CHAPTER 7 OTHER TRANSPORT INDUSTRIES

7.1 Railways

7.1.1 Introduction

The Egyptian National Railways (ENR) is considered to be the first railways built outside Europe after the invention of the steam locomotives at the beginning of the last century. The first line in Egypt was opened to traffic in the year 1856 between Cairo and Alexandria, followed by the second line between Cairo and Suez. By the first quarter of the nineteenth century, almost the Egyptian railway network had reached its present situation, except couple of freight lines which were built recently. The network in its present situation connects all the capitals of the governorates in lower and upper Egypt and is considered to have one of the highest network density if related to the agriculture served areas in the Nile valley and Delta.

ENR is the governmental authority responsible for the operation, maintenance and upgrading of the railway network and railway services. In section 7.1, the Egyptian National Railway System will be described in the framework of the present study, i.e. in the framework of "The Study of The Egyptian Inter City Transportation System". Section 7.1.2 will present the railway network configuration and operational characteristics, section 7.1.3 the description of the railway fleets, and section 7.1.4 the railway global production, revenue and expenditure.

7.1.2 Railway Network

The Egyptian railway network consists of 37 lines, on which passenger trains depart and arrive from and to formal terminals located at both ends of each of them. The two important lines are the lines number 01 and 24 serving the corridors between Cairo and Alexandria in the north, and between Cairo and Aswan High Dam in the South. For the purpose of network building, each of the 37 lines were sub-divided into a number of railway links, each link has constant physical and operating characteristics.

Table 7-1-1 presents a sample of the network links coding system. The link code given in field 1 of the table, consists of 4 digits, the first two from right defines the line number, while the next two digits gives the serial number of the link on the line, starting from the direction of Cairo, i.e. in the direction of the so-called up-line. As an example, line 01 consists of 27 homogeneous links, where link number 0101 starts from Cairo station, and link number 0127 is the last link on the Alexandria side. The in-node and out-node code numbers and names for each link are given in fields 2 to 5. Here again, the unified coding system for networks defined in the Transport Sector Information System

Project has been followed.

Table 7-1-1 Sample of Railway Network Links Coding System

Link Code	Innode		Outnode		Link Length	Innode		Outnode	
	Code	Name	Code	Name		X	Y	X	Y
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
0101	100	Cairo Sta.	20153	Shubra Rail Br.	6.317	674	603	675	606
0102	20153	Shubra Rail Br.	1401	Shubra EL Kheima	1.000	675	606	674	607
0103	1401	Shubra EL Kheima	1403	Qalyub Sta.	6.819	674	607	672	610
0104	1403	Qalyub Sta.	1406	Toukh	18.978	672	610	672	621
0105	1406	Toukh	1407	Benha Sta.	11.890	672	621	671	627
0106	1407	Benha Sta.	21452	Benha Br.(1)	0.500	671	627	670	627
0107	21452	Benha Br.(1)	21745	Benha Br.(2)	0.5	670	627	670	628
0108	21745	Benha Br.(2)	1707	Quweisna	10.698	670	628	668	633
0109	1707	Quweisna	1708	Berket EL Saba	11.326	668	633	665	637
0110	1708	Berket EL Saba	21753	Berket EL Saba Br.	1.000	665	637	664	638
0111	21753	Berket EL Saba Br.	1603	Tanta Sta.	17.372	664	638	660	647
0112	1603	Tanta Sta.	21648	Dalgamoun Br.	16.763	660	647	652	648
0113	21648	Dalgamoun Br.	1604	Kafr EL Zayat Sta.	1.000	652	648	650	649
0114	1604	Kafr EL Zayat Sta.	21870	Kafr EL Zayat Br.	1.000	650	649	649	649
0115	21870	Kafr EL Zayat Br.	21872	EL Tawfikia S.B.1	4.781	649	649	647	648
0116	21872	EL Tawfikia S.B.1	21847	EL Tawfikia Sta.	0.901	647	648	645	649
0117	21847	EL Tawfikia Sta.	1804	Itay EL Baroud Sta.	11.150	645	649	641	653
0118	1804	Itay EL Baroud Sta.	1806	Damanhour Sta.	25.199	641	653	629	662
0119	1806	Damanhour Sta.	1809	Abu Hummus	16.431	629	662	621	665
0120	1809	Abu Hummus	1810	Kafr EL Dawar	17.927	621	665	610	668
0121	1810	Kafr EL Dawar	21867	Abis Sta.	16.741	610	668	606	672
0122	21867	Abis Sta.	21874	Bohir.EL Haggar Sta.	1.740	606	672	604	673
0123	21874	Bohir.EL Haggar Sta.	20240	Sidi Gaber Sta.	3.027	604	673	599	672
0124	20240	Sidi Gaber Sta.	200	Alexandria Sta.	4.826	599	672	596	671
0125	21867	Abis Sta.	21868	Ezbet Orfi Sta.,B.P.	1.730	606	672	603	672
0126	21868	Ezbet Orfi Sta.,B.P.	20241	EL Qabari	9.273	603	672	596	670
0127	21874	Bohir.EL Haggar Sta.	21868	Ezbet Orfi Sta.,B.P.	1.121	604	673	603	672
0201	1407	Benha Sta.	1303	Menya EL Qamh	18.384	671	627	680	630
0202	1303	Minya EL Qamh	1304	EL Zagazig Sta.	16.941	680	630	689	635
0203	1304	EL Zagazig Sta.	1305	Abu Hammad	18.789	689	635	699	632
0204	1305	Abu Hammad	1903	EL Tell EL Kebir	10.902	699	632	705	633

Remarks Sta. : Railway Station.
H.B. : Halt & in the same time a Block Post.
H. : Halt.
S.B. : Signal Box.
B.P. : Block Point.

Node numbers consisting of 4 digits or less, represents capitals of governorates or marakez according to the national administrative coding system of CAPMAS. Node numbers consisting of 5 digits, and starts with the figure 2, represents an additional railway node within the corresponding governorate, whose code number is given in the second and third digits, and represents a branching points or other

important station or block post in the relevant governorate. The link length is given in field 6. For the purpose of network graphical presentation, the X&Y co-ordinates are given in columns 7 to 10. Figs. 7-1-1 (1) & (2) presents the node and link map of the Egyptian railway network for lower and upper Egypt according to the unified coding system of the Transport Sector Information System.

Information about signaling systems, link capacity, and number of existing daily operating trains have been obtained from the signaling and operation departments of ENR. Table 7-1-2 presents a sample of these information. Field 4 in this table defines the link type, where the figure 4 means a four-track line, 2 means a double track line, and 1 means a single track line. Abbreviation of signaling system is given at the bottom of the table. Link capacity is given as the total number of maximum daily trains which could be operated on the link, and have been calculated according to the so-called Scott Formula. The numbers of present maximum daily operated trains by train type are given in fields 8 to 16. The differences between the capacities and the present daily operated trains represent the reserve capacities of each links.

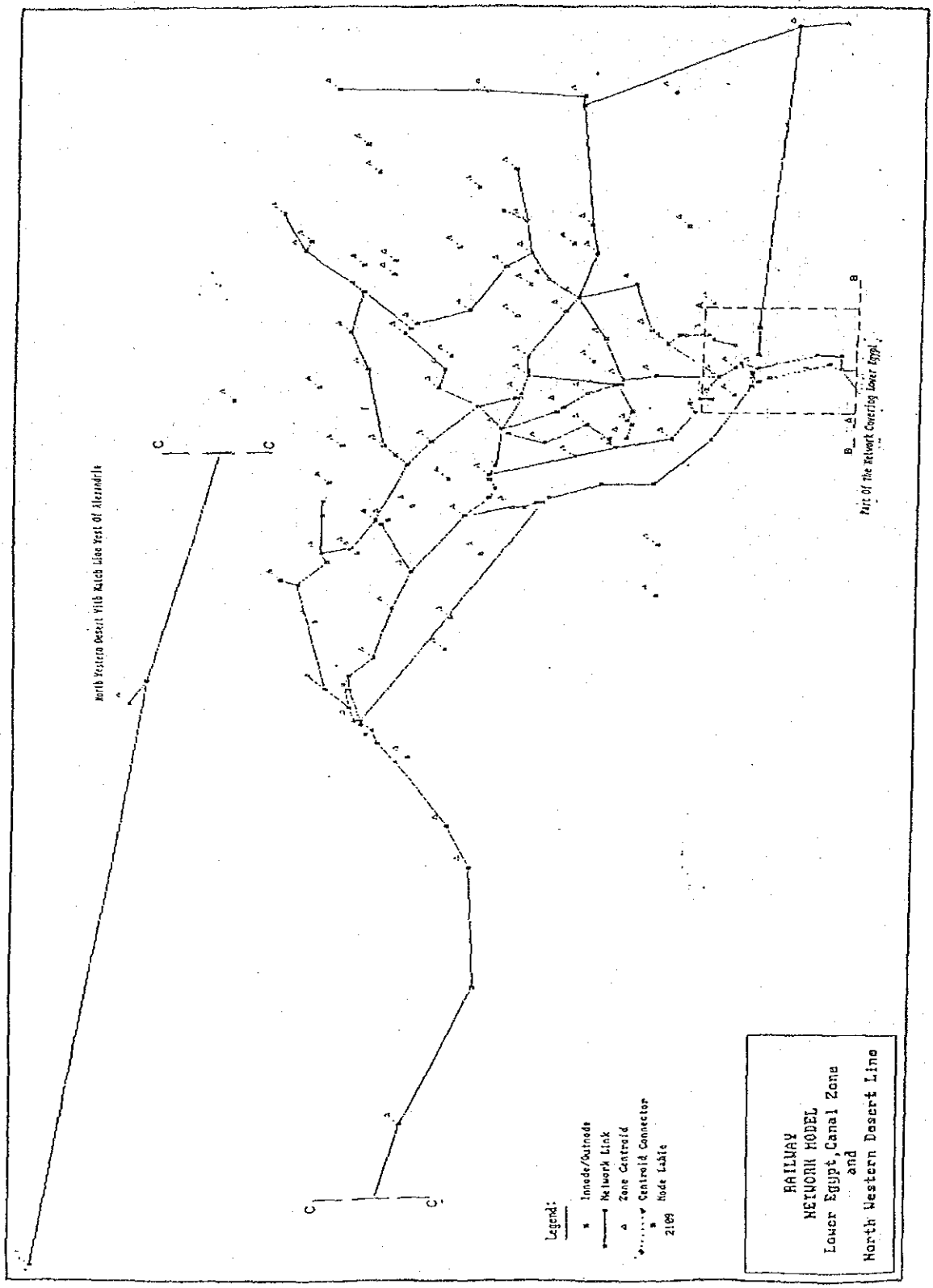


Fig. 7-1-1 Railway Network Model (1)

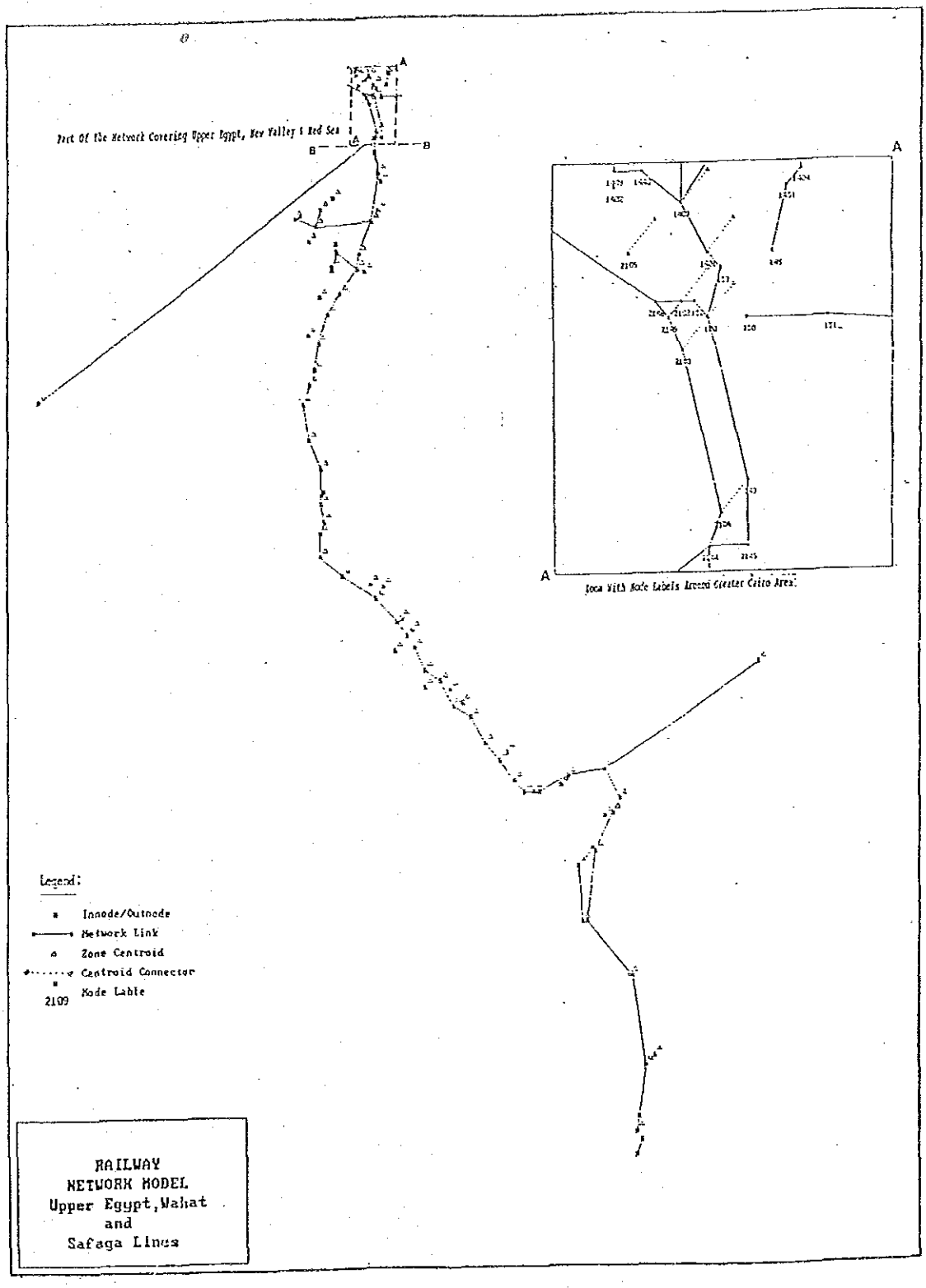


Fig. 7-1-1 Railway Network Model (2)

Table 7-1-2 Sample of Railway Capacity and Number of Operating Trains by Link

Link Code	Innode Code	Outnode Code	Link Length (km)	Link Type	Signal System	Link Capacity	DMU (Tur)	DMU (Hun)	Sleep Trains	Number Of Daily Trains: Express (AC)	Express (Nor)	Semi-exp. (AC)	Semi-exp. (Nor)	Local	Freight
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
0101	100	20153	6.317	4	E(CTC)	320	6	6	2	28	10	44	44	74	
0102	20153	1401	1.000	4	E(CTC)	320	6	6	2	28	10	44		74	
0103	1401	1403	6.819	4	E(CTC)	320	6	6	2	28	10	44	44	74	
0104	1403	1406	18.978	2	T(2)	320	6	6	2	28	10	44	30	74	
0105	1406	1407	11.890	2	T(2)	320	6	6	2	28	10	44	30	6	
0106	1407	21452	0.500	2	T(3)	110	6	4	2	28	3	21	25	6	
0107	21452	21745	0.500	2	T(3)	110	6	4	2	28	3	21	25	6	
0108	21745	1707	10.698	2	T(3)	110	6	4	2	28	3	21	25	6	
0109	1707	1708	11.326	2	T(3)	110	6	4	2	28	3	21	25	6	
0110	1708	21753	1.000	2	T(3)	110	6	4	2	28	3	21	25	6	
0111	21753	1603	17.372	2	T(3)	110	6	4	2	28	3	21	25	6	
0112	1603	21648	16.763	2	T(3)	320	6		2	28	5	24	22	6	
0113	21648	1604	1.000	2	T(3)	320	6		2	28	5	24	22	6	
0114	1604	21870	1.000	2	T(3)	306	6		2	28	5	24	22	6	
0115	21870	21872	4.781	2	T(3)	306	6		2	28	5	24	22	6	
0116	21872	21847	0.901	2	T(3)	306	6		2	28	5	24	22	6	
0117	21847	1804	11.150	2	T(3)	306	6		2	28	5	24	22	6	
0118	1804	1806	25.199	2	T(3)	320	6		2	28	5	24	24	6	
0119	1806	1809	16.431	2	T(3)	320	6		2	28	5	24	28	8	
0120	1809	1810	17.927	2	T(3)	320	6		2	28	5	24	28	8	
0121	1810	21867	16.741	2	T(3)	320	6		2	28	5	24	28	8	
0122	21867	21874	1.740	2	T(3)	306	6			28	5	22	28	8	
0123	21874	20240	3.027	2	T(3)	306	6			28	5	22	28	8	
0124	20240	200	4.826	4	T(3)	324	6			28	5	22	28	240	
0125	21867	21868	1.730	2	T	96			2			2	2		
0126	21868	20241	9.273	2	T	96			2			2	4	14	
0127	21874	21868	1.121	2	T	96			2			2	2		
0201	1407	1303	18.384	2	T	86		2				25	12	16	
0202	1303	1304	16.941	2	T	86		2				25	12	16	
0203	1304	1305	18.789	2	T	86						24	10	14	
0204	1305	1903	10.902	2	T	86						24	10	14	
0205	1903	21947	42.522	2	T	86						24	10	14	
0206	21947	1902	6.675	2	T	86						26	14	30	
0207	1902	1901	32.766	1	S	50						14	4	6	

Remarks E :Electric
CTC:Central Traffic Control
M :Mechanical
EM : Electro Mechanical
T :Tires
S :Staff

The level of service offered by railways could be modeled through the train type and speeds. Information on the running and travel speeds by train type on the different links of the network was obtained from ENR operation department. An example of this type of information is illustrated in Table 7-1-3.

For the full set of information for the railway net description, reference is made to the "RWNET" computer file kept in the project computerized working files.

Table 7-1-3 Sample of Railway Running and Travel speeds by Link (1)

Link Code	Innode Code	Outnode Code	Link Length (km)	Running Speeds(km/hr) DMU (Tur.)	DMU (Hun.)	Sleep. Trains	Express (AC)	Express (Nor.)	Semi-exp. (AC)	Semi-exp. (Nor.)	Local	Freight
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
0101	100	20153	6.317	60	60	60	60	60	60	60	60	
0102	20153	1401	1.000	90	90	70	60	60	60	60	60	
0103	1401	1403	6.819	140	105	70	120	105	105	105	70	
0104	1403	1406	18.978	140	105	70	120	105	105	105	70	
0105	1406	1407	11.890	140	105	70	120	105	105	105	70	
0106	1407	21452	0.500	60	60	60	60	60	60	60	60	
0107	21452	21745	0.500	60	60	60	60	60	60	60	60	
0108	21745	1707	10.698	140	105	70	120	105	105	105	70	
0109	1707	1708	11.326	140	105	70	120	105	105	105	70	
0110	1708	21753	1.000	80	80	70	80	80	80	80	70	
0111	21753	1603	17.372	140	105	70	120	105	105	105	70	
0112	1603	21648	16.763	140		70	120	105	105	105	70	
0113	21648	1604	1.000	140		70	120	105	105	105	70	
0114	1604	21870	1.000	90		70	90	90	90	90	70	
0115	21870	21872	4.781	140		70	120	105	105	105	70	
0116	21872	21847	0.901	140		70	120	105	105	105	70	
0117	21847	1804	11.150	140		70	120	105	105	105	70	
0118	1804	1806	25.199	140		70	120	105	105	105	70	
0119	1806	1809	16.431	140		70	120	105	105	105	70	
0120	1809	1810	17.927	140		70	120	105	105	105	70	
0121	1810	21867	16.741	140		70	120	105	105	105	70	
0122	21867	21874	1.740	140			120	105	105	105	70	
0123	21874	20240	3.027	140			120	105	105	105	70	
0124	20240	200	4.826	105			105	105	105	105	70	
0125	21867	21868	1.730									
0126	21868	20241	9.273									
0127	21874	21868	1.121									
0201	1407	1303	18.384		90		90	90	90	90	70	
0202	1303	1304	16.941		90		90	90	90	90	70	
0203	1304	1305	18.789				90	90	90	90	70	
0204	1305	1903	10.902				90	90	90	90	70	
0205	1903	21947	42.522				90	90	90	90	70	
0206	21947	1902	6.675				90	90	90	90	70	
0207	1902	1901	32.766				70	70	70	70	70	

Table 7-1-3 Sample of Railway Running and Travel speeds by Link (2)

Link Code	Innode Code	Outnode Code	Link Length (km)	Travel Spe (km/hr) DMU (Tur.)	DMU (Hun.)	Sleep. Trains	Express (AC)	Express (Nor.	Semi-exp. (AC)	Semi-exp. (Norm.)	Local	Freight
(1)	(2)	(3)	(4)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
0101	100	20153	6.317	60	60	60	60	60	60	60	30	
0102	20153	1401	1.000	60	60	60	60	60	60	60	30	
0103	1401	1403	6.819	112	75	60	80	69	60	60	30	
0104	1403	1406	18.978	112	75	60	80	69	60	60	30	
0105	1406	1407	11.890	112	75	60	80	69	60	60	30	
0106	1407	21452	0.500	60	60	60	60	60	60	60	30	
0107	21452	21745	0.500	60	60	60	60	60	60	60	30	
0108	21745	1707	10.698	112	75	60	80	69	60	60	30	
0109	1707	1708	11.326	112	75	60	80	69	60	60	30	
0110	1708	21753	1.000	80	75	60	80	69	60	60	30	
0111	21753	1603	17.372	112	75	60	80	69	60	60	30	
0112	1603	21648	16.763	112		60	80	69	60	60	30	
0113	21648	1604	1.000	112		60	80	69	60	60	30	
0114	1604	21870	1.000	90		60	80	69	60	60	30	
0115	21870	21872	4.781	112		60	80	69	60	60	30	
0116	21872	21847	0.901	112		60	80	69	60	60	30	
0117	21847	1804	11.150	112		60	80	69	60	60	30	
0118	1804	1806	25.199	112		60	80	69	60	60	30	
0119	1806	1809	16.431	112		60	80	69	60	60	30	
0120	1809	1810	17.927	112		60	80	69	60	60	30	
0121	1810	21867	16.741	112		60	80	69	60	60	30	
0122	21867	21874	1.740	112			80	69	60	60	30	
0123	21874	20240	3.027	112			80	69	60	60	30	
0124	20240	200	4.826	36			80	69	60	60	30	
0125	21867	21868	1.730					69	60	60	30	
0126	21868	20241	9.273									
0127	21874	21868	1.121									
0201	1407	1303	18.384		60		60		54	50	30	
0202	1303	1304	16.941		60		60		54	50	30	
0203	1304	1305	18.789				60		54	50	30	
0204	1305	1903	10.902				60		54	50	30	
0205	1903	21947	42.522				60		54	50	30	
0206	21947	1902	6.675				60		54	50	30	
0207	1902	1901	32.766				60		54	50	30	

7.1.3 Railway Fleet

The ENR fleet is classified into three main types:

- -Locomotives
- -Passenger Coaches
- -Freight Wagons

The present total number of line locomotives owned by ENR is 521. The majority of the line locomotives have horse power

2,475 or 1,600. The number of locomotives assigned to passenger service was 380, while that assigned to freight service was 141. Table 7-1-4 presents the ENR locomotive statistics for July 1992. The availably for freight locomotives is lower than that for passenger due to the difference in average age of the locomotives assigned to each service, and the efficiency of usage of the available locomotives in passenger service is higher than that in freight, due to the type of the long range train planning for passenger service compared to the irregular short term train planning for freight service.

Table 7-1-4 Locomotive Fleet, its Availability and Efficiency of Usage

	Description	Unit	Passenger Locomotives			Freight Locomotives			Total Stock
			German	Canadian	Total Pass	Normal Coupler	Automatic Coupler	Total Freight	
1	Number Of Locomotives	Stocks	125	255	380	91	50	141	521
2	Total Stock Hours	St.*Hr	93,000	189,720	282,720	67,704	37,200	104,904	387,624
3	Loco.Hrs Retained For Maintenance	Hr	21,636	37,682	59,318	21,036	14,374	35,410	94,728
4	Loco.Hrs Available For Operation	Hr	71,364	152,038	223,402	46,668	22,828	69,494	292,896
5	Loco.Hrs In Actual Operation	Hr	68,820	146,086	214,906	39,840	16,468	56,306	271,212
6	Loco.Hrs Without Operation	Hr	2,544	5,952	8,496	6,828	6,360	13,188	21,684
7	Percentage Availability	%	76.7	80.1	79	68.9	61.4	66.2	75.6
8	Efficiency of Usage	%	96.4	96.1	96.2	85.4	72.1	81	92.6

Source : ENR Statistics

The present fleet for passenger services owned by ENR is 3,030 coaches of different types, from which 2,269 is available for operation. Table 7-1-5 presents ENR coach statistics for July 1992. From the available fleet, 1,095 coaches are operated in express and semi-express normal third and second class trains, while 418 coaches are operated in first and second class air conditioned express trains. Almost one fifth of the fleet (495 coaches representing 22% of the available fleet) is assigned to passenger services on branch lines, a service which is considered uneconomical at present time for railways.

Table7-1-5 Passenger Coaches by ENR and their Availability

Coach Type		Stock	Defective Number	Defective Percentage	Ready for Operation
Sleeping AC	Hungarian	43	9	20.9	34
	Hungarian	22	5	22.7	17
First Class AC	German	21	4	19.0	17
	French	41			41
	German	77	25	32.5	52
Second Class AC	French	96	7	7.3	89
	Semaf	244	42	17.2	202
	German	52	52	100.0	
Second Class Normal	Semaf	605	159	26.3	446
	Romanian	88	13	14.8	75
	German	54	54	100.0	
Third Class Normal	Semaf	449	117	26.1	332
	Romanian	371	129	34.8	242
Branch Line Second Class		145	32	22.1	113
Branch Line Third Class		441	59	13.4	382
Suburban		250	54	21.6	196
Power	Semaf	31			31
Total		3,030	761	25.1	2,269

Source :ENR Statistics

ENR fleet for freight service consists of different types of wagons according to the commodity to be transported. Table 7-1-6 presents ENR freight wagons statistics for July 1992. The bulk and hopper wagons are used mainly for cereal transport like wheat and maize, the box wagons for bagged commodities like cement, fertilizers, wheat flour and sugar. Open type wagons are used for the transport of phosphate ores, stones, gravel, and other similar minerals. Tanks are used for the transport of liquid commodities like petroleum products, molasses and water. Flat wagons are used mainly for the transport of steel bullets and bars, rails, steel beams, machinery, and other special commodities. ENR has surplus wagons than that needed for the present railway freight transport demand.

Table7-1-6 ENR Freight Wagon Fleet

Description	Number In Stock	Wagon Pay Load (Ton)	Total Stock (Ton)	Daily Defectives (Number)	(%)	(Ton)
Bulk Romanian	342	50	17,100	86	25	4,300
Bulk Semaf	134	65	8,710	3	2	195
Bulk Italian	190	50	9,500	40	21	200
Total Cereals	666		35,310	129	19	6,495
Bagged Italian	253	50	12,650	27	11	1,350
Box Semaf	732	50	36,600	95	13	4,750
Box New	140	50	7,000	32	23	1,600
Box 40 Tonne	1,300	40	52,000	200	15	8,000
Total Box	2,425		108,250	354	15	15,700
Iron Ores	748	65	48,620	326	44	21,190
Open Coal	414	50	20,700	103	25	5,150
Open Phosphate	290	40	11,600	39	13	1,560
Open Phosphate	50	50	2,500	6	12	300
Open Normal	482	20/	14,460	37	8	1,110
Open New	250	50	12,500	1	0	50
Total Open	2,234		110,380	512	23	29,360
Flat Permanent Way	527	50	26,350	27	5	1,350
Flat Containers	100	60	6,000	6	6	360
Flat Special	1,135	30/4	56,750	46	4	2,300
Total Flat	1,762		89,100	79	5	4,010
Hooper Belgiun	909	40	36,360	159	18	6,360
Truss	200	30	6,000	12	6	
Tanks Petroleum	1,732	40	69,280	403	23	16,120
Tanks Moulas						
Tanks Water	222	40	8,880	35	16	1,400
Total Tanks	1,954		78,160	438	22	17,520
Two Axles	400	10	4,000	6	2	60
Grand Total	10,550		467,560	1,689	16	79,865
Vans	370			26	7	
Grand Total + Vans	10,920		467,560	1,715	16	79,865

Source : ENR Statistics

7.1.4 ENR Production, Revenue and Expenditure

According to the financial statements and development plans of ENR, the volume of passenger and freight transport by railways is as follows:

Table 7-1-7 ENR Operation Performance

	Year 1991/92	1992/93
(1) Passenger		
Number of pass. trips ENR (mill.)	625	656
Number of pass. trips Metro(mill.)	167	191
Passenger-Km ENR (mill.)	43,867	46,765
Passenger-Km Metro(mill.)	2,338	2,674
(2) Freight		
Volume transported in ton (mill.)	11.2	11.7
Volume transported in ton-Km	3,210	3,274

The revenues collected is estimated to be as follows:

Table 7-1-8 ENR Revenue

Unit:Mill.LE

Revenue Item		Year 1991/92	1992/93
1. Passenger revenue	ENR	228	292
	Metro	48	52
2. Freight revenue		62	80
3. Sleeping and dining services		10	13
4. Other revenues(Transfers)		40	51
Total revenue		388	488

1991/1992 figures are actual, while 1992.93 figures are ENR estimate.

The expenditure by ENR is as follows:

Table 7-1-9 ENR Expenditure

Unit:Mill.LE

Expenditure Item	Year 1991/92	1992/93
1.Total consumables for the production	100	117
2.Total services for the production	50	61
3.Salaries	215	225
(Labor force in 91/92 was 88,000)		
4.Interest and depreciation	164.5	226
Total Expenditure	529.5	659
Revenue/Expenditure Ratio(%)	74	79

1991/1992 figures are actual, while 1992.93 figures are ENR estimate.

ENR is assuming that the revenue/expenditure ratio will reach 100% by the year 1997/1998, i.e. by the end of the first year of the fourth five-year plan. At that time, the

total expenditure is estimated to be 1,218 millions LE, ENR passenger transport in pass.-Km 60,213 mill., Metro passenger in pass.-Km 4,592 mill., and ENR freight transport in ton.-Km 3,544 millions. In other words, the revenue is assumed to be increased by 283% from that of 1991/92, while the production of ENR pass.-Km will increase only by 37%, the production of Metro pass.-Km by 96%, and ENR ton.-Km by 10%.

In the light of the hard competition between rail and road transport, ENR may not be able to cover its total expenditure based on these policies. ENR will be able to cover its expenditure by its own revenues if it gets rid of the uneconomic services for railways like branch line services and local passenger services on main lines, focus only on inter city express passenger service and block train freight transport for strategic commodities, double or triple its production from these services which have proven to be economic and suitable for railways especially in the case of the high railway network and population densities in the Nile valley and Delta where there are ample railway market share from these services, and finally raise the efficiency of the available fleets and manpower.

7.2 Inland Waterways

7.2.1 Introduction

The inland waterway network consists of a set of navigation lines serving the ports on their routes and the land crossed by them. These navigation lines pass through the natural water channels (the Nile, Aswan High Dam lake, Manzala lake, etc.) and through man made canals (El Beheiri canal, El-Tawfiki canal, Noubaria canal, etc.) primarily built to provide the land located away from the river Nile banks with sweet water for irrigation and human needs. A series of barrages have been built in the last two centuries on the river Nile to enable the level of water to be raised to feed the canals branching south of the barrages. These barrages form barriers for inland navigation on the river Nile and on the canals, and normally are provided with waterway locks to enable waterway vessels to change their levels on both sides of the barrage. To connect the east side with the west side banks of the river Nile, and also to cross the numerous canals built all-over the country, many bridges have been built across the river Nile and the canals, forming sometimes, when built not elevated, another important navigation barrier during their closure to waterway traffic.

In section 7.2, the inland waterway system will be described in the framework of the first part of the present study, i.e. in the framework of "The Study Of The Egyptian Inter city Transportation System". In section 7.2.2 the present inland waterway network will be described, while the inland waterway fleets owned by the public as well as the private sector will be presented in section 7.2.3. Expenditure on inland waterways on maintenance as well as investment will be presented in section 7.2.4.

7.2.2 Inland Waterway Network

The General Authority for River Transport (RTA) classifies the waterways into the following classes:

a. first class waterways, these are the waterways having locks which permits the navigation of two unit trains at a time, each having a net loading up to 920 ton, a width of 7.5m, length of 90 to 100m, and a draft of 1.50 up till 1.80m when fully loaded. These waterways have locks with dimensions not less than 100 by 16m and most of the bridges across them are of the elevated type. The total length of the first class waterways is 1,500Km.

b. second class waterways, these are the waterways which branches from first class waterways, and having locks which permits the navigation of single sailing units with a net loading capacity of 50 up till 150 ton, or single mechanical units with lengths of 30 up till 50m,

and breadth of 6 and 7m. Total length of these waterways is 1,850Km.

c. third class waterways; these are all other navigable waterways, which branches from second class waterways, and having operating characteristics equal or less than the second class waterways. Total length of these waterways is 350Km.

RTA divides the navigable inland network into a series of navigable lines, each passes through defined canals or parts of the river Nile. Table 7-2-1 presents a general description of these navigable lines. Each navigable line consists of a series of reaches which are called Hibses. Normally the reach (hibs) is bound on its both ends by two barrages with their locks. Water levels at the start and end of the reach varies according to water discharge required for irrigation purposes and is defined by the Ministry of Irrigation. As it is clear from Table 7-2-1, the inland waterway network contains 82 reaches, which form 36 navigable lines according to the definition of RTA. Table 7-2-1 shows also the numbers of bridges, locks and ports on each navigable line, as well as their totals in the whole network.

For the purpose of network building each reach will be divided into a series of successive links, whose total lengths equals the length of the reach. The link has an in-node and an out-node, and has constant physical and operational characteristics over its entire length. Parameters representing these physical and operational characteristics are the length of the link, water levels, depth of the waterway (permissible draft), breadth of the waterway section, and permissible vessels speed. The link could include elevated bridges within it as long as they do not hinder navigation. If the bridge is of the moving type, it must be represented by an in-node and out-node, i.e. by an individual link, to consider the delay encountered when crossing the bridge. Also locks are represented by individual links. In this way, the link could be considered as the basic element of the network model required for traffic assignment purposes.

