TRANSPORT PLANNING AUTHORITY
MINISTRY OF TRANSPORT
THE ARAB REPUBLIC OF EGYPT

No.

MiNTS – MISR NATIONAL TRANSPORT STUDY

THE COMPREHENSIVE STUDY ON THE MASTER PLAN FOR NATIONWIDE TRANSPORT SYSTEM IN THE ARAB REPUBLIC OF EGYPT

FINAL REPORT

TECHNICAL REPORT 2

RAILWAY SECTOR

March 2012

JAPAN INTERNATIONAL COOPERATION AGENCY

ORIENTAL CONSULTANTS CO., LTD.
ALMEC CORPORATION
KATAHIRA & ENGINEERS INTERNATIONAL

EID
J R
12-039

TRANSPORT PLANNING AUTHORITY
MINISTRY OF TRANSPORT
THE ARAB REPUBLIC OF EGYPT

MiNTS – MISR NATIONAL TRANSPORT STUDY

THE COMPREHENSIVE STUDY ON THE MASTER PLAN FOR NATIONWIDE TRANSPORT SYSTEM IN THE ARAB REPUBLIC OF EGYPT

FINAL REPORT

TECHNICAL REPORT 2

RAILWAY SECTOR

March 2012

JAPAN INTERNATIONAL COOPERATION AGENCY

ORIENTAL CONSULTANTS CO., LTD.
ALMEC CORPORATION
KATAHIRA & ENGINEERS INTERNATIONAL

USD1.00 = EGP5.96
USD1.00 = JPY77.91

(Exchange rate of January 2012)

Table of Contents

Item Page

CHAPTER 1: INTRODUCTION.....1-1

1.1. BACKGROUND.....1-1
1.2. THE MiNTS FRAMEWORK.....1-1
1.2.1. Study Scope and Objectives.....1-1
1.2.2. A Consultative Planning Process.....1-2
1.2.3. Sustainability and Human Resources Development.....1-3
1.3. REPORTING STRUCTURE.....1-3

CHAPTER 2: PRESENT STATUS OF EGYPTIAN RAILWAY.....2-1

2.1. PREFACE.....2-1
2.2. RRAILWAY NETWORK.....2-1
2.3. ORGANIZATION.....2-4
2.4. TRANSPORT ACTIVITY.....2-7
2.4.1. Passenger Transportation.....2-7
2.4.2. Freight Transportation.....2-7
2.4.3. Uses’ Opinion.....2-9
2.5. RAILWAY SYSTEM.....2-12
2.5.1. Track and Structure.....2-12
2.5.2. Rolling Stock.....2-14
2.5.3. Signaling System.....2-16
2.5.4. Workshops and Depot.....2-18
2.5.5. Other facilities.....2-18
2.6. TRAIN OPERATION.....2-19
2.7. Financial Matters.....2-22
2.7.1. Financial Conditions.....2-22
2.7.2. Tariff.....2-23

CHAPTER 3: ANARISYS OF RAILWAY TRANSPORTATION.....3-1

3.1. PASSENGER TRANSPORTATION.....3-1
3.1.1. Analysis of Current Passenger Transportation.....3-1
3.1.2. Issues of Passenger Transportation.....3-11
3.2. FREIGHT TRANSPORTATION.....3-12
3.2.1. Current Freight Transportation by ENR.....3-12
3.2.2. Issues of Freight Transportation.....3-20
3.3. Safety.....3-21
3.3.1. Accidents on Railway.....3-21
3.3.2. Analysis of Accidents.....3-21
3.4. CURRENT ISSUES AND POLICY SETTING.....3-27
3.4.1. Characteristics of Railway Transport Service.....3-27
3.4.2. Hardware Issues.....3-27
3.4.3. Software Issues.....3-28
3.4.4. Humanware Issues.....3-29

3.4.5. Conclusion 3-30

CHAPTER 4: DEVELOPMENT PLAN OF RAILWAY 4-1

4.1. METHODOLOGY 4-1
4.1.1. Safety 4-1
4.1.2. Costumer Service 4-1
4.1.3. Efficiency 4-2
4.1.4. Measurer for Improvement 4-4
4.2. DEMAND FORECAST 4-5
4.2.1. Passenger Demand Forecast 4-5
4.2.2. Demand Forecast of Freight Transport 4-6
4.3. CANDIDATE OF PROJECT 4-13
4.3.1. Projects Proposed in Previous Studies 4-13
4.3.2. Current ENR Projects 4-16
4.3.3. Proposed Projects 4-19
4.4. PROJECT OVERVIEW 4-21
4.4.1. Cairo Alexandria Bypass Route (RW-403) 4-21
4.4.2. High Speed Railway for Cairo – Alexandria via Tanta (RW-400) 4-23
4.4.3. High Speed Railway for Cairo Aswan 4-24
4.4.4. Freight Transportation System Change (RW-412) 4-26
4.4.5. Railway Link for Freight Network 4-28
4.4.6. Other Projects 4-29
4.5. OTHER RECOMMENDATIONS 4-33
4.5.1. Improvement of Tacks 4-33
4.5.2. Improvement of Workshop Environment 4-33
4.5.3. Train Formation 4-34
4.5.4. Tourist Train 4-34
4.6. IMLEMENTATION PLAN 4-35
4.6.1. General Guideline 4-35
4.6.2. Implementation Plan 4-35

APPENDIX

1. Railway Line Information A-1
2. Train Diagram A-3
3. Run Curve (Train Operation Speed) A-9
4. Projects Profile A-12

CHAPTER 1: INTRODUCTION

1.1. BACKGROUND

The Japan International Cooperation Agency (JICA) and the Transport Planning Authority of the Ministry of Transport are cooperating in the conduct of the *Comprehensive Study on The Master Plan for Nationwide Transport System in the Arab Republic of Egypt* (MiNTS – Misr National Transport Study), based upon agreements finalized during July, 2009[1]. Oriental Consultants Company Limited, headquartered in Tokyo, Japan, is the designated lead consultant for the study. Associated firms are Almec Corporation, Japan and Katahira & Engineers International, Japan. Technical efforts in Egypt were initiated during December, 2009.

1.2. THE MiNTS FRAMEWORK

1.2.1. Study Scope and Objectives

MiNTS is comprehensive in nature, that is, approaches have been designed to mitigate transport problems and contribute to the sustainable development of the nation. Investigative efforts extend over the entirety of the Republic (Figure 1.2.1), with a particular focus being major corridors of movement for both persons and cargo. All major modes of transport are addressed including road, rail, maritime, inland waterways, civil aviation and pipelines. However, the practical master planning focus falls upon those modes falling under the jurisdiction of the Ministry of Transport; that is, the road, rail, maritime and inland waterway sectors.

Five key milestones form the foundation upon which planning efforts are based:

- Establish a nationwide, multi-modal database whose validity rests on a series of focused transport surveys and data collection exercises;
- Formulate overall strategies and policies for development of the nationwide transport fabric;
- Develop an integrated, multi-modal transport master plan with years 2017, 2022 and 2027 being short, medium and ultimate planning horizons, respectively;
- Identification, within the master plan framework, of high-priority projects; and,
- Implementation of an effective and productive technology transfer program with Egyptian counterparts.

[1] *Scope of Work - Comprehensive Study on The Master Plan for Nationwide Transport System in the Arab Republic of Egypt*, as mutually agreed upon between the Japan International Cooperation Agency and the Ministry of Transport, Government of Egypt, July 16, 2009.

Source: JICA Study Team

Figure 1.2.1 MiNTS Study Area

The transport strategy embedded within MiNTS must concurrently contribute to an efficient economic structure, strengthen linkages within Egypt as well as with neighboring countries, and provide a base for market-oriented transport activity. Economic expansion and social transformations within Egypt are well underway; continuing improvements in productivity and well-being are expected. As economic growth continues, changes in transport activities and behavior will follow suit. **Thus, the foci of transport planning must gradually shift from alleviation of present deficiencies to realization of a transport system founded upon sustainable evolution and integrated, mutually supportive transport solutions.** This strategy is particularly valid given the almost 20-year planning horizon adopted by MiNTS.

1.2.2. A Consultative Planning Process

The final structure of MiNTS, and the successful reception thereof, can only be achieved as a direct result of cooperative efforts and close liaison between the Study Team and local experts. Considerable efforts have been expended in gathering information, reviewing previous studies and holding numerous discussions to enhance knowledge of, and sensitivity to, local transport conditions, norms and practices.

The Study Team, housed in the offices of the Transport Planning Authority, Ministry of Transport, is being strongly assisted by its designated counterpart Special Working Group, Coordination Committee and Steering Committee. Thus, continuous and productive technical liaison is being maintained with a number of organizations including the Ministry of Transport and various entities thereof (Office of the Minister, Transport Planning Authority, Egypt National Railways, General Authority for Roads, Bridges and Land Transport, General Authority for River Transport, Maritime Transport Sector); the Ministry of Housing, Utilities and Urban Communities; Ministry of Civil Aviation; Ministry of Agriculture and Land Reclamation; Ministry of Trade and Industry; Ministry of Industrial Development; Ministry of the Interior; Ministry of Local Development; Ministry of Finance; State Ministry of Foreign Affairs, Sector of International Cooperation; Ministry of the Environment; CAPMAS (Central Agency for Public Mobilization and Statistics); as well as various Governorates and entities thereof. Close coordination has also been effected with Universities and various departments within those learned institutions.

Likewise, effective consultations are programmed with various international agencies, funding institutions, donors, and consultant groups in order to obtain an overview of previous, current, and likely future activities and/or involvement in Egypt.

1.2.3. Sustainability and Human Resources Development

The components of the Master Plan diversify beyond the traditional “hardware” concepts associated with infrastructure provision. Additional key elements of the process consist of “software” aspects, that is, available technology, international standards, and modal integration needs (cargo/passenger terminals, logistics chains, transfer points) as well as “humanware” needs. In the latter case, this represents the cultivation of human resources via the designation of training and education programs as well as other requirements for developing expertise. In other words, “sustainability”, or the notion that the planning process must allow Egyptian stakeholders to participate in visualizing and shaping their own future. This is of substantial importance in terms of ownership building if MiNTS is to be adopted and used by the people and their elected officials both during, and following, the conduct of MiNTS.

1.3. REPORTING STRUCTURE

The *Final Report* consists of three elements: *The Master Plan* report, *Technical Reports* and *Appendix Reports*.

- *The Master Plan* report is seen as the main document whose intent is to present, in a synoptic sense, main findings of the MiNTS investigations;

- *Technical Reports* represent a series of sector-specific reports which document the technical underpinning of *The Master Plan* document (Table 1.3.1), and,

- *Appendix Reports* represent task-specific or activity-specific documents and other data summaries, some of which have been developed in response to client group requests.

Table 1.3.1 Technical Reporting Structure

Report Number	Subject
1	Road Sector
2	Rail Sector
3	Inland Waterway Transport Sector
4	Maritime Sector
5	Civil Aviation and Pipeline Sectors
6	Demand Simulation and Scenario Testing
7	Organizational and Functional Aspects of the Transport Sector
8	Private Sector Participation
9	Environmental Considerations
10	The MiNTS Vision, Policies and Strategies
11	Transport Survey Findings
12	Project Prioritization
13	Counterpart Training Program

Source: JICA Study Team

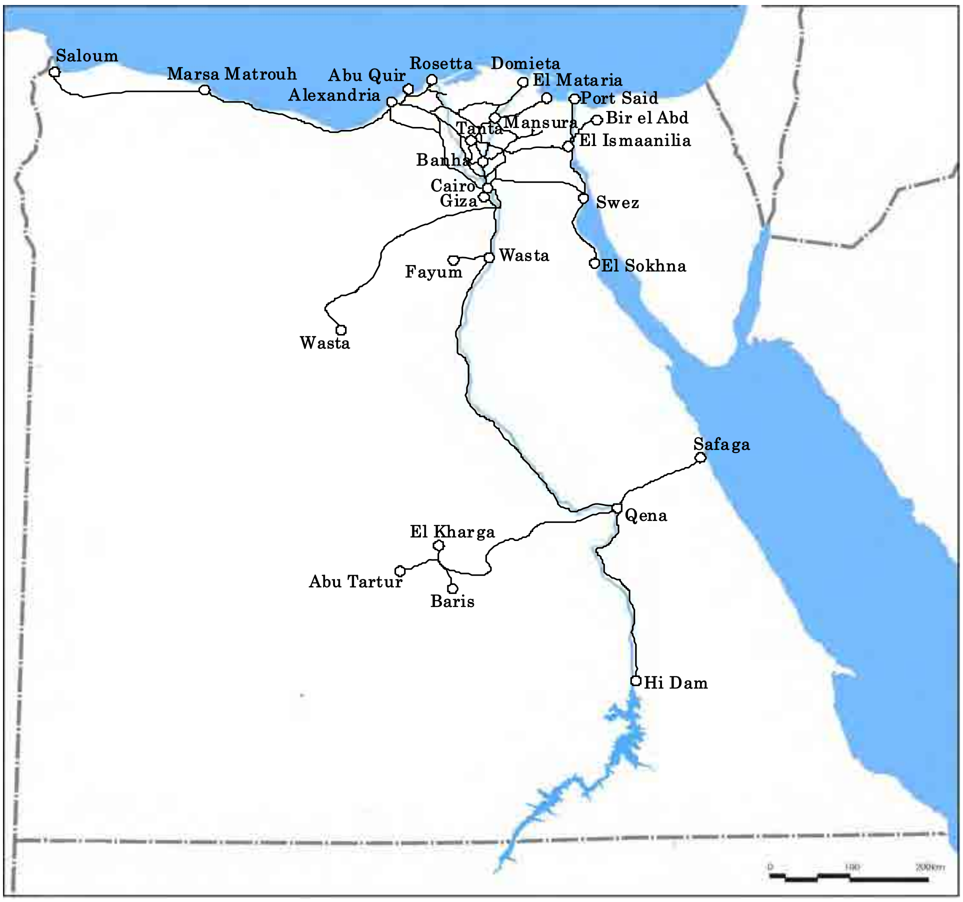
CHAPTER 2: PRESENT STATUS OF EGYPTIAN RAILWAY

2.1. PREFACE

Egyptian National Railway (ENR) started operation in 1854 between Alexandria and Kafr Eassa as the first railway in Africa. In 1856 the line was extended to Cairo and the railway network was expanded to major towns. Now the lines are approximately 5100km long. Beside the ENR lines, there are urban heavy rail (metro) lines in Cairo which started operation in 1987 and total route length is 65.5 km including at- grade sections. A subway is operated by Cairo Metro Organization under ENR.

2.2. RAILWAY NETWORK

Figure 2.2.1 shows the extent of the Egyptian railway. The network connects major cities in the Nile Delta. There is also a line along the Nile River up to the southernmost station at the Aswan High Dam. Entire railways are standard-gauged and not electrified.



Source Study Team

Figure 2.2.1 Railway Network of Egypt

Figure 2.2.2 shows the network of ENR together with the number of tracks. The two sections from Cairo to Alexandria and Cairo to Aswan High Dam are the main trunk lines of ENR and both have double tracks or more for the entire sections. Branch lines from Benha to Suez, from Tanta to El Mansoura and from Alexandria to Abu Keer also have double tracks. All the other lines are single-tracked. On the double tracks, trains run on the left hand side.

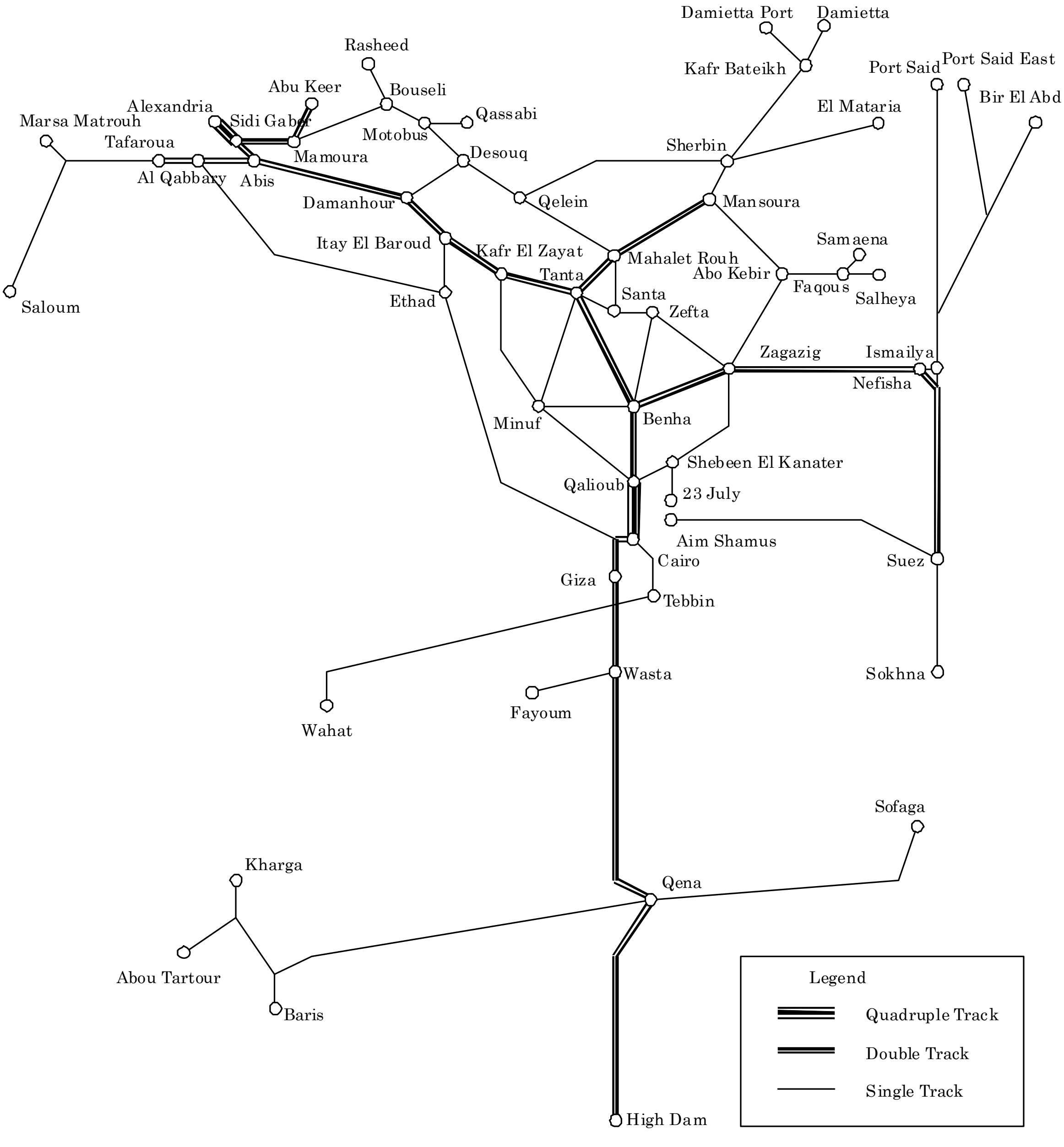


Figure 2.2.2 ENR Network :Number of Tracks

Source Study Team based on ENR data

The total line length extends to 5,130 kilometres, or 9,560 track kilometres which are subdivided into:

Quadruple tracks: 20 kilometres (0.4 percent of total).

Double track: 1,460 kilometres (28.5 percent of total).

Single track: 3,650 kilometres (71.2 percent of total).

Detailed data of each line section are shown in Table App 1.1 of Appendix

2.3. ORGANIZATION

Egypt was the second country in the World to introduce railway service after England. The first railway line was completed in 1853. The General Authority for the Egyptian Railway was established under the Ministry of communication by Law No. 366/1956. The aim of that law was to give the Egyptian Railway more freedom from the strict rules that govern the activities of governmental bodies. According to that law, the chairman of the Egyptian Railway was the Minister of Communications. In 1966 Presidential Decree No. 2715 limited the responsibilities of the Minister of Transport to supervision and monitoring of the performance of the General Authority of the Egyptian Railway and gave the responsibilities of its management to the chairman and the board of directors. In 1980, Law 152 granted the authority more autonomy to enable it to perform its duties in a more flexible environment. The main features of that law can be summarized as:

- Emphasize the National character of the railway. This means that local authorities have no power regarding its activities.
- Granting the Authority complete monopoly for the construction, operation maintenance and provision of railway service on the national level.
- Granting the Authority the right to establish stock companies either owned solely by the Authority or with other entities to perform the objectives of the Authority.
- Granting exemption of the Authority from normal governmental procedures. This meant that the Authority will have its own budget, the right to establish its own management system, exemption of rules of importation and the use of foreign currency and the right to implement its own decisions for the fulfilment of its objectives.
- The funds for the Authority are compiled of the amount allocated for the Authority in the general budget of the country, the income from the services of the Authority and the difference between the service prices if the government set the services prices at a level lower than the price approved by the Authority.
- Full legal protection of the Authority' funds.
- The appointment of a representative of the employees in the board of directors of the Authority.

The ENR is transporting about 13% of the passenger transport expressed in passenger km and about 1.8% of cargo transport expressed in ton km. Although the share of cargo transport is minor, it amounts to about 25% of the revenue of the ENR. The main reason behind this situation is that the passengers' ticket price is kept at a low level for social considerations.

ENR has been neglected for decades due to the lack of sufficient funds resulting in a deteriorated state of equipment, maintenance service and untrained personnel. The recurring train accidents and delays, deteriorated state of locomotives, trains and signalling system, lack of qualified labor, solid safety and security systems, and insufficient budget, are major reasons behind ENR’s losses which are estimated at $1 billion annually.

In the recent years, ENR suffered from a chain of serious train accidents. In most cases, the causes behind these accidents were the dilapidated infrastructure, poor maintenance and safety checks in addition to the overcrowded passenger coaches.

ENR is in the midst of a major reform program covering all aspects of their operation. The main railway policy objective set by the Egyptian Government in general and by the Ministry of Transport in particular are as follows: .

Table 2.3.1 Objectives of the ENR Reform Program

Objective	Policies
Enhance Safety of Services	• Introduce safety regulations and oversight • Improve safety performance to reach acceptable safety levels for rail services in Egypt
Improve Customer Service Levels	• Enhance operational performance to become a credible and reliable mode of transport
Develop Rail Freight Business	• Unlock the potential of ENR's freight business • Compete successfully with other modes of transport
Commercialize with Social Responsibility	• Ensure access of citizens to rail services • Ensure that ENR's social responsibility does not hinder its commercialization drive
Achieve Financial Self Sustainability	• ENR to become profitable within a mid-term time frame • ENR to achieve self-funding from its cash flows to maintain the required high level of investments

Source: Identification and Formulation of Budgetary Support Programme for the Transport Sector in Egypt, Europe Aid, 2008

Activities to achieve these objectives are bundled into three phases, a restructuring phase (2007 -09), a commercialization phase (2010 -2012) and a market opening phase (2012 +).The restructuring phase concentrates efforts on the core business areas of short distance passenger transportation, long distance passenger transportation and freight transportation. A new organizational structure was developed as illustrated in Fig 2.3.1 below. Total number of staff is 73,000 persons

.

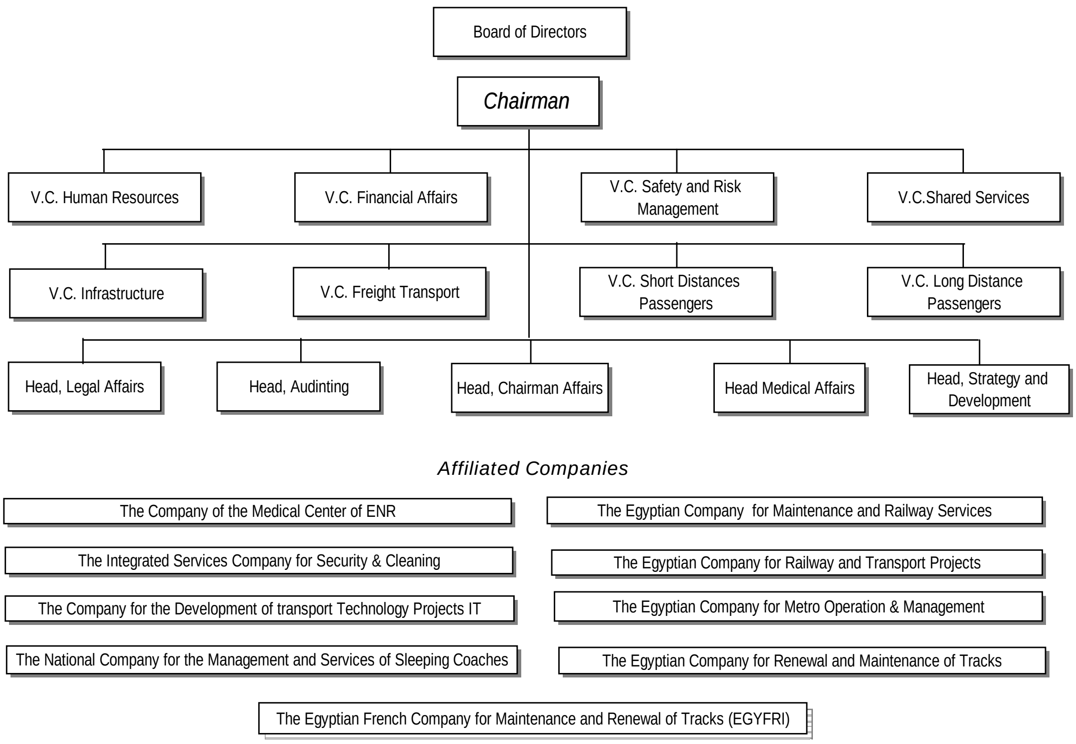


Figure 2.3.1 New Organization Chart of Egyptian National Railway since 2007

Law 152/1980 has enabled the Authority to establish eight affiliated companies to improve its performance. These companies are:

1) The Company of the Medical Center of ENR

2) The Egyptian Company for Maintenance and Railway Services

3) The Integrated Services Company for Security & Cleaning

4) The Egyptian company for Railway and Transport Projects.

5) The Company for the Development of Transport Technology Projects IT

6) The Egyptian Company for Metro Operation & Management

7) The National Company for the Management and Services of Sleeping Coaches.

8) The Egyptian Company for Renewal and Maintenance of tracks.

9) The Egyptian French Company for Maintenance and renewal of Tracks (EGYFRI)

ENR has a history of serious accidents that are attributed to poor maintenance of the rolling stock, outdated signalling system and overcrowded passenger cars. The issues facing the current Safety Department of ENR are:

- Lack of formal and structured safety organization.

- Absence of key safety management systems.

- No effective compilation of statistical safety performance data.

- Low enforcement of safety rules/ policies.

- Lack of power conferred to safety related employees and safety inspectors.

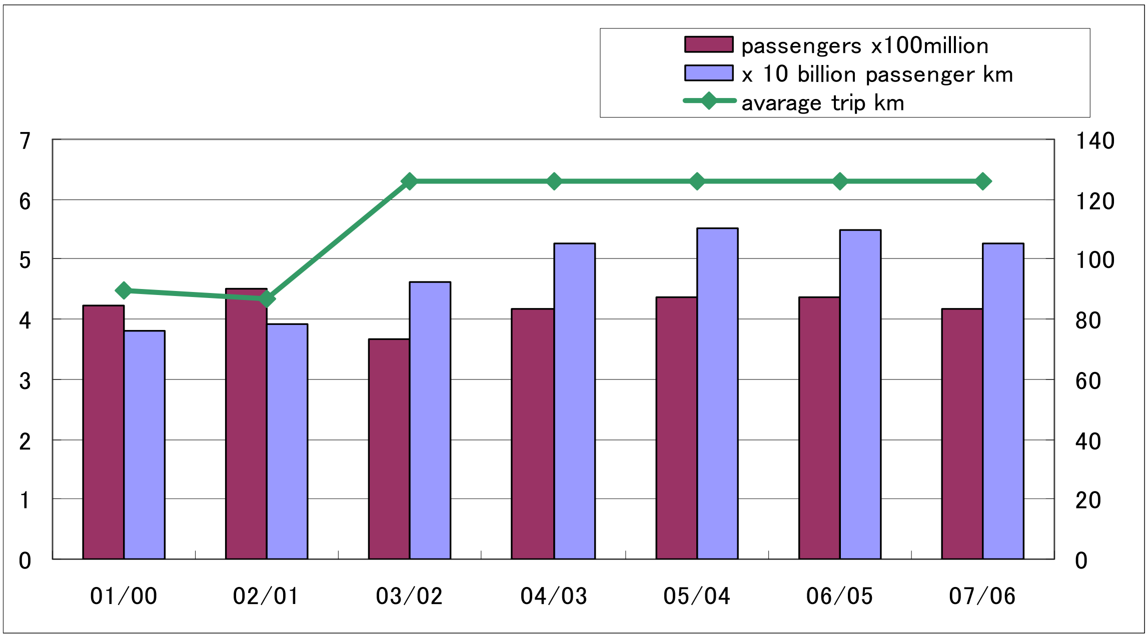
- Ineffective allocation and shortage of safety leadership and qualified skills.

To improve these safety issues, the EC has supported a twinning programme titled: "Assistance to the Egyptian Ministry of Transport for reforming Railway Safety Regulations, Procedures and Practices".

2.4. TRANSPORT ACTIVITY

2.4.1. Passenger Transportation

Figure 2.4.1 shows the trend of annual passenger ridership. The number of passengers has not changed much but passenger KM has increased since 2001/2002. Therefore, average trip length has been increasing since 2002/2003. The average trip length in year 2006/2007 was 126 km. It appears that ENR serves long trips more than commuting trips.[2]

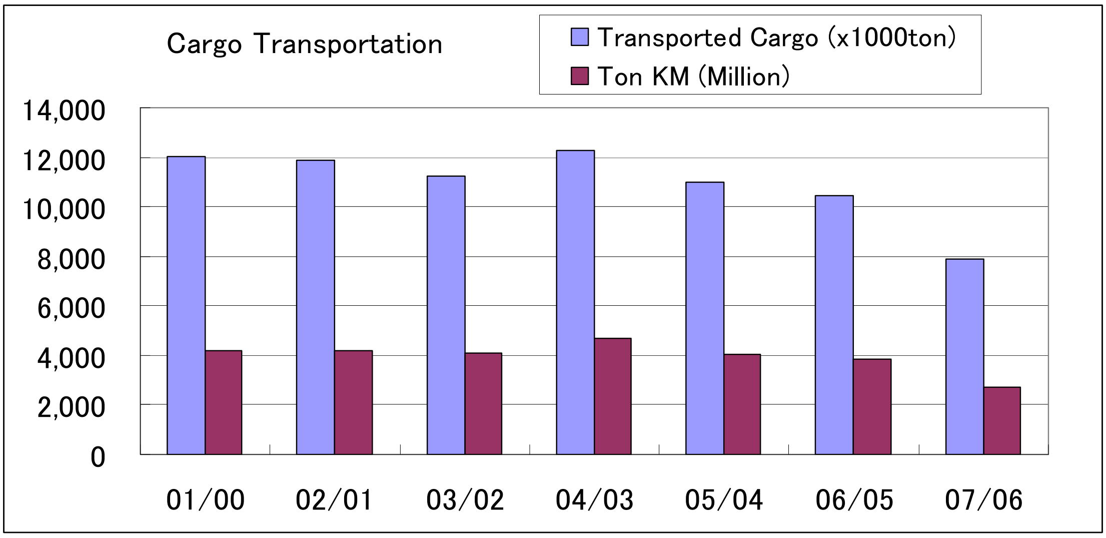


Source Statistical Year Book 2009

Figure 2.4.1 Transition of Passenger Transportation

2.4.2. Freight Transportation

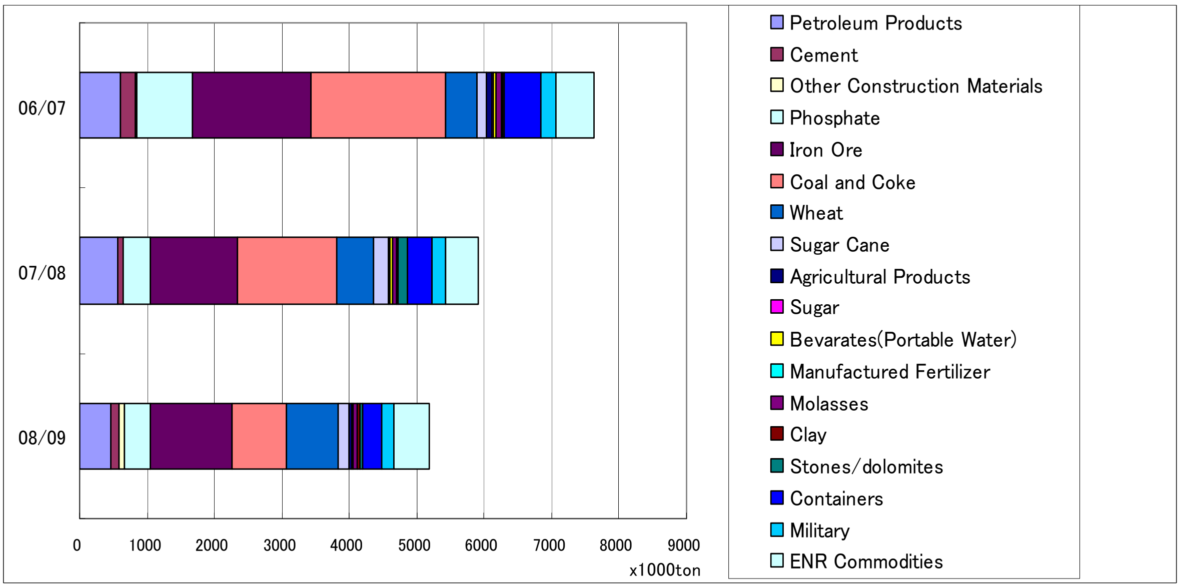
Figure 2.4.2 shows the transition of freight transportation. Volume of transported Cargo has decreased since year 2004/2003 and in year 2007/2006 total volume of cargo and ton KM decreased to almost 2/3 of year 2004/2003.



Source: Statistical Year Book 2009

Figure 2.4.2 Transition of Freight Transportation

Figure 2.4.3 shows the breakdown of commodities. Most of the commodities are primary products such as coal, minerals, cereals, etc. In year 2007/2008, transportation volume was drastically reduced from the previous year except for cereals. In year 2008/2009 it recovered slightly but still remained very small comparing with 2006/2007.



Source: Statistical Year Book 2009

Figure 2.4.3 Commodities of Railway Freight

2.4.3. Uses' Opinions

2.4.3.1 Passenger Transport

(1) General

In the masterplan study for Egyptian National Railway conducted in 1995-1996 with the support of JICA, ENR user opinion surveys were conducted. As the resultant report is very interesting and useful to this masterplan study, one part is summarized below.

(2) Characteristics of comments

1) General

Generally, since the interviews were carried out in terms of "the passengers' free comments on the railway services" on board (within the coach of the train), the dominant comments were naturally related to "Railway services (especially coaches)" and "Train Operation".

And, since the questions about the "fare" were already included in the other questioning items, there are not many comments related to "Fare".

