9.4.4 Easing of Environmental Problems

The last and significant role of IWT is to ease environmental problems. Taking into account the growth in the number of licensed drivers, vehicle ownerships and land cargo transportation, it is likely that road traffic conditions in Egypt will grow more severe.

In the 1990s, road traffic condition around the GCR (Greater Cairo Region) has already tended to change for the worse under such circumstances. Figure 9.4.3(1) and 9.4.3(2) indicate road traffic volume into/from the GCR in 1990 and 2000 respectively. It is presumed that the road traffic volume around the GCR through principal nationwide roads increased by roughly 60 % during the 1990s (see Table 9.4.1 for details).

In the Nile Delta, there are traffic-concentration problems such as chronic traffic congestion, the increase in atmosphere pollutants from road traffic, and increases in traffic accidents. In general, the road sector consumes the most energy among other inland transport modes, and this sector has larger emission factors than other modes. Thus, it is likely that such traffic problems could hinder the country from sustainable development in the future.

For this reason, it is essential that strategies of traffic volume control be adopted from a long-term and comprehensive viewpoint. To that end, IWT development/ promotion plans can play an important role in controlling the road traffic volume.

Table 9.4.1 Daily Traffic Volume (vehicles/day) into/from the GCR

Name of Road	1990	2000	Ratio*
Cairo – Ismailia Desert Road **	9,158	20,290	2.22
Damanhour - Tanta Road	20,670	26,448	1.28
Alexandria - Damanhour Agriculture Road	23,907	37,317	1.56
Cairo- (Giza) - Beni Suef Road **	8,640	10,349	1.20
Cairo - Suez Desert Road **	5,224	10,962	2.10
Ismailia - Abu Hamad Road	5,785	8,367	1.45
Tanta - Berket El Sabaa Road (Quweisna)	18,563	25,156	1.36
Belbes - Abu Zaabel Road **	6,003	10,109	1.68
Mahalla El Kobra - Talkha Road	9,788	17,528	1.79
Cairo - Benha Agriculture Road **	39,686	55,163	1.39
Mansoura - Mit Ghamer Road	9,691	17,404	1.80
Cairo - Alexandria Desert Road **	9,344	17,886	1.91
Helwan - El Saff Road **	na	12,047	na
Shirbin - Damietta Road	na	16,595	na
Ismailia - Port Said Road	na	12,233	na

Note : Source of data in 2000 is "General Authority for Roads & Bridges and Land Transport"

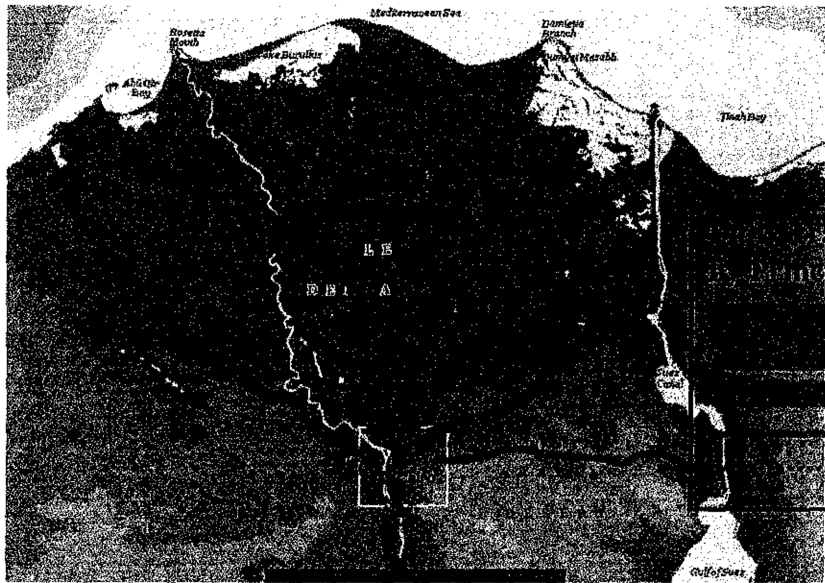

Figure 9.4.3(1) Daily Traffic Volume into/from the GCR by Principal Roads in 1990

Figures in parentheses indicate the ratio of road traffic volume from 1990 to 2000.

Figure 9.4.3(2) Daily Traffic Volume into/from the GCR by Principal Roads in 2000

Note (1) : Source of data in 1990 is JICA study "The Study on the Transportation System and the National Road Transportation Master Plan"

Note (2) : Source of data in 2000 is "General Authority for Roads & Bridges and Land Transport"

Note (3) : Ratio* of Traffic Volume (2000) to (1990)

Note (4) : Roads marked ** are directly linked with the GCR

Chapter 10 Demand Forecast

10.1 Socio-economic Framework for the Target Years in Egypt

10.1.1 Population

The population of Egypt in the year 2000 is estimated to be 63.8 million. The average annual growth rate is 2.0% for the period 1991-2000, indicating a gradual decline year by year during the last decade from 2.2% in 1981 to 1.8% in 2000. It is assumed that such historical trend of the gradual decline of the annual population growth rate would continue towards the future considering worldwide social phenomena of the decline of birthrates presumably attributing to the progress of women's employment and high-level education.

In this view, the future population growth rates were estimated by applying the time-series analysis using the population record in the last decade. The resulting average figures of average annual growth rates towards the respective target years are as follows (see Table 10.1.1):

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

"The National Strategy of National Economic and Social Development of the 21st Century" by the Ministry of Planning shows the forecast future population of around 80 million and an annual growth rate of 1.2% in the year 2017, indicating almost the similar figure as that estimated by the time-series analysis mentioned above. On the other hand, as to annual population growth rate of 1.85% in 2020 in the Middle East and Northern Africa region that includes Egypt forecast by UN seems to be too large to apply for Egypt considering the recent historical trend.

From the above, in this study, the population growth rates of 1.5% in the period of 2001 – 2010 and 1.1% in the period of 2011 – 2020 with high correlation coefficient were adopted.

Table 10.1.1 Historical Trend and forecast of Egyptian Population

Unit: '000

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001-2010	2011-2020
Population	53,617	54,780	55,930	57,064	58,180	59,272	60,396	61,524	62,655	63,800	74,040	82,600
Annual Growth Rate	2.2%	2.2%	2.1%	2.0%	2.0%	1.9%	1.9%	1.9%	1.8%	1.8%	1.5%	1.1%

Source: Future population was estimated by JICA Study Team according to the following equation.

Note: Y = 0.000464 X + 0.94657; X: year, Y: annual population growth rate, |R (correlation coefficient)| = 0.96

10.1.2 Gross Domestic Product (GDP)

As to the target growth of the economy of Egypt, which is generally shown by applying the representative economic index of GDP, the fourth five-year plan (1996/1997 - 2001/2002) showed an annual growth rate of 6.9% before the beginning of the plan. Though currently the five-year plan has not yet expired, the expected achievement of the average annual growth rate of GDP during the planned five years could be inferred to be less than the target figure of 6.9% from the actual resulting figures to date. The average annual growth rates of Egyptian GDP in the last ten years (1991 - 2000) and the five years (1996 - 2000) are 4.8% and 5.4%, respectively.

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

Referring to those forecast figures in GDP growth, and taking account of the recent actual achievement, 5.4% of annual GDP growth rate was adopted towards the target years in this study, which coincides with the achievement in the last five years and is in the range of the figures forecast by the international organization and targeted by the government for the current five-year plan (see Table 10.1.2).

Table 10.1.2 Historical Trend and forecast of Egyptian GDP

Unit: billion L.E. at 1995 constant price

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001-2010	2011-2020
GDP	174.5	182.3	187.5	194.9	204.0	214.2	226.0	238.6	253.0	265.9	451.8	767.6
Annual Growth Rate	1.1%	4.4%	2.9%	3.9%	4.7%	5.0%	5.5%	5.6%	6.0%	5.1%	5.4%	5.4%

Source: Future GDP was estimated by JICA Study Team.

10.2 Demand Forecast

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

10.2.1 Methodological Procedure

The cargo transported by the inland waterways in Egypt is divided into two categories, viz. overseas trade cargo and domestic trade cargo. In the first, the volume of cargo of the former category was estimated and then in the second, the volume of cargo of the latter category was estimated. Then, in the last step, the results of the first and the second steps were summarized.

In the first step of the forecast of the overseas trade cargo, the entire cargo volume through Egyptian major ports, viz. the Greater Alexandria Port, Damietta Port, Port Said Port, and the Red Sea ports (Suez Port and Safaga Port) was estimated. In the second step, the entire cargo volume was allocated to the existing major ports. In the allocation, a portion of local containers was allocated to the new port, viz. East Port Said Port as well as the existing major ports. In the third step, inland O/D (origin and destination) traffic of the seaport cargo was estimated. Then in the last step, a portion of the entire inland O/D traffic was allocated to the traffic by inland waterways.

On the other hand, as to the forecast of the domestic trade cargo, in the first step of the forecast, inland O/D traffic by waterways in the future was estimated taking account of the historical trend (traditional pattern). In the second step, the possibility of the conversion from land transport (railway and road) to inland waterway transport in the domestic trade was studied.

Finally, the above results were integrated into the entire cargo traffic by inland waterways covering both overseas trade and domestic trade cargo (see Fig. 10.2.1).

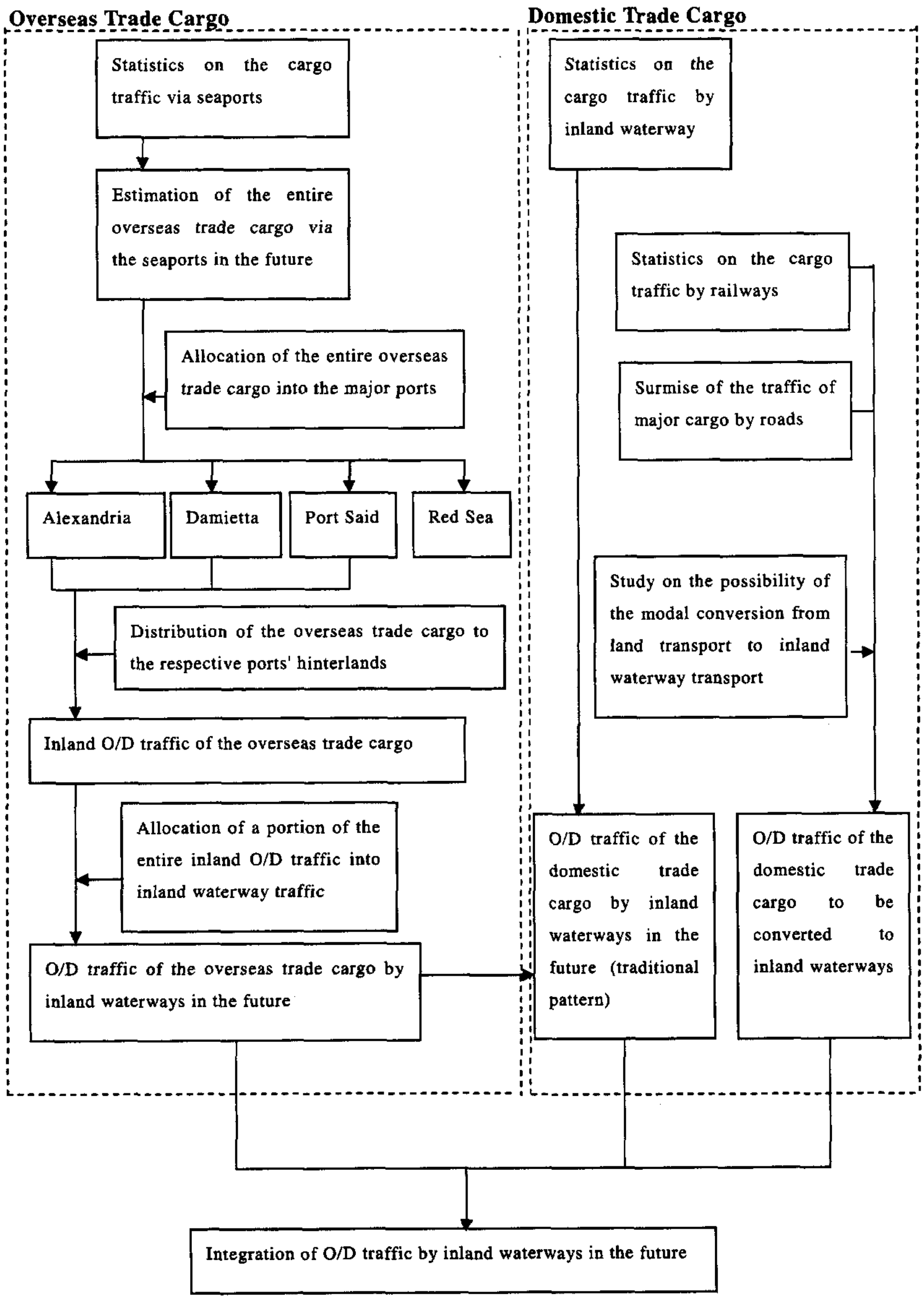

Fig. 10.2.1 Flow of Inland Waterway Traffic Forecast

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

(1) Overseas Trade Cargo via the Seaports

1) Forecast by Cargo Item

a) Containerizable General Cargo

The volumes of imported containerizable general cargo were assumed to increase for the future in proportion to Egyptian GDP growth with growth elasticity (hereinafter referred to as "the method of growth elasticity"). The resulting volumes of imported containerizable general cargo are 15.2 million MT in 2010, and 24.6 million MT in 2020. On the other hand, the volumes of exported containerizable general cargo were assumed to increase for the future in proportion to the growth of trade partners' weighed total of GDP with growth elasticity. The resulting volumes of exported containerizable general cargo are 6.3 million MT in 2010, and 11.4 million MT in 2020 (see Table 10.2.1).

Table 10.2.1 Historical Trend and Forecast of Imported and Exported Containerizable General Cargo

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2010	2020
Egyptian GDP (billion LE)	174.5	182.3	187.5	194.9	204.0	214.2	226.0	238.6	253.0	265.9	451.8	767.6
Imports ('000 MT)	6,381	6,956	8,488	6,377	6,999	8,483	7,931	10,544	10,996	9,367	15,186	24,622
Trade partners' GDP (billion US$)	6,354	6,501	6,593	6,817	6,999	7,218	7,468	7,684	7,912	8,126	10,680	14,036
Exports ('000 MT)	2,151	2,453	2,410	1,913	2,301	2,988	2,474	3,565	3,384	3,496	6,301	11,354

Note (1): GDP at 1995 constant price

Note (2): Growth Elasticity in imports: 4.4% (General Cargo)/4.8%(GDP) = 0.91 in 1991 - 2000

Note (3): Growth rate of imported containerizable general cargo: 5.4%(GDP) × 0.91(growth elasticity) = 5.0%

Note (4): Growth Elasticity in exports: 5.6 % (General Cargo)/2.8%(GDP) = 2.0 in 1991 - 2000

Note (5): Growth rate of exported containerizable general cargo = 3.0%(GDP) × 2.0(growth elasticity) = 6.1%

b) Timber

In the case of imported timber, the time-series analysis in the consumption per capita of imported timber was adopted to forecast the total volume of timber via the seaports in the target years by using the historical records in the last ten years. The resulting volumes of the imported timber are 4.6 million and 6.1 million in MT in 2010 and 2020, respectively (see Table 10.2.2).

