

Higher Committee for
Greater Cairo Transportation Planning
Government of the Arab Republic of Egypt

Japan International
Cooperation Agency
(JICA)

No.

Transportation Master Plan and Feasibility Study of Urban Transport Projects in Greater Cairo Region in the Arab Republic of Egypt Phase II

CREATS

Cairo REgional Area T ransportation S tudy

FINAL REPORT Vol. I
Summary

December 2003

Pacific Consultants International (PCI)

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Greater Cairo Transportation Planning
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The following foreign exchange rates are applied in this study.
USD \$1.00 = 6.0 Egyptian Pound (LE)

(As of September 2003)

PREFACE

In response to the request from the Government of the Arab Republic of Egypt, the Government of Japan decided to conduct the Phase 2 Study for “Transportation Master Plan and Feasibility Study of Urban Transport Projects in Greater Cairo Region in the Arab Republic of Egypt” and entrusted the Study to the Japan International Cooperation Agency (JICA).

JICA selected and dispatched the study team headed by Dr. Katsuhide Nagayama of Pacific Consultants International to the Arab Republic of Egypt between February 2003 and October 2003. In addition, JICA set up an Advisory Committee headed by Professor Noboru Harata of Tokyo University between February 2003 and January 2004, which examined the Study from the specialist and technical point of view.

The Study Team held discussions with the officials concerned of the Government of the Arab Republic of Egypt and conducted field surveys at the study area. Upon returning to Japan, the Study Team conducted further studies and prepared this final report.

I hope that this report will contribute to development in the Arab Republic of Egypt, and to the enhancement of friendly relationship between our two countries.

Finally, I wish to express my sincere appreciation to all the officials concerned of the Government of the Arab Republic of Egypt for cooperation to the Study.

December 2003

Kazuhisa Matsuoka
Vice President
Japan International Cooperation Agency

December 2003

Mr. Kazuhisa Matsuoka
Vice President
Japan International Cooperation Agency
Tokyo, Japan

Letter of Transmittal

Dear Sir,

We are pleased to submit herewith the Final Report of the Phase 2 study for “Transportation Master Plan and Feasibility Study of Urban Transport Project in Greater Cairo Region in the Arab Republic of Egypt”.

The Study was undertaken in the Arab Republic of Egypt from February 2003 through October 2003 by the Study Team organized by Pacific Consultants International under the contract with JICA.

This report compiles Feasibility Studies of five priority projects identified within the framework of the Transport Master Plan, which was built in Phase 1 study in order to contribute to the sustainable development in Greater Cairo Region.

We would like to express our sincere gratitude and appreciation to all the officials of your agency and the JICA advisory Committee. We also would like to send our great appreciation to all those who were extended their kind assistance and cooperation to the Study Team, in particular, Ministry of Transport and Egyptian National Institute of Egypt as the counterpart agency. We beg to acknowledge our sincere gratitude to H.E. Eng. Hamdy Al Shayeb, the Minister of Transport, for his strong support to our activities.

We hope that the report will be able to contribute significantly to development in the Arab Republic of Egypt.

Very truly yours,

Dr. Katsuhide Nagayama
Team Leader,
The Study Team for the Transportation Master Plan
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| MB Consultants | <ul style="list-style-type: none"> • Environmental Survey |
| Namaa For Engineering Testing & Consultation S.A.E. | <ul style="list-style-type: none"> • Soil Investigation Survey |

CREATS Phase II – Final Report Volume I Summary

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Further details of each program and component are presented in main text, Volume II and Volume III.

| Programs and Components | Refer to Main Text |
|---|---|
| Program A | Volume II: Strategic Corridors, Area Transport Management and Development Program |
| Component A-1: East Wing Public Transport Development | Chapter 2 |
| Component A-2: West Wing Public Transport Development | Chapter 3 |
| Component A-3: Traffic Management Program along Metro 4 Corridor | Chapter 4 |
| Program B | Volume III: CTA Transport Improvement in the East Sector of Cairo |
| Component B-1: Supertram Line 1 | Chapter 2 to Chapter 4 |
| Component B-2: CTA Restructuring | Chapter 5 |

INTRODUCTION AND APPROACH

The Japan International Cooperation Agency (JICA) and the Higher Committee for Greater Cairo Transport Planning, Ministry of Transport, are cooperating in the conduct of **CREATS - Cairo Regional Area Transportation Study** (Transportation Master Plan and Feasibility Study of Urban Transport Projects in Greater Cairo Region in the Arab Republic of Egypt). Pacific Consultants International (PCI), headquartered in Tokyo, Japan, is the designated lead consultant for this study.