2) Dominant comments

a. Related to Coach
As for "Coach", regardless of the line category and service class, the following comments were dominant;

- Improve service (To maintain in general)
- More cleaning
- Improve toilets
- Improve doors

3) Line category-wise characteristics

a. On the main line, there were several passengers who had comments such as "Good Service (Reasonable) in general", but in the branch lines few passengers had such comments.

b. A higher percentage of branch line comments were related to the "Train Operation" compared to main line passengers. This is especially true for the comments of "Punctuality", "More trains" and "More coaches". This suggests that the current branch line operations do not satisfy the needs of railway passengers.

c. Comments Related to Coaches

- The comments "Improve windows", "Improve seals" and "Improve lights" were more common on branch lines than on main lines. This suggests that the service level on branch lines is worse than on main lines.

- On the main line, the comments of "Improve quality of food sold in coaches" and "Food prices sold in coaches are too expensive" are notable (Food sales are only for First A/C and Second A/C on the main line)

- The comments of "Isolate smokers" were found on main lines, but not on branch lines.

- The comments of "Medical care" were mainly found on main lines.

d. Comments Related to Train Operation

- As mentioned above, ("Punctuality", "More trains" and "More coaches") were comments more frequent from branch line passengers than from main passengers.

- Other common comments on branch lines were "Adjust the train schedule to meet passengers' needs", "Reduce waiting time for passing trains", "Double tracks", and "Faster trains".

- This highlights the problems of the branch line train operations, and suggests that the passengers of branch lines want a train operation service similar to that on the main line.

4) Main Line Characteristics (by line and direction)

a. Cairo – Alexandria Line
In the Cairo – Alexandria Line, more passengers give the comment "Good service (Reasonable) in general" than on the other main lines.

b. Cairo – Aswan Line
More passengers on the Cairo – Aswan Line request "To improve windows", "To improve toilets", "To improve water supply", and "Medical care" than on the other main lines. This probably reflects the characteristics of long distance train operation on this line.

5) Characteristics by class

The following comments by service class were made on both the main and branch lines :

The percentage of passengers reporting "Good service (reasonable) in general" was generally lower in the lower classes of service (i.e. third class). The passengers requesting "To improve service (To maintain in general)" increased at lower service classes.

The percentage requesting "More cleaning" and "To improve windows/seats/doors/light/toilets", increased at lower service classes.

Also, "the percentage requesting "To follow the schedule (punctuality)", "More trains" and "More coaches", increased at lower service classes.

These observations suggest that regardless of the line category of the main line and branch line, the railway passengers of Second class and Third class have strong needs for basic improvement of the general service level (coaches and train operation).

The comments "To isolate smokers", "More telephones" and "To improve quality of foods sold in coaches" are more common in First class and Second A/C class. These comments indicate that basic needs are met, but higher service levels are requested.

This suggests that different service improvements are required for passengers of First class and Second A/C Class, if ENR wants to attract more passengers.

2.4.3.2 Railway Freight Customers' Opinion for Railway Freight Service

(1) General

This section covers the opinions of railway freight customers. The Study Team interviewed several railway freight customers to obtain information about freight marketing. Due to the limited survey time, a limited number of customers were interviewed. The following is a summary of interview results.

(2)Interview results

1) Need for more suitable freight wagons

Sometimes, the freight wagons arranged for a customer were not suitable for the customer's specific needs. And although ENR has some specialized wagons for specialized commodities, there are not enough of these wagons, so not enough wagons are provided to customers.

Fortunately, interviewed customers have the opinion that if there are more suitable wagons, then they will be willing to order more fright services from the railway. This suggests that when ENR can provide proper service to freight customers, ENR can attract more freight volume.

2) Need for enough freight train operations

Some customers complain about not enough freight train operations due to a lack of locomotives. When there is no locomotive available, wagons with commodities cannot start from the customer point to the destination. As a result, the customer must ship via truck.

These customers suggest that if ENR arranges more trains in accordance with customer needs, customers will increase their railway freight volume. According to the interviews, railway transport is preferable for large volume transport.

3) Need for more cleaning of freight wagons

Sometimes, the interviewed customers found nails on the floor of the wagon provided. So packages of commodities were sometimes damaged or cut.

To prevent damage to packages, there should be more cleaning of wagons. Customers need good quality wagons.

4) Need to arrange wagons in accordance with customer schedules

The nature of some commodities requires that they be distributed in accordance with the end user's required schedule. However, sometimes the freight train is not on schedule. As a result, the delayed commodities do not satisfy the end user's need. The end user complains to the supplier and may change to a more reliable supplier. This change of supplier can mean a switch to truck transport. This situation reduces railway freight volume.

To prevent a decrease of railway freight volume, ENR must provide freight wagons to customers on time.

Source Study Team based on ENR data

2.5. RAILWAY SYSTEM

2.5.1. Track and Structure

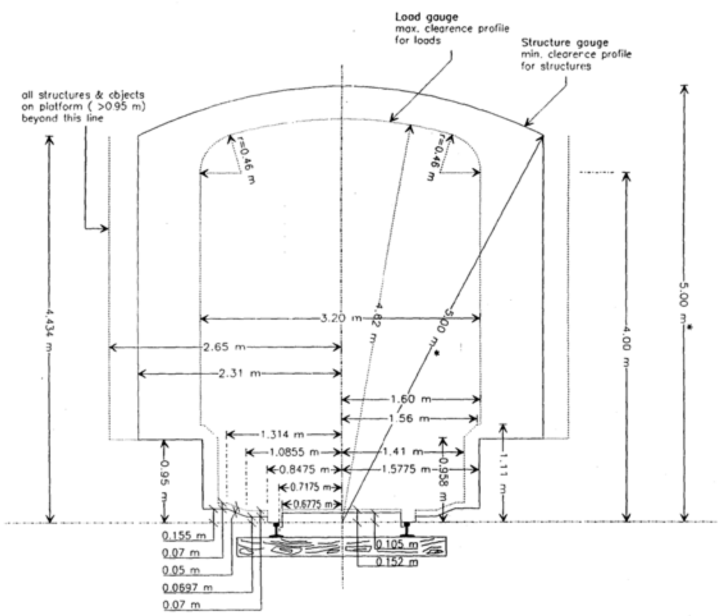
Main standards for track construction are as follows.

Track gauge: 1,435 mm

Minimum radius of curve:	500m	(V<100km/h)
	600m	(V=100km/h)
	850m	(V=120km/h)
	1350m	(V=140km/h) (daily load of freight > 60,000 ton)
	1150m	(V=140km/h) (daily load of freight < 60,000 ton)
Maximum gradient	1.25 %	
Maximum gradient at station	0.25 %	

Following figures show structure gauge and load gauge (rolling stock gauge) of ENR. Figure 2.5.1 is for single track and Figure 2.5.2 is for double track.

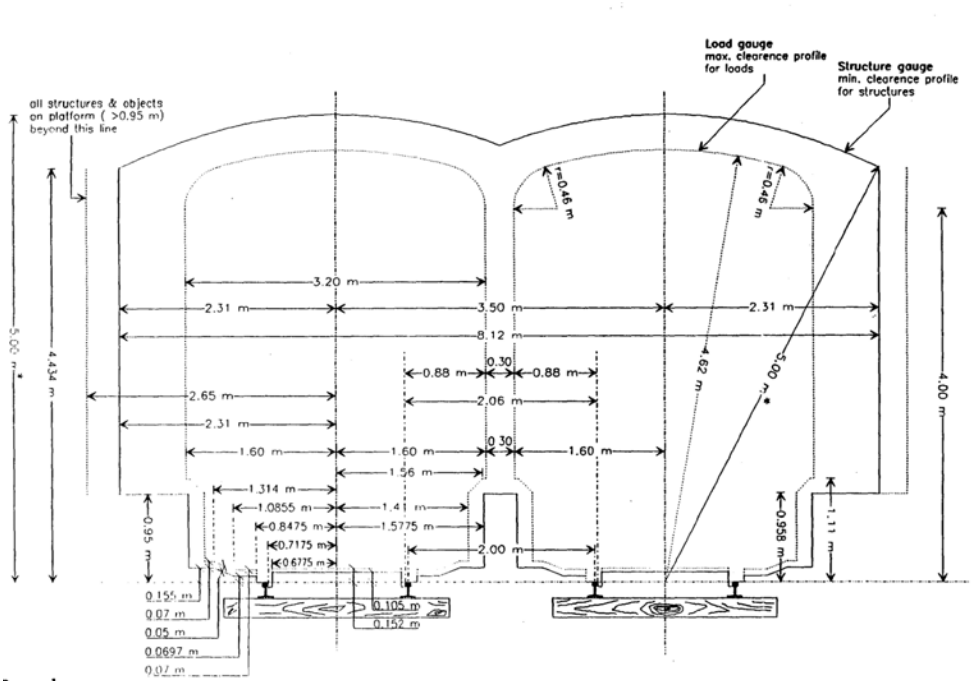
Track gauge is standard gauge (1435mm) and the platforms are not low platforms like many European countries adopt but are elevated platforms like in the UK. Height of the platform is 950mm from the top of rail.



Source ENR

Figure 2.5.1 Structure Gauge and Load Gauge (Single Track)

In double track, the distance between track centres is 3.5 m and clearance between load gauge is 0.3 m[3]. This is rather small and might cause a problem when higher speed is required.



Source ENR

Figure 2.5.2 Structure Gauge and Load Gauge (Double Track)

Lines are classified into three levels according to the maximum speed and track structure. The following figure indicates the classes per line. Density of the sleepers and wear limit is different depending on the class of the line.

[3] *In conventional railway of JR standard distance between track centres is 3.8m and minimum clearance between rolling stock gauge is 600mm.*

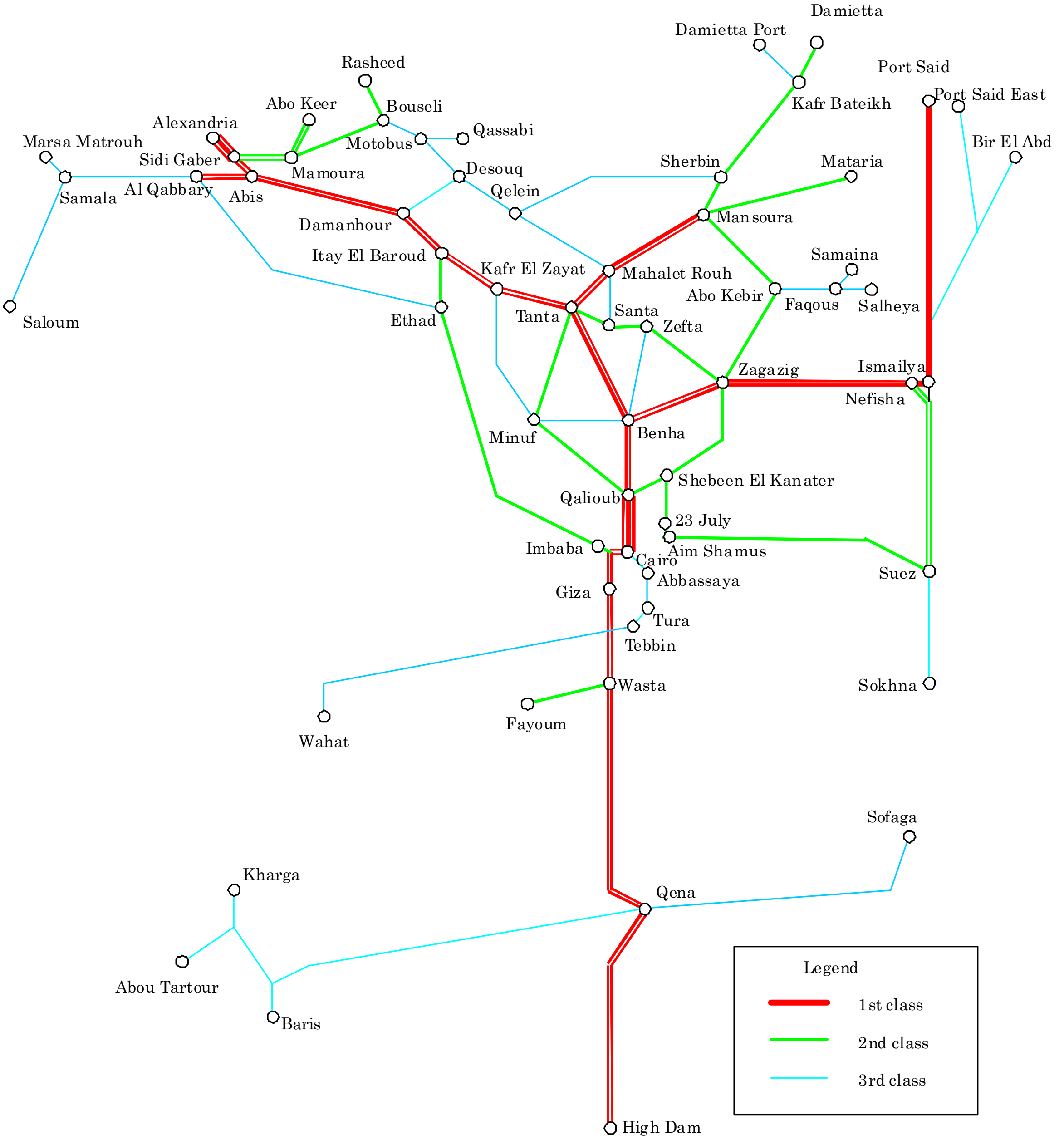


Figure 2.5.3 Class of Line

2.5.2. Rolling Stock

Trains are operated with concentrated traction systems. Total number of locomotives is 821. Total number of passenger coaches is 3,808 and total number of freight wagons is 11,876.

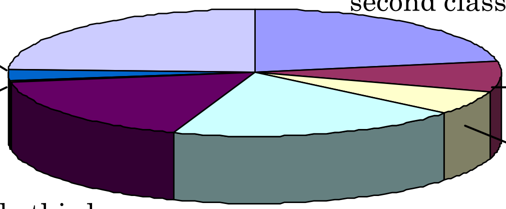
Table 2.5.1 shows the types of locomotives.

Table 2.5.1 Types of Locomotives

Locomotive type.	Outline.
Type-EMD 	OUTPUT :3000HP Maximum speed :120km/h Axle arrangement : C_0-C_0 Manufacturer : EMD (US) For mainline and some local train.
Type-GM 	OUTPUT :4000HP Maximum speed :120km/h Axle arrangement : C_0-C_0 Manufacturer : GM (US) For Long-distance and freight.
Type-Henchel 	OUTPUT :2500HP Maximum speed :120km/h Axle arrangement : C_0-C_0 Manufacturer :Henhcel (W.Germany), Canada For General use. Known by the local name "Beetle", the Locomotive in which only the body was made in Canada is also contained in this.
Type-Adtranz 	OUTPUT :2300HP Maximum speed :120km/h Axle arrangement : C_0-C_0 Manufacturer : Adtranz (Germany) For passenger trains and freight
. Type-Canadian 	OUTPUT :1500HP Maximum speed :120km/h Axle arrangement : B_0-B_0 Manufacturer :More than one maker.(US and Canada) For operation of a local train and the freight train of about ten cars.
Type-Alstom 	OUTPUT :1000HP Maximum speed : 80km/h Manufacturer :Alstom(France) Axle arrangement : B_0-B_0 For switching yard

Source Study Team based on ENR data

Figure 2.5.4 shows the breakdown of passenger coaches and Figure 2.5.5 shows the breakdown of freight wagons.



Source Study Team based on ENR data

Figure.2.5.4 Breakdown of Passenger Coaches

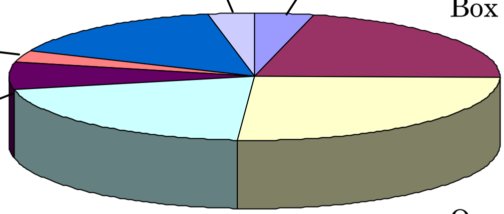


Figure 2.5.5 Breakdown of Freight Wagons

Long distance trains consist of more than 10 coaches. Maximum length of a passenger train is 16 cars including locomotive and power car.

Short distance trains consist of 6 coaches. In suburbs of Cairo and Alexandria the drivers cab is installed in the end car and push-pull operation is conducted.

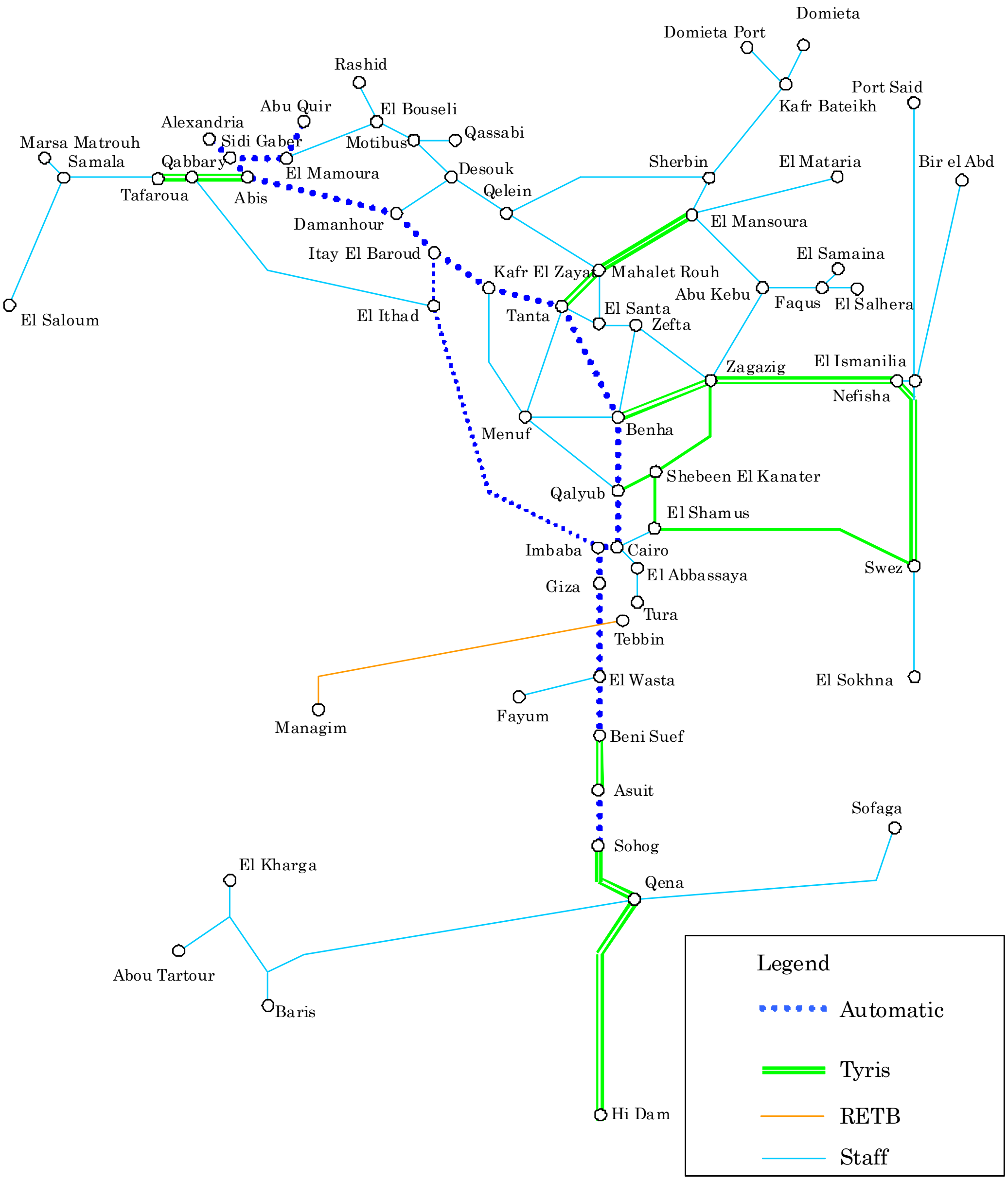
Maximum length of a freight train is 640m. Where there is a gradient in the line two locomotives are coupled in one train, one at the front and the other at the back.

Figure 2.5.6 Passenger Car with Drivers Cab (Alexandria)

2.5.3. Signalling System

The following figure shows the signalling system of ENR. Cairo to Alexandria and a few other lines are equipped with automatic signals but most of the lines are still manually operated.

Tyris is adopted in the double track sections. This system has no token for blocking but is equipped with blocking instruments which are electrically interlocked with those of adjacent cabins.



Rail Lines with Electrical Signalling	585 Km
Rail Lines with Mechanical Signalling	4,545 Km
Total Length	5,130 Km

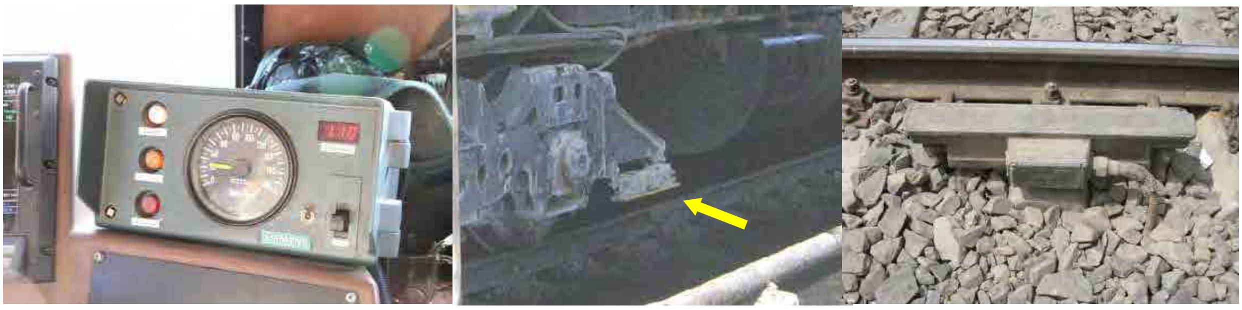
Source Study Team based on ENR data

Figure 2.5.7 Signalling Systems

Automatic Train Control System (ATC):

Onboard equipment for the signalling system is installed in the locomotive running in the automatic section. A coupling coil is installed on the side of the locomotive and it will detect the signal aspect, and speed restriction location by passing above a track coil installed wayside.

When a driver does not implement suitable action regarding the signal aspect or speed restriction, the brakes will be automatically applied.



Cab Onboard Wayside coil

Figure 2.5.8 ATC System

2.5.4. Workshops and Depot

ENR has 11 workshops in the country for maintenance of rolling stock. The study team visited five workshops at:

Farz Workshop (Cairo),

Hadra Workshop (Alexandria),

Qabbary Workshop (Alexandria),

Luxor Workshop, and

Aswan Workshop.

Figure 2.5.9 Inspection Track of Workshop

Conditions of the workshops are different General observations of workshops are as follows.

- Hard hats and protective shoes are not worn by every worker.
- Inside the working area the ground and pits are stained with oil.
- Maintenance facilities are out of date.

2.5.5. Other facilities

ENR has about 700 railway stations in total for both passenger and cargo transport throughout the country.

There are 1261 level crossings. A total of 333 crossings are provided with an electrical signalling system.

There are 511 bridges on the Nile and water ways, 58 bridges over the railway for cars, 137 tunnels for cars and pedestrians and 179 bridges over the railway for pedestrians.

2.6. TRAIN OPERATION

Several classes of trains are operated for passenger trains: air conditioned trains with 1st and 2nd class, luxurious trains with compartments, sleeping trains, ordinary trains with no air conditioning and mixed trains. High class trains that are fully air conditioned are operated only between Alexandria, Cairo and Aswan. Sleeping cars are operated between Cairo and Aswan. Most of the trains of other lines are not air conditioned.

There are 40 trains operated from Cairo to Alexandria per direction and 24 trains are first class or second class with air-conditioning. The fastest train runs between Cairo and Alexandra in 2 hours and 25 minutes only stopping at Sidi Gabar. Scheduled speed (average speed including dwell time) is 86km/hr.

Maximum design speed for this line is 140km/h however actual maximum speed is 120km/h and it is enough to achieve this travel time.

Actual run curve for the express train of this line traced by GPS logger is indicated in figure APP 3.1 and figure APP 3.2 of the Appendix.

There are trains from Cairo to Port Said branching from Benha and trains from Cairo to Domietta branching from Tanta sharing the Cairo to Alexandria corridor.

In the Cairo to Aswan Corridor, there are 17 trains running between Cairo and Aswan including 3 trains with sleepers. Most of them are running at night. The fastest train between Cairo and Aswan runs in 12 hours and 35 minutes. Scheduled speed is 69.8km/h. Trains in the daytime are terminated at Minya, Asuit, Sohag or Luxor. Train speed between Cairo and Asuit is rather faster than in the opposite direction. Scheduled speed between Cairo and Asuit is more than 90 km/h. There are through operation trains between Alexandra and Aswan, and Alexandra and Luxor as well. The train from Alexandra runs more than 1100km in 16 hours and 40 minutes.

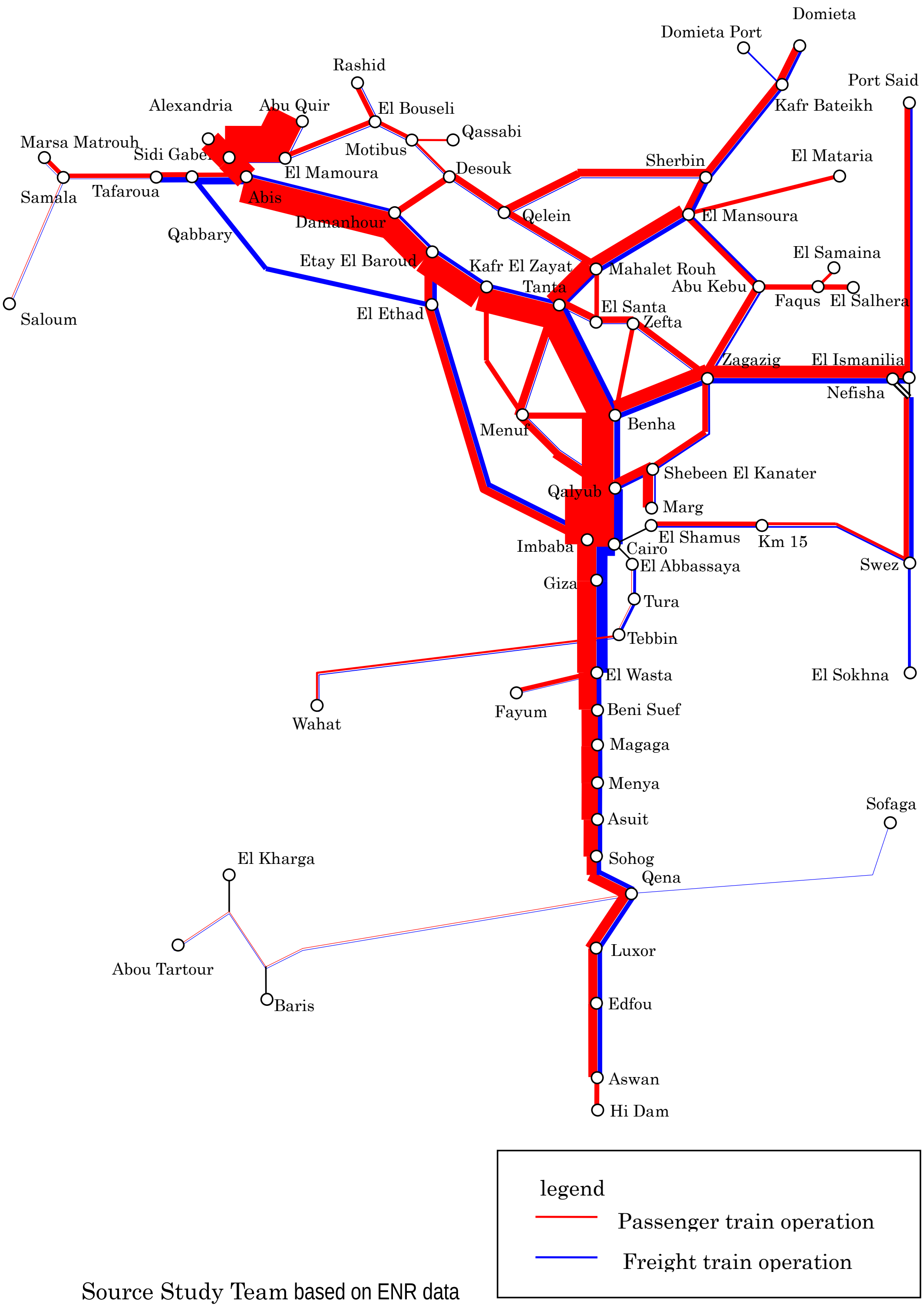
Night time passenger trains are only operated in the Cairo to Aswan corridor.

Diagrams of passenger trains for each line are indicated in figure APP 2.1 to APP 2.26 of the Appendix.

The schedules of passenger trains are fixed but the schedules of freight trains and non revenue trains include track work vehicles are varied every day so the train diagram is made every day by handwriting. In case of train delay, staff has to fix the diagram by handwriting and it requires a great deal of experience for this work.

The following figure indicates the number of trains in operation for each line.

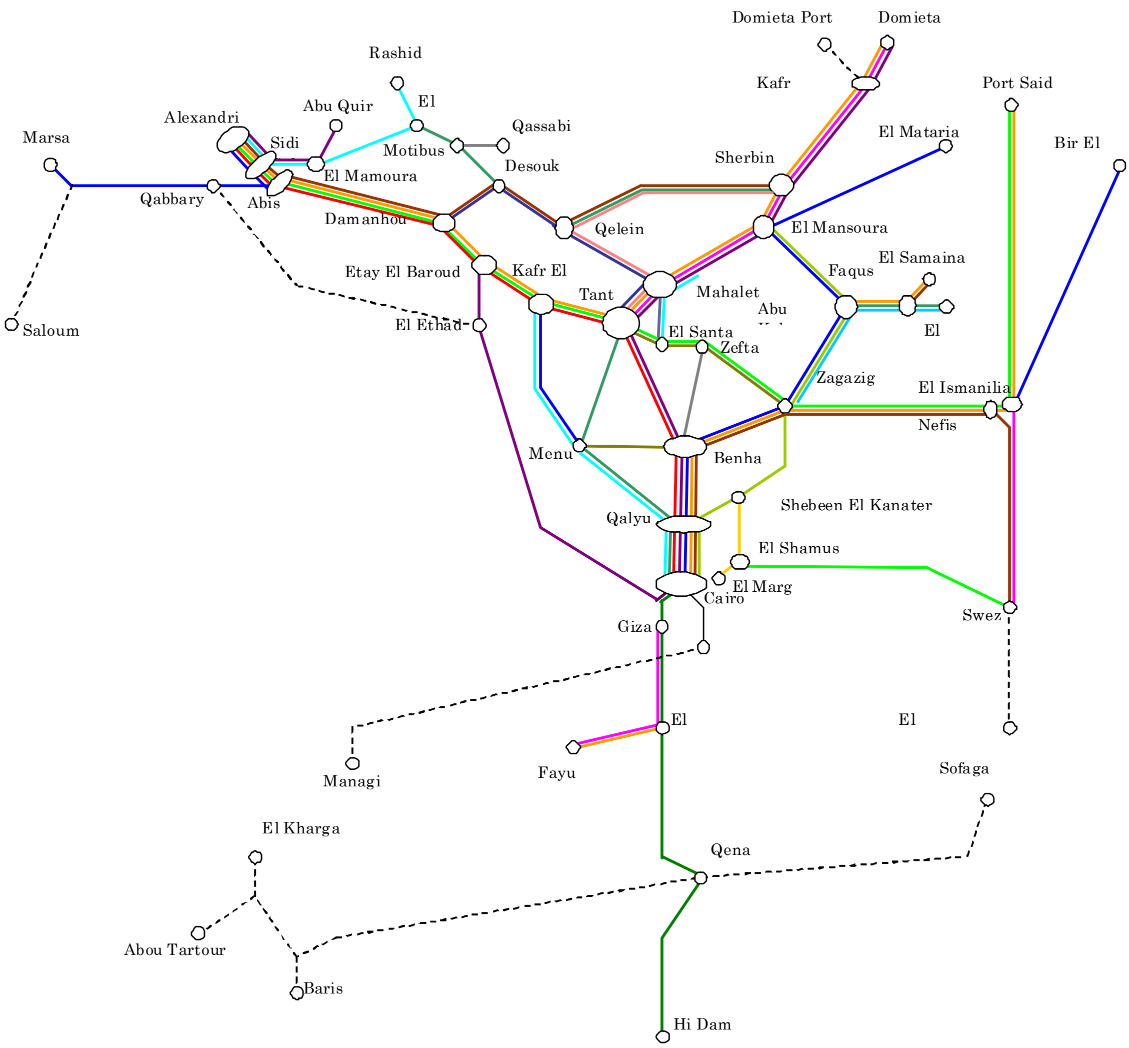
The red line indicates passenger trains and the blue line indicates freight trains. The width of the line is proportional to the number of trains. Many trains are operated between Cairo and Alexandria and in the suburban areas of Cairo and Alexandria.



Source Study Team based on ENR data

Figure 2.6.1 Trains per Each Line

Figure 2.6.2 shows routes of trains. Train routes are not simple in the delta area but it may be convenient for passengers if they can travel directly to their destinations without changing trains.



Source Study Team based on ENR data

Figure 2.6.2 Route Map of Train Service

2.7. Financial Matters

2.7.1. Financial Conditions

The fiscal year 2007/2008, revenues were EL1,467 million which consist of EL1,117 million by passengers transportation, EL149 million by freight transportation, and EL201 million by others.

On the other hand, total operation costs were EL1,408 million which are EL877 million as wage cost, EL384 million as commodity cost, and EL147 million as service cost. Consequently, total profit was EL59 million.

If depreciation of EL471 million and other cost of EL39 million are added to the above costs, total profit became EL–451million. In other words, total loss was EL451 million.

As total track length is 9540km average operation cost for 1 km is about EL15,000.

Table 2.7.1 Approved ENR Budget for 2008/2009 (ENR)

(EL Million)

Item	Actual		Approval 2008/ 2009	Details of Approval 2008/2009					
	2006/ 2007	2007/ 2008		Freight	Short Distance Train	Long Distance Train	Infra-structure	Shared Service	Center
Passenger Revenue	696.2	1,116.8	1689.0		924.8	764.2			
Freight Revenue	143.9	149.1	200.0	200.0					
Share & Food and Sleeping	21.0	28.2	20.0					20.0	
Various	180.8	172.6	230.1					230.1	
Total Revenues (a)	1,041.9	1,466.8	2,139.1	200.0	924.8	764.2	0.0	250.1	0.0
Operation Cost Wages	786.5	877.0	947.0	75.2	112.6	144.6	247.3	101.8	265.5
Commodity Cost	372.0	384.1	509.0	73.8	101.8	150.7	75.7	32.2	74.8
Services Cost	138.8	147.0	201.8	16.3	8.0	22.8	67.8	4.3	82.5
Total Operation Cost (b)	1,297.3	1,408.1	1,657.7	165.4	222.4	318.1	390.8	138.3	422.7
Total Profit & Previous Deficit (a-b)	-255.3	58.7	481.3	34.6	702.4	446.1	-390.8	111.8	-422.7
(Depreciation)	503.3	470.9	552.0	185.6	53.6	69.2	230.4	5.6	7.5
(Other Cost)	67.6	39.1	45.0	0.0	0.0	0.0	0.0		45.0
Total Profit or Deficit	-826.2	-451.3	-115.7	-151.0	648.7	376.9	-621.2	106.1	-475.2
(Interests)	271.0	30.3	1,117.8						1,117.8
(Taxes)	0.1	0.2	0.2						0.2
Net Profit or Deficit	-1,097.3	-481.8	-1,233.6	-151.0	648.7	376.9	-621.2	106.1	-1593.2

Source: ENR

2.7.2. Tariff

Although there is no distinct pricing principle for passengers and freight, current pricing of ENR seems to be based on the following three principles which are common to passengers and freight.