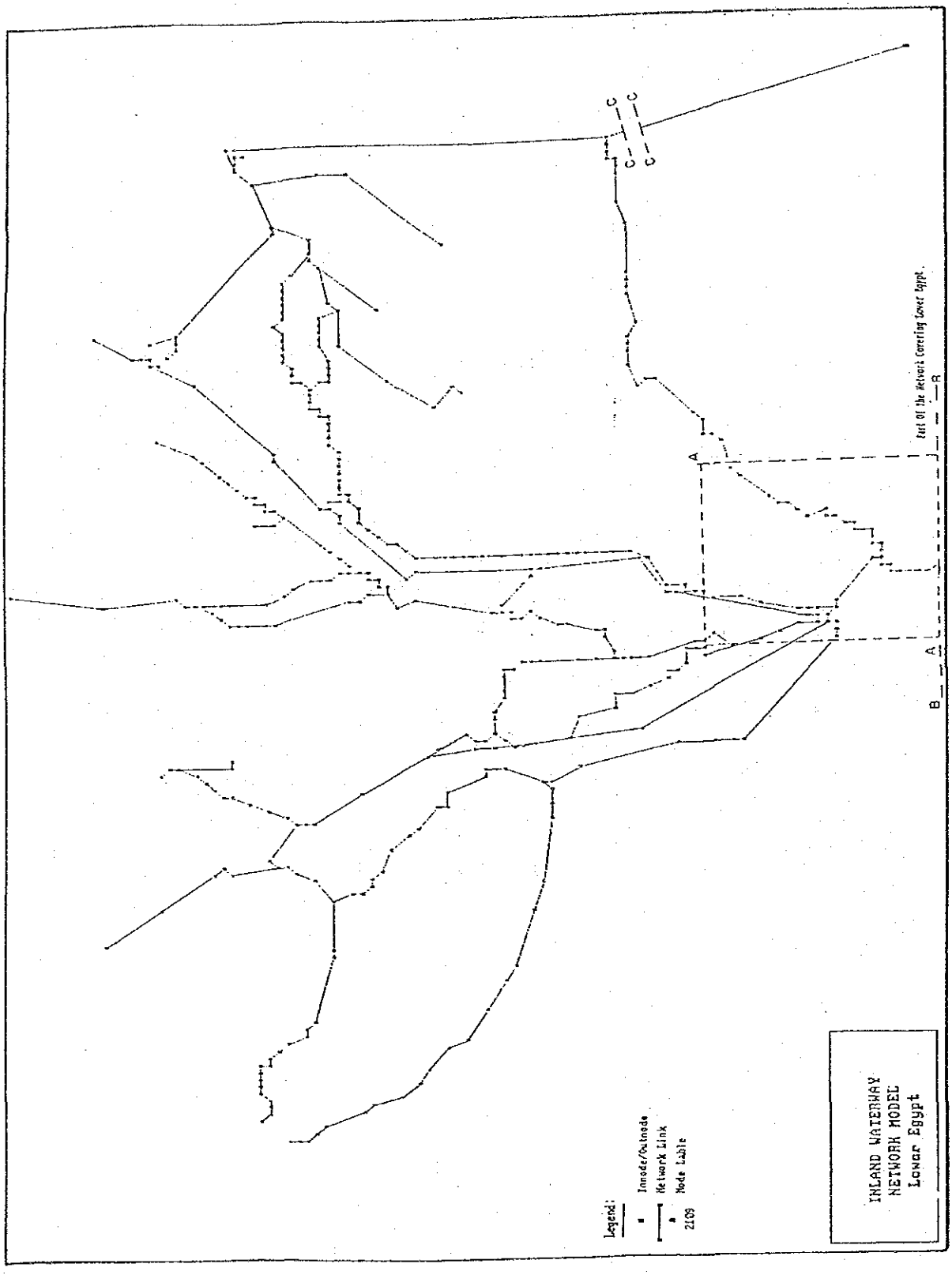


Fig. 7-2-1 Inland Waterway Network Model (1)

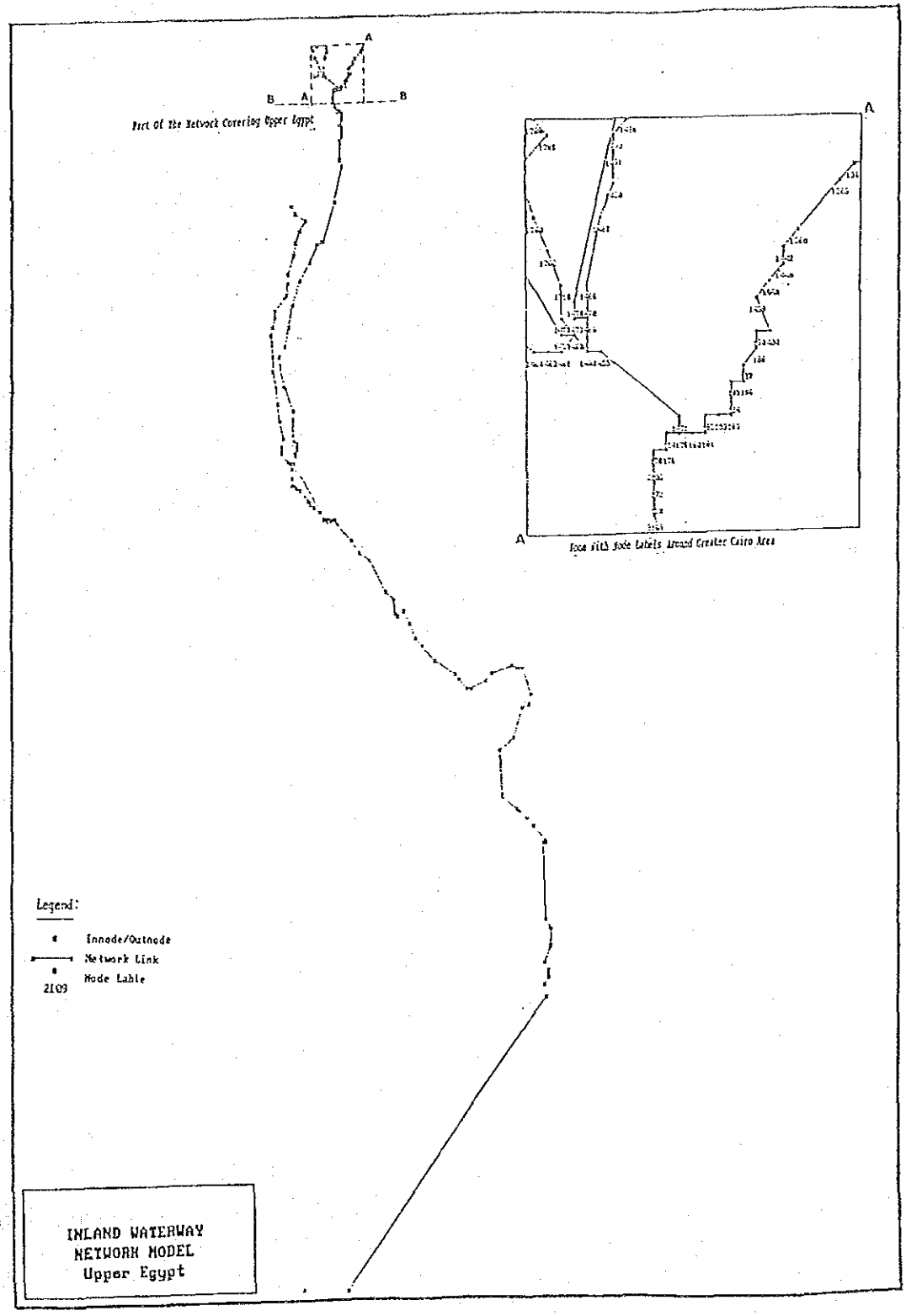


Fig. 7-2-1 Inland Waterway Network Model (2)

Table 7-2-1 RBA Navigation Lines

Code	Navigation Line Name	Canals Names On The Navigation Line	Hibs	Links	Bridge		Locks	Ports
					Fixed	Moving		
1100	Aswan/Cairo	Nile River	5	99	11	4	3	52
1200	High Dam/Wadi Halfa	High Dam Lake	0	1	0	0	0	0
1300	Asyout/Dairout/Mallawi	Ibrahimia Canal	2	39	3	14	2	0
1301	Dairout Drain To Nile	Dairut Drain	1	4	0	1	1	0
1400	Dairout/El Fayoum	Bahr Youssef	6	44	5	13	6	0
2100	Qanater El Delta/Alexandria	Rayah Behiri-Noubaria Canal	7	44	20	1	7	6
2130	Cairo/Abu Zabaal/Ismailiya	Ismailia Canal	3	72	21	13	8	2
2200	Kafr Boulin/Damanhour/Alexandria	EL Raya EL Behiri-ELKhandak -Can.-El Mahmoudia Can.	4	61	5	9	5	3
2300	Qanater El Delta/El Dalgamon/Zawiet Ghazal	Ray.Mounoufi-Bagouria Can.- -Rashid Bran./Mahmoudia Can.	6	67	4	21	6	0
2400	Fom El Bagouria/Tanta/El Dalgamon	Ray.Mounoufi-Bahr Shibeen- -Bagouria Can.-El Mahmoudia	3	39	1	14	4	0
2501	Desouk/El Zeiny Lock	Bahr EL Saaedy	3	18	0	5	4	0
2502	Drain Num.9	Drain NO. 9	1	4	1	1	0	0
2503	Bahr Neshert Drain	Bahr Neshert Drain	1	5	0	2	0	0
2510	Qanater El Delta/Kafr El Zayat/El Qadaba	Rashid Branch	2	10	1	2	2	0
2520	El Atef/Edfina/Rashid	Rashid Branch	2	7	0	1	1	0
2600	Meleeg/El Santa/El Mahala/Demera	Rayah Mounoufi-Shibeen Bahr	3	51	3	18	3	0
2601	Damiatta Branch/Bahr Shebeen	EL Rayah EL Abasi	1	4	0	1	1	0
2602	Bahr El Maleh	Bahr EL Malah	1	8	0	3	1	0
2603	Bahr Tiyra	Bher Tiyra	2	23	0	9	3	0
2604	Demera/Belqas	Rayah Belqas	1	8	0	3	1	0
2605	Bahr Basendilah	Bahr Basendial	2	26	1	10	3	0
2606	Main Gharbiya Drain	Main Gharbiya Drain	1	19	0	7	1	0
2700	El Mansoura/Faraskour/Damiatta/Medit. Sea	Damietta Branch	4	39	2	9	3	0
2800	Cairo/Benha/Meet Ghamr/Mansoura	Rayah Tawfik Mansouria Can.	4	79	3	31	4	0
2900	Mansoura/Dekernes/Manzala City	EL Bahr EL Ssaghir	3	68	1	29	4	0
2901	Omoum EL Beheira Drain	Bahr EL Saghir/Bahr Hadous	2	22	0	9	2	0
2902	Bahr Saft Drain From San EL Hagr	Bahr Saft Drain	1	1	0	0	0	0
2903	EL Canal EL Melahy TO EL Manzala	EL Canal EL Melahy	1	1	0	0	0	0
2101	Kolongiel/EL Bahr EL Saaghir	Kolongiel Conn.	1	5	0	1	1	0
2102	EL Ananiya/EL Manzala Canal	EL Ananiya Canal	2	8	0	2	1	0
2111	Port Said/Ismailiya/Suez	Suez Canal	2	2	0	0	0	0
2112	Suez Canal/EL Manzala Canal	EL Fapouty Canal (EL Raswa)	1	4	3	0	0	0
2121	EL Matariya(Dakahlia)/Port Said	EL Manzala Canal	1	4	0	0	0	0
2122	Damietta/EL Matariya(Dakahlia)	EL Manzala Canal	1	2	0	0	0	0
2123	EL Manzala Canal/Bahr EL Baqar Drain	Bahr EL Baqar Drain	1	4	0	1	0	0
2124	EL Manzala Canal/Bahr Hadous Drain	Bahr Hadous Drain	1	17	0	6	0	0
36	TOTAL		82	909	85	240	77	63

Based on the information collected from RTA, and using the Database Computer Application for Inland Waterways developed in the Transport Sector Information System Project now in run at TPA, the Study team input the basic data needed for the analysis of the waterway network on strategic planning level. The unified coding system for the networks modal

nodes have been adopted for inputting the waterway link data. Table 7-2-2 shows a part of the "WREF_COD" file which defines the code numbers and names of the nodes and their X&Y co-ordinates. The condition zero and one in the third column of this table defines whether the node represents a modal network node and in the same time a transport zone centroid or represents a network modal node only. The WREF_COD file contains 908 records for all nodes of the whole waterway network and is available in the computerized working files of the project. The waterway network consists of 909 links, from which 240 represent moving bridges and 77 represent locks, mainly on navigation lines of class two and three.

Table 7-2-2 Sample of Waterway Nodes according to the Transport Information System Codes

Node Code	Node Name	Cond.	X		Y		Coordinate	
			Deg	Min	Deg	Min	X	Y
30200	Alex. P.	0	29	56	31	11	596	671
30300	P. Said	0	32	14	31	16	734	676
31102	Damietta	0	31	47	31	25	707	685
31103	Faraslour	0	31	41	31	20	701	680
31201	Meet Ghamr	0	31	16	30	43	676	643
31202	Aga	0	31	16	30	56	676	656
30131	Tibeen P.	1	31	16	29	46	676	586
30134	Marazeek B.	1	31	16	29	49	676	589
30136	Mostorod M.B.(1)	1	31	19	30	9	679	609
30153	Shubra Rail B.	1	31	17	30	7	677	607
30154	Fom Ism. Canal.(1)	1	31	13	30	6	673	606
30158	Tibeen Steel P.	1	31	15	29	45	675	585
30159	Tibeen Cock P.	1	31	16	29	47	676	587
32770	Qena Petrol P.	1	32	38	26	11	758	371
32771	Nga Hammadi Alum. P.	1	32	18	26	2	738	362
32772	Nga Hammadi M.B.(1)	1	32	16	26	2	736	362
32773	Nga Hammadi M.B.(2)	1	32	16	26	2	736	362
32774	Nga Hammadi Sug.P.	1	32	12	26	6	732	366
32775	Nga Hammadi L.(1)	1	32	10	26	8	730	368
32776	Nga Hammadi L.(2)	1	32	10	26	8	730	368
32839	Wadi Halfa	1	31	14	21	59	674	119
32844	High Dam	1	32	53	23	57	773	237
32850	Khazaan Aswan	1	32	52	24	2	772	242
32851	Kima P.	1	32	54	24	7	774	247
32852	Aswan Petrol P.	1	32	54	24	8	774	248
32856	Idfu B.	1	32	53	24	59	773	299
32857	Idfu F-Silicon P.	1	32	53	25	0	773	300
32858	EL Sibiya P.	1	32	40	25	13	760	313

Based on the input data, several reports for strategic planning purposes could be produced by the application database program mentioned above. These reports could be produced on the level of a link, a reach (hibs), a naviga-

tion line, or the whole network. Table 7-2-3 illustrates a sample of the waterway link planning information presented in the LINKFILE report on the level of the whole network. The information found in this file, together with the information about X&Y for each node from the WREF_COD file have been used to produce the inland waterway network model. Fig. 7-2-1 illustrates a graphical illustration of this model. This network model will be used later in modal network analysis and traffic assignment.

Table7-2-3 Sample of Waterway Link Information from the "LINKFILE"

Link Code	Innode Code	Outnode Code	Innode Name	Outnode Name	Link type	Innode Kilometrage	Link Length
110001	32850	32804	Khazaan Aswan	Aswan P.	1st Class	0.00	7.00
110002	32804	32851	Aswan P.	Kima P.	1st Class	7.00	2.00
110003	32851	32852	Kima P.	Aswan Petrol P.	1st Class	9.00	3.00
110004	32852	32862	Aswan Petrol P.	EL aqaba P.	1st Class	12.00	5.00
110005	32862	32853	EL aqaba P.	Aswan Clay P.	1st Class	17.00	10.00
110006	32853	32854	Aswan Clay P.	Kabira P.	1st Class	27.00	15.00
110007	32854	32855	Kabira P.	Kom Ombo P.	1st Class	42.00	7.00
130001	32551	32556	Asyut L.(1)	Fom Ibrahimia.Canal L.	Lock	0.00	0.30
130002	32556	32557	Fom Ibrahimia.Canal	Asyut F. B.	2nd Class	0.30	0.01
130003	32557	32558	ASYUT F. B.	Asyut M. Rail B.(1)	2nd Class	0.31	1.00
130004	32558	32559	Asyut M. Rail B.(1)	ASYUT M. RAIL B.(2)	Mov.Brid.	1.31	0.04
130005	32559	32560	Asyut M. Rail B.(2)	Asyut King FaisaL B.	2nd Class	1.34	0.25
130006	32560	32561	Asyut King FaisaL B.	Asyut Cement Com. B.	2nd Class	1.59	6.00
290001	31299	32064	Bahr EL Saaghir L.1	Bahr EL Saaghir L.2	Lock	0.00	0.30
290002	32064	32065	Bahr EL Saaghir L.2	Meet Mazaah M.B.(1)	2nd Class	0.30	1.15
290003	32065	32066	Meet Mazaah M.B.(1)	Meet Mazaah M.B.(2)	Mov.Brid.	1.45	0.04
290004	32066	32067	Meet Mazaah M.B.(2)	Shaha M.B.(1)	2nd Class	1.49	4.31
290005	32067	32068	Shaha M.B.(1)	Shaha M.B.(2)	Mov.Brid.	5.80	0.04
290006	32068	32069	Shaha M.B.(2)	MEHALET DEMNA M.B.1	2nd Class	5.84	1.66
290007	32069	32070	Mehalet Demna M.B.1	Mehalet Demna M.B.2	Mov.Brid.	7.50	0.04
290008	32070	32071	Mehalet Demna M.B.2	Kakr A. Moemin M.B.1	2nd Class	7.54	1.46
290009	32071	32072	Kakr A. Moemin M.B.1	Kafr A. Moemin M.B.2	Mov.Brid.	8.00	0.04
290010	32072	32073	KAFR A. MOEMIN M.B.2	Geziret Qebaab M.B.1	2nd Class	8.04	0.96
290101	31374	31375	EL Masab/Bahr Hadous	1st M.B.(1)	3rd Class	0.00	5.00
290102	31375	31376	1st M.B.(1)	1st M.B.(2)	Mov.Brid.	5.00	0.04
290103	31376	31377	1st M.B.(2)	L. OF Drain(1)	3rd Class	5.04	0.46
290104	31377	31378	L. OF Drain(1)	L. OF Drain(2)	Lock	5.50	0.30
290105	31378	31379	L. OF Drain(2)	2nd M.B.(1)	3rd Class	5.80	5.70
290106	31379	31380	2nd M.B.(1)	2nd M.B.(2)	Mov.Brid.	11.50	0.04
290107	31380	31381	2nd M.B.(2)	3rd M.B.(1)	3rd Class	11.54	1.46
290108	31381	31382	3rd M.B.(1)	3rd M.B.(2)	Mov.Brid.	13.00	0.04
290109	31382	31383	3rd M.B.(2)	4th M.B.(1)	3rd Class	13.04	1.46
290110	31383	31384	4th M.B.(1)	4th M.B.(2)	Mov.Brid.	14.50	0.04

As the locks and moving bridges represent navigation barriers and affects the capacity and the journey speeds on the navigation lines, two other important reports have been produced. The first is the LOCKFILE report which contains

the names of the locks, the kilometric position from the beginning of the navigation line, whether the lock has a single or double basin, and the important dimension of the basins of the lock which affects its throughput capacity together with the water levels at the entrance and exit of the lock. Table 7-2-4 contains a sample of the information found in the LOCKFILE. The second report is the BRDGFILE, and it contains the position of the moving bridges on each navigation line together with the dimensions of the vents on both sides of the central pier. Table 7-2-5 contains a sample of the information found in the BRDGFILE.

Table 7-2-4 Sample of the Information about Locks

Line Code	Lock Code	Lock Name	Lock K.Metrage From Beginning Of Waterway	Lock Basin Number	Lock Dimension			
					Length (m)	Width (m)	Base Level	Sill Level
1100	1	Esna	169.00	(1)	80.00	16.00	0.00	0.00
1100	2	Nga Hammadi	359.04	(1)	80.00	16.00	0.00	0.00
1100	3	Asyut	546.04	(1)	80.00	16.00	0.00	0.00
1300	1	Fom EL Ibrahimia Canal	0.00	(1)	50.00	9.00	0.00	0.00
1300	2	Dairout	45.54	(1)	35.00	8.50	0.00	0.00
			0.00	(2)	55.00	9.00	0.00	0.00
2100	1	Fom EL Riah EL Beheri	0.40	(1)	116.00	16.00	0.00	0.00
2100	2	EL Khatatba	43.30	(1)	116.00	16.00	0.00	0.00
2100	3	Fom EL Noubaria	84.00	(1)	116.00	16.00	0.00	0.00
2100	4	EL Boustan	112.50	(1)	116.00	16.00	0.00	0.00
2100	5	Janaklees	145.30	(1)	116.00	16.00	0.00	0.00
2100	6	EL Nahdaa	184.30	(1)	116.00	16.00	0.00	0.00
2100	7	ALexandria Port	204.15	(1)	116.00	16.00	0.00	0.00
			0.00	(2)	55.00	16.00	0.00	0.00
2200	1	Kafr Boulin	0.00	(1)	55.00	12.00	0.00	0.00

Table 7-2-5 Sample of Movable Bridges Data

Bridge Code	Line Code	Bridge Name	Bridge K.M. From Beginning Of Waterway	Width of Vent(1)	Width of Vent(2)
4	1100	Nag Hammadi	340.00	28.00	28.00
5	1100	Sohag	445.04	20.00	20.00
11	1100	EL Gglla	966.44	20.00	20.00
14	1100	Imbaba	969.98	21.00	21.00
2	1300	Asyut Rail Way	1.31	10.50	10.50
5	1300	Manqbad	7.84	9.00	9.00
6	1300	Bani Hussein	14.88	9.00	9.00
7	1300	EL Hawatka	22.92	9.00	9.00
8	1300	New Manfalut	26.96	9.00	9.00
9	1300	Old Manfalut	27.50	9.00	9.00
10	1300	Bani Qurrah	29.24	9.00	9.00
11	1300	Nazaaly	36.08	9.00	9.00

7.2.3 Inland Waterway Fleet

By law, RTA is the governmental agency authorized to permit running licenses of mechanical boats on the inland waterway network. Sailing boats are licensed from relevant governorates, within which they normally operate, and are normally not considered in inter city transport, as they are used mainly for short distance transport of sand and gravel transport. Table 7-2-6 gives the total inland waterway fleets available in Egypt according to the statistics of RTA. The two government owned companies in the field of waterway transport owe the largest part of the inland waterway mechanical fleet. As it is clear from Table 7-2-6, the Nahri Transport Company owes 171 train units, while the Maaii Transport Company owes 124 train units. A train unit consists from two vessels; a pushed vessel and a pusher barge, and a train unit can carry a net load up to 920 ton when operated to its maximum draft. The Nahri company owes also 98 self-propelled units while the Maaii owes 124 units. In addition to these two transport companies, the Sugar Company owes 199 medium size self-propelled units for their own transport needs of sugar and molasses from upper Egypt

Table 7-2-6 Inland Waterway Fleets Owned by Public and Private Sectors

Company Name Specification	No. Of Units	Type	Cargo Handling Type	Length (m)	Width (m)	Height (m)	Draft (m)	Dead Weight Tonne (Pushed)	Dead Weight Tonne (Pusher)	Power (HP)
(1)Nahri Transport Com.										
(1-a)Nahri Fleet	35	Fleet	Bulk-Liqued	45	8	2.20	1.80	115	125	306
(1-b)German Fleet	36	Fleet	Bulk-Liqued	50	7	2.20	1.80	125	135	420
(1-c)Hungarian Fleet	28	Fleet	Bulk-Liqued	51	8	2.20	1.80	125	135	420
(1-d)Nahda Fleet	26	Fleet	Bulk	45	8	2.20	1.60	115	125	278
(1-e)Obur Fleet	15	Fleet	Bulk	51	7	2.25	1.60	125	135	342
(1-f)Salam Fleet	31	Fleet	Bulk	50	7	2.25	-	125	135	375
(1-g)Mechanical Barges	98	Self Motion	Bulk-Liqued	-	-	-	-	-	110	175
(1-h)Tractors	49	Tractor	Bulk-Liqued	-	-	-	-	-	-	-
(2)Maaii Trasnport Com.										
(2-a)Maaii Fleet	25	Fleet	Bulk	43	8	2.10	1.70	105	115	350
(2-b)Kafat Fleet	28	Fleet	Bulk	46	8	2.10	1.80	105	115	330
(2-c)Romanian Fleet	40	Fleet	Bulk	45	7	2.50	1.60	110	120	460
(2-d)Tersana Fleet	30	Fleet	Bulk	50	7	2.50	1.60	125	135	480
(2-e)Salam Fleet	1	Fleet	Bulk-Liqued	51	7	2.50	1.80	125	135	375
(2-f)Mechanical Barges	129	Self Motion	Bulk-Liqued	-	-	-	-	-	110	175
(2-g)Tractors	22	Tractor	-	-	-	-	-	-	-	-
(3)Sugar Com.										
(3-a)Mechnical Barges	199	Self Motion	Bulk-Liqued	41	7	2.10	15.00	-	-	180
(3-b)Tractors	25	Tractor	-	-	-	-	-	-	-	-
(4)Private Sector										
(4-a)Mechanical Barges	700	Mechanical	Bulk-Liqued	37	6	2.00	1.30	-	-	200
(6)Tourism Boats	262	-	-	57	10	7.00	1.50	-	-	450

Source:RTA Statistics, July 1992

to Cairo and Alexandria. The private sector owe a fleet of 700 units, most of them are of the medium sized self-propelled units.

Cruising over the river Nile is playing a bigger role in the last decade. In the late 1970's, there are only a dozen of tourist cruising boats running between Luxor and Aswan, compared to 262 cruising boats, most of them 5-stars, are operated successfully in 1992 between Cairo and Aswan.

7.2.4 Expenditure On Inland Waterway Infrastructure

RTA is the governmental agency responsible for maintenance, upgrading and development of inland waterways in Egypt. The budget of RTA in the year 1990/1991 was LE 8,011,719, from which LE 1,673,779 were allocated for salaries and consumables for RTA governmental staff in the central administration and districts. An investment of LE 6,327,940 was allocated for structural maintenance and development projects. Actual investment expenditure in the same year by project was as follows:

Table 7-2-7 RTA Investment by Project

Name Of Project	Actual Expenditure(LE)
a. Construction of Admin. Buildings	455,999
b. Construction of Cargo Handling Terminals	453,719
c. Development of the Navigation Line Cairo/Aswan	1,035,199
d. Development of the Navigation Line Beheri/Noubaria	2,176,266
e. Development of the Navigation Line Port Said/Mataria	146,700
f. Development of the Navigation Line Damietta Branch	256,744
g. Renewal of Vehicles and Telecommunication Aids	92,296
Actual Investment Expenditure 1990/1991	4,616,927

The current 5-year development plan has approved a total investment of 127.5 million LE, and have been scheduled by year and project as shown in Table 7-2-8.

Table 7-2-8 RTA Investment Schedule by Project

Name of Project	5-year Total (1,00LE)	First Year Expenditure
a. Construction of Cargo Handling Term.	600	600
b. Develop. of Nav. Line Cairo/Aswan	4,000	1,500
c. Develop. of Nav. Line Beheri/Noubaria	10,000	3,000
d. Develop. of Nav. Line Port said/Matar.	1,000	400
e. Develop. of Damietta Branch	108,950	--
f. Renewal of Vehicles and Telcomm.Aids	2,950	500
Proposed Investment Plan	127,500	6,000

The average annual investment expenditure is in the order of 5 millions LE, and the abnormal increase in the 5 year plan is due to the proposal of the development of the Damietta branch to transfer it from a second class to a first class navigation line.

Typical expenditure items in the year 1990/1991 was as follows:

Table 7-2-9 RTA Expenditure Items in 1990/1991

(1) Dredging works	
a. Up and Down Souhag Bridge	126,000 m3
b. Up and Down Menia Bridge	2,416,500 m3
c. Salwa Region,Upper Egypt	13,000 m3
d. Navigation Line Beheri/Noubaria Canal, Dredging	397,000 m3
e. Navigation Line Beheri/Noubaria Canal, Excavation	9,200 m3
f. Navigation Line Port Said/ Mataria, Dredging	83,618 m3
(2) Embankment Protection	
a. Entrance of Noubaria Lock	600 m3
b. Delivery,& installation of metallic sheet piles	214 ton
c. Reinforced Concrete Works	198 m3
(3) Lock Maintenance Works	
a. Delivery and Installation of Dock Anchorage at Ghatatba Lock	
b. Development and Raising the Efficiency of the Small Maleh Lock	
c. Development and Raising the Efficiency of the Big Maleh Lock	
d. Fixation of a Crane on a Pontoon	
e. Development of the Noubaria Entrance Lock	
e. Repair of the Up Gate of the Ghatatba Lock	
(4) Maintenance of RTA Equipment	
a. Construction and Delivery of a Tractor for RTA	
b. Development of the Service Boat Misr	
c. Repair of the Service Ship in High Aswan Lake	
(5) Studies	
a. Study of the Navigation Problems in front of Qena Bridge	
b. Study of the Navigation Problems in Qus Region	
c. Study of the Development of the Navigation On the Damietta Branch.	

RTA does not implement the above mentioned projects by its own staff, but assigns them to specialized contractors and consultants.

CHAPTER 8 PRESENT TRANSPORT DEMAND

8.1 Present Passenger Movement

8.1.1 Passenger Flow characteristics by Road Side OD Survey

The road side OD survey was carried out on July, 1992 at 62 survey stations located at the governorate borders to form cordon lines. The road side OD survey included;

- Traffic counting for 14/24 hours,
- OD interview for passenger car drivers, taxi and bus passengers and truck drivers.
- Mode preference interview for passenger car drivers
- Road inventory survey.

Table 8-1-1 shows the sample rate of interviewed bus passenger to the total bus passenger. The survey station nos. and their locations are given in Appendix. In average, 24.3% of bus passengers were interviewed their origin and destination. Table 8-1-2 shows the 14/24 hours factors by vehicle types, The 14/24 hours factor of bus is the lowest of 1.18 while that of truck shows the highest of 1.52 reflecting their movement pattern. Table 8-1-3 shows the sample rate of vehicles to the total counted vehicles. Totally 46,372 passenger vehicles were interviewed.

Table 8-1-1 Bus Passenger Sample Rate (1)

NO	ST	PASSENGER TOTAL	PASSENGER SAMPLE	(%)	NO	ST	PASSENGER TOTAL	PASSENGER SAMPLE	(%)
1	1	3,564	1,173	32.9	33	34	2,318	558	24.1
2	2	5,026	1,145	22.8	34	35	297	124	41.8
3	3	2,749	599	21.8	35	36	1,919	453	23.6
4	4	1,267	517	40.8	36	37	4,532	1,125	24.8
5	5	3,267	1,139	34.9	37	38	4,025	1,240	30.8
6	6	4,455	1,043	23.4	38	39	3,003	1,193	39.7
7	7	2,496	571	22.9	39	40	1,338	360	26.9
8	8	4,496	919	20.4	40	41	740	285	38.5
9	9	752	269	35.8	41	42	877	128	14.6
10	10	9,052	2,468	27.3	42	43	40	8	20.0
11	11	3,482	787	22.6	43	50	4,135	242	5.9
12	12	10,379	2,954	28.5	44	55	1,646	345	21.0
13	13	5,028	1,064	21.2	45	56	163	38	23.3
14	14	5,200	1,503	28.9	46	57	641	157	24.5
15	15	1,408	583	41.4	47	58	7,225	2,037	28.2
16	16	914	372	40.7	48	59	3,229	679	21.0
17	18	1,153	273	23.7	49	60	2,191	206	9.4
18	19	1,830	341	18.6	50	72	2,488	562	22.6
19	20	2,104	157	7.5	51	73	114	0	0.0
20	21	1,416	167	11.8	52	78	3,090	681	22.0
21	22	7,739	1,831	23.7	53	102	1,326	334	25.2
22	23	323	62	19.2	54	105	442	101	22.9

Table 8-1-1 Bus Passenger Sample Rate (2)

NO	ST	PASSENGER TOTAL	PASSENGER SAMPLE	(%)	NO	ST	PASSENGER TOTAL	PASSENGER SAMPLE	(%)
23	24	1,956	531	27.1	55	209	1,888	309	16.4
24	25	902	184	20.4	56	210	2,341	658	28.1
25	26	636	248	39.0	57	211	364	71	19.5
26	27	4,078	759	18.6	58	212	3,229	462	14.3
27	28	2,502	651	26.0	59	301	1,515	281	18.5
28	29	1,011	182	18.0	60	302	824	196	23.8
29	30	2,174	563	25.9	61	303	6,246	1,511	24.2
30	31	3,183	785	24.7	62	304	3,364	693	20.6
31	32	582	150	25.8					
32	33	383	119	31.1	TOTAL		161,057	39,146	24.3

Table 8-1-2 24/14 Hours Factor

Vehicle	Traffic Volume 24 hrs	Traffic Volume 14 hrs	24/14 factor
P.Car	13,850	10,469	1.323
Taxi	15,844	11,709	1.353
Bus	2,523	2,147	1.175
Truck	36,600	24,163	1.515
Total	68,817	48,488	1.419

Table 8-1-3 Sample Rate by Vehicles (1)

St.	Counted Vehicles P.Car	Taxi	Bus	Interviewed P.Car	Taxi	Bus	Sample Rate (%) P.Car	Taxi	Bus
1	1495	1420	363	763	304	147	51.0	21.4	40.5
2	3166	1582	482	1364	379	186	43.1	24.0	38.6
3	794	786	271	261	184	88	32.9	23.4	32.5
4	567	566	299	287	197	62	50.6	34.8	20.7
5	902	1175	235	264	281	95	29.3	23.9	40.4
6	1644	2474	260	519	509	133	31.6	20.6	51.2
7	464	469	205	116	153	71	25.0	32.6	34.6
8	1772	1446	404	350	365	126	19.8	25.2	31.2
9	749	1083	48	93	251	31	12.4	23.2	64.6
10	4788	4941	903	2510	1054	315	52.4	21.3	34.9
11	1201	2428	422	489	528	105	40.7	21.7	24.9
12	5348	5083	749	3001	1432	357	56.1	28.2	47.7
13	801	1032	272	446	318	108	55.7	30.8	39.7
14	857	1794	358	306	892	164	35.7	49.7	45.8
15	227	1078	103	68	274	49	30.0	25.4	47.6
16	33	205	41	21	112	30	63.6	54.6	73.2
18	241	239	60	132	206	35	54.8	86.2	58.3
20	1010	250	463	62	115	119	6.1	46.0	25.7

Table 8-1-3 Sample Rate by Vehicles (2)

St.	Counted Vehicles			Interviewed			Sample Rate (%)		
	P.Car	Taxi	Bus	P.Car	Taxi	Bus	P.Car	Taxi	Bus
19	1671	1236	80	602	320	48	36.0	25.9	60.0
21	484	394	81	74	111	36	15.3	28.2	44.4
22	8457	8731	1401	1534	761	244	18.1	8.7	17.4
23	1245	802	18	422	248	12	33.9	30.9	66.7
24	196	408	72	115	156	54	58.7	38.2	75.0
25	271	379	40	124	171	26	45.8	45.1	65.0
26	321	193	38	136	88	22	42.4	45.6	57.9
27	3556	917	345	827	194	117	23.3	21.2	33.9
28	310	963	291	140	235	90	45.2	24.4	30.9
29	441	1531	95	185	479	37	42.0	31.3	38.9
30	1387	690	236	479	182	68	34.5	26.4	28.8
31	3606	1126	455	373	321	113	10.3	28.5	24.8
32	136	68	32	67	52	21	49.3	76.5	65.6
33	139	35	42	83	30	12	59.7	85.7	28.6
34	430	173	136	281	124	101	65.3	71.7	74.3
35	5	37	11	5	24	9	100.0	64.9	81.8
36	522	1263	118	290	280	52	55.6	22.2	44.1
37	2769	2498	197	1306	685	154	47.2	27.4	78.2
38	449	714	223	208	330	121	46.3	46.2	54.3
39	242	430	125	113	204	83	46.7	47.4	66.4
40	246	540	71	103	217	41	41.9	40.2	57.7
41	45	595	72	34	184	35	75.6	30.9	48.6
42	187	178	49	58	102	28	31.0	57.3	57.1
43	209	198	1	98	88	1	46.9	44.4	100.0
50	735	442	449	240	112	149	32.7	25.3	33.2
55	294	533	81	122	154	58	41.5	28.9	71.6
56	98	114	17	32	70	9	32.7	61.4	52.9
57	181	117	62	88	74	29	48.6	63.2	46.8
58	3929	3048	737	756	608	213	19.2	19.9	28.9
59	543	963	336	243	243	102	44.8	25.2	30.4
60	75	391	110	27	156	93	36.0	39.9	84.5
72	184	281	96	104	135	85	56.5	48.0	88.5
73	26	34	10	17	39	10	65.4	114.7	100.0
78	1615	987	211	822	300	97	50.9	30.4	46.0
102	112	110	61	91	96	40	81.3	87.3	65.6
105	40	8	14	22	8	14	55.0	100.0	100.0
209	384	569	82	66	281	58	17.2	49.4	70.7
210	3641	908	408	789	242	82	21.7	26.7	20.1
211	30	276	13	6	125	13	20.0	45.3	100.0
212	1782	1874	271	221	392	80	12.4	20.9	29.5
301	291	284	78	159	110	61	54.6	38.7	78.2
302	2849	1662	182	561	411	38	19.7	24.7	20.9
303	1109	2898	666	404	519	156	36.4	17.9	23.4
304	809	1162	708	120	281	144	14.8	24.2	20.3
Total	72110	68811	14759	23599	17496	5277	32.7	25.4	35.8

Fig. 8-1-1 shows the share of passenger by mode at road side OD survey stations. The weighed average share by mode of all the survey stations are;

- 21.4% for passenger car,
- 29.7% for inter city taxi, and
- 48.9% for inter city bus.