STUDY STRUCTURE

CREATS is divided into two phases, namely, Phase I for formulation of the Transport Master Plan and Phase II for feasibility studies for selected priority projects. The Transport Master Plan, which addresses the multi-modal and integrated transport needs of Greater Cairo over the next 20 years, is identified as CREATS Phase I and was completed during November, 2002. The Master Plan recommends a number of projects including humanware and software projects as well as hardware components, out of which top priority projects are as shown in Tables 1 and 2. **It is noted that the CREATS Master Plan has been formulated with a crucial prerequisite that all committed projects, including MRT Line 3 as a given condition, shall be accomplished as scheduled.**

CREATS Phase II was initiated during February, 2003 with the purpose of conducting feasibility studies of five high priority projects identified within the framework of the CREATS Master Plan. These are public transport connections between Cairo and 10th of Ramadan City as well as 6th of October City (termed the East Wing and West Wing, respectively); traffic management techniques along major roads in Cairo and Giza; a new role for the Heliopolis Metro via the introduction of a modern light rail transit (LRT) system termed Supertram Line 1; and, organizational restructuring of the Cairo Transport Authority (CTA).

OBJECTIVES

Phase II efforts build upon the humanware, software and hardware conclusions of the CREATS Master Plan. That is, five priority projects, jointly selected in consultation with Egyptian specialists and members of the committees associated with CREATS, are subject to more detailed investigations. These five projects are arrayed into two core programs:

Program A: *Strategic Corridors, Areas Transport Management and Development Program*, whose key objectives are (refer to Figure 1):

- Component A-1: Conduct a feasibility study for development of a public transport system within the East-West Corridor composed of the East Wing, linking Ain Shams station with 10th of Ramadan City, including formulation of inter-modal facility development plans in Ain Shams (Area 1);
- Component A-2: Conduct a feasibility study for development of a public transport system within the West Wing, linking Giza and the 6th of October City, with investigative foci being the West Wing terminus point in the central area of Giza (Area 2); and
- Component A-3: Formulate a short-term traffic management and a bus priority plan along the corridor which, within the longer-term CREATS framework, contains the proposed Metro Line 4; and,

Program B: *Cairo Transport Authority (CTA) Transport Improvement Project in East Sector of Cairo*, whose principal objectives are (refer to Figure 2):

- Component B-1: Conduct a feasibility study for improvement, upgrading and modernization of the Heliopolis Metro tram system, with a particular focus being Supertram Line 1 as proposed within CREATS, including CTA bus route restructuring for efficient inter-modal operations in the catchment area of Supertram Line 1; and
- Component B-2: Formulate an organizational and institutional reform plan for CTA.

Table 1 Highest Priority Projects for Infrastructure Development (Top 20)

| Project and Program | Rank | Points | Begin |
|---|------|--------|-------|
| MRT Line 1 Improvements * | 1 | 18 | S |
| MRT Line 3 * | 2 | 21 | S |
| MRT Line 4 | 3 | 20 | L |
| Public Bus Fleet Modernization | 4 | 48 | S/M |
| MRT Line 2 Extensions | 5 | 51 | S |
| Supertram Line 1 | 6 | 57 | S |
| Supertram Line 3 | 7 | 74 | M/L |
| West Wing - 6th of October Truck Busway (Phase 1) | 8 | 75 | S |
| Central Cairo Grade Separation Plan Package * | 9 | 82 | S |
| East Wing - Railway (Phase 1) | 10 | 86 | S/M |
| Tram/ Heliopolis Metro Rehabilitation | 11 | 93 | S/M |
| East Wing - Railway (Phase 2) | 12 | 93 | L |
| River and Rail Container Terminals | 13 | 98 | M |
| Shobra El Kheima Grade Separation Plan Package * | 14 | 100 | S |
| Supertram Line 2 | 15 | 113 | M/L |
| West Wing – Railway (Phase 2) | 16 | 114 | L |
| North Cairo Grade Separation Plan Package * | 17 | 122 | M/L |
| Giza Grade Separation Plan Package * | 18 | 133 | S/M |
| Heliopolis/ Madinet Nasr Grade Separation Plan Package * | 19 | 148 | M/L |
| Ring Road (on Maryoteya Road) | 20 | 151 | S |

Note: 1) Project with * stands for the committed project.

