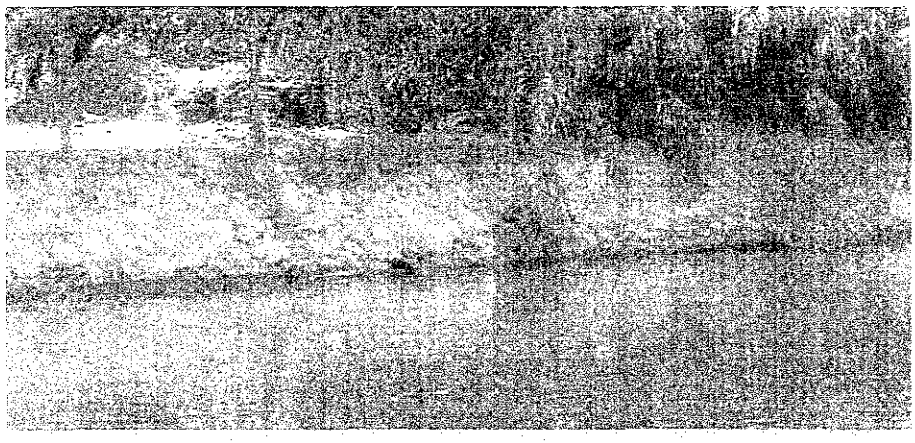


Photo 6.3.2 (1) Masonry Bank Protection (In the Vicinity of Khatatba Lock, Beheiry Canal)

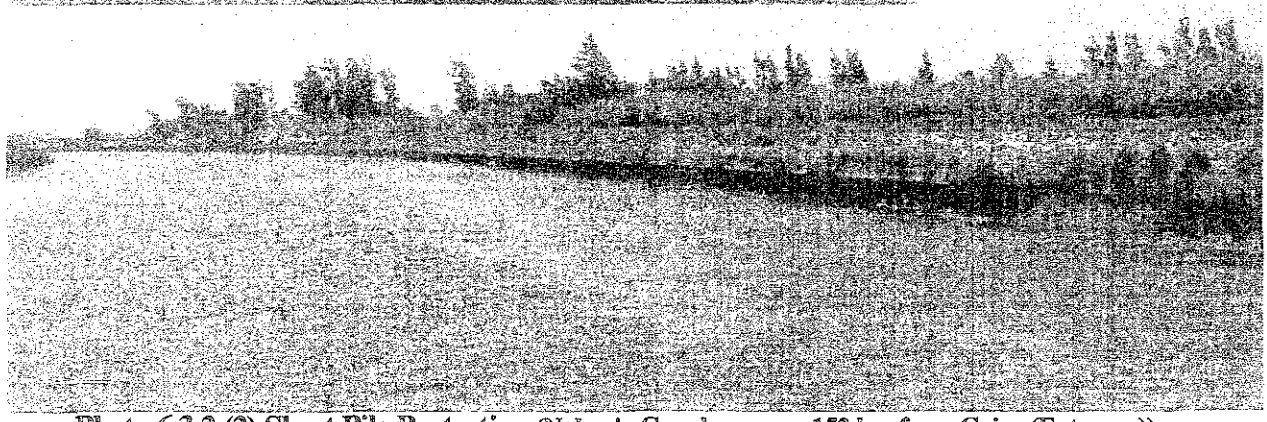


Photo 6.3.2 (2) Sheet Pile Protection (Nobaria Canal, approx. 152 km from Cairo (Entrance))

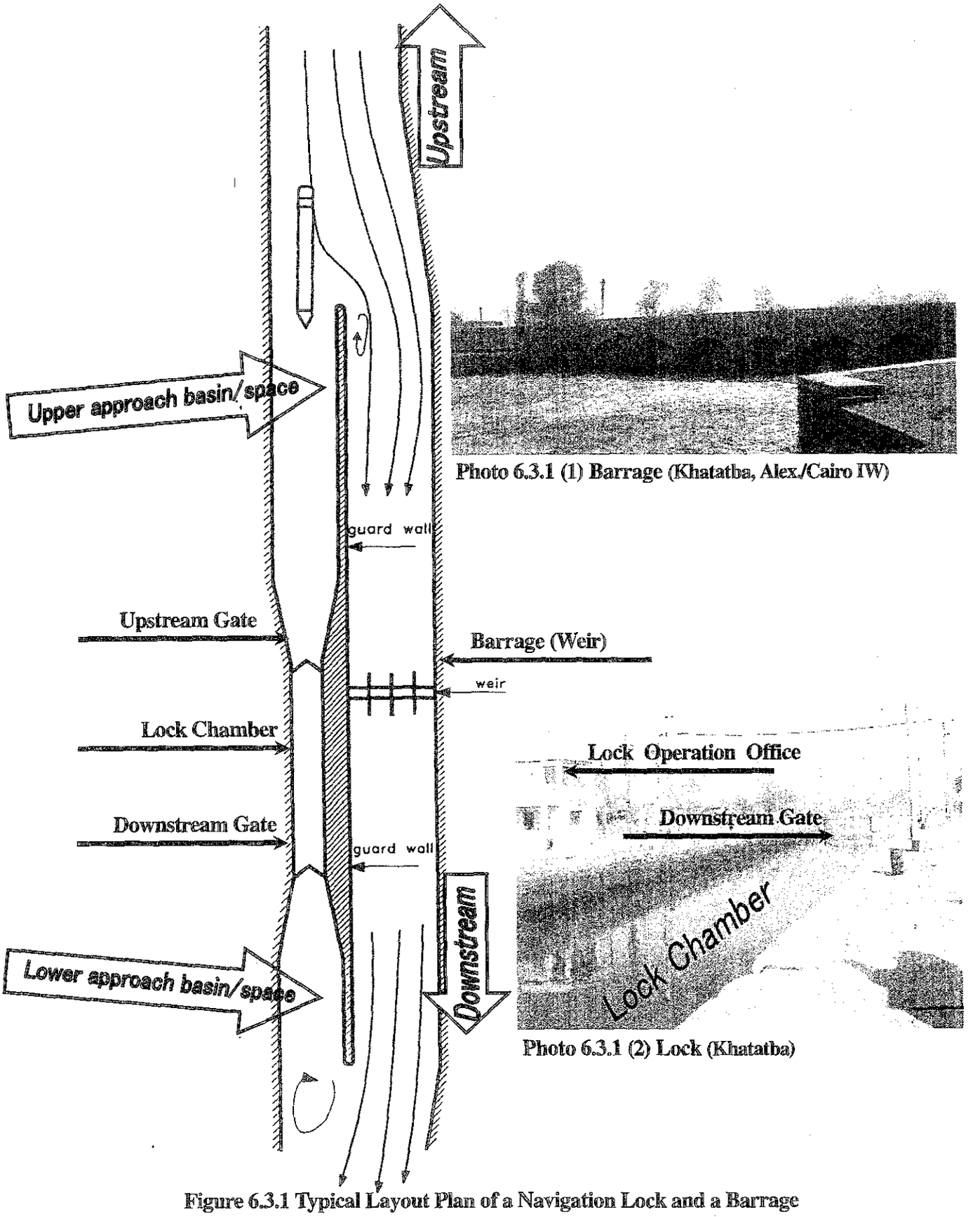


Photo 6.3.1 (1) Barrage (Khatatba, Alex./Cairo IW)

Photo 6.3.1 (2) Lock (Khatatba)

Figure 6.3.1 Typical Layout Plan of a Navigation Lock and a Barrage

6.3.2 Beheiry/Nobaria Canal (Cairo/Alexandria Waterway)

Beheiry/Nobaria Canal consists of total 6 stretches which are divided by locks. There are 2 stretches on the Beheiry Canal (from Entrance Lock up to Bolin Lock via Kahatba Lock), 3 stretches on the Nobaria Canal (from Bolin Lock to Nahda Lock through Busstan and Janakless Locks) and a last stretch of about 20 km through Lake Maryut connecting to Alexandria seaport.