The share of inter city bus of Cairo - Upper Egypt corridor on East Nile Highway counts 68.3%, which is slightly higher than that of Cairo - Alexandria corridor on both Cairo - Alexandria desert road (42.3%) and agriculture road (47.2%).

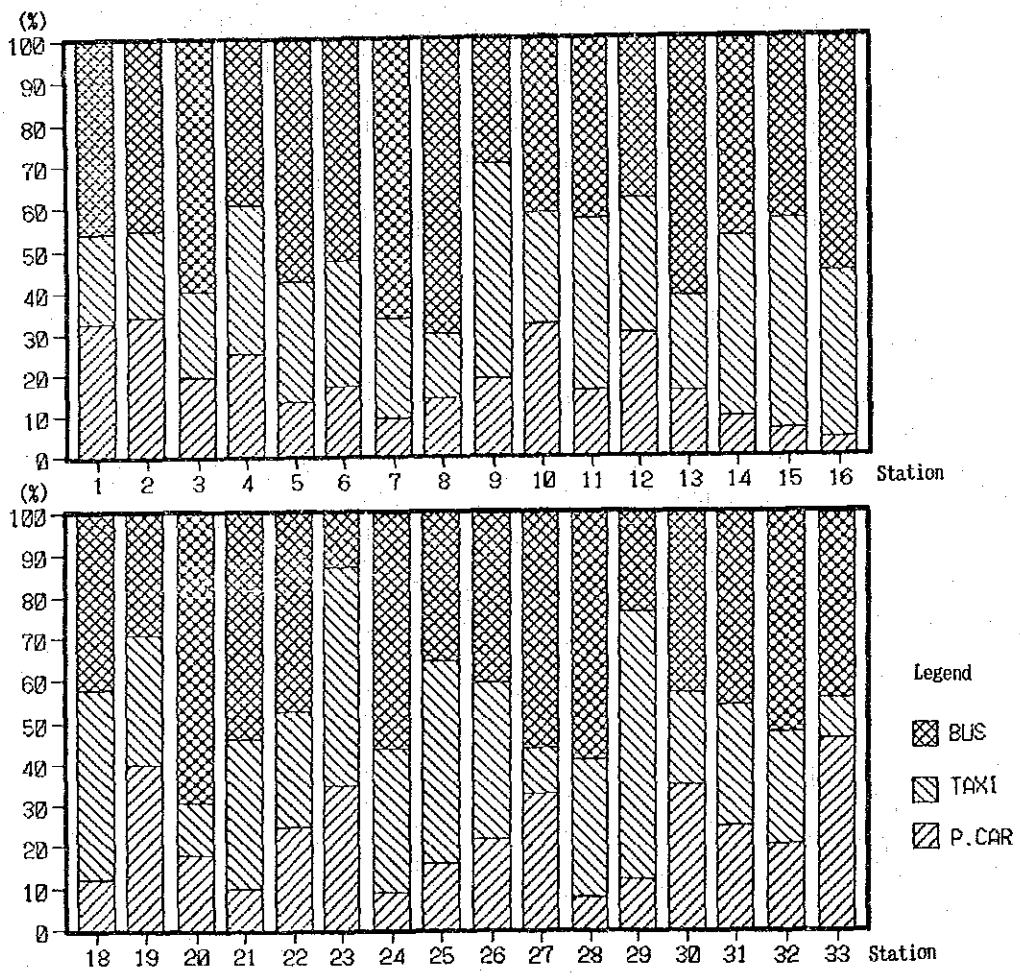


Fig. 8-1-1 Modal Share of Vehicle Passenger (1)

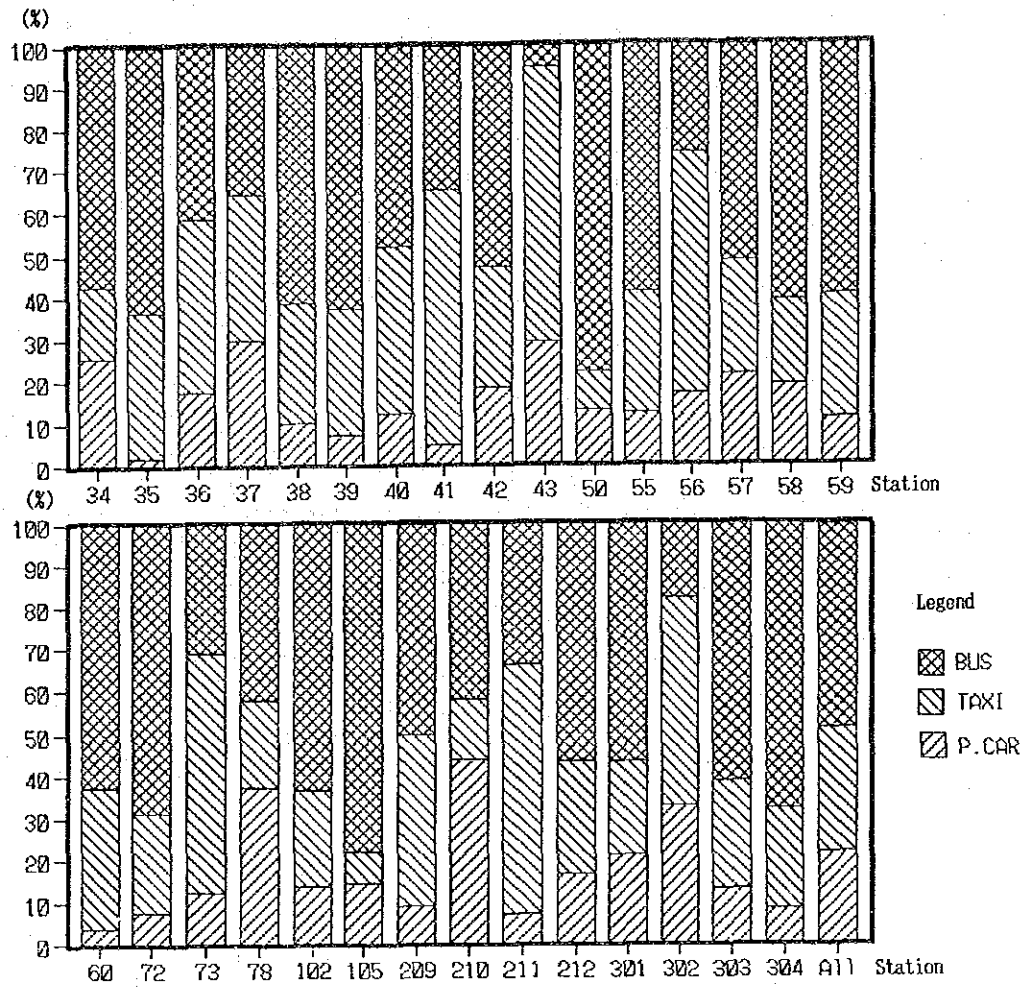


Fig. 8-1-1 Modal Share of Vehicle Passenger (2)

Fig. 8-1-2 (1) through (3) show the occupancy of vehicles by passenger car, taxi and bus. The average occupancies are;

- 2.70 passengers in passenger car including driver,
- 5.59 passengers in taxi excluding driver and
- 30.52 passengers in bus excluding driver.

The passenger distribution of taxi shows the peak at 7 passengers, which corresponds to the passenger capacity of inter city taxi. Buses show the peak at 41 - 45 passengers.

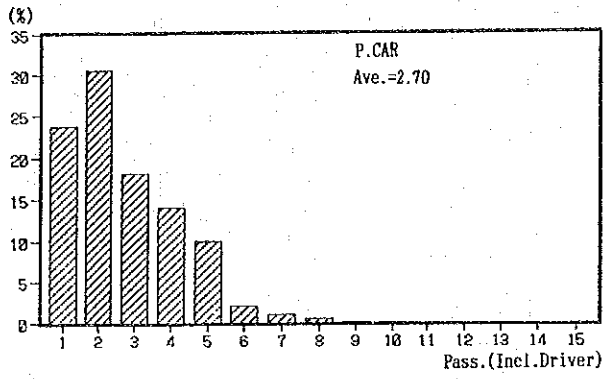


Fig. 8-1-2 Vehicle Occupancy (1) Passenger Car

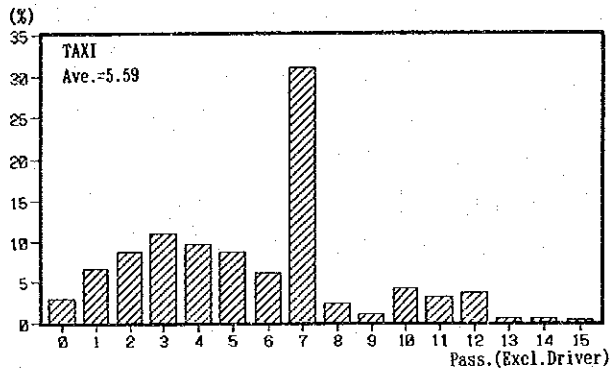


Fig. 8-1-3 Vehicle Occupancy (2) Inter City Taxi

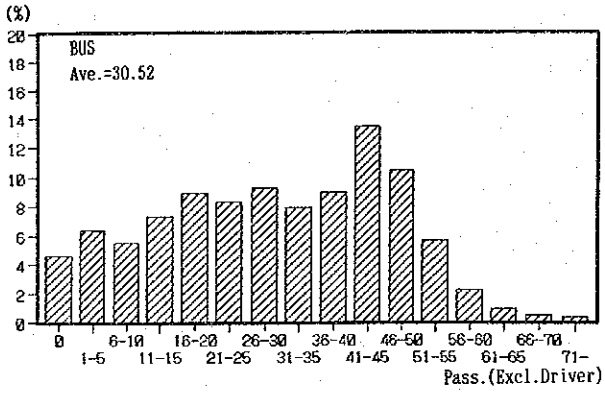


Fig. 8-1-4 Vehicle Occupancy (3) Inter City Bus

8.1.2 ENR Passenger Flow

Fig. 8-1-5 shows the trend of ENR passenger in terms of passenger-Km for the years 1984 - 1990 based on the annual statistics 1991 by CAPMAS. The annual passenger-Km in 1990 was 38,000 million pass.-Km including intra-governorate passenger, and that in 1992 is estimated at 43,800 million pass.-Km by linear regression method.

According to ENR passenger records in a form of station OD, the total monthly passenger was 40.4 million in terms of transported passenger and 4,140 million in terms of pass.-Km in Feb. 1992, or annually 485 million pass./year and 49,700 million pass.-Km, which almost coincides with the CAPMAS figure. Out of the total 40.4 million pass., about 24.8% of passenger is counted in intra zonal (semi-governorate zone) passenger.

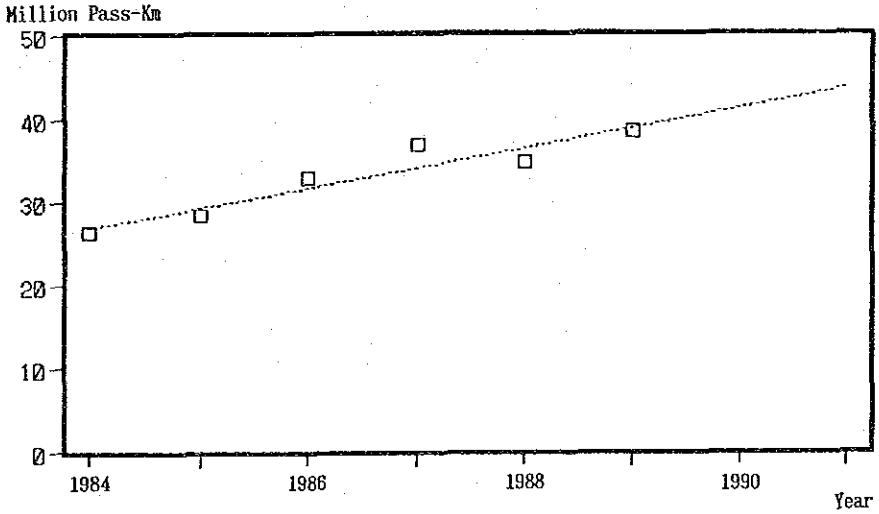


Fig. 8-1-5 Trend of ENR Passenger - Km

Fig. 8-1-6 shows the present pattern of ENR passenger assigned on the spider network based on 29 semi-governorate zone OD matrix developed from station OD. Two major flows from Greater Cairo to Qena in Upper Egypt direction and from Greater Cairo to Alexandria in Delta Area are seen and the passenger flow within Gharbia and Minufia governorates in Delta Area is also remarkable.

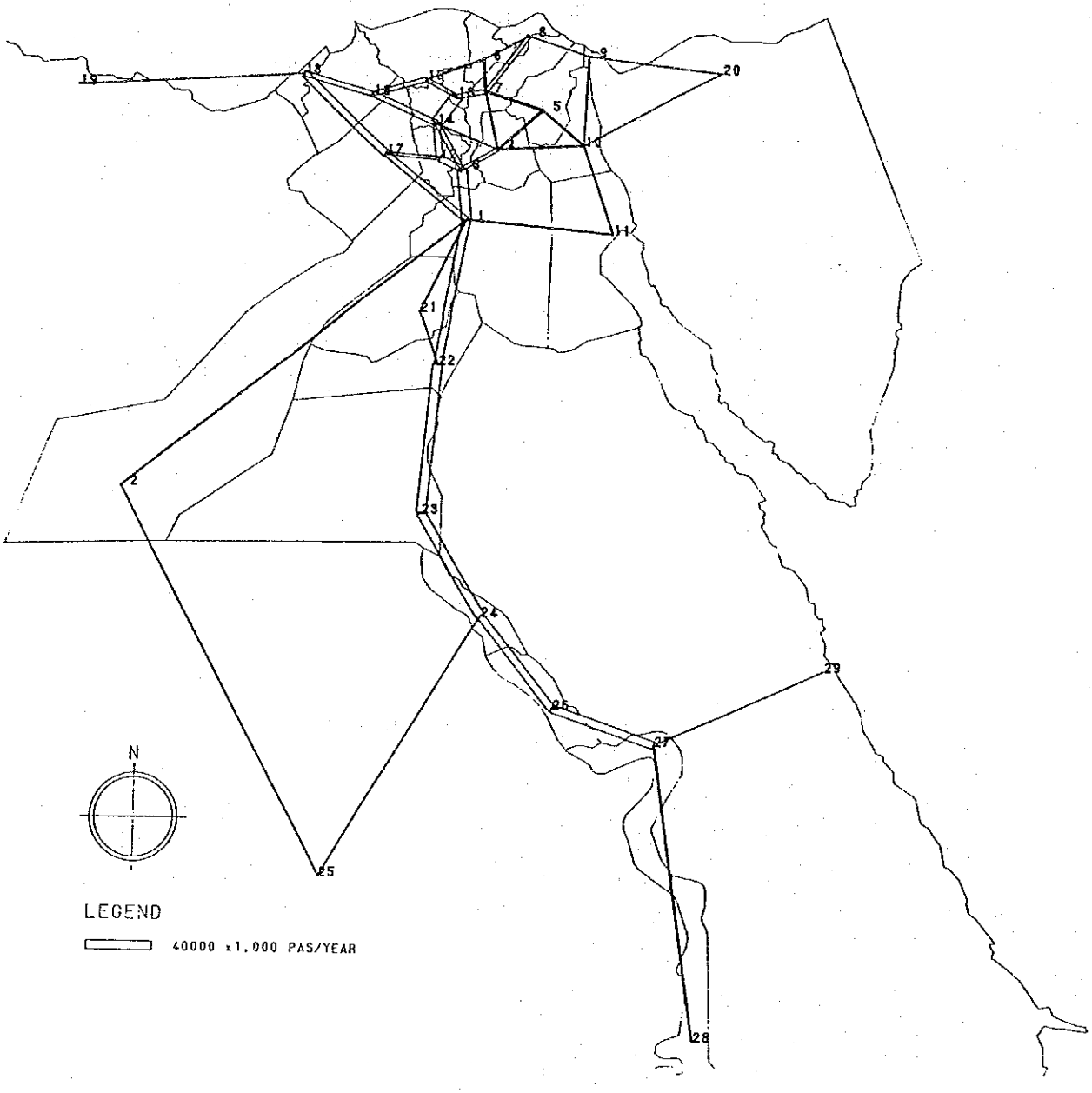


Fig. 8-1-6 Present ENR Passenger Flow Assigned on Spider Network

8.1.3 Present Passenger OD

(1) Expansion

Fig. 8-1-7 shows the process to produce the present passenger OD matrix from the survey results of the road side OD survey and ENR statistics.

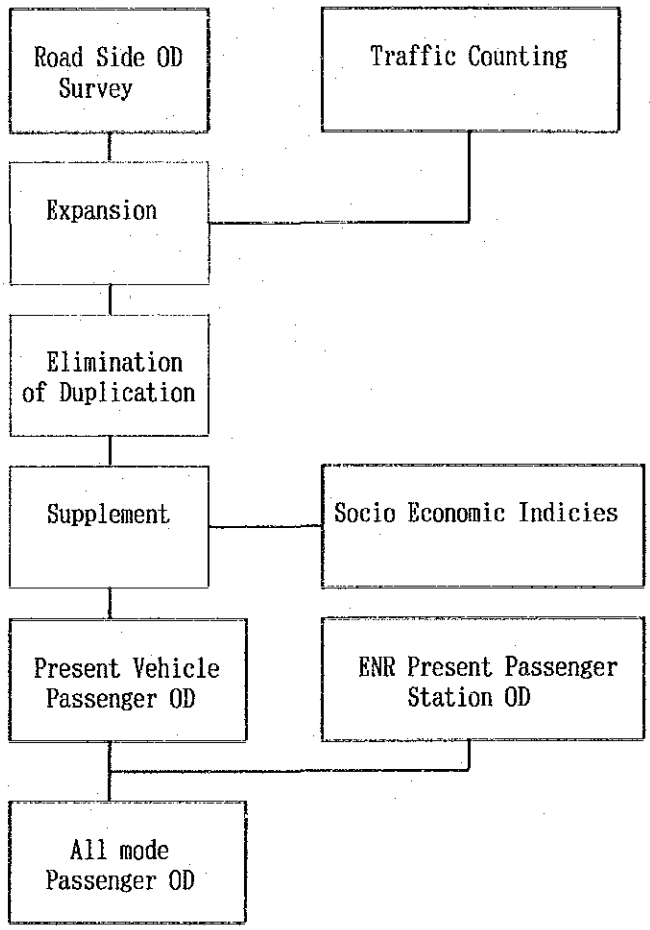


Fig. 8-1-7 Present Passenger OD Matrix Production Process

The sample data was expanded to the total by the following factors;

A. Expansion factor of interviewed bus passenger to the total bus passengers. The expansion factors by survey station are shown in Table 8-1-1.
B. Expansion factor of 14/24 hours counting. The average expansion factors at six 24 hours survey stations by vehicle classification are shown in Table 8-1-2.
C. Expansion factor of interviewed vehicles to the counted vehicles. The expansion factors by survey station are shown in Table 8-1-3.

(2) Elimination of duplication

The road side OD survey stations form cordon lines surrounding traffic zones. An OD pair traffic which crosses cordon lines would logically be the same amount, if trips are made within one day, however they do not meet practically by the sampling process.

The cordon lines that an OD pair would cross were listed up and after comparing the passenger numbers at the cordon lines, the maximum numbers were picked up for each OD pair. The resulted total passengers including international trips are 792,000 passengers a day, and 788,000 excluding international trips, which is 2.3 times ENTS-II observed passengers of 332,000 pas./day.

(3) Estimate of Total Passenger

Out of totally 29 traffic zones excluding two foreign zones, the following zones are included in the same zone groups within a cordon line.

Group 1: zones 4, 5, 6, 8
Group 2: zones 10,11
Group 3: zones 7,13,14,15

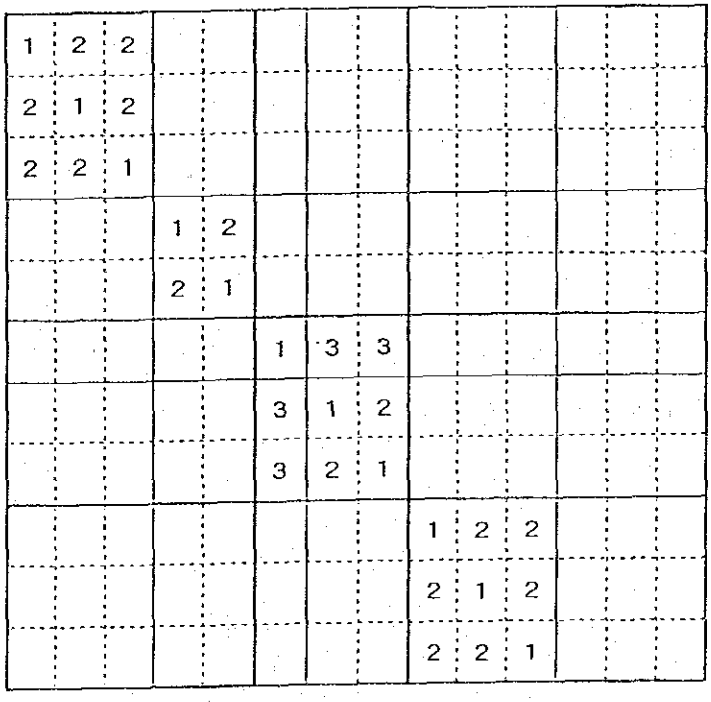


Fig. 8-1-8 Concept of OD Table

The traffic between zones within a zone group could not be observed at the survey stations on cordon lines. The concept is shown in Fig. 8-1-8, where the broad lines show borders of zone groups, narrow lines show that of 29 traffic zones, and the broken lines show that of 188 Markaz base zones. The intra zone group traffic are in the cells marked "1", "2" and "3". The traffic in the cells "3" are inter zone traffic in 29 semi-governorate zone system, and should be estimated to obtain the total passengers.

The regression analysis of generated passengers in 188 Markaz zones excluding zones within above 10 semi-governorate zones by 1992 population and estimated GRDP showed the high multiple correlation coefficient of 0.99. The resulted formula is;

$$T = 6.1058 \times P + 3.9223 \times GRDP$$

where; T : Generated passenger (pas./day)
P : Population in 1992 (1,000 pop.)
GRDP: GRDP in 1992 (1,000 LE)

By the formula, the total inter semi-governorate zone passenger including that in the cells "3" was estimated at 893,587 pas/day, which is 1.19 times the observed inter semi-governorate zone passenger, and the unobserved passengers are in the level of 20% of the observed passenger. This passenger does not include intra semi-governorate zone passenger (cells "2") and the intra Markaz zone passenger (cells "1"). The inter semi-governorate zone passenger in ENTS-II in 1979 was 638,000 pas.day, which is 1/1.45 times the present.

(4) Supplement of Empty Cells

To fill the empty cells in OD matrix, the following gravity type model was applied. The parameters are given in Table 8-1-4.

$$Tij = (Gi \times Ai)^{a1} \times Dij^{a2} \times Dum^{a3} \times EXP(a4)$$

where; Tij : Trip (pas/day)
Gi : Generated passenger in i zone (pas/day)
Ai : Attracted passenger in j zone (pas/day)
Dij : Distance between zones i and j (Km)
Dum : Dummy
a1 - a4 : Parameters(see Table 8-1-4)

Table 8-1-4 Parameters

VEHICLE	a1	a2	a3	a4	R2
P.CAR	0.311781	-0.24496	1.517844	-1.70662	0.78
TAXI	0.227113	-0.44291	1.598289	0.82675	0.85
BUS	0.272623	-0.27325	1.599480	-0.27645	0.83

R2: correlation coefficient

The trips in the cells "1", "2" and "3" were estimated by this formula. The trips in zero cells where zero trips were observed other than cells "1", "2" and "3", were left as zero to keep the better fitness with cordon line trips. The intra Markaz zone trips were estimated applying the average trip distance of 10Km, which was also applied in ENTS-II. The result was adjusted by the total of inter semi-governorate zone trips to the control total calculated in the section (3) above.

Table 8-1-5 shows the estimated result and that in ENTS-II in 1979.

Table 8-1-5 Passenger Movement in 1979 and 1992

	Observed		Synthesized			
			(Incl.29-intra)		(Excl.29-intra)	
	Pass/Day	(%)	Pass/Day	(%)	Pass/Day	(%)
1979						
Pass.Car	55,432	7.6	129,600	8.1	97,130	9.7
Taxi+Bus	276,712	38.1	991,800	62.0	541,620	54.0
Subtotal	332,144	45.7	1,121,400	70.2	638,750	63.8
Rail	394,521	54.3	476,712	29.8	363,000	36.2
Total	726,665	100.0	1,598,112	100.0	1,001,750	100.0
1992						
Pass.Car	144,720	6.8	298,680	10.7	191,031	9.9
Taxi+Bus	643,843	30.4	1,153,103	41.5	737,797	38.2
Subtotal	788,563	37.3	1,451,783	52.2	928,828	48.2
Rail	1,328,000	62.7	1,328,682	47.8	998,764	51.8
Total	2,116,563	100.0	2,780,465	100.0	1,927,592	100.0
1992/1979						
Pass.Car	2.61		2.30		1.97	
Taxi+Bus	2.33		1.16		1.36	
Subtotal	2.37		1.29		1.45	
Rail	3.37		2.79		2.75	
Total	2.91		1.74		1.92	

Table 8-1-6 shows the socio-economic indices of population and car ownership in 1979 and 1992. The population increased by 1.40 times during 13 years period of 1979 - 1992, and the passenger increased by 1.92 times, which is slightly higher than the population growth.

The comparison of passenger in terms of passenger - Km is given in Table 8-1-7, where travel distance of vehicle passengers other than rail was calculated along the assigned route.

Table 8-1-6 Socio Economic Indices in 1979 and 1992

Indices	1979	1992	92/79
Population (1,000)	40,889	57,331	1.40
GDP(1991 Price) (M.LE)	29,973	59,107	1.97
Car Ownership			
Pass.Car	372,000	876,842	2.36
Taxi	98,632	211,634	2.15
Bus	17,679	33,696	1.91

Table 8-1-7 Comparison of Passenger - Km

MODE	1979		1992		
	1,000PKm	Km	1,000PKm	Km	92/79
P.CAR	8,164	63	21,859	86	2.68
TAXI+BUS	48,603	49	78,375	75	1.61
SUBTOTAL	56,767	51	100,234	78	1.77
RAIL	37,808	79	120,000	100	3.17
TOTAL	94,575	62	220,234	90	2.33

8.1.4 Characteristics of Present Passenger Movement

1) Passenger Demand Generation by Zone

Fig. 8-1-9 shows the present passenger demand by 29 semi-Governorate zones excluding 188 zone base intra movements. The total passenger generated from Cairo (Zone 1) occupies 16.4%, followed by North Gharbia (Zone 13) whose capital is Tanta 8.6%, and Alexandria (Zone 18) 7.6%.

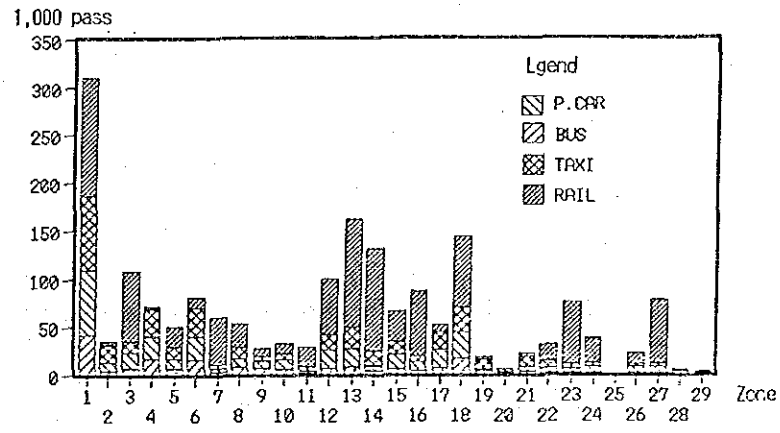


Fig. 8-1-9 Present Passenger Generation by Zone and by Mode

By mode, following Cairo Metropolitan Area, the 9.5% of the passenger car demand generates from North Sharkia (Zone 4) whose capital is Zagazig, 9.4% from Alexandria (Zone 18) and 8.6% from East Dahkalia (Zone 6) whose capital is Mansula. In the taxi passenger, following Cairo Metropolitan Area, 8.1% of the demand generates from Alexandria (Zone 18), 7.1% from East Dakalia (Zone 6) and 6.8% from North Sharkia (Zone 4). In the bus passenger, following Cairo Metropolitan Area, 8.0% of the demand generates from East Dahkalia (Zone 6), 7.6% from North Sharkia (Zone 4) and 6.7% from Alexandria (Zone 18). In the rail passenger, following Cairo Metropolitan Area, 11.3% of the demand generates from North Gahrbia (Zone 13), 10.6% from South Gharbia (Zone 14), 7.4% from Alexandria (Zone 18) and 7.2% from Qaliubia (Zone 3), and they shows the deference order from that in the vehicle passengers. The passenger demand is characterized by the high generation from zones in the delta area, however in the case of rail passenger, such zones in the southern area as Minya (Zone 23) or Qena (Zone 27) also show the high generation.

2) Trip Length Distribution by Mode

Figs. 8-1-10 through 8-1-13 show the trip length distributions by modes of passenger car, taxi, bus and rail. As the Study deal with only the inter semi-Governorate zone traffic, the intra zone movements were eliminated from the result of the road side OD survey, therefore in all the modes, trips with the trip length of less than about 60Km show the decreasing tendency. It also be noted that the trips with the length of about 200Km, which corresponds to the distance between Cairo and Alexandria, jump up.