2) Ranking contains top twenty projects based on accumulated points achieved via testing and sensitivity analyses. "Begin" refers to initiation of project during short (to year 2007), medium (years 2008 to 2012) or long (after year 2012) term.

3) Project written in bold letters denotes the projects selected for this Phase II Feasibility Study.

Source: JICA Study Team

Table 2 Highest Priority Programs for Institutional Development (Top 10)

| Project and Program | Rank | Points | Begin |
|--|------|--------|-------|
| Improvement/ Restructuring of Operators | 1 | 39 | S |
| Public Bus Fleet Modernization | 2 | 48 | S/M |
| Institutional Strengthening | 3 | 52 | S |
| Accessible Public Transport for All | 4 | 78 | S |
| Cargo Transport Sector Restructuring | 5 | 90 | M |
| Human Resources Development | 6 | 97 | S |
| Investment Decision Procedures | 7 | 98 | S |
| Targeted Support for the Poor | 8 | 113 | S |
| Traffic Demand Management | 9 | 128 | M/L |
| Traffic Management and Control | 10 | 131 | S/M |

Note: 1) Project with * stands for the committed project.

2) Ranking contains top twenty projects based on accumulated points achieved via testing and sensitivity analyses. "Begin" refers to initiation of project during short (to year 2007), medium (years 2008 to 2012) or long (after year 2012) term.

3) Project written in bold letters denotes the projects selected for this Phase II Feasibility Study.

Source: JICA Study Team

COLLABORATIVE PLANNING PROCESS

The Study Team, housed in the offices of the Egyptian National Institute of Transport (ENIT), was strongly assisted by its designated Steering Committee and Higher Committee. In addition, taking into account the necessity of extensive involvement of a wide variety of relevant authorities for Phase II, two Technical Counterpart Committees were established to facilitate exchange of information. Thus, productive technical liaison was maintained with a number of organizations concerned, including the Office of the Prime Minister; Ministry of Transport and various entities thereof (Egyptian National Institute of Transport, National Authority for Tunnels, Egypt National Railways, General Authority for Roads, Bridges and Land Transport, General Authority for Civil Aviation, Cairo Metro Organization, Transport Planning Authority); the Ministry of Housing, Utilities and Urban Communities; Ministry of Planning; State Ministry of Foreign Affairs, Sector of International Cooperation; Ministry for Environment Affairs; CAPMAS (Central Agency for Public Mobilization and Statistics); Ministry of Justice; as well as Cairo, Giza and Qalyobeya Governorates and various entities thereof (General Secretaries Offices, Cairo Transport Authority, Traffic Police Departments, Road and Transport Directorates, Traffic Engineering Bureaus). Close coordination was effected with Universities (University of Cairo, Ain Shams University, Azhar University) and various departments within those learned institutions.