Table 10.2.2 Historical Trend and Forecast of the Volumes of Imported Timber

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2010	2020
Timber ('000 MT)	986	904	1,315	1,327	1,648	1,575	1,826	2,137	1,969	2,403	4,561	6,059
Consumption per capita (kg)	18	17	24	23	28	27	30	35	31	38	62	73
Population ('000)	53,617	54,780	55,930	57,064	58,180	59,272	60,396	61,524	62,655	63,800	74,040	82,600

Note: Y= 2.3491 X – 4660.009; X: year, Y: consumption per capita, R (correlation coefficient) = 0.95

c) Sugar

The volumes of imported sugar in the future were estimated by subtracting local sugar production from local sugar demand. The local sugar demand in the future was computed by assuming the future sugar consumption per capita by taking account of the past record. The resulting volumes of the imported sugar are 353,000 and 480,000 in MT in 2010 and 2020, respectively (see Table 10.2.3).

Table 10.2.3 Historical Trend and Forecast of the Volumes of Imported Sugar

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2010	2020
Local production ('000 MT)	908	895	914	967	1,077	1,087	1,151	1,215	-	-	2,020	2,420
Imported sugar ('000MT)	561	338	196	503	825	443	969	531	-	-	353	480
Demand ('000 MT)	1,469	1,233	1,110	1,470	1,902	1,530	2,120	1,746	-	-	2,373	2,900
Consumption per capita (kg)	27	23	20	26	33	26	35	28	-	-	35	35
Population ('000)	53,617	54,780	55,930	57,064	58,180	59,272	60,396	61,524	62,655	63,800	74,040	82,600

Note (1): The local sugar production in the future was estimated by the Ministry of Planning.

Note (2): Local production is expressed in the refined sugar volume containing cane sugar and beat sugar.

d) Paper

The volumes of imported paper in the future were estimated by "the method of growth elasticity" for the reference of the past GDP growth rate. The resulting volumes of imported paper are 575,000 MT in 2010, and 951,000 MT in 2020 (see Table 10.2.4).

Table 10.2.4 Historical Trend and Forecast of Imported Paper

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2010	2020
GDP (billion LE)	174.5	182.3	187.5	194.9	204.0	214.2	226.0	238.6	253.0	265.9	451.8	767.6
Paper ('000MT)	247	342	196	296	333	300	172	-	-	-	575	951

Note (1): GDP at 1995 constant price

Note (2): Growth Elasticity: 4.0% (General Cargo)/4.2%(GDP) = 0.95 in 1991 - 1996

Note (3): Growth rate of imported containerizable general cargo: 5.4%(GDP) × 0.95(growth elasticity) = 5.2%

e) Flour

The volumes of imported flour in the future were assumed to be kept at the recent level. The volumes of imported flour were estimated to be 45,000 MT in both 2010 and 2020 (see Table 10.2.5).

Table 10.2.5 Historical Trend and Forecast of Imported Flour

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2010	2020
Flour ('000MT)	429	104	502	284	257	84	53	44	46	46	45	45

Note: The future volumes of imported flour were computed as an average of the last three years (1998 – 2000).

f) Iron and Steel Products

The volumes of imported iron and steel products in the future were estimated by subtracting estimated local iron and steel production from local demand in the future. The local demand in the future was estimated by adopting the cross section analysis in correlating consumption per capita with GDP in the various countries including Egypt in the year 2000 and the forecast GDP of Egypt in the future (see Table 10.2.6). On the other hand, the future production of the local steel mills (ANSDK (Alexandria National Iron & Steel Company) with direct reduction furnaces in Dekheila, EISC (Egypt Iron & Steel Company) with blast furnaces at Helwan in Cairo and other mills with electric furnaces) was estimated taking account of the results of the interviews to them and the historical trends of their production. The resulting volumes of the imported iron and steel products are 1,208,000 and 917,000 in MT in 2010 and 2020, respectively (see Table 10.2.7).

Table 10.2.6 Iron and Steel Consumption per capita and GDP in 2000

Country	Population (million)	Consumption (million MT)	Consumption (kg per capita)	GDP per capita (US$)
India	1,016	26.9	26	460
China	1,261	141.2	112	840
Egypt	64	4.7	74	1,490
Iran	64	6.9	108	1,630
Turkey	65	12.4	190	3,090
Brazil	170	15.8	93	3,570
Venezuela	24	1.9	79	4,310
Mexico	98	14.4	147	5,080
Spain	39	17.5	444	14,960
Canada	31	17.5	570	21,050
France	59	17.6	299	23,670

Source: INSA: International Steel Association

Note (1): GDP: Current prices of the year 2000

Note (2): Cross section analysis: Y= 0.0127 X – 86.386; X: GDP in 2000 (billion US$), Y: consumption per capita (kg), R (correlation coefficient)= 0.84

Table 10.2.7 Historical Trend and Forecast of the Imported Iron and Steel Products

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2010	2020
Local production ('000 MT)	2,523	2,664	2,866	3,019	2,950	2,936	3,914	4,403	4,805	4,588	7,234	9,695
Imported iron & steel products ('000MT)	643	545	977	979	1,058	1,258	1,382	1,960	1,604	718	1,208	917
Exported iron & steel products ('000MT)	0	4	123	96	61	0	192	0	0	274	-	-
Demand ('000 MT)	3,166	3,205	3,720	3,902	3,947	4,194	5,104	6,363	6,409	5,032	8,442	10,612
Consumption per capita (kg)	59	59	67	68	68	71	85	103	102	79	114	128
Population ('000)	53,617	54,780	55,930	57,064	58,180	59,272	60,396	61,524	62,655	63,800	74,040	82,600

Source: The local production statistics: the Ministry of Industry.

Note (1): Production of ANSDK: 2.4 million MT in 2010 and 3.2 million MT in 2020.

Note (2): Production of EISC: One million MT in 2010 and 2020.

Note (3): Production of other mills: Y= 166.083 X – 329993.833; X: year, Y: production, R (correlation coefficient)= 0.87

g) Scrap

The volumes of imported scrap in the future were assumed to be kept at the level of the last decade. The volumes of imported scrap were estimated to be 201,000 MT in both 2010 and 2020 (see Table 10.2.8).

Table 10.2.8 Historical Trend and Forecast of Imported Scrap

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2010	2020
Scrap ('000MT)	114	109	96	74	62	201	16	-	-	-	201	201

Note: The future volumes of imported scrap were estimated as the maximum of the last decade.

h) Cars

The volumes of imported cars in the future were assumed to be kept at the level of the last decade. The volumes of imported cars were estimated to be 36,000 MT in both 2010 and 2020 (see Table 10.2.9).

Table 10.2.9 Historical Trend and Forecast of Imported Cars

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2010	2020
Cars ('000MT)	3	12	11	36	27	17	10	-	-	-	36	36

Note: The future volumes of imported cars were estimated as the maximum of the last decade.

i) Wheat

The volumes of imported wheat in the future were estimated by subtracting estimated local wheat production from local demand in the future. The local demand in the future was estimated by adopting the cross section analysis in comparing consumption per capita with various countries with the similarity of Egypt in wheat consumption such as Arabic countries. The per capita consumption was also crosschecked by the time-series analysis that gave small difference with the results of the cross section analysis. On the other hand, the future local production of wheat was estimated by adopting the time-series analysis using the historical trends of the production. The resulting volumes of the imported wheat are 9.3 million and 8.9 million in MT in 2010 and 2020, respectively (see Table 10.2.10).

Table 10.2.10 Historical Trend and Forecast of the Volumes of Imported Wheat

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2010	2020
Local production ('000 MT)	4,482	4,618	4,833	4,437	5,723	5,735	5,850	6,094	6,346	6,456	9,177	11,729
Imported wheat ('000MT)	5,047	5,733	4,652	5,888	5,877	6,355	6,920	6,925	6,564	7,166	9,334	8,922
Demand ('000 MT)	9,529	10,351	9,485	10,325	11,600	12,090	12,770	13,019	12,910	13,622	18,511	20,651
Consumption per capita (kg)	178	189	170	181	199	204	211	212	206	214	250	250
Population ('000)	53,617	54,780	55,930	57,064	58,180	59,272	60,396	61,524	62,655	63,800	74,040	82,600

Source: The local production statistics: the Ministry of Agriculture.

Note: Local production: Y= 255.191X – 503755.905; X: year, Y: production, R (correlation coefficient) = 0.90

j) Maize

The volumes of imported maize in the future were estimated by subtracting estimated local maize production from local demand in the future. The local demand in the future was estimated by adopting the cross section analysis in comparing consumption per capita with various countries with the similarity of Egypt in maize consumption. The per capita consumption was also crosschecked by the time-series analysis that gave small difference with the results of the cross section analysis. On the other hand, the future local production of maize was estimated by adopting the time-series analysis using the historical trends of the production. The resulting volumes of the imported maize are 6.3 million and 7.1 million in MT in 2010 and 2020, respectively (see Table 10.2.11).

Table 10.2.11 Historical Trend and Forecast of the Volumes of Imported Maize

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2010	2020
Local production ('000 MT)	5,122	5,070	5,039	5,437	5,178	5,825	5,147	5,430	5,908	5,650	6,232	6,875
Imported maize ('000MT)	884	763	2,297	2,078	2,712	2,146	3,266	3,328	4,500	5,110	6,255	7,056
Demand ('000 MT)	6,006	5,833	7,336	7,515	7,890	7,971	8,413	8,758	10,408	10,760	12,487	13,931
Consumption per capita (kg)	112	106	131	132	136	134	139	142	166	169	169	169
Population ('000)	53,617	54,780	55,930	57,064	58,180	59,272	60,396	61,524	62,655	63,800	74,040	82,600

Source: The local production statistics: the Ministry of Agriculture.

Note: Production of maize: An average growth rate of wheat production in the last decade of 1.0% was used to forecast for the future production.

k) Iron Pellets

The volumes of imported iron pellets used for raw material at the steel mill of ANSDK in the future were estimated according to the production plan of ANSDK. The volumes of imported iron pellets were estimated to be 3.8 million and 5.0 million in MT in 2010 and 2020, respectively (see Table 10.2.12).

Table 10.2.12 Historical Trend and Forecast of Imported Iron Pellets

Unit: '000MT

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2010	2020
Iron Pellets	1,337	1,604	1,640	1,557	1,257	1,394	1,988	3,146	2,180	3,222	3,750	5,000

Note: The numbers of modules were estimated to be three and five in 2010 and 2020, respectively; one module of the direct reduction furnace requires 1.25 million MT of iron pellets.

l) Coal

The volumes of imported coal via Alexandria Port used for raw material at the steel mill of EISC in the future were estimated to be kept intact from the present level. The volumes of imported coal via Alexandria Port were estimated to be 1.5 million MT in both 2010 and 2020. On the other hand, the volumes of imported coal via the Red Sea ports were estimated to be also kept intact from the present level. The volumes of imported coal via Red Sea ports were estimated to be 85,000 MT in both 2010 and 2020 (see Table 10.2.13).

Table 10.2.13 Historical Trend and Forecast of Imported Coal

Unit: '000MT

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2010	2020
Coal via Alexandria	1,312	1,412	1,556	1,732	1,568	1,833	1,659	1,936	1,704	1,691	1,500	1,500
Coal via Red Sea	103	93	216	145	166	110	139	98	104	53	85	85

Note (1): There is no plan to expand production capacity of the Helwan steel mill in the future.

Note (2): The future volumes of coal imported via the Red Sea ports were estimated as an average of the last three years.

m) Cement

The volumes of imported cement in the future were estimated by subtracting estimated local cement production from local demand in the future. The local demand in the future was estimated by adopting the cross section analysis in comparing consumption per capita with various countries with the similarity of Egypt in cement consumption. On the other hand, the future local production of cement was estimated by adopting the time-series analysis using the historical trends of the production. The resulting volumes of the imported cement are 4.7 million and 3.6 million in MT in 2010 and 2020, respectively (see Table 10.2.14).

Table 10.2.14 Historical Trend and Forecast of the Volumes of Imported Cement

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2010	2020
Local production ('000 MT)	15,762	14,943	15,116	16,445	16,937	18,111	19,253	20,972	22,140	23,598	29,647	37,683
Imported cement ('000MT)	32	6	3	458	1,465	1,369	2,678	3,840	5,326	3,651	4,675	3,619
Demand ('000 MT)	15,794	14,949	15,119	16,903	18,402	19,480	21,931	24,812	27,466	27,249	34,322	41,301
Consumption per capita (kg)	295	273	270	296	316	329	363	403	438	427	464	500
Population ('000)	53,617	54,780	55,930	57,064	58,180	59,272	60,396	61,524	62,655	63,800	74,040	82,600

Source: The local production statistics: the Ministry of Industry.

Note: Production of cement: $Y = 803.536X - 1585459.607$; X: year, Y: production, R (correlation coefficient) = 0.93

n) Sulfur

The volumes of imported sulfur were estimated to be kept intact from the present level. The volumes of imported sulfur were estimated to be 349,000 MT in both 2010 and 2020 (see Table 10.2.15).

Table 10.2.15 Historical Trend and Forecast of Imported Sulfur

Unit: '000MT

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2010	2020
Sulfur	0	0	0	207	172	235	349	-	-	-	349	349

Note: The future volumes of imported sulfur were estimated as the maximum in the last decade.

o) Fertilizer

The volumes of imported and exported fertilizer in the future were estimated by subtracting estimated local fertilizer production from local demand in the future. The local demand in the future was estimated by adopting the time-series analysis for the consumption per capita and crosschecked by the cross section analysis in the comparison with the various countries. On the other hand, the future production of the local fertilizer was estimated by the time-series analysis. The resulting volumes of the imported and fertilizer are 194,000 in MT in both 2010 and 2020, the volumes of the exported fertilizer are 1,267,000 and 880,000 in MT in 2010 and 2020, respectively (see Table 10.2.16).