(1) Full cost recovery principle: the tariff level is set so that total revenue from passengers and freight will recover total costs of passengers and freight.

(2) What the traffic will bear principle: Tariff will be deecided by payment ability of passengers

(3) Discounts for distance: Tariff for long distance is cheaper per km than short distance travel.

Table 2.7.2 and Table 2.7.3 indicate passenger fares on express trains between Cairo and Alexandria and between Cairo and Aswan.

Table 2.7.2 Fare Table from Cairo to Lower Egypt

Central Administration for Marketing, Sales and Customer Services
Tarrif of Passenger Travel Wages starting from 1/4/2009
From Cairo to some stations of lower Egypt

Stations	Distance	Spanish		French		Second
		First Class	Second Class	First Class	Second Class	Special
Banha	45	20.00	13.00	12.00	7.00	3.00
Quesna	57	21.00	14.00	14.00	9.00	4.00
Berkat Alsabaa	68	22.00	15.00	17.00	9.00	4.00
Tanta	86	23.00	18.00	18.00	10.00	5.00
Etay Al-barood	122	30.00	18.00	23.00	13.00	6.00
Damanhour	147	33.00	20.00	26.00	15.00	7.00
Kafr El-Dawar	182	38.00	22.00	33.00	18.00	9.00
Sidi Gaber	203	41.00	29.00	35.00	19.00	10.00
Alexandria	208	41.00	29.00	35.00	19.00	10.00
Al-Amreya	230	44.00	25.00	38.00	20.00	11.00
Al-Hmam	275	51.00	29.00	44.00	25.00	13.00
Al-Amid	295	53.00	30.00	48.00	26.00	14.00
Al-Alameen	319	56.00	32.00	50.00	27.00	14.00
Marsa Matrouh	503	74.00	40.00	67.00	34.00	20.00
Menya El-Qamh	63	21.00	14.00	15.00	9.00	4.00
Zaqaziq	80	23.00	15.00	18.00	10.00	5.00
Ismailia	159	34.00	21.00	29.00	15.00	8.00
Qantara west	191	40.00	22.00	33.00	18.00	9.00
Port Said	237	46.00	27.00	40.00	21.00	11.00
Suez / Benha	245	48.00	27.00	41.00	21.00	12.00
Suez / Robeky	126	30.00	19.00	23.00	14.00	6.00
Al-Mahalla Alkobra	114	29.00	18.00	22.00	13.00	6.00
Samanoud	121	30.00	18.00	23.00	13.00	6.00
Sherbeen	164	35.00	21.00	30.00	17.00	8.00
Mansora	140	33.00	19.00	25.00	14.00	7.00
Kafr Saad	190	38.00	22.00	33.00	18.00	9.00
Damietta	205	41.00	25.00	35.00	19.00	10.00
Desouq	171	37.00	21.00	30.00	17.00	8.00
Kafr Al-Sheikh	149	34.00	20.00	26.00	15.00	7.00
Zefta	79	23.00	15.00	18.00	10.00	4.00
Meit Ghamr	80	23.00	15.00	18.00	10.00	5.00
Alsanta	91	25.00	17.00	20.00	12.00	5.00
Senbellaween	127	30.00	19.00	23.00	14.00	7.00
Ashmoon	45	20.00	13.00	12.00	7.00	3.00
Menouf	65	21.00	14.00	15.00	9.00	4.00
Shebin El-Koum	79	23.00	15.00	18.00	10.00	4.00

Source: ENR

Cairo to Alexandria

Stations		First	Second
Cairo	Tanta	25	18
Tanta	Alexandria	30	20
Cairo	Alexandria	50	35

Table 2.7.3 Fare Table from Cairo to Upper Egypt

Central Administration for Marketing, Sales and Customer Services
Tariff of Passenger Travel Wages starting from 1/4/2009
From Cairo to some stations of upper Egypt

Stations	Distance	Spanish		French		Second Special
		First Class	Second Class	First Class	Second Class	
Giza	13	15.00	10.00	0.00	0.00	2.00
Al-wosta	92	25.00	17.00	0.00	0.00	5.00
Beni Swef	124	30.00	19.00	30.00	19.00	6.00
Fayoum	130	32.00	19.00	0.00	0.00	7.00
Maghagha	180	38.00	22.00	0.00	0.00	9.00
Beni Mazar	198	40.00	25.00	0.00	0.00	10.00
Metay	208	41.00	25.00	0.00	0.00	10.00
Menya	247	48.00	27.00	50.00	30.00	12.00
Meloy	292	52.00	30.00	60.00	34.00	14.00
Derot	313	56.00	32.00	60.00	34.00	14.00
Al-Quoseya	327	58.00	32.00	60.00	34.00	15.00
Manfalout	347	59.00	33.00	60.00	34.00	15.00
Asyut	375	61.00	34.00	60.00	34.00	16.00
Abu Teeg	399	64.00	35.00	70.00	38.00	17.00
Toma	418	66.00	35.00	70.00	38.00	17.00
Tahta	435	67.00	37.00	70.00	38.00	18.00
Sohag	467	69.00	38.00	70.00	38.00	19.00
Gerga	502	74.00	40.00	80.00	41.00	20.00
Nagaa Hamadi	553	78.00	42.00	80.00	46.00	21.00
Deshna	578	80.00	43.00	90.00	54.00	22.00
Qena	609	83.00	44.00	90.00	54.00	22.00
Fakt	629	84.00	44.00	90.00	54.00	23.00
Qous	640	87.00	45.00	90.00	54.00	23.00
Luxor	671	90.00	46.00	90.00	54.00	24.00
Esna	724	94.00	48.00	100.00	62.00	25.00
Edfo	776	99.00	51.00	100.00	62.00	26.00
Klabsha	818	103.00	52.00	110.00	70.00	27.00
Kom ombo	834	104.00	53.00	110.00	70.00	27.00
Drao	842	105.00	53.00	110.00	70.00	27.00
Aswan	879	109.00	55.00	110.00	70.00	28.00
High Dam	895	110.00	55.00	110.00	70.00	29.00

Source ENR

Fare is not proportional to distance but is cheaper if the distance is longer. Highest is First class of Spanish and it is about 4 to 5 times second special fare. It is little bit higher than bus but still one fifth of an air ticket.

Table.2.7.4 indicates the passenger fare for local trains. Fares for local trains have been regulated and set at extremely low levels for social reasons. The fare is less than a half of a special train.

Table 2.7.4 Fare Table for Short Distance Trains

Distance	Third class		Developed	
	Full	Half	Full	Half
10	1	1	1	1
20	1	1	1	1
30	1	1	1.25	1
40	1	1	1.25	1
50	1	1	1.75	1
60	1	1	1.75	1.25
70	1.25	1	2	1.25
80	1.25	1	2.25	1.25
90	1.5	1	2.5	1.5
100	1.75	1	2.75	1.75
110	1.75	1	3	1.75
120	1.75	1	3.25	1.75
130	2	1.25	3.5	2
140	2	1.25	3.75	2
150	2.25	1.25	4	2.25
160	2.25	1.25	4.25	2.25
170	2.25	1.5	4.25	2.25
180	2.5	1.5	4.5	2.5
190	2.75	1.5	4.75	2.75
200	2.75	1.5	5	2.75
210	2.75	1.75	5.25	2.75
220	3	1.75	5.5	3
230	3	1.75	5.75	3
240	3.25	1.75	6	3.25
250	3.25	1.75	6.25	3.25
260	3.25	2	6.25	3.25
270	3.5	2	6.5	3.5
280	3.75	2	6.75	3.75
290	3.75	2	7	3.75
300	3.75	2.25	7.25	3.75
310	4	2.25	7.5	4
320	4	2.25	7.5	4
330	4	2.25	7.75	4
340	4.25	2.25	7.75	4.25
350	4.25	2.25	8	4.25
360	4.25	2.25	8.25	4.25
370	4.25	2.5	8.25	4.25
380	4.5	2.5	8.5	4.5
390	4.5	2.5	8.75	4.5
400	4.75	2.5	8.75	4.75
410	4.75	2.5	9	4.75
420	4.75	2.5	9.25	4.75
430	4.75	2.75	9.25	4.75
440	5	2.75	9.5	5
450	5	2.75	9.5	5
460	5	2.75	9.75	5
470	5.25	2.75	10	5.25
480	5.25	2.75	10	5.25
490	5.25	2.75	10.25	5.25
500	5.5	3	10.25	5.5

Distance	Third class		Developed	
	Full	Half	Full	Half
510	5.5	3	10.5	5.5
520	5.5	3	10.75	5.5
530	5.5	3	10.75	5.5
540	5.75	3	10.75	5.75
550	5.75	3	11	5.75
560	5.75	3	11.25	5.75
570	5.75	3.25	11.25	5.75
580	5.75	3.25	11.25	5.75
590	6	3.25	11.5	6
600	6	3.25	11.5	6
610	6	3.25	11.75	6
620	6.25	3.25	11.75	6.25
630	6.25	3.25	12	6.25
640	6.25	3.25	12	6.25
650	6.25	3.25	12.25	6.25
660	6.25	3.25	12.25	6.25
670	6.5	3.5	12.25	6.5
680	6.5	3.5	12.5	6.5
690	6.5	3.5	12.75	6.5
700	6.5	3.5	12.75	6.5
710	6.75	3.5	12.75	6.75
720	6.75	3.5	13	6.75
730	6.75	3.5	13.25	6.75
740	6.75	3.75	13.25	6.75
750	6.75	3.75	13.25	6.75
760	7	3.75	13.5	7
770	7	3.75	13.5	7
780	7	3.75	13.75	7
790	7.25	3.75	13.75	7.25
800	7.25	3.75	14	7.25
810	7.25	3.75	14	7.25
820	7.25	3.75	14.25	7.25
830	7.25	3.75	14.25	7.25
840	7.25	3.75	14.25	7.25
850	7.5	4	14.5	7.5
860	7.5	4	14.75	7.5
870	7.5	4	14.75	7.5
880	7.75	4	14.75	7.75
890	7.75	4	15	7.75
900	7.75	4	15.25	7.75
910	7.75	4.25	15.25	7.75
920	7.75	4.25	15.25	7.75
930	8	4.25	15.5	8
940	8	4.25	15.5	8
950	8	4.25	15.75	8
960	8.25	4.25	15.75	8.25
970	8.25	4.25	16	8.25
980	8.25	4.25	16	8.25
990	8.25	4.25	16.25	8.25
1000	8.25	4.25	16.25	8.25

Distance	Third class		Developed	
	Full	Half	Full	Half
1010	8.5	4.5	16.5	8.5
1020	8.5	4.5	16.5	8.5
1030	8.5	4.5	16.75	8.5
1040	8.5	4.5	16.75	8.5
1050	8.75	4.5	16.75	8.75
1060	8.75	4.5	17	8.75
1070	8.75	4.5	17.25	8.75
1080	8.75	4.75	17.25	8.75
1090	8.75	4.75	17.25	8.75
1100	9	4.75	17.5	9
1110	9	4.75	17.5	9
1120	9	4.75	17.75	9
1130	9.25	4.75	17.75	9.25
1140	9.25	4.75	18	9.25
1150	9.25	4.75	18	9.25
1160	9.25	4.75	18.25	9.25
1170	9.25	4.75	18.25	9.25
1180	9.5	5	18.5	9.5
1190	9.5	5	18.5	9.5
1200	9.5	5	18.75	9.5
1210	9.5	5	18.75	9.5
1220	9.75	5	18.75	9.75
1230	9.75	5	19	9.75
1240	9.75	5	19.25	9.75
1250	9.75	5.25	19.25	9.75
1260	9.75	5.25	19.25	9.75
1270	10	5.25	19.5	10
1280	10	5.25	19.5	10
1290	10	5.25	19.75	10
1300	10.25	5.25	19.75	10.25
1310	10.25	5.25	20	10.25
1320	10.25	5.25	20	10.25
1330	10.25	5.25	20.25	10.25
1340	10.25	5.25	20.25	10.25
1350	10.5	5.5	20.5	10.5
1360	10.5	5.5	20.5	10.5
1370	10.5	5.5	20.75	10.5
1380	10.5	5.5	20.75	10.5
1390	10.75	5.5	20.75	10.75
1400	10.75	5.5	21	10.75
1410	10.75	5.5	21.25	10.75
1420	10.75	5.75	21.25	10.75
1430	10.75	5.75	21.25	10.75
1440	11	5.75	21.5	11
1450	11	5.75	21.75	11
1460	11	5.75	21.75	11
1470	11.25	5.75	21.75	11.25
1480	11.25	5.75	22	11.25
1490	11.25	5.75	22	11.25
1500	11.25	5.75	22.25	11.25

Source Study Team based on ENR data

CHAPTER 3: ANALYSIS OF RAILWAY TRANSPORTATION

3.1. PASSENGER TRANSPORTATION

3.1.1. Analysis of Current Passenger Transportation

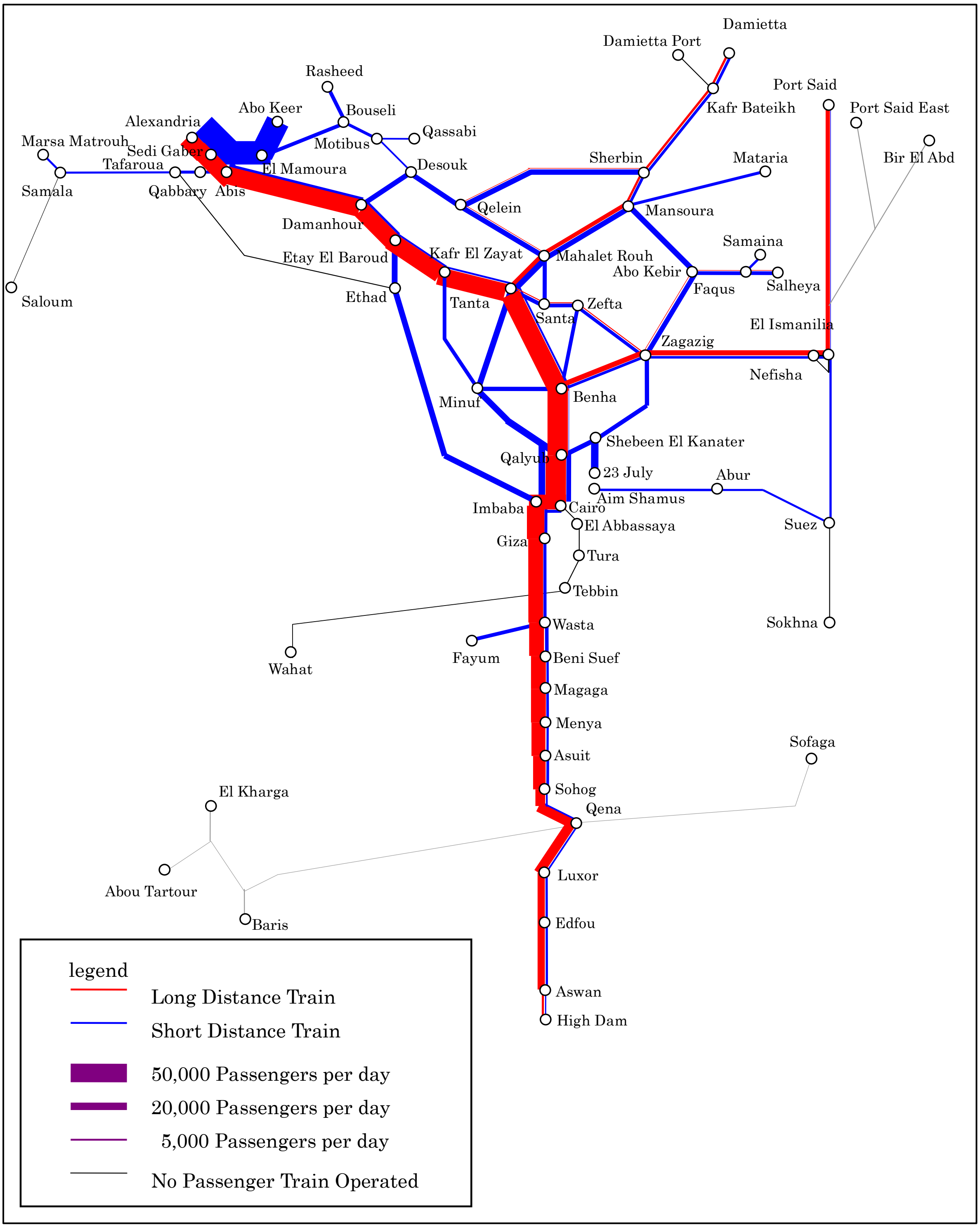
Figure 3.1.1 indicates the actual passenger capacity of each line.

Table 3.1.1 is the base data of Figure 3.1.2. Capacity is calculated by summing passenger capacity of each train running one day for both directions.

Cairo – Alexandria and Cairo – Aswan are considered as major trunk lines and Benha – Ismailya – Port Said and Tanta – Mansoura – Damietta routes follow the above two lines.

To analyze the passenger transportation by railway, actual ridership data is required but not available.

For the reserved tickets there are ticket sales data for January 2009 to December 2009. Ridership of each section was estimated from ticket sales data and is indicated in Figure 3.1.2 to Figure 3.1.5. Indicated ridership is the total for one year.



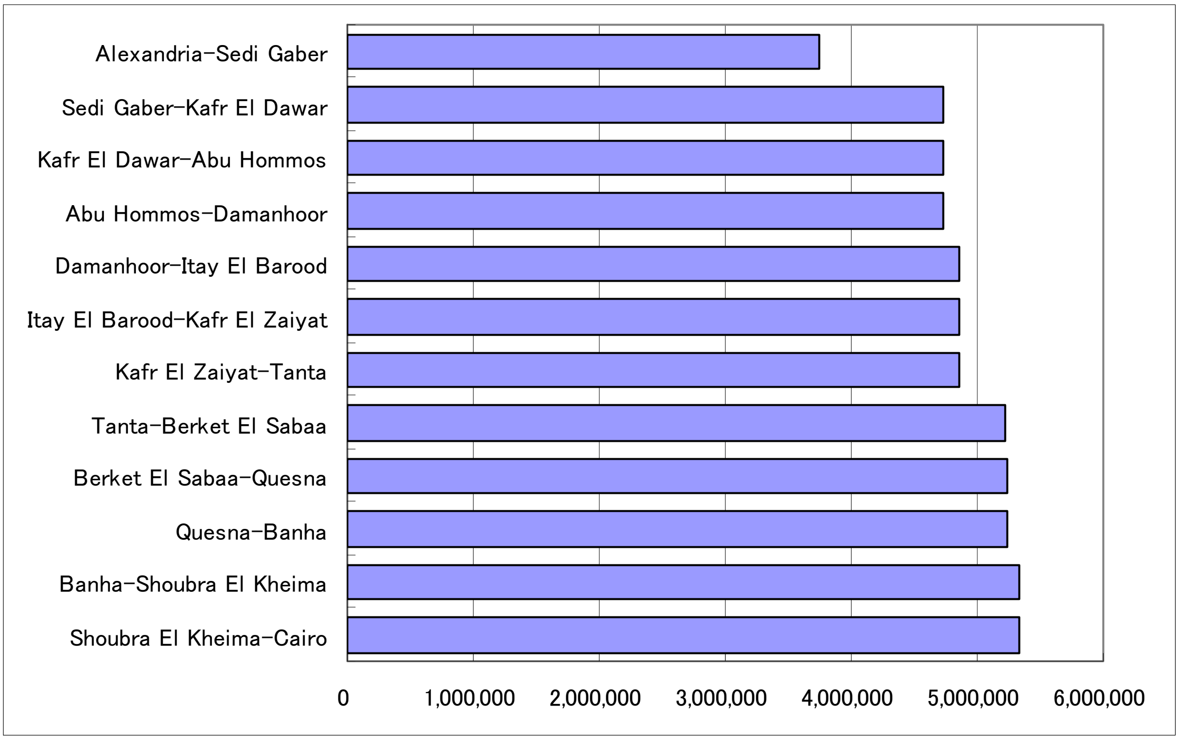
Source Study Team based on ENR data

Figure 3.1.1 Passenger Capacity per Line

Table.3.1.1 Passenger Capacity of the Lines

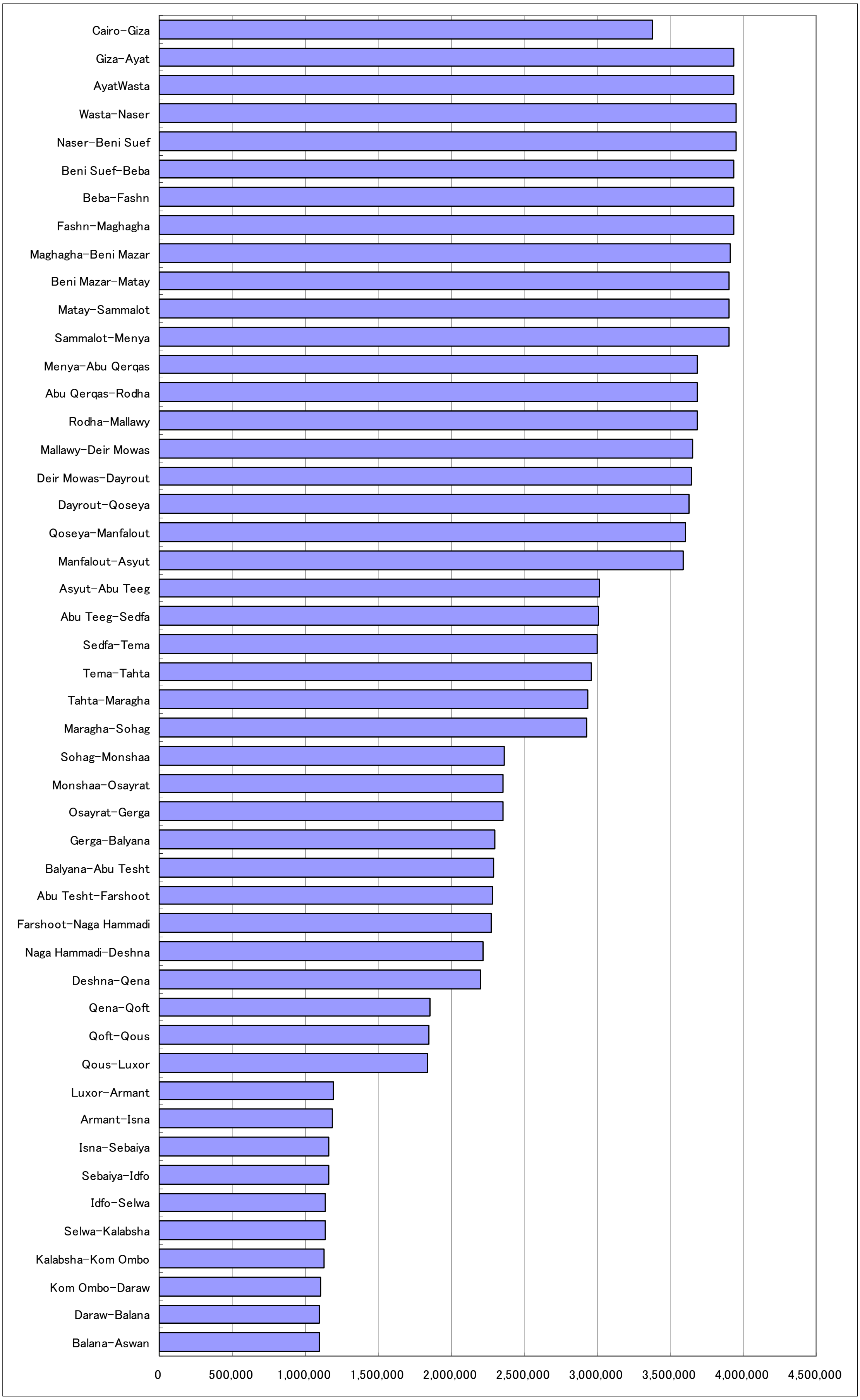
Line	Section	Passenger Capacity		
		Express Train	Local Train	Total
Cairo-Aswan	Cairo-Wasta	40,832	8,208	49,040
	Wasta-Beni Suef	40,832	9,120	49,952
	Beni Suef- Mughagha	40,832	6,384	47,216
	Mughagha-Minya	40,832	7,296	48,128
	Minya-Asyut	38,456	6,384	44,840
	Asyut- Sohag	33,704	7,296	41,000
	Sohag - Luxor	26,056	4,560	30,616
	Luxor - Edfu	19,120	5,472	24,592
	Edfu - Aswan	19,120	5,472	24,592
Aswan-High Dam	Aswan- High Dam	6,360	2,736	9,096
Wastan- Fayum	Wasta - Fayum	-	10,944	10,944
Cairo-Alexandria	Cairo-Qalyub(M.Line)	89,590	1,368	90,958
	Cairo-Qalyub(S.Line)	-	12,768	12,768
	Cairo-Qalyub Menouf Line	-	18,240	18,240
	Qalyub - Benha	55,280	912	56,192
	Benha-Tanta	52,028	4,560	56,588
	Tanta-Etay el-Barud	47,652	4,560	52,212
	Etay el-Barud -Damanhur	47,652	6,384	54,036
	Damanhur-Abis	47,652	7,296	54,948
	Abis-Sidi Gaber	47,652	7,296	54,948
	Sidi Gaber-Alexandria	47,652	6,840	54,492
Manashi	Embaba - Etay el-Barud	-	15,504	15,504
Benha-Port Said	Benha - Zaqaziq	14,292	7,752	22,044
	Zaqaziq - Ismailiya	14,052	6,384	20,436
	Ismailiya - Port Said	11,412	912	12,324
Ain Shams - Suez	Ain Shams - Abur	-	6,384	6,384
	Abur - Suez	-	5,472	5,472
	Farz Suez-Suez	-	5,472	5,472
Ismailiya - Suez	Ismailiya - Suez	-	8,208	8,208
Qalyub - Zaqaziq	Qalyub - Shibeen el-Qanatirr	-	12,768	12,768
	Shibeen el-Qanatir-Zaqaziq	-	11,400	11,400
Zaqaziq - Mansura	Zaqaziq - Abu Kebir	1,200	13,224	14,424
	Abu Kebirr - Mansura	-	15,048	15,048
Tanta - Mansura	Tanta - Muhallet Ruh	3,486	16,872	20,358
	Muhallet Ruh - Mansura	11,576	14,136	25,712
Mansura - Damietta	Mansura - Shirbeen	5,668	7,296	12,964
	Shirbeen - Damietta	5,668	7,296	12,964
Mansoura - El Mataria	Mansura - El Mataria	-	8,208	8,208
Qalyub-Tanta	Qalyub - Qanatir el-Kheiriya New	-	18,240	18,240
	Qanatir el-Kheiriya New - Minuf	-	16,416	16,416
	Minuf -_Tanta	-	15,504	15,504
Tanata-Zagazig	Tanta - Santa	2,400	10,944	13,344
	Santa - Mit Ghamr	2,400	10,032	12,432
	Mit Ghamr-Zaqaziq	2,400	9,120	11,520
Benha - Zifta	Benha - Zifta	-	10,032	10,032
Benha - Minuf	Benha - Minuf	-	11,856	11,856
Minuf - Kafr el-Ziyat	Minuf - Kafr el-Ziyat	-	10,032	10,032
Abu Kebir - Salihiya	Abu Kebir - Salihiya	1,200	10,032	11,232
Faqus - El Sammana	Faqus - El Sammana	-	6,384	6,384
Santa - Muhallet Ruh	Santa - Muhallet Ruh	-	10,944	10,944

Source Study Team based on ENR data



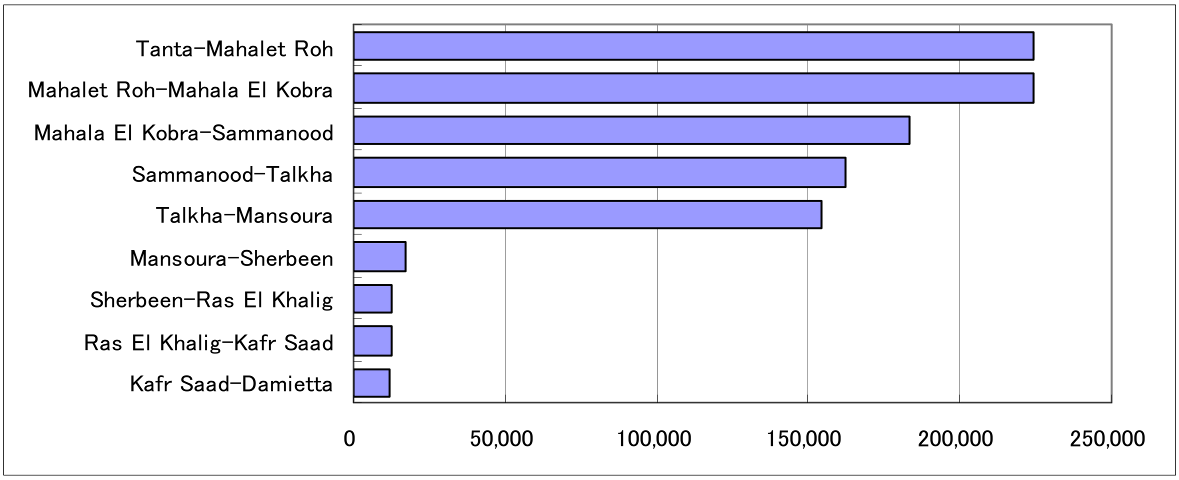
Source Study Team based on ENR data

Figure 3.1.2 Annual Ridership 1 (Alexandria - Cairo)



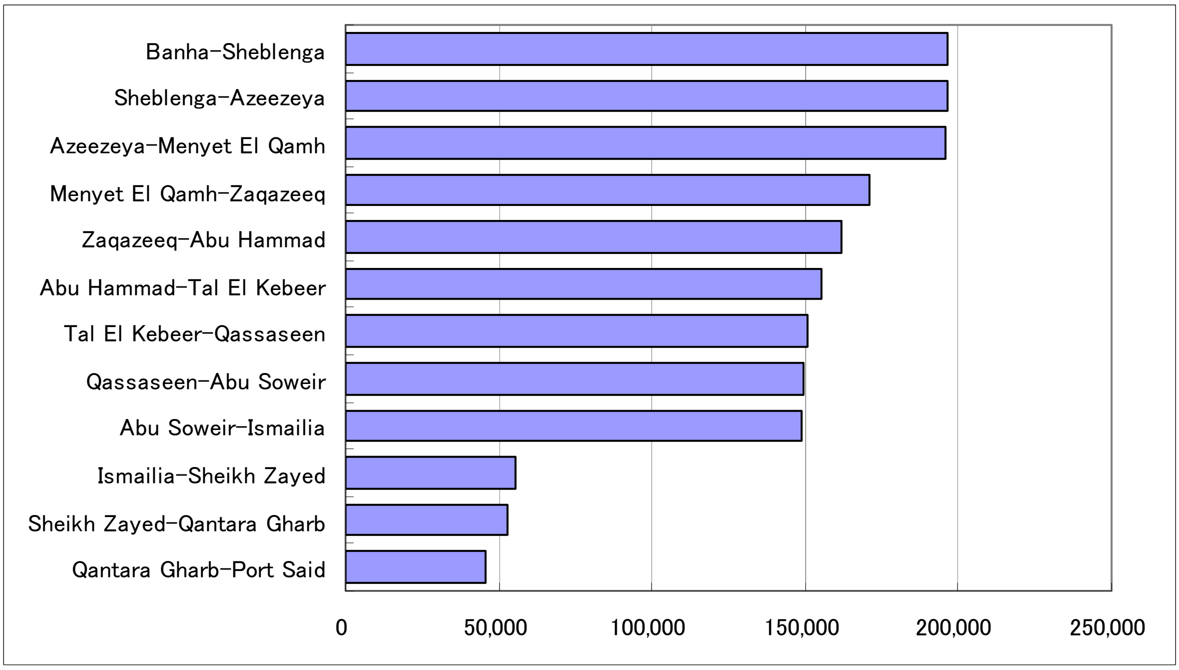
Source Study Team based on ENR data

Figure 3.1.3 Annual Ridership 2 (Cairo-Aswan)



Source Study Team based on ENR data

Figure 31.4 Annual Ridership 3 (Tanta-Mansoura-Domietta)



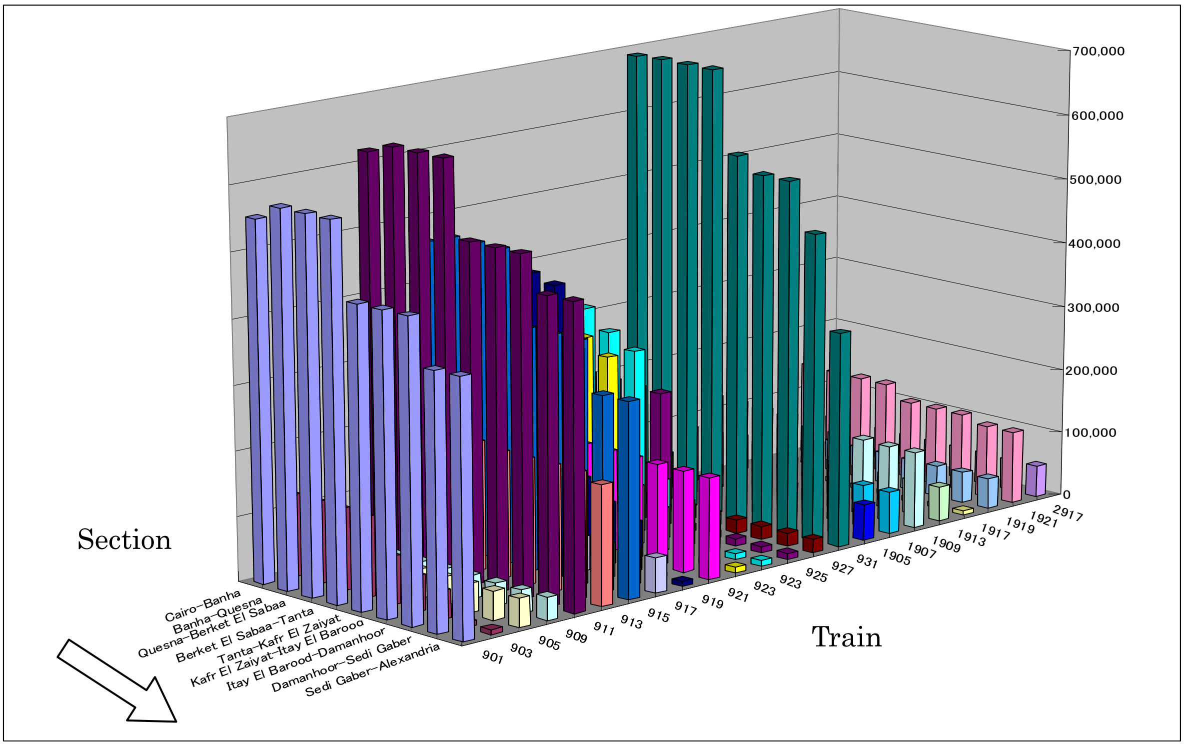
Source Study Team based on ENR data

Figure 3.1.5 Annual Ridership 4 (Benha-Zagazig-Ismailia-Port Said)

In Cairo-Alexandria Line, train capacity per day is about 50,000 passengers. Actual ridership for a year is about 5 million passengers. Average of ridership for one day is about 14,000 passengers and this is about 28% of the capacity. Considering that some of the trains are not operated on week ends, annual capacity is not 365 times daily capacity but the ridership is deemed too small for the capacity.