(1) Nile Mainstream (from Ather El Nabi Port to the entrance of Beheiry Canal)

In the Capital region, Ather El Nabi Port is one of the major potential ports which should be expected to develop as container terminal by RTA (see Section 6.4). The Length of stretch is about 40 km between Ather El Nabi Port and the entrance of Beheiry Canal. This stretch is an important section which should be utilized for not only calling at Ather El Nabi but also calling other major ports such as Helwan, Tebbin and other upstream ports (see Figure 6.3.4). However, there are few studies/surveys on this stretch (El Nabi up to Beheiry Canal). So that there are no recent bathymetric charts of the Delta except for some local/limited surveys which are carried out for some civil works such as bank protection, repair of bridges.

(2) Beheiry Canal (from Entrance Lock up to Bolin Lock)

This canal is composed of 2 stretches (Entrance Lock / Khatatba Lock and Khatatba / Bolin Lock), and total length of 82 km runs almost parallel to the Rosetta Branch. The navigable width on this canal varies between 40 m - 50 m, 60 m in case of summer season. There are several spillways connecting Beheiry Canal with Rosetta Branch, in order to secure more efficient water distribution. RTA has an idea of deepening/widening a spillway for new connecting navigable waterway which has possible to strengthen the existing navigation way network

(3) Nobaria Canal (from Bolin Lock to End (Maritime) Lock)

Nobaria Canal is composed of 4 stretches which are divided by 5 locks (Bolin/ Busstan/ Janakless / Nahda / Maritime Lock), and total length is about 120 km. This canal has been constructed about 25 years ago under the "Nasser Administration". The major purpose of this construction work was to connect Alexandria with Cairo through Beheiry Canal. Nowadays, this canal contributes to not only river transport activity but also irrigation for West Delta.

(4) Navigation Lock on Cairo/Alexandria waterway

With regard to navigation locks on this waterway, detailed information are described in the main report. As shown by tables in the main parts of the Study report, eight locks (from entrance lock at Delta barrage to Small/Big Maleh (Maritime) Lock) are located on Beheiry/Nobaria Canal. Dimensions of these locks except for Small Maleh Lock are appropriate for the standard for 1st waterway.

Namely, 7 locks except small one has 116 m long and 16 m wide, then the chamber of small one is only 55 m in length and 16 m in width. The dimensions of last one can only permit passing single barge. In case of passing two-units convoy, a convoy will have difficulties in re-coupling at up and

down-stream of this lock.

Table 6.3.1 Locks along Beheiry and Nobaria Canals

No	Canal/Lock	Distance (Km)	Dimensions (m)			Depth* (m)	Year of Construction	Barrage
			Length	Height	Width			
	Beheiry Canal							
1	Qunatar Lock	0	116	n.a.	16	1.07	1976	Yes
2	Khatatba Lock	42	116	5	16	0.58	1976	Yes
	Nobaria Canal							
3	Bolien Lock	82/0	116	n.a.	16	0.37	1974	Yes
4	El Bostan	28	116	n.a	16	0.14	1974	Yes
5	Janaklis	61	116	n.a	16	0.19	1974	Yes
6	El Nahda	101	116	9	16	5.44	1974	None
7	Maritime Lock							
	Small Maleh	120	55**	n.a.	16	2.5 – 3.0	1974	None
	Big Maleh	120	116	n.a.	16	2.5 – 3.0	1974	None

* : Depth indicates average retaining height of water between up- and downstream of lock based on the data of water levels in the last 5 years

**: The site measurement indicates the length of lock chamber is some 66 m.

Source: RTA

6.3.3 Damietta Branch (Cairo/Damietta Waterway)

The Damietta Branch is at present not navigable over longer periods. However, this branch has been regarded as a potential navigation line which forms major axis in the Delta. From the latter half for 1980's, several studies were carried out and made the recommendation for improvement / rehabilitation works of the branch in order to link Greater Cairo Metropolitan with new seaport of Damietta. In the same time, the construction work for connection canal including a barge's basin was commenced by Damietta Port Authority (DPA), and this construction work has been completed with grain silos and belt conveyer system for inland barges.

On the other hand, the Faraskour Lock was constructed in 1986 by Italy grant. Damietta Branch rehabilitation / improvement Project is under construction based on this revised discharge condition.

(2) Physical Conditions of Damietta Branch

The maximum velocity in the reach Delta to Zefta under un-dredged conditions is in the range of 1.3 m/sec, the minimum is around 0.1 m/sec. After the dredged condition, the maximum velocity in this reach reduces to 1.2 m/sec and the minimum velocity remains almost unchanged.

(2)-1 River Section between Delta and Zefta Barrages

On this stretch the river frequently changes its course and width due to meanders, and generally flows a north and north-eastern direction. Twelve larger islands ranging in length between 600 and 2000 m are existent on this route. The width of the river generally changes between 100 m and 300

m.

(2)-2 River Section between Zefta Barrages and Faraskour Lock

On downstream of Zefta, the river continues to meander towards north up to Samannud from where the course is predominantly north-east. The length between Zifta Barrage and Fraskour Dam is about 134 km. Four large islands of 700 to 2000 m length are located in the lower part of this river section only. There exists one sharp of about 300 m radius in the narrow river section and one of 250 m radius in the wide river section. All other bend radii vary between 400 and 900 m and generally more.

(2)-3 Section to Damietta seaport

The final section to Damieeta port is via aforementioned man-made canal constructed in the 80's. This canal is reported to have water depth of about 4 m, and canal width at bottom is 40 m.

(2)-4 Navigational Constraints

Before the commencement of Damietta Branch improvement/rehabilitation project, navigational constraints of this branch were pointed out as following.

-inadequate depth of the downstream sill levels at Old Delta and Old Zefta locks and consequently inadequate water depths for navigation for the most time of a year,

-inadequate water depth for navigation, and locally undefined navigation routes during longer periods of the year, especially in the stretches between Delta Barrage and downstream of Benha, and between Zifta Barrage and downstream of El Mansoura. In these sections, shoals and shallow water depth can be observed particularly in straight river sections and in transitions between the bends.

(3) Damietta Branch Rehabilitation Project

The rehabilitation works for Damietta branch under the construction contract for civil works, hydraulic steel structures, electrical and mechanical works and dredging works is carried out with a budget of L.E 200 million and the opening of the upgraded waterway is expected at the completion of new Delta Lock in late 2003 according latest information given by RTA.

The scope of works comprises of the following:

1) River Regulation Works
2) New Navigation Lock at Delta Barrage
3) New Navigation Lock at Zifta Barrage
4) New Navigation Lock and Barrage at El Mansoura
5) Hydraulic Steel Structures and Equipment

After completion of the above rehabilitation works, Damietta Branch waterway will provide a minimum channel width of 40 m.