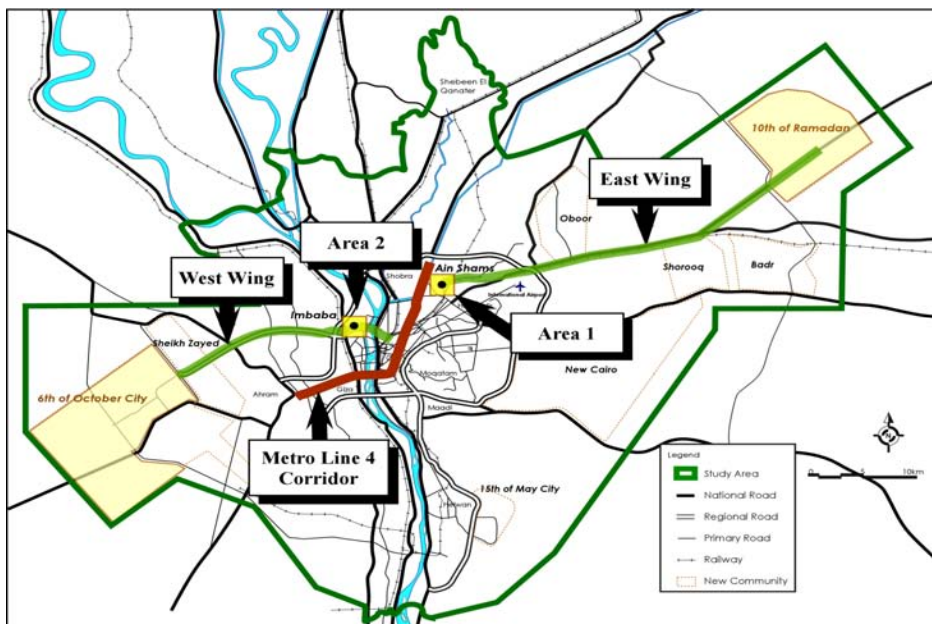


Figure 1 Project Locations for Program A

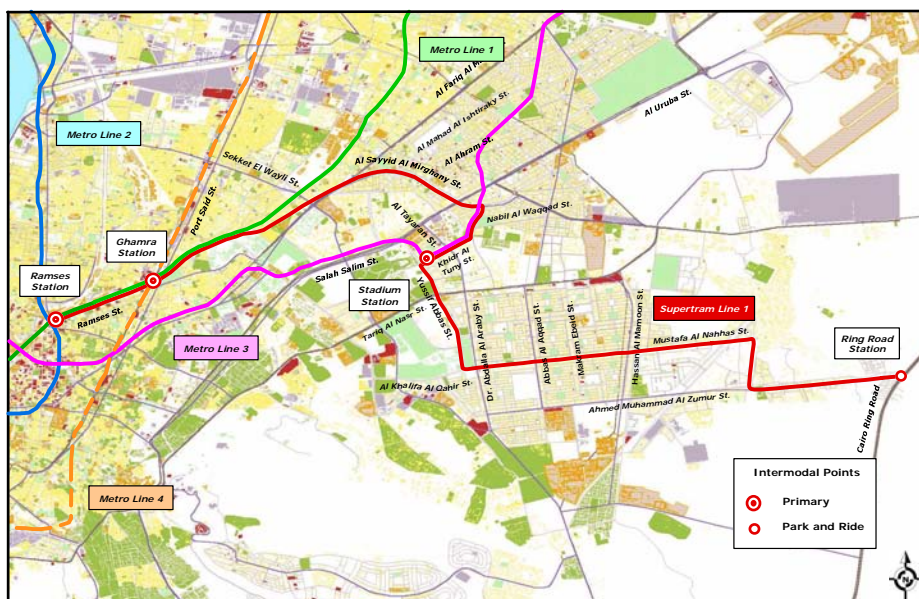


Figure 2 Project Location of Supertram Line 1

REPORTING STRUCTURE

Phase II Final Report documents findings of the *Phase II Feasibility Studies* and provides details for the two programs, and projects therein, in terms of approaches and methodologies; investigative efforts; evaluation of alternative solutions; conduct of environmental, economic and financial and investigations; and, formulation of implementation strategies. *The Final Report* consists of four (4) separate volumes:

- **Volume I: Summary**, containing highlights of recommended strategies for the projects and programs contained within Program A and Program B;
- **Volume II: Program A Feasibility Studies**, detailing feasibility studies for those projects contained within the Program A framework; that is, the East Wing, the West Wing, Ain Shams and Giza areas intermodal analyses, as well as transportation system management in the Metro Line 4 corridor; and,
- **Volume III: Program B Feasibility Studies**, detailing feasibility studies for those projects contained within the Program B framework.; that is, detailing of Supertram Line 1, public transport improvements in the East Sector of Cairo and an organizational restructuring program for the CTA.
- **Volume IV: Technical Appendix**, compiling further detailed technical descriptions to supplement the main texts for selected three issues, namely, Transport Model, Intermodal Theory, and A View towards Potential Financing Mechanisms.

<Notice>

It is noted that the feasibility studies are conducted for priority projects that the procedures for their implementation should start immediately after the completion of the study. In case that the implementation of the projects is delayed, new factors at the time of implementation should be taken into consideration. In particular, the growth of the new communities in both the East and West Wings is a key factor to affect the economic and financial feasibilities of the proposed public transport systems (Components A-1 and A-2). Therefore, social factors such as population growth potentials and residents' preferences in the new communities need to be reviewed, if are necessary when the projects are to be implemented.

A-1

EAST WING PUBLIC TRANSPORT DEVELOPMENT

development of new communities in the eastern part of the Greater Cairo will be a key to mitigate diseconomies due to the excessive concentration of socioeconomic activities in the central areas of Cairo, which has been recognized in the national policy. The CREATS Master Plan addresses the importance of these new communities' growth and proposes to provide a reliable public transport system in the East Wing Corridor, by upgrading the existing Suez Line as part of the suburban rail system. Complete detail on this Project is presented in Chapter 2, Main Report Volume II.