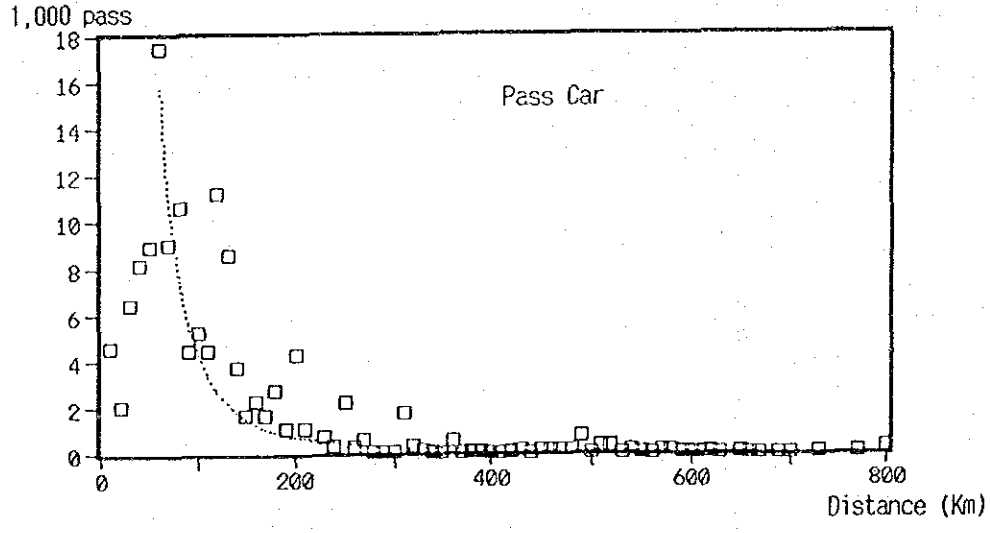


Fig. 8-1-10 Trip length Distribution (1)
Passenger Car

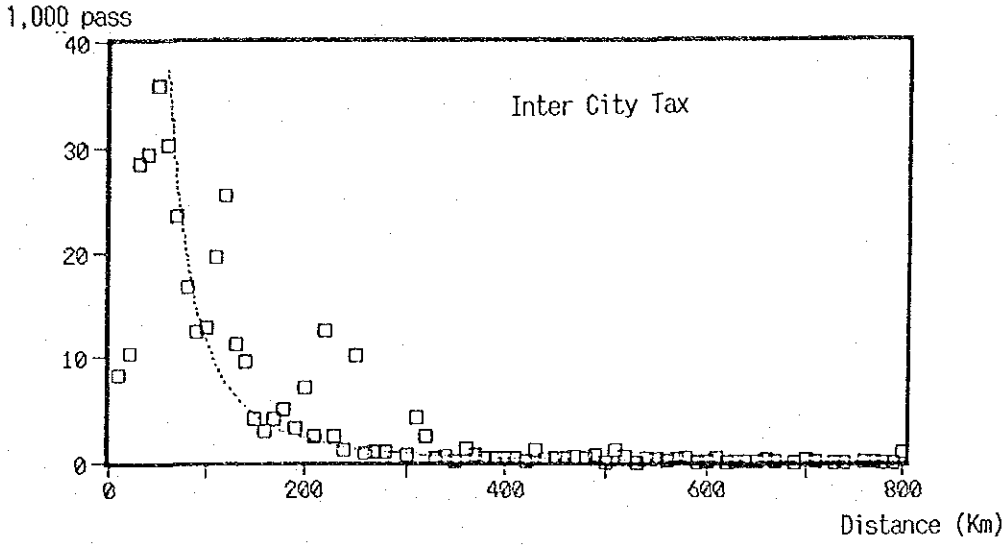


Fig. 8-1-11 Trip Length Distribution (2)
Inter City Taxi

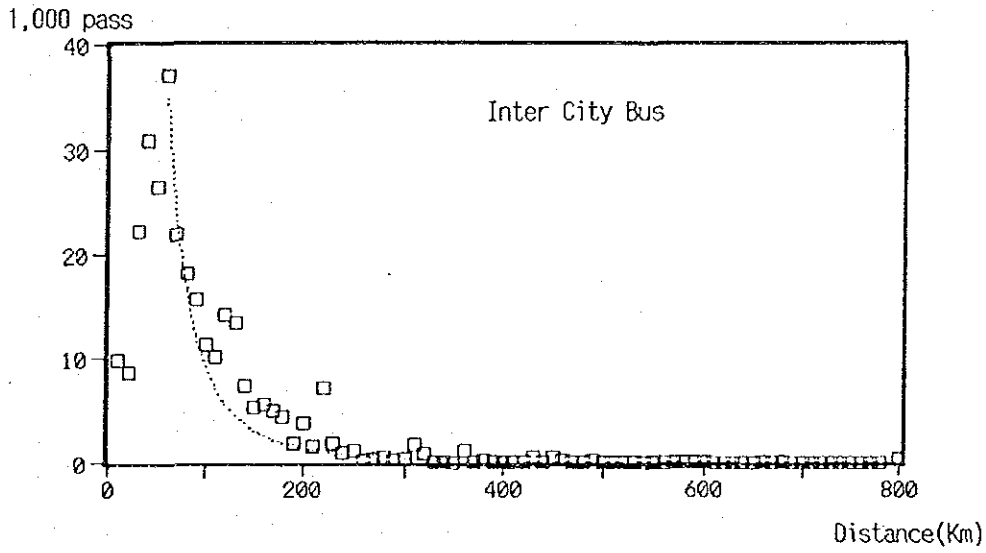


Fig. 8-1-12 Trip Length Distribution (3)
Inter City Bus

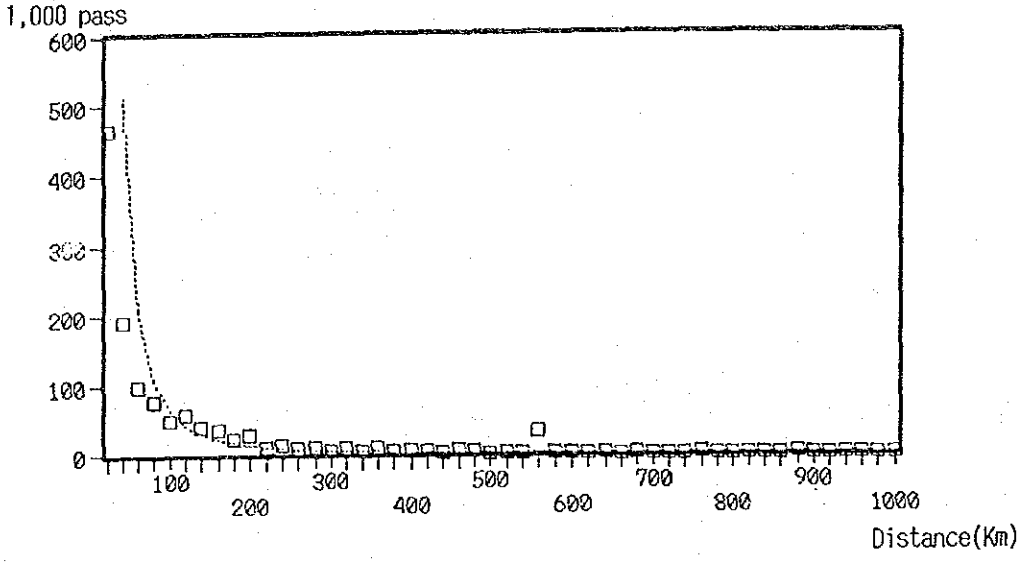


Fig. 8-1-13 Trip Length Distribution (4)
Rail Passenger

3) Present Mode Share by Distance

Fig. 8-1-14 shows the present mode share by trip distance. The mode share of passenger car and public modes, and rail and bus+taxi show the rather good relationship with the distance, however that of bus and taxi does not show the good relationship.

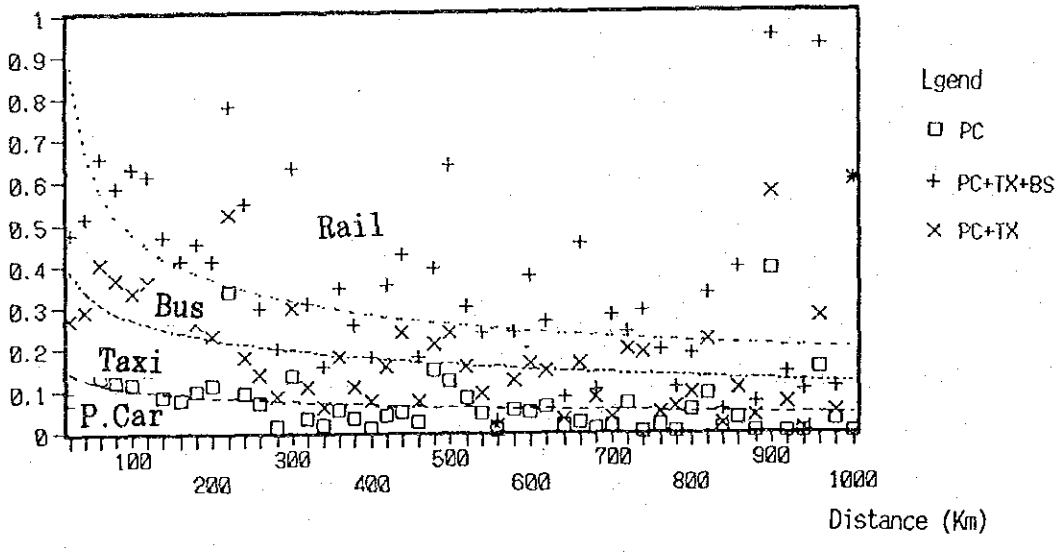


Fig. 8-1-14 Present Passenger Mode Share by Travel Distance

4) Present Passenger Flow Pattern

(1) Private Car Passenger

Fig. 8-1-15 shows the present private car passenger flow between 29 semi-governorate zones in a form of desire lines integrated from the 188 Markaz zone OD matrix. The highest flow is seen between Greater Cairo Metropolitan Area and Alexandria with about 20,000 pass./day. Many flows concentrate to Cairo as seen in passenger flows of other modes. No high flow is seen in Upper Egypt area, and almost all the high flows appear in Delta Area.

(2) Inter City Taxi Passenger

Fig. 8-1-16 shows the present inter city taxi passenger flow between 29 semi-governorate zones integrated from the 188 Markaz zone OD matrix. The high demands are seen between Greater Cairo Metropolitan Area - Minufia and Alexandria - North Beheira where Sadat City is located with about 30,000 pass./day. The inter city taxi passenger flow shows rather short distance comparing that of inter city buses, connecting neighboring zones especially in Upper Egypt area.

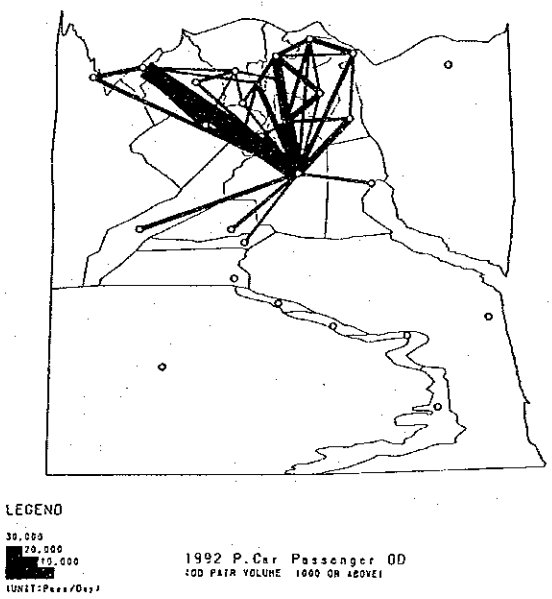


Fig. 8-1-15 1992 Private Car Passenger Flow

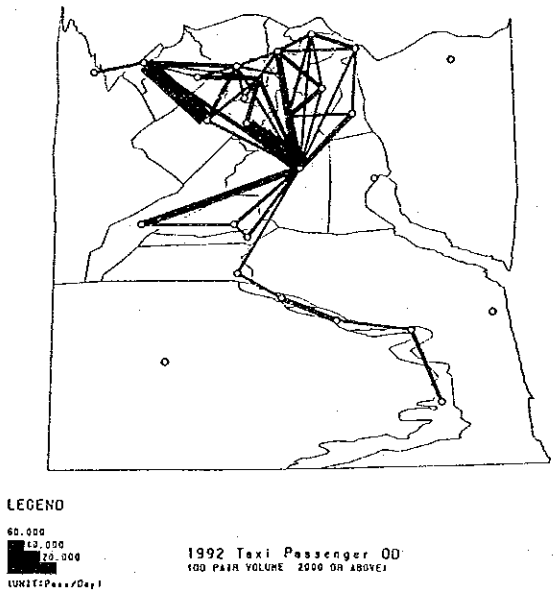


Fig. 8-1-16 1992 Inter City Taxi Passenger Flow

(3) Inter City Bus Passenger

Fig. 8-1-17 shows the present inter city bus passenger flow between 29 semi-governorate zones integrated from 188 Markaz zone OD matrix. The inter city bus passenger flow shows almost same pattern as inter city taxi passenger flow, however bus passenger flow is characterized by the longer trips than taxi trips in such OD pairs as Cairo - Sinai and Cairo - Matrouh. The trips are more concentrated in Cairo than taxi trips.

(4) Rail Passenger

Fig. 8-1-18 shows the present inter city rail passenger flow between 29 semi-governorate zones integrated from the 188 Markaz zone OD matrix. The highest flow is seen on the Cairo - Alexandria corridor (60,000 pass./day) and the flow between North Gharbia - South Gharbia (Tanta: 100,000 pass./day). Rail passenger flow shows rather long distance trip between Cairo and such zones in Upper Egypt as Qena (4,000 pass./day) and Asyut. The another characteristics of rail passenger flow is trips between zones in Upper Egypt.

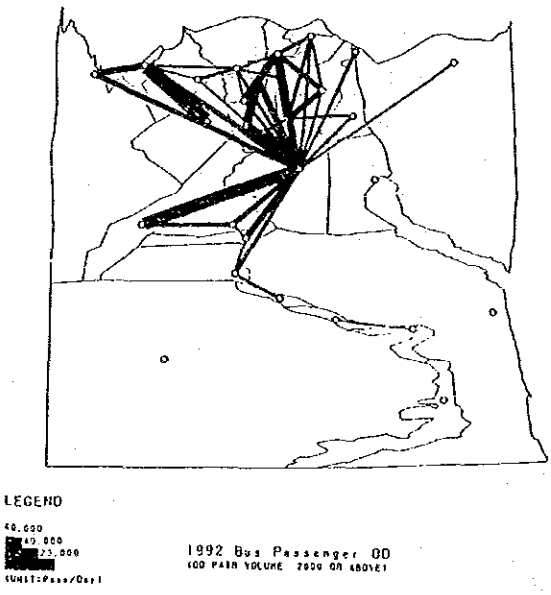


Fig. 8-1-17 1992 Inter City Bus Passenger Flow

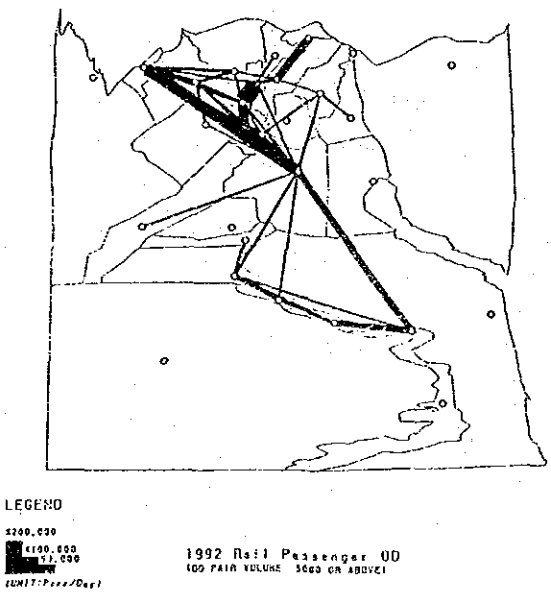


Fig. 8-1-18 1992 Rail Passenger Flow

8.2 Present Commodity Movement

8.2.1 Commodity Flow Characteristics by Road Side OD Survey

Table 8-2-1 shows the sample rate of interviewed trucks at the road side OD survey stations. The survey station codes and their locations are given in Appendix. Totally 29,398 trucks were interviewed the o-d of commodities, loading weight, and so on. The average sample rate of all the survey stations is 20.1%.

Table 8-2-1 Sample Rate of Trucks

St.	Count	Sample	Rate(%)	St.	Count	Sample	Rate(%)
1	2084	328	15.7	34	374	285	76.2
2	2205	808	36.6	35	83	39	47.0
3	3088	758	24.5	36	1553	180	11.6
4	2863	401	14.0	37	8250	1226	14.9
5	1910	290	15.2	38	1917	454	23.7
6	5155	1010	19.6	39	1358	799	58.8
7	2899	228	7.9	40	921	405	44.0
8	4079	628	15.4	41	483	167	34.6
9	1948	349	17.9	42	1577	413	26.2
10	10238	1790	17.5	43	1080	384	35.6
11	3444	540	15.7	50	1128	383	34.0
12	12152	3084	25.4	55	1033	366	35.4
13	1197	464	38.8	56	617	197	31.9
14	4208	1129	26.8	57	839	149	17.8
15	1003	319	31.8	58	5988	954	15.9
16	291	122	41.9	59	1089	259	23.8
18	751	357	47.5	60	362	65	18.0
19	1655	364	22.0	72	970	352	36.3
20	2783	99	3.6	73	329	238	72.3
21	2392	315	13.2	78	1394	486	34.9
22	10481	1428	13.6	102	296	151	51.0
23	2837	579	20.4	105	305	83	27.2
24	1179	130	11.0	209	998	375	37.6
25	463	161	34.8	210	2630	211	8.0
26	1942	632	32.5	211	205	32	15.6
27	3907	308	7.9	212	4284	502	11.7
28	1762	396	22.5	301	861	180	20.9
29	1937	547	28.2	302	1552	321	20.7
30	2410	390	16.2	303	4046	853	21.1
31	2639	280	10.6	304	2892	268	9.3
32	793	220	27.7				
33	378	167	44.2	Total	146487	29398	20.1

Table 8-2-2 shows the average loading weights by 30 commodity groups and by area. The average loading weight of cement and sugar exceed 20 tons, while that of fruits and vegetables, live stock and animal products are 2 - 3 tons. The percentage of empty vehicles after expansion is 36.2%. The

loading weights in Upper Egypt is heavier than Delta area.

Table 8-2-2 Average Loading Weight by Commodities

Commodities	Weight (ton)	Veh. (No.)	Av.Weight (ton/Veh.)		
			Av.	Delta	Upper
1 Crude Oil	0	0	0.00	0.00	0.00
2 Petroleum Products	7,077	515	13.74	11.58	14.07
3 Natural Gas	0	0	0.00	0.00	0.00
4 Cement	9,544	457	20.88	20.04	22.77
5 Other Const. Mats.	28,268	2,459	11.50	8.57	15.20
6 Phosphate	36	4	9.00	9.00	-
7 Iron Ore	0	0	0.00	0.00	0.00
8 Coal/Coke	152	24	6.33	4.27	21.50
9 Other Minerals	3,775	268	14.09	13.36	29.33
10 Wheat	4,928	329	14.98	14.54	20.69
11 Other Cereals	4,604	465	9.90	7.59	12.51
12 Fruits/Vegetables	10,430	3,600	2.90	2.24	4.92
13 Sugar Cane	605	69	8.77	7.99	17.54
14 Fiber Crops	326	101	3.23	3.00	5.54
15 Live Stock	1,126	541	2.08	1.87	2.64
16 Animal Products	2,060	777	2.65	2.41	7.22
17 Other Agric. Products	3,840	716	5.36	4.03	9.69
18 Sugar	2,038	100	20.38	11.98	31.34
19 Edible Oil/Fats	976	84	11.62	8.29	15.68
20 Animal Feed	3,728	575	6.48	5.10	13.80
21 Beverages	383	70	5.47	3.70	6.91
22 Other Food Products	3,535	759	4.66	3.84	5.28
23 Chemical Products	5,402	933	5.79	5.07	11.56
24 Metal/Metal Products	5,645	612	7.39	4.75	13.18
25 Textiles	1,565	502	3.12	2.79	5.80
26 Manufactured Fertilizer	2,780	272	10.22	8.77	22.22
27 Pulp/Paper	1,542	317	4.86	3.74	9.81
28 Lumber/Timber	1,950	429	4.55	3.34	5.38
29 Other Manuf. Goods	5,502	1,813	3.03	2.40	3.74
30 Mixed Commodities	9,222	1,969	4.68	3.87	5.99
Total	121,039	18,760	6.45		

The sample based truck freight by commodity classification is summarized in Table 8-2-3. Construction materials counts the highest share of 34.7% within the six commodity groups, followed by industrial products (30.1%). By 30 commodity items, other construction materials including sand and earth counts the highest share of almost 1/4 of all the commodities, followed by fruits and vegetables (8.9%).

The weight in this Table is the total of all the commodities at survey stations, and they are not same as that expressed in the present OD matrix in the later section, which is the commodity volume moving among Governorates.

Table 8-2-3 Commodity Share by Freight Vehicles

Products	ton	(%)	Products	ton	(%)
1 Crude Oil & Petro.	7,715	6.3	16 Animal Products	2,215	1.8
1 Crude Oil	0	0.0	17 Other Agric.Prod	4,077	3.3
2 Petroleum Prod.	7,672	6.3	5 Industrial Products	36,947	30.1
3 Natural Gas	0	0.0	18 Sugar	2,040	1.7
2 Construction Mat.	42,568	34.7	19 Edible Oil/Fats	982	0.8
4 Cement	10,011	8.2	20 Animal Feed	3,992	3.3
5 Other Const.Mat.	32,557	26.5	21 Beverages	400	0.3
3 Minerals	4,168	3.4	22 Other Food Prod.	3,599	2.9
6 Phosphate	36	0.0	23 Chemical Product	5,896	4.8
7 Iron Ore	0	0.0	24 Metal/Metal Prod	5,875	4.8
8 Coal/Coke	259	0.2	25 Textile	1,618	1.3
9 Other Minerals	3,873	3.2	26 Fertilizer	3,066	2.5
4 Agricultural Prod.	29,460	24.0	27 Pulp/Paper	1,655	1.3
10 Wheat	5,125	4.2	28 Lumber/Timber	2,027	1.7
11 Other Cereals	4,862	4.0	29 Other Manufact.P	5,797	4.7
12 Fruit/Vegetables	10,974	8.9	6 Mixed Commodities	1,821	1.5
13 Sugar Cane	661	0.5	30 Mixed Commoditie	1,821	1.5
14 Fiber Crops	343	0.3			
15 Live Stock	1,203	1.0	Total	122,679	100.0

Note:Sub total includes commodities
not specified.
Commodity Iron Ore may include scraps.

Table 8-2-4 shows the number of vehicles and the percentage of cargo handling types observed. The bulk cargo counts the highest share of 20.7%, and the cargo in container counts only 1.1%.

Table 8-2-4 Share of Cargo Handling Types by Freight Vehicles

Handling Type	Veh.	(%)
1 Bulk	6,821	20.7
2 Liquid	586	1.8
3 Chilled	243	0.7
4 Container	363	1.1
5 Packed	1,812	5.5
6 Bottled	441	1.3
7 Sacked	3,630	11.0
8 Boxes	1,144	3.5
9 Others	4,727	14.3
10 Empty	13,264	40.2
Total	33,031	100.0

8.2.2 ENR Commodity Flow

Table 8-2-5 shows the transported commodity volume by ENR in 1991. The total volume transported is 11 million in ton and 3,006 million in ton-Km including intra governorate freight. The average transported distance is 273 Km. According to the annual statistics 1991 of CAPMAS, the transported volume in terms of ton-Km for the 5 years period of 1984 - 1989 shows slight increase of 40 million ton-Km per year (see Fig. 8-2-1).

Among the transported commodities, iron ore occupies the highest share of 22.7% in terms of ton, followed by construction materials other than cement (14.1%), wheat (12.4%) and petroleum products (11.4%). The share of these four commodities reaches to 60% of the total.

Table 8-2-5 ENR Freight in 1991

Products	1,000 ton	(%)	Mill.t*Km	(%)
1 Crude Oil	0.0	0.0	0.0	0.0
2 Petroleum Products	1,250.4	11.4	364.3	12.1
3 Natural Gas	0.0	0.0	0.0	0.0
4 Cement	342.2	3.1	73.4	2.4
5 Other Const.Material	1,546.2	14.1	175.9	5.9
6 Phosphate	653.2	5.9	452.5	15.1
7 Iron Ore	2,502.0	22.7	875.7	29.1
8 Coal/Coke	830.7	7.6	208.0	6.9
9 Other Minerals	51.1	0.5	29.4	1.0
10 Wheat	1,364.0	12.4	306.4	10.2
11 Other Cereals	95.3	0.9	34.8	1.2
12 Fruit/Vegetables	0.2	0.0	0.0	0.0
13 Sugar Cane	283.9	2.6	14.4	0.5
14 Fiber Crops	0.0	0.0	0.0	0.0
15 Live Stock	0.0	0.0	0.0	0.0
16 Animal Products	5.0	0.0	1.6	0.1
17 Other Agric.Prod.	0.6	0.0	0.1	0.0
18 Sugar	516.0	4.7	266.2	8.9
19 Edible Oil/Fats	136.9	1.2	61.2	2.0
20 Animal Feed	0.7	0.0	0.4	0.0
21 Beverages	0.0	0.0	0.0	0.0
22 Other Food Prod.	12.3	0.1	4.9	0.2
23 Chemical Products	0.1	0.0	0.0	0.0
24 Metal/Metal Prod.	519.2	4.7	114.1	3.8
25 Textile	0.0	0.0	0.0	0.0
26 Fertilizer	300.0	2.7	127.3	4.2
27 Pulp/Paper	0.6	0.0	0.1	0.0
28 Lumber/Timber	17.4	0.2	2.3	0.1
29 Other Manufact.Prod.	573.8	5.2	165.1	5.5
30 Mixed Commodities	0.0	0.0	0.0	0.0
Total	11,001.8	100.0	3,006.2	100.0

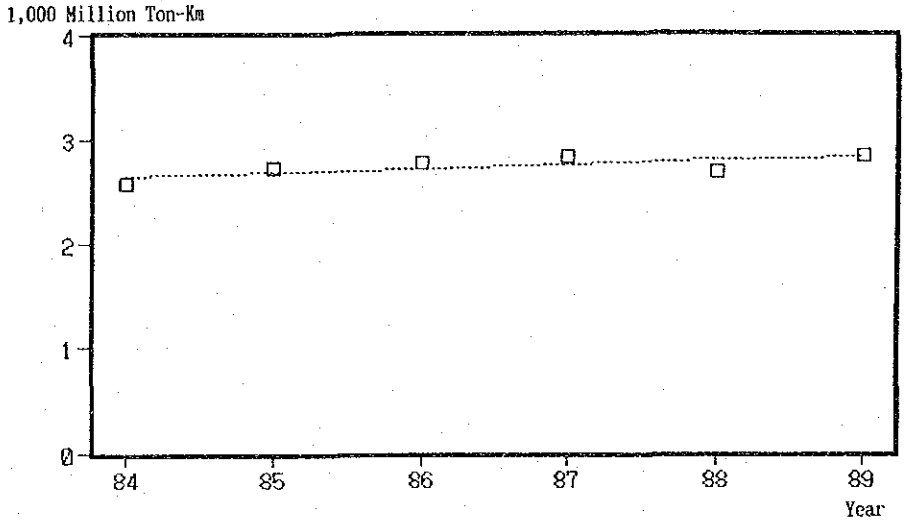


Fig. 8-2-1 Trend of ENR Freight

Fig. 8-2-2 shows the present total ENR commodity flow pattern assigned on the spider network based on 29 semi-governorate zone OD matrix developed from station OD information. Four major commodity flows of Cairo - Alexandria, Cairo - Giza, Cairo - Qena and Cairo - Damietta are seen. The flow from Giza - Cairo contains only the transport of Iron Ore (2.5 million ton). Out of 1.4 million ton of wheat transported by ENR, the flow of Damietta - Greater Cairo occupies the share of 0.86 million ton or 60%.

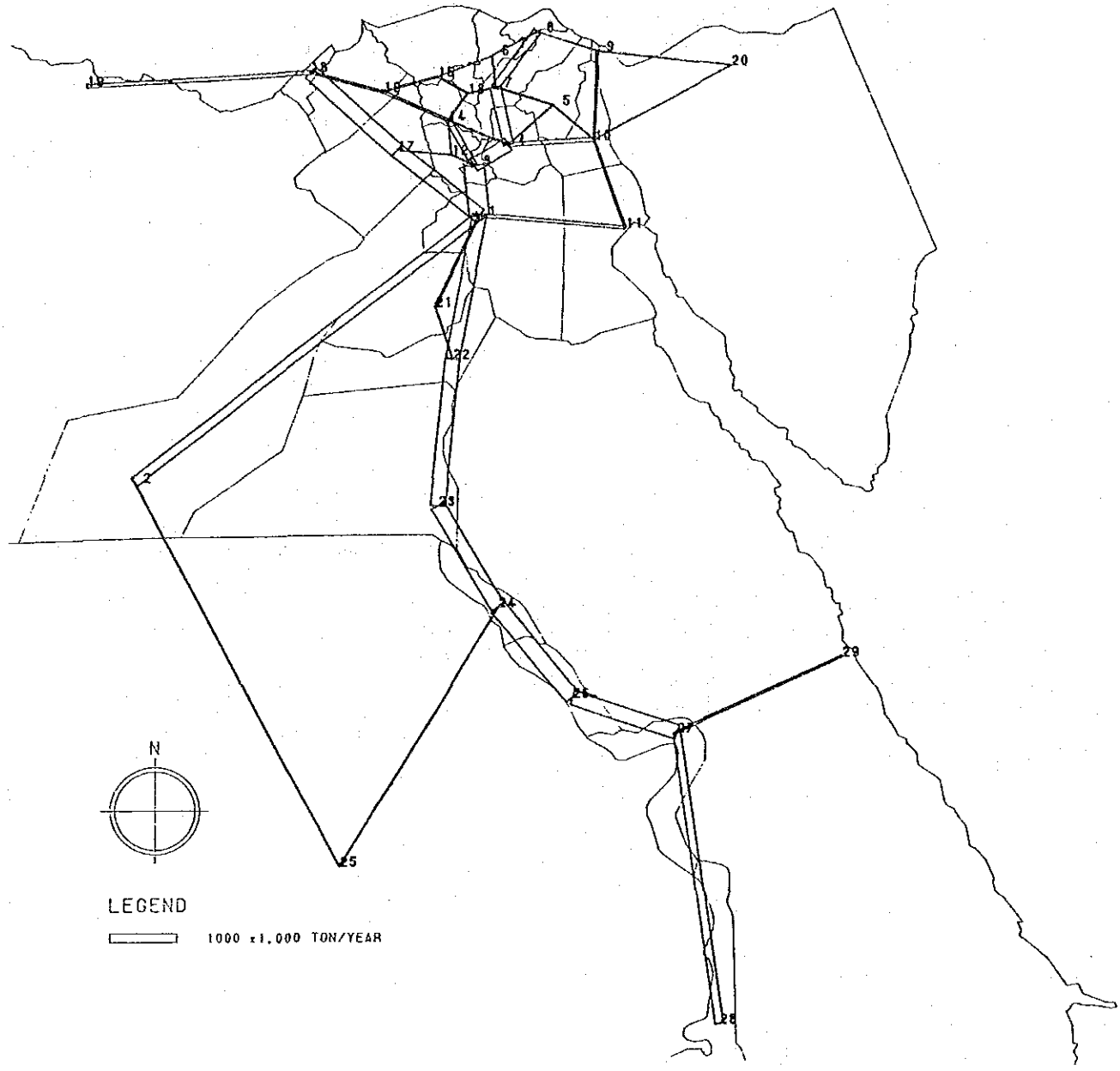


Fig. 8-2-2 Present ENR Commodity Flow Assigned on Spider Network

8.2.3 Commodity Flow by Inland Waterway

Table 8-2-6 shows the transported commodity volume by inland waterway in 1991. Out of the total 3.3 million ton of freight, cement which includes lime stone and clinker occupies 31.6% in terms of ton, followed by Coal and Coke (24.5%) and other minerals which includes clay and kaolin (13.2%). The total transported weight by inland waterway is about 30% of that by ENR and 40% in terms of ton - Km reflecting the longer transport distance in waterway.

The commodities transported by inland waterway are limited comparing those by highway or railway.

Table 8-2-6 Inland Waterway Freight 1991

Products	1,000 ton	(%)	Mill.t*Km	(%)
1 Crude Oil	0.0	0.0	0.0	0.0
2 Petroleum Products	430.7	13.1	105.6	8.6
3 Natural Gas	0.0	0.0	0.0	0.0
4 Cement	1,039.9	31.6	246.5	20.2
5 Other Const.Material	160.2	4.9	23.4	1.9
6 Phosphate	82.5	2.5	68.8	5.6
7 Iron Ore	0.0	0.0	0.0	0.0
8 Coal/Coke	804.6	24.5	206.5	16.9
9 Other Minerals	434.8	13.2	374.0	30.6
10 Wheat	0.0	0.0	0.0	0.0
11 Other Cereals	18.7	0.6	4.2	0.3
12 Fruit/Vegetables	0.0	0.0	0.0	0.0
13 Sugar Cane	0.0	0.0	0.0	0.0
14 Fiber Crops	0.0	0.0	0.0	0.0
15 Live Stock	0.0	0.0	0.0	0.0
16 Animal Products	0.0	0.0	0.0	0.0
17 Other Agric.Prod.	0.0	0.0	0.0	0.0
18 Sugar	252.7	7.7	154.8	12.7
19 Edible Oil/Fats	0.0	0.0	0.0	0.0
20 Animal Feed	0.0	0.0	0.0	0.0
21 Beverages	0.0	0.0	0.0	0.0
22 Other Food Prod.	0.0	0.0	0.0	0.0
23 Chemical Products	0.0	0.0	0.0	0.0
24 Metal/Metal Prod.	35.6	1.1	22.8	1.9
25 Textile	0.0	0.0	0.0	0.0
26 Fertilizer	7.6	0.2	3.3	0.3
27 Pulp/Paper	0.0	0.0	0.0	0.0
28 Lumber/Timber	0.0	0.0	0.0	0.0
29 Other Manufact.Prod.	2.1	0.1	1.7	0.1
30 Mixed Commodities	17.8	0.5	11.2	0.9
Total	3,287.4	100.0	1,222.7	100.0

Fig. 8-2-3 shows the schematic waterway commodity flow in the years 1989, 1990 and 1991. The major commodity between Asyut - Aswan is petroleum product from Asyut refinery

plant. The total commodity volumes shows the decreasing tendency especially at the sections between Cairo - Alexandria and Samalout - Asyut. The monthly fluctuation of transported commodity is given in Fig. 8-2-4.

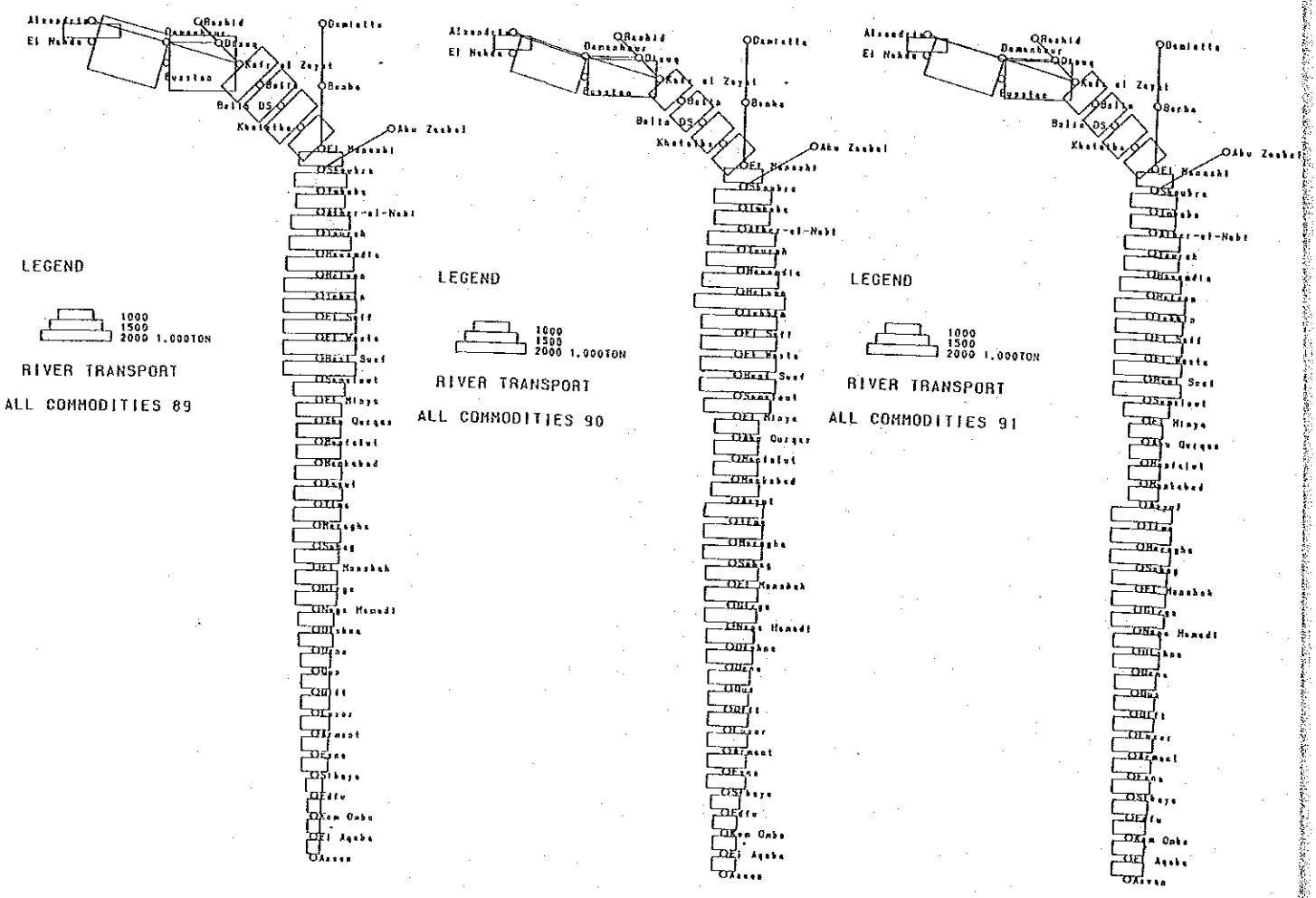


Fig. 8-2-3 Schematic Inland Waterway Commodity Flow

Fig. 8-2-5 shows the present total water way commodity flow pattern assigned on the spider network based on 29 semi-governorate zone OD matrix developed from river port OD information.