(4) Section of Navigation Waterway

Dredging program and navigable waterway alignment are designed at width of minimum 40 m, depth of 2.3 m. The width of waterway is varied on basis of other conditions such as bend radii, and water depth is set up taking account of some clearances which can permits passing barge's draht of 1.80 m. These designs make it possible to navigate full loaded twin-type units from Damietta seaport up to Cairo Capital region

(5) Locks, Navigation Aids and Bridges

(Lock)

At present, there are 3 old locks along the Damietta Branch. Old Delta Barrage Lock is 12 m wide and 80 m long while the Dam Lock and the Zifta Barrage Lock are both 12 m wide and 64 m long. Faraskour New dam lock has dimensions of 132 m length and 16 m width. The rehabilitation project for the construction of 2 new locks and dredging of a navigation channel on the Damietta branch is currently underway by the Ministry of Transport, River Transport Authority. After the completion of these locks, new locks provide 120 m usable lock chamber by 17 m wide. All locks are capable of accommodating 4 barges of 55m by 7.5 m or two sets of twin-units of max. 110 m by 7.5 m each

(Bridge)

It is reported that there are 13 bridges to cross the Branch except for old bridges which are scheduled to remove at short notice once new one is completed. Among others, 9 bridges are movable (swing) type. The minimum navigable width and vertical air clearance is 17 m and 8 m respectively in near future once old bridges shall be removed.

6.3.4 Ismailia Canal (Cairo/Ismailia – Port Said Waterway)

(1) General

This canal is located on the east area of the Nile River and flowing in the north-eastern part in the Delta. Total length of approximately 128 km connects the capital region of Cairo with Ismairia city through El Temsah Lake up to Suez Canal .

This canal is at present not navigable from 1960's. However, the canal is has been considered as a potential navigation line which forms major axis in the East Delta. From the latter half f or 1990's, technical assistance studies of the African Development Bank (AfDB) were completed by French consultant (well known as "Two Canal Study") . Physical conditions of this canal are summarized as below, these data are mainly quoted from these "Two Canal Study" and in addition to recent information.

(2) Section of Canal

The Scope of "Two Canal Study" dealt with the stretch of 28 km to 128.6 km (end of Ismailia). According to RTA, the former stretch (from 0 km to 28 km) has wide and deep enough for barge navigation and could fulfill the requirement of 1st class waterway.

The remainder stretch (from 28 km to 128 km) is composed of two reaches as following.

- From 28 km to 111.4 km before 10 km upstream of Ismailia City.
  This section is continuously improved (widened and deepened) for the irrigation purpose by MWRI.
- From 111.4 km to 128.6 km
  This section is passing through the center of Ismailia City.

In the first section (28 -111.4 km), continuously improvement programs are made by MWRI
In the second section (111.4 km - End), cross-sections continuously are narrower and shallower than the above first section

(Lock)

The canal is maintained and improved by the Irrigation Department. Since the canal closed for navigation, the gate opening at Sariakos Lock and El Sahlia Lock has never been operated and a considerable quantity of sludge deposits within the upstream of lock gate in particular. The old lock at Belbis and El Kasaseen have already been demolished at present

(Bridge)

Unlike Beheiry and Nobaria Canals, the canals have provided with many road and footway bridges. Among others, recently built bridges conform to the requirements set by Ministerial Decree No. 126 [12] which specified 6 m vertical clearance owing to the provision of enough vertical clearance or movable type by swinging. But, some bridges are elevated at low-level of swing, only 1-2 m above the water surface level. These movable bridges have not been operated since the late 1960's.

Table 6.3.2 Locks along Ismailia Canal

No	Lock	Distance	Dimensions (m)			Water Retaining Level	Year of Construction	Barrage
		(Km)	L	H	W	(m)		
1	El Fom							Yes
	New Lock	0	117	n.a.	17	n.a.		
	Old Lock	0	40	n.a.	8.5	n.a.		
2	Sariakos	12.8	116	n.a.	16	2.0	Under Construction	Yes
3	El Menaier	28	116	3.5	17	n.a.		Yes
4	~~Belbis~~	~~49.7~~	~~38~~		~~8.5~~		Demolished	
5	El Salhia	75	116	3.5	17	n.a.	1986	Yes
~~6~~	~~El Kasaseen~~	~~93.5~~	~~38~~		~~8.5~~		Demolished	
7	Ismailia Lock	127	38.5	n.a.	8.5	n.a.		None
8	End Lock	128	38.5	n.a.	8.5	n.a.		None

Navigation Guide, July 1997

6.3.5 Upper Nile River between Aswan and Cairo

The Nile River in Cairo area is over 300 m in width and is crossed by bridges, of which minimum dimensions are 4.45 m vertical clearance and 21 m span (pier intervals) at Embaba Railway Bridge as indicated in Table 6.8.13 while the vertical clearance defined under the bridge is 13 m.

Table 6.3.3 Bridges across Upper Nile River between Aswan and Cairo

No	Bridge	Distance from Aswan (km)	Navigable Width -Pier Span- (m)	Vertical Clearance (m)
1	Aswan New	7	Nile River Width	13
2	Edfo	116	3 span x 50	13
3	Luxur	214	90	13
4	Kena	290	3 span x 50	13
5	Kena Railway	292	5 span x 80	13
6	Naga Hamady Railway	340	2 span x 38	Movable
7	Naga Hamady Road	340.5	2 span x 38	Movable
8	Sohag	425	3 span x 40	13
9	Asyut	545	3 span x 45	13
10	El Minia	700	2 span x 50	13
11	Bany Swif	823	3 span x 47	13
12	El Marazik Railway	924.5	1 span x 85	13
13	El Monib	951	2 span x 150	13
14	El Giza	954	1 span x 110	11
15	El Gamaa	955	1 span x 110	10
16	El Tahrir	957	2 span x 50	4.5 (Movable)
17	6th October	958	1 span x 55	10
18	15th May	959	1 span x 45	10
19	Embaba Railway	960	2 span x 21	4.45
20	El Farag Road	962	1 span x 110	10
21	El Warak	964	1 span x 45	n.a.

6.3.6 Maintenance of Inland Waterway Facilities by RTA

(1) General Overview

As regards water depth of navigation canal, daily measurements are executed by means of water level gauges at up- and down-stream of all locks provided by RTA with accurate information on water levels fluctuation of waterway. The locks under management of RTA are inspected twice a year to identify the need for any maintenance or repair.

At present, RTA executes only practically remedial maintenance of waterway and lock facilities. But, due to lack in thorough inspection and preventive repairing, the maintenance conditions of all locks under management of RTA are not so fair enough to keep normal operation of lock gate opening until substantial failure or critical problem would become clear to cause serious consequences for continuity of operation. In many cases, existing navigation locks are faced with

some extent of sludge deposits.

(2) Recent Maintenance and Repair Works

Although lack or weak of proper budget allocation restrains effective and timely execution of necessary maintenance & repair by technical departments of RTA, a total amount 4.9 million L.E. was tendered for new construction of navigation canals, maintenance & repair of locks, etc. during past 1996 –2000 fiscal years and the total amount spent for maintenance and repair of locks during past fiscal year 1997 to 2002 was 3.6 million L.E.