Table 10.2.16 Historical Trend and Forecast of the Imported and Exported Fertilizer

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2010	2020
Local production ('000 MT)	5,609	6,036	6,387	6,690	7,132	7,754	8,007	7,421	8,252	9,218	11,877	15,101
Imported fertilizer products ('000MT)	569	139	289	159	262	394	262	203	188	190	194	194
Exported fertilizer ('000MT)	327	633	299	573	435	488	447	570	627	774	1,267	880
Demand ('000 MT)	6,178	6,175	6,676	6,849	7,394	8,148	8,269	7,624	8,440	9,408	12,070	15,294
Consumption per capita (kg)	109	101	114	110	120	129	130	115	125	135	146	175
Population ('000)	53,617	54,780	55,930	57,064	58,180	59,272	60,396	61,524	62,655	63,800	74,040	82,600

Source: The local production statistics: the Ministry of Industry.

Note (1): Local production of fertilizer: $Y = 322.405X - 636156.798$; X: year, Y: production, R (correlation coefficient) = 0.93

Note (2): Consumption per capita: $Y = 2.860X - 5588.685$; X: year, Y: production, R (correlation coefficient) = 0.80 (ceiling in 2015)

Note (3): The volumes of imported fertilizer in the future were estimated as an average of the last three years.

p) Petroleum

The volumes of imported and exported petroleum in the future were estimated by subtracting estimated local petroleum production from local demand in the future. The local demand in the future was estimated by assuming the future consumption per capita and crosschecked by the cross section analysis in the comparison with the various countries. On the other hand, the future production of the local petroleum was estimated by the time-series analysis. The resulting volumes of the imported petroleum are 2,051,000 in MT in both 2010 and 2020, and the volumes of the exported petroleum are 3,788,000 and 4,454,000 in MT in 2010 and 2020, respectively (see Table 10.2.17).

Table 10.2.17 Historical Trend and Forecast of the Imported and Exported Petroleum

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2010	2020
Local production ('000 MT)	21,038	20,470	20,561	21,466	22,132	22,132	22,921	23,184	23,435	22,491	27,333	30,958
Imported petroleum ('000MT)	6,807	2,114	2,040	1,157	1,183	2,315	1,659	1,875	1,793	2,486	2,051	2,051
Exported petroleum ('000MT)	3,420	2,962	4,682	4,950	4,663	5,265	4,378	3,254	3,830	3,380	3,788	4,454
Demand ('000 MT)	27,845	22,584	22,601	22,623	23,315	24,447	24,580	25,059	25,228	24,977	29,384	33,009
Consumption per capita (kg)	456	358	320	310	321	324	334	354	342	339	346	346
Population ('000)	53,617	54,780	55,930	57,064	58,180	59,272	60,396	61,524	62,655	63,800	74,040	82,600

Source: *The local production statistics: the Ministry of Petroleum.*
Note (1): Local production of petroleum: Y= 362.472X – 701236.927; X: year, Y: production, R (correlation coefficient) = 0.95
Note (2): Consumption per capita in the future was estimated as an average of the last three years.
Note (3): The volumes of imported petroleum in the future were estimated as an average of the last three years.

q) Edible Oil

The volumes of imported edible oil in the future were estimated by subtracting estimated local petroleum production from local demand in the future. The local demand in the future was estimated by assuming the future consumption per capita and crosschecked by the cross section analysis in the comparison with the various countries. On the other hand, the future production of the local petroleum was estimated by the time-series analysis. The resulting volumes of the imported and exported petroleum are 1.1 million and 1.2 million in MT in 2010 and 2020, respectively (see Table 10.2.18).

Table 10.2.18 Historical Trend and Forecast of the Imported Edible Oil

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2010	2020
Imported Edible Oil ('000MT)	746	679	864	731	866	988	863	886	915	991	1,073	1,197
Consumption of imports per capita (kg)	14	12	15	13	15	17	14	14	15	16	14	14
Population ('000)	53,617	54,780	55,930	57,064	58,180	59,272	60,396	61,524	62,655	63,800	74,040	82,600

Note: Consumption per capita of imported edible oil in the future was estimated as an average of the last decade.

r) Coke

The future volumes of exported coke that is the by-product at the Helwan steel mill were assumed to be kept at the present level. The volumes of exported coke were estimated to be 300,000 MT in both 2010 and 2020 (see Table 10.2.19).

Table 10.2.19 Historical Trend and Forecast of Exported Coke

Unit: '000MT

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2010	2020
Coke	0	0	148	378	371	0	306	12	0	523	300	300

Note: The future volumes of exported coke were estimated according to the interview to EISC.

s) Molasses

The volumes of exported molasses were assumed to increase in proportional to an increase in sugar cane production. The volumes of exported molasses were estimated to be 416,000 and 517,000 in MT in 2010 and 2020, respectively (see Table 10.2.20).

Table 10.2.20 Historical Trend and Forecast of Exported Molasses

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2010	2020
Sugar cane (million MT)	11.1	11.5	11.7	12.4	13.8	14.1	-	14.0	-	15.7	20.6	25.6
Exported molasses ('000 MT)	131	154	180	170	246	223	186	250	401	423	416	517
Weight percentage for sugar cane	1.2%	1.3%	1.5%	1.4%	1.8%	1.6%	-	1.8%	-	2.7%	2.0%	2.0%

Note: Local production of sugar cane: Y = 501.328X – 987047.246; X: year, Y: production, R (correlation coefficient) = 0.93

t) Other General Cargo

The volumes of imports and exports of other general cargo were estimated as 394,000 and 39,000 in MT in 2010 and 2020, respectively (see Table 10.2.21).

Table 10.2.21 Historical Trend and Forecast of Other General Cargo

Unit: '000MT

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2010	2020
Import	91	152	165	147	244	134	181	321	474	386	394	394
Export	1	2	5	10	6	17	23	33	44	39	39	39

Note: The cargo volumes in imports and exports were assumed as the maximum in the last decade.

u) Livestock

The volumes of imported livestock were estimated as 176,000 in MT in both 2010 and 2020 (see Table 10.2.22).

Table 10.2.22 Historical Trend and Forecast of Imported Livestock

Unit: '000MT

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2010	2020
Import	1	15	176	72	48	33	6	-	-	-	176	176

Note: The cargo volumes of imported livestock were assumed as an average in the last three years.

v) Other Dry Bulk Cargo

The volumes of imports and exports of other dry bulk cargo were estimated as 600,000 and 651,000 in MT in 2010 and 2020, respectively (see Table 10.2.23).

Table 10.2.23 Historical Trend and Forecast of Other Dry Bulk Cargo

Unit: '000MT

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2010	2020
Import	0	11	25	368	365	900	483	196	1,320	284	600	600
Export	203	562	1,042	730	679	639	547	447	529	976	651	651

Note: The cargo volumes in imports and exports were assumed as the respective averages in the last three years.

w) Soybeans

The volumes of imported soybeans were estimated as 255,000 in MT in both 2010 and 2020 (see Table 10.2.24).

Table 10.2.24 Historical Trend and Forecast of Imported Soybeans

Unit: '000MT

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2010	2020
Soybeans	0	0	0	0	151	303	243	0	404	362	255	255

Note: The cargo volumes in imported soybeans were assumed as an average in the last three years.

2) Containers

a) Mediterranean Ports

The Egyptian Mediterranean ports containing the ports of the Greater Alexandria, Damietta and Port Said have the respective dedicated container terminals. The progress of containerization in the future was estimated by adopting the linear regression analysis by assuming the logistic curve fitting and using the historical data in the past decade. The resulting figures in import in 2010 and 2020 are 11.4 million and 20.2 million in MT, respectively. On the other hand, the resulting figures in export in 2010 and 2020 are 4.1 million and 7.7 million in MT, respectively (see Tables 10.2.26 and 10.2.27).

Table 10.2.26 Historical Trend and Forecast of Imported Container Cargo via Mediterranean Ports

Unit: '000MT

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2010	2020
Containerizable Cargo	5,338	5,991	7,893	5,754	6,280	7,650	7,160	9,712	9,428	7,408	13,363	21,665
Container cargo	1,660	1,526	1,626	2,126	2,791	2,936	3,488	4,367	4,689	4,811	11,388	20,164
Percentage of containerization	31.1%	25.5%	20.6%	36.9%	44.4%	38.4%	48.7%	45.0%	49.7%	64.9%	85.2%	93.1%

Note (1): Excluding transshipped containers.

Note (2): Percentage of containerization: $P = P_m / \left(1 + C^{t-t_o}\right)$; t: year, ultimate % of containerization: $P_m = 0.95$, $C = 0.843$, $t_o = 1997$, |R (correlation coefficient)| = 0.87

Table 10.2.27 Historical Trend and Forecast of Exported Container Cargo via Mediterranean Ports

Unit: '000MT

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2010	2020
Containerizable Cargo	1,468	1,901	1,698	1,323	1,752	2,217	1,844	2,759	2,313	2,145	4,509	8,126
Container cargo	633	615	674	874	1,125	1,191	1,310	1,912	1,606	1,630	4,143	7,684
Percentage of containerization	43.1%	32.4%	39.7%	66.1%	64.2%	53.7%	71.0%	69.3%	69.4%	76.0%	91.9%	94.6%

Note (1): Excluding transshipped containers.

Note (2): Percentage of containerization: $P = P_m / \left(1 + C^{t-t_o}\right)$; *t: year, ultimate % of containerization:*

$P_m = 0.95$, $C = 0.820$, $t_o = 1993$, |R (correlation coefficient)| = 0.86

b) Red Sea Ports

The Red Sea ports containing the ports of Suez and Safaga are handling a small number of containers mostly at Suez Port. The volumes of container cargo in the future were estimated by taking account of the historical data in the past decade. The resulting figures in import in 2010 and 2020 are 378,000 and 613,000 in MT, respectively. On the other hand, the resulting figures in export in 2010 and 2020 are 281,000 and 507,000 in MT, respectively. (see Tables 10.2.28 and 10.2.29).

Table 10.2.28 Historical Trend and Forecast of Imported Container Cargo via Red Sea Ports

Unit: '000MT

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2010	2020
Containerizable Cargo	1,043	965	595	623	719	833	771	832	1,569	1,959	1,824	2,957
Container cargo	31	33	21	55	66	104	84	267	302	-	378	613
Percentage of containerization	3.0%	3.4%	3.6%	8.9%	9.2%	12.5%	10.9%	32.1%	19.2%	-	20.7%	20.7%

Note: The percentage of containerization in import in the future was assumed as an average in the last three years.

Table 10.2.29 Historical Trend and Forecast of Exported Container Cargo via Red Sea Ports

Unit: '000MT

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2010	2020
Containerizable Cargo	683	552	712	590	549	771	630	806	1,070	1,351	1,791	3,228
Container cargo	8	30	23	36	46	102	66	174	162	-	281	507
Percentage of containerization	1.1%	5.3%	3.2%	6.1%	8.3%	13.2%	10.5%	21.6%	15.1%	-	15.7%	15.7%

Note: The percentage of containerization in export in the future was assumed as an average in the last three years.

c) The Number of Containers in TEUs

The volumes of container cargo expressed in MT in the target years were converted to the number of containers expressed in TEUs. The resulting figures of the local containers as a total of imports and exports including empty containers in 2010 and 2020 are 2.1 million and 3.7 million in TEUs, respectively.

3) Allocation of the Total Cargo to the Major Ports

The volumes of the overseas trade cargo estimated in total were allocated to each of the major ports containing the Greater Alexandria, Damietta, Port Said, East Port Said and the Red Sea ports (Suez and Safaga) by taking account of their historical shares out of the total. The resulting figures by port are shown in Table 10.2.30.

Table 10.2.30 Forecast Cargo Volume in Egyptian Overses Trade via Egyptian Seaports

Trade		Commodity		Actual Record 2000					Projection 2010					Projection 2020				
				Alexisandria	Damietta	Port Said	Red Sea	Total	Alexisandria	Damietta	Port Said	Red Sea	Total	Alexisandria	Damietta	Port Said	Red Sea	Total
Conventional Cargo	Import	Break-bulk General Cargo		2,177	152	267	1,553	4,149	1,675	101	199	1,445	3,420	1,273	77	151	2,343	3,844
		Break-bulk General Cargo (Statistically Mixed in Containerization)	Timber	1,909	448			2,358	3,632	843			4,474	4,824	1,120			5,943
			Sugar	356		72		427	228		121		349	310		164		474
			Paper	124				124	419				419	693				693
			Flour	46				46	45	11			56	45	11			56
			Others	0	30		356	386	0	57	138	199	394	0	57	138	199	394
			Sub-total	2,435	478	72	356	3,341	4,324	911	258	199	5,692	5,872	1,187	301	199	7,560
		General Cargo (Non-containerizable)	Iron/Steel Products	0	312	41	365	718	406	285	117	400	1,208	308	216	89	304	917
			Scrap	-				-	201				201	201				201
			Cars	-				-	36				36	36				36
			Livestock	-					176				176	176	0	0	0	176
			Sub-total	0	312.3	41	364.6	718	819	285	117	400	1,621	721	216	89	304	1,330
		General CargoTotal		4,612	943	380	2,273	8,208	6,818	1,297	574	2,045	10,734	7,866	1,481	541	2,846	12,735
		Dry Bulk	Wheat	3,587	1,799	760	1,020	7,166	3,729	2,814	1,243	1,548	9,334	3,564	2,690	1,188	1,479	8,922
			Maize	3,370	1,707	29	4	5,110	4,186	2,053	14	2	6,255	4,722	2,316	16	2	7,056
			Soybean		362			362	0	255	0	0	255	0	255	0	0	255
			Iron Pellets	3,222				3,222	3750				3,750	5000				5,000
			Coal	1,691			53	1,744	1500			85	1,585	1500			85	1,585
			Cement	939	1,891		822	3,651	1,452	2,219	0	1,004	4,675	1,124	1,718	0	777	3,619
			Sulphur	-				-	349				349	349				349
			Fertilizer	126	51		13	190	178	10	0	6	194	178	10	0	6	194
			Others	0	135		149	284	154	157	0	289	600	154	157	0	289	600
			Sub-total	12,934	5,945	789	2,061	21,729	15,297	7,508	1,257	2,934	26,997	16,591	7,146	1,204	2,639	27,579
		Liquid Bulk	Petroleum Oil	1,397	131		958	2,486	931	19	2	1,099	2,051	931	19	`2	1,099	2,051
			Oil and greese	546	55		390	991	697	17	0	360	1,073	777	19	0	401	1,197
			Sub-total	1,943	186		1,348	3,477	1,628	36	2	1,459	3,124	1,708	38	2	1,500	3,248
		Import Total		19,489	7,074	1,169	5,682	33,414	23,742	8,841	1,833	6,438	40,855	26,165	8,664	1,747	6,986	43,562
	Export	Break-bulk General Cargo		314	176	25	1,139	1,654	259	60	48	1,510	1,876	312	72	58	2,721	3,163
		Break-bulk Statistically Mixed		0	3	0	37	39	0	7	2	30	39	0	7	2	30	39
		Iron/Steel Products (Non-containerizable)		0	141	133	2	276					0					0
		General CargoTotal		314	320	158	1,177	1,969	259	67	50	1,540	1,915	312	79	60	2,751	3,202
		Dry Bulk	Coke	523				523	300				300	300				300
			Fertilizer	311	371	1	91	774	307	321	269	371	1,267	213	223	187	258	880
			Others	1	217	208	550	976	4	56	31	560	651	4	56	31	560	651
			Sub-total	835	588	209	641	2,273	610	377	300	931	2,218	516	279	217	818	1,830
		Liquid Bulk	Petroleum Oil	2,533	0	572	276	3,380	2,464	0	533	790	3,788	2,897	0	627	929	4,454
			Mollases	370	53	0	0	423	394	17	0	6	416	490	21	0	7	517
			Sub-total	2,903	53	572	276	3,803	2,858	17	533	796	4,204	3,387	21	627	936	4,971
		Export Total		4,052	961	939	2,093	8,045	3,727	460	883	3,267	8,337	4,216	378	904	4,505	10,003
	Conventional Cargo Total (excluding Containers)			23,541	8,035	2,108	7,775	41,459	27,469	9,301	2,716	9,705	49,191	30,381	9,043	2,652	11,491	53,566
Local Containers ('000 TEUs)				505	-	-	-	-	1,500	159	198	65	1,922	1,500	680	700	106	2,986

Source: Estimated bu the Study Team

Note: Break-bulk cargo (containerizable) means break-bulk cargo that is containerizable but not yet containerized.