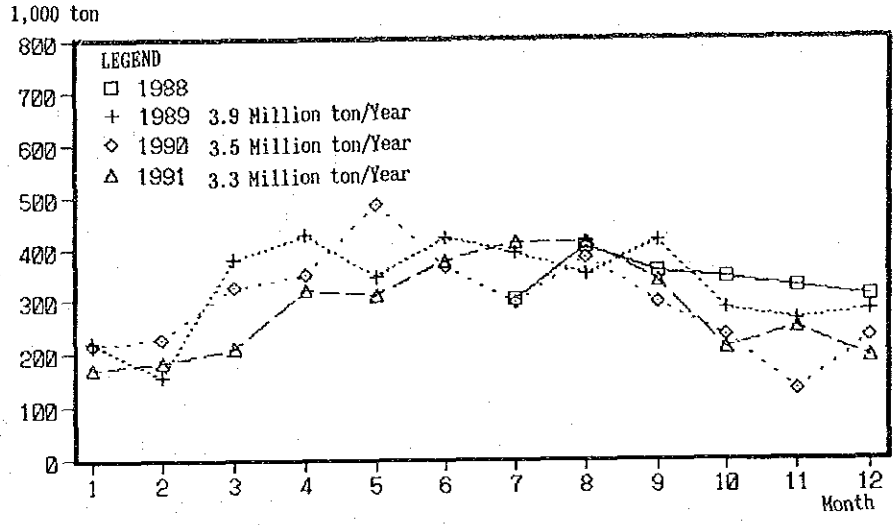


Fig. 8-2-4 Monthly Fluctuation of Inland Waterway Freight

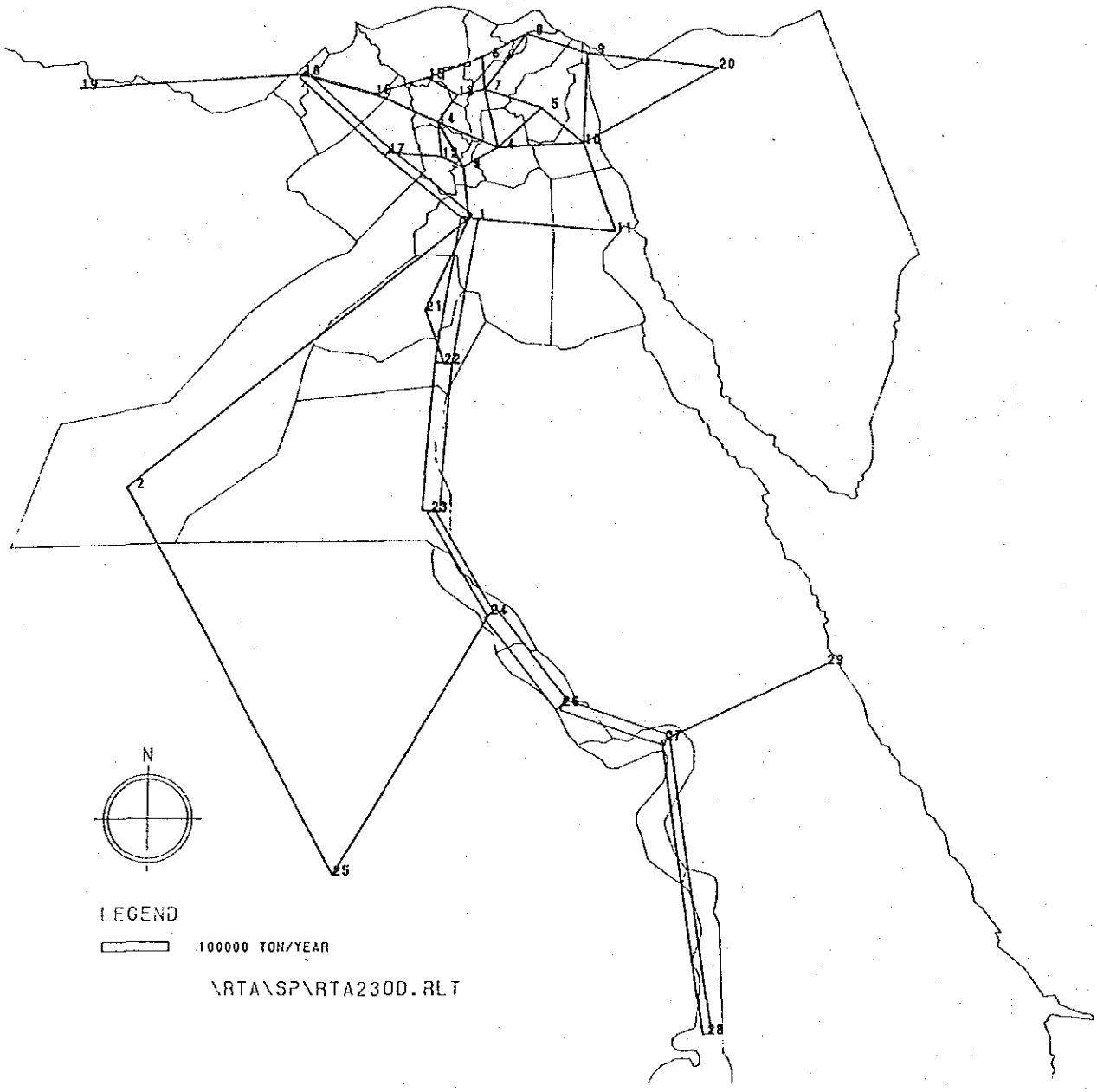


Fig. 8-2-5 Present Inland Waterway Commodity Flow Assigned on Spider Network

8.2.4 Present Commodity OD Matrix

Fig. 8-2-6 shows the process to estimate the present freight OD.

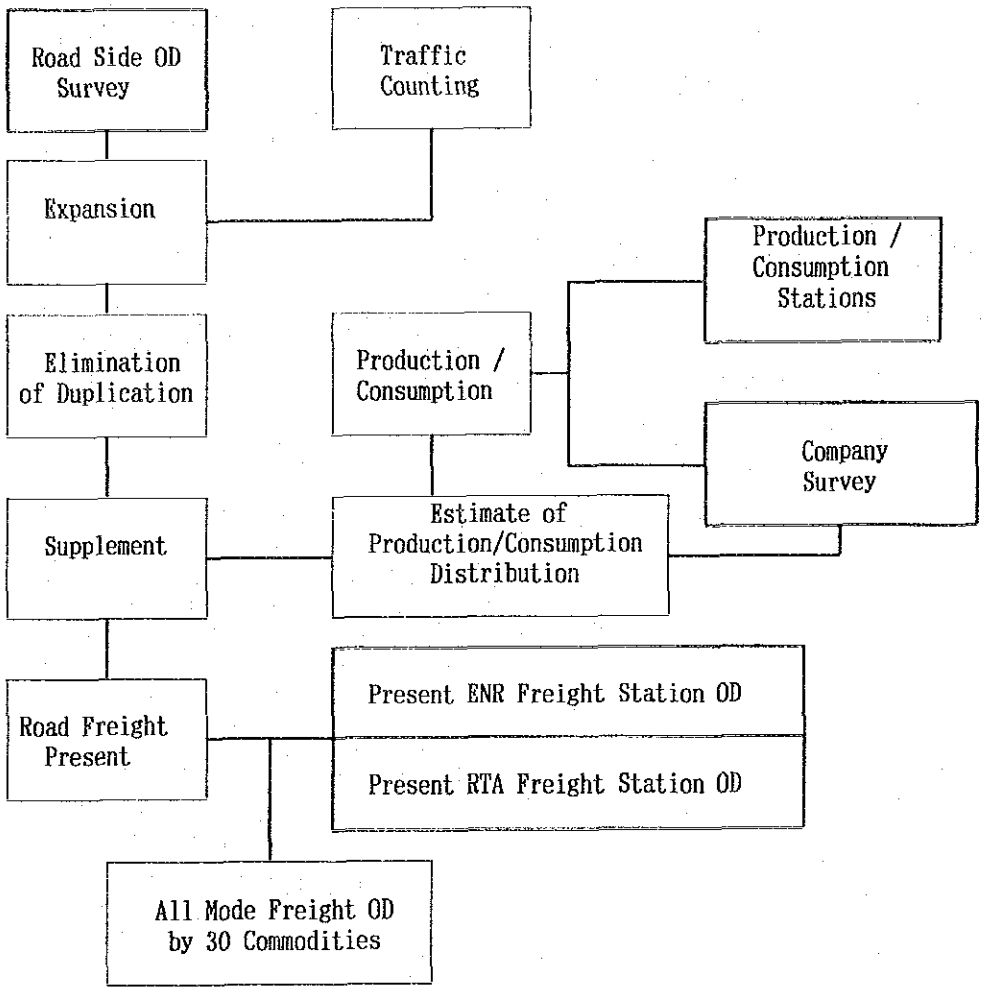


Fig. 8-2-6 Commodity OD Matrix Production Process

(1) Expansion

The expansion factors of 24/14 hours and the interviewed vehicles to the counted vehicles are processed as that in passengers. The average 24/14 hours factor is 1.515, and the sample rate of interviewed vehicles by survey station is shown in Table 8-2-1 in the section 8.2.1.

(2) Elimination of Duplication

The commodities were aggregated into 30 major commodity items, and duplicated counts of OD pair flows at cordon lines were eliminated on the basis of these 30 commodity items by the same processes as in the case of passenger.

(3) Supplement

The OD pair flows of commodities which could not be observed at the road side OD survey shall be estimated as in the case of passenger flow. The commodity flows obtained from company survey and various statistics was distributed to OD pairs applying gravity model based on the generation and attraction volumes and OD pair distances. The empty cells were filled by these OD pair volumes.

The resulted total commodity flow by 30 commodity items and by modes are shown in Table 8-2-7. The total volume excluding that by pipe lines is estimated at 178.4 million ton/year and the road transport volume occupies 93%. The transported cargo volume in ENTS-II in 1979 also excluding pipe lines was 76.6 million ton/year, which is 1/2.16 times the present. The most transported cargo item is construction materials other than cement, whose share is 25.0%, followed by cement, petroleum products and fruits and vegetables.

Table 8-2-7 Transported Commodity Volume, 1992 (1)

Unit:1,000 ton/year

Commodity	Observed				Inter Zone						
					Adjusted				Total	Net/	Share
	Net	HWY	RWY	WWY	Net	HWY	RWY	WWY	Gross	Grs	(%)
1 COIL	43952	0	0	0	23454	0	0	0	0	0.00	0.0
2 PETR	24488	11104	1251	431	11749	11104	1208	423	12736	0.92	7.1
3 NGAS	6110	0	0	0	4290	0	0	0	0	0.00	0.0
4 CMET	16369	25912	343	1040	9667	25843	341	1010	27194	0.36	15.2
5 CMAT	94501	44386	1546	160	50833	43662	737	160	44558	1.14	25.0
6 PHOS	947	69	653	82	676	69	649	82	801	0.84	0.4
7 IORE	3615	0	2502	0	2489	0	2502	0	2502	0.99	1.4
8 COAL	2649	209	831	805	1339	209	807	805	1821	0.74	1.0
9 MNRL	2359	5059	51	435	1636	4997	46	400	5443	0.30	3.1
10 WEAT	9705	6853	1364	19	5478	6551	1351	19	7921	0.69	4.4
11 CERE	22885	5599	95	0	9504	5358	93	0	5450	1.74	3.1
12 FRUT	15326	14413	0	0	6410	13965	0	0	13965	0.46	7.8
13 SCAN	11141	610	284	0	2255	609	8	0	617	3.66	0.3
14 FCRP	1449	491	0	0	800	466	0	0	466	1.72	0.3
15 LSTK	2167	1532	0	0	820	1462	0	0	1462	0.56	0.8
16 APRD	2118	2724	5	0	981	2613	5	0	2617	0.37	1.5
17 AGPR	1742	5414	1	0	1030	5291	1	0	5291	0.19	3.0
18 SGAR	1834	1568	516	253	1260	1540	511	253	2303	0.55	1.3
19 FATS	1220	1082	137	0	857	1049	128	0	1178	0.73	0.7
20 AFED	3294	6143	1	0	1789	5681	1	0	5682	0.31	3.2
21 BVRG	598	472	0	0	379	455	0	0	455	0.83	0.3
22 OFOD	2406	3600	13	0	1982	3563	11	0	3574	0.55	2.0
23 CHEM	32069	6459	0	0	20252	6239	0	0	6239	3.25	3.5
24 MTAL	4676	6587	519	36	2481	6587	463	36	7086	0.35	4.0
25 TXTL	2422	2104	0	0	1894	2097	0	0	2097	0.90	1.2
26 FTLZ	6249	3717	300	8	4623	3683	241	8	3932	1.18	2.2

Table 8-2-7 Transported Commodity Volume, 1992 (2)

Unit:1,000 ton/year

Commodity	Observed				Inter Zone						
	Net	HWY	RWY	WWY	Net	Adjusted HWY	RWY	WWY	Total Gross	Net/ Grs	Share (%)
27 PULP	663	1871	0	0	461	1870	0	0	1870	0.25	1.0
28 LUMB	1142	2347	17	0	1018	2249	13	0	2262	0.45	1.3
29 MANU	732	6633	573	2	560	6545	526	2	7073	0.08	4.0
30 MIXC	0	1738	0	18	0	1738	0	18	1756	0.00	1.0
Total	318827	168693	11001	3287	170966	165495	9642	3214	178350	0.96	100.0
Share						92.79	5.41	1.80	100.00		

Table 8-2-8 shows the present freight in terms of ton-Km estimated based on the distances between 29 semi-governorate zones. There are deference in the estimated ton-Km and the actual ton-Km in rail and waterway. The average hauling distance in railway show the longest of 368Km, and the transport share in terms of ton-Km in road transport decreases to 87.0% from that in terms of handling cargo volume. The hauling distance of phosphate (Commodity 6) have the longest of 641Km among the 30 commodities.

Table 8-2-8 Estimated Ton-Km by Commodity and by Mode(1)

COMMODITY	TON-KM(M.TON-KM)				AVERAGE DISTANCE(KM)			
	HWY	RWY	WWY	TOTAL	HWY	RWY	WWY	TOTAL
1 COIL	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2 PETR	2,063.6	360.6	95.4	2,519.6	185.8	298.4	225.6	197.8
3 NGAS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4 CMET	4,036.9	95.4	270.6	4,402.9	156.2	279.8	268.0	161.9
5 CMAT	7,679.1	118.3	13.1	7,810.5	175.9	160.6	81.8	175.3
6 PHOS	19.3	443.7	50.5	513.5	278.1	683.2	612.9	640.9
7 IORE	0.0	1,251.0	0.0	1,251.0	0.0	500.0	0.0	500.0
8 COAL	19.7	189.2	182.5	391.4	94.2	234.4	226.8	215.0
9 MNRL	1,885.6	29.9	342.1	2,257.6	377.4	652.8	855.7	414.8
10 WEAT	1,577.3	285.9	4.2	1,867.4	240.8	211.6	224.6	235.8
11 CERE	937.3	32.2	0.0	969.5	174.9	347.4	0.0	177.9
12 FRUT	2,904.5	0.0	0.0	2,904.5	208.0	0.0	0.0	208.0
13 SCAN	112.5	3.4	0.0	115.9	184.7	453.3	0.0	188.0
14 FCRP	87.4	0.0	0.0	87.4	187.5	0.0	0.0	187.5
15 LSTK	236.2	0.0	0.0	236.2	161.6	0.0	0.0	161.6
16 APRD	392.7	1.4	0.0	394.1	150.3	304.3	0.0	150.6
17 AGPR	943.4	0.1	0.0	943.5	178.3	166.7	0.0	178.3
18 SGAR	584.5	281.4	135.9	1,001.8	379.6	550.9	537.8	435.0
19 FATS	197.6	39.0	0.0	236.6	188.3	303.7	0.0	200.9
20 AFED	959.9	0.4	0.0	960.3	169.0	571.4	0.0	169.0
21 BVRG	82.9	0.0	0.0	82.9	182.1	0.0	0.0	182.1

Table 8-2-8 Estimated Ton-Km by Commodtity and by Mode(2)

COMMODITY	TON-KM(M.TON-KM) HWY	RWY	WWY	TOTAL	AVERAGE DISTANCE(KM) HWY	RWY	WWY	TOTAL
22 OFOD	680.0	5.1	0.0	685.1	190.9	472.2	0.0	191.7
23 CHEM	1,188.6	0.0	0.0	1,188.6	190.5	0.0	0.0	190.5
24 MTAL	1,216.9	113.1	17.7	1,347.7	184.7	244.2	495.8	190.2
25 TXTL	435.7	0.0	0.0	435.7	207.8	0.0	0.0	207.8
26 FTLZ	654.0	122.3	3.2	779.5	177.6	507.5	421.1	198.3
27 PULP	413.7	0.1	0.0	413.8	221.3	250.0	0.0	221.3
28 LUMB	350.9	1.9	0.0	352.8	156.0	146.2	0.0	155.9
29 MANU	1,328.7	176.9	1.9	1,507.5	203.0	336.1	904.8	213.1
30 MIXC	373.0	0.0	9.6	382.6	214.6	0.0	539.3	217.9
TOTAL	31,361.9	3,551.3	1,126.7	36,039.9	189.5	368.3	350.6	202.1
SHARE	87.0	9.9	3.1	100.0				

Table 8-2-9 shows the comparison of cargo transport demand in 1979 and 1992 in terms of both ton and ton-Km. The average growth of all the three modes in terms of ton is 2.16, however the total freight in waterway show the decreasing tendency. The average growth of the three modes in terms of ton-Km is 2.54, which is higher than that in ton.

Table 8-2-9 Comparison of Freight

ITEM	WEIGHT 1,000TON	%	TON-KM Mill.T-Km	%	Ave.Dist. (Km)
1979					
ROAD	73,300	88.7	10,800	76.1	147
RAIL	5,000	6.1	1,800	12.7	360
WATERWAY	4,300	5.2	1,600	11.3	377
TOTAL	82,600	100.0	14,200	100.0	172
1992					
ROAD	165,495	92.8	31,362	87.0	190
RAIL	9,642	5.4	3,551	9.9	368
WATERWAY	3,214	1.8	1,127	3.1	351
TOTAL	178,351	100.0	36,040	100.0	202
92/79					
ROAD	2.26		2.90		1.29
RAIL	1.93		1.97		1.02
WATERWAY	0.75		0.70		0.93
TOTAL	2.16		2.54		1.17

8.2.5 Characteristics of Present Freight

1) Generation and Attraction by Zone

Table 8-2-10 shows the present cargo generation and attraction volume of all the commodities by 29 zones. Cairo Metropolitan Area (Zone 1) shows the higher concentration of freight than the generation volume. The three zones of Cairo Metropolitan Area, Suez and Alexandria show the high generation of freight, while the five zones of Cairo Metropolitan Area, Alexandria, North Beheira, South Sharkia and East Dakhalia show the high concentration of freight.

Table 8-2-10 Freight Generation and Attraction by Zone

ZONE	GENERATION(1,000TON/Y)				ATTRACTION(1,000TON/Y)			
	HWY	RWY	WWY	TOTAL	HWY	RWY	WWY	TOTAL
1 CAI	28,590	1,714	2,300	32,604	32,590	5,118	167	37,874
2 GIZ	5,718	2,515	1	8,234	6,626	128	0	6,754
3 QAL	5,786	3	1	5,791	5,796	25	0	5,821
4 SKS	7,013	0	0	7,014	10,813	39	0	10,852
5 SKN	2,131	8	0	2,139	1,971	106	0	2,077
6 DKE	4,886	0	0	4,886	8,042	22	0	8,064
7 DKW	1,658	66	0	1,724	1,613	383	0	1,996
8 DAM	4,191	863	0	5,054	4,821	11	0	4,831
9 PTS	3,081	142	0	3,223	4,176	73	0	4,249
10 ISM	3,881	49	0	3,929	3,307	268	0	3,575
11 SUZ	19,269	468	0	19,737	3,515	79	0	3,594
12 MIF	4,700	3	0	4,703	9,978	48	0	10,026
13 GHS	10,212	0	0	10,213	9,725	16	0	9,741
14 GHN	1,998	137	0	2,135	3,286	468	0	3,754
15 KAF	4,474	1	2	4,477	4,097	71	0	4,168
16 BHS	6,346	125	29	6,500	3,175	29	160	3,363
17 BHN	6,150	7	29	6,186	10,998	22	0	11,019
18 ALX	22,313	1,375	227	23,914	16,235	401	875	17,511
19 WDS	8,657	159	0	8,815	1,929	255	0	2,184
20 SIN	1,300	0	0	1,300	1,686	0	0	1,686
21 FAY	1,675	2	0	1,677	2,762	224	0	2,986
22 BES	1,979	12	2	1,993	2,498	42	0	2,540
23 MYA	2,367	150	1	2,518	2,910	310	908	4,127
24 ASY	1,418	546	46	2,011	3,375	409	415	4,198
25 NEW	14	0	4	17	177	0	0	177
26 SOH	1,146	81	267	1,494	3,101	400	128	3,629
27 QEN	1,952	359	183	2,494	3,213	442	178	3,833
28 ASW	894	691	121	1,706	1,104	202	384	1,689
29 RED	1,697	168	0	1,865	1,978	53	0	2,031
TOTAL	165,495	9,642	3,214	178,350	165,495	9,642	3,214	178,350

By mode, Cairo, Giza, Alexandria and Aswan show the high rail cargo generation and Cairo, Alexandria Sohag, Qena and Aswan show the high waterway cargo generation.

2) Modal Share by Commodity

The road transport freight occupies 93% of the total in terms of ton of all the inter semi-governorate freight, and that of rail and waterway is 7%, however mode shares by commodity in Fig. 8-2-7 show that 100.0% of iron ore, 81.0% of phosphate, 44.3% of Cole/coke and 22.2% of refined sugar are transported by rail, and 44.2% of Cole/coke, 7.3% of other minerals which consists of mainly kaolin and clay, 10.0% of refined sugar and 10.2% of phosphate are transported by waterway.

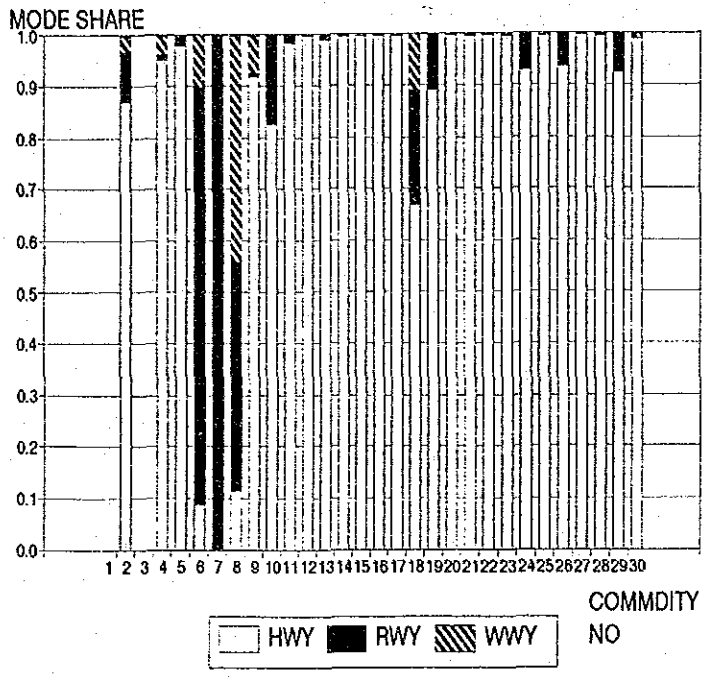


Fig. 8-2-7 Freight Mode Share by Commodity Group

3) Present Commodity Flow Pattern

(1) Petroleum Products

Fig. 8-2-8 shows the present petroleum products flow between 29 semi-governorate zones. The total freight of petroleum products was estimated at 12.8 Mill.ton/Year, of which 0.8 mill.ton/Year is transported Qaliubia to Minya. The concentration is seen at North Gahrbia zone where one of the refinery plants is located. From Sinai to Suez, 0.5 million ton is transported. 87.2% of petroleum products is transported by lorries, 9.5% by rail and 3.3% by waterway.

(2) Cement

Fig. 8-2-9 shows the present cement flow between 29 semi-governorate zones. The total freight of cement including lime stone and clinker was estimated at 27.2 mill.ton/Year, of which 13 mill.ton is transported between Cairo and Suez. Another flow from Cairo to Minufia is seen. 95.0% of cement is transported by highway, 1.3% by rail and 3.7% by waterway.

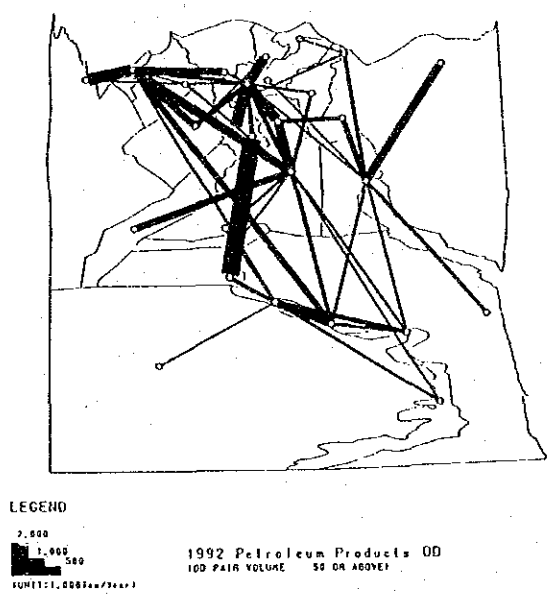


Fig. 8-2-8 1992 Petroleum Products Flow

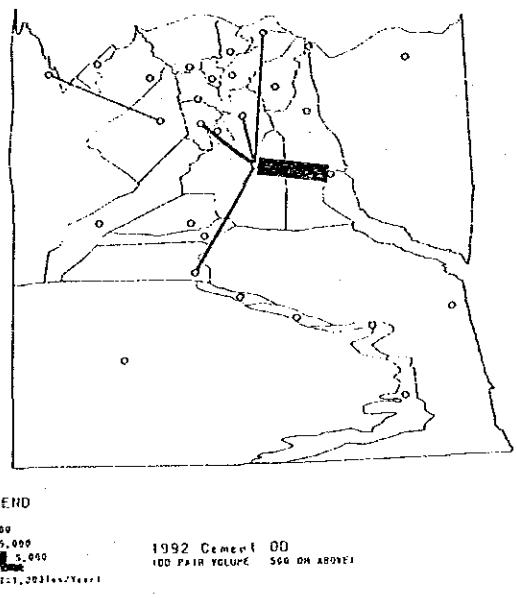


Fig. 8-2-9 1992 Cement Flow

(3) Other Construction Materials

Fig. 8-2-10 shows the present construction materials other than cement flow between 29 semi-governorate zones. The total freight of construction materials other than commodities included in cement such as sand, earth, gravel, brick, block and prefabricated products was estimated at 44.6 mill.ton/year, of which 3.2 million ton is transported from Western Desert to Alexandria, and another 2.3 million ton from South Beheira to Alexandria. 98.0% of other construction materials is transported by highway, 1.6% by rail and 0.4% by waterway.

(4) Phosphate

Fig. 8-2-11 shows the present phosphate ore flow between 29 semi-governorate zones. The total freight of phosphate ore was estimated at 0.8 mill.ton/year and its flow shows one of the simplest patterns among commodity groups. Most of them are transported from Aswan to Asyut and South Gahrbia zones, and Qena to Cairo zones. Despite of the policy of Egyptian Government to transport phosphate ore by mass transport modes, 8.7% of phosphate ore is transported by highway, 81.0% by rail and 10.3% by waterway.

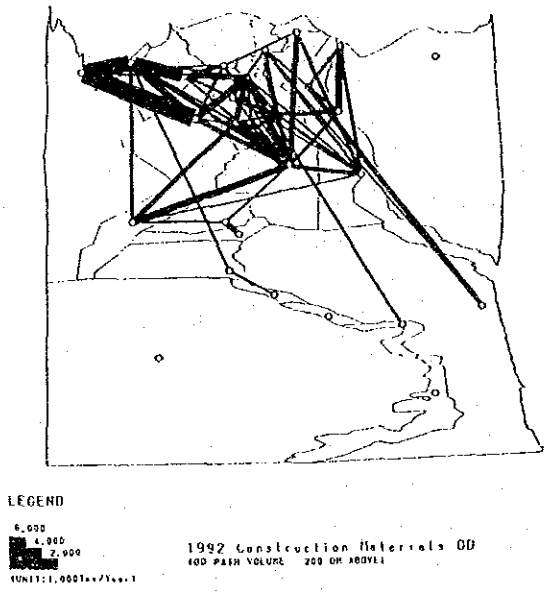


Fig. 8-2-10 1992 Other Construction Materials Flow

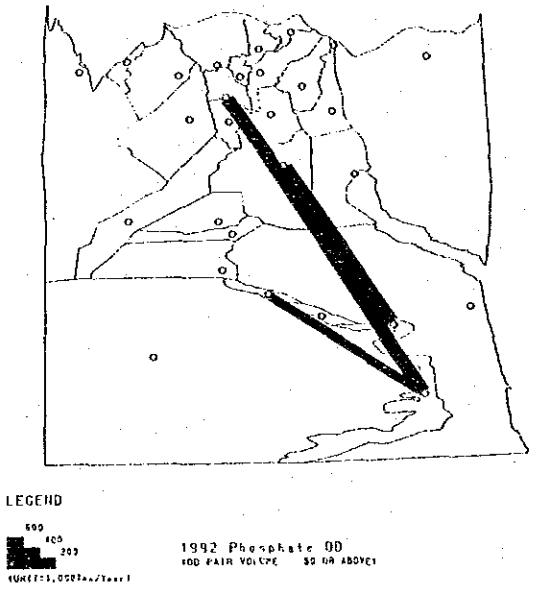


Fig. 8-2-11 1992 Phosphate Flow

(5) Iron Ore

Fig. 8-2-12 shows the present iron ore flow between 29 semi-governorate zones. Iron ore is produced mostly in Bahareia Oasis in Giza zone and is transported to steel factories in Helwan, at southern part of Cairo by rail. The total inter zone freight was estimated at 2.5 mill.ton/year. All of inter zone movement is counted by rail.

(6) Coal and Coke

Fig. 8-2-13 shows the present coal and coke flow between 29 semi-governorate zones. The total freight of coal and coke was estimated at 1.8 mill.ton/year. Almost all (1.6 mill. ton/year) are transported from Alexandria to Cairo zones including imported coal and processed coke. 10.5% is transported by highway, 44.3% by rail and 44.2% by waterway.

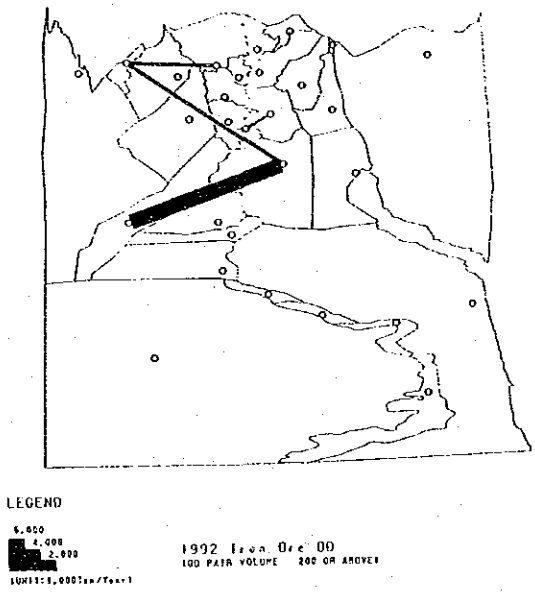


Fig. 8-2-12 1992 Iron Ore Flow

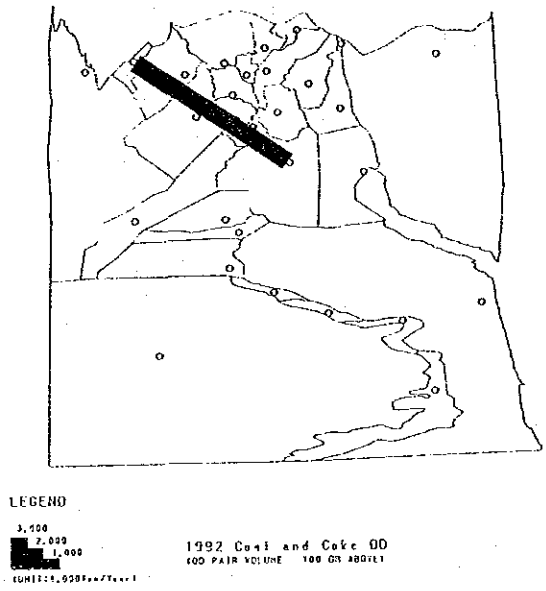


Fig. 8-2-13 1992 Coal and Coke Flow

(7) Other Minerals

Fig. 8-2-14 shows the present other minerals flow between 29 semi-governorate zones. The total freight of minerals other than iron ore, phosphate, and lime stones was estimated at 5.5 mill/ton/year. Salt, kaolin and clay for brick and pottery are included in this commodity item. The main flow is between Alexandria and Red Sea (0.8 mill.ton/year), however another 0.8 mill.ton/year of freight is seen between Qualiubia and South Sharkia zones. 91.8% is transported by highway, 0.8% by rail and 7.4% by waterway.

(8) Wheat

Fig. 8-2-15 shows the present wheat and flour flow between 29 semi-governorate zones. The total freight of wheat including flours was estimated at 7.9 mill.ton/year, of which 1.0 mill.ton/year is transported from Damietta Port to Cairo, and 0.8 mill.ton/year from Alexandria. The import flow from Suez and Safaga ports are seen in the figure. 82.7% is transported by highway, 17.1% by rail and 0.2% by waterway.