BASIC CONCEPT AND STRATEGIES

Along the **East Wing Corridor**, which was defined as a corridor between Ain Shams and 10th of Ramadan City in the East, several new community developments have been in progress as shown in Figure A-1-1. The total length of the corridor is about 50 km long.

Among those new communities, the 10th of Ramadan City has the biggest population and is expected to accommodate 576,000 residents in 2022. The Oboor and Shorooq new communities will have 300,000 populations, while the Badr new community will be with a 200,000 population.

Current and future population growth potential along the East Wing is very robust, and several suburban centers, which are located along the corridor, need a mass transit system development towards the future.

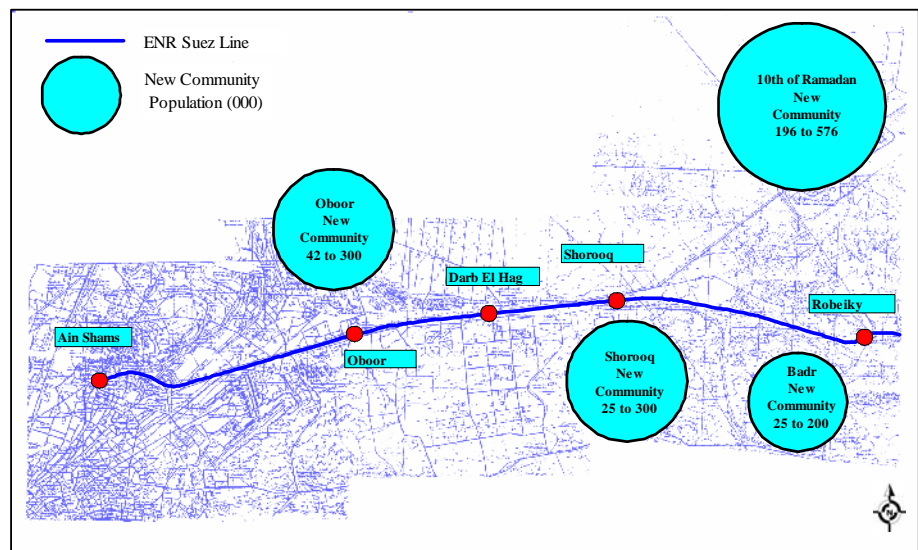


Figure A-1-1 New Communities along the East Wing

Travel Characteristics of Residents in New Communities

According to the interview survey, which was conducted for residents of new communities, the following characteristics were revealed.

- 70% of the interviewed residents travel to Cairo at least one a week;
- More than 80% of the interviewee use public transport to go to Cairo;
- More than 60% of car users would use public transport if service is improved; and,
- Social trips for visiting friends and relatives and/or participating in social activities, share about one third of the total trips to Cairo. Thus, travel demands between the new communities and the Cairo CBD are not limited to commuting.

These survey results indicate that public transport development along the East Wing is indispensable and urgent to secure "quality of life" of the residents in the new communities. Given a good and reliable public transport mode, it could encourage people to move to the new communities, thereby leading to a success in the urban development policy.

Current Transport Service along the East Wing Corridor

The existing main road along the East Wing is Ismailia Desert Road. It connects all the new communities along the corridor except for the Badr new community where is linked with Badr by Suez Desert Road. Shared taxi offers a major road-based public transport service to connect the central areas of Cairo and the new communities along the corridor. Although no CTA bus service is provided between the 10th of Ramadan and the Cairo CBD area at present, a private bus

company (East Delta Bus) serves to/from Ramses area. The service starts at 6 a.m. and ends at 10 p.m. at the city terminal (the 10th of Ramadan). The headway of the service is every 20 minutes and its travel time to Cairo is approximately 90 minutes.

As for the railway, Egyptian National Railway (ENR) operates eight trains per day on the Suez Line, which connects Ain Shams and Suez via the East Wing Corridor. Travel time between Ain Shams Station and Robeiky Station is approximately 45 minutes. However, the number of passengers of the line is very limited, because of its long headway.

A RAILWAY SYSTEM FOR THE EAST WING

For the East Wing public transport development, the CREATS Master Plan proposed a railway link from the Cairo CBD to the 10th of Ramadan City, by rehabilitating the existing ENR Suez Line and constructing a new railway link extending to the new city directly.