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

The inland O/D traffic in the overseas trade cargo via the Egyptian seaports was estimated by multiplying the total cargo traffic via the seaports and the percentage of inland O/D traffic by cargo item and inland traffic route. The major O/D traffic routes are between the seaports and the Greater Cairo. Almost all the remaining routes are between the seaports and the corresponding governorates where the respective seaports are located except for some cargo such as molasses from/to Upper/Middle Egypt.

Prior to the estimation of cargo traffic by inland traffic route, the items of cargo suitable for barge transport (hereinafter referred as "the target cargo" for the modal shift to IWT") were selected. In the selection of "the target cargo", cargoes that have sufficient annual volumes between two specified transport modes such as the respective seaports and Greater Cairo enabling to make barge business viable were selected. In addition, the condition that cargoes need to be stackable mono-commodity in each barge operation was considered. In the latter condition, miscellaneous general cargoes possibly stowed in a barge hold as mixture were excluded from "the target cargo" (see Tables 10.2.31 – 10.2.34).

Table 10.2.31 Inland Traffic of the Target Cargo for IWT between Alexandria and Greater Cairo in Overseas Trade Cargo

Unit: '000MT

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

Source: The percentage of O/D traffic between Alexandria Port and the Greater Cairo was referred to "the Study on Rehabilitation Scheme of the Greater Alexandria Port" made by JICA in 1998.

Note: The intra-regional traffic within Alexandria Governorate is excluded.

Table 10.2.32 Inland Traffic of the Target Cargo for IWT between Alexandria Port and Upper Egypt in Overseas Trade

Unit: '000MT

Cargo Item		To Alexandria Port (A)		From Upper Egypt (B)		B/A
		2010	2020	2010	2020	%
Export	Molasses	206	257	206	257	100.0%

Source: Estimated by JICA Study Team.

Table 10.2.33 Inland Traffic of the Target Cargo for IWT between Damietta Port and the Greater Cairo in Overseas Trade

Unit: '000MT

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

Source: The percentage of O/D traffic between Damietta Port and the Greater Cairo was referred to "the Study on Rehabilitation Scheme of the Greater Alexandria Port" made by JICA in 1998.

Note: The intra-regional traffic within Damietta Governorate is excluded.

Table 10.2.34 Inland Traffic of the Target Cargo for IWT between Port Said Port and the Greater Cairo in Overseas Trade

Unit: '000MT

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

Source: The percentage of O/D traffic between Port Said Port and the Greater Cairo was referred to "the Study on Rehabilitation Scheme of the Greater Alexandria Port" made by JICA in 1998.

Note: The intra-regional traffic within Port Said Governorate is excluded.

(2) Domestic Trade Cargo

1) General

The domestic trade cargo in Egypt is currently transported by the three modes, viz. inland waterway, railway and road (truck). The O/D traffic of the cargo to be transported by inland waterway in the target years was estimated separately by current transport modes. The current inland waterway traffic is called as "the traditional inland waterway transport (IWT) pattern" in this study, and the future traffic of this pattern was estimated by taking account of the historical trend of the traffic and the estimated economic and social indices as well as the overseas trade cargo.

On the other hand, "the current railway traffic pattern" is considered to be possibly converted into the inland waterway in terms of the objects of this study. "The current road traffic" is also considered to be possibly converted into the inland waterway in terms of the objects of this study as well as "the current railway traffic pattern".

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

a) Methodology

As to the traffic of local products for the local consumption, taking account of the objective of this study to propose the measures for Inland Waterway Transport (IWT) promotion, inter-regional transport in medium-distance and long-distance was put emphasized on rather than intra-regional transport in short-distance where IWT has generally disadvantage compared with road transport.

b) Inter-regional Traffic in the Traditional Pattern

Major cargoes currently transported by IWT and railways in inter-regional transport are listed in Table 10.2.37. As shown in the table, they are bulk cargoes or heavy/bulky break-bulk cargoes that are transported in long distance and are naturally considered to be suitable for IWT or railway. The volumes of those cargoes in the future were forecast on the assumption that the current pattern in transport mode will be kept intact since the reason why modal shift will occur was not clearly identified without any transport projects motivating the shift (hereinafter referred to as "traditional pattern").

In addition to by IWT and railways, road transport is also currently used in inter-regional transport. Although there is no sufficient statistics to enable clear identification by cargo item, volume and route, inter-regional cargo traffic by road, however, was roughly outlined by referring to the statistics of agricultural products with the regional crop distribution, and to the statistics of industrial products with the information on the location of factories. The first-hand information from trucking companies on the said traffic was also used.

Firstly as to agricultural local products for local consumption, there seems to no large disparity between the distributions of production and population, except for sugar cane production that is produced mostly in Upper Nile. Most agricultural products presumably distributed by road in intra-regional transport (short-distance). On the other hand, refined cane sugar is presumably transported by road in inter-regional transport (long-distance) as well as in intra-regional transport.

Secondary as to industrial local products for local consumption, cement, fertilizer and iron/steel products (ranked from the first to the third in the statistics in 2000) are listed as major products in terms of production volume (weight) that is the key factor for cargo transport sector.

Cement

The following cement factories are located as follows (See Figure 10.2.2 (1) & (2)):

- Toura in Cairo on the riverside of the Nile: 945km from the Aswan Dam (Toura Portland Cement Co.)
- Helwan in Cairo on the riverside of the Nile: 935km (Helwan Portland Cement Co. and National Company for Cement)
- Suez (Suez Co. for Cement)
- Beni-Suef in the Middle Egypt away from the Nile
- El Menia in the Middle Egypt on the Nile riverside: 700km: white cement
- Mankabad in the Upper Egypt on the Nile riverside: 556km
- Asuit in the Upper Egypt on the Nile riverside: 546km (Asuit Co. for Cement.)

Currently almost all cement products (23.6 million tons in 2000) from the above factories are distributed to the local market by truck in inter-regional transport as well as intra-regional transport. The above factories are placed geographically uniformly in Egypt, viz. in Cairo, the Middle Egypt and Upper Egypt, so as to avoid heavy long-distant transport of cement, and hence the possibility of modal shift from road transport to IWT with advantage in long-distant transport seems to be little.

Fertilizer

The following fertilizer factories are located as follows (See Figure 10.2.2 (1) & (2)):

- Abu Queer in Alexandria on the seacoast of the Mediterranean: nitrogenous fertilizer (Abu Queer Co. for Fertilizer)
- Alexandria: nitrogenous fertilizer (Egyptian Co. for Chemical Industry)
- Kafr El Zayat in Gharbia in the Lower Egypt on the riverside of the Rasheed Branch: phosphate fertilizer: EFIC (Egyptian Financial and Industrial Company: SFIE)
- Abu Zaabal in the Lower Egypt along Ismalia approx 20km from the entrance: phosphate fertilizer: AZFC (Abu Zaabal Fertilizer and Chemical Company)

- Suez (El-Nasr Co. for Chemical Industry and Fertilizer)
- Helwan (El-Nasr Co. for Chemical and Coke Industry)
- Mankabad in the Upper Egypt on the Nile riverside 556km from Aswan Dam: phosphate fertilizer: EFIC
- Aswan (Kima) in the Upper Egypt on the Nile riverside: nitrogenous fertilizer

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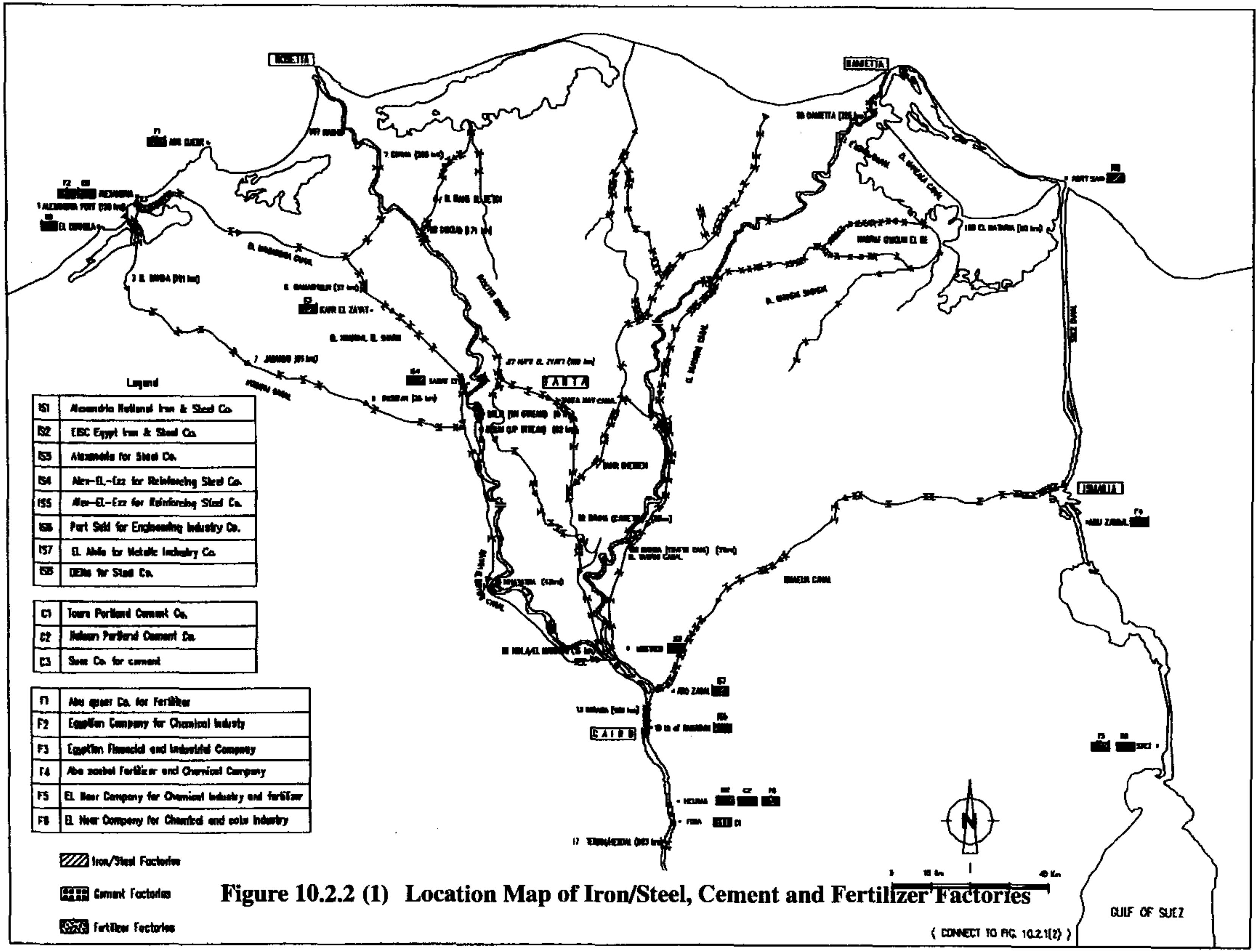