Major profile of these maintenance and repair works for locks is summarized as follow:

(Kanatar Lock)

It is reported that no major maintenance works has been undertaken since the last maintenance program for this lock in early 90's. Consequently, lock gate operation has to be done by manpower at present.

(Katatba Lock)

A major overhaul was carried out during Jan. 2000 to May 2001 spending one (1) million L.E. This work includes replacement of lock gates, repair of lock chamber, upgrading all utilities, refurbishment of control panel and emergency supply units, etc. In this overhaul, silt deposits of about 1,500 m3 were removed from lock chamber as well.

(Bolin Lock)

Minor overhaul program was executed in 1997, spending one (1) month period for completion. Mechanical maintenance was also carried out in 2000 to 2001.

(Bustan and Janaklis Locks)

A overhaul work was undertaken for these two locks in 1997 for 7 period months to complete. It is reported that the navigation through Janaklis lock was stopped for only one month period in the low water season in January.

In case of Bustan lock, since one of lock gate was damaged, it is reported that the damaged lock gate was replaced in 2001.

(Nahda Lock)

Small scale of repair works were undertaken for electrical work in 1998 spending 435 thousands L.E. in 10 months period and mechanical work in 1995. Furthermore, a minor scale maintenance work was completed in 2000. But at present, the lock gate seems necessary to repair due to considerable water leakage during pumping up operation of lock chamber since the highest retaining water level at this gate is 5.5 to 6 m. RTA programs a full scale of maintenance and repair work including dry-up lock chamber in 2002.

(Maritime Lock)

The gate of small lock was repaired in 1999 spending 1.44 millions L.E., which includes replacement of lock gates, repair of culverts and fenders, maintenance of gearboxes, cleaning-up lock and chamber from silt deposits (less than 100 m3), painting, etc. A minor repair work was also done in 1999 for 4 months to complete. At present, the seaside lock gate is subjected to water leakage and would be required to repair, for which RTA schedules major overhaul work in this year.

According to data on the works tendered and the amount spent by Civil Engineering Department during past fiscal years from July 1997, a sum of 192 millions L.E. was tendered for dredging works and lock construction, etc. to improve the inland waterway navigability and the total amount of 127 million L.E. was spent for execution. In the past 5 years, major civil works undertaken by RTA has focused on dredging works at Upper River Nile waterway and rehabilitation of Damietta Branch.

Among other projects for improvement or development to be carried out in Fifth Five Years Plan, RTA has expressed to undertake a series of projects for maintenance and repair works in fiscal year of 2002/2003, for which necessary budget allocation has been requested to the government.

6.4 Existing Major River Port/Sea Port Facilities

6.4.1 Major River Port Facilities

(1) Present Situation

1) General

River ports are one of the basic infrastructures of IWT. A lot of river ports have been developed mainly to serve the factories located near the Nile River. Since most river ports belong to the private sector, RTA has no accurate information about river ports. According to "The Strategy of the Public Authority for the River Transport until 2012 (1999)", forty-four river ports along the Nile River and canals in the Nile Delta are listed up. Thirty-five river ports are owned by industrial companies, such as sugar, cement, fertilizer, aluminum, iron/steel, coke, and petroleum companies. Out of these 35 ports, 31 ports are located in Upper Egypt and 4 ports in the Nile Delta. They are used for unloading the raw materials to the factories and loading the industrial products of the factories. RTA owns 3 river ports for public but they are rarely used for IWT.

2) Ports Owned by RTA

RTA owns 3 river ports, which are El Hadid and El Solb (Iron and Steel) Port in Aswan, Ather El Nabi Port in Cairo and El Nahda Port near Alexandria.

El Hadid and El Solb Port equipped with a belt conveyer system was developed by the Iron and Steel

Company in 1960 for transporting iron from Aswan to Tebbin. After the transportation of iron was stopped, the ownership was moved to RTA. At present, a small volume of stones and petroleum are handled at this port.

The quay at Ather El Nabi Port was constructed in about 1962 and it has been used mainly for unloading stones from barges and feluccas. However most of this area is used for a public market and cargoes are rarely handled now. A new container terminal is to be developed at this port area by RTA and a private terminal operator.

El Nahda Port, which has a 100 m long quay and a storing area, was developed by RTA to encourage the use of river transport between El Nahda and Alexandria Port by the factories located near the port. However it is not used at present.

(2) Development Plans

1) Private Ports

Some industrial companies expect to increase the use of river transport because of its advantages of large transport capacity and low cost compared with land transport. However it is generally considered that private port owners have no major port development plans at this moment except certain rehabilitation and renovation as the cargo volumes of river transport have been decreasing recently.

2) RTA Ports (Ather El Nabi Container Terminal Project)

RTA owns three ports but all ports are rarely used now. RTA has no future usage plans about El Hadid and El Solb (Iron and Steel) Port and El Nahda Port, while RTA is promoting the development of a new container terminal at Ather El Nabi Port in Cairo. At present, there is no IWT of containers in Egypt. Therefore, this project, the introduction of container transport system into river transport, is epoch-making.

The Ather El Nabi Port is located in southern Cairo at about 952 km (the distance from the High Dam) at the Nile River. The site is located on the eastern side of the Nile River and connected to the Nile River by the Branch Canal. The site contains an existing quay, built in the first half of the sixties. However this port area is used for the public market at present. RTA owns the land area east of the Branch Canal at Ather El Nabi from the canal to the road going south – north about 200m east of the canal, which is about 8 ha

In July 2000, RTA and Egytrans, one of the largest Egyptian transport companies, engaged a concession contract for the construction, management and operation of this container terminal. Basic scheme of the development plan is as follows:

- Development of the infrastructure including quays, backyards, sheds, dredging, and access road will be conducted by RTA.
- Barges and necessary cargo handling equipment will be provided by Egytrans.

- RTA will lease the infrastructure to Egytrans.
- Container terminal will be operated by Egytrans.

6.4.2 Major Sea Port Facilities

(1) Present Situation

1) Outline of Egyptian Sea Ports

There are five major commercial sea ports in Egypt, namely Greater Alexandria Port (Alexandria and El Dekheila port), Damietta Port, Port Said Port, Suez Port (including Adabiya Port) and Safaga Port. More than 90% of maritime traffic handled at commercial ports under the control of Ministry of Transport involves the five major ports in 1999. As for container cargo, Greater Alexandria Port, Damietta Port and Port Said Port are the main container handling ports.