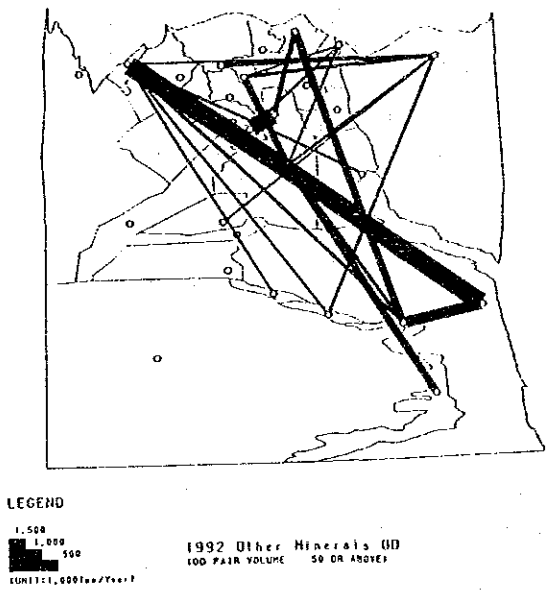


Fig. 8-2-14 1992 Other Minerals Flow

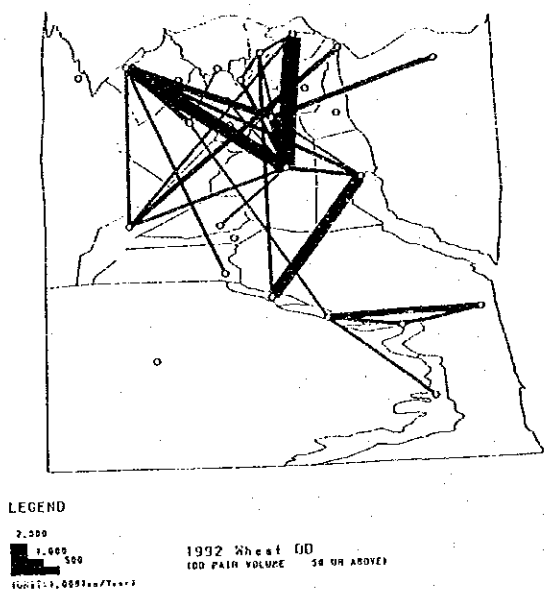


Fig. 8-2-15 1992 Wheat Flow

(9) Other Cereals

Fig. 8-2-16 shows the present other cereals flow between 29 semi-governorate zones. The total freight of cereals other than wheat consisting of sorghum, maize, raise, beans, etc. was estimated at 5.5 mill.ton/year, of which 0.6 mill.ton is transported from Alexandria to South Sharkia. The import flows from Alexandria occupies almost half of the total flow. 98.3% of other cereals is transported by highway and 1.7% by rail. Inland waterway does not participate in this commodity.

(10) Fruits and Vegetables

Fig. 8-2-17 shows the present fruits and vegetables flow between 29 semi-governorate zones. The total freight of fruits and vegetables was estimated at 14.0 mill.ton/year, of which 0.5 mill.ton is transported from Giza and Minya to Cairo and 0.8 mill.ton from Minufia to Cairo. Most of flows concentrate to such big cities as Cairo and Alexandria. The share of rail counts at less than 0.1% and almost all the fruits and vegetables are transported by highway.

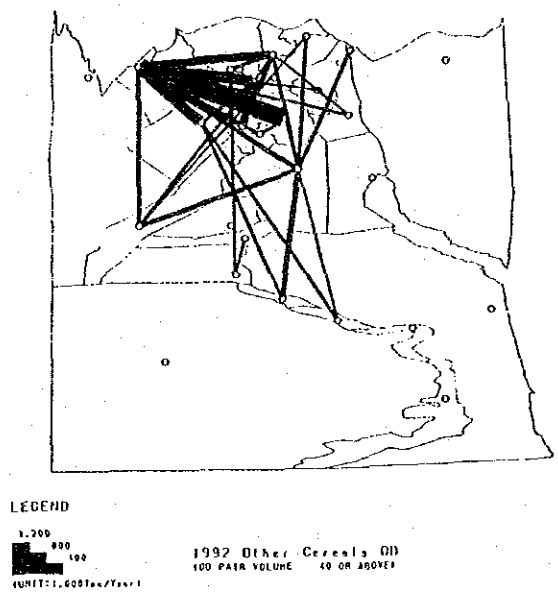


Fig. 8-2-16 1992 Other Cereals Flow

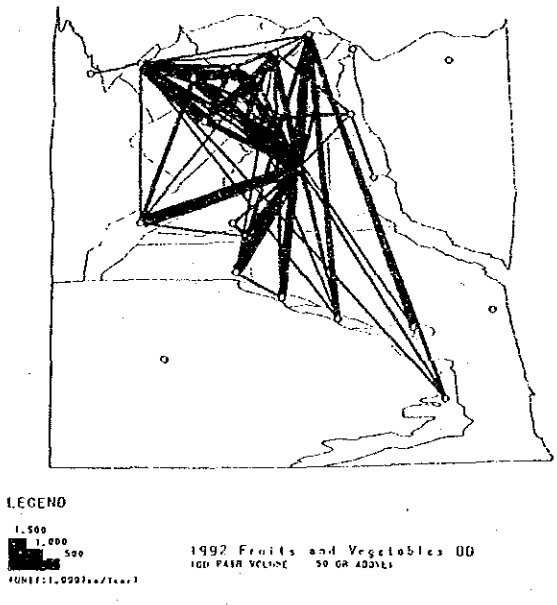


Fig. 8-2-17 1992 Fruits and Vegetables Flow

(11) Sugar Cane

Fig. 8-2-18 shows the present sugar cane flow between 29 semi-governorate zones. The total inter zone freight of Sugar Cane was estimated at 0.6 mill.ton/year, of which 0.07 mill.ton is transported from Sohag to Cairo and 0.8 million ton each between Alexandria - South Beheira and Alexandria - Cairo. Most of the sugar cane transported by rail (0.3 mill. ton/year) is processed at near by factories and it was counted as the intra zone movement. Therefore 98.8% of inter zone freight is transported by highway and the rest (1.2%) by rail.

(12) Fiber Crops

Fig. 8-2-19 shows the present fiber crops flow between 29 semi-governorate zones. The total freight of fiber crops mainly consisting of cotton was estimated at 0.5 mill. ton/year, of which 0.05 mill.ton is transported from Alexandria to South Sharkia and 0.04 mill.ton to South Gharbia. 42% of total freight concentrates to Alexandria zones. All the fiber crops are transported by highway.

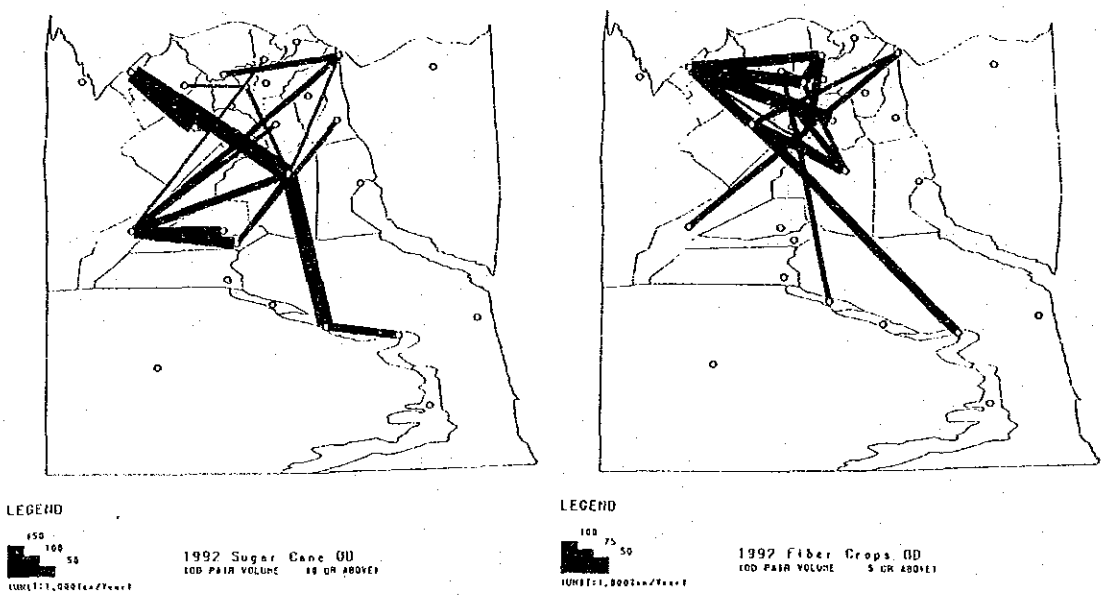


Fig. 8-2-18 1992 Sugar Cane Flow

Fig. 8-2-19 1992 Fiber Crops Flow

(13) Live Stocks

Fig. 8-2-20 shows the present live stocks flow between 29 semi-governorate zones. The total freight of live stocks was estimated at 1.5 mill.ton/year, of which 0.17 mill.ton is transported between East Dakhalia and Cairo zones and 0.09 mill.ton from Cairo to Giza. 42% of total freight concentrates to Cairo. All the live stocks are transported by highway.

(14) Animal Products

Fig. 8-2-21 shows the present animal products flow between 29 semi-governorate zones. The total freight of animal products was estimated at 2.6 mill.ton/year, of which 0.22 mill. ton is transported between North Beheira - Alexandria and 0.18 mill.ton to East Dakalia zones. 99.8% of animal products is transported by highway and the rest (0.2%) by rail.

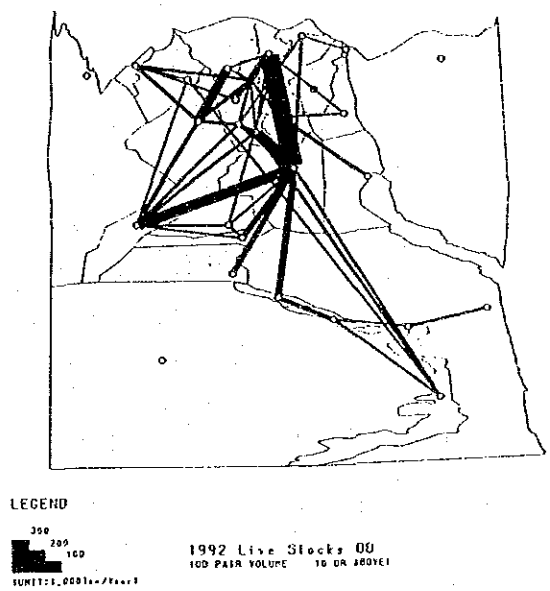


Fig. 8-2-20 1992 Live Stocks Flow

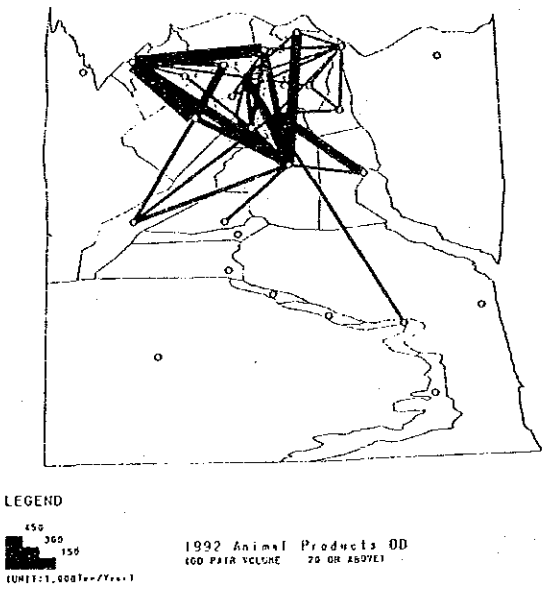


Fig. 8-2-21 1992 Animal Products Flow

(15) Other Agricultural Products

Fig. 8-2-22 shows the present other agricultural products flow between 29 semi-governorate zones. The total agricultural products other than commodities specified above was estimated at 5.3 mill.ton/year, of which 0.58 mill.ton is transported between Alexandria and Cairo, and 0.56 mill.ton between West Dakhalia and Alexandria. Many flows concentrate to such big cities as Cairo (36.5%) and Alexandria (50.2%). The share of rail counts at less than 0.1%, and almost all the freight is transported by highway.

(16) Refined Sugar and Molasses

Fig. 8-2-23 shows the present refined sugar and molasses flow between 29 semi-governorate zones. The total freight of refined sugar and molasses was estimated at 2.3 mill. ton/year. The figure shows the two main flows in Upper Egypt of Aswan - Cairo and Qena - Cairo, each contains about 0.22 and 0.25 mill.ton. 66.8% of refined sugar and molasses is transported by highway, 22.2% by rail and 11.0% by waterway.

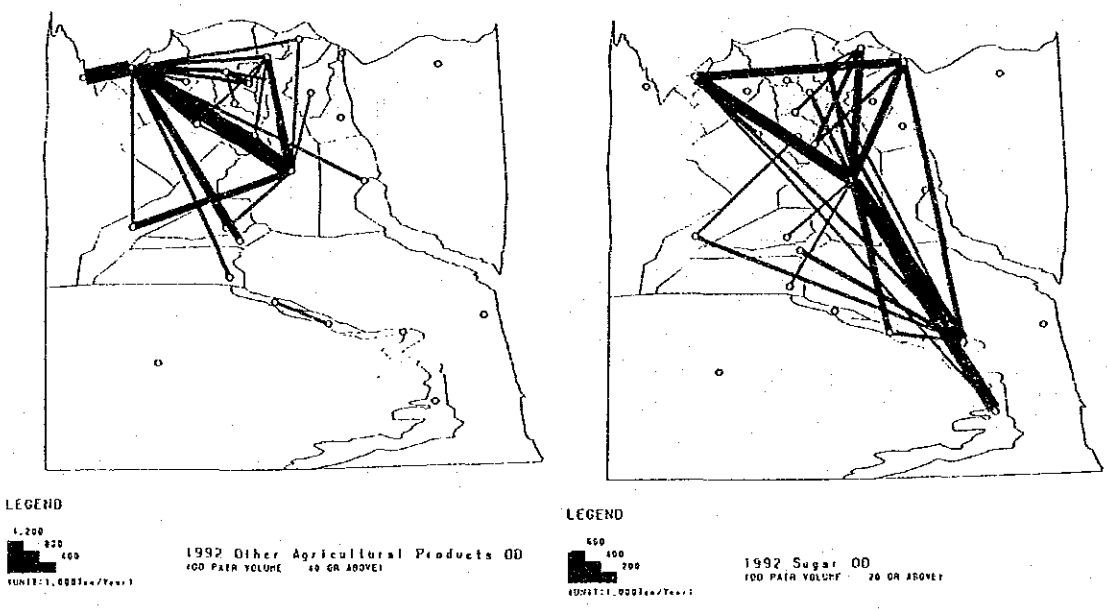


Fig. 8-2-22 1992 Other Agricultural Products Flow

Fig. 8-2-23 1992 Sugar Flow

(17) Edible Oil and Fats

Fig. 8-2-24 shows the present edible oil and fats flow between 29 semi-governorate zones. The total freight of edible oil and fats was estimated at 1.21 mill.ton/year, of which 0.18 mill.ton is transported from Alexandria to Qaliubia and 0.15 mill.ton between South Gharibia and North sharkia zones. More than half amount generates from Alexandria (60.5%). 89.1% of edible oil and fats is transported by highway and the rest (10.9%) by rail.

(18) Animal Feeds

Fig. 8-2-25 shows the present animal feeds flow between 29 semi-governorate zones. The total freight of animal feeds was estimated at 5.7 mill.ton/year, of which 0.41 mill.ton is transported between Qaliubia and South sharkia zones, each 0.26 mill.ton between North Beheira and Sohag, and Alexandria and North Beheira zones. The share of rail counts at less than 0.1% and almost all the animal feeds are transported by highway.

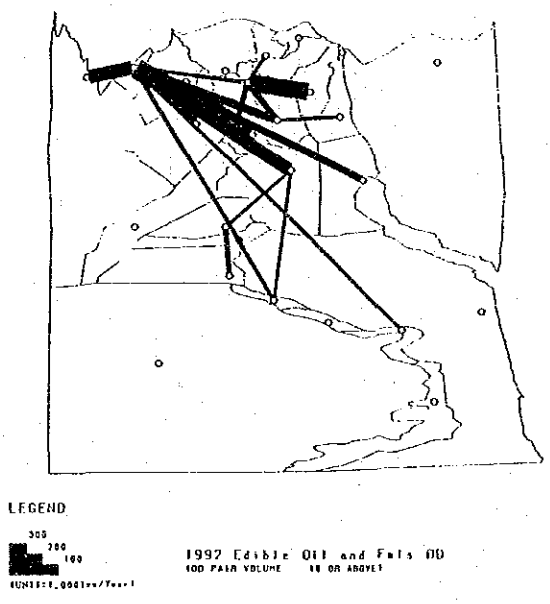


Fig. 8-2-24 1992 Edible Oil and Fats Flow

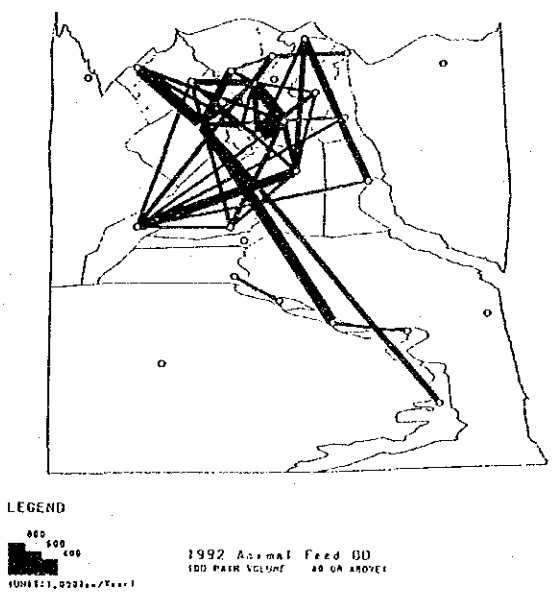


Fig. 8-2-25 1992 Animal Feed Flow

(19) Beverages

Fig. 8-2-26 shows the present beverages flow between 29 semi-governorate zones. The total freight of beverages was estimated at 0.5 mill.ton/year, of which 0.16 mill.ton is transported between Cairo and Damietta zones. All the beverages are transported by highway.

(20) Other Food Products

Fig. 8-2-27 shows the present other food products flow between 29 semi-governorate zones. The total freight of food products other than food products specified above was estimated at 3.6 mill.ton/year, of which 0.25 mill.ton is transported between Cairo and Alexandria zones, and 0.22 mill.ton between Cairo and Port Said. 99.7% of other food products is transported by highway and the rest (0.3%) by rail.

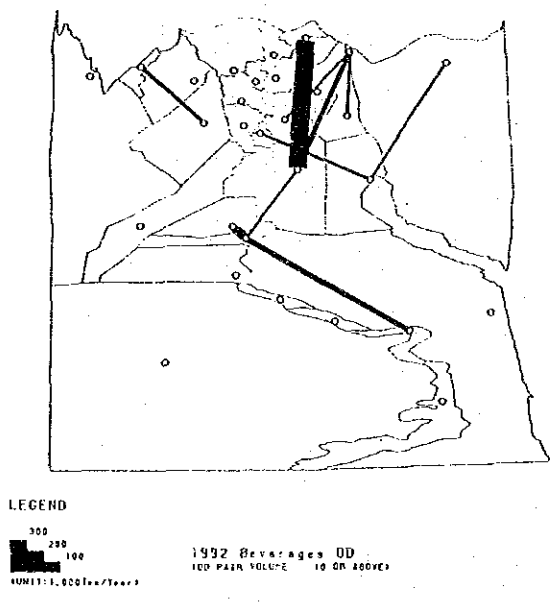


Fig. 8-2-26 1992 Beverage Flow

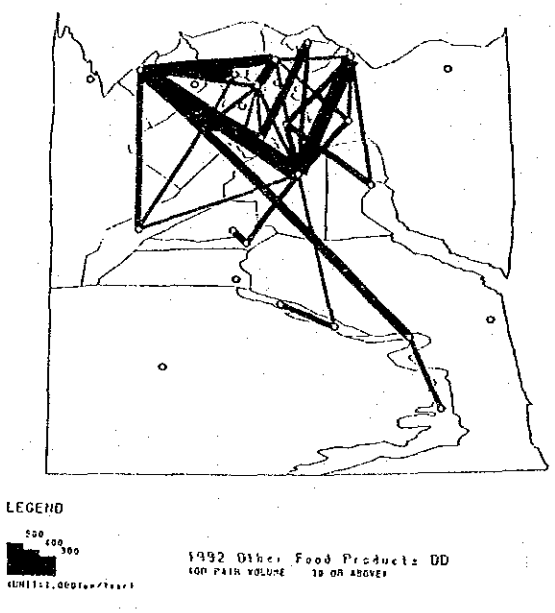


Fig. 8-2-27 1992 Other Food Products Flow

(21) Chemical Products

Fig. 8-2-28 shows the present chemical products flow between 29 semi-governorate zones. The total freight of chemical products consisting soaps for various purposes, alcohol, perfumes, etc. was estimated at 6.3 mill.ton/year, of which 0.5 mill.ton is transported between Cairo and Alexandria zones. The high generation from Alexandria zone (41.4%) is observed. All the chemical products is transported by highway.

(22) Metal and Metal Products

Fig. 8-2-29 shows the present metal and metal products flow between 29 semi-governorate zones. The total freight of metal and metal products was estimated at 7.1 mill.ton/year, of which 0.9 mill.ton is transported between Cairo and Giza zones, and 1.06 mill.ton between Cairo and Alexandria. The high concentration to Cairo (52.1%) is observed. 93.0% of metal and metal products is transported by highway, 6.5% by rail and 0.5% by waterway.

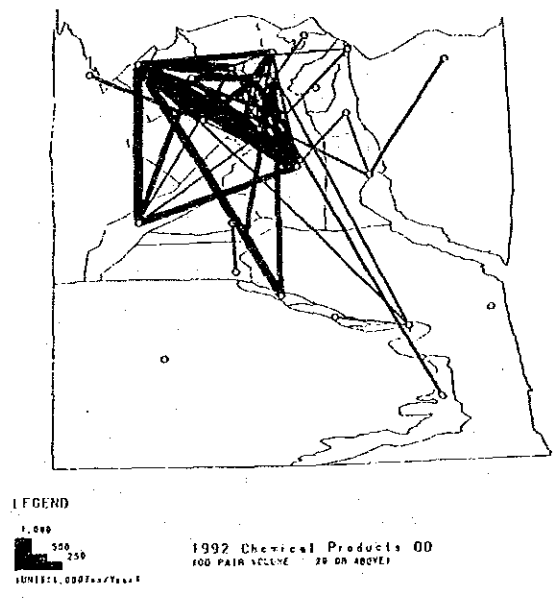


Fig. 8-2-28 1992 Chemical Products Flow

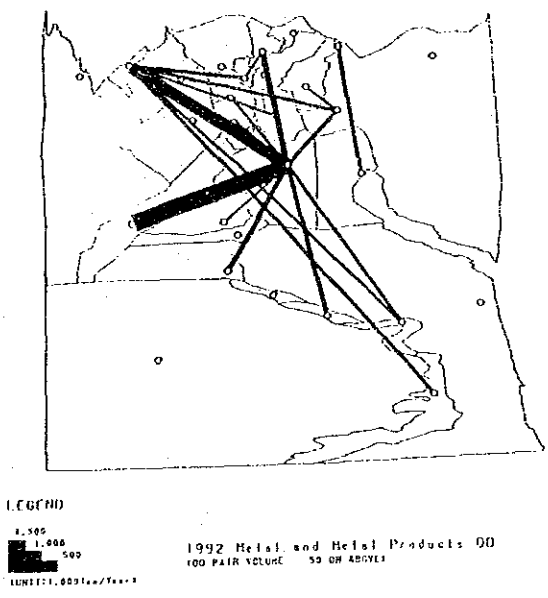


Fig. 8-2-29 1992 Metal and Metal Products Flow

(23) Textiles

Fig. 8-2-30 shows the present textile flow between 29 semi-governorate zones. The total freight of textiles was estimated at 2.1 mill.ton/year, of which 0.18 mill.ton is transported between Cairo and Alexandria zones and another 0.18 mill. ton between Port Said and South Sharkia zones. The high concentration to Alexandria zone (49%) is observed. All the textiles is transported by highway.

(24) Manufactured Fertilizer

Fig. 8-2-31 shows the present manufactured fertilizer flow between 29 semi-governorate zones. The total freight of manufactured fertilizer consisting of nitrogen, phosphate and calcium fertilizers was estimated at 3.9 mill.ton/year, of which 0.22 mill.ton is transported between Qualiubia - South Sharkia, each 0.21 mill.ton between Alexandria - Minufia and Alexandria - Western Desert zones. 34.2% concentrates to Alexandria. 93.7% of manufactured fertilizer is transported by highway, 6.1% by rail and 0.2% by waterway.

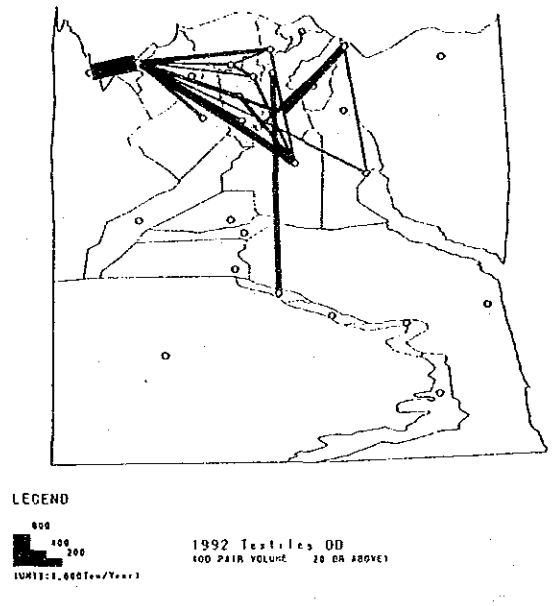


Fig. 8-2-30 1992 Textile Flow

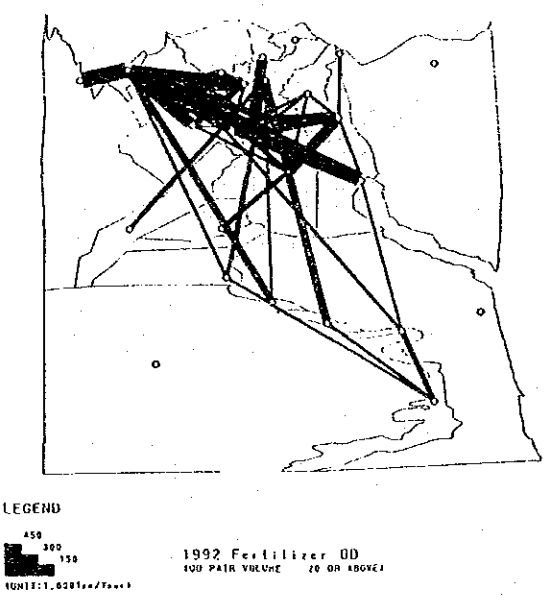


Fig. 8-2-31 1992 Manufactured Fertilizer Flow

(25) Pulp and Paper

Fig. 8-2-32 shows the present pulp and paper flow between 29 semi-governorate zones. The total freight of pulp and paper was estimated at 1.8 mill.ton/year, of which each 0.38 mill.ton is transported between Alexandria - Cairo and Alexandria - Qualiubia zones. 60.4% concentrates to Alexandria. The share of rail counts at less than 0.1% and almost all the pulp and paper is transported by highway.

(26) Lumber and Timber

Fig. 8-2-33 shows the present lumber and timber flow between 29 semi-governorate zones. The total freight of lumber and timber was estimated at 2.3 mill.ton/year, of which 0.5 mill.ton is transported between Damietta and Port Said, 0.3 mill. ton between Port Said - Cairo and 0.25 mill.ton between Cairo - Suez zones. The most of lumber and timber are imported. 40.6% concentrates to Port Said and 33.0% to Damietta. 99.4% of lumber and timber is transported by highway and the rest (0.6%) by rail.

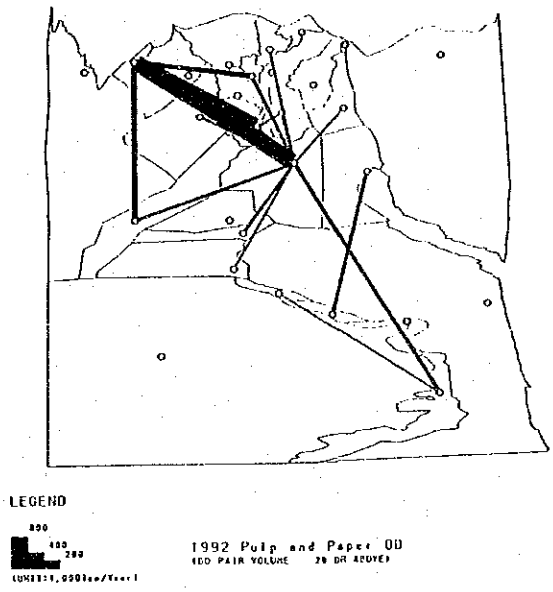


Fig. 8-2-32 1992 Pulp and Paper Flow

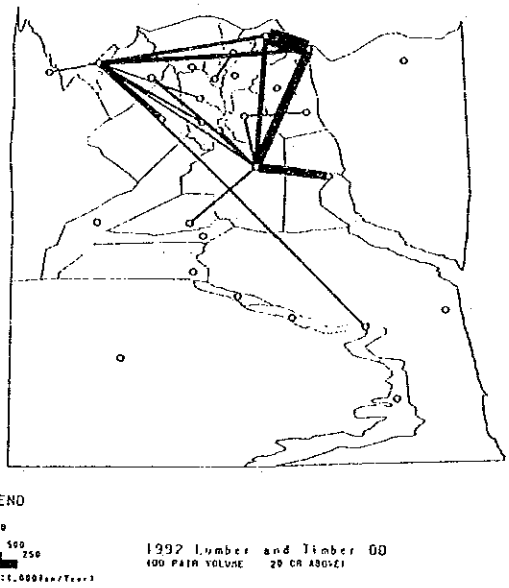


Fig. 8-2-33 1992 Lumber and Timber Flow

(27) Other Manufactured Goods

Fig. 8-2-34 shows the present other manufactured flow between 29 semi-governorate zones. The total freight of manufactured goods other than commodities specified above, consisting of machines, equipments, apparatus, furnitures, etc. was estimated at 7.1 mill.ton/year, of which 0.67 mill. ton is transported between Alexandria and Cairo zones, 0.47 mill.ton between Cairo and South Sharkia and 0.35 mill. ton between Cairo and Giza. 49.3% concentrates to Cairo. 92.5% of other manufactured goods is transported by highway, 7.4% by rail and 0.1% by waterway.

(28) Mixed Commodities

Fig. 8-2-35 shows the present mixed commodities flow between 29 semi-governorate zones. The total freight of mixed commodities consisting of parcels, etc. or specified as general cargo was estimated at 1.8 mill.ton/year, of which 0.16 mill. ton is transported between Damietta - Cairo and South Beheira - South Gharibia zones. 41.2% concentrates to Cairo. 99.0% of mixed commodities is transported by highway and the rest (1.0%) by waterway.

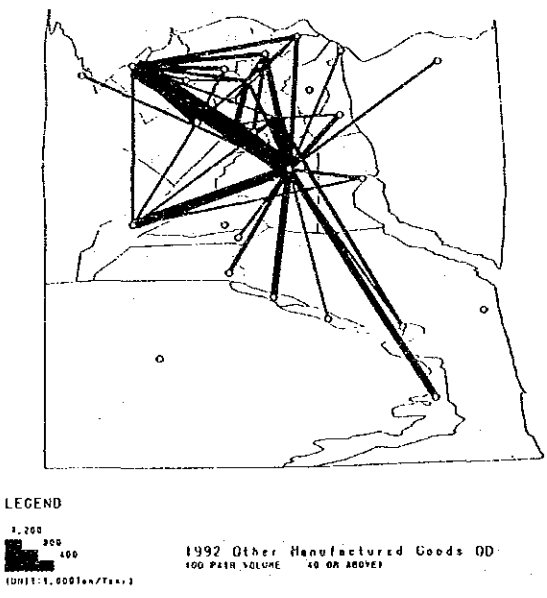


Fig. 8-2-34 1992 Other Manufactured Goods Flow

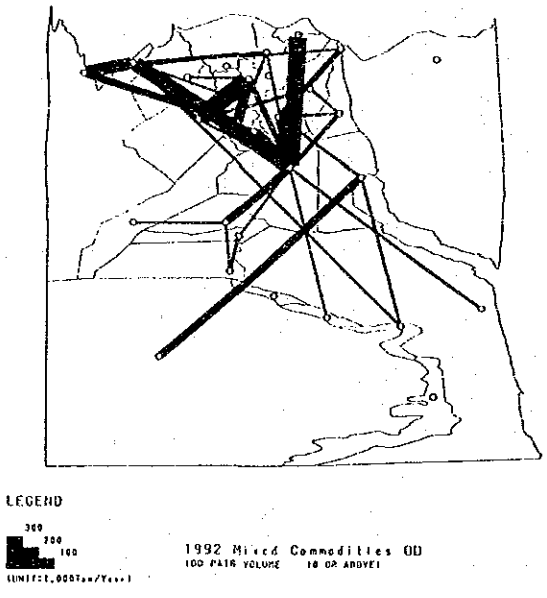


Fig. 8-2-35 1992 Mixed Commodities Flow

8.3 Vehicle Flow

8.3.1 Vehicle Flow

Fig. 8-3-1 (1) and (2) show the vehicle flow on inter city highway network based on the vehicle flow information from RBA traffic counts and from road side OD traffic counting. Fig 8-3-1 (1) shows the traffic flow in Egypt and (2) shows that in Delta area.

The highest flow appears on Cairo Alexandria Agriculture Road in Qalyubia, where AADT is about 40,000 veh./day. Five medium - high traffic flow concentrate to Tanta, from Cairo, Alexandria, Mit Ghamr, Damietta and Tala. Cairo - Alexandria desert road shares about 1/2 of traffic on Agriculture road.