Figure 10.2.2 (1) Location Map of Iron/Steel, Cement and Fertilizer Factories

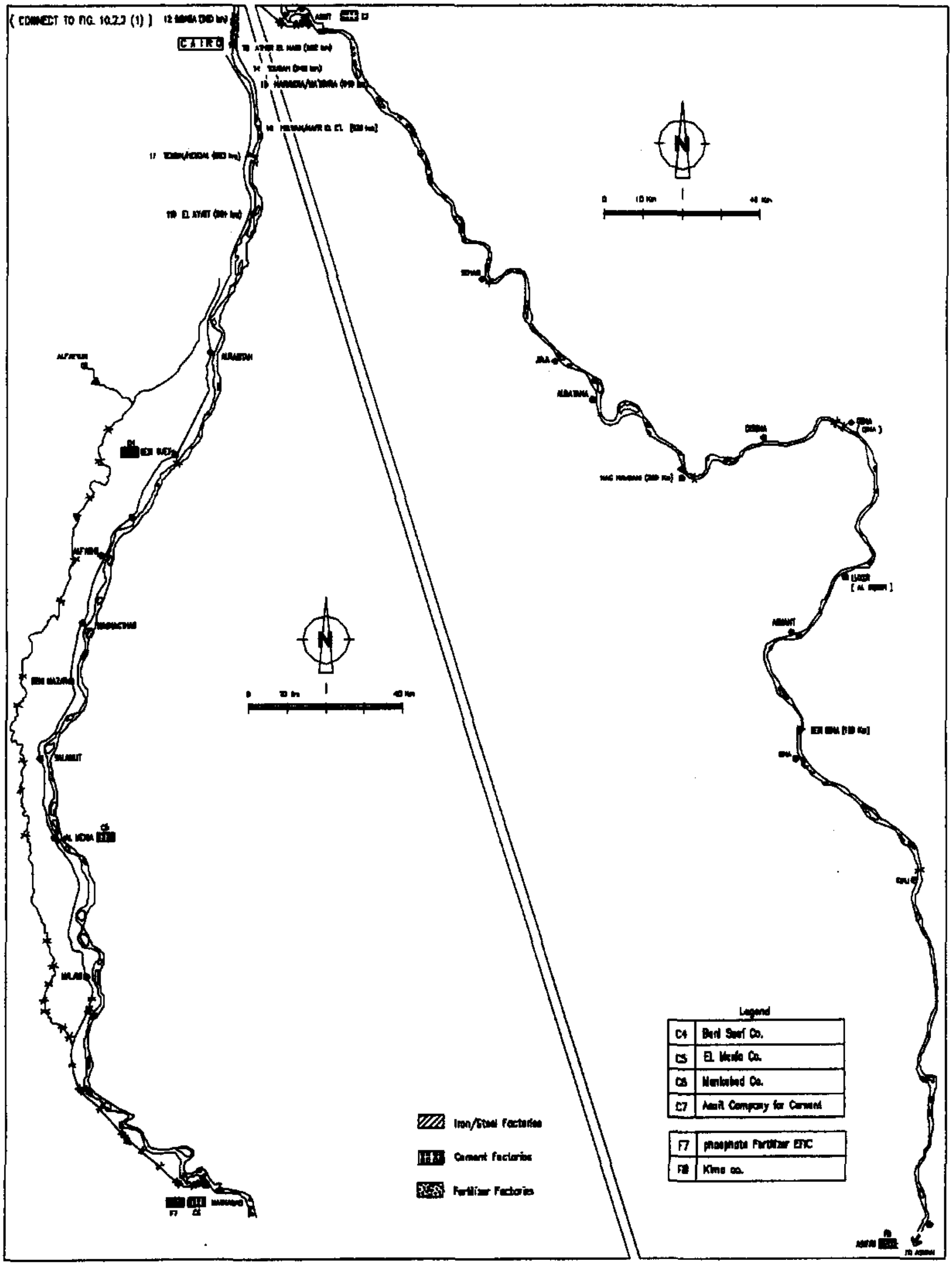


Figure 10.2.2 (2) Location Map of Iron/Steel, Cement and Fertilizer Factories

Currently almost all fertilizer products (8.4 million tons in 2000) from the above factories are distributed to the local market by truck in inter-regional transport as well as intra-regional transport. The above factories are placed geographically uniformly in Egypt, viz. in Cairo, the Middle Egypt and Upper Egypt, so as to avoid heavy long-distant transport of fertilizer, and hence the possibility of modal shift from road transport to IWT with advantage in long-distant transport seems to be little.

Iron and Steel Products

The following mills are located as follows (See Figure 10.2.2 (1) & (2)):

- El Dekheila behind Dekheila (ANSDK (Alexandria National Iron & Steel Co.): direct reduction furnace)
- Helwan in Cairo on the Nile riverside (EISC (Egypt Iron & Steel Co.): blast furnace)
- Alexandria: (Alexandria for Steel Co.: electric furnace: blast furnace)
- Sadat City (Alex -El-Ezz for Reinforcing Steel Co.: electric furnace)
- 10th of Ramadan City (Alex -El-Ezz for Reinforcing Steel Co.: electric furnace)
- Port Said (Port Said for Engineering Industry Co.: electric furnace)
- Abu Zabal in Kalubia(El Ahlia for Metalic Industry Co. electric furnace)
- Mostrod in Kalubia (Delta for Steel: Co. electric furnace)

Currently a large portion of iron and steel products (4.3 million tons in total in 2000) from the local factories are distributed to the local market by truck, a lesser portion by railways in inter-regional transport as well as intra-regional transport. Although the above factories are not necessarily placed geographically uniformly in Egypt different from the factories of cement and fertilizer, modal shift from road transport to IWT seems to be little; IWT needs double handling of the products, viz. from truck to barge and vice versa and hence is apt to damage the vulnerable bulky and heavy products due to distortion and bend by their own weights during loading/unloading operations at river ports.

Table 10.2.37 Inter-regional Transport of Major Cargoes by IWT and Railway in the Future in Traditional Pattern

Unit: '000 MT

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

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

Note (1): Private sector has their own river port facilities to handle their captive cargoes.

Note (2): Future amounts of clay and stones were assumed as the average in the last three years. Stones are mostly limestone as the raw material for the Helwan steel mill.

Note (3): Future transport volume of molasses was assumed in proportional future forecast production volume shown in Table 10.2.20.

Note (4): Future transport volume of chemical fertilizer was assumed in proportional to the future forecast per consumption volume shown in Table 10.2.16.

Note (5): Future transport volume of steel sheets was assumed on the constant level taking account of production capacity of EISC.

Note (6): Future transport volume of raw sugar was assumed in proportional to the future forecast production volume shown in Table 10.2.3.

(3) Modal Split in Inland Cargo Transport

1) Modal Split Model

To allocate the future entire inland cargo traffic of "the target cargo" for the modal shift to IWT as defined in this section (1), 4) to be transported by different modes such as railway, road and inland waterway to the respective modes, the modal split analysis is generally conducted. In terms of the estimation method of the analysis, there are two representative methods in the light of the subject of this study focusing on cargo traffic. One is "share curve fitting method in modal split" in which one main factor such as the difference of cost or time causes modal choice. The other is "function model method" in which plural factors affecting modal choice such as cost and time are set as explanatory variables with a modal split share as an objective variable and coefficient of the function are determined by multiple regression analysis using actual statistics. In the "function model method", "logitmodel" is known as the representative and the latest model. In terms of cargo transport, two factors of transport cost and time are considered to mainly affect to modal split between different modes.

From the above, in this study, "multi-nominal logitmodel" of a type of "aggregate model" in which an average value at each traffic mode is used rather than individual activities within the mode considered in "disaggregate model". There, however, are no sufficient statistics on modal split in cargo transport to enable the multiple regression analysis in "logitmodel". In addition, currently there are constraints to great extent on the free choice of inland waterway compared with railway and road; shortage of air clearance of the maritime lock at Alexandria Port disable the passing of barges laden with containers and break-bulk cargoes such as sawn timber, and the waterways of the Damietta branch are unusable for barge transport due to the shallowness. Thus, in this study, cargo transport in the target years is assumed to be split into different modes according to "logitmodel" on the hypothesis that "generalized cost" in "worth function" is the sum of transport cost and time cost that is computed by multiplying hourly unit cargo value and transport hours.

On the above assumption, the modal split share was determined by using "logitmodel" and the respective allocated volumes were computed.

2) Categorization in View of the Application of Logitmodel

The logitmodel function to estimate modal split shares between the three transport modes in the future needs to be prepared individually by each cargo category, because generalized costs are different between each of them. The items of cargoes that are currently transported by inland waterways or will be possibly transported by inland waterways in the future were grouped by the following six categories by taking account of the characteristics of the generalized cost determined by cost and time factors:

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

Out of the above six categories, the modal split model was applied for the former three categories, viz. containers, break-bulk cargo and bulk cargo (wheat). A portion of estimated entire traffic of those cargoes that have the possibility of the modal shift from railway and road transport to IWT were allocated into IWT by using the modal split model under the following assumption:

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

On the other hand, the latter three categories, viz. coal, coke and molasses are currently transported by IWT dominant over other modes. There seems to be no reason why modal shift from inland waterway to other modes. Hence, as to this category, current pattern of inland waterway transport is assumed to be kept intact. This pattern is categorized as "traditional pattern" the same as mentioned in this section (2) 2) b). In this traditional pattern, the modal split model, viz. the "logitmodel", was not applied, and instead the historical trends were referred to forecast the future values.

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

In the above six categories, the traffic by inland waterways of the first two categories, viz. containers and break-bulk cargo, is currently non-existent. In the worth function of "logitmodel" of those categories where there is no current traffic by inland waterway, its coefficients to estimate the future modal split were determined on the assumption that if the respective generalized costs of the different modes are equal, their modal split shares are also equal. The applicability of the "logitmodel" used in those categories is expected to be verified by using actual statistics of modal split after inland waterway transport will be generated in those categories.

i) Container Transport

Alexandria Port – Ather El Nabi Port in Greater Cairo Route

As to container transport between Alexandria Port and Ather El Nabi Port in Greater Cairo, transport cost and time as the explanatory variables of the worth function of "logitmodel" were estimated according to the following conditions:

- Inland waterway
  a) Laden container capacity of a river barge: 96 TEUs (1,430 DWT)
  b) Speed of a barge with a 600-ps engine: 8 km/hr through the canals within the Nile Delta and 11 km/hr through the Nile
  c) Fuel consumption: 1.86 MT/day (marine diesel)
  d) Service life of a barge: 30 years
  e) Crew formation: 5 crews per fleet (captain (1), mechanic (1), sub-mechanic (1), sailor (2))
  f) Hours to be spent per lock: 30 hrs (at other 6 locks) to 60 hrs (at Nahada Lock) per lock
  g) Average distance of the secondary delivery by truck within the Greater Cairo: 10 km

- Railway
  a) Laden container capacity of a block train: 60 TEUs (2 TEUs/flat car × 30 flat cars)
  b) Average speed of a train: 40 km/hr (excluding time at a marshaling yard)
  c) Locomotive price: 10.7 million LE
  d) Flat car price: 271,000 LE
  e) Fuel consumption: 7L/km (diesel)
  f) Service life: 25 years (locomotive) and 40 years (flat cars)
  g) Average distance of the secondary delivery by truck within the Greater Cairo: 10 km

- Road
  a) Laden container capacity of a tractor-trailer unit: 2 TEUs
  b) Average speed of a unit: 60 km/hr (inter-cities)
  c) Tractor-trailer unit price: 473,000 LE
  d) Fuel consumption: 2.6 km/L (diesel)
  e) Service life: 9 years

Table 10.2.38 Potential Modal Split Shares in Transport of Overseas Trade Containers Cargo between Alexandria Port and Greater Cairo in 2020

Item		Alexandria Port - Ather El Nabi Port		
		IWT Distance (232 km)		
		IWT	Railway	Road
Transport cost (main mode)	LE/TEU	187	327	421
Transport time (main mode)	hrs	35.7	9.7	4.8
Average distance (secondary delivery by truck)	km	10	10	-
Transport cost (secondary delivery by truck)	LE/TEU	40	40	-
Transport time (secondary delivery by truck)	hrs	1.3	1.3	-
Transport cost total	LE/TEU	228	367	421
Transport time total	hrs	37.0	11.0	4.8
Annual interest rate	%	13.92%	13.92%	13.92%
Cargo value	LE/TEU	230,000	230,000	230,000
Hourly unit cargo value	LE/TEU/hr	4	4	4
Time cost total	LE/TEU	135	40	18
Generalized cost (Cg)	LE/TEU	363	407	438
Index of Cg (IWT=100)		100	112	121
Modal split share		36%	33%	31%

Source: Estimated by the Study Team

The resulting potential modal split shares of the respective modes between Alexandria Port and the Greater Cairo in terms of the overseas trade containers are summarized in Table 10.2.38. As shown in the table, in the transport cost, IWT has a great advantage over road and railway transport (54% and 62% of the road and railway transport costs respectively). Even adding the time cost, the total cost (generalized cost), IWT is the most economical transport measure compared with road and railway.

<u>Dekheila Port – Ather El Nabi Port in Greater Cairo Route</u>

As to container transport between Dekheila Port and Ather El Nabi Port in Greater Cairo, transport cost and time of Inland Waterway Transport (IWT) using river-coastal barge were estimated according to the following conditions:

a) Laden container capacity of a river barge with a 600-ps engine: 88 TEUs in laden containers (1,260 DWT)
b) Speed of a barge: 8 km/hr through the canals within the Nile Delta and 11 km/hr through the Nile and between the ports of Dekheila and Alexandria

The resulting potential modal split shares of the respective modes between Dekheila Port and the Greater Cairo in terms of the overseas trade containers are summarized in Table 10.2.39. As shown in the table, in the transport cost, IWT has a great advantage over road and railway transport (62% and 71% of the road and railway transport costs respectively). Even adding the time cost, the total cost (generalized cost), IWT has competitiveness against road.

Table 10.2.39 Potential Modal Split Shares in Transport of Overseas Trade Containers Cargo between Dekheila Port and Greater Cairo in 2020

Item		Dekheila Port- Ather El Nabi Port		
		IWT Distance (242 km)		
		IWT	Railway	Road
Transport cost (main mode)	LE/TEU	221	327	421
Transport time (main mode)	hrs	36.1	9.7	4.8
Average distance (secondary delivery by truck)	km	10	10	-
Transport cost (secondary delivery by truck)	LE/TEU	40	40	-
Transport time (secondary delivery by truck)	hrs	1.3	1.3	-
Transport cost total	LE/TEU	261	367	421
Transport time total	hrs	37.5	11.0	4.8
Annual interest rate	%	13.92%	13.92%	13.92%
Cargo value	LE/TEU	230,000	230,000	230,000
Hourly unit cargo value	LE/TEU/hr	4	4	4
Time cost total	LE/TEU	137	40	18
Generalized cost (Cg)	LE/TEU	398	407	438
Index of Cg (IWT=100)		100	102	110
Modal split share		35%	34%	32%

Source: Estimated by the Study Team

<u>Damietta Port – Ather El Nabi Port in Greater Cairo Route</u>

As to container transport between Damietta Port and Ather El Nabi Port in Greater Cairo, transport cost and time of IWT using river barge were estimated according to the following conditions:

a) Laden container capacity of a river barge: 96 TEUs in laden containers (1,430 DWT)

b) Speed of a barge with a 800-ps engine: 13 km/hr through Damietta Branch and the Nile

The resulting potential modal split shares of the respective modes between Damietta Port and the Greater Cairo in terms of the overseas trade containers are summarized in Table 10.2.40. As shown in the table, in the transport cost, IWT has a great advantage over road and railway transport (52% and 61% of the road and railway transport costs respectively). Even adding the time cost, the total cost (generalized cost), IWT has competitiveness against road.