2) Greater Alexandria Port (Alexandria and El-Dekheila)

The port area is divided into six Customs Zones stipulated by the Resolution No.618/1997. The first Zone is a district between berths No.5 and No. 15, including general cargo berths, repairing floating units and marine service berths. The second Zone is a district between berth No.16 and No.31, including passenger terminal as well as general cargo and Ro-Ro berths. The third Zone is a district between berths No.33 and No.47, including general cargo and barge cargo berths. The fourth Zone is a district between berths No.49 and No.68, including container terminal as well as barge cargo, coal, fertilizer and cement berths. The fifth Zone is a district between berths No.71 and No.85, including grain terminal as well as timber, barge cargo and molasses berths. The sixth Zone is a district between berths No.87/1, 87/2, 87/3, 87/4, 87/5 and No.86, including petroleum products and vegetable oil berths.

a) Container Terminal of Alexandria Port

The container terminal is operated by Alexandria Container Handling Company. There are three container berths (No.49, 51 and 53) of which total length is 560m and one Ro-Ro berth (No.54) of which length is 160m. Berth depth is practically maintained at 12.0m though design depth is 14.0m. Potential handling capacity of Alexandria Container Terminal is expected to be 400 thousand to 450 thousand TEUs by introducing additional container handling equipment.

b) Grain Terminal of Alexandria Port

The grain terminal is operated by Alexandria General Company for Silos and Storage. There are three grain berths (No.82, 84 and 85) of which length and depth are 535m and 10.0m respectively. A new grain berth (280m length and 14.0m depth) is under construction adjacent to berth No. 85.

c) Coal Terminal of Alexandria Port

The coal terminal is operated by El-Nasre Company for Coal and Cokes. There are four coal berths (No.61, 62, 63 and 64) of which total length and depth are 600m and 10.0m respectively.

d) Petroleum Terminal of Alexandria Port

There are five petroleum berths (No.87/1, 87/2, 87/3, 87/4, 87/5) of which total length and depth are 762m and 10.0m - 12.0m respectively. The terminal handles butane, lubricant oil, petroleum gas, vegetable oil, LPG, fuel oil, jet oil and naphtha.

e) General Cargo Berth of Alexandria Port

There are 31 general cargo berths of which total length and depth are 3,804m and 5.5m - 12.0m respectively.

f) Approach Channel of Alexandria Port

Alexandria Port is protected by marine rocks and two breakwaters. The entrance to the inner harbor is approximately 400m in width. Outer harbor channel from the harbor entrance to the inner harbor is maintained to be 220m in width and 14.0m in depth.

g) Container Terminal of El-Dekheila Port

El-Dekheila Container Terminal is also operated by Alexandria Container Handling Company. There are four container berths (No.96/1, 96/2, 96/3 and 96/4) of which total length and depth are 1,040m and 12.0m - 14.0m respectively. Potential handling capacity of El-Dekheila Container Terminal is expected to be 1.0 million TEUs.

h) General Cargo Berth of El-Dekheila Port

Berth No.92 of which length and depth are 300m and 15.0m respectively is prepared as general cargo berth. However, bulk carrier carrying maize often uses these berths.

i) Grain Terminal of El-Dekheila Port

There are two grain berths (No.94/1 and 94/2) of which total length and depth are 490m and 14.0m respectively.

j) Iron Ore and Coal Terminal of El-Dekheila Port

There are two berths (No.90/1 and 90/2). Berth length and depth of berth No.90/1 is 375m and 20.0m respectively. Berth length and depth of berth No.90/2 is 255m and 14.0m respectively.

k) Approach Channel of El-Dekheila Port

The main channel in El-Dekheila Port is 2,800m in length, 250m in width and 24.0m in depth.

3) Damietta Port

Damietta Port is located 8.5km west of Ras El Bar, Damietta branch of River Nile to the Mediterranean Sea and also 70km west of Port Said Port. Damietta Port started its operation June 26th 1986. Dimension of the entrance channel is 11.3km long, 300m - 250m wide and 15m deep. Two breakwaters protect the entrance channel. The western breakwater is 1,640m long and the

eastern breakwater is 738m long.

a) General Information

- Area: 6.2 sq.km (Land area) / 3.1 sq.km (Water area)
- Tide: Two feet above the constant level of the map
- Maximum permissible vessel draft: 12.8m (42feet)

b) Container Terminal

The container terminal is operated by Damietta Container and Cargo Handling Company. There are 4 berths of which total length is 1,050m. Berth depth is maintained at 14.5m while the entrance channel is facing siltation problems.

c) Grain Terminal

The grain terminal is operated by Damietta General Company for Silos and Strages. There are 2 berths of which length and depth are 300m and 14.5m respectively.

4) Port Said Port

Port Said Port is located at the northern entrance of the Suez Canal. Two breakwaters protect the canal entrance leading to the port. The eastern breakwater is approximately 6.5 km long and the western breakwater is approximately 2.8 km long.

a) General information

- Approach channel: 140m wide, 12.5 to 13.0m deep
- Tide: 70cm
- Maximum permissible vessel draft: 12.8m (42feet)

b) Container Terminal

The container terminal is operated by Port Said Port Container Handling Company. There are one container berth (No.11) and two multi-purpose berths (No.12 and No.13) mainly used by large mother vessels of which total length and depth are 1,050m and 12.81m respectively. There is also general cargo berth (No.9) of which length and depth are 295m and 8.2m, mainly used by small feeder vessels.

Two additional post-Panamax QGCs have been introduced at the terminal.

c) Grain Terminal

The grain terminal is operated by marine shipping companies. There are two grain berths (No.7 and 8) of which total length and depth are 530m and 12.81m respectively.

5) Suez Port (including Adabeya)

Suez Port is located at the southern end of the Suez Canal.
Adabeya is located at the west coast of Suez Gulf and 10 km southwest of Suez Port.

a) General Information

- Water area: 258km^2 (Suez + Adabeya)
- Land area: 327 thousand m^2 (Suez), 837 thousand m^2 (Adabeya)

6) Safaga Port

Safaga Port is located at the western coast of the Red Sea and 50 km south of Hurgada. The port is a large inlet (natural gulf) which is sheltered by natural protection from the east and north directions by Safaga Island.

a) General Information

- Land area: 418 thousand m^2

6.5 IWT Cargo Handling at Major River Ports and Sea Ports

6.5.1 Cargo Handling at Major River Ports

(1) Cargoes

Inbound commodities are mostly raw materials for the factories such as limestone, phosphate, coal, petroleum and sugar canes. Outbound commodities are raw materials and industrial products of the factories such as petroleum products, aluminum and coke. The areas where large volumes of cargoes are handled are Deshna, Samallot, El Tebbin, El Hawamdiya and Nekla.

(2) Cargo Handling Methods

The most suitable cargo handling equipment is selected based on the characteristics of each cargo. Generally, a company handles its own cargoes with its own handling equipment. Some companies such as a sugar company use their own barges. The cargo handling productivity at each port depends on the system and the efficiency of cranes and pumps.

6.5.2 IWT Cargo Handling at Sea Ports

(1) Transshipment Cargoes between Sea and River Ports

The existing river transport route is connected with only Alexandria Port among several seaports. Dekheila Port, part of the Greater Alexandria Port, is not used for river transport because the existing barges cannot navigate the sea area between Alexandria Port and Dekheila Port. Therefore, only Alexandria Port handles export/import cargoes for IWT. The cargo volume from Alexandria Port to river ports is 398 thousand tons in 1999. Main cargoes are coal and sulphur. The cargo volume from

river ports to Alexandria Port is 293 thousand tons in 1999. Main cargoes are molasses and coke.

Table 6.5.1 Cargo Volume from Alexandria Port to River Ports in 1999

Unit: thousand metric tons

Break Bulk		Dry Bulk					Total
General Cargo	Iron & Steel	Clay	Other Minerals	Coal	Sulphur	Aluminum	
5	19	18	6	200	140	9	398

Source) RTA

Table 6.5.2 Cargo Volume from River Ports to Alexandria Port in 1999

Unit: thousand metric tons

Dry Bulk				Liquid Bulk	Total
Clay	Coke	Phosphate	Aluminum	Molasses	
5	94	0.3	6	188	293

Source) RTA

(2) Cargo Handling of Transshipment for IWT at Alexandria Port

Basically there are two cargo handling methods for the transshipment between sea going vessels and river barges. One is the direct transshipment with ship gears or quay cranes. The other one is transshipment via stockyard or tank. Off-shore cargo transshipment between sea going vessels and river barges is carried out at the calm water area protected by breakwaters near the entrance of Nobaria canal.