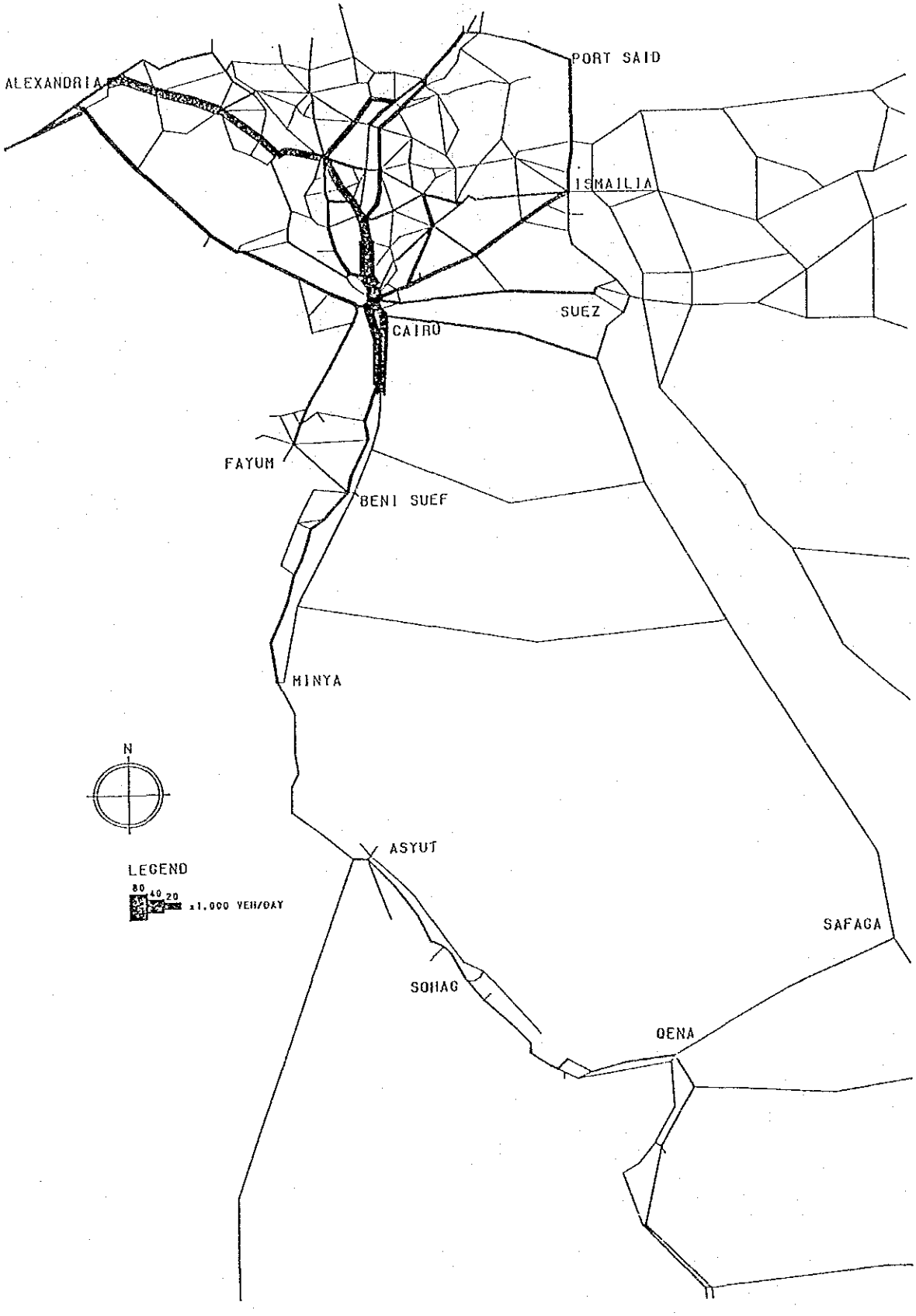


Fig. 8-3-1 Present Traffic Flow (1)

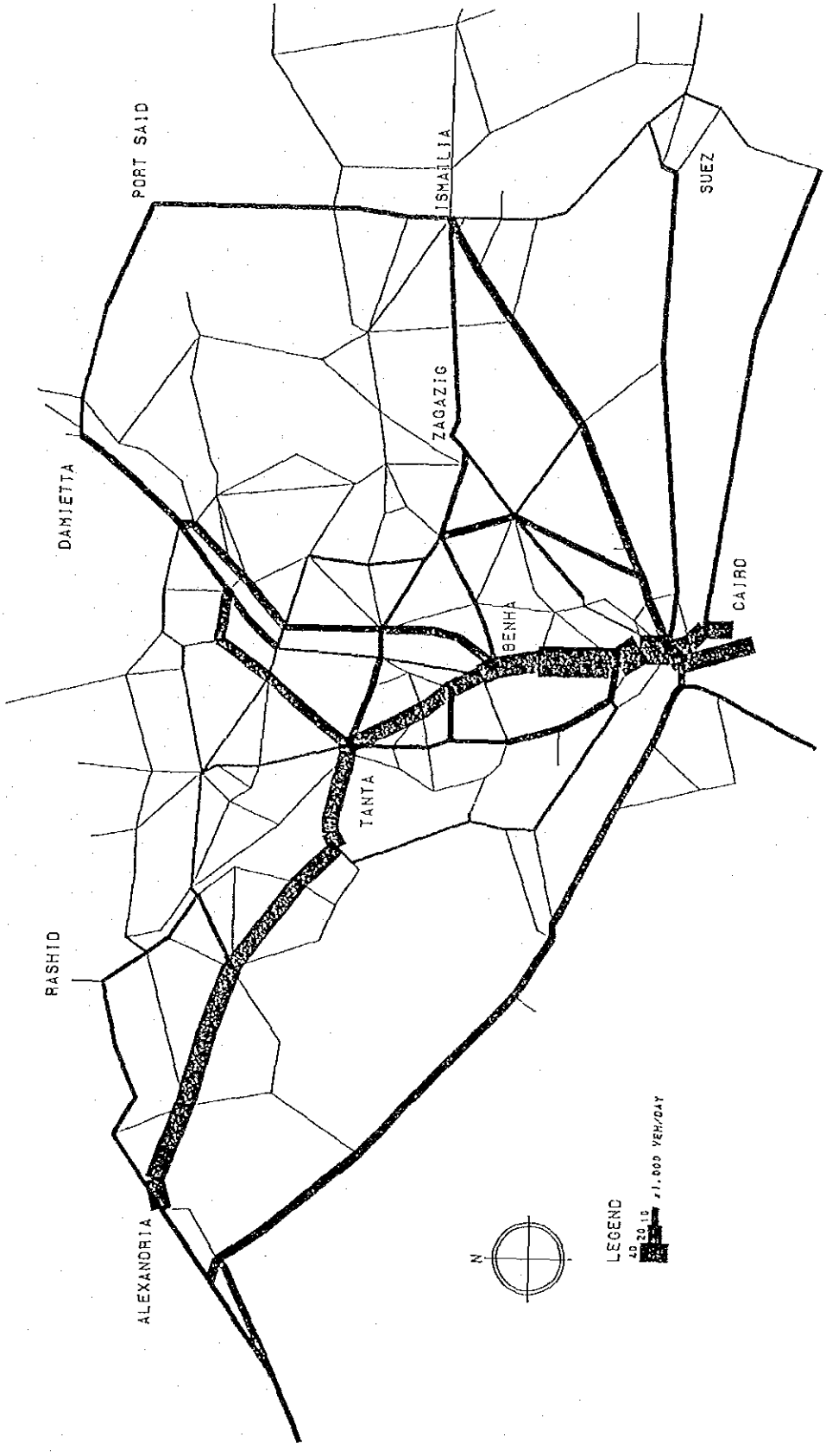


Fig. 8-3-1 Present Traffic Flow (2)

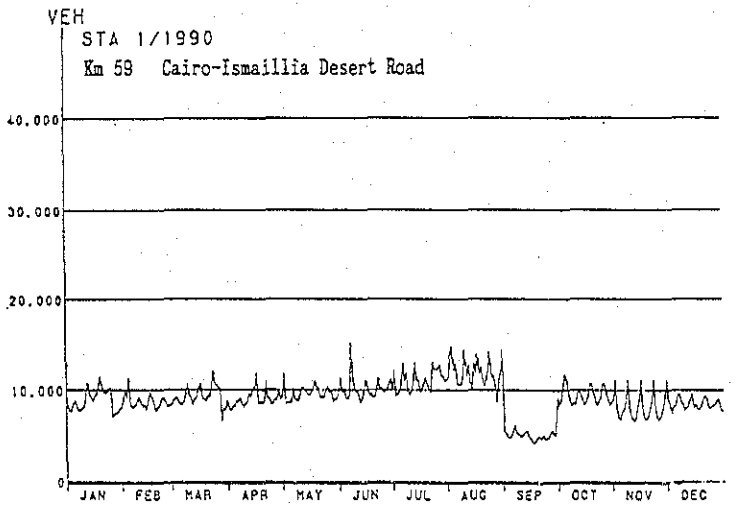
8.3.2 Annual Fluctuation

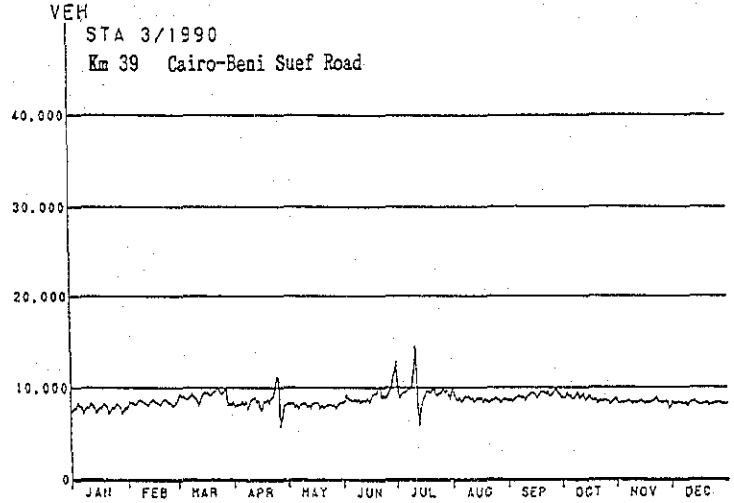
Figs. 8-3-2 (1) through (4) show the annual fluctuation in 1990 at the 14 RBA permanent traffic counting stations where automatic loop counters are installed. At almost all the stations, traffic volume in July - Aug. is slightly higher and extraordinary patterns appear just after Haji Holidays. The effect on traffic by Ramadan is not clear.

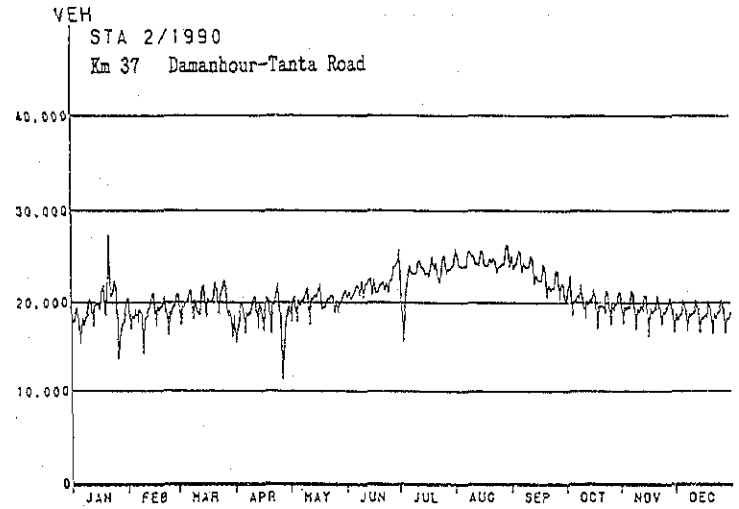
The 30th and 50th high hourly traffic volume ratio to AADT are calculated as shown in Table 8-3-1. The station no.1 on the middle of Cairo - Ismaillia Road shows the highest 30th and 50th hourly factors of 15.6% and 13.8% respectively, reflecting commuting traffic between Cairo and Tenth of Ramadan City. The station no.14 located on Minya - Asyut Road shows the lowest 30th and 50th factors of 6.9% and 6.7%. The averages of 30th and 50th factors are about 8.5%.

Table 8-3-1 30th and 50th Hourly Traffic Volume Ratio to AADT

Sta No	Location	AADT (Veh./Day)	30th		50th	
			Veh./h	HF(%)	Veh./h	HF(%)
1 Km 59	Cairo-Ismaillia Desert Road	9,158	1,428	15.6	1,264	13.8
2 Km 37	Damanhour-Tanta Road	20,670	1,597	7.7	1,570	7.6
3 Km 39	Cairo-Beni Suef Road	8,640	638	7.4	612	7.1
4 Km 74	Cairo-Suez Desert Road	5,224	459	8.8	439	8.4
5 Km 52	Ismaillia-Abu Hamad Road	5,785	477	8.2	467	8.1
6 Km 8.4	Tanta-Berket El Sabaa Road	18,563	1,506	8.1	1,476	8.0
7 Km 27	Belbes-Abu Zaabel Road	6,003	496	8.3	488	8.1
9 Km 5	Mahalla El Kobra-Talkha Road	9,788	788	8.1	779	8.0
10 Km 16	Cairo-Benha Agriculture Road	39,686	2,924	7.4	2,895	7.3
11 Km 34	Mansoura-Mit Ghamer Road	9,691	787	8.1	773	8.0
12 Km115	Cairo-Alexandria Desert Road	9,344	1,060	11.3	999	10.7
13 Km 50	Giza-Fayoum Desert Road	5,177	463	8.9	440	8.5
14 Km 70	Minya-Asyut Road	5,143	355	6.9	347	6.7
15 Km 17	Alexandria-Damanhour Agriculture road	23,907	1,761	7.4	1,723	7.2







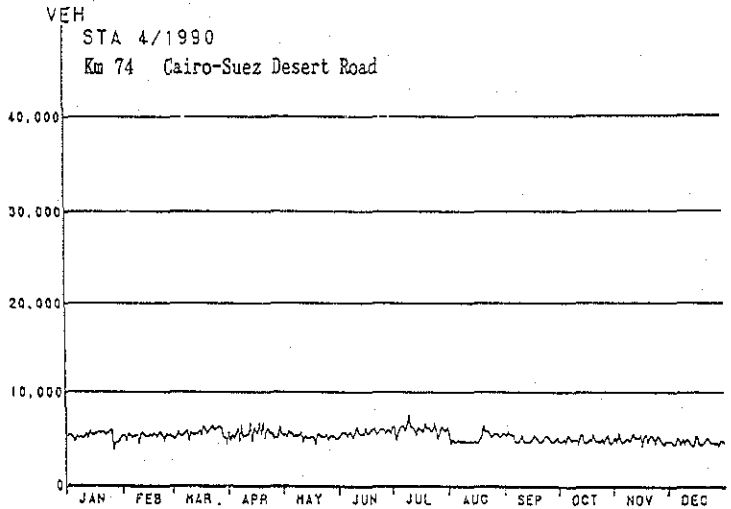


Fig. 8-3-2 Annual Fluctuation (1)

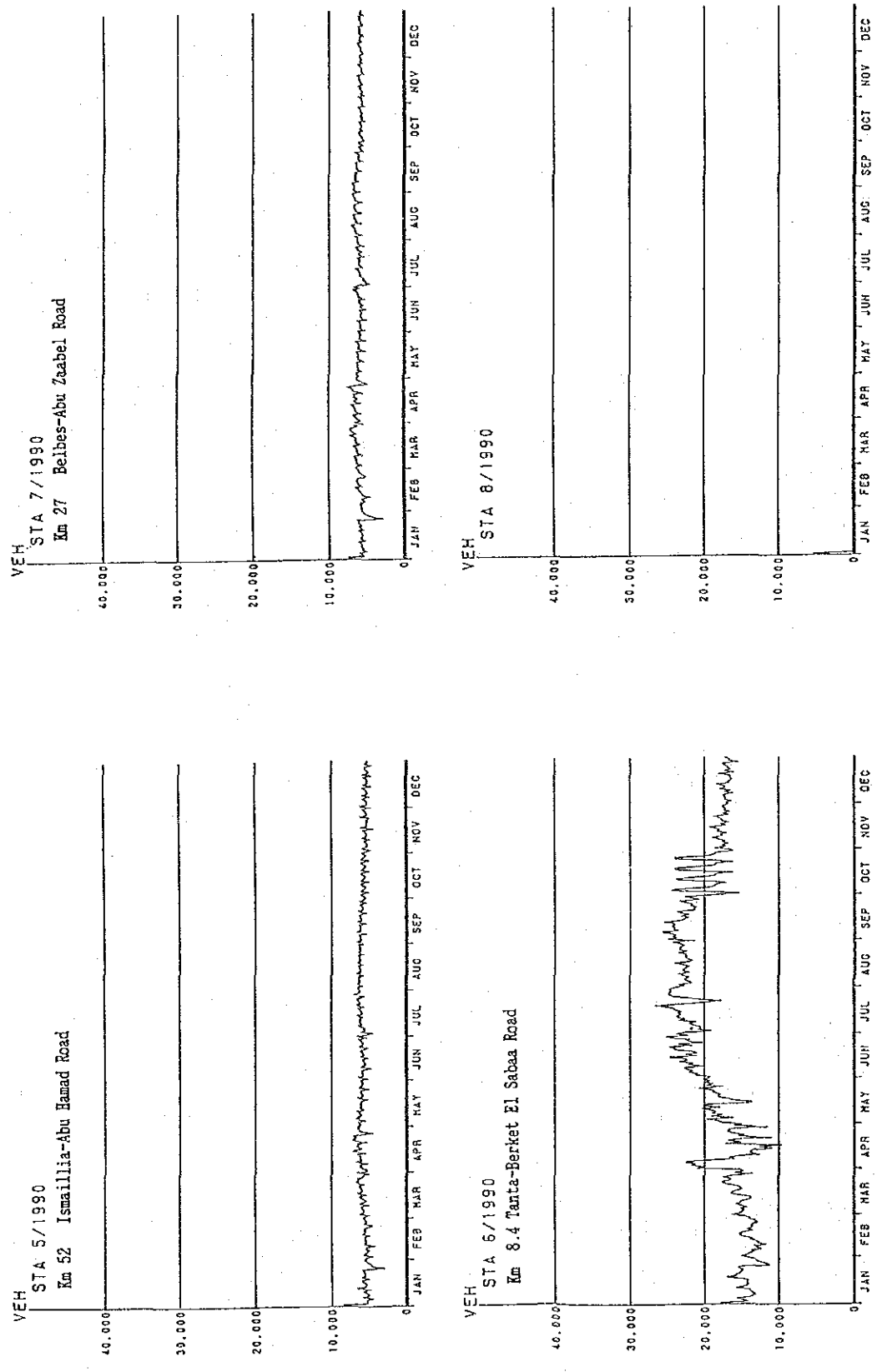
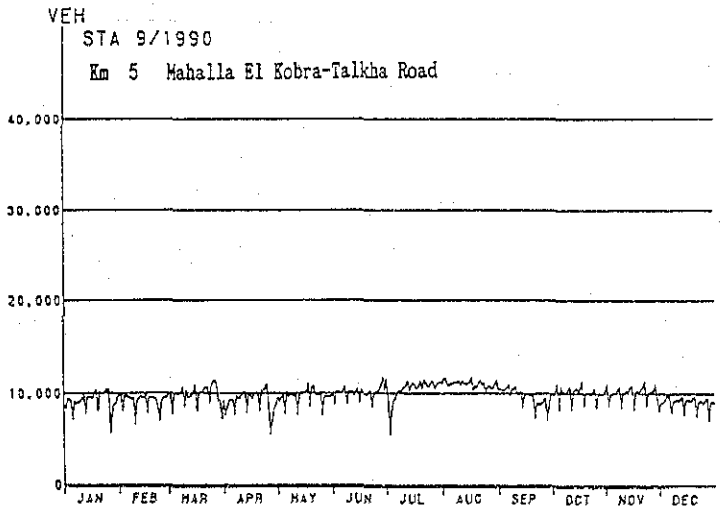
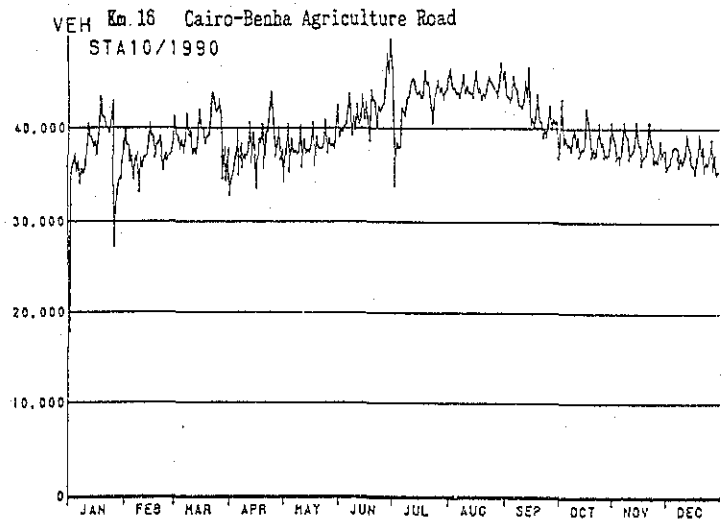
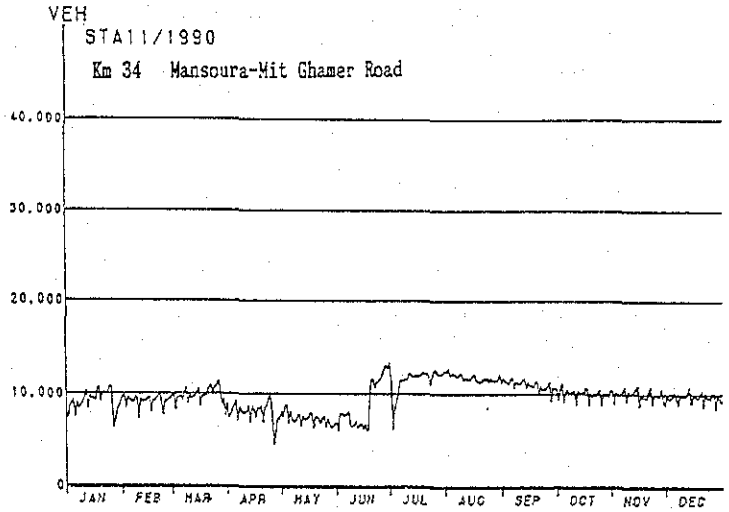


Fig. 8-3-2 Annual Fluctuation (2)







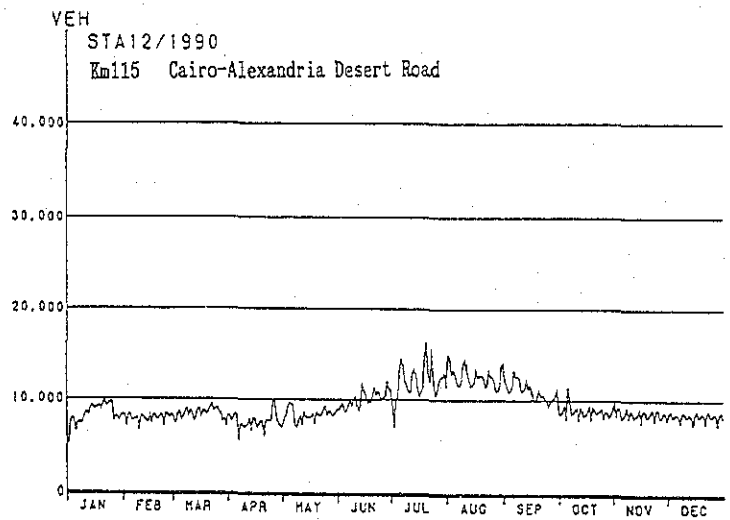
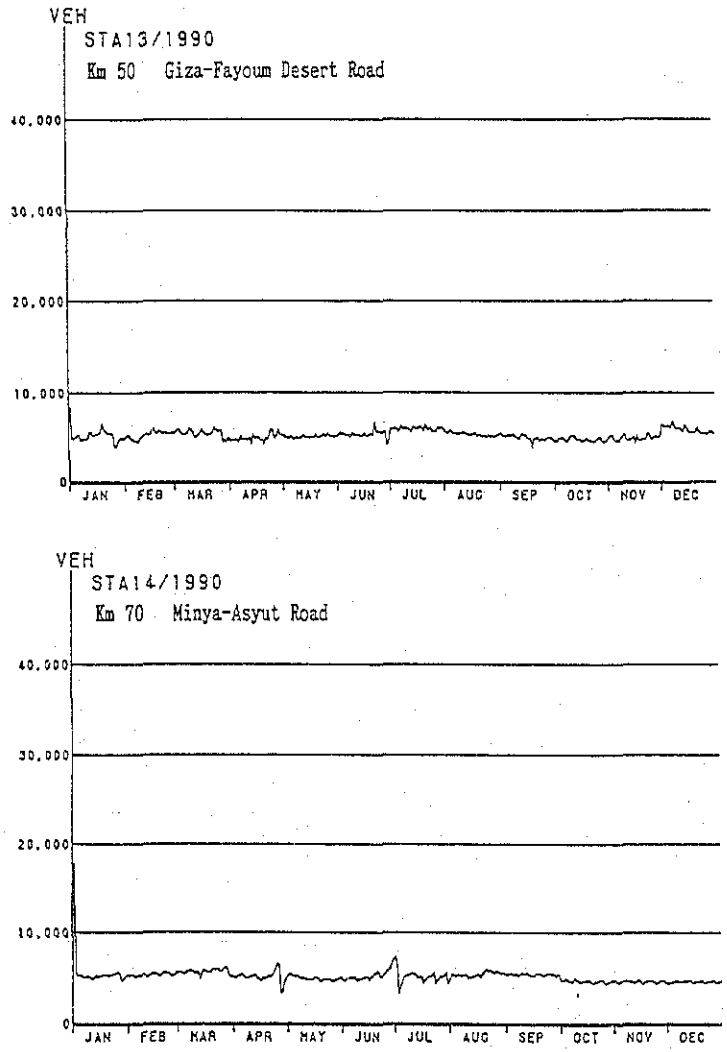


Fig. 8-3-2 Annual Fluctuation (3)



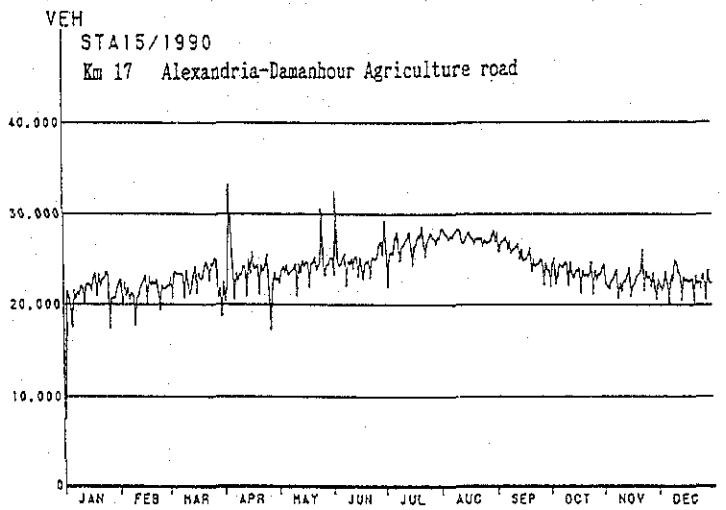


Fig. 8-3-2 Annual Fluctuation (4)

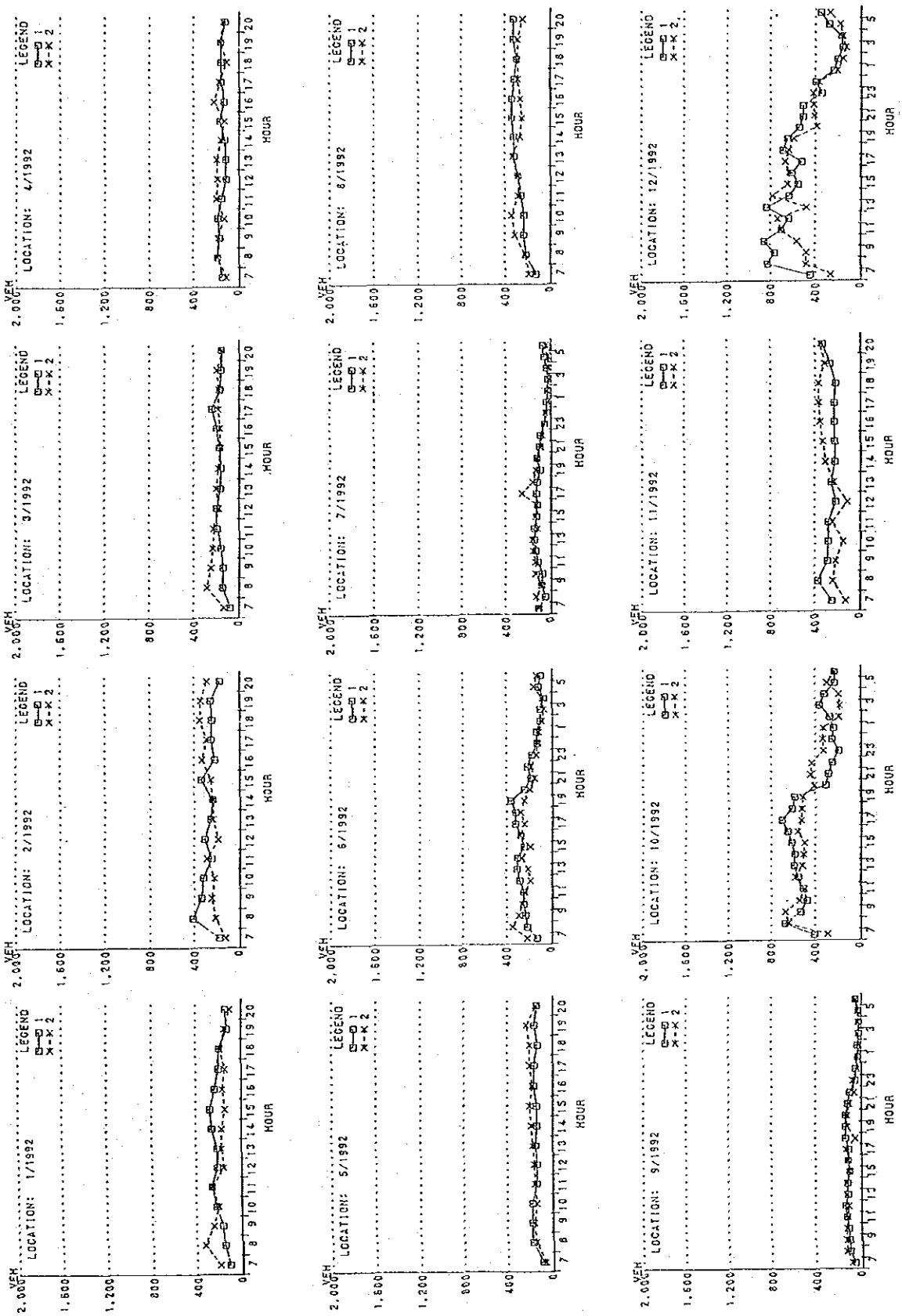


Fig. 8-3-3 Hourly Fluctuation (1)

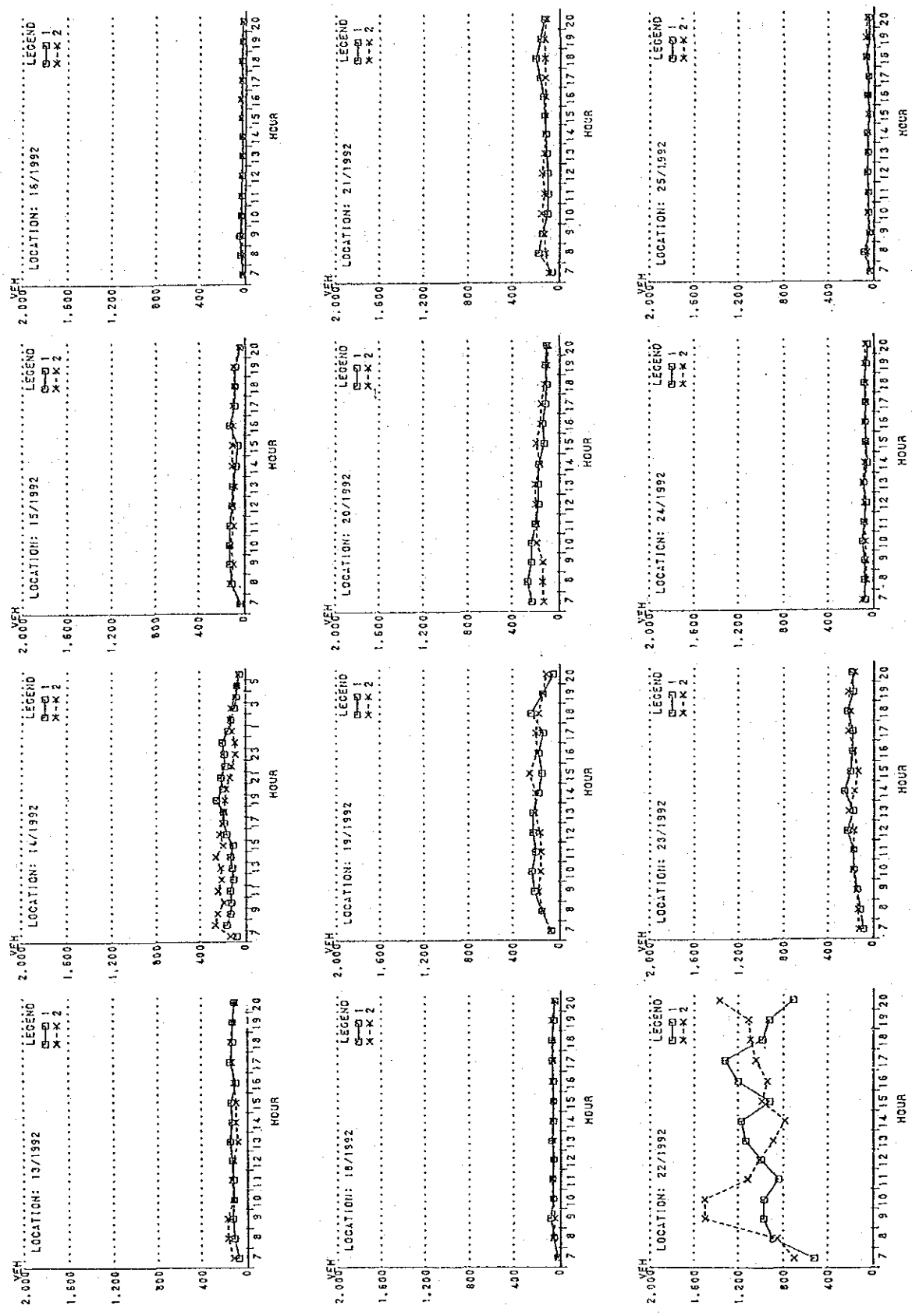


Fig. 8-3-3 Hourly Fluctuation (2)

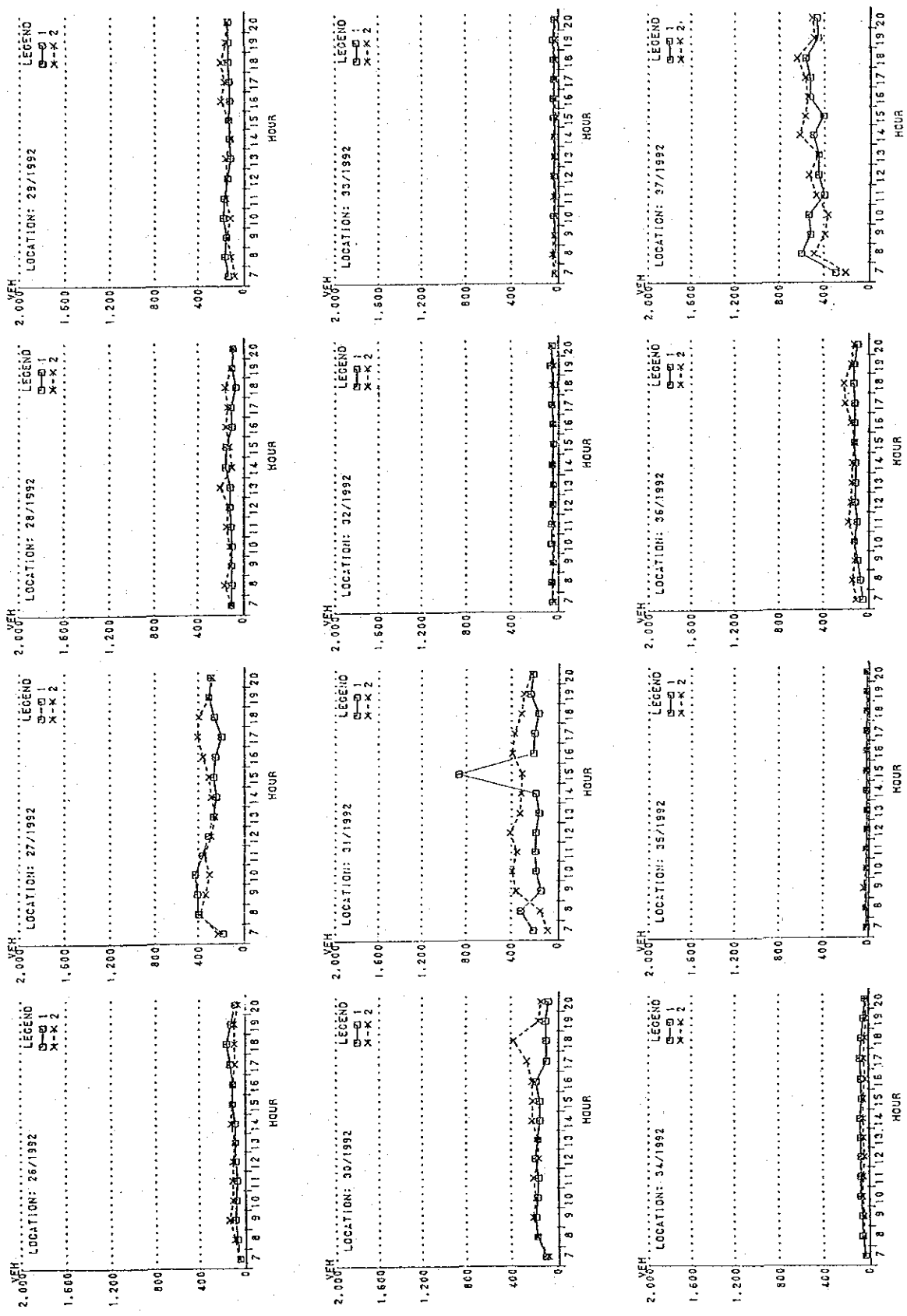


Fig. 8-3-3 Hourly Fluctuation (3)