Table 10.2.40 Potential Modal Split Shares in Transport of Overseas Trade Containers Cargo between Damietta Port and Greater Cairo in 2020

Item		Damietta Port - Ather El Nabi Port		
		IWT Distance (268 km)		
		IWT	Railway	Road
Transport cost (main mode)	LE/TEU	177	315	423
Transport time (main mode)	hrs	29.2	9.3	6.3
Average distance (secondary delivery by truck)	km	10	10	-
Transport cost (secondary delivery by truck)	LE/TEU	40	40	-
Transport time (secondary delivery by truck)	hrs	1.3	1.3	-
Transport cost total	LE/TEU	218	355	423
Transport time total	hrs	30.5	10.6	6.3
Annual interest rate	%	13.92%	13.92%	13.92%
Cargo value	LE/TEU	230,000	230,000	230,000
Hourly unit cargo value	LE/TEU/hr	4	4	4
Time cost total	LE/TEU	111	39	23
Generalized cost (Cg)	LE/TEU	329	394	446
Index of Cg (IWT=100)		100	120	135
Modal split share		38%	33%	29%

Source: Estimated by the Study Team

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

The possibility of container transport by barges between Port Said Port (including East Port Said Port) and Ather El Nabi Port was examined by considering the following three alternatives in terms of route and specification of barge/coaster:

a) Alternative 1:
   Route (342 km):
      Port Said Port - Mediterranean Sea - Damietta Port - Damietta Branch - the Nile - Ather El Nabi Port
   River-Coastal Barge:
      Laden container capacity of 75 TEUs in laden containers (1,070 DWT)
      Speed: 13 km/hr (800-ps engine)

b) Alternative 2 (342 km):
   Route:
      Port Said Port - Mediterranean Sea - Damietta Port (Transshipment) - Damietta Branch - the Nile - Ather El Nabi Port
   Coaster (Fully-Cellular Container Ship) (Port Said – Damietta Port):
      Laden container capacity of 100 TEUs in laden containers (1,650 DWT)
      Speed: 20 km/hr (1,800-ps engine)
   River Barge (Damietta Port– Ather El Nabi Port):
      Laden Capacity of 96 TEUs in laden containers (1,430 DWT)
      Speed: 13 km/hr (800-ps engine)

c) Alternative 3 (215 km):
   Route:
      Port Said Port – Suez Canal – Ismailia Canal - the Nile - Ather El Nabi Port
   River Barge:

Laden Capacity of 96 TEUs in laden containers (1,430 DWT)
Speed: 8 km/hr through the two canals and 11 km/hr through the Nile (600-ps engine)

In both cases of Alternatives 1 and 2, IWT seems to have no competitiveness against road and railway in terms of generalized cost; 111% and 122% of the road and railway transport costs respectively in Alternative 1, and 130% and 143% in Alternative 2. The main reasons of insufficient competitiveness of IWT are listed as follows:

- Roundabout sea route via the Mediterranean Sea
- Navigational restriction in the access channel of Port Said Port due to convoy navigation of high priority throughout Suez Canal
- Costly river-coastal barge or coaster
- Transshipment cost at Damietta Port (in Alternative 2 only)

On the other hand in case of Alternative 3, IWT could be broadly competitive against road and railway on the condition that Ismailia Canal would be improved so as to enable it navigable for the said river barges by constructing a lock to connect Ismailia Canal and Suez Canal and widening/deepening required places of Ismailia Canal. A hypothetical project for improvement of Ismailia Canal, however, seems to be unjustifiable from the viewpoint of the national economy even in the stage of the Master Plan.

ii) Break-bulk Cargo Transport

Alexandria Port – Ather El Nabi Port in Greater Cairo Route
As to break-bulk cargo transport between Alexandria Port and Ather El Nabi Port in Greater Cairo, transport cost and time as the explanatory variables of the worth function of "logitmodel" were estimated according to the following conditions:

- Inland waterway
  a) Laden capacity of a barge: 1,380 MT (1,450 DWT)
  b) Speed of a barge with a 600-ps engine: 8 km/hr through the canals within the Nile Delta and 11 km/hr through the Nile
  c) Average distance of the secondary delivery by truck within the Greater Cairo: 10 km

- Railway
  a) Laden capacity of a block train: 1,600 MT (45 MT/flat car × 35 freight cars)
  b) Average distance of the secondary delivery by truck within the Greater Cairo: 10 km

- Road
  a) Laden capacity of a tractor-trailer unit: 40 MT

The resulting potential modal split shares of the respective modes between Alexandria Port and Ather El Nabi Port in the Greater Cairo in terms of the overseas trade break-bulk cargo are summarized in Table 10.2.41. As shown in the table, in the transport cost, IWT has a great advantage over road and railway transport (44% and 56% of the road and railway transport costs respectively). Even adding the time cost, the total cost (generalized cost), IWT has competitiveness against road and railway.

Table 10.2.41 Potential Modal Split Shares in Transport of Overseas Trade Break-bulk Cargo between Alexandria Port and Greater Cairo in 2020

Item		Alexandria Port - Ather El Nabi Port		
		Distance (232km)		
		IWT	Railway	Road
Transport cost (main mode)	LE/MT	6.8	13.7	19.8
Transport time (main mode)	hrs	36.2	7.7	4.8
Average distance (secondary delivery by truck)	km	10	10	-
Transport cost (secondary delivery by truck)	LE/MT	1.9	1.9	-
Transport time (secondary delivery by truck)	hrs	1.3	1.3	-
Transport cost total	LE/MT	8.7	15.6	19.8
Transport time total	hrs	37.6	9.0	4.8
Annual interest rate	%	13.92%	13.92%	13.92%
Cargo value	LE/MT	3,220	3,220	3,220
Hourly unit cargo value	LE/MT/hr	0.1	0.1	0.1
Time cost total	LE/MT	1.9	0.5	0.2
Generalized cost (Cg)	LE/MT	10.6	16.0	20.0
Index of Cg (IWT=100)		100	152	189
Modal split share		45%	31%	24%

Source: Estimated by the Study Team

Damietta Port – Ather El Nabi Port in Greater Cairo Route

As to break-bulk cargo transport between Damietta Port and Ather El Nabi Port in Greater Cairo, transport cost and time of IWT using river barge were estimated according to the following conditions:

a) Laden capacity of a river barge: 1,380 MT (1,450 DWT)
b) Speed of a barge with a 600-ps engine: 11 km/hr through Damietta Branch and the Nile

The resulting potential modal split shares of the respective modes between Damietta Port and the Greater Cairo in terms of the overseas trade containers are summarized in Table 10.2.42. As shown in the table, in the transport cost, IWT has a great advantage over road and railway transport (43% and 57% of the road and railway transport costs respectively). Even adding the time cost, the total cost (generalized cost), IWT has competitiveness against road and railway.

Table 10.2.42 Potential Modal Split Shares in Transport of Overseas Trade Break-bulk Cargo between Damietta Port and Greater Cairo in 2020

Item		Damietta Port - Ather El Nabi Port		
		Distance (268km)		
		IWT	Railway	Road
Transport cost (main mode)	LE/MT	6.6	13.1	19.6
Transport time (main mode)	hrs	32.2	7.3	6.3
Average distance (secondary delivery by truck)	km	10	10	-
Transport cost (secondary delivery by truck)	LE/MT	1.9	1.9	-
Transport time (secondary delivery by truck)	hrs	1.3	1.3	-
Transport cost total	LE/MT	8.5	14.9	19.6
Transport time total	hrs	33.5	8.6	6.3
Annual interest rate	%	13.92%	13.92%	13.92%
Cargo value	LE/MT	3,220	3,220	3,220
Hourly unit cargo value	LE/MT/hr	0.1	0.1	0.0
Time cost total	LE/MT	1.7	0.4	0.3
Generalized cost (Cg)	LE/MT	10.2	15.4	19.9
Index of Cg (IWT=100)		100	151	195
Modal split share		45%	31%	23%

Source: Estimated by the Study Team

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

On the other hand, the traffic by inland waterway of the third category, viz. bulk cargo (wheat) is narrowly found with almost negligibly small amount between Alexandria and Imbaba Grain Terminal along the Nile within the Greater Cairo. In the winter crop season, a great portion of wheat is brought to the terminal by railway (74%), followed by road (24%) and inland waterway (2%). Wheat by railway comes mostly from Damietta Port and the lesser portion from Alexandria Port. In the estimation of the future modal split, "logitmodel" was also applied. In this category, the coefficients of the worth function to estimate the future modal split were determined according to the current modal split with some adjustment due to the assumption that Damietta Branch will be usable for barge navigation. As to maize transport, the same modal split share of inland waterway as wheat was assumed.

i) Bulk Cargo Transport

<u>Alexandria Port – Imbaba Port in Greater Cairo Route</u>

As to bulk cargo transport between Alexandria Port and Imbaba Port in Greater Cairo, transport cost and time as the explanatory variables of the worth function of "logitmodel" were estimated according to the following conditions:

- Inland waterway
  - a) Laden capacity of a barge: 1,380 MT (1,450 DWT)
  - b) Speed of a barge with a 600-ps engine: 8 km/hr through the canals within the Nile Delta and 11 km/hr through the Nile
  - c) Average distance of the secondary delivery by truck within the Greater Cairo: 10 km
- Railway
  - a) Laden capacity of a block train: 1,600 MT (65 MT/wagon × 30 wagons)
- Road

a) Laden capacity of a tractor-trailer unit: 40 MT

The resulting potential modal split shares of the respective modes between Alexandria Port and Imbaba Port in the Greater Cairo in terms of the overseas trade bulk cargo (grains) are summarized in Table 10.2.43. As shown in the table, in the transport cost, IWT has a great advantage over road and railway transport (27% and 49% of the road and railway transport costs respectively). Even adding the time cost, the total cost (generalized cost), IWT has competitiveness against road and railway.

Table 10.2.43 Potential Modal Split Shares in Transport of Overseas Trade Bulk Cargo (Grains) between Alexandria Port and Imbaba Port in 2020

Item		Alexandria Port – Imbaba Port		
		Distance (222 km)		
		IWT	Railway	Road
Transport cost	LE/MT	5.3	10.9	19.7
Transport time	hrs	34.2	7.5	4.6
Annual interest rate	%	13.92%	13.92%	13.92%
Cargo value	LE/MT	460	460	460
Hourly unit cargo value	LE/MT/hr	0.0073	0.0073	0.0073
Time cost total	LE/MT	0.250	0.054	0.034
Generalized cost (Cg)	LE/MT	5.6	11.0	19.7
Index of Cg (IWT=100)		100	196	354
Modal split share		56%	32%	12%

Source: Estimated by the Study Team

<u>Damietta Port – Imbaba Port in Greater Cairo Route</u>

As to break-bulk cargo transport between Damietta Port and Imbaba Port, transport cost and time of IWT using river barge were estimated according to the following conditions:

a) Laden capacity of a river barge: 1,380 MT (1,450 DWT)
b) Speed of a barge with a 600-ps engine: 11 km/hr through Damietta Branch and the Nile

The resulting potential modal split shares of the respective modes between Damietta Port and Imbaba Port in terms of the overseas trade containers are summarized in Table 10.2.44. As shown in the table, in the transport cost, IWT has a great advantage over road and railway transport (26% and 49% of the road and railway transport costs respectively). Even adding the time cost, the total cost (generalized cost), IWT has competitiveness against road and railway.

Table 10.2.44 Potential Modal Split Shares in Transport of Overseas Trade Bulk Cargo (Grains) between Damietta Port and Imbaba Port in 2020

Item		Damietta Port – Imbaba Port Distance (258 km)		
		IWT	Railway	Road
Transport cost	LE/MT	5.0	10.3	19.5
Transport time	hrs	27.7	7.0	6.0
Annual interest rate	%	13.92%	13.92%	13.92%
Cargo value	LE/MT	460	460	460
Hourly unit cargo value	LE/MT/hr	0.0073	0.0073	0.0073
Time cost total	LE/MT	0.203	0.051	0.044
Generalized cost (Cg)	LE/MT	5.2	10.3	19.6
Index of Cg (IWT=100)		100	200	379
Modal split share		55%	33%	12%

Source: Estimated by the Study Team

Possibility of Barge Transport between Dekheila Port and Imbaba Port

The possibility of bulk cargo (grains) transport by barges between Dekheila Port and Imbaba Port was examined by considering barge basins required at Dekheila Port and the inauguration of river-coastal barges.

At Dekheila Port, grains including wheat and maize are currently discharged from bulk carriers at Berths Nos. 92-1, 92-2, 94-1 and 94-2 on the General Cargo Quay transported through belt conveyors or by truck and then stored in grain silos placed behind Berth No. 94-2 or the bottom of the quay. Once stored grains are distributed inland by railway or truck; currently, barges are not used. To start barge transport for grains from Dekheila Port to Imbaba Port by using river-coastal barges, it is necessary to newly install a barge basin with berths specialized for barges and connected with grain silos on the quay. All the existing berths at the General Cargo Quay, however, are deep-water berths in the range of 12 m – 15 m deep, and hence they are unsuitable for catering barges. There seems to be no suitable place for a barge basin near the existing grain silos different from Alexandria Port and Damietta Port.

If suitable barge basins would be prepared within Dekheila Port, the said barge transport for grains could be competitive against railway and road transport even using costly river-coastal barges.

Possibility of Barge Transport between Port Said Port and Imbaba Port

The possibility of bulk cargo (grains) transport by barges between Port Said Port and Imbaba Port was examined by considering the following two alternatives in terms of route and specification of barge:

a) Alternative 1:
   Route (332 km):
   Port Said Port - Mediterranean Sea - Damietta Port - Damietta Branch - the Nile - Imbaba Port
   River-Coastal Barge:
   Laden capacity of 1,070 MT (1,130 DWT)
   Speed: 11 km/hr (600-ps engine)

b) Alternative 2 (205 km):
Route:
Port Said Port – Suez Canal – Ismailia Canal - the Nile - Imbaba Port
River Barge:
Laden capacity of 1,380 MT (1,450 DWT)
Speed: 8 km/hr through the two canals and 11 km/hr through the Nile (600-ps engine)

In case of Alternatives 1, IWT seems to have no competitiveness against railway in terms of generalized cost; 115% of railway transport cost. The main reasons of insufficient competitiveness of IWT against railway are listed as follows:

- Roundabout sea route via the Mediterranean Sea
- Navigational restriction in the access channel of Port Said Port due to convoy navigation of high priority throughout Suez Canal
- Costly river-coastal barge or coaster

On the other hand in case of Alternative 2, IWT could be broadly competitive against road and railway transport on the condition that Ismailia Canal would be improved so as to enable it navigable for the said river barges by constructing a lock to connect Ismailia Canal and Suez Canal and widening/deepening required places of Ismailia Canal. A hypothetical project for improvement of Ismailia Canal, however, seems to be unjustifiable from the viewpoint of the national economy even in the stage of the Master Plan.