In order to establish an efficient container river transportation system, cargo transshipment system at sea ports is important as well as the development of the river container terminal. Therefore, the location of the berths for river barges, scale of backyard area and cargo handling system between sea going vessels and river barges should be considered carefully before starting the container IWT service. The berths for river barges should be prepared in or near the container terminal as far as possible in order to reduce time and cost of land transportation.

6.6 Barge System of Inland Water Transport

6.6.1 General Rules & Regulation

Navigation Rules for inland waterway are mainly prescribed in Ministerial Decree No.282/1998, in which RTA is authorized to issue license to owners of barges and to have inspection for hull and machinery etc, even in dry-dock condition when necessary. Validity of license to barge owner is 3-years for cargo transportation barge and 2-years for passenger ship.

At present, maximum dimensions and speed of barges at present are prescribed as follows as per RTA Decree Nr.254 to Ministerial Degree No.282/1998 which requires to obtain RTA approval for dimensions of new-building barges. Other items including safety, stability, load line and numbers of crew and license are also prescribed in this decree.

Length : 50m
Breadth : 7.5m
Draft : 1.5m
Height above water : 3.5m
Max. speed : 13km/hr, 7knots

6.6.2 Existing Barge Fleet

Existing barge fleets for inland waterway navigation in Egypt are summarized in the following tables. These fleets of barges are owned by private, public or government sector. Number of crew onboard cargo transport barge is as follows:

Below 250 tons	: Chief 1, Mechanic 1, Sailor 2
Over 250 tons	: Superior Chief 1, Mechanic 1, Sailor 2
Pusher	: Superior Chief 1, Mechanic Assist. 2, Mechanic 1, Sailor 2

The data on the range of age of each barge fleet shows average age of about 15 –35 year.

Technical Feature of Existing Barge Units

Description		Gov. Sector	Private Sector	Sugar Company	GNWT*	GRWT*	General Business Sector
1. Propeller Barge							
Number of Unit	Nr	46	1251	157	70	51	68
Ave. Length	m	15.7	13.9	44.4	40.9	42.6	22.2
Ave. Breadth	m	4.3	3.03	7.51	7.21	7.02	5.48
Ave. Depth	m	1.93	1	2.22	2.1	2.06	2.07
Ave. Draft	m	1.44	0.66	1.67	1.54	1.53	1.51
Ave. Max. Dead Weight	Ton	55.64	65.9	362.4	286.7	293.6	126.2
Ave. Engine Power	Hp	126.56	61.5	190.4	201.3	215.1	176.7
Largest Size of Propeller Barge L x B x D x d = 50m x 7.5m x 2.25m x 1.6m							
2. Twin Unit (Pusher and Barge)							
Number of Unit	Nr		2		118	168	
Ave. Length	m		22.5		47	47.3	
Ave. Breadth	m		3.8		7.4	7.4	
Ave. Depth	m		1.1		2.2	2.2	
Ave. Draft	m		0.9		1.61	1.64	
Ave. Max. Dead Weight	Ton		212.5		336.1	350.8	
Ave. Engine Horse Power	Hp		105		434.4	446.3	
Largest Size of Twin Unit : L x B x D x d = 50m x 7.5m x 2.25m x 1.6m							

GNWT*: General Nile Company for Water Transportation

GRWT*: General Nile Company for River Transportation

Source: RTA

6.6.3 Previous Studies on Coastal Going Barges

(1) Coastal-Going Barge between Dikheila and Alexandria

At present, cargoes have been transported from the port of Alexandria to Cairo via Nobaria and Beheiry Canals. But, in connection with new port of Dikheila for inland transport by barge, barges have to pass an open sea area of about 2-miles between two ports and this coastal connection can not be realized so far.

Since inland vessels has a small freeboard, coastal sailing of inland vessel in wave conditions will cause serious problems such as sea water flow into barge holds, breaking of connecting wires for twin unit barge, etc. Netherlands Consultant carried out a feasibility study on introduction of coastal going barge for coal carrier in 1989. This study for possible development of coastal going coal barges has summarized allowable significant wave heights as follows.

Permissible Wave Height for Coastal Sailing by Previous Study

		Propeller Barge	Twin Unit
Loaded Draft(m)	m	1.5	1.5
Significant Wave Height (without modification)	m	0.45	0.31
Significant Wave Height (with modification)	m	0.6 *1	0.39 *2

*1 To increase the bulwark height

*2 To strengthen the barge connecting wire

(2) Container Barges

Almost all containers handling through seaports are recently transported by inland road traffic. In order to transport containers from Dikheila port through inland waterway via Alexandria port, special considerations must be taken to the capability of coastal navigation by container barges. In this respect, conceptual design on two types of container barges navigable on the above route of was carried out by the previous study, which shows the result that two tiers loading on barge could not be possible due to its excessive draft.

Inland Container Transport Company "Egytrans" has recently developed new project for inland container transportation using existing waterway of Beheiry and Nobaria canals to connect Alexandria or Dikheila Port with Cairo city. This project has proposed an advanced design concept of self-propelled coastal going container pusher barge, which is capable of 62 TEU containers (4-rows, 2-tiers and 8-bays). The special feature of the design concept is application of liftable wheel house system using hydraulic power to keep forward visibility within air draft restriction for passing under existing bridges. This self-propeller pusher barge with twin engines is tied together with a pushed dumb barge having loading capacity of 44 TEU (4-rows, 2-tiers and 6-bays) and, therefore, the total 106 TEU container units can be loadable on this twin unit barge system.

The above propeller barge is so designed in dimensioning the length overall of 63 m and the breadth of 11.8 m to use longer End lock at Alexandria (Big Lock) and other locks or to pass under existing bridges along canal waterways without any special modification.

But, pusher barge for coastal sailing is classed by Lloyd Register of Shipping (British Classification Society) and there still remain the following subjects for further investigation.

1) Water Depth on Navigation Route
2) Night Navigation (Lock Operation by RTA)
3) Waiting Time at Locks
4) Air Clearance when Empty Containers are loaded

6.7 Navigational Conditions of Inland Water Transport

6.7.1 Waiting time & Passing time at Locks

According to previous studies, operation time at each lock was summarized in shown below table. The Study Team conducted site surveys as well as made interview with operators of lock offices. As a result, each lock operational time is about the same as below table.

(unit: minute)

No.Lock	Km	W	L	Crew	Power	Head (m)	Time for Fill/Sink		Time for Up/Dn		Communi-cation
1 Kanater	0	16	116	6	Electric. &Manual	2.0-1.4	10	10	20	20	Telephone Nearby
2 Khatatba	42.25	16	116	10	Electric. &Manual	1.5-0.2	20	15	30	25	Wireless
3 Bolin	0	16	116	10	Electric. &Manual	1.1-0.4	15	12	25	22	Wireless
4 Bustan	28.5	16	116	13	Manual	0.4-0.2	10	10	20	20	Wireless
5 J.Klees	61	16	116	6	Electric. &Manual	1.1-0.2	12	10	22	20	Wireless
6 Nahada	100	16	116	9	Electric. &Manual	6.5-4.9	45	35	55	45	Wireless
7 End lock	119.5	16 16	116 80	10	Electric.& Manual	2.5-2.5	15	15	25	25	Wireless Telephone

Queuing occurs, in most cases, when units of barges arrive after 18:00 at a closed lock and wait until operation resumes the next morning.