As for the Cairo – Aswan Corridor, capacity per day at the Giza and Minya section is about 40,000 passengers while annual ridership is about 3.9 million. Percentage of capacity is also about 28%.

Figure 3.1.6 and Figure 3.1.7 show the ridership by train number for the Cairo-Alexandria corridor and Figure 3.1.8 and Figure 3.1.9 show the ridership of the Cairo - Alexandria corridor.

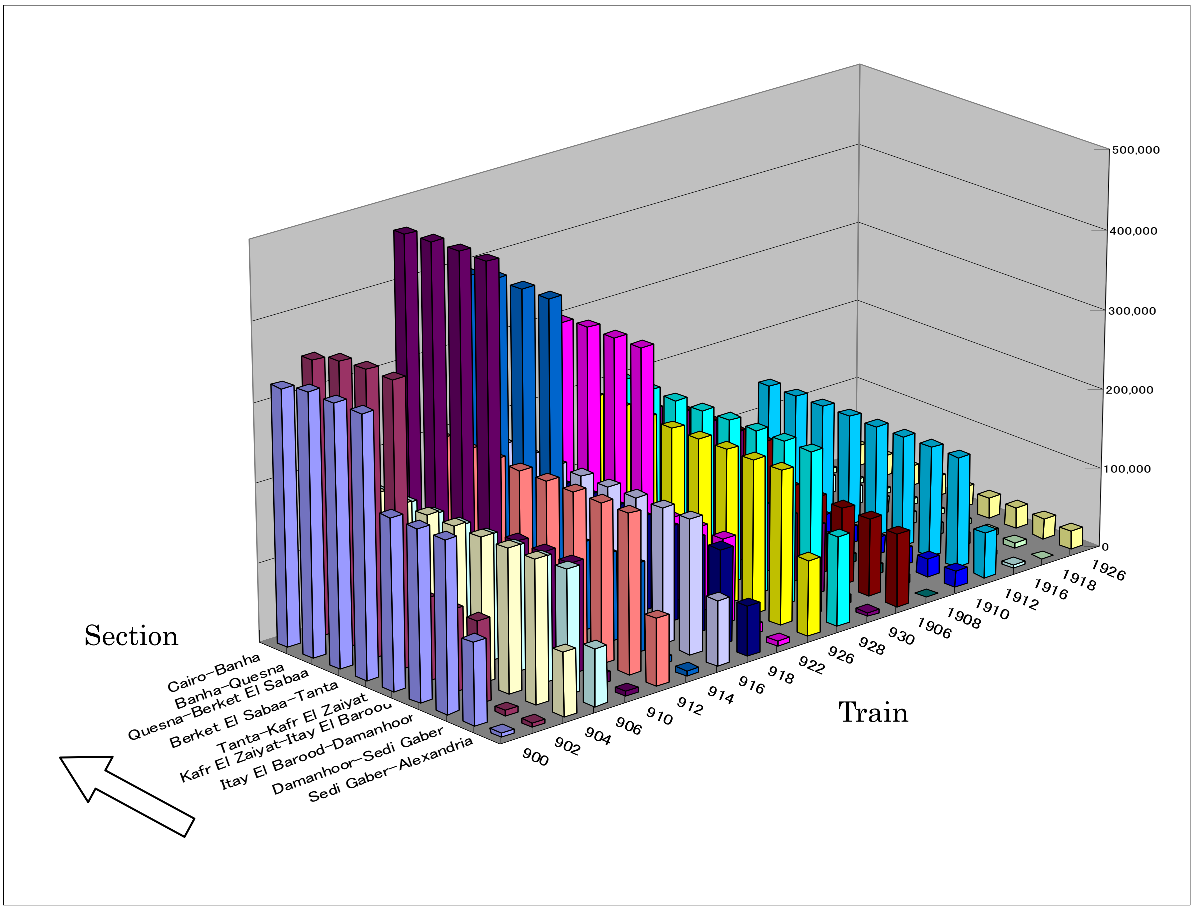


Time Table

Train No.	Cairo	Benha	Tanta	Damanhur	Alexandria
901	8:15	8:51	9:22	10:05	11:05
903	6:00	6:36	7:20	8:15	9:15
905	8:00	→	→	→	10:25
909	9:00	→	→	→	11:25
911	11:15	11:52	12:23	13:50	14:10
913	12:00	→	12:55	→	14:20
917	14:00	→	→	→	16:25
919	14:15	14:51	15:32	16:39	17:40
921	18:00	→	18:58	→	20:30
923	16:15	16:51	17:24	18:24	19:25
927	19:00	→	→	→	21:20
931	20:15	20:51	21:22	22:11	23:10
1905	7:00	→	→	→	9:25
1907	12:15	12:52	13:23	14:07	15:10
1909	13:00	→	13:58	→	15:30
1913	16:00	→	→	→	18:25
1917	17:15	17:51	18:32	19:15	20:15
1919	21:00	→	→	→	23:20
1921	22:15	22:52	23:25	0:10	1:10
2917	15:00	→	→	→	17:25

Source Study Team based on ENR data

Figure 3.1.6 Passenger Numbers of Express Train (Cairo → Alexandria)

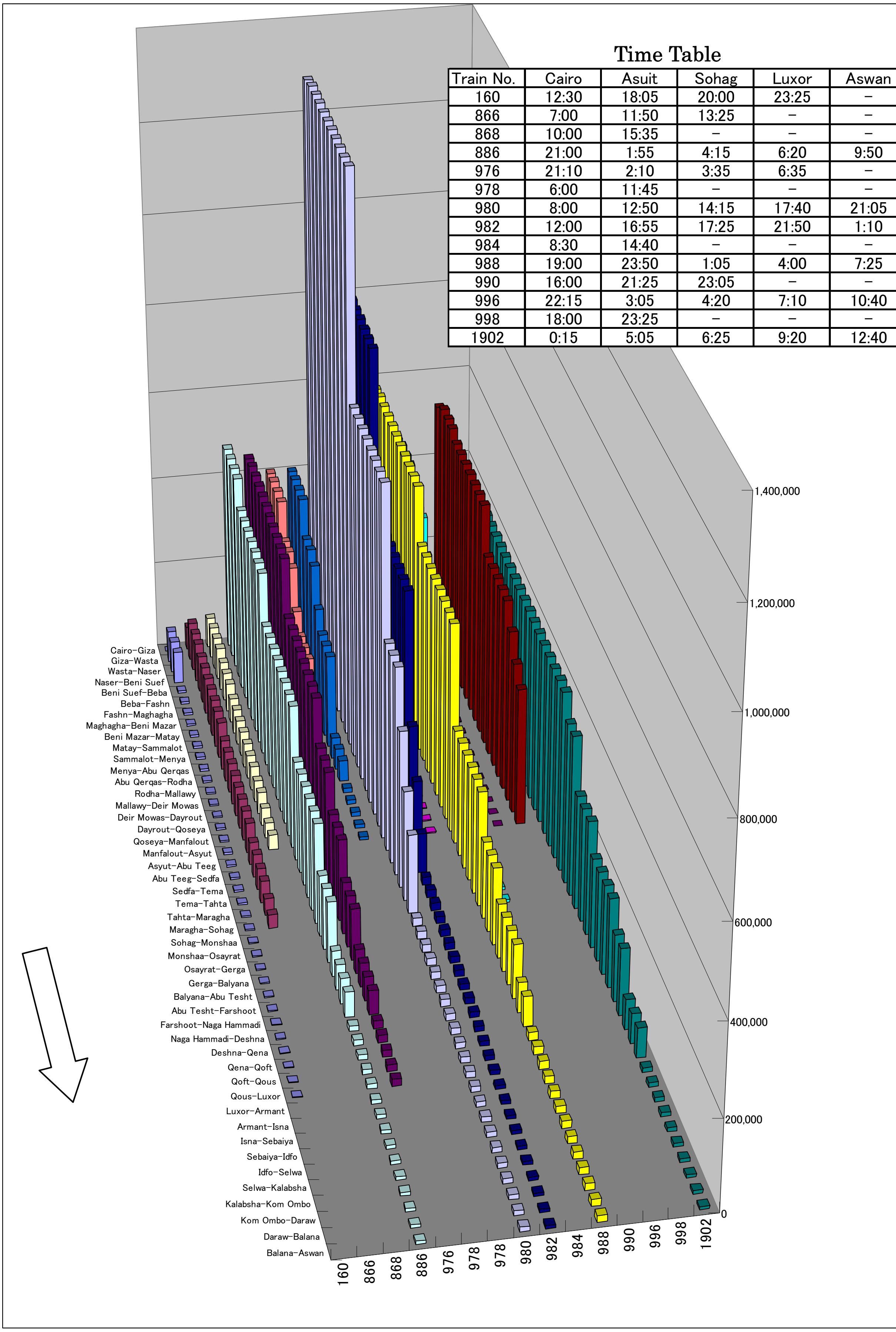


Time Table

Train No.	Alexandria	Damanhur	Tanta	Benha	Cairo
900	8:15	9:19	10:05	10:37	11:10
902	5:45	6:50	7:45	8:30	9:05
904	8:00	→	→	→	10:20
906	7:00	→	→	→	9:20
910	11:15	12:18	13:04	13:42	14:15
912	12:00	→	13:36	→	14:30
914	12:15	13:18	14:11	14:53	15:25
916	14:00	→	→	→	16:25
918	15:00	→	→	→	17:25
922	15:15	16:18	17:10	17:42	18:15
926	19:00	→	→	→	21:25
928	18:00	→	19:34		20:30
930	20:15	21:18	22:06	22:47	23:10
1906	10:00	→	11:36	→	12:30
1908	16:00	→	→	→	18:25
1910	17:15	17:15	19:02	19:33	20:10
1912	20:00	→	→	→	22:25
1916	18:15	19:19	20:05	→	21:10
1918	21:00	→	→	→	23:25

Source Study Team based on ENR data

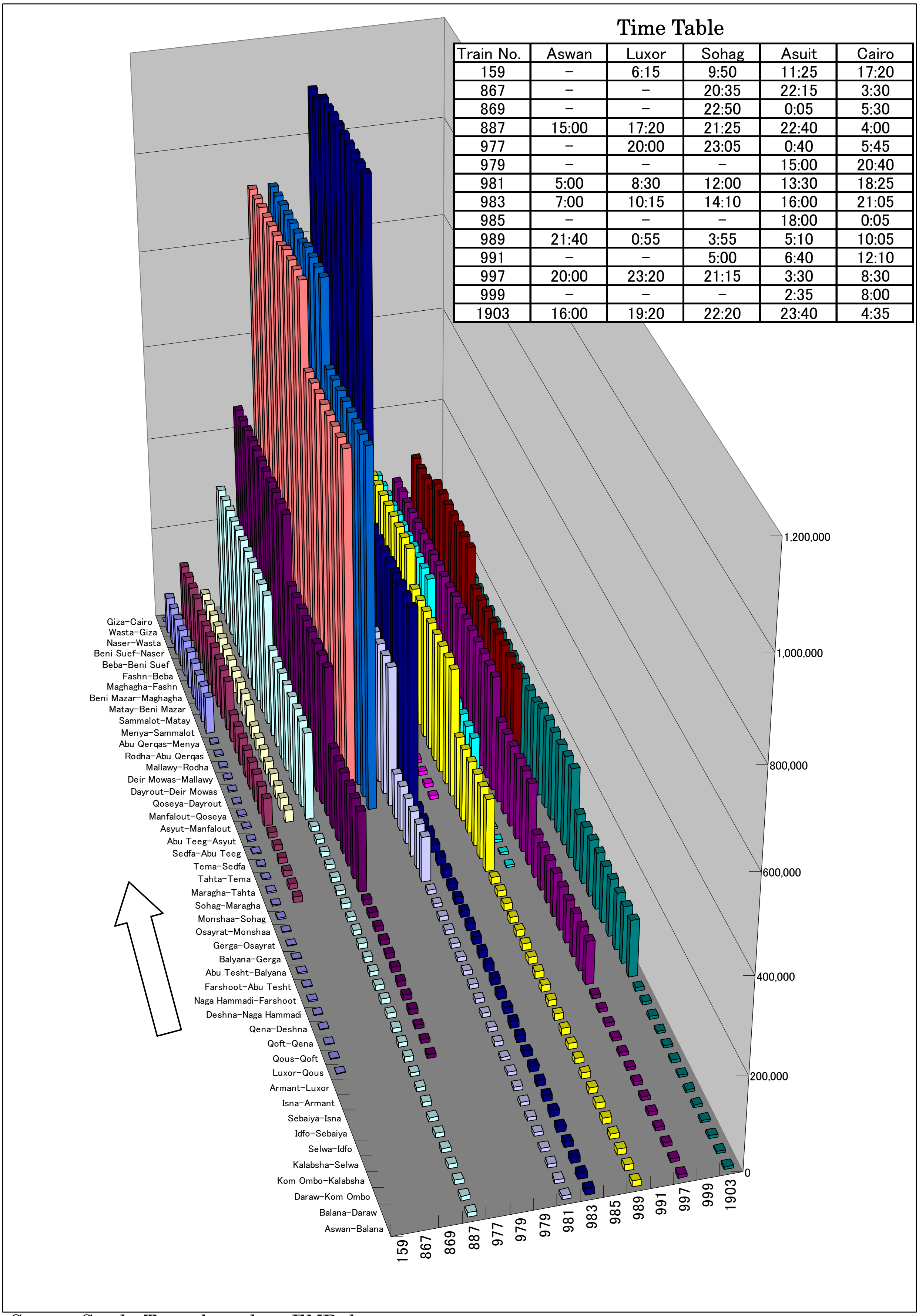
Figure 3.1.7 Passenger Numbers of Express Train (Alexandria → Cairo)



Train No.	Cairo	Asuit	Sohag	Luxor	Aswan
160	12:30	18:05	20:00	23:25	–
866	7:00	11:50	13:25	–	–
868	10:00	15:35	–	–	–
886	21:00	1:55	4:15	6:20	9:50
976	21:10	2:10	3:35	6:35	–
978	6:00	11:45	–	–	–
980	8:00	12:50	14:15	17:40	21:05
982	12:00	16:55	17:25	21:50	1:10
984	8:30	14:40	–	–	–
988	19:00	23:50	1:05	4:00	7:25
990	16:00	21:25	23:05	–	–
996	22:15	3:05	4:20	7:10	10:40
998	18:00	23:25	–	–	–
1902	0:15	5:05	6:25	9:20	12:40

Source Study Team based on ENR data

Figure 3.1.8 Passenger Numbers of Express Train (Cairo → Aswan)



Time Table

Train No.	Aswan	Luxor	Sohag	Asuit	Cairo
159	–	6:15	9:50	11:25	17:20
867	–	–	20:35	22:15	3:30
869	–	–	22:50	0:05	5:30
887	15:00	17:20	21:25	22:40	4:00
977	–	20:00	23:05	0:40	5:45
979	–	–	–	15:00	20:40
981	5:00	8:30	12:00	13:30	18:25
983	7:00	10:15	14:10	16:00	21:05
985	–	–	–	18:00	0:05
989	21:40	0:55	3:55	5:10	10:05
991	–	–	5:00	6:40	12:10
997	20:00	23:20	21:15	3:30	8:30
999	–	–	–	2:35	8:00
1903	16:00	19:20	22:20	23:40	4:35

Source Study Team based on ENR data

Figure 3.1.9 Passenger Numbers of Express Train (Aswan → Cairo)

According to the above figures, ridership varies depending on train number. Some trains are always full while some are almost empty. In the Cairo – Alexandria corridor, the ridership is almost flat from Cairo to Alexandria. In the Cairo – Aswan corridor, ridership also varies depending on train number but even a fully loaded train in the section from Cairo up to Asyut or Sohag will lose the demand beyond those cities.

As for local trains, an origin and destination matrix of ENR passengers was provided by ENR that was estimated based on ticket sales. According to the matrix, the number of passengers for one month is around 150,000. Considering that the annual passenger number is around 400 million, the data captures only 3 to 4 % of the total and many stations are missing. It may be dangerous to analyze the current transportation demand with such incomplete data. Also it is a serious issue for ENR to plan a strategy for passenger transportation without reliable data.

3.1.2. Issues of Passenger Transportation

Accuracy

Most of the trains are running behind schedule, especially in the case of local trains. In the Cairo – Alexandria corridor and the Cairo – Aswan corridor, express trains are operated without long delays however, on other lines the track is single and once there is a delay it affects the trains of the opposite direction and the delay will expand to the entire line. It is difficult to recover and the delay will last the whole day. Consequently passengers have to wait a long time at the station or inside the train.

Condition of Passenger Coaches

Express trains or high class trains are in rather good condition. Inside the coach of the local trains, however, most of the coaches are running with broken windows of which the glass is broken or missing or they cannot be shut properly. Sometimes the entire window frame is missing. Also seats are broken and doors cannot be kept closed.

Riding Quality

In the line where high class trains are operated, the track conditions are good. However, in some local lines, the ride is bumpy due to bad truck condition.

Passenger Information

In the station there are no train schedules for the passengers or information telling where to buy the tickets, how much the fare will be, where to board, when the trains will come, etc. This may become a cause for people to leave the train and choose another mode of transportation.

Figure 3.1.10 Passenger Train without Window Frame

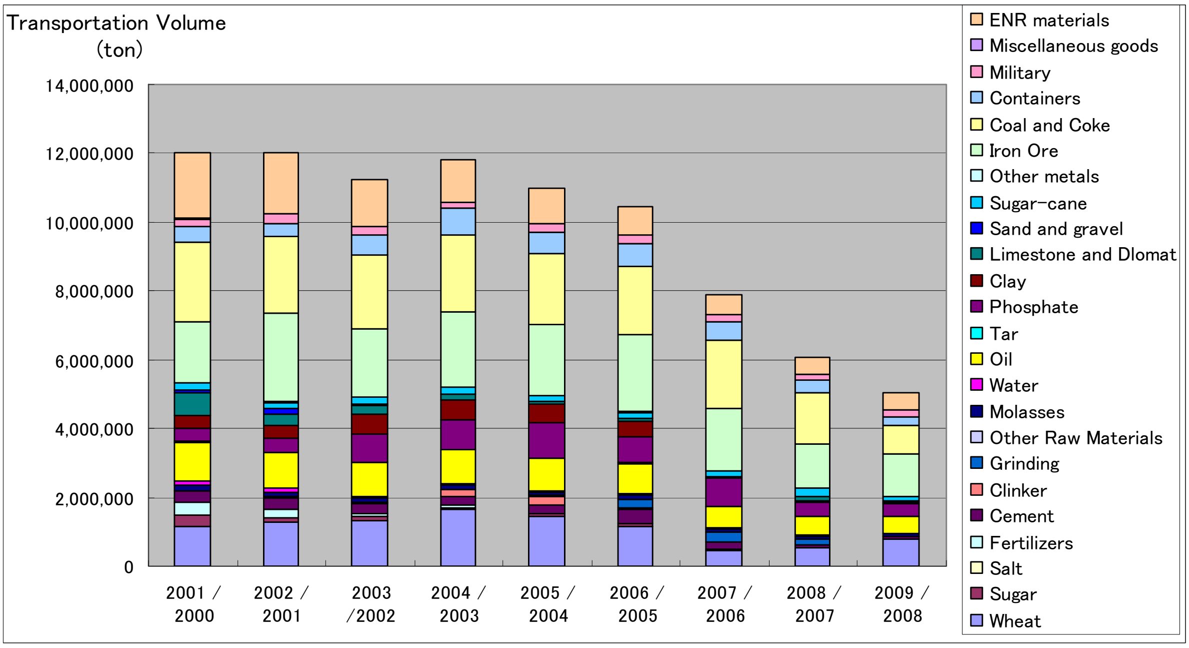
Occupancy

As described in 3.1.1, some trains are operated with a full load of passengers but many are operated almost empty.

3.2. FREIGHT TRANSPORTATION

3.2.1. Current Freight Transportation by ENR

The following figure indicates freight volume transported by ENR. Freight transportation volume by railway had been holding at the level of about 12 million tons until the year 2003. However, since then it has been rapidly declining down to only 5 million tons in 2009.



Source Study Team based on ENR data

Figure 3.2.1 Railway Freight Transportation by Commodity

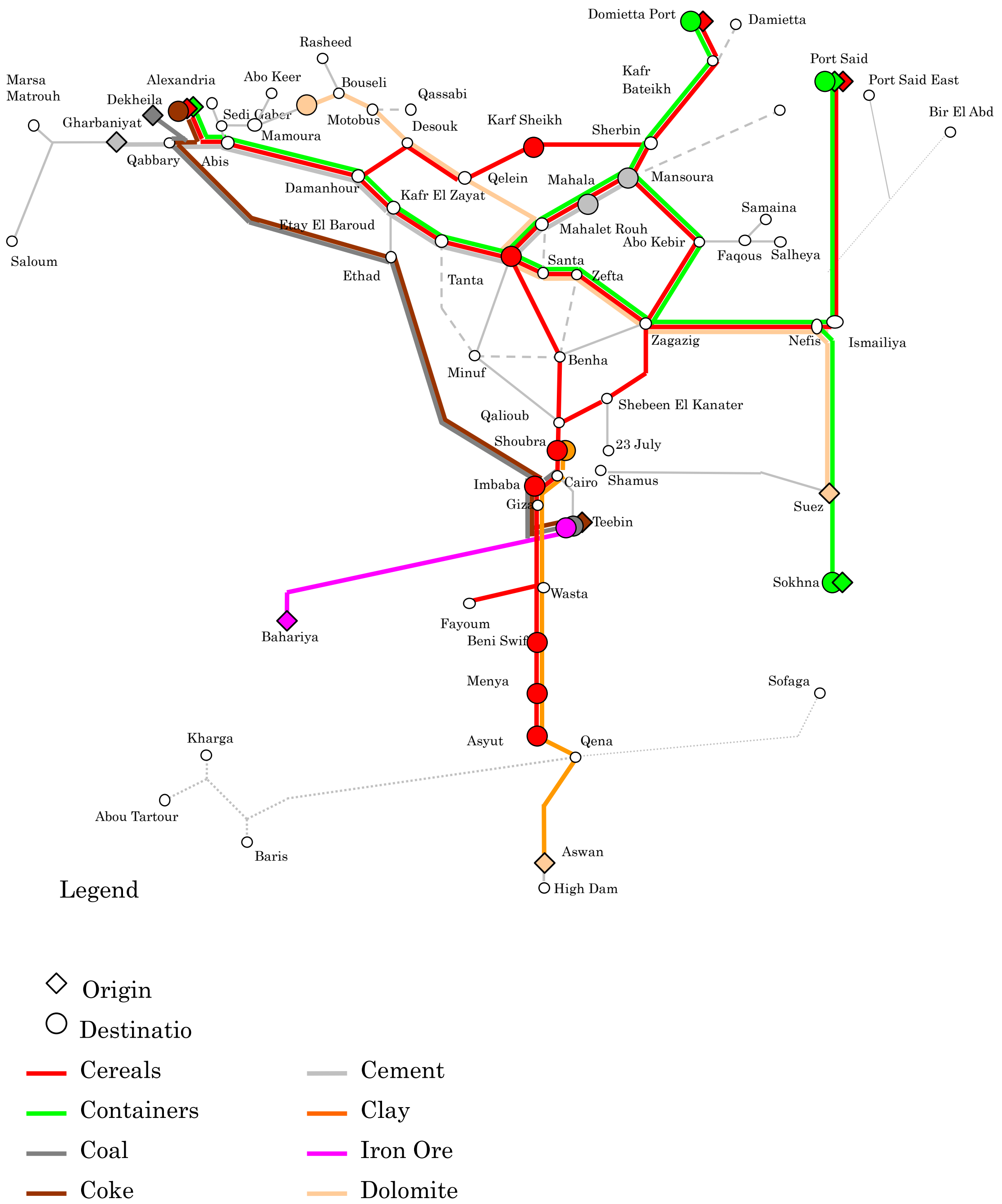
Table 3.2.1 Railway Freight Transportation by Commodity

	2001 / 2000	2002 / 2001	2003 /2002	2004 / 2003	2005 / 2004	2006 / 2005	2007 / 2006	2008 / 2007	2009 / 2008
Wheat	1,167,283	1,269,408	1,308,487	1,641,631	1,452,002	1,148,025	451,145	547,791	767,161
Sugar	301,880	117,556	116,567	47,846	58,294	76,328	21,536	1,963	0
Salt	38,030	32,750	7,080	0	0	0	0	0	0
Fertilizers	353,316	229,068	105,852	79,979	14,187	30,804	13,240	0	0
Cement	342,870	342,870	291,601	257,494	259,487	401,780	196,450	81,400	116,700
Clinker	0	0	16,972	187,458	259,383	36,080	12,720	0	0
Grinding						254,000	305,316	170,040	0
Other Raw Materials	3,330	22,295	9,325	14,400	7,105	1,333	0	0	
Molasses	126,668	127,187	143,720	122,472	98,960	116,724	84,330	66,729	51,000
Water	139,160	128,320	40,680	33,560	28,080	39,280	38,780	40,660	34,213
Oil	1,130,278	1,027,394	972,771	985,192	943,893	872,286	609,309	555,211	463,061
Tar	18,371	16,840	17,142	18,360	16,400	17,700	3,080	0	
Phosphate	381,537	408,913	799,650	858,766	1,046,347	765,120	844,736	413,885	378,215
Clay	361,200	361,200	594,965	582,670	515,720	472,644	15,400	14,400	52,800
Limestone and Dloma	673,283	339,440	249,085	181,403	99,065	60,468	19,280	137,950	29,000
Sand and gravel	89,595	165,745	39,115	0	0	0	0	0	
Sugar-cane	189,400	176,450	209,570	183,430	157,450	170,540	146,640	224,170	148,768
Other metals	24,040	24,480	840	7,900	0	29,720	0	1,200	
Iron Ore	1,750,475	2,575,660	1,974,136	2,178,330	2,048,635	2,226,919	1,817,320	1,295,225	1,220,620
Coal and Coke	2,305,828	2,233,788	2,137,037	2,253,934	2,099,574	2,013,012	1,999,057	1,472,439	814,365
Containers	477,601	368,825	589,870	753,885	606,535	630,670	533,739	371,370	279,271
Military	220,675	286,552	239,227	187,334	238,429	251,497	208,042	197,517	176,055
Miscellaneous goods	6,377	782	3,606	711	912	373	1,887	1,933	1,298
ENR materials	1,935,418	1,777,715	1,369,714	1,236,983	1,026,260	836,493	570,903	493,086	514,457
Total	12,036,615	12,033,238	11,237,012	11,813,738	10,976,718	10,451,796	7,892,909	6,086,969	5,046,983

Source ENR

Currently Phosphate is not transported by railway due to a track problem in the Karga – Qena – Safaga line. Cereals (Wheat), Cement, Oil, Iron Ore, Coal and Coke and Containers are supposed to be the core commodities.

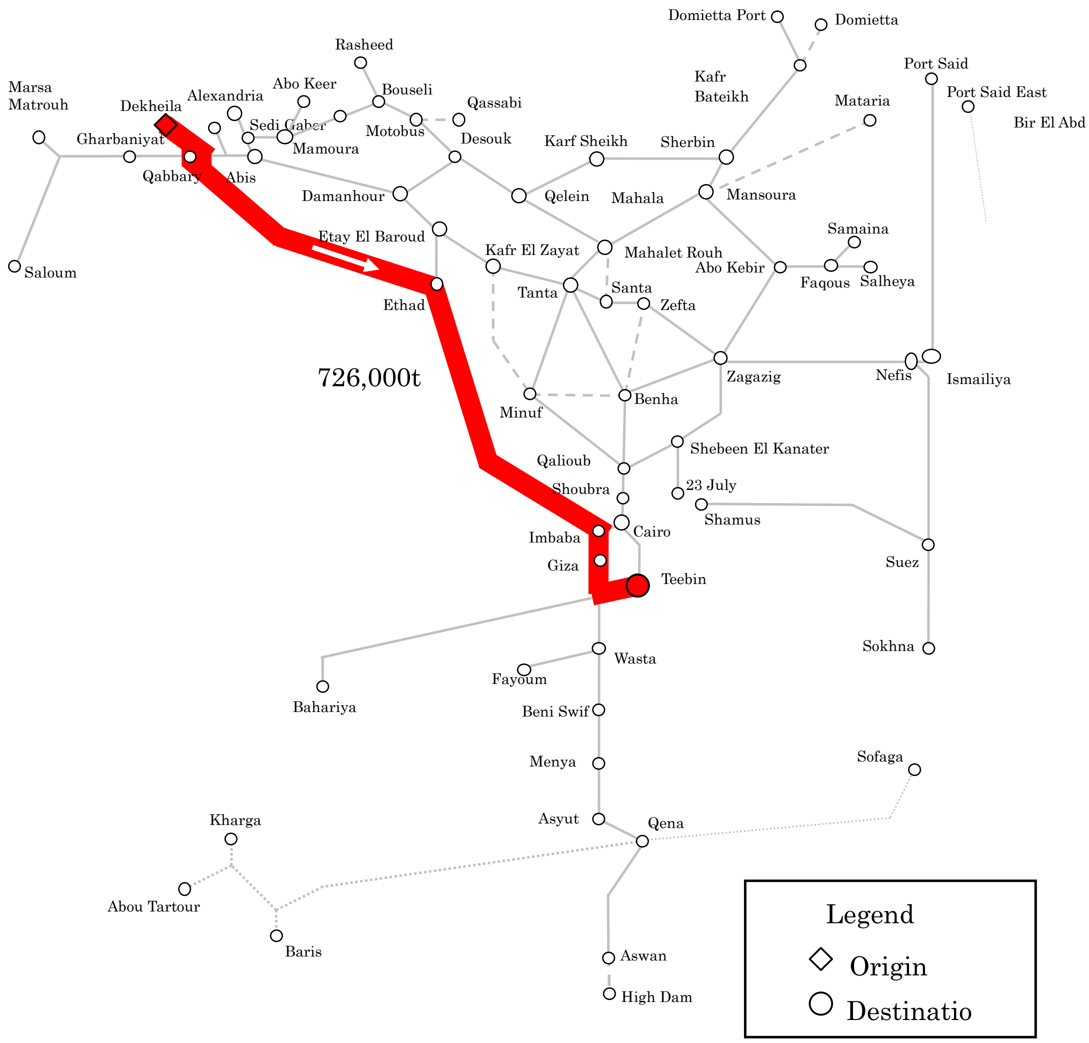
Figure 3.2.2 indicates the origin, destination and route of railway freight transportation for the core commodities.



Source Study Team based on ENR data

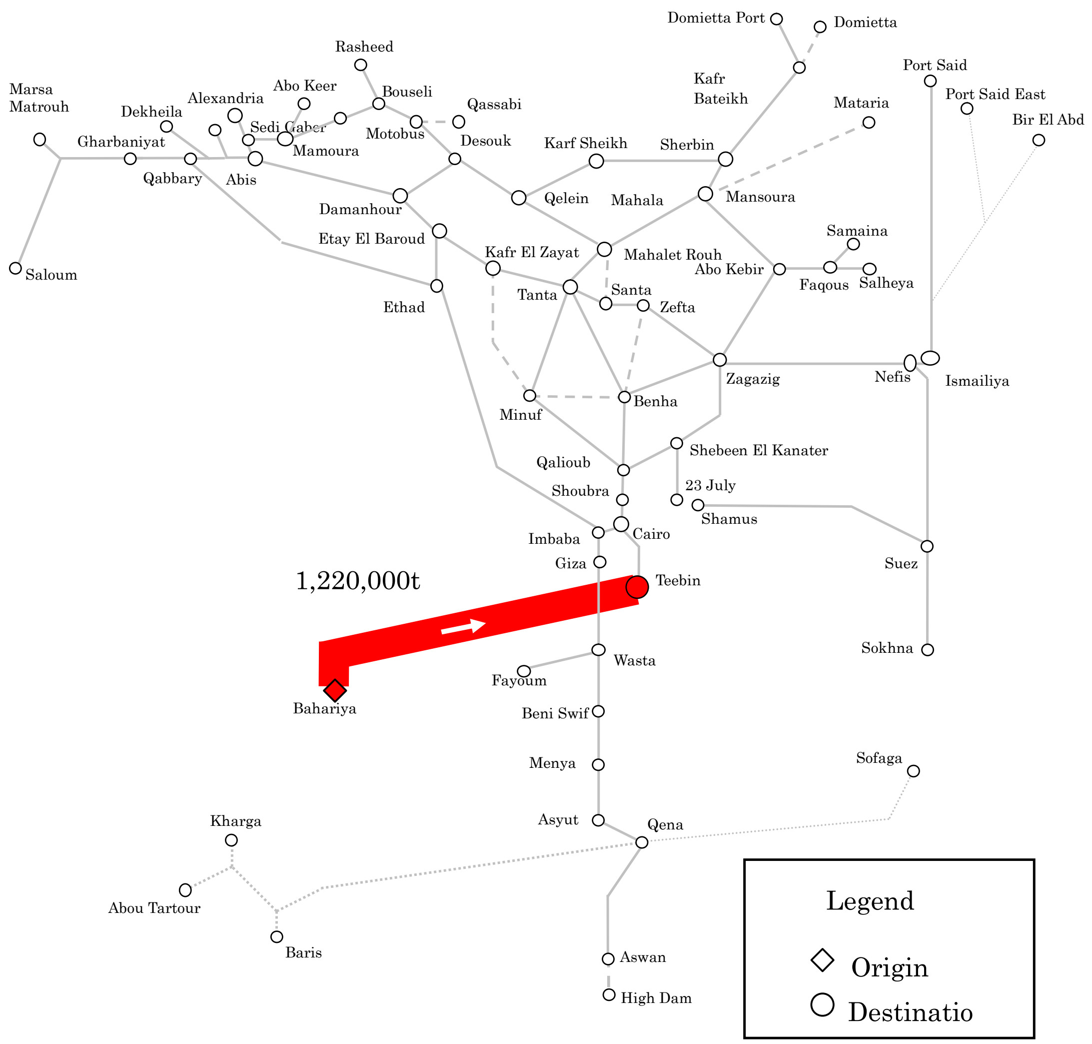
Figure 3.2.2 Railway Freight Transportation for Core Commodities

Figure 3.2.3 and Figure 3.2.4 show the transportation route of coal and iron ore. Both of them are destined for steelworks in Tebben. Those are the most stable commodities for railway freight transportation.