5) Category of Currently Existent Cargo Traffic predominantly by Inland Waterway (Traditional Pattern)

The cargo traffic of the last three categories, viz. bulk cargo of coal, coke and molasses from/to Alexandria Port but not from/to Dekheila Port is the currently existent traffic by inland waterway dominant over other modes. There seems to be no reason why modal shift from inland waterway to other modes. Hence, as to this category, current pattern of inland waterway transport is assumed to be kept intact. This pattern is categorized as "traditional pattern" the same as mentioned in this section (2) 2) b). As mentioned previously, in this traditional pattern, the modal split model, viz. the "logitmodel", was not used, and instead the historical trends were referred to forecast the future values.

(4) Traffic Allocation to Inland Waterway Transport (IWT)

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

A portion of the estimated entire traffic of overseas trade cargo via the Mediterranean seaports in 2020 as shown in Tables 10.2.31 – 10.2.34 was allocated to the inland waterway transport according to the modal split share of the inland waterway (see Tables 10.2.38 – 10.2.40). In the allocation of the categories of "currently non-existent or narrowly existent cargo traffic by inland waterway", only the incremental traffic from 2000 to 2020 was considered for conservative allocation to the inland waterway. On the other hand, the category of "currently existent and dominant cargo traffic by inland waterway", current share is assumed to be kept intact as mentioned in the former paragraph (3) 5) ("traditional pattern"). The resulting allocation by route is shown in Table 10.2.45 – 10.2.47.

In the allocation of the inland traffic via the ports of Damietta, the modal split shares were computed in the conditions of the waterways from Damietta Port to Cairo including Damietta Branch and the canal connecting Damietta Port and the branch, as well as road and railways.

Table 10.2.45 Allocated Inland Waterway Traffic between Alexandria Port and River Ports in the Greater Cairo in the Overseas Trade Cargo

Unit: '000 MT

Cargo Item		Total Cargo of All Transport Modes			Cargo Volume Alloca-ted to IWT (2010)	Allocat tion Share to IWT for the Total (2010)	Total Cargo of All Transport Modes		Cargo Volume Alloca-ted to IWT (2020)	Alloca-tion Share to IWT for the Total (2020)	Allocat-tion Share to IWT for Incre-ment
		2000	2010	Increm-ent from 2000 to 2010			2020	Increm-ent from 2000 to 2020			
Up-stream	Maize	2,204	2,737	533	192	14%	3,088	884	432	14%	-
	Wheat	2,346	2,439	-	171	14%	2,331	-	326	14%	-
	Coal	1,691	1,500	-	675	45%	1,500	-	675	45%	-
	Timber	498	948	449	101	11%	1,259	761	342	27%	45%
	Cement	704	1,089	385	87	8%	843	139	62	7%	45%
	Iron/Steel Products	80	304	225	51	17%	231	151	68	29%	45%
	Sugar	233	149	-	-	-	203	-	-	-	-
	Containers (TEUs)	172	512	340	60	12%	512	340	120	23%	36%
Down-stream	Molasses	176	188	-	188	100%	233	-	233	100%	-
	Coke	523	300	-	300	100%	300	-	300	100%	-
	Fertilizer	249	245	-	-	-	170	-	-	-	-
	Containers ('000TEUs)	172	512	340	60	12%	512	340	120	23%	36%
Total	Conventional Cargo	8,703	9,899	1,592	1,763	18%	10,158	1,935	2,440	24%	-
	Containers ('000TEUs)	345	1,025	680	120	12%	1,025	680	240	23%	-
	Total	11,268	17,515	6,644	2,656	15%	17,774	6,986	4,225	24%	-

Note (1): The volume of container cargo is expressed in '000 TEUs, and the total is expressed in '000 MT by transforming TEU to MT in container volume.

Note (2): In grains, 25% was allocated to Alexandria Port against Dekheila Port (IWT: 25% x 56% = 14%)

Note (3): In containers, 33% and 67% were allocated to Alexandria Port and Dekheila Port, respectively

Table 10.2.46 Allocated Inland Waterway Traffic between Alexandria Port and River Ports in Upper Egypt in the Overseas Trade Cargo

Unit:'000MT

Cargo Item		Total Cargo of All Transport Modes			Cargo Volume Allocated to IWT (2010)	Cargo Volume Allocated to IWT (2020)	Allocation Share to IWT for the Total
		2000	2010	2020			
Downstream	Molasses	194	205	257	205	257	100%

Source: Estimated by JICA Study Team

Table 10.2.47 Allocated Inland Waterway Traffic between Damietta Port and River Ports in the Greater Cairo in the Overseas Trade Cargo

Unit: '000 MT

Cargo Item		Total Cargo of All Transport Modes			Cargo Volume Allocated to IWT (2010)	Allocation Share to IWT for the Total (2010)	Total Cargo of All Transport Modes		Cargo Volume Allocated to IWT (2020)	Allocation Share to IWT for the Total (2020)	Allocation Share to IWT for Increment
		2000	2010	Increment from 2000 to 2010			2020	Increment from 2000 to 2020			
Up-stream	Wheat	1,479	2,313	834	229	10%	2,211	732	403	18%	55%
	Maize	1,403	1,688	285	78	5%	1,904	501	275	14%	55%
	Cement	1,418	1,665	247	-	-	1,288	-	-	-	-
	Timber	123	231	108	24	11%	307	184	83	27%	45%
	Soybean	298	210	-	-	-	210	-	-	-	-
	Iron/Steel Products	223	204	-	-	-	155	-	-	-	-
	Containers (TEUs)	14	61	47	9	14%	262	248	94	36%	38%
Down-stream	Fertilizer	297	257	-	-	-	178	-	-	-	-
	Containers (TEUs)	14	61	47	9	14%	262	248	94	36%	38%
Total	Conventional Cargo	5,240	6,566	1,473	332	5%	6,253	1,417	761	12%	-
	Containers ('000TEUs)	29	123	94	17	14%	524	496	188	36%	-
	Total	5,454	7,479	2,173	461	6%	10,150	5,101	2,161	21%	-

Source: Estimated by JICA Study Team.

Note (1): The volume of container cargo is expressed in '000 TEUs, and the total is expressed in '000 MT by transforming TEU to MT in container volume.

On the other hand, as mentioned in this section (3), 3), i) and ii), barge transport between Port Said Port and the river ports in the Greater Cairo such as Ather El Nabi Port and Imbaba Port seems to have small possibility even towards the stage of the Master Plan. So as to take a general view of the future entire inland traffic between the Egyptian seaports facing the Mediterranean and the river ports in the Greater Cairo, the traffic between Port Said Port and the Greater Cairo is shown in Table 10.2.48 though any traffic was not allocated to IWT on the route.

Table 10.2.48 Inland Traffic between Port Said and the Greater Cairo in Overseas Trade Cargo

Unit: '000 MT

Cargo Item		Total Cargo of All Transport Modes			Cargo Volume Alloca-ted to IWT (2010)	Alloca-tion Share to IWT for the Total (2010)	Total Cargo of All Transport Modes		Cargo Volume Alloca-ted to IWT (2020)	Alloca-tion Share to IWT for the Total (2020)
		2000	2010	Increm-ent from 2000 to 2010			2020	Increm-ent from 2000 to 2020		
Up-stream	Wheat	625	1,022	397	0	0%	977	352	0	0%
	Containers ('000 TEUs)	46	62	16	0	0%	241	195	0	0%
Down-stream	Containers ('000 TEUs)	46	62	16	0	0%	241	195	0	0%
Total	Conventional Cargo	625	1,022	397	0	0%	977	352	0	0%
	Containers ('000 TEUs)	93	125	32	0	0%	482	389	0	0%
	Total	1,313	1,948	635	0	0%	4,557	3,244	0	0%

Source: Estimated by the Study Team

The traffic allocated to IWT on the routes between the Egyptian Mediterranean Seaports and the River Ports in the Greater Cairo in the Overseas Trade Cargo is summarized in Table 10.2.49. In the table, the entire traffic composed of "target cargo" suitable for IWT and "non-target cargo" is shown. As indicated in the table, the estimated percentages of IWT traffic for the entire traffic on the routes between the seaports and the Greater Cairo are 10% in 2010 and 17% in 2020, respectively.

Table 10.2.49 Summary of the Traffic Allocated to IWT between the Egyptian Mediterranean Seaports and the River Ports in the Greater Cairo in the Overseas Trade Cargo

'000 MT

Cargo Item		Total Cargo of All Transport Modes 2000	Total Cargo of All Transport Modes 2010	Cargo Volume Allocated to IWT (2010)	Allocation Share to IWTfor the Total (2010)	Total Cargo of All Transport Modes 2020	Cargo Volume Allocated to IWT (2020)	Allocation Share to IWTfor the Total (2020)
Alexandria Port	Conventional Cargo	8,703	9,899	1,763	18%	10,158	2,440	24%
	Containers ('000 TEUs)	345	1,025	120	12%	1,025	240	23%
	Target Cargo Total	11,268	17,515	2,656	15%	17,774	4,225	24%
	Non-target Cargo Total	2,107	2,372	0	-	2,319	0	-
	Total	13,375	19,888	2,656	13%	20,094	4,225	21%
Damietta Port	Conventional Cargo	5,240	6,566	332	5%	6,253	761	12%
	Containers ('000 TEUs)	29	123	18	15%	524	188	36%
	Target Cargo Total	5,454	7,479	465	6%	10,150	2,161	21%
	Non-target Cargo Total	822	367	0	-	363	0	-
	Total	6,277	7,846	465	6%	10,513	2,161	21%
Port Said Port	Conventional Cargo	625	1,022	0	0%	977	0	0%
	Containers ('000 TEUs)	93	125	0	0%	482	0	0%
	Target Cargo Total	1,313	1,948	0	0%	4,557	0	0%
	Non-target Cargo Total	1,108	1,211	0	-	1,203	0	-
	Total	2,421	3,159	0	0%	5,760	0	0%
Total	Conventional Cargo	14,569	17,488	2,095	12%	17,388	3,200	18%
	Containers ('000 TEUs)	466	1,272	138	11%	2,030	428	21%
	Target Cargo Total	18,035	26,943	3,120	12%	32,482	6,385	20%
	Non-target Cargo Total	4,037	3,950	0	-	3,885	0	-
	Total	22,072	30,893	3,120	10%	36,367	6,385	17%

Source: Estimated by the Study Team

Note: Share of IWT in the entire cargo containing target and non-target cargoes in 2000 is estimated as 2% (434,000 MT/22,072,000 MT).

2) Allocation in the Domestic Trade Cargo

Estimated entire traffic of raw phosphate from Sibaya in the Upper Egypt to Kafr El Zayat Fertilizer factory of EFIC and Abu Zaabal factory of AZFC has the possibility of the modal shift to IWT from railway and road transport on the following assumption:

- Creation of the New Boulin Canal connected with Rasheed Branch
- Capital and maintenance dredging in the waterway for the EFIC factory at Kafr El Zayat

- Completion of the new lock currently under construction in Ismalia Canal located in the middle from the canal entrance to the AZFC factory at Abu Zaabal along the canal .
- Installation of Navigation Aids enabling day and night navigation throughput the waterways including the Upper Nile

Under the above assumption, the modal split share was determined by using "logitmodel" and the respective allocated volumes were computed (see Tables 10.2.50).

Table 10.2.50 Current and the Future Modal Split in Raw Phosphate Transport

Unit: '000MT

Route	Mode	Year		
		2000	2010	2020
from Sibaya Phosphate Mine to Abu Zaabal Factory (in IWT, Currently via Shoubra and in the future directly to the factory)	IWT	137	251	319
	Railway	65	83	106
	Rode	116	75	95
	Total	317	409	520
from Sibaya Phosphate Mine to Kafr El Zayat Factory (in IWT in the future, it is assumed that New Boulin Canal will be created)	IWT	0	280	356
	Railway	300	106	135
	Total	300	387	491

Source: Based on information from EFIC (Egyptian Financial and Industrial Co.) and AZFC (Abu Zaabal Fertilizer & Chemical Co.), estimated by JICA Study Team.

There was no clear identification of the cargo that has the possibility of the modal shift to IWT other than raw phosphate.

On the other hand, IWT cargoes as "traditional pattern" cargo, viz. clay, stones and molasses, were extracted from Table 10.2.37 and were integrated with raw phosphate allocated to IWT to make another table showing solely IWT cargoes (see Table 10.2.51).

Table 10.2.51 Major Domestic Trade Cargoes Transported by IWT in the Future

Unit: '000 MT

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

Source: Estimated by JICA Study Team

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

In addition to raw phosphate as IWT cargo that will be generated from the New Boulin Canal Project as shown in Table 10.2.50, sulfur imported via Alexandria Port and used as raw material for the phosphate factory of EFIC and insecticide factory is assumed to be transported by IWT via Nobaria Canal, the New Boulin Canal and Rasheed Branch for those factories by shifting form road transport after the completion of the New Boulin Canal Project. Super phosphate solely produced by EFIC currently exported via Alexandria Port is also assumed to be transported by IWT as well as imported grease used as raw material for soap making factory. Those factories within Kafr El Zayat are all located along the riverside of Rasheed Branch. Those IWT cargoes relating to the project are summarized in Table 10.2.52.

Table 10.2.52 IWT Cargoes Generated form the New Boulin Canal Project

Unit: '000 MT

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

Source: Estimated by JICA Study Team

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

11.1 General

In the conceptual plan for the target year 2020, major strategies and policies were drawn up. Among others, the following objectives of IWT (Inland Waterway Transport) are taken up as the principal roles for the purpose of supporting industrial development and economic expansion in the future.

To promote IWT, the master plan aims at proposing ways to realize these four objectives for the year 2020.

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

To achieve above four objectives, the master plan identified existing problems of IWT system and individually examined the solutions or approaches for each problem. These solutions/approaches are separately summarized as improvement measures in Section 11.3 and Section 11.4. For instance, improvement measures to solve problems include new barge system, 24-hours operation such as night navigation system and other effective measures.

In the master plan, such improvement measures are considered according to basic strategies and major premises in the long term. Previous Section 11.2 outlines basic strategies and major premises to decide on IWT promotion policy.

At last, Section 11.5 summarizes the preliminary economic analysis to appraise the economic feasibility of the projects of the master plan for the development of IWT.

In IWT sector, it is well known that there were two major-epochs such as the establishment of RTA and the opening to Alexandria/Cairo IW. One or two years hence, Damietta Branch will be passable way as third epoch-making and trunk axis in the East Delta will be active.