6.7.2 Obstacles on Navigation

According to the Survey be G.E.M. Consultants B.V., The Netherlands in 1993-94, in Nobaria canal the following navigational obstacles were confirmed existing:

- Sunken units 12
- Unused water sources 4
- Various other obstacles 13

The above obstacles are classified as A, B and C according to the degree of jeopardy for units traffic. And these classifications mean ranging from immediate removal or remove as soon as possible to not urgent.

In addition, following problems were pointed out:

-High-speed sailing is difficult at many stretches of the canal because of the obstacles and the shoals;

-Many damaged and collapsed bank protections were observed at various locations at the canal. Since high-speed sailing and using anchor into the bank are not common practices, the most likely cause seems to be poor quality of the bank protection works.

6.7.3 Other Navigational Conditions (such as communication tools navigation charts, etc.)

1) Bathymetric and navigation charts

There are no recent bathymetric charts of the Nile Delta available except for some surveys specifically carried out for bank protection, bridges, dams and reported shallows in the river.

2) Signal and mark system

There are no navigational aids or any positioning marks for sailing units between Cairo and Alexandria. Some kilometer marks exist along the banks of the Beheiry and Nobaria canals but they are rather badly maintained.

3) Radio communication

The locks are equipped with medium wave transmitter/receiver for RTA use only. Barges do not have any communication facilities on board.

Chapter7 Administration and Management System of Inland Water Transport

7.1. Regulations on establishment of RTA

7.1.1 Establishment of the River Transport Authority (RTA)

The River Transport Authority (RTA) was established in 1979 by Presidential Decree No. 474. According to this law, RTA is regulated as follows.

1) Ministry of Transport (MOT) controls all transportation in Egypt. RTA belongs to MOT and has its independent personality.

2) The River Transport Authority aims at developing the national economy by upgrading the efficiency of river transport facilities through the Nile River and its navigational channels.

3) Jurisdictions: see the main report

4) A legislative organ

RTA is managed by a board of directors and this board controls issues and suggests the general policy that RTA works in accordance.

5) The chief of board

The chief of the board is the representative of RTA and manages it.

The chief of the board prepares for the budget to present it to the board to assure it.

7.1.2 Laws in relation to Inland Transport

Specific laws and decrees related to inland water transport in Egypt are in the Table 7.1.1 in the main report.

7.2 Organizational Framework of RTA

7.2.1 Function of each Section

The organizational structure of the Authority:

- The Presidency of the Authority.
- The Central Administration for Navigational Affairs.
- The Central Administration for Technical Affairs.
- The Central Administration for Financial and Administrative Affairs.
- The Regional Institute for River Transport.

7.2.2 Organizational Chart

Present organizational structure of RTA can be represented as shown in the Table 7.2.2.

7.2.3 Numbers of each Section workers

Present number of workers of each section in RTA is given in Table 7.2.3 in the main report. .

7.2.4 Organization for Maintenance

(1) RTA's Technical Sector Organization

The technical sector in RTA head office organization is composed of two departments, i.e. Mechanical/Electrical Engineering and Civil Engineering Departments. The organizational structure of technical sections has not been changed basically from the end of 80's. Total number of staff personnel who belongs to these technical sections amounts to 117 staffs at present. Daily operation of locks owned by RTA is carried out under control of Navigation Sector.

(2) Mechanical and Electrical Engineering Department

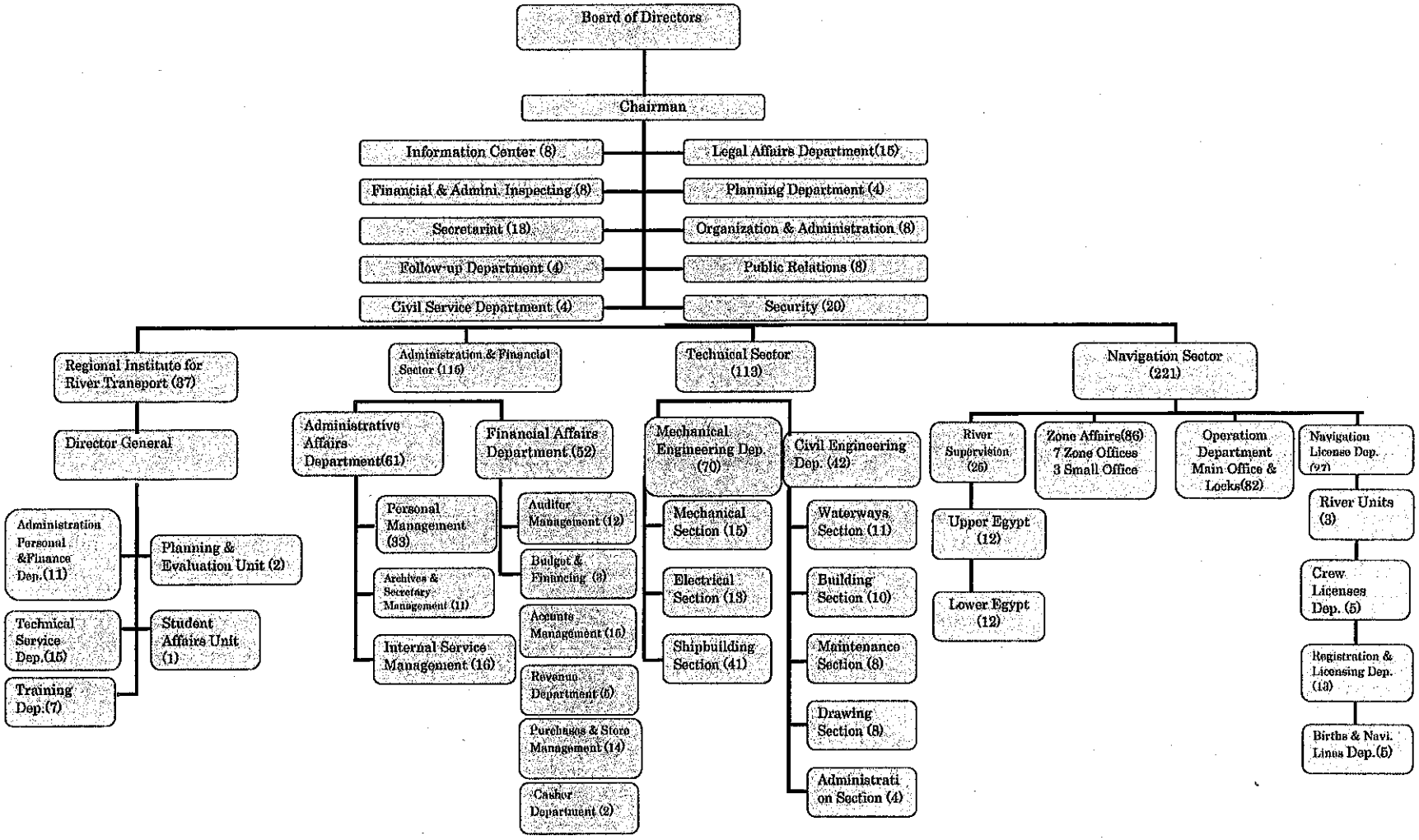
Total numbers of personnel in Mechanical and Electrical Department amounts to 71 staffs at present, which shows drastic decrease as compared those in the 80's. The Organizational structure of this Department indicates three (3) sections as follows:

Mechanical Engineering Section
Electrical Engineering Section
Shipbuilding Engineering Section

Mechanical Department is responsible for design, preparation of tender documents, supervision of construction, operation, maintenance and repair of all mechanical, electrical, floating facilities and equipment owned by RTA. Each section has Execution and Design Sub-sections that is provided with a sub-sectional head staff because the section let their supporting technical staffs normally work out actual design tasks according to the needs for such moment. In fact, the actual design works done by the Department are quite limited and the majority of maintenance and repair works as well as most design works for new construction rely on outside sources for qualified engineers or contractors for such specific works.

Presently, major activities by Mechanical and Electrical Department are summarized as follows:

Table 7.2.2 The Organizational Chart of R.T.A.



- Daily operation of floating facilities and equipment except for locks
- Daily maintenance, minor repairs of equipment
- Preparation of specifications, tendering and supervision for execution of new constructions works done by outside engineers or contractors

Each sub-section seems to be cooperative to similar tasks or in other wards to be ambiguous in its responsibility. For instance, the roles and functions for maintenance and repair of lock facilities are divided into the above two departments while those for daily operation belongs to Navigation Sector Department

Though it seems that RTA has well equipped with suitable equipment for specific tasks for normal maintenance and repair works, only a very limited part of normal maintenance and repair works are done by RTA using the equipment because that:

- Spare parts or additional tools for self-owned equipment are not available timely due to lack of budget
- Qualified or well-trained manpower resources for specific tasks are not provided within RTA
- Experience and expertise in use of self-owned equipment is not so enough to carry out specific activities effectively
- Lack of sound scheme in normal activities and manpower allocation of RTA prevent from the regular, proper and preventive execution of maintenance and repair work

(3) Civil Engineering Department

The total staff is 48 numbers in this Department. This Department was reinforced in terms of staff number as compared with organization in the end of 80's. At present, Civil Engineering Department is divided into five (5) sections as follows:

Management Section
Navigation Projects Section
Construction Section
Maintenance Section
Drawing Section

Major tasks of Civil Engineering Department is clearly concentrated into preparation of tender documents, tendering and supervision for execution of construction, maintenance and repairs for all civil engineering works. But these tasks will be normally done by outside qualified engineers except for small scale of or simple constructions. RTA usually prepares dredging works after a hydrographic survey for dredging area has been made and prepared. Supervision of dredging and construction works in navigable waterways is often executed in cooperation with MWRI.

Navigation Projects Section is given responsibility to provide a navigable waterway in sufficient water depth and width including survey works, dredging, provision of navigation aids. The Construction Section will design facilities, prepare tender documents and supervise civil

construction works that will be mainly executed by outside contractors. RTA carries out design of only small and simple constructions. In order to cope with necessary regular maintenance and repair of existing facilities, Maintenance Section was established in addition to sections for new construction activities, but it seems that the Section faces lack in workshop facilities and, in particular, necessary trained-technique of their personnel in technical fields on waterway navigation.

7.3 Working Conditions & Training System

7.3.1 Working Conditions

Working hours:

Working hours are from 08:00 to 15:00 Saturday to Tuesday and from 08:00 to 15:15 on Wednesday. Thursday and Friday are holidays.

7.3.2 Training System

RTA Workers are able to take training course in a voluntary basis. For the purpose of promotion, training is compulsory.

7.4 Sailing rules in inland water

The sailing rules are found in the Ministerial Decree No. 15/1983, No.282/1998, No.9040/1957, and Annex of No.8922/1956.

General steering and sailing rules in traffic routes are as follows:
•Restrictions on speed (Art.26) •Sailing hours (Art.26) •Prohibition of casting debris into the water (Art.27/28) •Protest (Art.29) •Responsibility between ships (Art.30, 31, 32) •Maneuvering and warning signals (Art.33) •Overtaking (Art.33)
•Crossing a waterway (Art.35) •Rescue (Art.37) •Restrictions on staying within waterways (Art.38) •Restriction on plying over specified dimensions (Art.39)
•Maneuvering at a narrow pass (Art.40) •Sailing under poor visibility (Art.41)
•Asking for aid (Art.42) •Obligation of rescue (Art.43) •Transit through bridges and locks (Art.44, 45, 46, 47, 48, 49, 50) •Navigation lights (Art.51, 52, 53, 54)
•General rules (Art.55, 56, 57, 58, 59, 60, 61)

7.4.1 Qualification of riverine crew

(1) The present qualifications of riverine crew are as follows:
-Navigation: there are nine (9) qualifications from Cruising ship captain to
Seaman
-Engineering: there are five (5) qualifications such as Engineer, Mechanic ,etc.

(2) The capacity of each qualification is shown in Table 7.4.1 in the main reports

(3) Vocational training
The River Transport Local Institute was established in 1998 complying with the Art.27 (b) and Art.28 of the Decree No.282/1998, the Institute provides various training courses, which almost correspond to the various ranks of the riverine crew. Those courses are shown in Table 6.6.8 in

the main report.

(4) Riverine accidents
A captain is obliged to submit a report in writing to the Authority whenever an accident occurs by the Art.29 of the Ministerial Decree 282/1998.

The record of accidents in the last five years is shown in below table.

Table Accidents in the last five years

	Sinking	Partial Submergence	Collision	Striking	Fire
1997	1	1	1	-	-
1998	4	-	-	1	2
1999	3	-	7	2	2
2000	-	-	3	-	3
2001	1	1	1	-	-

Source: RTA

Riverine accidents officially reported to the authority are rather few. However, considering the actual river transport conditions, in which many deteriorated barges are still plying without sufficient supporting facilities, actual number of accidents is likes much higher.

7.5 Financial Situation and Budget of RTA

7.5.1 Financial Situation of RTA

In the budget of RTA (1999/2000) the current (ordinary) revenue consists of RTA own revenue (35%) and Governmental subsidy (65%). And the investment budget in the same year consists of RTA own revenue (3%) and Governmental subsidy (97%).

7.5.2 Existing Tariff

The existing tariff of inspections for ships and annual fees is stipulated in Law No.10 (1956).

Inspection for the ship body and equipments
The engineless ship 0.40LE
The engine ship 1.50LE
(Passenger ship / Ferries: Every two years, Cargo ship / Tugs: Every three years)

Inspection for Boiler
The internal width of the furnace (every meter) 0.50LE

Inspection for Propeller Engine – each 3.00LE

(Passenger ship: Every two years, Cargo ship: Every one and half years)

Annual tonnage fees

The engineless ship	0.07LE/ton/year
The propeller engine ship	0.25LE/HP/year

Passenger ships with Superstructure (closed)

$$\text{Load is volumetric tons} = \frac{\text{Volume of closed spaces for passenger ship (m3)}}{2.83}$$