Source Study Team based on ENR data

Figure 3.2.3 Railway Freight Transportation (Coal)

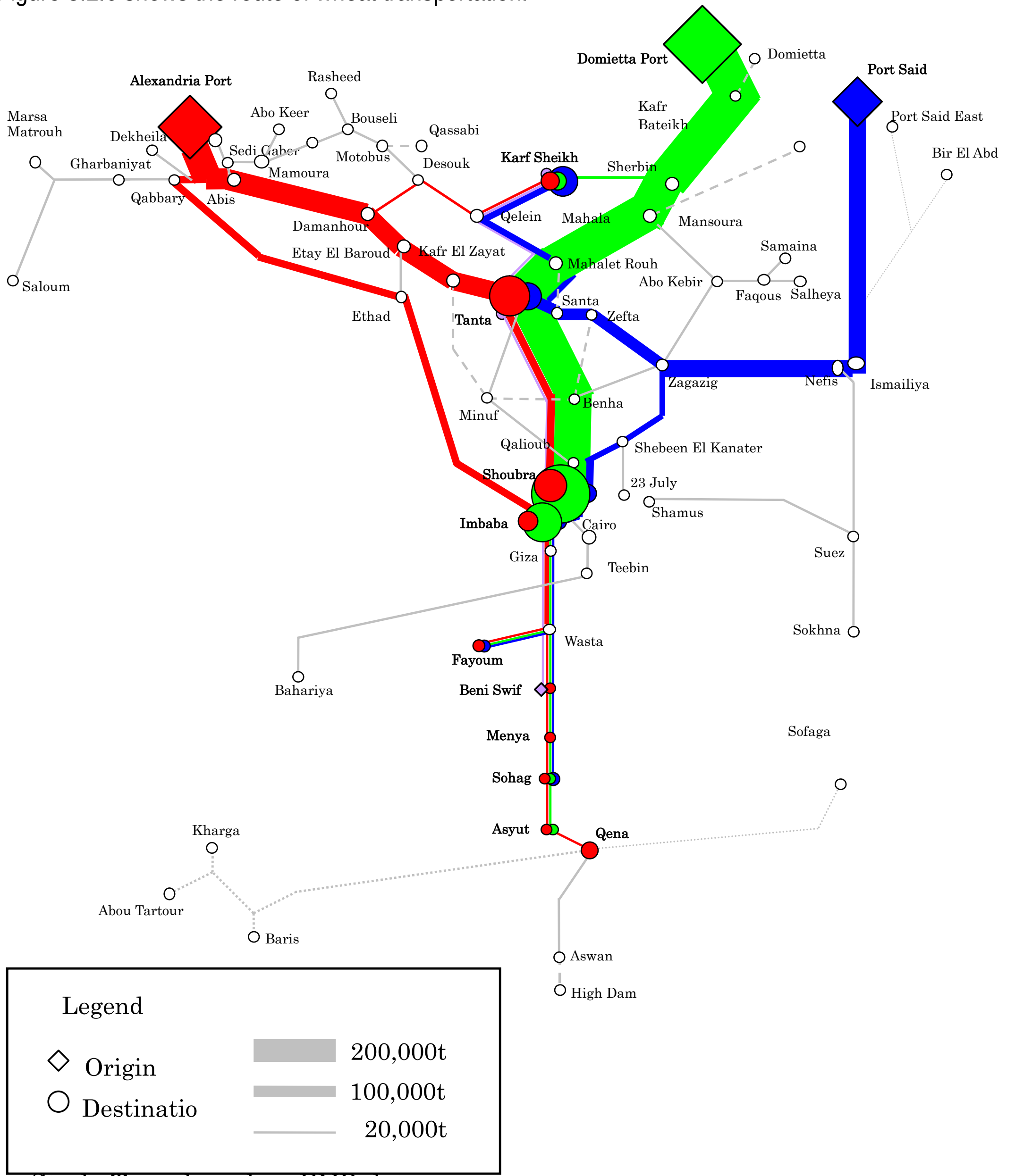


Source Study Team based on ENR data

Figure 3.2.4 Railway Freight Transportation (Iron Ore)

Figure 3.2.5 Freight Train Carrying Iron Ore on Bahareya Line

Figure 3.2.6 shows the route of wheat transportation.



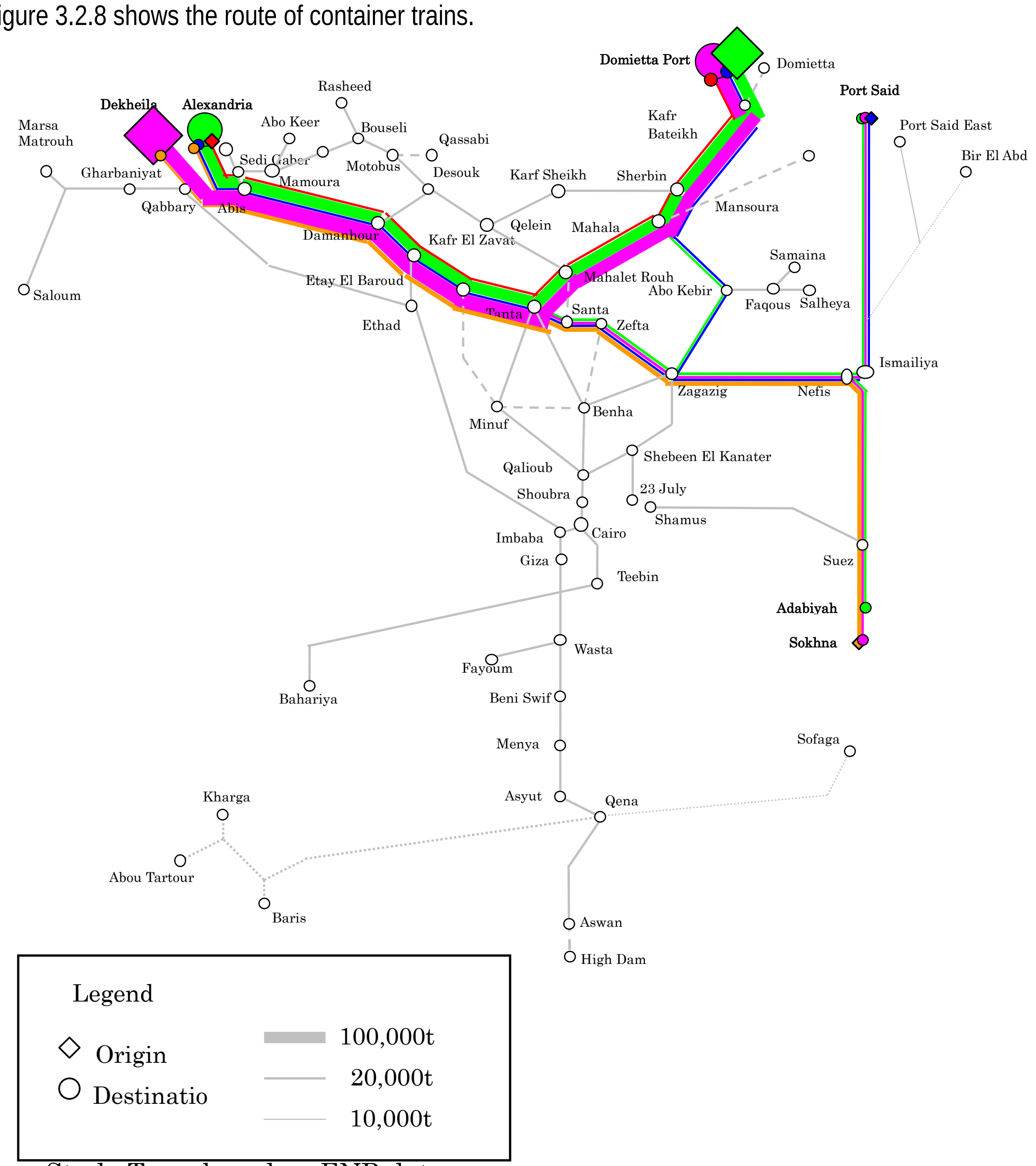
Source Study Team based on ENR data

Figure 3.2.6 Railway Freight Transportation (Wheat)

Wheat is imported and transported from the port to the cities. Hopper wagons are used for transporting the wheat. It is then stored in the silo located near the station in the city and loaded onto trucks to be distributed in the town.

Figure 3.2.7 Hopper Wagon Unloading Wheat (Shoubra)

Figure 3.2.8 shows the route of container trains.



Source Study Team based on ENR data

Figure 3.2.8 Railway Freight Transportation (Containers)

Volume of each route is as follows.

Table 3.2.2 Container Transportation Volume

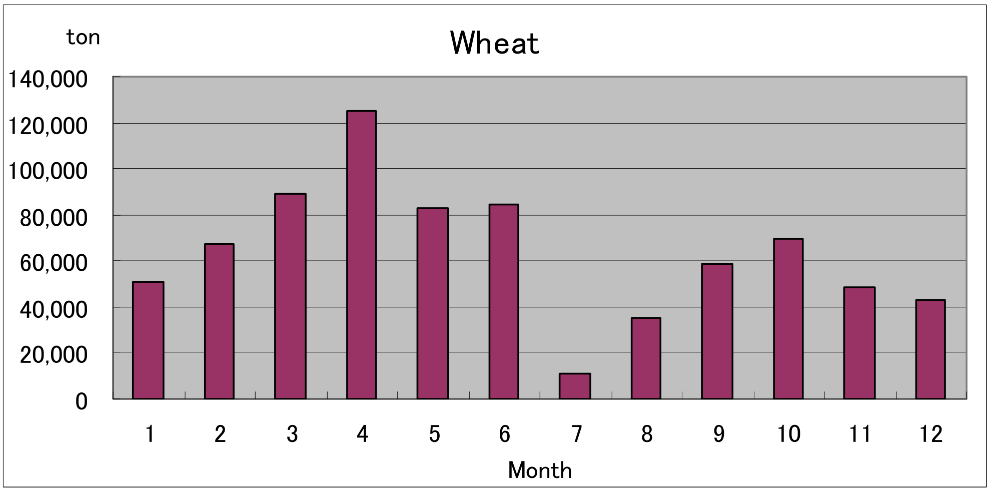
(x 1000 tons per year)

Origin/Destination		→	←
Alexandria, Dekheila	Damietta	118,301	97,740
	Port Said	6,950	7,500
	Sokhna	16,315	15,495
Damietta	Port Said	6,150	6,150
	Sokhna, Adabiyah	2,325	2,325
Port Said	Sokhna	0	3,315

Source Study Team based on ENR data

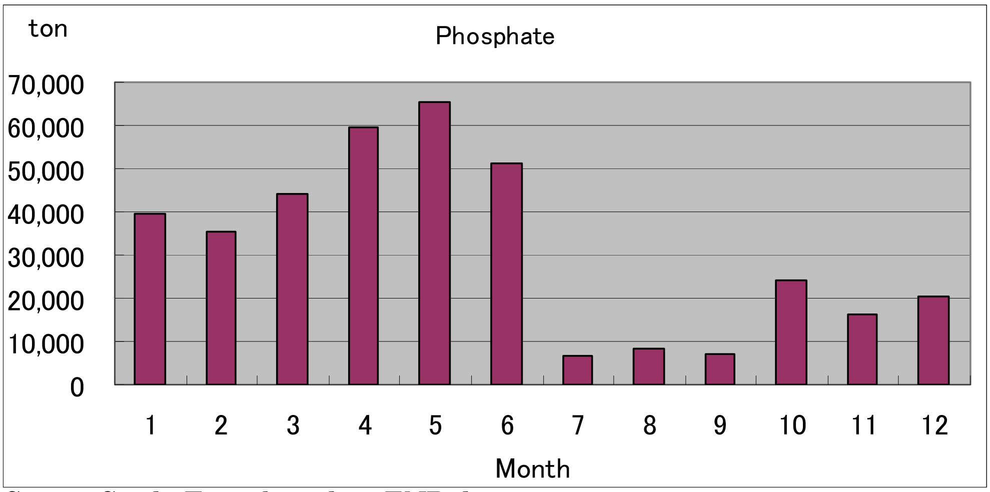
All container transportation by railway is for transit. Containers are transported from port to port even if the final destination is an inland town. Road transportation is used for transport to the final destination.

Figure 3.2.9-1 to Figure.3.2.9-6 indicate monthly railway transportation volume of core items.



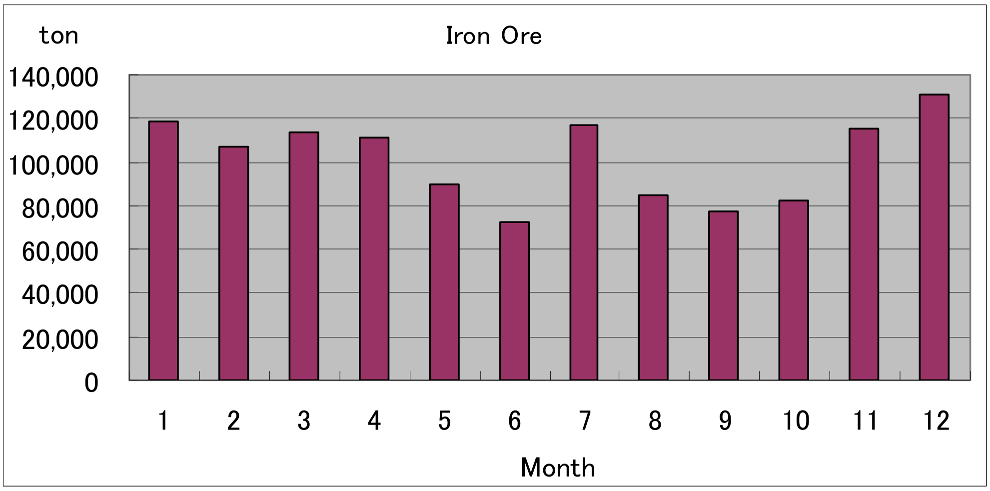
Source Study Team based on ENR data

Figure 3.2.9-1 Monthly Transportation Volume (Wheat)



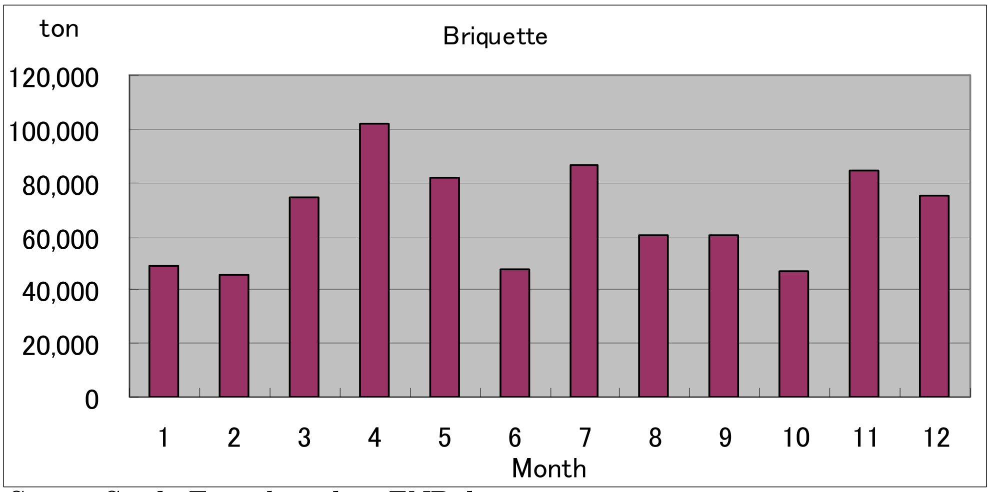
Source Study Team based on ENR data

Figure 3.2.9-2 Monthly Transportation Volume (Phosphate)



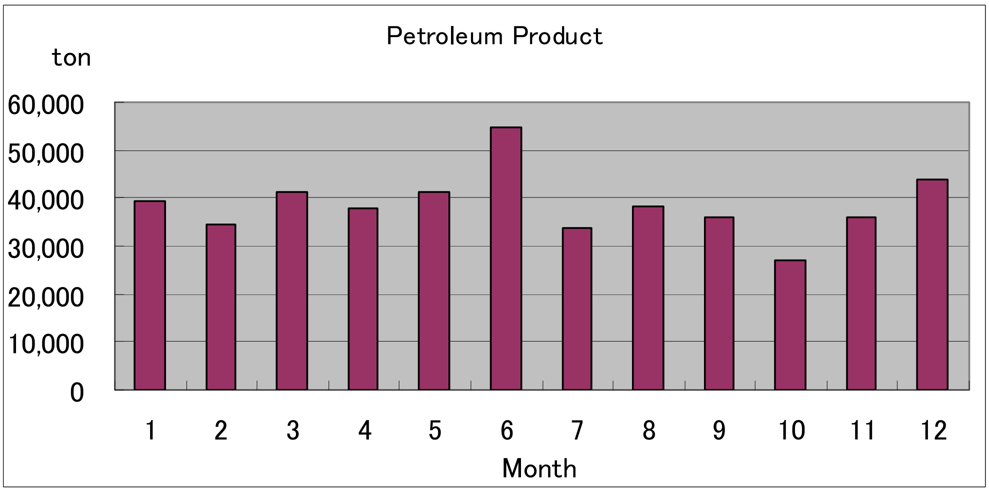
Source Study Team based on ENR data

Figure 3.2.9-3 Monthly Transportation Volume (Iron Ore)



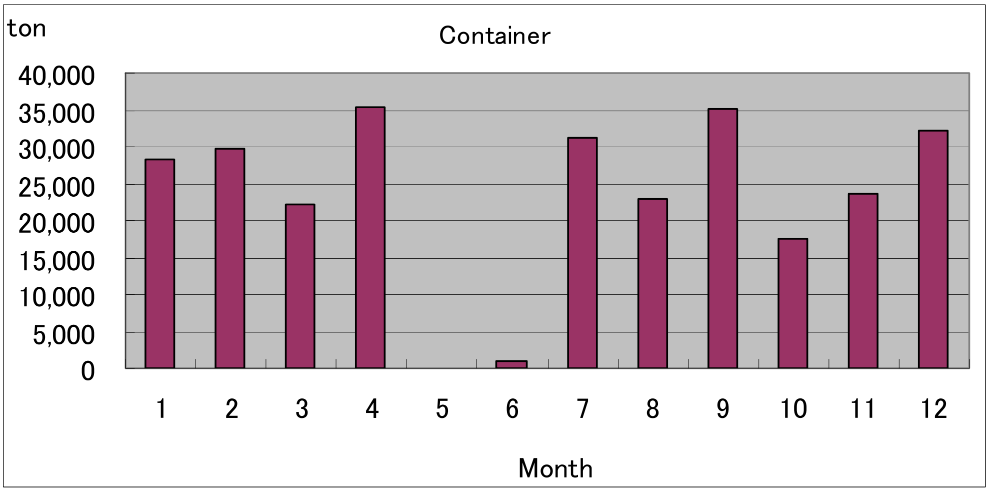
Source Study Team based on ENR data

Figure 3.2.9-4 Monthly Transportation Volume (Briquettes)



Source Study Team based on ENR data

Figure 3.2.9-5 Monthly Transportation Volume (Petroleum Products)



Source Study Team based on ENR data

Figure 3.2.9-6 Monthly Transportation Volume (Containers)

Transport demands of some commodities vary depending on the month but others are constant. It is generally understood that agricultural products are highly seasonal. Containers are coming by ship and the volume of one ship is significant, therefore, there are variations in the amount of goods to be transported depending on the timing of the ship arrivals.

Thus, there are big differences between peak season and off peak. The railway operator has to provide the facilities not just to carry the average of total demand but to carry the peak demand.

According to Figure 3:2.1, transportation volumes of most of the items have been decreasing. Some items such as sugar and fertilizers were more than 300 thousand tons in 2000 but they are not transported by railway anymore. It is anticipated that those items have been shifted to road transportation.

Most of the Items that are still transported by railway have the facilities for loading and unloading such as wheat, oil, and iron ore. Coal and balk cargos are deemed to have shifted to road transportation. Small cargo freight trains will not be operated until sufficient volume of cargos are brought to the station and they have to wait until the volume become sufficient. Also they have to look for a locomotive after cargoes reach a sufficient volume. Under such conditions, customers reasonably select other modes.

3.2.2. Issues of Freight Transportation

Lack of locomotives

The number of locomotives is too small to meet the demand. As freight trains are not operated regularly, locomotives for freight trains do not standby at the station. It takes a couple of days to find a locomotive after freight cargoes are gathered at the station.

No regular schedule

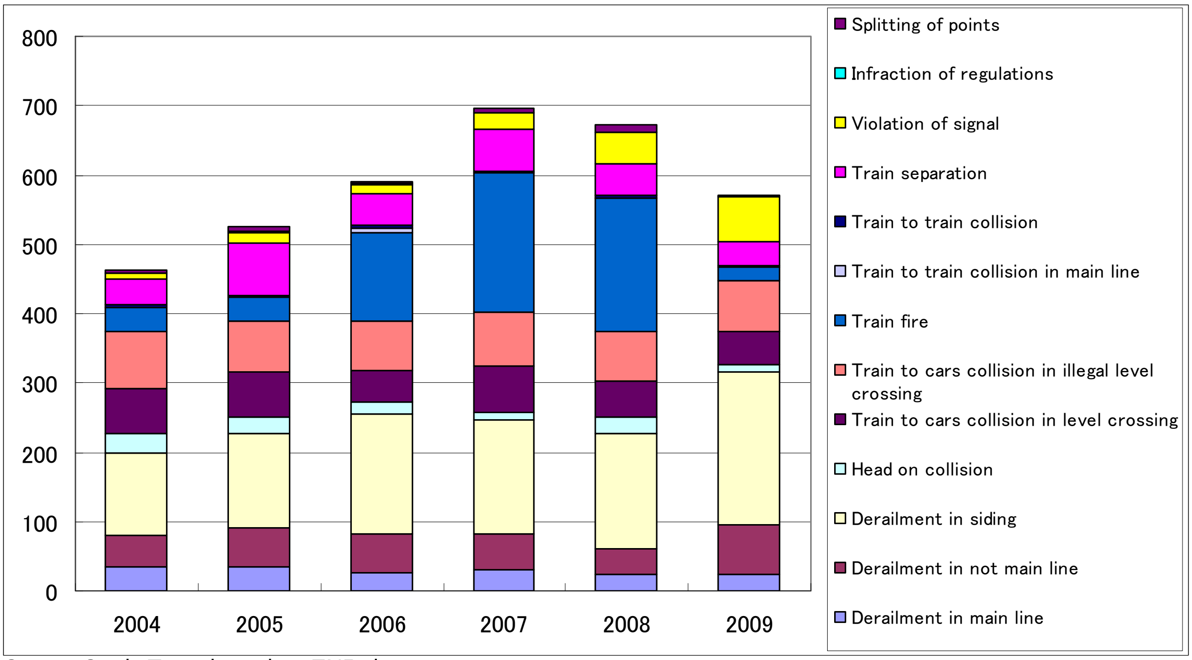
Train schedules are decided after a sufficient volume of cargo is gathered. Customers can not foresee when the cargoes will be transferred to the destination.

3.3. Safety

Safety is the most important matter that transportation industries have to secure. To secure safety should have highest priority over all other matters.

3.3.1. Accidents on the Railway

Figure 3.3.1 indicates the number of accidents that occurred during 2004 to 2009.



Source Study Team based on ENR data

Figure 3.3.1 Number of Accidents during 2004 to 2009

Derailment is the largest form of accidents except for years 2007 and 2008.

The largest number of derailments was in 2009. There were 25 to 35 derailments on the main line. However, if derailments “other than on the main line” and those “ on sidings” are included, the number was greater than 200 and in the year 2009, it increased above 300.

3.3.2. Analysis of Accidents

In 2009, 567 accidents occurred in total. The largest form of accidents was derailments on sidings and the number was 220. If including derailments on the main line and derailments not on the main line, total number of derailments was 316. The number of collisions between trains and automobiles was about 120, the second largest one. The number of signalling violations was 64 and train separations was 35. The number of fires in locomotives was 20.

3.3.2.1 Derailment Accidents

The number of derailments is extremely high and even minor derailments have the possibility to be serious. The cause of the derailments was analyzed based on the ENR accident record.

<u>Analysis of Derailment Accidents</u>

Table 3.3.1 shows the classification of derailment accidents.

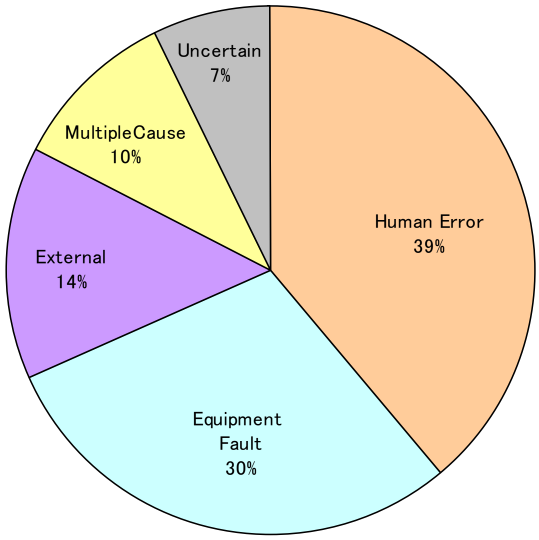
Table 3.3.1 Classification Table of Derailment Accidents

No.	Cause of Derailment	Number of accidents and Ratio (%)		More detailed causes
1	Responsibility of manoeuvre worker, block observer, etc.	42 (13%)	4	1-1 The manoeuvre worker or the block observer gave the driver incorrect instructions.
			23	1-2 The manoeuvre worker did not secure the switch.
			13	1-3 The manoeuvre worker did not observe the switch.
			2	1-4 Others
2	Signs were not secured.	5 (2%)	5	2-1 The switch manual was not secured. Switch did not respond. Bad switch maintenance.
3	Run through signals without permission.	42 (13%)	31 (1)	3-1 The driver ran through the semaphore.
			11	3-2 The driver pulled out without permission.
4	Driver's irregular operation	24 (7%)	20 (1)	4-1 Excessive speed by the driver
			2	4-2 Excessive speed by the driver, He also moved with the fallen car.
			2 (1)	4-3 Excessive speed by the drive, and the driver did not notice the sand on the rail, or water under the rail.
5	Other driver's mistake	12 (4%)	5	5-1 The driver moved on track covered with sand.
			3 (1)	5-2 The driver continued on until he hit the buffer stop.
			1	5-3 The driver ran the locomotive until it hit the danger car.
			1 (1)	5-4 The locomotive ran down a descending track and kept moving.
			2	5-5 Other driver's mistake.
6	Lacking of rolling stock maintenance	56 (17%)	22	6-1 The bogie did not rotate while moving.
			8	6-2 Failure of the break beam
			5	6-3 Corrosion in the wheels
			3	6-4 Meshing of the car
			18	6-5 others
7	Lacking of track maintenance	34 (10%)	17	7-1 Lack of track maintenance (main line)
			12	7-2 Lack of track maintenance (side line)
			5	7-3 Lack of track maintenance(workshop)
8	Responsibility of loading authority	5 (2%)	5	8-1 unsuitable loading and unloading
N	Multiple causes or uncertain cause	56 (17%)	23	9-1 Uncertain cause
			19	9-2 Multiple causes concerning railway, rolling stock or operation
			10	9-3 Causes concerning signalling and operation
			4	9-4 Causes concerning rolling stock and operation
10	External factor	31 (10%)	14	10-1 Collapse of coal or cement, etc of private companies.
			3	10-2 Crane pulled the car by mistake
			11	10-3 Water burst from sewage pipe, etc.
			3	10-4 Obstacles of stones on the rail
11	Obstruction at the level crossing	5 (2%)	5 (2)	11-1Tracks etc. crossed the rail at legal or illegal crossing
12	Natural disaster, etc.	10 (3%)	7	12-1 Fall of rocks （Natural disaster, etc.）
			3	12-2 Sand on the rail （Natural disaster）
Total number of accidents		322 (100%)	322	

Source Study Team based on ENR data

Hatched color indicates the classification of accidents categorized as human, equipment, external, multiple causes and uncertain.

The ratios of these classifications are indicated in figure 3.3.2



Source Study Team based on ENR data

Figure 3.3.2 Classification of Derailment Accidents

The biggest number is human error and they are mostly the fault of the drivers or switch control workers. The second biggest item is equipment fault. Equipment includes the rolling stock and tracks. This is a matter of maintenance or aged equipment. From another point of view, maintenance issues can be reclassified as human error. Multiple causes and uncertain causes also include human error. Therefore more than a half of the causes are classified as human errors.

To eliminate the human errors, training is the most effective. However, humans make mistakes. It is impossible to totally eliminate human errors. Backup systems for the drivers, such as ATP, are necessary that prevent accidents even in the case of a human error.

<u>Countermeasures against Derailment</u>

Table 3.3.1 shows the main points of countermeasures to prevent derailment of ENR trains. These countermeasures have to be examined more by ENR.

These countermeasures would be effective and should be carried out to prevent derailment of ENR trains. There are no countermeasures that can eliminate accidents completely. Therefore, continuous efforts to prevent accidents in every division and every field of railways are indispensable.

Table 3.3.2 Countermeasures to prevent Derailment

Classification of Derailment	Countermeasures
General	1. Training in training centres according to experience, duties and posts 2. On the job training at each site and office 3. Raising the moral to preserve safety and to prevent accidents by group discussions concerning accidents that have occurred, etc. 4. Improvement of the circumstances of each working area (Installation of signals for drivers to be able to confirm them more easily. Removal of obstacles such as concrete blocks, brake shoes, etc., installation of rest rooms for workers so that they may work in a more healthy and comfortable environment so that they are able to concentrate on the work)
1. Responsibility of switch man, signalman, etc. 2. Signs were not secured. 3. Run through signals without permission 4. Driver's irregular operation 5. Driver's other mistakes	1. Implementation of basic methods for each switchman, driver, etc. 2. Installation of Automatic Signalling System including local lines. 3. Installation of ATP to control the whole of the train operation as a long-range plan
6. Lack of rolling stock maintenance	1. Carry out inspection and maintenance of rolling stock especially taking care of the rotation mechanism of the bogies, the brake beams, and corrosion. 2. To improve the machinery and instruments.
7. Lack of track maintenance	1. Besides routine tack maintenance, endeavour to inspect and change deteriorated parts of switches. Replace the whole switch, as a long-range plan. 2. Introduce more track maintenance equipment.
8. Responsibility of loading authority	1. To supervise the persons concerned to pay attention for suitable loading and unloading.
9 Multiple causes or uncertain causes	1. There are many accidents in which the causes are uncertain. There is a possibility that those accidents were due to multiple causes. Further continuous examination is indispensable to make the causes clear and eliminate future accidents.
10. External factors	1. Carry out periodic visits to concerned private companies to ask for their cooperation and to awake in them a sense of accident prevention.
11. Obstructions at the level crossings	1. Install automatic barriers and warning systems at level crossings. 2. Examine level crossing surveillance methods, obstacle detection methods, and a method to report the emergency to the train driver.
12. Natural disaster, etc.	1. Examine measures to detect critical conditions, and the method to report the emergency to the train driver.

Source Study Team

3.3.2.2 Fire Accidents

Analysis of Fire Accidents

In years 2007 and 2008, fire accidents recorded the largest number. In the year 2009, 159 fire accidents on trains were reported.

The original list from ENR is not like the list of derailments and it does not include the cause of the accidents. It only listed the location of the origin of the fire and what type of car.

Table 3.3.3 shows the number of fire accidents. Among the 159 fire accidents 118 had occurred in locomotives and this is 74% of the total number. In locomotives, 37 occurred in the machinery (engine) and 58 occurred in the bogies and wheels. A total of 30 fire accidents occurred in passenger cars and of those, 7 each had occurred in the machinery, generators or bogies.

Table 3.3.3 Number of Train Fire Accidents in 2009

Kinds of Rolling Stocks	Part of fire	Number of accidents	Sub-total	Total
Locomotives	Machinery	37 (23.3%)		
	Electrical systems	7 (4.4%)		
	Generators	8 (5%)		
	Exhaust boxes	8 (5%)		
	Bogies and wheels	58 (36.5%)	118 (74.2%)	
Passenger cars	Machinery	7 (4.4%)		
	Electrical systems	6 (3.8%)		
	Generators	7 (4.4%)		
	Exhaust boxes	0 (0%)		
	Bogies and wheels	7 (4.4%)		
	Cabins	3 (1.9%)	30 (18.9%)	
Freight cars	Machinery	0 (0%)		
	Electrical systems	0 (0%)		
	Bogies and wheels	1 (0.6%)		
	Loading deck	3 (1.9%)	4 (2.5%)	
Unknown or others		7 (4.4%)	7 (4.4%)	159

Source Study Team based on ENR data

It is understood that fires occurred in the engines because the temperature of the engines becomes very high and they are surrounded with oil. Just a small defect will cause a fire. However, bogies, especially for passenger cars and freight cars don't use oil or flammable material. However, there were a total of 66 bogie and wheel fires and this is more than half of the total number of accidents. It is anticipated that fuel or engine oil leaked from the engine and then coated the bogie frame and was ignited by a spark from the brake shoe.

Countermeasures to prevent Fire Accidents

(1) In the regular maintenance, engine shall be kept clean so that oil leaks can be easily found.

(2) In the regular maintenance, oil on the bogie frame shall be wiped off.

(3) Install a fire detection device to cut off the fuel and report the problem to the driver when detected

(4) Fire extinguishers shall be installed in all locomotives, passenger cars and the caboose.

3.3.2.3 Level Crossing Accidents

More than 100 accidents on level crossing have occurred every year. Assumed causes of the accidents are:

(1) Driver was not aware the train was coming.

(2) Driver was not aware there was a rail crossing.

(3) Driver thought he could cross before the train comes, and

(4) Car was stopped in the crossing.

Those are all car drivers' faults however, sufficient countermeasures shall be taken.

Countermeasures for Level Crossing Accidents are:

(1) Carry out a campaign for the drives to stop before the crossing and not to cross when he see a train coming.

(2) Install warning devices at level crossings

(3) Change the signs at level crossings to make them much more visible

(4) Widen the pavement at the crossing so that car will not run off the shoulder

(5) Provide an emergency switch near the crossing to indicate a stop signal for the train and

(6) Provide obstruction detecting devices to actuate the stop signal when detected.

3.3.2.4 Violation of Signal

It is alarming that the number of violations of signals is increasing. In the year 2007 it was 24 but increased by 20 each year and in the year 2009 the number was 64. An ATP system is one of the most effective countermeasures for this issue however the driver's actions is the most important.

In Japanese railways, finger-pointing and call is obligatory for the driver when train passes a signal so that he will not overlook the signal and so he will take the correct action. It has also a sleep-averting effect.

3.3.2.5 Train Separations

Train separations are not uncommon. During 2004 to 2009, they occurred 34 to 76 times every year.

Many rolling stock of ENR use automatic couplers. This type of coupler is slides up and down easily while coupling. Coupler height of each car should be maintained equally. When running, however, the height fluctuates because of vibration or pitching of the rolling stock. When the track condition is bad, the difference of coupler height becomes very big and finally the coupler slides away and the train separates.

It is presumed that most of the train separations are caused by bad track conditions and therefore, urgent improvement of the track is recommended.

3.4. CURRENT ISSUES AND POLICY SETTING

3.4.1. Characteristics of Railway Transport Service

Generally speaking, railway service has the following strengths, in principle, compared to other modes of transport, when demand is high.

- High transport capacity;
- High speed;
- Long distance;
- Punctuality (congestion free compared to roads);
- Safe;
- Low cost; and,
- Environmentally friendly.

On the other hand, the railway transport service is provided only from station to station. Passengers and freight need access and egress transport services to reach their real origins and destinations. This is necessary for railway transport service, and is one of the weakest points of railway service. In addition, railway service is limited to the railway network where railway stations exist, although the network covers most important areas of Egypt.

(1) Passenger Transport Service

The number of Railway passengers decreased from 435.6 million in 2005/06 to 247.5 million in 2009/10 according to ENR. The total number has decreased by more than 40 % in only these 4 years. The growth rate is about minus 13% per annum. Serious defects in railway passenger transport could be foreseen.