Moreover, proposed measures in the master plan will result in more significant changes in IWT sector. The introduction of new-type barges and night navigation together with other measures are expected to facilitate a steady modal shift from road transport to IWT.
Needless to say, support from MOT, improving RTA's organization and review of RTA's roles will be paramount to facilitate the modal-shift, if such a dramatic change in modal-shares is to be achieved.

11.2 Basic Strategy and Major Premises

At first, this sub-section describes that IWT sector has existing problems which are primary factor of the recent recession in this sector. Secondary, the master plan takes up basic strategies to solve such problems. Especially, these strategic policies include approaches to promote IWT in the East Delta, as well as to handle bulk cargo by barges at Dekhila port.

11.2.1 Existing Problem in IWT Sector

(1) Change in the Modal Shares of each Mode

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

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

The total cargo net-flow by inland transport in 2000 is illustrated in Figure 11.2.1. It is assumed that the total cargo net-flow is equal to the sum of import cargo and local production of each sector. It is recommended that the IWT sector focus on "target cargo " (this term will be explained in detail in a later section). Among import and export cargo of 49 mil. MT, 26.6 mil. MT. is considered to be "target cargo". However, IWT sector has only a slight share of such "target cargo", that is only 0.4 million MT presently.

Table 11.2.1 Change in the Modal Shares in Egypt

(Unit: 1,000 MT)

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

Source (1) : Data in 1979 and 92 are quoted from "The Study on the Transportation System and the National Road Transportation Master Plan (1993)" by JICA.

Source (2) : Data in 2000 are estimated by JICA Team.

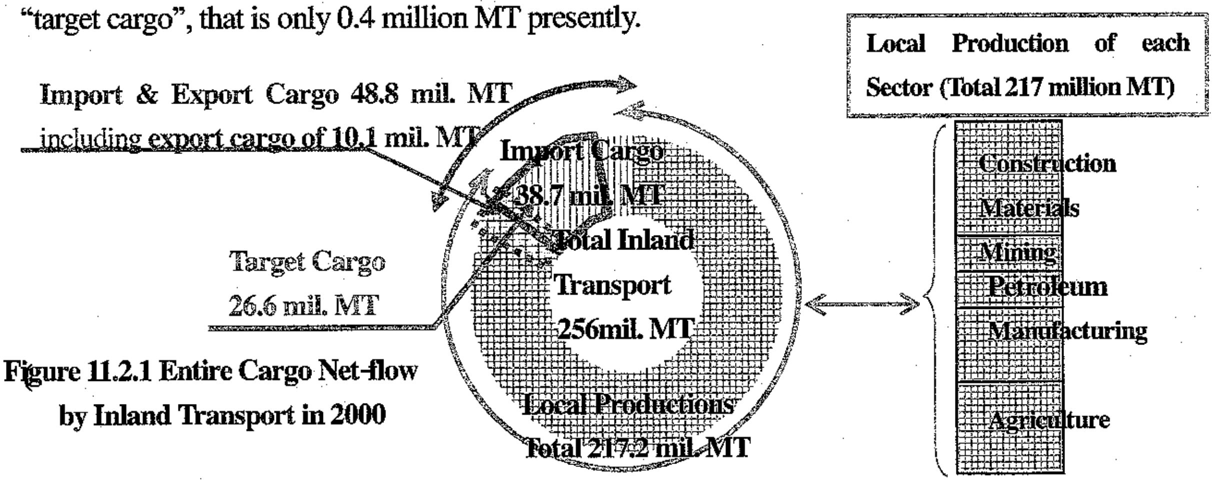


Figure 11.2.1 Entire Cargo Net-flow by Inland Transport in 2000

Here, the modal share of IWT in 2000 is presumed as follows: the entire traffic volume is presumed at 256 million MT in Figure 11.2.1. Meanwhile, cargo volumes by IWT and Railway are known with statistics of RTA (River Transport Authority) and ENR (Egyptian National Railways), so it is assumed that remainder is transported by trucks.

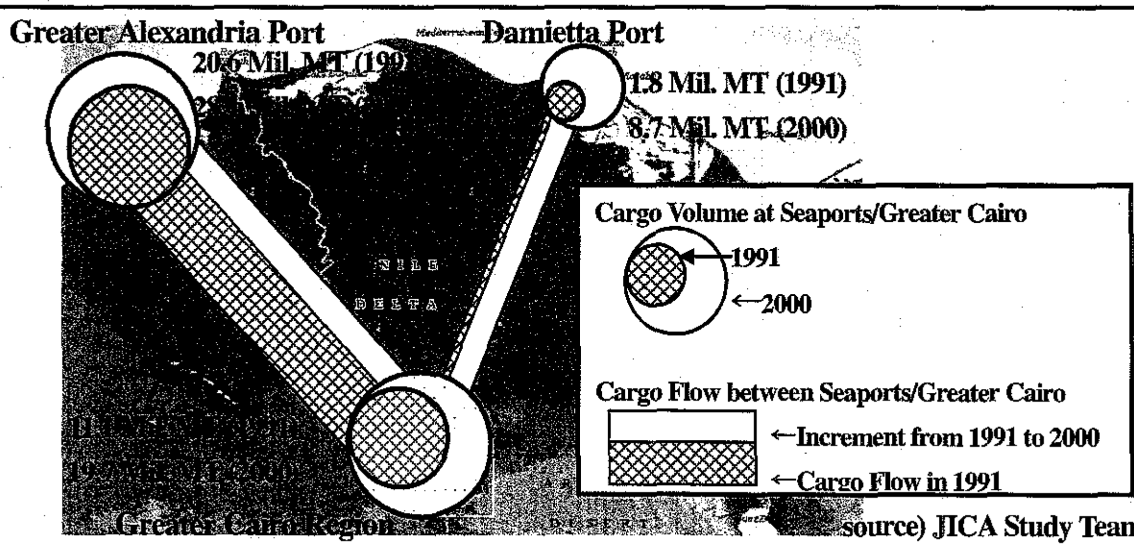
(2) Existing Problems in the Present IWT sector

As for the rise and fall of IWT sector, the Nile mainstream between Aswan and Cairo region has been fully utilized as 1st class IW since the dawn of motorized barge. In the mid-1970's, improvements of Alexandria/ Cairo IW was completed connecting the largest seaport and the capital region. For some time, barge business was making full use of both trunk IWs, and was very active in the early 1980's. Traffic cargo volume by IWT also reached at its peak in the same period. After that, modal share in IWT sector has decreased during recent 20 years, so the Study broadly identified the following five (5) problems of its depression in barge transport:

1) Insufficient Accessibility to Major Seaports

During the 1980s, Egyptian government has made every effort to build deep-water seaports both in the East and West Delta areas. Namely, the construction of Damietta Port and the development of El Dekheila Port as a western part of the Greater Alexandria Port, the purpose of both projects are to meet the increase in larger ocean-going vessels. As the fruits of both projects, handled cargo volumes at two major seaports have rapidly increased as shown in Figure 11.2.2. However, IWT sector is behind road and railway sectors in the strengthening of accessibilities to such seaport as follows:

- Damietta/Cairo IW is the process of rehabilitation project (Navigable IW is expected to serve connection route between seaport and GCR in the year 2003).
- Alexandria/Cairo IW has not been improved since its commencement in the mid-70s, except for some minor maintenance works. Thus, insufficient IW facilities can hinder barges from smooth and safe navigation.
- River transport between El Dekheila and Cairo is not possible. Because the open sea area between El Dekheila and Alexandria is not navigable by existing barge system, and a coastal barge has not yet been materialized.



source) JICA Study Team

Figure 11.2.2 The Growth in Overseas Cargo (total) at two Major Seaports from/to GCR

Meanwhile, road and railway sectors have been able to cope with the increase in the secondary transport from/to such large growth in overseas trade at both seaports. For instance, widening/improving works along Alexandria Desert Road and Agriculture Road, newly construction of access railway to both seaports made steady progress during the same period.

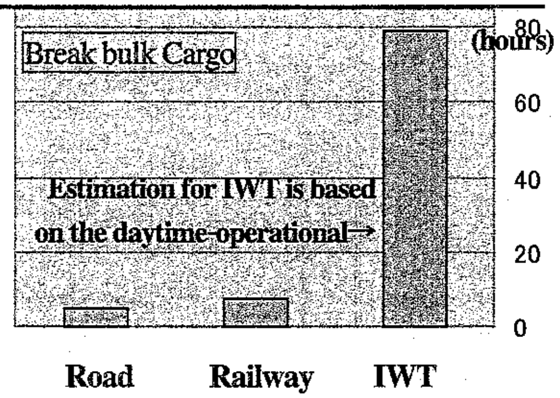
2) Hindrance from Efficient-Transport and Transport Cost-Saving

Presently, barge navigation is operated according to the daytime-based operational system from sunrise to sunset during working time of only 10 hours.

On the other hand, other transport sectors have already introduced night or full-day operational and managerial system.

Therefore, it is considered that IWT has two major problems against other transport modes as follows:

- Time-competitiveness of IWT is seriously inferior to road and railway sectors.
- IWT can hinder the Egyptian whole transport system from efficient activities and smooth inter-modal transportation because other elements are forced to adjust to daytime-based operation.



Source) JICA Study Team

Fig. 11.2.3 Comparison of Transport Time between Alexandria and Cairo

In addition, one of the effective measures to save transport cost is to increase the transportation lot; in other words, enlarging the size of barges. However, the drive to enlarge or renovate existing barge fleet seems to be stagnant in recent years.

3) Shortcoming to Participate in Transport of Containers

In recent years, containers transportation is rapidly increasing in accordance with the growth in overseas trade and the development of containerization, by fully utilizing its advantages of punctuality, safety and transport time for door-to-door services, as shown in Figure E-7 below.

However, both public and private sectors attending to IWT have the following two disadvantages/ shortcomings in the field of secondary transport of containers from/to seaports:

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

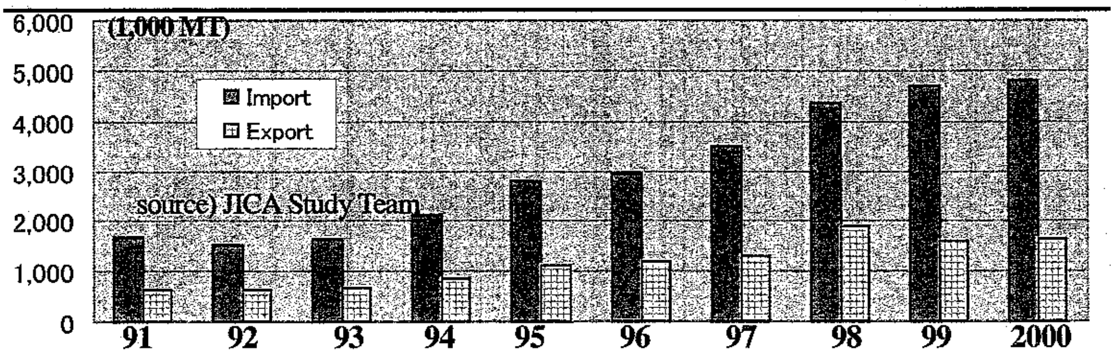


Figure 11.2.4 Historical Trend of Container Cargo via Mediterranean Seaport

At present, the majority of above containers cargo at seaports are transported from/to GCR. Road and railway sectors have made every attempt to provide infrastructures to cope with above rapid growth in containers, and made a success of such secondary transport of containers between seaports and GCR.

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

As mentioned in previous problems 1)~3), the advance of IWT is not necessarily steady although Egyptian transport sector is changing in every aspects so rapidly. One of reasons of such delays, that public and private sectors of IWT could not provide much investment in order to catch up the structural change of the whole transport sector such as cargo flow patterns. In addition, the following problems seem to hinder the advance of IWT sector from timely and efficient actions:

- Coordination and Close Connection with Relevant Organizations

A significant feature of Egyptian IW is coping with both navigational use and utilization of water resources. To achieve both purposes, a good coordination with relevant organizations such as MWRI (Ministry of Water Resources & Irrigation) is vital. Meanwhile, it is likely that such coordination demands some efforts/time-consuming procedures at the stages of policy/planning decision making and its implementations.

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

To formulate required policies and materialize its contents, it is necessary to timely respond to market trends, customer needs besides above coordination with public bodies. However, there are insufficient systems or framework to catch up needs of market, and insufficient public relations which announce achievements / advantages of IWT to the society.

5) Participations and Investment by Private Sector in IWT market

As described in above item 4), it is essential to encourage private sector in order to promote IWT market, according to the appropriate role-sharing between public and private sectors. For instance, private companies already play an important role in road transport while privatization in the maritime sector s is steadily progress based on the open-door policy to private sector. On the other hand, IWT

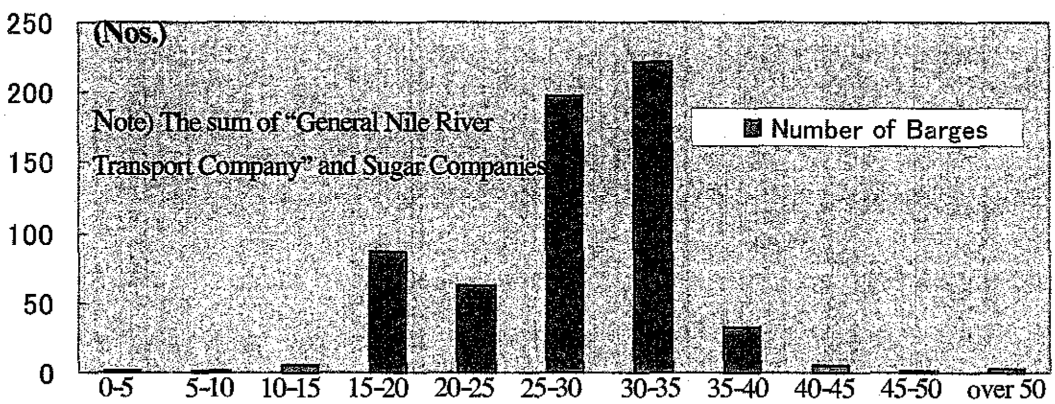


Figure 11.2.5 Distribution of the Age of Barge Fleet

sector seems to be behind such other sectors in the privatization.

It is vital for private operators to modernize and renovate an overage barge system, in order that cost-competitiveness should be improved by the saving in the transport-cost.
At present, the drive to introduce larger-sized barges seems to be stagnant since 1960s although most of barge fleet in Egypt has reached its age of 30 as shown in Figure 11.2.5. Prime reasons are as follows:

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

11.2.2Basic Strategies in the Master Plan

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

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