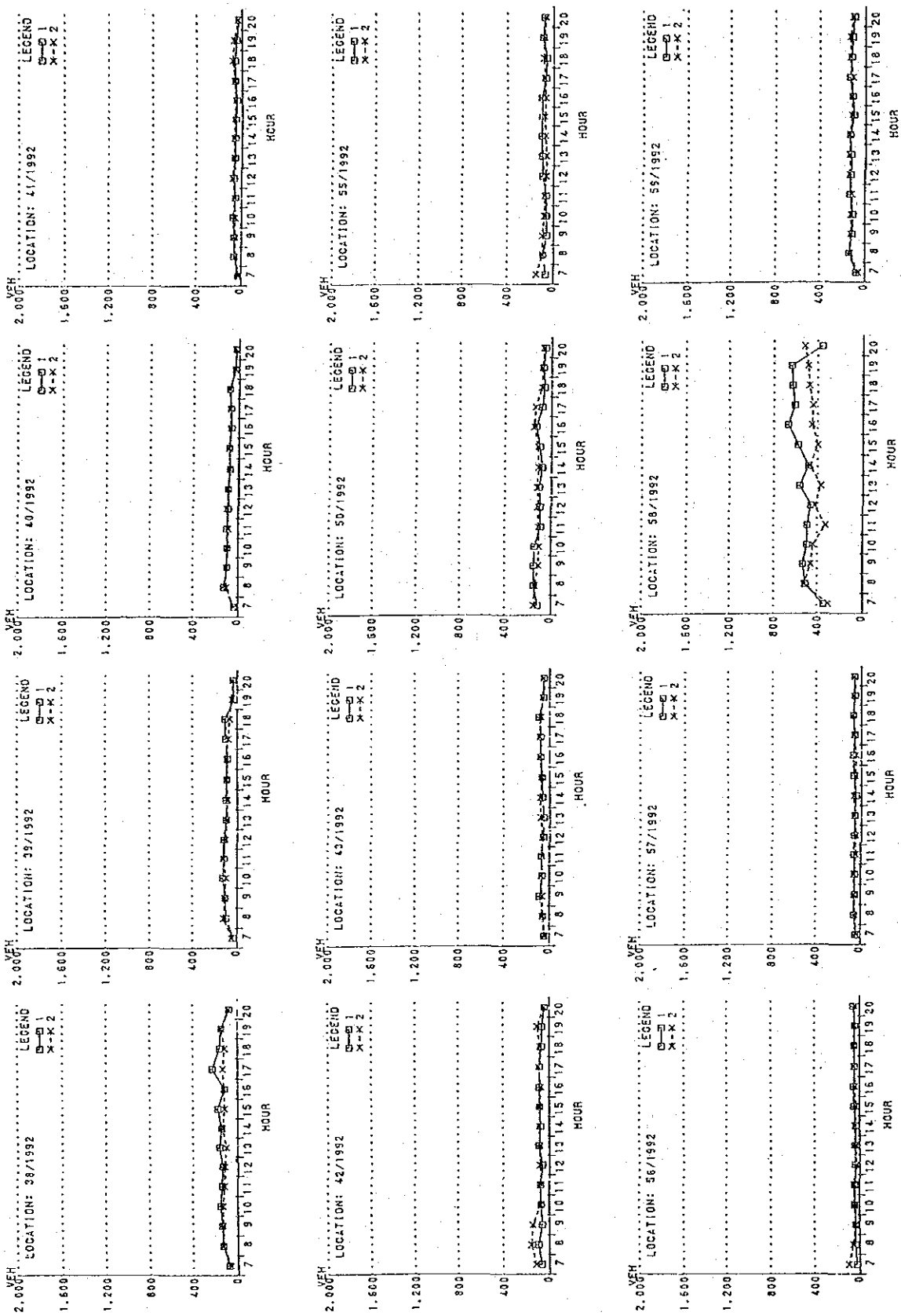


Fig. 8-3-3 Hourly Fluctuation (4)

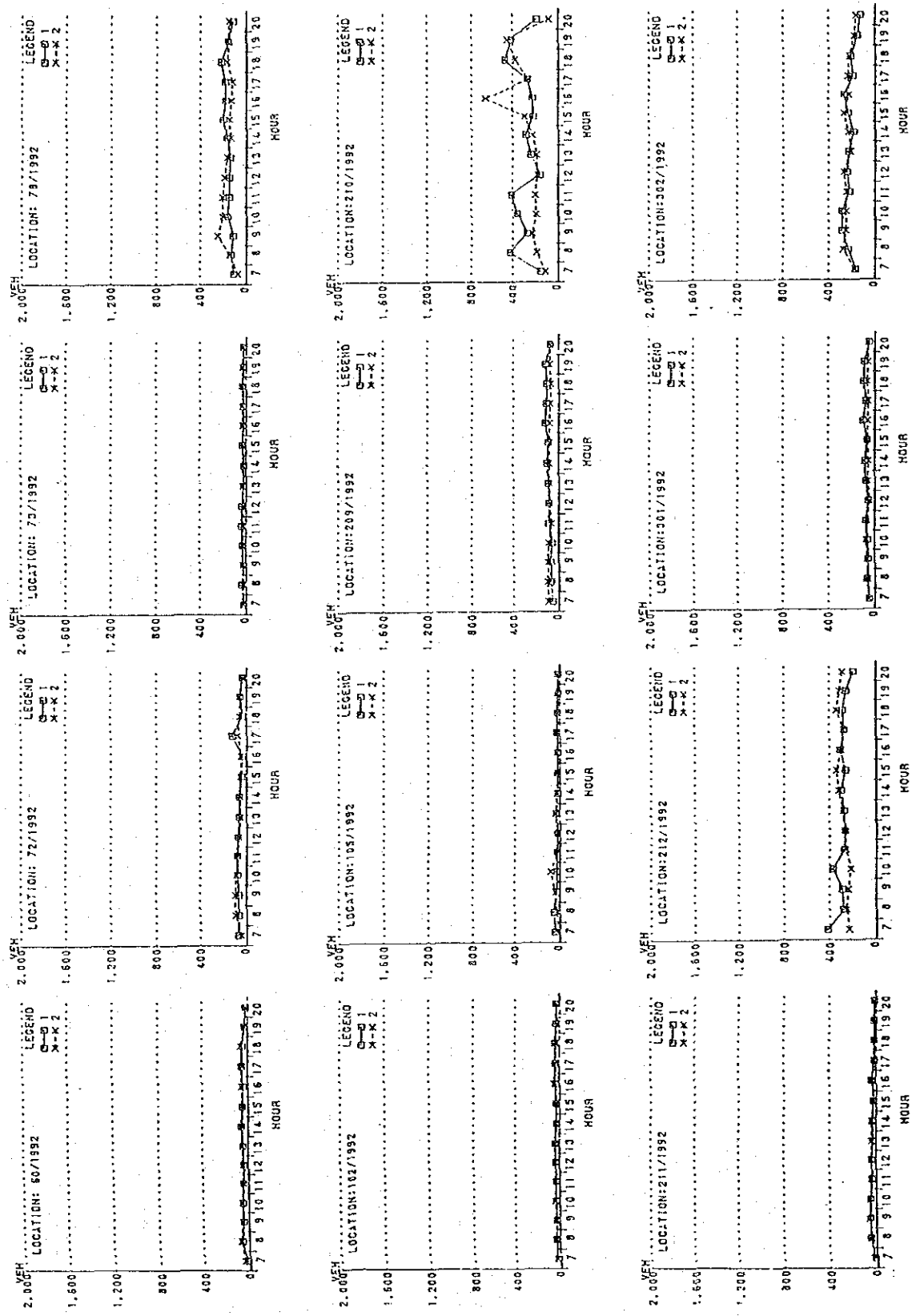


Fig. 8-3-3 Hourly Fluctuation (5)

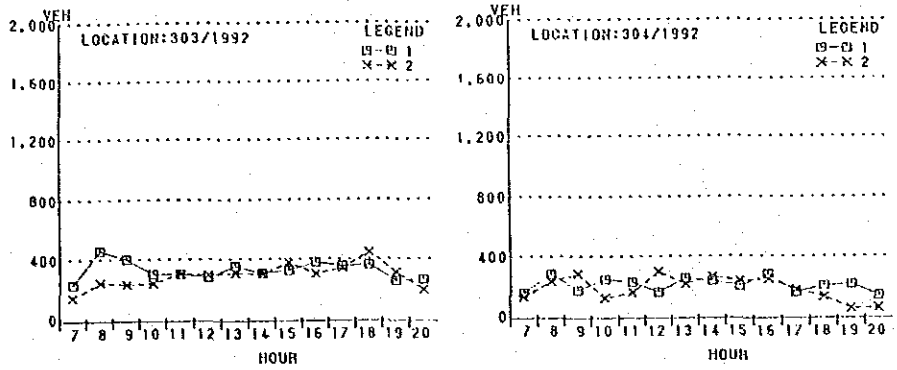


Fig. 8-3-3 Hourly Fluctuation (6)

8.3.4 Vehicle Composition

Fig. 8-3-4 shows the vehicle composition on a sample basis at road side OD survey stations. Truck including trailer shows the high percentage of 30% - more than 80%, and inter city taxi shows about 30% - 40%.

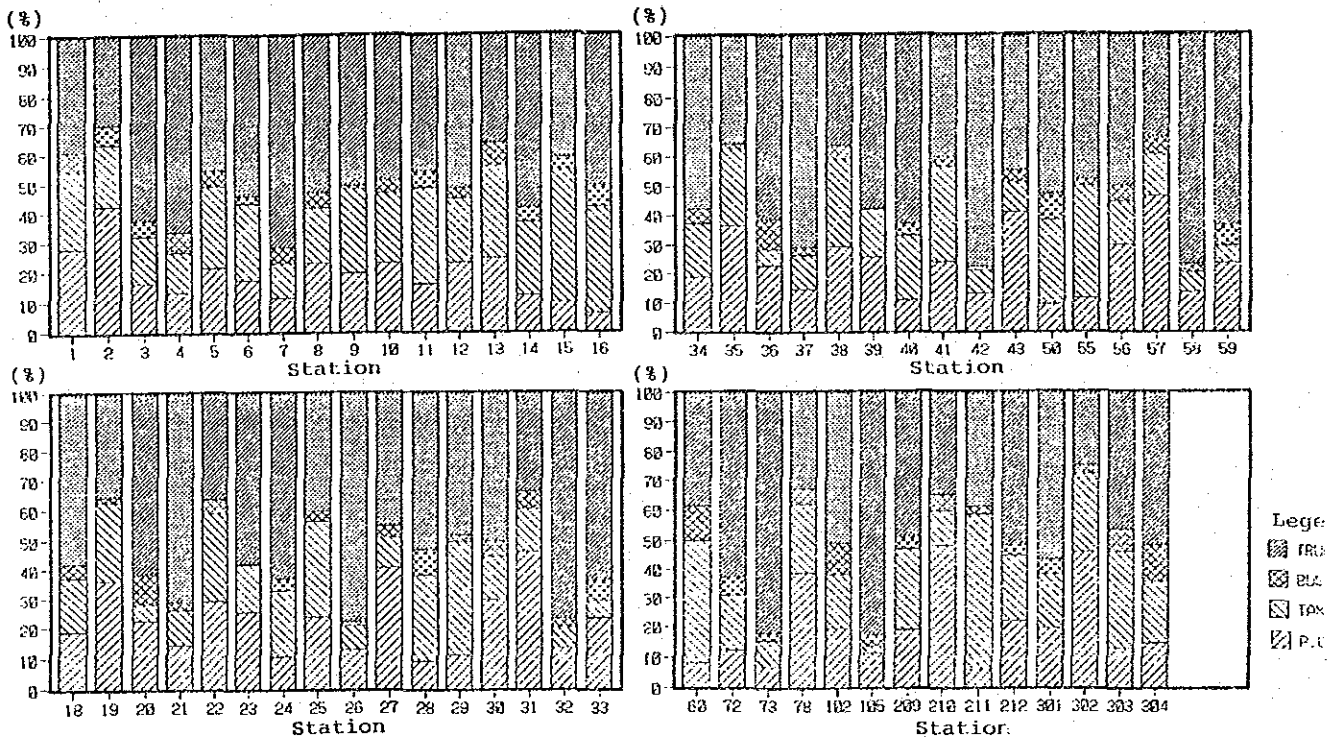


Fig. 8-3-4 Vehicle Composition

CHAPTER 9 PRESENT TARIFF AND TRANSPORTATION COST

9.1 Passenger Tariff

9.1.1 Inter City Bus

Fig. 9-1-1 shows the relationship between present tariff and travel distance of the four inter city bus companies by classes obtained from the interview at bus terminals. In all the figures, passenger fare shows good relationship with travel distance and there is no difference among bus companies. Passenger fare of Super DX-AC is almost double of that in standard class.

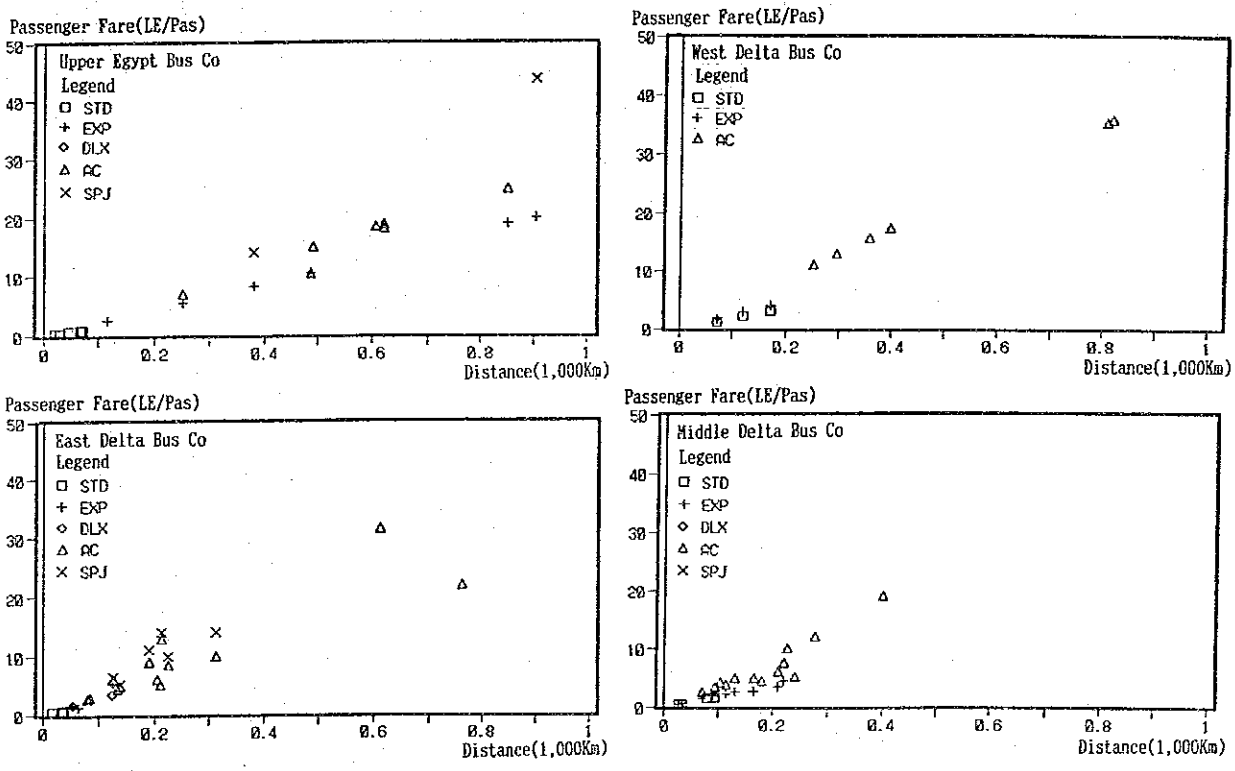


Fig. 9-1-1 Passenger Fare of Inter City Bus

Table 9-1-1 shows the parameters of the linear regression analysis of bus fares by distance.

Table 9-1-1 Parameters of Bus Fare

Class	a	b	r2
Economy	0.01795	-0.0328	0.98
Express	0.02191	0.0833	0.98
DX-AC	0.03157	0.7666	0.85
Super DX-AC	0.04564	-0.2512	0.98

Fare(LE) = a x Dist.(Km) + b

The weighed average fare of above four classes buses by their operating seat capacities by distance is calculated as;

Fare(LE) = 0.0342 x Dist.(Km) -0.1552

The correlation coefficient was calculated at 0.99.

9.1.2 Inter City Taxi

Fig. 9-1-2 shows the present passenger fare of inter city taxi obtained from the interview at taxi terminals. The difference of marks in the figure means the difference of taxi terminals where information comes. The taxi fare shows also good relationship with travel distance, with inclination between Super Jet Class and standard class inter city bus fare. There is no significant difference among the terminals.

The regression analysis of inter city taxi fare gives the following formula. The correlation coefficient was 0.98.

Fare(LE) = 0.0352 x Dist.(Km) -0.2800

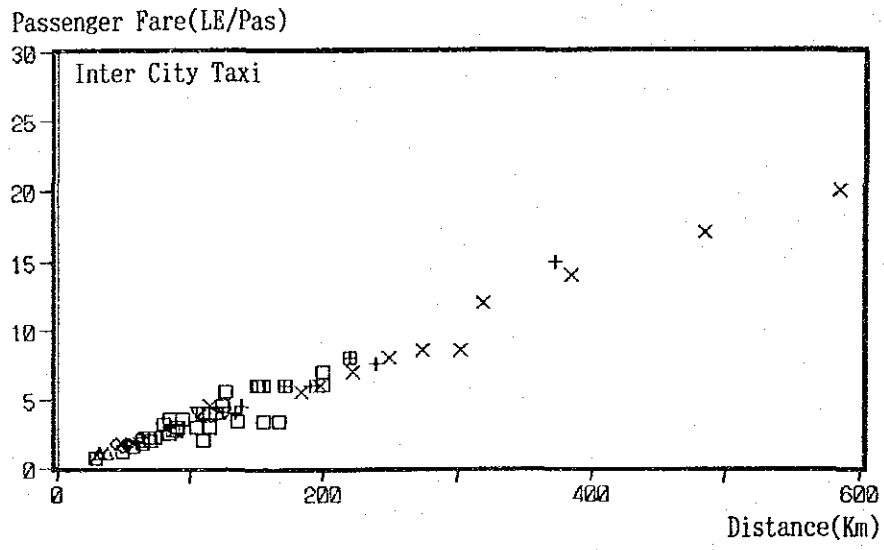


Fig. 9-1-2 Passenger Fare of Inter City Taxi

9.1.3 ENR

Fig. 9-1-3 shows the present ENR passenger fare system. Tariff is defined stepwise by five zones in accordance with travel distance of;

a. 1Km - 40 Km,
b. 41Km - 100Km,
c. 101Km - 200Km,
d. 201Km - 500Km and
e. more than 501Km,

and five classes of;

a. 1st class with air conditioner,
b. 1st class without air conditioner,
c. 2nd class with air conditioner,
d. 2nd class without air conditioner, and
e. 3rd class.

The increments of tariff between zones decline in accordance with travel distance. The 1st class A/C fare at the distance of 600Km is about LE 24, which is slightly higher than that of inter city taxi, which is LE 21.

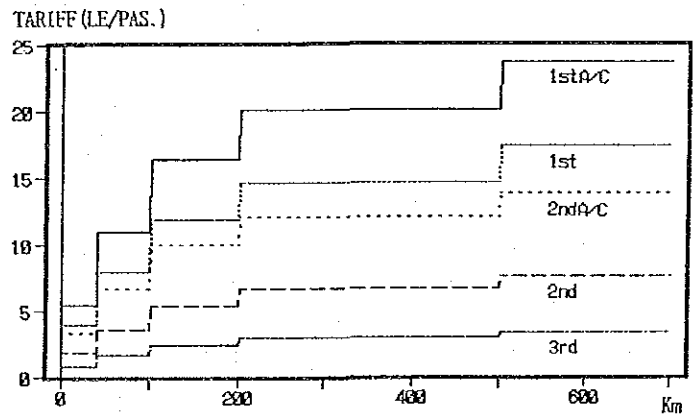


Fig. 9-1-3 Present ENR Passenger Tariff

The weighed average standard fare of the five classes by the actual number of passenger by class and by distance is expressed by the following regression formula;

$$Fare(LE) = 0.4128 \times Dist.(Km)^{0.4184} + 0.834$$

However, practically ENR has discount fare system for students, government officials, etc. and the discount rate by class is calculated as shown in Table 9-1-2 from the monthly revenue information. The overall collection rate is almost half of the standard tariff.

half of the standard tariff.

Table 9-1-2 Tariff Collection Rate by Class

Class	Collection (%)
1st AC	69.64
1st	5.42
2nd AC	60.00
2nd	79.49
3rd	52.93
Total	51.41

The weighed average practical fare of the five classes by distance is expressed by the formula;

$$\text{Fare(LE)} = 0.014252 \times \text{Dist.(Km)} + 0.936908$$

The comparison of the average standard fare and practical fare is shown in Fig. 9-1-4.

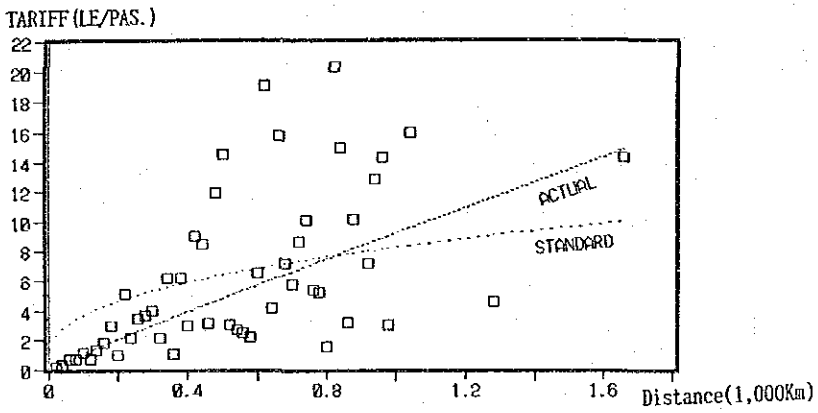


Fig. 9-1-4 ENR Standard Fare and Practical Fare

The comparison of inter city bus, inter city taxi and ENR fares are given in Fig. 9-1-5. There is almost no difference between inter city bus and inter city taxi fares.

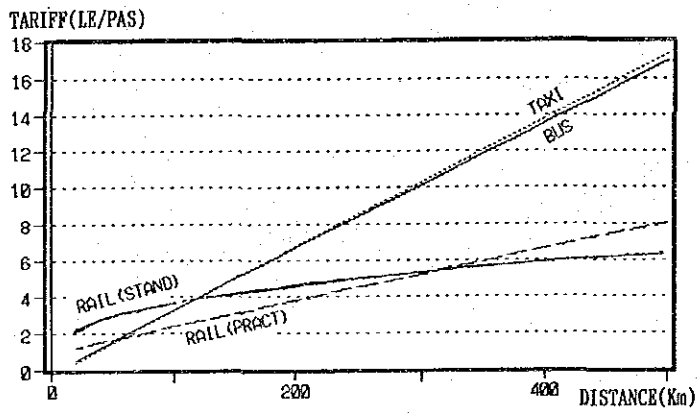


Fig. 9-1-5 Comparison of Various Passenger Fares

9.2 Freight Tariff

9.2.1 Truck Freight

Fig. 9-2-1 shows the present freight of truck obtained from the interview to trucking companies. Most of the companies have basic minimum charge until 150Km, and beyond 150Km, additional tariff is charged in relation with the distance. The basic minimum charges are about 12.0 LE/ton and bulk cargo is charged additionally 18 - 20% for their handling. Table 9-2-1 shows the freight at the distance of 200Km.

Table 9-2-1 Truck Freight at 200Km

Company	Freight (LE/ton)
A	12.393
B	12.000
C	9.000
D	13.204
E	14.500
F	14.015
G	14.243
H	15.214

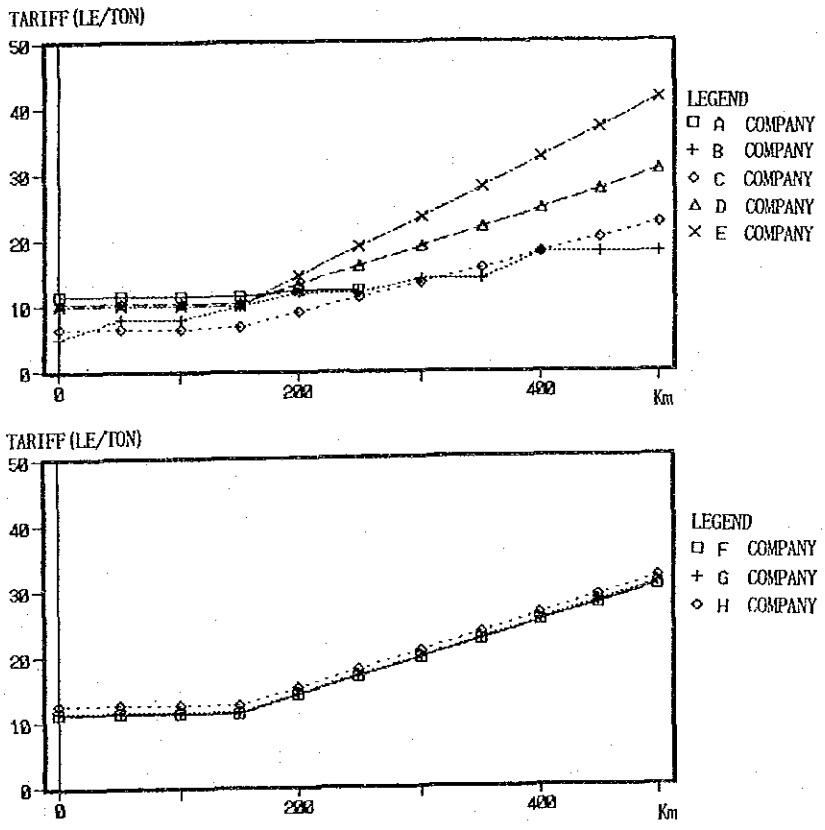


Fig. 9-2-1 Present Truck Tariff

9.2.2 ENR Freight

Fig. 9-2-2 shows the present ENR freight by commodity type summarized from 1991 ENR freight records by taking average tariff of commodity groups in terms of LE/ton for each 50Km. According to the interview to ENR, most of freight was decided through negotiation with clients except for individual general cargo, based on the standard tariff table prepared by distance and by 30 commodity types. The standard also mentions additional terminal charges for loading and unloading, etc.

Freight of petroleum products, construction materials other than cement, cereals other than wheat, and food products shows the good relationship to distance. Freight of manufactured products include various commodities show the high fluctuation and high level of freight comparing to other commodity groups, while the freight of phosphate shows the lowest level.

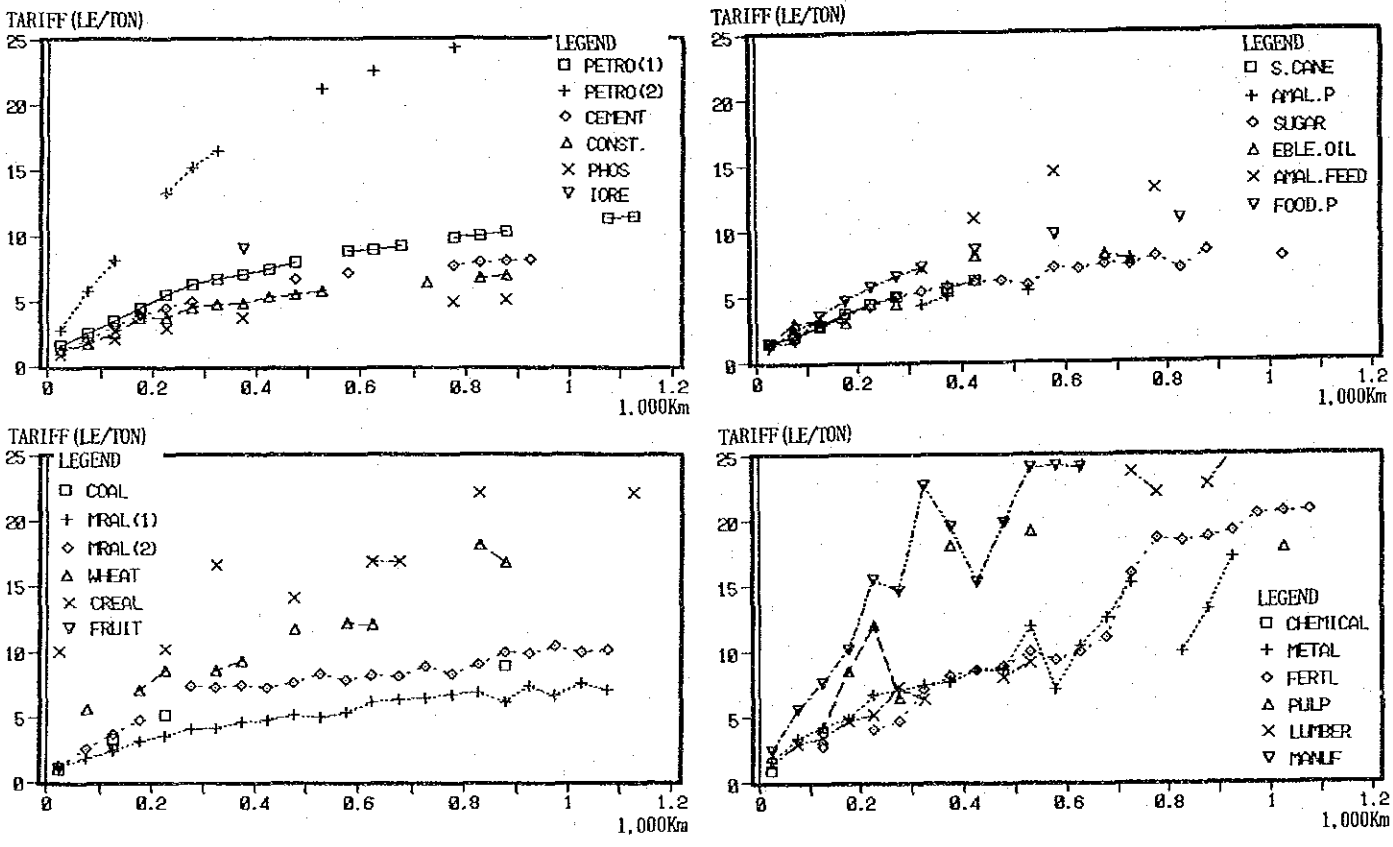


Fig. 9-2-2 Present ENR Freight Tariff

Table 9-2-2 summarizes the result of log linear regression analysis of ENR freight by 30 commodity groups and the freight per ton at the distance of 200Km.

Table 9-2-2 Parameters of ENR Freight

Commodity	Sample	a	b	r2	C(200Km)
PETR(1)	686	.59300	.20321	.97	4.704
PETR(2)	181	.69070	.29024	.97	11.274
CEMT	374	.48920	.31224	.94	4.170
CMAT	537	.47380	.27653	.92	3.404
PHOS	38	.38760	.37704	.99	2.939
COAL	60	.45940	.37986	.99	4.332
MNRL(1)	204	.48260	.25910	.99	3.342
MNRL(2)	142	.47040	.40406	.98	4.885
WHET	95	.46580	.63593	.65	7.503
CERE	25	.26830	2.81818	.76	11.677
FRUT	2	.32510	.51946	.81	2.908
SCAN	73	.38340	.46626	.90	3.555
APRD	7	.48230	.29001	.99	3.734
SGAR	460	.55830	.19196	.98	3.697
FATS	84	.52440	.24373	.89	3.923
AFED	18	.55600	.37419	.43	7.120
MTAL	1362	.56040	.27749	.91	5.404
FTLZ	422	.62960	.18109	.75	5.089
PULP	16	.50350	.59997	.72	8.644
LUMB	112	.55980	.27249	.93	5.293
MANU	1700	.73320	.21853	.78	10.632

Freight(LE/ton)=b x Dist.(Km)^a

9.2.3 Freight of Inland Waterway Transport

Fig. 9-2-3 shows the present freight of inland waterway transport by distance and by commodity group based on transportation records from two public waterway transport companies. The freight of petroleum product shows the good linear relationship to distance, while others show high fluctuation.

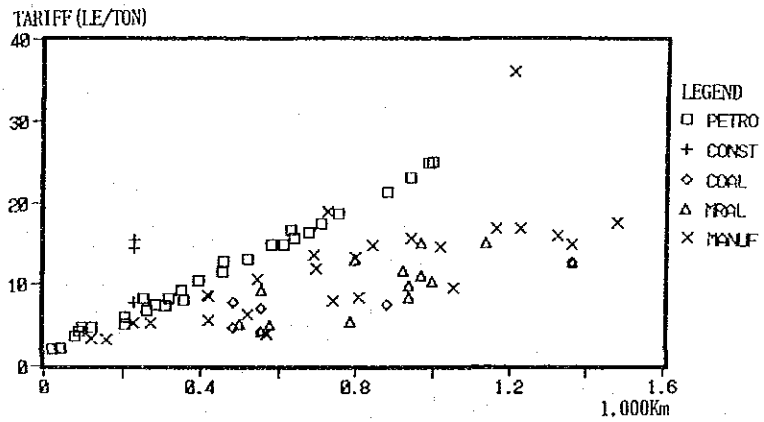


Fig. 9-2-3 Present Inland Waterway Tariff

Table 9-2-3 summarizes the result of regression analysis of inland waterway freight by commodity groups and the freight at the distance of 200Km.

Table 9-2-3 Parameters of Inland Waterway Freight

Commodity	Sample	a	b	r2	C(200Km)
PETR	31	0.023	1.385	0.99	5.985
CEMT	2	0.013	2.561		5.161
CMAT	1	0.000	0.055		0.055
MRAL	2	0.026	-14.520		-
SGAR	7	0.007	2.030	0.73	3.430
MRAL	14	0.011	0.428	0.54	2.628
MANF	26	0.013	2.045	0.52	4.645

Freight(LE/ton)=a x Dist(Km) + b

In the most of the commodities, the freights at the distance of 200Km by inland waterway and by rail are comparable and truck freights show the highest.