(2) Freight Transport Service

Freight traffic volume of ENR has also decreased radically from 10.45 million tons in 2005/06 to 5.07 million tons in 2008/09. The decrease is more than 50 % in these 3 years. Serious defects could be foreseen in railway freight transport the same as passenger transport.

3.4.2. Hardware Issues

(1) Railway Tracks

Tracks along local lines are sometimes so deteriorated that it causes damage to the freight, wagons and locomotives. This also relates to the comfort of passengers. For example, tracks of the Suez line are so deteriorated that passengers need to be very careful about shaking and jumping in their seats.

Only about 30% of the network is double or more tracks. Transport capacity is limited except for major trunk lines such as between Cairo and Alexandria. Electrification is installed on any ENR lines.

These defects of the railway tracks also affect the safety of the transport.

(2) Rolling Stock

It seems that ENR has enough locomotives, coaches and wagons. However, the operating ratio of locomotives is around 40%. Conditions of the coaches and wagons seem to be the same. It seems that the decrease in ENR passengers and freight is caused by the lack of working rolling stock.

Most of the rolling stock seem to be aged and deteriorated, although accurate ages are not clear. Comfort of passengers would not be expected except for higher class coaches on the main lines. Railway freight might be damaged due to the deteriorated wagons. This would affect the travel/transport speed of the railway service, which is one of the characteristics of the railway service. This also would affect the safety of the railway operation.

(3) Workshops and Depots

Workshops also seemed to have many problems. Machines and equipment in workshops are so old that proper maintenance and repair work would not be expected. Necessary spare parts for maintenance and repair are frequently lacking according to site surveys by the study team. It is as a matter of course that the operating ratio of locomotives is around 40% as mentioned above. These would affect transport capacity of course, attractiveness of railway transport service and might be one of the critical causes of railway accidents.

(4) Signalling System/Train Operation

The signalling system, which is the system to move trains safely, is also aged and outdated along most of the railway network. Travel/transport speed of trains is substantially affected by the old system. Transport capacity must be below the potential level. Safety would be increased if a modernized signalling system is introduced.

Freight train diagrams are drawn manually every day based on passenger train diagrams by each staff for each section from Quena to Luxor, and the section from Luxor to Aswan Hidam. Modernization of the system is considered urgent for efficient and safe transport.

(5) Railway Terminals

Railway transport service is not able to satisfy customers' needs to be transported from door to door as mentioned earlier. However, transshipment facilities such as cargo handling machines are not well provided in the railway freight terminals. Access/egress transport services for passengers are also seemed inappropriate. Therefore, it could be said that current railway terminals are not satisfactory in terms of terminal function. It seems that passengers are in a difficult situation to reach their final destination. Freight that has arrived would not be able to reach its final destination easily.

3.4.3. Software Issues

(1) Maintenance System

ENR explained to the Study Team that one of the reasons for the decease of passenger and freight transport volume is lack of locomotives. However, the operating ratio of locomotives is only 40 % as mentioned before. It seems that the maintenance system has a serious defect.

Regarding ENR coaches, malfunctioning coaches are operated mainly on the local lines. Coaches with no window glass are operated daily. Floors of local coaches are often deteriorated badly. Comfort of passengers is totally ignored on such coaches. The maintenance system of coaches also has a serious defect.

Apart from the rolling stock, track maintenance is also seemed insufficient.

(2) Safe Train Operation

The railway is able to provide systematic transport service, since track, rolling stock and signals are under control by one entity. Therefore, it would be expected that the railway transport is safe in nature. However, ENR has very many accidents as reported in the Interim Report I. It is surprising that the number of accidents has been increasing despite the rapid decrease of passenger and freight transport volume. This means that railway system of ENR is not functioning as originally intended.

(3) Transport Planning/Database Maintenance

ENR does not own any container wagons. When it comes to wagons, it is a Hardware issue. However, it is considered that transport planning of ENR does not place any importance on container transport by railway. This means that the transport planning of ENR is not functioning at all, because no one could fail to notice the current containerization progress in not only international transport but also the domestic market of EGYPT.

As a matter of fact, ENR transport containers mainly between sea ports. Containers are loaded on flat wagons and fixed by wire. It seems very time consuming and dangerous.

Transport statistics of ENR are maintained relatively well for freight transport, while passenger transport statistics are left with no proper maintenance. As the transport statistics are a base for transport planning, it seems urgent to establish a proper system to collect and record various transport information.

As mentioned above, the transport planning function is missing in ENR. It seems that an institutional arrangement is urgently needed to analyze and plan for the current and future transport market both for passengers and freight. Combined transport service provision would be a strategic solution, which is not independent planning of the railway but cooperative planning with other modes of transport under the principal of intermodality.

3.4.4. Humanware Issues

Recognition of Safety of ENR staff seems insufficient. As the railway carries a large number of passengers and freight on one train, the magnitude of a disaster becomes enormous when it happens. It would be necessary to enhance higher recognition of railway staff's recognition of the importance of safety.

Generally speaking, the work environment of workshops and depots does not seem good. Rubbish and trash are scattered in the work place. It seems that no one cares about cleanliness and neatness of their working environment. Furthermore, the inside of the railway stations is not clean in general. This might reduce the motivation of workers as well as trigger potential accidents.

Considering the previous issues, capacity building of ENR staff would be necessary in the following fields.

- Railway Transport Safety;
- Transport Planning and Data Management;

- Knowledge and Training for Modern Technology which would be introduced; and,
- Neat work environment:

3.4.5. Conclusions

Railway transport service basically has advantages over the other modes of transport, which are shown as "Strengths" in Table 3.4.1. However, ENR has been failing to realize those advantages to the customers. On the other hand, ENR has also failed to deal with basic "Weaknesses" in the same table.

Reliability is considered one of the advantages of railway service, generally. ENR has not been successful to provide this aspect of railway service as well. Enhancement of the "Strengths" and correction of the "Weaknesses" to realize the original role of the railway would be tasks to be tackled by ENR.

Table 3.4.1 Strengths and Weaknesses of the ENR Railway Transport

	Strengths	Weaknesses
Hardware	- Railway network covers major parts of the country - Environmentally friendly - Large transport capacity - High speed transport - Punctual transport service - Environmental friendly	- Old and obsolete system (workshops, rolling stock, tracks, signalling system) - Access/egress transport service is poor and obsolete. - Train speed is very slow except for main lines
Software	- Systematic transport service - Safe transport service	- Maintenance works are not performed well - Safe operation - Train diagram - Transport planning/Database maintenance
Humanware	- A large number of staff	- Knowledge and experience of modern technology

Source: JICA Study Team

CHAPTER 4: DEVELOPMENT PLAN FOR THE RAILWAY

4.1. METHODOLOGY

For a development plan for the railway, three points are focused on: safety, customer service, and efficiency. Measures for development are considered to improve the above three points.

4.1.1. Safety

Safety is, of course, the first priority. If a large accident happens, it causes loss of lives, property and trust. In any development, safety must be secured.

As stated in 3.3, derailment and fire accidents have increased recently. Fortunately, no serious disaster has occurred but derailment and fire accidents are not just the interruption of operation but they have the possibility to trigger a great disaster. Causes of those accidents must be cleared away.

Human error is the major reason for the accidents. Training is very important for this matter to transform the culture so that safety is the top priority. However, it is unavoidable that humans make mistakes. It is necessary to provide a hardware system that will issue an alarm when there is a critical matter and that will protect lives and property even when the staff undertake incorrect action. Automatic Train Protect (ATP) is such a device and it is installed in some lines and locomotives. The signalling system should be changed to provide ATP for the entire line. This is urgent for safe operation.

Overage of the facilities is the second reason for the accidents. Renewal of the facilities and providing proper maintenance for the tracks and rolling stock are also necessary.

4.1.2. Costumer Service

Customer satisfaction is important for any service business. The railway always competes with other transportation modes, especially with road transportation. Therefore, if there are any insufficient services compared with other modes of transportation, the customer will choose the other mode.

Currently, costumer service of the railway is not good and many costumers have shifted to other modes. There are many factors that cause costumers to leave the railway such as accuracy, cleanliness, safety, convenience etc. It is important to make the railway service more attractive and keep a good balance with other transportation modes.

Riding quality is one of the big factors of passenger satisfaction. It is not only the vibration level but also air conditioning, noise, cleanness, brightness, etc. Condition of the rolling stock is very important factor for this.

Travel time is another interest for the passengers. For reducing the traveling time, High Speed Trains will be very attractive for the passengers in order to be competitive with aviation service.

4.1.3. Efficiency

Efficiency is important for sustainable management. This means to provide the best performance with limited resources.

To operate the railway, it requires a huge amount of investment for infrastructure and rolling stock. Even when the train is not running, it costs for maintenance of those infrastructure and rolling stocks. Also trains that are running without fully loading passenger or cargos also produce a big loss. The best way to increase the efficiency is to attract the costumers and carry the passengers and cargoes at near capacity.

When the traffic volume is sufficient, electrification and distributed traction systems are much more efficient than concentrated traction systems with diesel locomotives. Electric cars have much higher acceleration and deceleration so that average speed becomes higher even when maximum speed is the same. It isn't necessary to change the locomotive at the terminal and therefore, turn back time is quite short compared with diesel trains. Energy can also be saved with regenerative brakes.

The freight transportation volume of 2010 was about 5 million tons. That is 14000 tons a day on average. Assuming that loading capacity of one wagon is 30 tons and one train travels each day, 470 wagons are required to transport this volume. Considering the return trip without loading 1000 wagons are enough for this volume. However the number of freight wagons is more than 10000 cars. That means that about 9000 wagons are not running and are stabled somewhere.

In freight transportation, Iron ore and wheat achieves a certain result as they are transported directly from the mine to the steel works or the port to the silo. However bulk cargoes are shifted to road transportation. It is recommended that, not only port containers, but bulk cargoes to be transported by container to minimize the loading and unloading time from trucks to railway wagons.

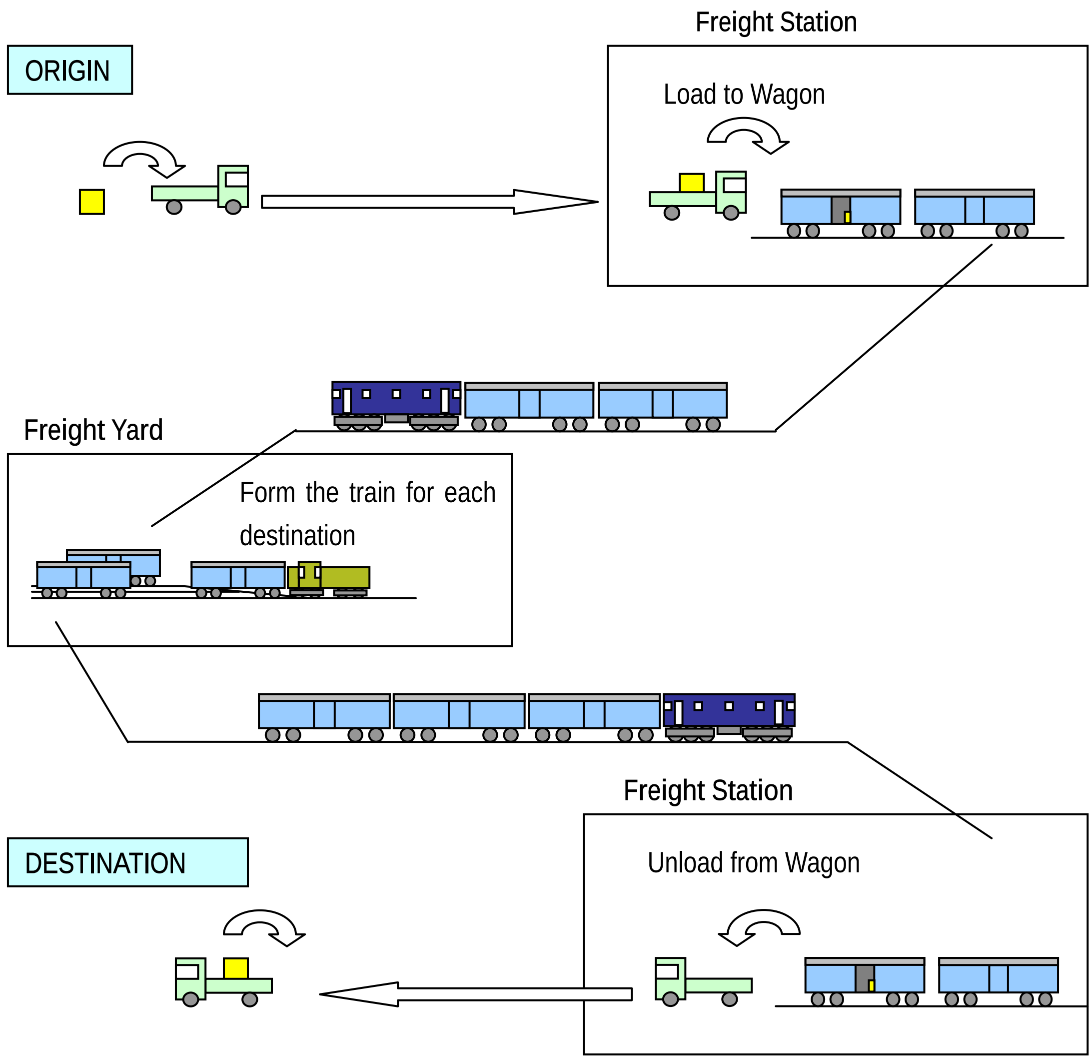
It is not only because of double handling but the schedule of freight train is not certain. Trains are scheduled after a certain volume of cargo is gathered and a locomotive is provided.

It is recommended to provide railway container terminals at the location of good access to roads and with facilities for loading and unloading. A logistic centre is one example or to convert the existing freight stations or freight yards to railway container terminals.

Figure 4.1.1 and Figure 4.1.2 indicate a comparison of conventional freight transportation and container transportation by railway.

Figure 4.1.1 shows the conventional system of freight transportation by railway

Cargoes are gathered by trucks from the Origin to a freight station. At the freight station cargos are unloaded from the trucks and loaded onto railway wagons. Normally this work is done by hand and it takes time. Then the freight wagons are gathered in the freight yard and shunted to each train by direction. After arriving, the station cargos are unloaded from the railway wagons and loaded onto the trucks. This also takes time and manpower.



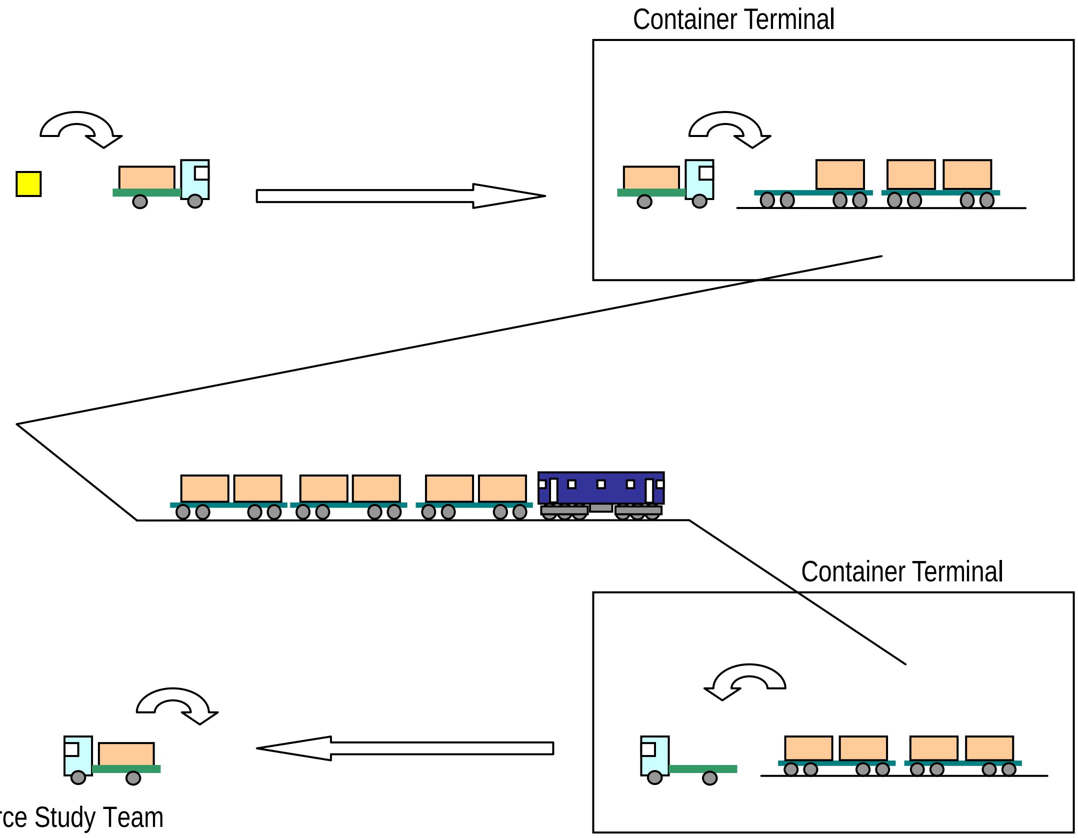
Source Study Team

Figure 4.1.1 Conventional Railway Freight Transportation

Compared with transportation by truck, additional time and effort for loading and unloading are required at the freight stations. Also, the trains have to be shunted at the freight yards and this takes additional time for transportation. Therefore, railways cannot compete with road transportation when distance is short even if the tariff is much cheaper.

To solve these problems, containerized transportation is recommended. Figure 4.1.2 shows railway freight transportation.

Freight stations are integrated with the railway container terminals so that origin and destination are simplified. Loading and unloading are done by reach stackers. It takes only a few minutes for one container. Train formation is fixed and it does not require shunting as the destination is simplified.

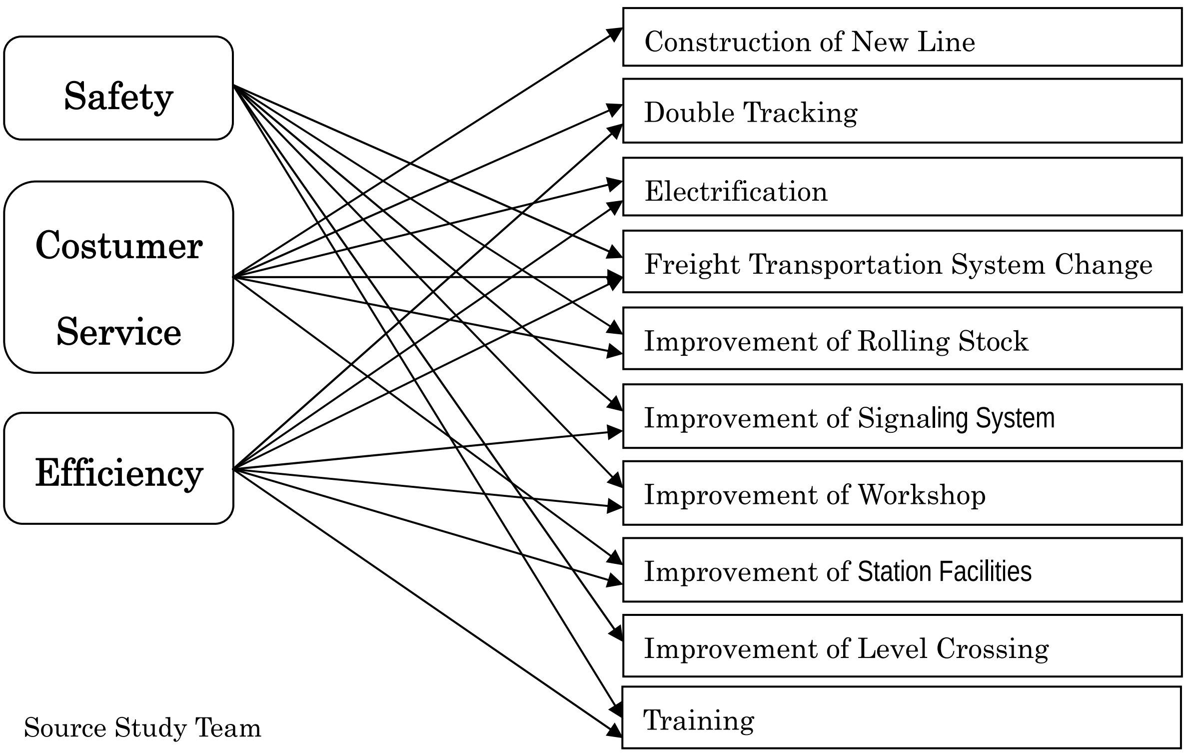


Source Study Team

Figure 4.1.2 Railway Container Transportation

4.1.4. Measures for Improvement

The following measures are considered for improvement of the railways.



Source Study Team

Figure 4.1.3 Measures for Improvement of Railways

4.2. DEMAND FORECAST

Future demand is projected by creating a simulation that includes the entire network of transportation in Egypt including road, air and inland water.

4.2.1. Passenger Demand Forecast

In the simulation, movement of the persons or cargo are calculated only from governorate to governorate. Therefore, it will not count short distance passengers moving inside a governorate, so it is not appropriate for analyzing branch lines of the existing railway.

When a High Speed Railway is constructed the number of passengers using the High Speed Railway will be more than 20,000 per day. This is about 10,000 persons per direction. If the train is the same as the Shinkansen (Bullet Train) in Japan and there are 12 cars per train, the capacity of the train will be about 1000 persons. As movement of the passengers is not constant for the whole the day train will not always be full to its capacity. About 20 trains per day per direction are required. Headway of operation is about 45 minutes.

If the High Speed Train stops over at Tanta, the demand forecast for 2027 is much bigger than "without stopping" at Tanta. Headway will be 30 minutes in this case.

For the High Speed Train to Aswan, the same number or more passengers is projected by the simulation.

4.2.2. Demand Forecast of Freight Transport

(1) Potential Demand for Railway Transport

Currently, more than 95% of freight transport depends on road transport in Egypt and intermodal transport, or, share increase in railway and inland water transport is an important transport policy. However, a quantitative target for this policy is rather difficult to establish. Before making a demand forecast, the maximum potential demands for railway and IWT were estimated from the viewpoint of transport cost. The analysis was done through the following two steps: (1) Which OD pairs are advantageous for railway and IWT in terms of transport cost and (2) what demand is expected among such OD pairs?

Step 1: Which OD pairs are advantageous for railway and IWT in terms of transport cost?

1) Transport Cost

The Ministry of Transport established and issued a guideline for transport cost (tariff) only for road transport, although it has no compulsory power. According to IWT operators, they offer an IWT tariff that is about 20% lower than the guideline. Loading and unloading costs correspond to about 15% each of the total transport cost in the case of 200 km transport. Container transport entails a higher loading/ unloading cost due to the initial cost of heavy machinery.

Economic freight transport cost of each mode is estimated as shown in table 4.2.1-1. The cost per ton-km does not include loading/ unloading costs. According to the studies on modal comparison of transport costs, IWT cost is reported at 1/4 to 1/5 of truck transport cost and railway transport cost at 1/2 to 1/3. As infrastructure is developed, O&M is rationalized and vessel size is improved in the future in Egypt, transport cost of IWT and railways will be presumably reduced down to the costs shown in Table 4.2.1-2.

Table 4.2.1-1 Economic Fright Transport Cost by Mode (Current)

(at 2011 price)

	Cost per ton-km (LE)			Loading Cost (LE/ton)			Unloading Cost (LE/ton)		
	Packed	Bulk	Container	Packed	Bulk	Container	Packed	Bulk	Container
Road	0.401	0.461	0.434	18.23	18.23	16.00	18.23	7.49	16.00
Railway	0.312	0.358	0.339	14.17	14.17	16.00	14.17	5.82	16.00
IWT	0.267	0.306	0.294	12.11	12.11	16.00	12.11	4.98	16.00

Source: Estimated by JICA Study Team based on various sources

Table 4.2.1-2 Economic Fright Transport Cost by Mode (Future)

(at 2011 price)

	Cost per ton-km (LE)			Loading Cost (LE/ton)			Unloading Cost (LE/ton)		
	Packed	Bulk	Container	Packed	Bulk	Container	Packed	Bulk	Container
Road	0.401	0.461	0.434	18.23	18.23	16.00	18.23	7.49	16.00
Railway	0.218	0.251	0.238	14.17	14.17	16.00	14.17	5.82	16.00
IWT	0.133	0.153	0.147	12.11	12.11	16.00	12.11	4.98	16.00

Source: Estimated by JICA Study Team based on various sources

2) Identification of OD pairs that are advantageous for IWT and Railway

In order to identify OD pairs that are advantageous for IWT and railway transport, the following conditions were assumed:

a) Advantageous mode is selected only by transport cost, regardless of transport time, cargo damage or security.

b) Truck transport provides door-to-door services while ports and stations are rarely final origin or destination for consignees. Consequently, 20km of feeder transport (access (10km) + egress (10km)) were added to line haul transport. That is:

Truck Transport Cost = (Loading Cost) + (Truck t-km cost) x (Distance)+ (Unloading Cost)

IWT Cost = (Truck Loading Cost + (Truck t-km Cost) x 10 + (Truck unloading Cost) x 2

+ (IWT Loading Cost + (IWT T-km Cost) x (Distance – 20) + IWT Unloading Cost)

Railway Transport Cost is estimated in the same way as IWT.

c) The cost matrix is developed by mode based on the distance matrix by mode.

d) The advantageous mode matrix is developed by selecting the most economic mode. The diagonal elements are given to truck transport.

Transport cost inclusive of loading/ unloading costs are estimated as shown in Tables 4.2.2-1 and 4.2.2-2. Figure 4.2.1 illustrates the OD pairs of Railway and IWT that are more advantageous than truck transport.

Table 4.2.2 Transport by Mode and by Distance (EL/ton)

(1) Under Current Transport Cost in 2011

Packed

Distance	Truck	Rail	IWT
20	44.5	111.1	109.0
100	76.6	136.1	130.4
200	116.7	167.2	157.0
300	156.8	198.4	183.7
400	196.9	229.6	210.3
500	237.0	260.8	237.0
600	277.1	292.0	263.6
700	317.2	323.2	290.3
800	357.4	354.4	317.0
900	397.5	385.5	343.6
1000	437.6	416.7	370.3

Bulk

Distance	Truck	Rail	IWT
20	34.9	80.7	77.7
100	71.8	109.3	102.3
200	117.9	145.2	132.9
300	164.0	181.0	163.5
400	210.1	216.8	194.1
500	256.2	252.7	224.8
600	302.3	288.5	255.4
700	348.4	324.4	286.0
800	394.5	360.2	316.7
900	440.6	396.0	347.3
1000	486.7	431.9	377.9

Container

Distance	Truck	Rail	IWT
20	40.7	104.7	104.7
100	75.4	131.8	128.2
200	118.8	165.8	157.6
300	162.3	199.7	187.0
400	205.7	233.6	216.4
500	249.1	267.6	245.8
600	292.5	301.5	275.2
700	335.9	335.4	304.6
800	379.3	369.4	334.0
900	422.8	403.3	363.4
1000	466.2	437.2	392.8

(2) Under Future Reduced Cost

Packed

Distance	Truck	Rail	IWT
20	44.5	111.1	109.0
100	76.6	128.6	119.7
200	116.7	150.4	133.0
300	156.8	172.2	146.4
400	196.9	194.1	159.7
500	237.0	215.9	173.0
600	277.1	237.7	186.3
700	317.2	259.6	199.7
800	357.4	281.4	213.0
900	397.5	303.2	226.3
1000	437.6	325.0	239.7

Bulk

Distance	Truck	Rail	IWT
20	34.9	80.7	77.7
100	71.8	100.7	90.0
200	117.9	125.8	105.3
300	164.0	150.9	120.6
400	210.1	176.0	135.9
500	256.2	201.1	151.3
600	302.3	226.2	166.6
700	348.4	251.2	181.9
800	394.5	276.3	197.2
900	440.6	301.4	212.5
1000	486.7	326.5	227.8

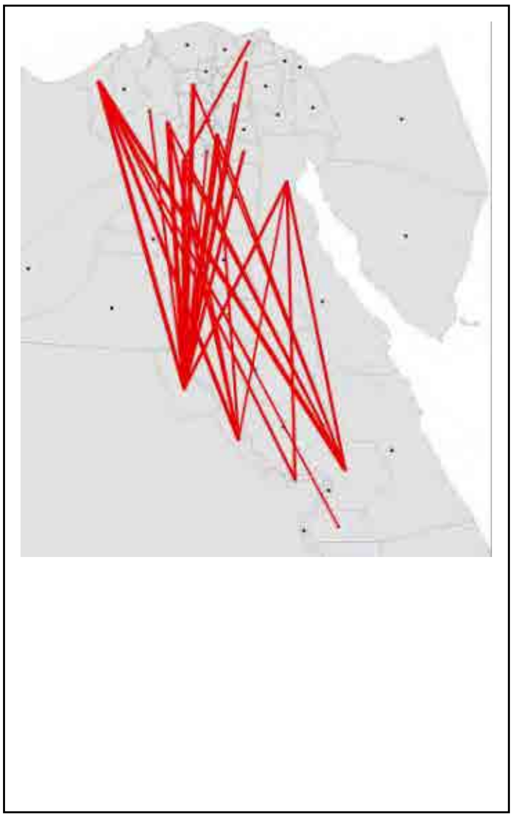
Container

Distance	Truck	Rail	IWT
20	40.7	104.7	104.7
100	75.4	123.7	116.4
200	118.8	147.4	131.1
300	162.3	171.2	145.8
400	205.7	194.9	160.5
500	249.1	218.7	175.2
600	292.5	242.5	189.9
700	335.9	266.2	204.6
800	379.3	290.0	219.4
900	422.8	313.7	234.1
1000	466.2	337.5	248.8

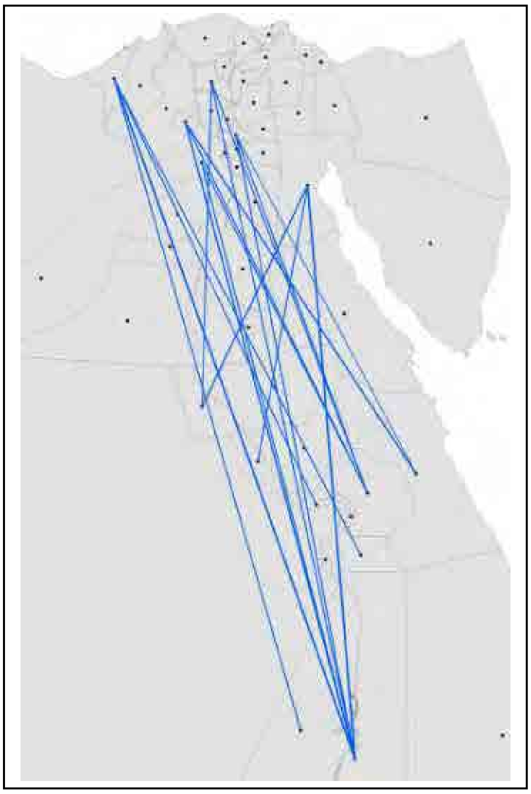
Source: Estimated by JICA Study Team

Figure 4.2.1 OD Pairs advantageous for IWT and Railway Transport

(1) IWT (Volume >2000 ton)



(2) Railway (Volume >1000)



Source; JICA Study Team

Step 2: What demand is expected among such OD pairs?

The maximum potential demand is estimated by undertaking the following procedures:

a) OD transport volumes in 2010 and 2027 were classified into one mode among trucks, railways and IWT with the lowest transport cost. Here, no modal share was considered but all the OD volume was applied to the lowest cost mode

b) The classification was made by commodity type for the years 2010 and 2027.

By implementing the above procedure, the following results were obtained.

1) In case the lowest mode obtains all at 2011 cost (Table 4.2.3)

The total share of railway and IWT is slightly over 10%. Because IWT cost is always lower than railway transport cost whenever IWT is available, zone pairs advantageous for railway are very few. In this case, transport demand in ton-km of IWT and railway has over 30% of share. It should be noted that this analysis does not include intra-governorate demand which is mostly transported by truck. If it is included, the share of IWT and railway would become less.

Table 4.2.3 In case the lowest mode obtains all at 2011 cost

	Cargo Type		Maximum Possible Demand (Ton/Day)				Maximum Possible Demand (1000Ton-km/Day)			
			Packed	Bulk	Container	Total	Packed	Bulk	Container	Total
Demand (Ton & Ton-km)	1	IWT	34,326	69,786	11,892	116,004	31,058	54,945	10,828	96,831
	2	Railway	1,481	6,215	609	8,305	316	2,441	198	2,955
	3	Container	397,319	487,615	175,773	1,060,707	83,073	90,937	34,530	208,541
	4	Total	433,126	563,616	188,274	1,185,017	114,447	148,323	45,556	308,326
Compo-sition(%)	1	IWT	7.9	12.4	6.3	9.8	27.1	37.0	23.8	31.4
	2	Railway	0.3	1.1	0.3	0.7	0.3	1.6	0.4	1.0
	3	Container	91.7	86.5	93.4	89.5	72.6	61.3	75.8	67.6
	4	Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: JICA Study Team

2) Demand of Railway and IWT, independently advantageous than Truck (Table 4.2.4)

In Table 4.2.3, demand more advantageous for railway than truck was hidden behind IWT. Then, OD pairs advantageous for railway and IWT independently to truck transport were identified and the same analysis was done, of which the results were shown in Table 4.2.4. Railway transport cost is higher than IWT cost and if the feeder transport cost is added, the potential market share of the railways is not as high as that of IWT. It became evident that IWT has a much higher potential demand than railway transport.

Table 4.2.4 Demand of Railway and IWT, independently advantageous than Truck

	Cargo Type		Maximum Possible Demand (Ton/Day)				Maximum Possible Demand (1000Ton-km/Day)			
			Packed	Bulk	Container	Total	Packed	Bulk	Container	Total
Demand (Ton & Ton-km)	1	IWT	34,326	70,967	11,892	117,185	31,058	55,985	10,828	97,871
	2	Railway	3,103	24,448	1,278	28,829	1,491	14,790	676	16,956
	3	Container	397,319	487,615	175,773	1,060,707	83,073	90,937	34,530	208,541
	4	Total	434,748	583,030	188,943	1,206,721	115,622	161,711	46,034	323,367
Compo-sition(%)	1	IWT	7.9	12.6	6.3	9.9	27.1	37.7	23.8	31.7
	2	Railway	0.7	4.3	0.7	2.4	1.3	10.0	1.5	5.5
	3	Container	91.7	86.5	93.4	89.5	72.6	61.3	75.8	67.6
	4	Total	100.4	103.4	100.4	101.8	101.0	109.0	101.0	104.9

Source: JICA Study Team

3) If transport cost is reduced to the European level (Table 4.2.5)

If the relative transport cost of railways and IWT are reduced to the present European level, the results of the same analysis are as shown in Table 4.2.4. The gap between IWT and railways is expanded because a significant cost reduction was assumed in IWT. Railways would play a more important role in freight transport only if IWT is not modernized as planned.

. Table 4.2.5 If transport cost is reduced to the European level

	Cargo Type		Maximum Possible Demand (Ton/Day)				Maximum Possible Demand (1000Ton-km/Day)			
			Packed	Bulk	Container	Total	Packed	Bulk	Container	Total
Demand (Ton & Ton-km)	1	IWT	86,655	191,041	29,575	307,270	61,004	101,091	21,984	184,079
	2	Railway	1,695	7,294	599	9,587	391	1,848	149	2,387
	3	Container	344,777	365,282	158,100	868,159	58,188	55,878	25,386	139,452

	Cargo Type		Maximum Possible Demand (Ton/Day)				Maximum Possible Demand (1000Ton-km/Day)			
			Packed	Bulk	Container	Total	Packed	Bulk	Container	Total
	4	Total	433,126	563,616	188,274	1,185,017	119,583	158,816	47,519	325,918
Compo-sition(%)	1	IWT	20.0	33.9	15.7	25.9	51.0	63.7	46.3	56.5
	2	Railway	0.4	1.3	0.3	0.8	0.3	1.2	0.3	0.7
	3	Container	79.6	64.8	84.0	73.3	48.7	35.2	53.4	42.8
	4	Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: JICA Study Team

4) Demand in 2027 at Current Cost (Table 4.2.6)

The same analysis was made using the OD matrix projected to 2027. The total market share of railways and IWT lowers from the 10% at present to 8% in 2027. This is because future transport demand is geographically expanded nationwide and as a result, the area where railway or IWT is available becomes relatively narrower.

Table 4.2.6 Demand in 2027 at Current Cost

	Cargo Type		Maximum Possible Demand (Ton/Day)				Maximum Possible Demand (1000Ton-km/Day)			
			Packed	Bulk	Container	Total	Packed	Bulk	Container	Total
Demand (Ton & Ton-km)	1	IWT	62,467	129,654	21,999	214,121	31,058	54,945	10,828	96,831
	2	Railway	3,354	11,522	2,934	17,810	316	2,441	198	2,955
	3	Container	971,029	910,777	754,587	2,636,393	83,073	90,937	34,530	208,541
	4	Total	1,036,851	1,051,953	779,521	2,868,324	114,447	148,323	45,556	308,326
Compo-sition(%)	1	IWT	6.0	12.3	2.8	7.5	27.1	37.0	23.8	31.4
	2	Railway	0.3	1.1	0.4	0.6	0.3	1.6	0.4	1.0
	3	Container	93.7	86.6	96.8	91.9	72.6	61.3	75.8	67.6
	4	Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: JICA Study Team

5) Demand in 2027 at Current Cost (Table 4.2.7)

Table 4.2.7 Demand in 2027 at Reduced Cost

	Cargo Type		Maximum Possible Demand (Ton/Day)				Maximum Possible Demand (1000Ton-km/Day)			
			Packed	Bulk	Container	Total	Packed	Bulk	Container	Total
Demand (Ton & Ton-km)	1	IWT	182,491	361,984	97,506	641,981	61,004	101,091	21,984	184,079
	2	Railway	3,900	13,305	3,059	20,264	391	1,848	149	2,387
	3	Container	850,459	676,664	678,956	2,206,079	58,188	55,878	25,386	139,452
	4	Total	1,036,851	1,051,953	779,521	2,868,324	119,583	158,816	47,519	325,918
Compo-sition(%)	1	IWT	17.6	34.4	12.5	22.4	51.0	63.7	46.3	56.5
	2	Railway	0.4	1.3	0.4	0.7	0.3	1.2	0.3	0.7
	3	Container	82.0	64.3	87.1	76.9	48.7	35.2	53.4	42.8
	4	Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: JICA Study Team

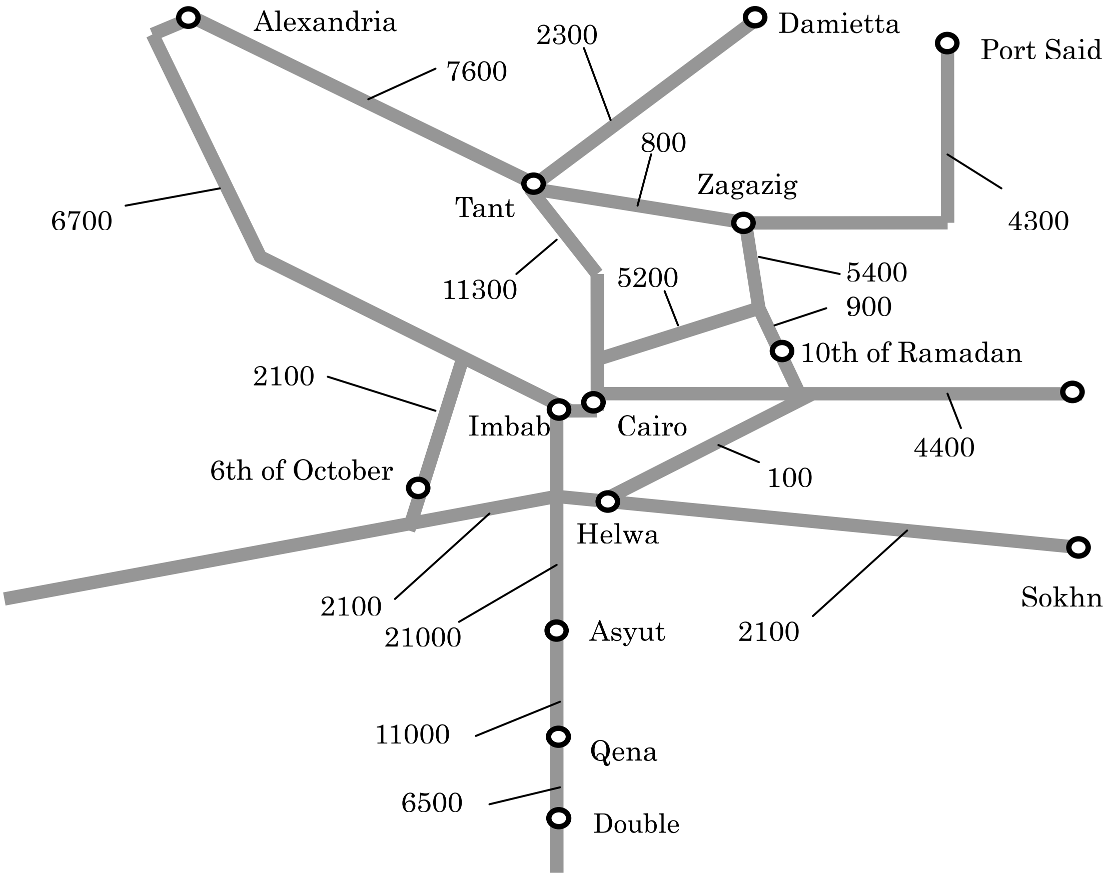
If the transport cost is reduced to the current European level, the demand for IWT and railways would increase but not so drastically as in 2010 demand. However, the potential demand of IWT in ton-km exceeds 50% of the total. This is a shocking result.

6) Conclusion

The potential demand for railways and IWT is estimated at about 10% under the current cost, even if ignoring factors other than cost. And the analysis showed that the share would decrease as the demand structure changes. Consequently, the MiNTS' forecast of 2-3% of share for railways and IWT seems reasonable.

(2) Forecasted Freight Demand

Figure 4.2.1 indicates demand forecast of railway freight on major lines in 2027.



Source Study Team

Figure 4.2.1 Freight Demand Forecast in 2027

Assuming that average loading of a freight train is 1000 ton, the line between Cairo and Alexandria requires about 4 trains every day for one direction. Also 4 trains are required for the line between Imbaba and Alexandria. For the line to Aswan, 11 trains up to Asyut, 6 trains up to Qena, and 4 trains up to Luxor will be required.

4.3. CANDIDATE PROJECTS

4.3.1. Projects Proposed in Previous Studies

The study team referred mainly to the following study reports already carried out.

(1) The Master Plan Study for Egyptian National Railways, Final Report (JICA, December, 1996)

(2) The Study on Multimodal Transport and Logistics Systems of the Eastern Mediterranean Region and Master Plan in the Arab Republic of Egypt, Final Report (JICA, August, 2008)

(3) The Feasibility Study for the Cairo – Alexandria Line Electrification Project in the Arab Republic of Egypt (JICA, December, 1979)

Recommended projects in the above studies are indicated in Table 4.3.1

Table 4.3.1 Projects Proposed in Previous Studies

Study No.	Project	Project Cost (Million LE)
(1)	Speed up of the train (10% reduction of traveling time)	88.8
(1)	Modernization of freight transportation (integration of freight stations)	134.5
(1)	Improvement of rolling stock availability	35
(1)	Renewal of rolling stock	1456
(1)	Improvement of information systems	15
(1)	Improvement of train protection systems	668.5
(1)	Improvement of track maintenance	1130.8
(2)	6th of October Direct Access Line Construction Project	240
(2)	Sadat City Access Line Construction Project	190
(2)	Electrification of Signalling of Beni Shebin El-Qanater – El Zagazig – El Mansoura – Damietta Line	734
(2)	10th of Ramadan Direct Access Line Construction Project (Bilbeis – 10th of Ramadan)	250
(2)	Railway Improvement Project (Ferdan – Port Said Port East)	900
(2)	Electrification of Signalling for Beni Suef – El Menia Asyut OLIne	1,640
(2)	Electrification of Signalling for El Rahm – Alexandria – Abu Qeer Line	1116
(2)	Burg El Arab Access Line Construction Project	750
(3)	Electrification of Cairo – Alexandria Line	

Source Study Team based on JICA report

Also, an improvement study was conducted by Booz Allen in 2006 and 19 projects were proposed. Those projects were assessed by the Rail sector and implemented with the assistance of an Italian specialist team. Those projects are taken over to 20 priority action plan.

A summary of the projects is shown in Table 4.3.2-1 to Table 4.3.2-3.

Table 4.3.2 - 1 ENR Transformation Plan (1/4)

Strategic Project	Initiative	Planned tasks until June 2010	Short Term	Mid Term	Long Term
1 Public Sector Framework	PSO	Complete negotiations with MoF; long term contract with Governorates Discontinuation of concessions Negotiations with military and other public sector entities			
	Freight liberalization	No activity planned for the time being			
	Sector Framework	Potentially define MOT PSO regulatory function (depending on negotiations with MoF)			
2 New operating model	Organization structure	Complete organization migration (all phases) Ensure stabilization of new organization structure			
	Corporate governance	Ensure implementation of the transformation / provide strategic guidance Ensure transparency and accountability of SBUs and ENR overall Ensure efficient decision-making Ensure implementation of the highest safety standards			
3 Efficiency improvement		Reduce duplication of efforts throughout management and operational levels at ENR Ensure appropriate authority and decision-making is formalized and implemented			
4 Human Resources	Manpower Plan	Complete coverage of all management positions Assess and implement efficiency initiatives			
	Internal labor market	Develop training program for employee career enhancement Implement competitive processes for open positions			
	HR governance and management	Transformation into new HR structure Development of HR policies for all ENR employees			
	Compensation	Review current compensation policy Design and implement bonus system Implement new system and ensure appropriate governance			
	Training	Develop a tailored training program based on development needs of employees Initiate ongoing technical training (at MATT) Integrate training and development planning with organizational planning			

Source ENR

Table 4.3.2 - 2 ENR Transformation Plan (2/4)

Strategic Project	Initiative	Planned tasks until June 2010	Short Term	Mid Term	Long Term
5 IT-Systems & Infra-structure	7 sub-initiatives	Issuance of RfP and selection process for providers Selection and implementation of ERP system Set-up of TransIT			
6 Finance and Accounting	Finance organization structure	Migration to new structure concurrently with new operating model migration Ensure regional roll-out and appropriate coordination within new structure			
	Accountability and transparency	Implementation of new accounting system Data gathering and initial reporting for split SBUs Transition from "manual" temporary accounting system into automatic system			
	Business control and information	Definition of key KPIs for each unit Finalization of KPIs and communication ready for implementation Financial sustainability achieved			
7 Non core activities	Non core businesses General services	Set up subsidiaries in the short term Restructuring of subsidiaries in the mid-long term			
8 Asset Im-provement	Permanent Way & Level Crossings	Carry out implementation plan including defined measures for tracks & level crossings renewal Implementation of required changes to the structure of Joint Ventures			
	Signaling	Corridor 1 started, technical study for corridors 2-3 ongoing Establish Program Management Office Selection of contractors for upgrade			
	Rolling Stock	Ongoing implementation of coaches maintenance improvement (included under "Maintenance" initiative) Implementation of the upgrade plan for coaches and wagons			
	Station Upgrades	Upgrade station infrastructure across the ENR network thereby improving customer service Implement new safety standards and improve image of ENR toward the public			
9 ERMAS	Locomotive maintenance performance	Ongoing implementation			
	Rolling Stock Maintenance company	Ongoing oversight on implementation of measures allowing start of production Complete Migration and integration of all workshops into ERMAS			

Source ENR

Table 4.3.2 - 3 ENR Transformation Plan (3/4)

Strategic Project	Initiative	Planned tasks until June 2010	Short Term	Mid Term	Long Term
10 **Freight services**	Egyptian Port Freight Services	Detailing of intermodal concept and other freight opportunities Search and selection of potential partners			
	Increase market share	Identify volume-increasing opportunities for core commodities			
	Commercial freight rates	Ongoing rate negotiations with key customers Exit non-focus commodities			
	Operating improvements	Definition of operating improvements (situation when additional locomotives available) Evaluate processes/procedures to improve efficiency			
	Intermodal	Develop intermodal freight services targeting inbound/outbound container port transports			
11 **Passenger services**	PLD PSD	Initiate development of longer term strategy for SBU PLD Develop marketing and communication strategy Optimize demand vs. supply Consider value added services Develop new services in urban and industrial areas			
12 **ER JET**	Real Estate, Advertising & Station devpt.	Take over the management of all ENR stations Develop business plan for stations and ENR assets Implement commercial and advertising plans			
13 **Passenger revenue optimization**	Fare Evasion reduction	Ongoing implementation of penalty fare and increased controls in stations as well as required construction measures Monitoring of results and expansion to other lines			
	Annual fare increases	Revisit for increase in FY 08/09			
	A/C far increases	Ongoing evaluation of service offering and fare increases for A/C class coaches			
	Egypt explorer	Detailing of concept and start of implementation			
	Peak-off peak fares	Detailing of the concept and preparation for implementation on the Cairo-Alex line Currently on hold			
	Class differentiation pricing	Ongoing implementation			

Source ENR

Table 4.3.2 - 4 ENR Transformation Plan (4/4)

Strategic Project	Initiative	Planned tasks until June 2010	Short Term	Mid Term	Long Term
14 **Safety Capabilities upgrade**	MoT	Establish Safety Management System Framework Start of Twinning consulting project Establish internal safety audit function Risk management and system accreditation			
	ENR	Organization structure migration and staff training Risk assessment safety policy development and documentation Establish coordination means between the safety area and the different SBU's Tasks as part of the Twinning consulting project			
15 **Customer Services**		Ongoing audits on status of train services and stations KPIs including regular monitoring of customer results SBU driven customer service initiatives Oversight and auditing by MoT CS Head			
16 **Communication**		Ongoing communication on the migration plan through regional meetings and newsletter External campaign to announce ENR improvements and increase customers			
17 **Procurement**	Procurement Process Improvement	Implementation of improved procurement processes including short term IT-procurement solution Measures to increase efficiency of procurement approach at ENR			
	Warehouses	Upgrade of warehouses			
	Obsolete parts	Develop/ Implement disposal plan Increase warehousing efficiency			
18 **Scrap**		Develop and implement scrap collection and sale process Install scrap collection and segregation bins Contract with scrap removal firms			
19 **Maintenance**		Formalize and implement cleaning, supervision and auditing procedures in remaining workshops Migrate to preventive / predictive maintenance models Develop and implement a (cross-functional) training plan Assess overall preventive maintenance strategy and implementation plan			

Source ENR

4.3.2. Current ENR Projects

Table 4.3.3-1 and Table 4.3.3-2 show current projects of ENR.

Table 4.3.3 – 1 Current Improvement Projects of ENR (1/2)

No.	Project outline	Area	Progress of the Project	Length		Cost	Cost/Length	Assumption construction period
				Kind of construction	km	million pounds.	million pounds/km	year
1	Double-tracking of the railway line Alkabbary Marsa Matrouh from km 15 to km 42.925 that the railway line runs to the city of New Borg Al Arab.	Northwestern Egypt	Under Construction	Duplication	28	1st.step 100	3.57	Dec.2007-Oct.2010 3year
				Dubletrack New Line	12.5	2nd.step 550	21.57	Mar.2009-Oct.2010 1.5year
				Singletrack New Line	13			
2	Double-tracking of the railway Ain Shams / Suez to serve the new cities in the east of Cairo and a link Tenth of Ramadan City.	Cairo east side	Finance/Budget Allotted	Duplication	45	500	500/(45+25+25) =5.26	2year
				Dubletrack New Line	25+25			
3	Double-tracking of the railway line between the Qalyoub station, EL Qnater station for 20km and a cost of 100million pounds.	Cairo North side	Project Idea Stagre	Duplication	20	100	5.00	2year
4	Track tripling for the railway line between Qalyoub and Benha. Railway Cairo / Alexandria 30 km in length, 200 million pounds.	Cairo North side	Project Idea Stagre	Single track New Line	30	200	6.67	3year
5	The development of a railway bridge lemon / Abbasiya /Tora, length of 20km and financial cost of 100 million pounds.	Cairo South side	Project Idea Stagre	Dubletrack New Line	20	100	5.00	2year
6	Double-tracking of the railway line at Mansoura / Damietta, length of 62km and financial cost of 500 million pounds.	Northern Egypt	Project Idea Stagre	Duplication	62	500	8.06	4year
7	Completion of railway project Ismilia / Rafah, length of 120km and financial cost of 800 million pounds.	Northeastern Egypt	Project Idea Stagre	Single track New Line	120	800	6.67	4year
8	Replacement of old mechanical interlocking system by electronic interlocking system for the section from Beni Suef to Asyut	Egypt central part	Bidding/Construting	Replacement of Signal system (Beni Suef ~Asyut)	251	1600	6.37	4year
9	Improvement of Tanta / Mansoura / Damietta corridor to increase the number of freight trains. The contents of the improvement are as follows;the upgrading of signaling installations, introduction of full new automatic block system with color light signals,replacement from current mechanical interlock system to electronic interlocking system,full new automatic level crossings, and introduction of new communication systems.	Northern Egypt	Project Idea Stagre	Improvement of Signal system (Tanta ~Damietta)	89	700	7.87	3year
10	Improvement of Benah / Zagazig / El Ismaailia / Port Said to join Port Said port with the ENR network, to increase the safety level, increase the maximum speed from 110 km/h to 140 km/h, and to increase the number of freight trains. The contents of the improvement are as follows;the upgrading of signaling installations, introduction of full new automatic block system with color light signals,replacement from current mechanical interlock system to electronic interlocking system,full new automatic level crossings, and introduction of new communication systems.	Egypt north-northeast part	Bidding/Construting	Improvement of Track (Ismaailia -Port said)	79	1000	1000/(192) =5.21	3year
				Improvement of Signal system (Benah ~Port said)	192			

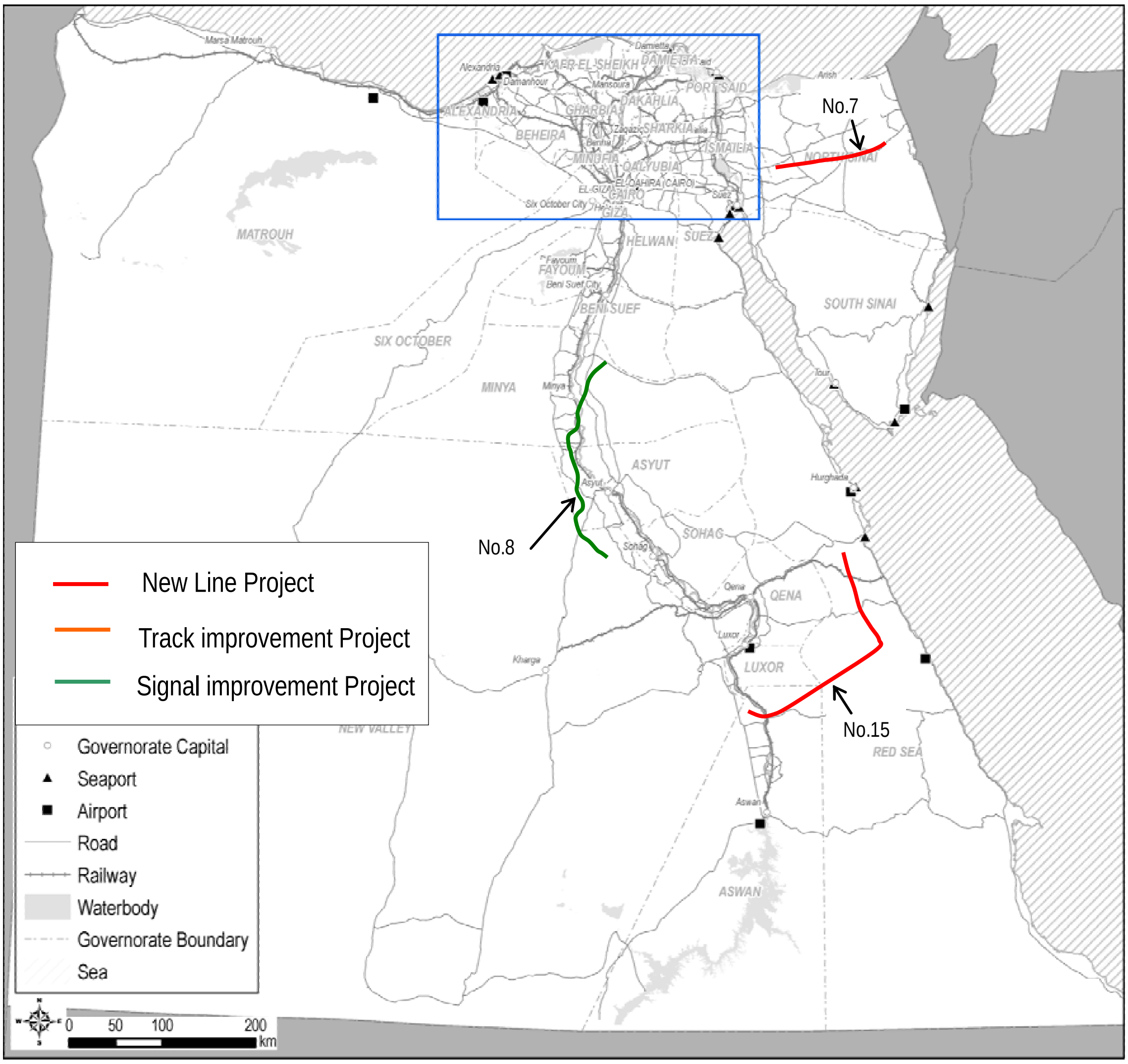
Source Study Team based on ENR data

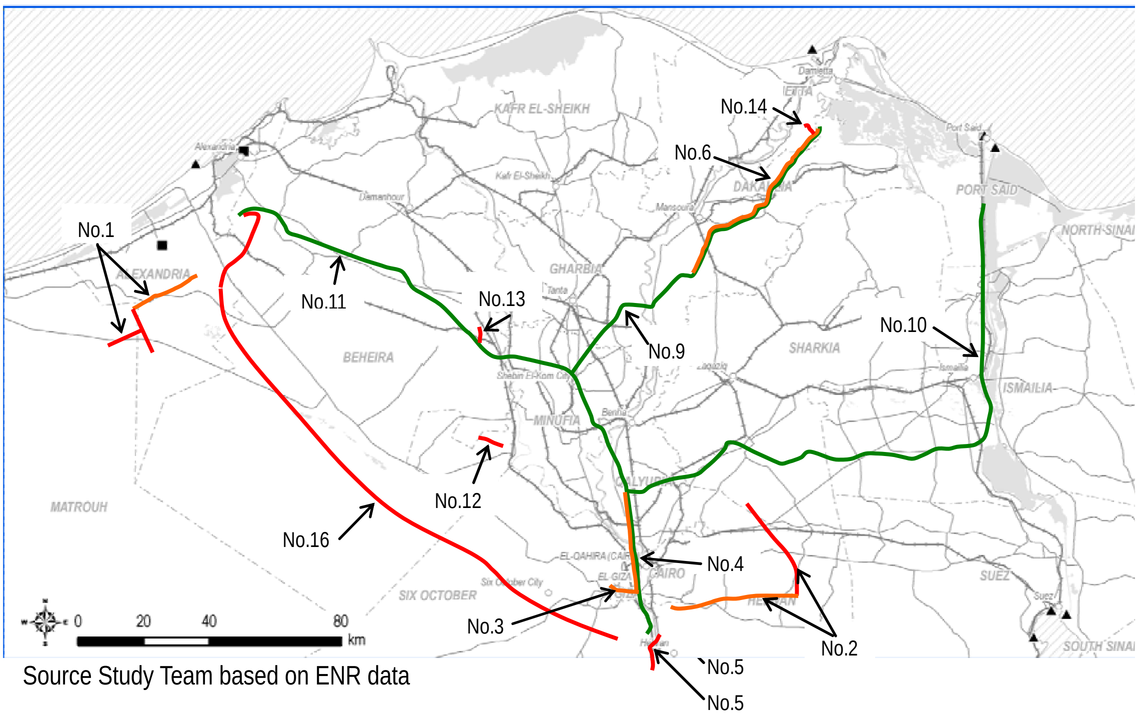
Table 4.3.3 – 2 Current Improvement Projects of ENR (2/2)

No.	Project outline	Area	Progress of the Project	Length		Cost	Cost/Length	Assumption construction period
				Kind of construction	km	million pounds.	million pounds/km	year
12	El Sadat city junction branched from Embaba - Etay el baroad line (ex Menouf-el Sadat) The new line start from 66.7km from line Embaba - Etay El baroad its length 34.4km consists of 3station and 1brige for train. Finish about 16km Digging Embakment masonry 2 station. Now Project is stopping because Recurred Right of way(R.ow) 18km	Northwestern Egypt	Under Construction	Single track New Line	34.4	300	8.72	5year
13	Establish a line for Basion city branched from cairo - Alex line - [shubra el Namela station] by 27 km long funded by ministry of finance including signals work. Start from 93km line Cairo / Alex and extended till Kfr El Shorbgy and go North Parralel to Menya Abyar Draing until arrive to Basion city (Length 27km). The connection contain 4 station and 3 railway bridge,4 car bridge ,some Pipelines for passing Water in canal and drainage and need 85 acre (Right of way)	Northern Egypt	Project Idea Stagre	Single track New Line	27	200	7.41	3year
14	Establish a junction for new Damitta city [passangers - freight] branched from 5.6 Damitta city , 11 km long. This condition start from 5.00km from line Kfr EL Btekh / Mew Dammiata. It's length 7km and another connection to the industrial Region with length 4km and its way go across inside agriculture land and need 17 acre (Right of way)	Northern Egypt	Project Idea Stagre	Single track New Line	11	70	6.36	2year
15	New Line Luxor-Hurghada 294 km. The trip by the proposed track takes two hours between the two cities with the speed of 150 km/h. The track can be divided into three sectors: First sector is about 100 km long starting from south Hurghada airport continuing along Hurghada/Quseir road and Red Sea coast passing by Safaga on km 50. As for the second sector, it is deviated to the west towards Luxor direction. It is 140 km long and passing by rugged mountainous areas. The third sector is 54 km long passing by easy slops till joining Cairo/Aswan line at Zenya Station 10.5 km away far from Luxor till Luxor Station.	Cairo South side	F/S Completed	Single track New Line	294	3598	12.24	5year
16	New Line Cairo - alex high speed 200 km. Project Description in Charge A High-Speed-railway project is due to establish an Outdoor station in the west side of the Cairo , and to connect it to Alexandria. A route is due to be built along the desert road which exists in the west side instead of along a Cairo-Alexandria line. A route is comparing a main part by 2 routes. Comparison study of the 3 plan is carried out by station connection of an end. Route extension is about 220 km. The operation maximum speed is planned at 300 km/h.	Northern Egypt	F/S Completed	Dubletrack New Line	220	13160	59.82	7year
17	The new Metro No. 3 line construction project. A project completes the metro No. 3 line of now under construction through 4 phase of construction. Total length 34.20km. Total Number of station 33.	Cairo City.	Under Construction Phase1,2 F/S Completed Phase 3,4	Dubletrack New Line	34.2	-	-	-

Source Study Team based on ENR data

Locations of the projects are shown in Figure 4.3.2





Source Study Team based on ENR data

Figure 4.3.1 Location Map of Current ENR Projects

Besides the projects above, several projects are planned and ongoing in ENR. Table 4.3.4 shows major items of the projects.

Table 4.3.4 Ongoing / Planned Projects by ENR

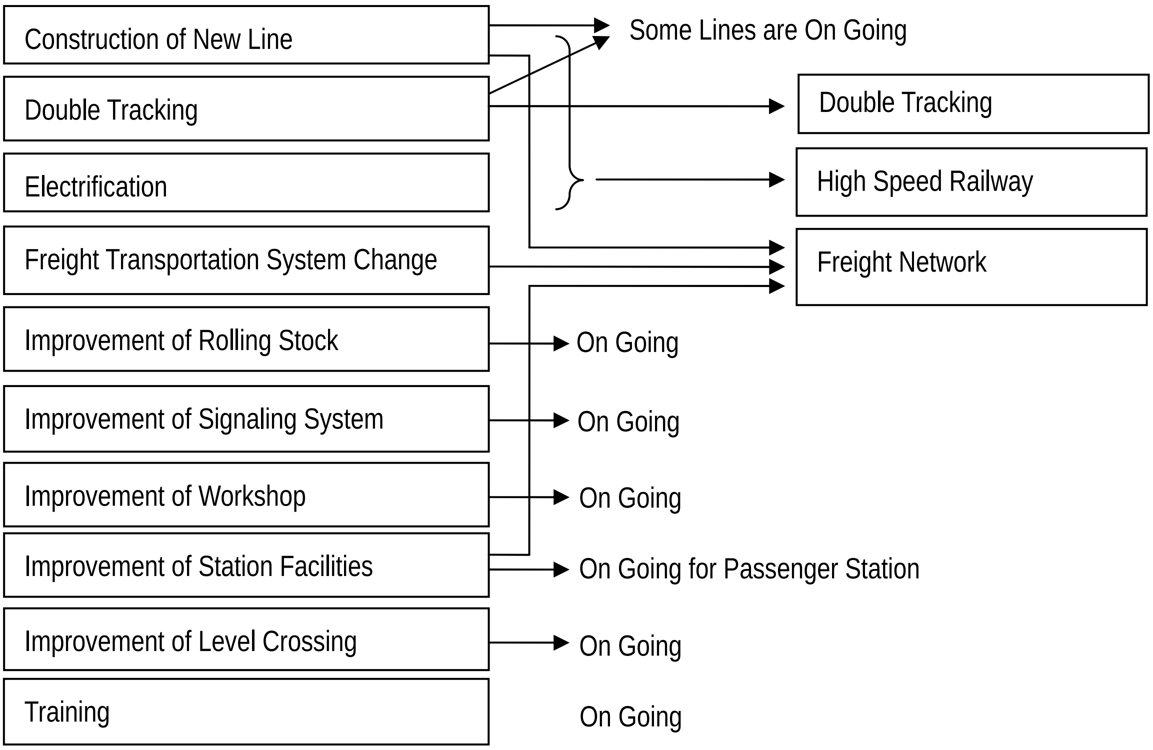
Projects	Project Cost (million LE)
Track Renewal	2,390
Development of level crossings	1,035
Construction of flyovers	196
Improvement of Workshops	1,374
Station Improvement (Cairo, Cidi Gabar, etc.)	1,053
Procurement of Locomotives	623
Rehabilitation of Locomotives	375
Procurement of Passenger Coaches for Long Distance Trains	7,626
Procurement of Passenger Coaches for Short Distance Trains	1,515
Renewal of the Passenger Coaches for Long Distance Trains	394
Procurement of Freight Wagons	680
Renewal of Freight Wagons	1,482
Dry Port Development	1,000
Reorganization and Training	1,562

Source Study Team based on ENR data

4.3.3. Proposed Projects

Among the measures for the improvements stated in 4.1.3, most items are already planned by ENR. It is expected that the railways will be improved if those projects are executed successfully.

Considering the current projects and ongoing programs, the following projects are proposed for improvement of railway transportation.



Source Study Team

Figure 4.3.2 Screening of Measures

Table 4.3.5 indicates proposed projects by the Study Team.

Category	code	Project
Double Tracking	RW-403	Double Tracking of Bypass Line for Cairo - Alexandria
High Speed Railway	RW-400	High Speed Railway for Cairo – Alexandria
	RW-999	High Speed Railway for Cairo – Aswan
Freight Network	RW-412	Freight System Change
	RW-406	Railway Link for 6th October City
	RW-407	Railway Link between Robeki to Helwan
	RW-420	Railway Link between Sokhna Port to Helwan
Other	RW-401	Improvement of Track Arrangement between Cairo – Qalyoub
	RW-408	Rehabilitation of Tracks of Qena - Kharga
	RW-409	Rehabilitation of Tracks for Qena - Safaga
	RW-410	Rehabilitation of Tracks for El kab – Bir El Abd

Source Study Team

Table 4.3.5 Proposed Projects

4.4. PROJECT OVERVIEW

4.4.1. Cairo Alexandria Bypass Route (RW-403)

<u>Outline of the Project</u>

To mitigate the congestion on the Cairo to Alexandria corridor, a High Speed Railway is planned. However, it will take a long time for designing, construction and training the staff until opening of the High Speed Railway. On the other hand, traffic volume of the Cairo to Alexandria corridor has almost reached capacity already and the corridor needs another line urgently.

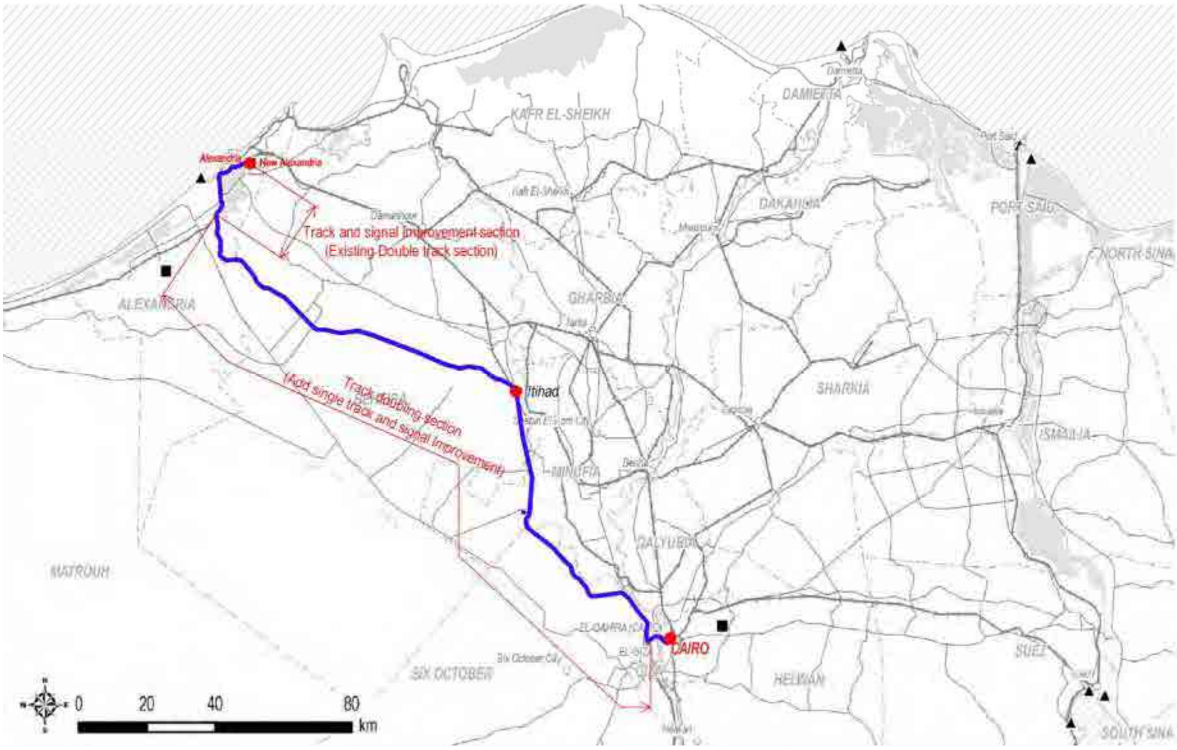
Fortunately, there is a line from Imbaba to Etay El Baroud and Ethad to Qabbary east to the delta. This line is currently used for freight trains from Dekheila port to Cairo and Imbaba to Etay El Baroud and it is used for passenger trains as well.

The line can work as another connection between Cairo and Alexandria. However, the line is single tracked and an automatic signalling system is provided in the southern half. It is recommended to make this line a double tracked railway and provide for another route from Cairo to Alexandria. As there is no big town around the line, the line should be used for special trains from Cairo to Alexandria without any stops.

Near Alexandria this route goes around to the west to reach Alexandria station, which is about 15 additional kilometres. This is big time loss for special trains. It is recommended to terminate the train near Qabbary. The location is only 1.5km south of Alexandria station and it is very close to the taxi terminal.

When the High Speed Railway is constructed the role for special trains on this line will be ended. The line will be used mainly for freight trains for future increase of freight transportation. The line is also connected to the line of the 6 October link.

Figure 4.4.1 shows the location of this project



Source Study Team

Figure 4.4.1 Location Map of Cairo – Alexandria Bypass Route

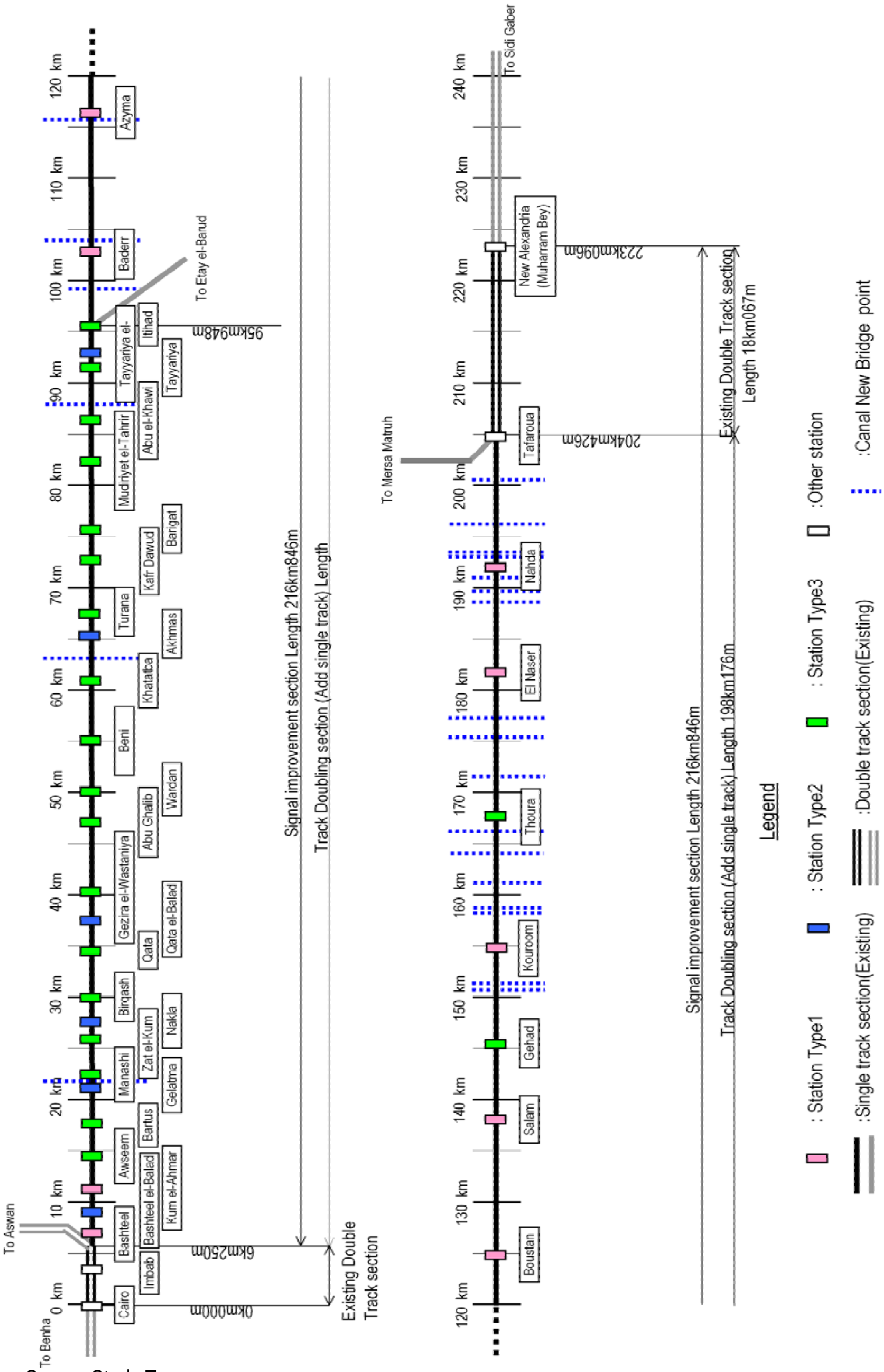
Contents of the project

(1) Double tracking of Imbaba to Qabbary

(2) Install automatic Signalling system for the entire route

(3) Construct New station 1.5km south of Alexandria

Figure 3.3.7 shows the route diagram of this line



Source Study Team

Figure 4.4.2 Route Diagram of Bypass Line

Effect of the Project

(1) Mitigate the congestion on the Cairo Alexandria corridor.

(2) As this line will not be congested, punctual operation of the special train is expected.

(3) Provide a high capacity freight corridor.

Project Cost

3,300 Million LE

4.4.2. High Speed Railway for Cairo – Alexandria via Tanta (RW-400)

(Alternative of Cairo Alexandria High Speed Railway)

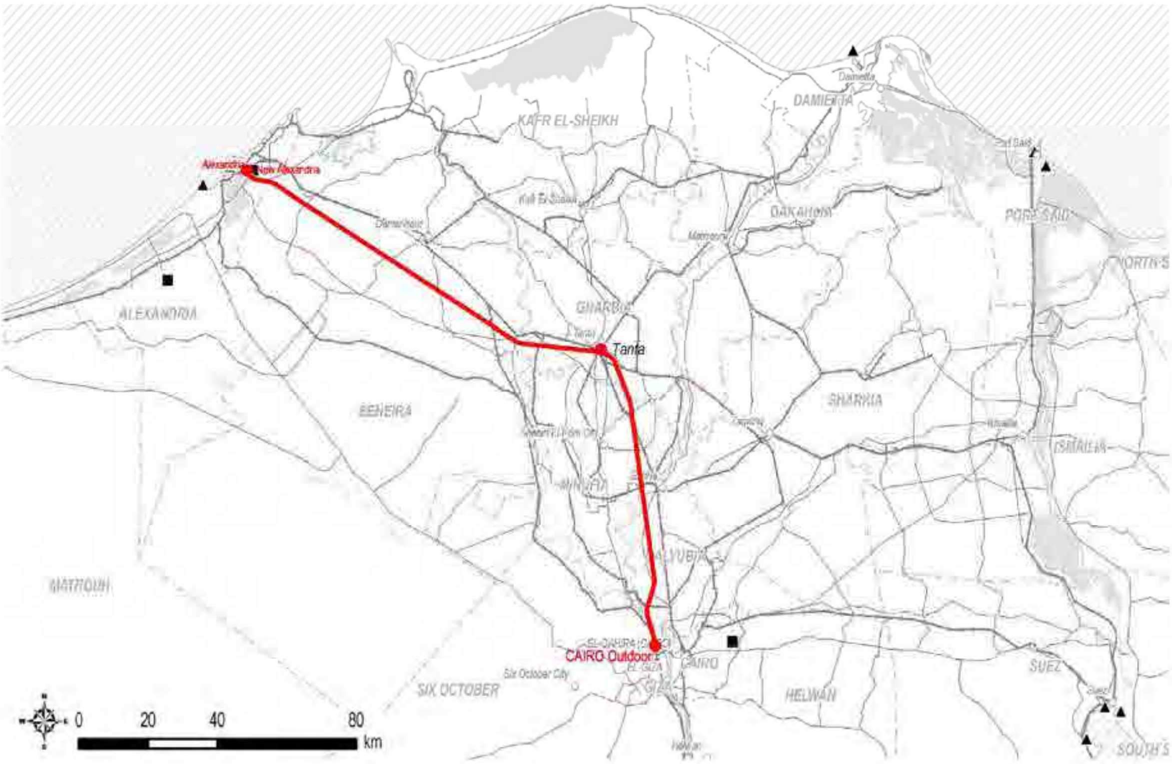
Outline of the Project

This line is an alternative to the High Speed Railway Cairo – Alexandria run along the desert road. The purpose of this line is to install a station at Tanta for the convenience of delta area users.

Considering the difficulty of land acquisition in the Cairo area and Alexandria area, a terminal station is planned east of Imbaba at Cairo that is close to Metro Line 3 station and south of the existing Alexandria station that is close to the taxi terminal. Tanta station is in the same location as the existing station for connection to the existing line. North and south of Tanta station this line will use the same right of way as the existing line and a viaduct will be constructed above the existing line.

Maximum operation speed is 300km/h.

Figure 4.4.3 shows the location of the project.



Source Study Team

Figure 4.4.3 Location Map of High Speed Railway via Tanta

Contents of the Project

(1) Construction of a High Speed Railway between Cairo – Alexandria via Tanta, 196 km in length.
(2) Construction of Railway stations at Cairo and Alexandria and Tanta.
(3) Construction of a depot and workshop for the maintenance of the High Speed Railway cars
(4) Procurement of High Speed Railway cars

Effect of the Project

(1) The travel time between Cairo – Alexandria, will be shortened. (total travel time 45 minutes for non stop train, 50 minutes for trains stopping at Tanta)

(2) Up grade of passenger service due to the comfortable car space.

(3) Passengers transport will be active and the economy will be active as well.

(4) The capacity of the current railway line between Cairo and Alexandria can be used by other than express trains, by transference of the role of the express trains to the High Speed railway.

4.4.3. High Speed Railway for Cairo Aswan

Outline of the Project

The Cairo to Aswan corridor is the second most congested corridor for long distance trains in ENR. There are populous cities along the Nile River and this route is popular with the tourists. The line will be saturated sooner or later.

To meet the demand and initiate farther passenger movement, a High Speed Railway is recommended for this corridor.

The Cairo terminal will be in the same location as the Cairo – Alexandria High Speed Railway so that through operation is possible. The route will connect Fayoum, Beni Suef, Minia, Asyut, Sohag, Qena, Luxor, Edouf, Kom Ombo, and Aswan.

Route length is 750km from Cairo to Aswan. As the route length is very long and demand from the upper area is not so great, construction will be divided to 3 phases, Cairo – Asyut, Asyut – Luxor, and Luxor – Aswan

Maximum operation speed is 300km/h

Contents of the Project

(1) Construction of a High Speed Railway between Cairo – Aswan 750km in length.
    Phase 1 Cairo – Asyut
    Phase 2 Asyut – Luxor
    Phase 2 Luxor – Aswan
(2) Construction of a New Railway Station.
(3) Construction of a depot and workshop for the maintenance of the High Speed Railway cars
(4) Procurement of High Speed Railway cars

Figure 4.4.4 shows the route of the High Speed Railway.

Figure 4.4.4 Route of High Speed Railway for Cairo – Aswan (1/3)

Figure 4.4.4 Route of High Speed Railway for Cairo – Aswan (2/3)

Figure 4.4.4 Route of High Speed Railway for Cairo – Aswan (3/3)

Effect of the Project

(1) The travel time between Cairo – Aswan, will be shortened. One day trip to Aswan is possible.

(2) Up grade of passenger service due to the comfortable car space.

(3) Passenger transport will be active and the economy will be active as well.

(4) The capacity of the current railway line between Cairo – Aswan will increase and will be convenient for local trains and freight trains.

Project Cost

Phase 1 41,000 Million LE

Phase 2 31,000 Million LE

Phase 3 21,000 Million LE

4.4.4. Freight Transportation System Change (RW-412)

Outline of the Project

As stated in 4.1 it is recommended to change the freight transportation system.

Freight stations should be integrated and be changed to container terminals as hub stations for freight transportation.

Not only port containers but domestic cargo should be transported in containers thereby reducing the loading/unloading time. Trains should be operated regularly so that costumers can project the time when the cargo will arrive at the destination.

By employing this system, the railway will only transport the commodities that loading facilities are provided for such as wheat, coal, oil, etc. The origin and destination becomes very simple therefore, freight yards with huge areas for shunting are not necessary anymore. The current freight yard is one of the candidates for the location of the container terminal.

Dedicated container wagons are required to minimize the loading/unloading time and safe transportation as there currently are no container wagons.

Recommended locations for container terminals are as follows.

1. Cairo – Alexandria corridor	Cairo, Qabbary
2. Port Said corridor	Tel El Kebir, Port Said
3. Damietta corridor	Tanta, Mansoura, Damietta
4. Aswan corridor	Imbaba, Beni Suef, Asyut, Qena, Aswan

To evaluate the effect of the project it is recommended to construct one corridor in the first stage as a pilot project.

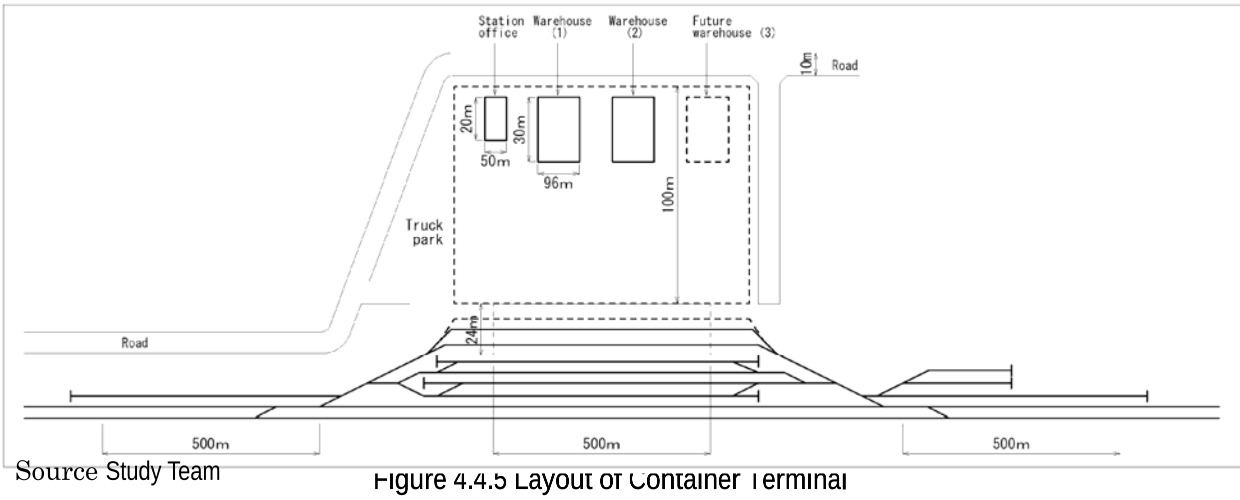
Contents of the Project

(1) Construct the railway container terminal. It would be converted from the current freight station or current freight yard.

(2) Provide container wagons. These will be converted from the current freight wagons by installing locking devices for the containers.

(3) Create train operation schedules so that container trains will be operated regularly.

Typical layout of a container terminal is indicated in Figure 4.4.5.



Source Study Team

Figure 4.4.5 Layout of Container Terminal

<u>Effect of the Project</u>

(1) Costumer can project when cargoes will arrive at the destination.
(2) Providing speedy transportation service with reduction of loading/unloading time
(3) Reduction of travel time by eliminating the shunting procedure
(4) Reduction of operation and maintenance cost by integrating freight stations

<u>Project Cost</u>

4680 million LE

4.4.5. Railway Link for Freight Network

To complete the network of freight transportation by railway, additional rail links are proposed to bypass the congested areas and thus reduce the travel time.

The following four lines are proposed to complete the network.

(1) Railway Link for 10th of Ramdan City (RW-313)
Connecting Ain Shams – Suez line and Qalyub – Zagzig line passing 10th of Ramadan City
(2) Railway Link for 6th of October City (RW-406)
Connecting Oasis line (Tebeen – Wahat) and Imbaba – Etay El Baroud line passing 6th of October City
(3) Railway Link between Robeki – Helwan (RW-407)
Connecting Ain Shams – Suez line and Abbasey – Torah Albalad line
(4) Railway Link between Sokhna Port to Helwan (RW-420)
Connecting Sockhna to Helwan

These new lines will be connected to the Dry Port and provide a bypass route so that freight trains will not need to travel through the congested area near Cairo.

Railway link for 10th of Ramadan City is already listed in the projects of ENR. The railway link for 6th of October City is also planed in other projects but not listed in the plan of ENR.

The Study Team proposes 3 lines for the new project.

4.4.5.1 Railway Link for 6th of October City (RW-406)

Contents of the project

(1) Construction of new double track line through 6th of October city (41.5 km in length)
(2) Construction of one freight station and three passenger stations

Effect of the Project

(1) This line connects the industrial area to Damietta Port.
(2) This line connects the industrial area to Sokhna Port via Suez, and Port Said Port via Ismailiya as well.
(3) This line can be used for commuter trains to the central district of Cairo.

Project Cost

1,600 Million LE

4.4.5.2 Railway Link between Robeki – Helwan (RW-407)

Contents of the project

(1) Construction of new single track line between Robeki st. and Helwan st., 67.3 km in length.
(2) Construction of 3 stations for passenger & freight transportation. These stations have the passing tracks for passenger & freight trains.

Effect of the Project

(1) This line connects the industrial area of 10th of Ramdan City to the central district of Cairo.

(2) This line connects the industrial area of 6th of October City with 10th of Ramdan City via the central district of Cairo.

Project Cost

1,400 Million LE

4.4.5.3 Railway Link between Sokhna Port to Helwan (RW-420)

Contents of the project

(1) The line connects Sokhna Port to Helwan, 111 km in length.
(2) Together with RW-406 Railway Link for 6th October City, Sokhna Port will be connected to Alexandria by way of 6th of October City.

Effect of the Project

The line forms a freight corridor between Sokhna Port and Alexandria Port by way of Helwan and 6th of October City.

Project Cost

1,400 Million LE

4.4.6. Other Projects

4.4.6.1 Improvement of Track Arrangement for Cairo – Qalyub (RW-401)

Outline of the Project

Figure 4.4.5 indicates the current track layout between Cairo and Qalyub. Track arrangement is quadruple however it is not double plus double track. The two tracks in the middle are double tracks for long distance trains bound for Alexandria. Of the outer tracks, the eastern one is for Menuf and the western one is for Zagazig. Both are used as single tracks. There in no siding track for passing between Cairo and Qalyub and it might be a bottle neck for train operation for both lines.

It is recommended to change the arraignment to a double plus double track to solve this problem. Figure 4.4.6 shows the proposed track arrangement.

Contents of the project

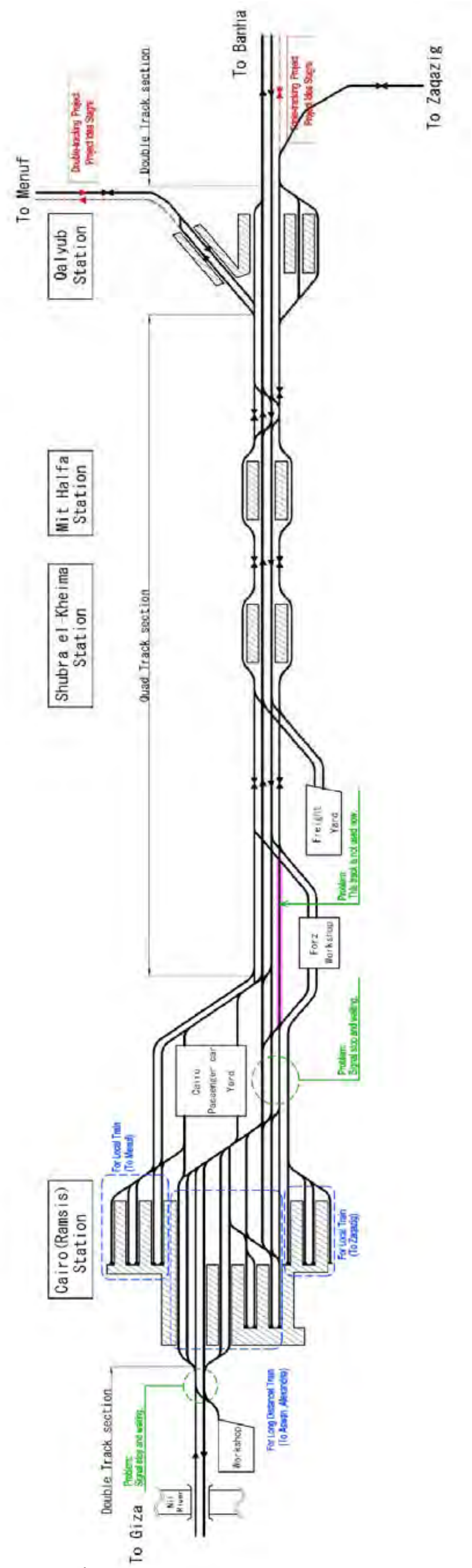
(1) Construction of an elevated railway at Qalyub Station for the train operation to and from Cairo and Minuf
(2) Construction of new platforms and new lines at Cairo Station
(3) Rearrangement of lines at Cairo Station and Qalyub Station

Effect of the Project

(1) Smooth operation by the separation of local trains and long distance trains
(2) Improvement of complicated train operation and train waiting time at Cairo Station,

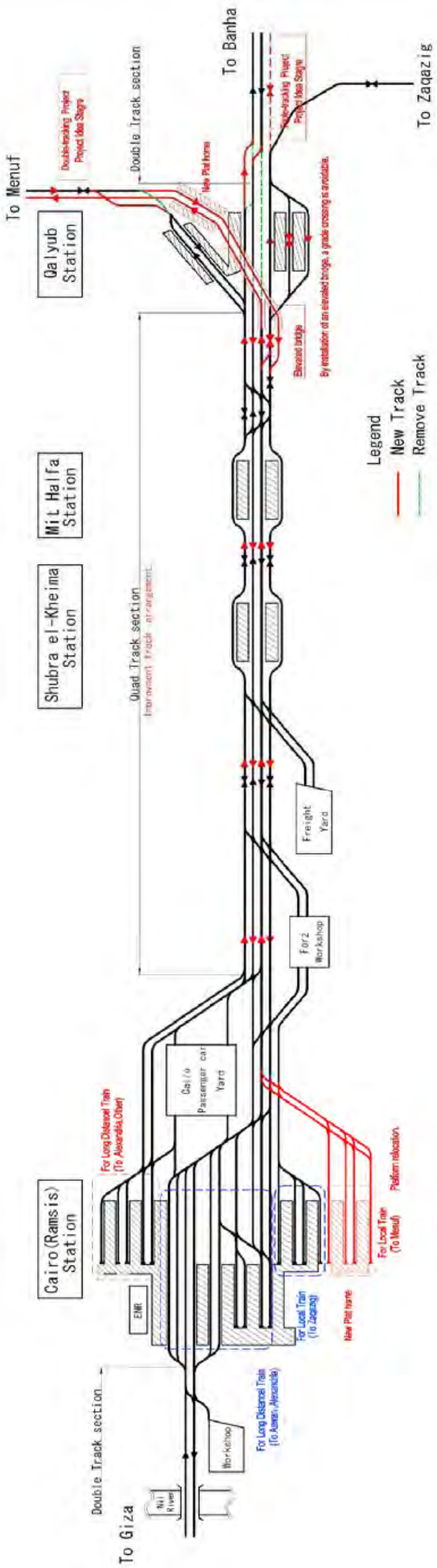
Project Cost

720 Million LE



Source Study Team

Figure 4.4.6 Current Track Arrangement Between Cairo - Qalyub



Source Study Team

Figure.4.4.7 Proposed Track Arrangement Between Cairo - Qalyub

4.4.6.2 Rehabilitation of Tracks for Qena – Kharga (RW-408) , Qena - Safata (RW-409)

Outline of the Project

This line was used to transport phosphate from the mine to the port. Phosphate was one of the core items of railway freight transportation, however, the line is currently closed due to track problems. Rails of some portions have been stolen by thieves. It is highly desired to resume the line and to restart the phosphate transportation. Also this is the only railway line connecting upper Egypt and the Red Sea.

Contents of the project

Rehabilitation of the existing line between Qena – Kharga 255 km in length and between Qena – Safaga 170 km in length for both freight transportation and passenger transportation according to the result of the demand forecast

The project includes the following.

(1) Rehabilitation of railway
(2) Rehabilitation of electric facilities such as signalling, telecommunications, etc.
(3) Construction of a new station at Kharga

Effect of the Project

To achieve the convenience of the inhabitants in Kharga by using the disused line

Project cost

Qena – Kharga	2,300 Million LE
Qena – Safaga	1,900 Million LE

4.4.6.3 Rehabilitation of Tracks for El-Kab – Bir El Abd (RW-410)

Outline of the Project

This line is branched from the Ismailiya – Port Said line and crosses over Suez Canal passing El Ferdan Bridge. The line is closed due to track problems. The bridge is the largest railway swing bridge in the world and it closes the Canal when a train is passing. Currently, the bridge is operated once a day without a train passing so that it will not locked by rust. The line is the only route to Sinai and a project for extending the line to Rafar is on going. Also the line to Port Said East is branched from this line. It is desired to reopen this line.

Contents of the Project

Rehabilitation of the existing line between El-Kab – Bir El Abd, 100 km in length, for both freight transportation and passenger transportation according to the result of the demand forecast

The project includes the following.

(1) Rehabilitation of the railway
(2) Rehabilitation of electric facilities such as signalling, telecommunications, etc.
(3) Construction of new stations at East El Kab and Romany.

(4) Improvement of Port Said East railway station

Effect of the Project

To achieve the convenience of the inhabitants around the new stations at East El Kab and Romany by using the disused line

To create demand by using the Port Said East railway station

Project Cost

1,600 Million LE

4.5. OTHER RECOMMENDATIONS

4.5.1. Improvement of Tacks

The tracks of the trunk lines such as the Cairo – Alexandria corridor or Cairo Aswan corridor are rather good. However, the tracks of the local lines are not in good condition.

Derailments happen very frequently and track condition is one of the reasons. Bad track condition also causes train separations.

Figure 4.5.1 Track of Cairo – Aswan Line

It is understood that there is a backlog of track maintenance because of lack of budget and it will be improved by increasing of maintenance capacity. However, it is urgent to mitigate the accidents and improve the ride quality.

It is recommended to provide track inspection equipped with measuring equipment and measure the track condition such as irregularity of track alignment. Track maintenance will be conducted heavily on the locations where irregularity is detected. However, an inspection car costs a great deal. To install measuring equipment such as a vibration accelerometer on a revenue train is one option for identifying the locations of bad tracks.

Figure 4.5.2 Track of Cairo – Suez Line

4.5.2. Improvement of Workshop Environment

It was recognized during a site visit to a workshop that the environment of the workshop is not in good condition. To provide the trains with a good quality workshop environment is important. The following measures are recommended to improve the environment of the workshops.

- To clean up the obstacles
- To clean the floor
- To improve the maintenance equipment to bring it in line with the modernization of the rolling stock
- To provide hard caps for the workers
- Installation of shower rooms and rest rooms

4.5.3. Train Formation

The condition of local trains is not good. It is understood that the capacity of the workshop is not adequate to maintain all the trains in good condition and the fares are not high enough to provide well maintained trains.

Local trains consist of a locomotive and 6 coaches. In some lines 6 cars is still more capacity than is needed for the number of passengers. It is recommended to change the trains with 6 coaches to 4 coaches to provide fully outfitted trains with 4 coaches instead of 6 coaches with lack of parts.

This will also save on fuel consumption.

4.5.4. Tourist Trains

There are a lot of sightseeing spots in the Upper Egypt area. Luxor and Aswan are world famous and many foreigners visit the sites. Currently, night trains are popular with tourists for visiting there.

It is recommended to provide special trains for tourists from Cairo to Aswan like the Oriental Express in Europe or the Blue Train in South Africa.

Those trains should have special facilities such as compartments and dining cars and provide special service with well trained crews. Rolling stock must always be well maintained.

The purpose of providing these trains is not just attracting the costumers with high budgets but to improve the service quality of ENR.

4.6. IMPLEMENTATION PLAN

4.6.1. General Guidelines

The General Guidelines for the railway development plan are shown in Figure 4.6.1. This indicates the basic policies for determining the development schedule of the railway development projects. This was used as a basis for project prioritization stated in the main text, to classify all the projects into short-, medium- and long-term projects.

4.6.2. Implementation Plan

Table 4.6.1 shows the implementation schedule for the railway improvement plan. This plan was developed based on the abovementioned guidelines and project prioritization results stated in the main text, however, the characteristics of each project were carefully scrutinized. Consequently, the implementation periods of some projects were slightly modified from the specified periods in the prioritization. As for the railway projects, the implementation periods shown in Table 4.6.1 are the final ones. The following factors were taken into consideration in order to finalize the schedule:

(1) Railway Link for 6th of October City (RW-406), Railway Link between Robeki – Helwan (RW-407) and Railway Link between Sokhna – Helwan (RW-420)

All of these projects should be implemented in the early stages for the sake of the dry port. The link for 6th October will take only two years because of the short distance of 40km in the desert. The other two lines need three years due to longer distance of 111km and 40 km passing mountainous areas.

(2) Improvement of Track Arrangement for Cairo – Qalyub (RW-401)

This project may be not urgent if there is less frequent operation on the branch lines for Menuf and Zagazig, because this project will contribute to such branch lines more than the main trunk line.

(3) Rehabilitation of Tracks for Qena – Kharga (RW-408), Rehabilitation of Tracks for Qena – Safaga (RW-409) and Rehabilitation of Tracks for El-Kab - Bir El Abd (RW-410)

Because of the nature of rehabilitation project, no period was allocated for preparation and design works. Restoration of public security is preconditioned for commencement of this project because operation is currently suspended due to theft of tracks, etc.

(4) Double Tracking of Bypass Line for Cairo – New Alexandria (RW-403)

The project shall start in an early stage because it will serve express trains until the HSR for Cairo-Alexandria (RW400). After the HSR is operated, this line will serve mainly for freight trains.

(5) High Speed Railway for Cairo – Alexandria via Tanta [High/Higher speed Alt-2] (RW-400)

The project is designated as a long-term project because of the huge investment required.

(6) High Speed Railway for Cairo - Aswan (Cairo-Aswan) (RW-999)

With the experience of construction of the HSR Cairo-Alexandria, this project is to be commenced by dividing it into three phases.

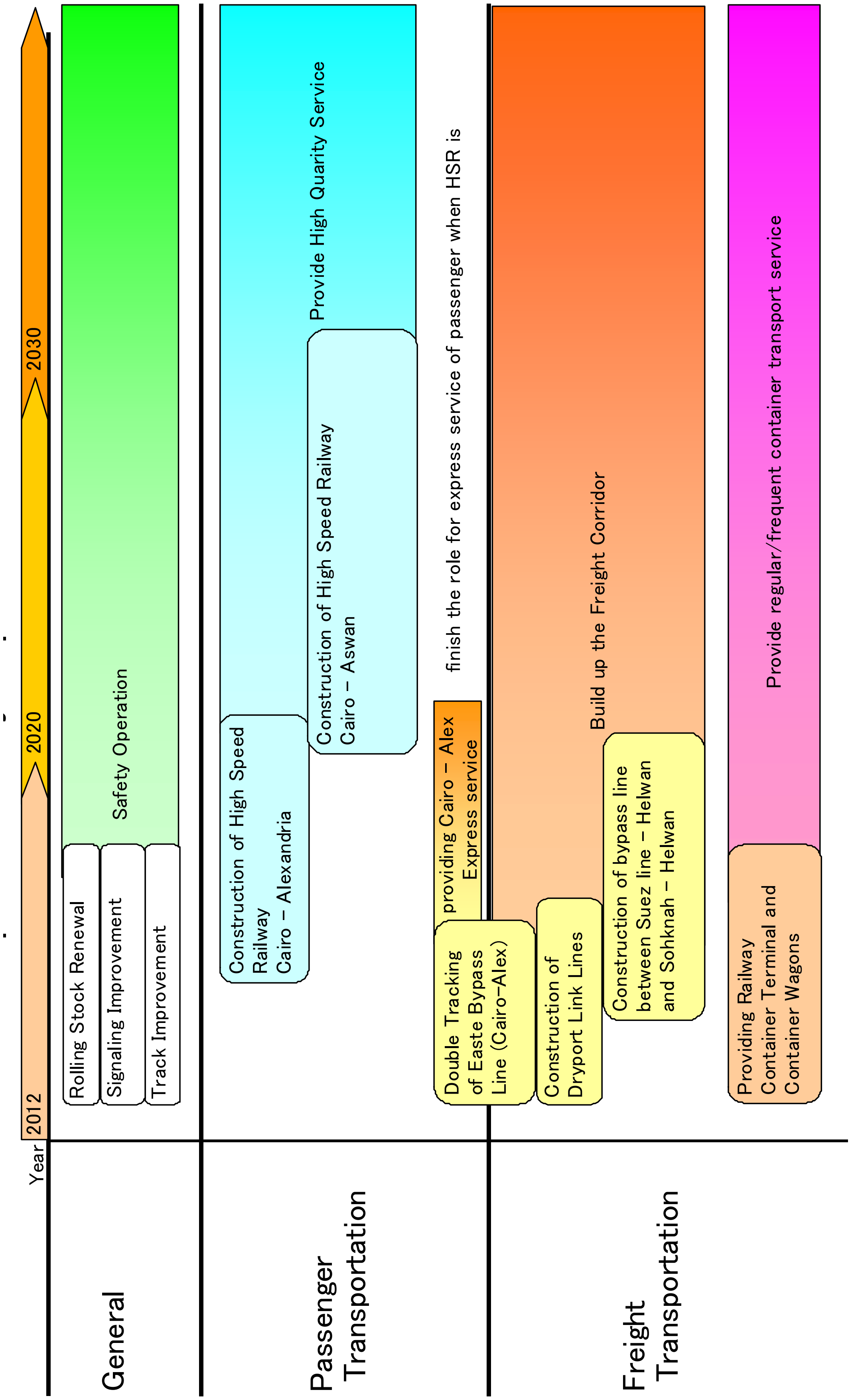


Figure 4.6.1 General Guidelines for Railway Improvement Plan

Source: JICA Study Team

Table 4.6.1 Implementation Schedule of ENR Railway Improvement Plan