In the process of the alternative route analysis, the Study Team examined a **busway connection** to/from the new city as a possible option of public transport for the East Wing, and compared priority of various railway route options with the busway option as well. Six (6) alternative route plans, consisting of one busway and five alternative railway route plans were examined. As the conclusion, a railway option, which connects Ain Shams and the 10th or Ramdadan City at shortest distance, was selected as the best option based on preliminary economic evaluation. The busway option, which utilizes median of Ismailia Desert Road for exclusive busways, was not recommended, because such an option consequently causes severe traffic congestions on the road, thereby resulting in a comparatively low economic internal rate of return for the busway project.

Future Transport Demand Forecast

Future passenger demand was estimated for the selected option of the East Wing Railway, and its volume band chart by section is depicted as shown in Figure A-1-2.

The estimated number of passengers in 2022 is approximately 390,000 per day for both directions at the most congested section between Ring Road Station and Oboor Station.

To meet such a great passenger demand in 2022, a double track and diesel car operation system will be needed as the basic planning concept of the East Wing Railway

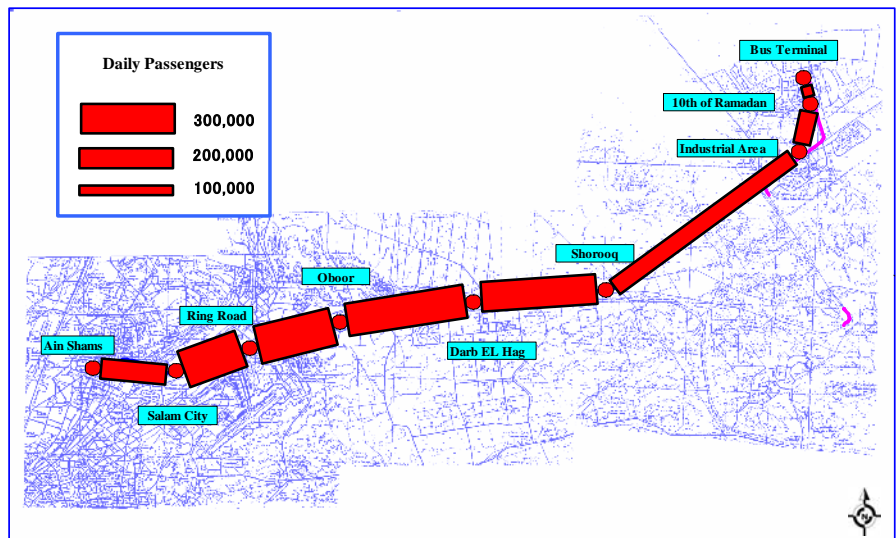


Figure A-1-2 Passenger Flow of the East Wing in 2022

Development of New Stations

In addition to the existing four stations (Ain Shams, Oboor, Darb El Hag and Shoroog), five new stations are planned along the East Wing Corridor. These new stations are as below.

- Salam City: At grade station, where future connection to the planned Metro Line 3 is expected.
- Ring Road: At grade station, where an intermodal system is considered with road-based transport modes such as buses, minibuses, shared-taxis, taxis and private cars.
- Industrial Area: At grade station, where is expected to serve workers to/from industrial area of the 10th of Ramadan as well as passengers who travel toward the East further.
- 10th of Ramadan: Elevated station, where is the center of the 10th of Ramadan City.
- Bus Terminal: Elevated station, where an Intermodal terminal with bus, shared taxi and even private cars for residents of the new city.

Track Layout

The East Wing railway starts from the ENR Ain Shams Station and the new station at Bus Terminal Station in the 10th of Ramadan City. The whole section shall be **double-tracked** to meet the anticipated demand in the future, 2022.

The existing ENR Suez Line shall be utilized between Ain Shams Station and Shorooq Station with necessary rehabilitation for the commuter train operation. From Shorooq Station, the line will be separated from the Suez Line and overpass the Ismailia Desert Road and reach the 10th of Ramadan City by passing new stations of Industrial Area, 10th of Ramadan and Bus Terminal Stations along the northern side of the road. The section between Shorooq and the Bus Terminal shall be newly constructed. The total route length is estimated to be **49 km**, out of which **30 km** for the rehabilitation of the existing Suez Line and **19 km** for the newly constructed line (Figure A-1-3).

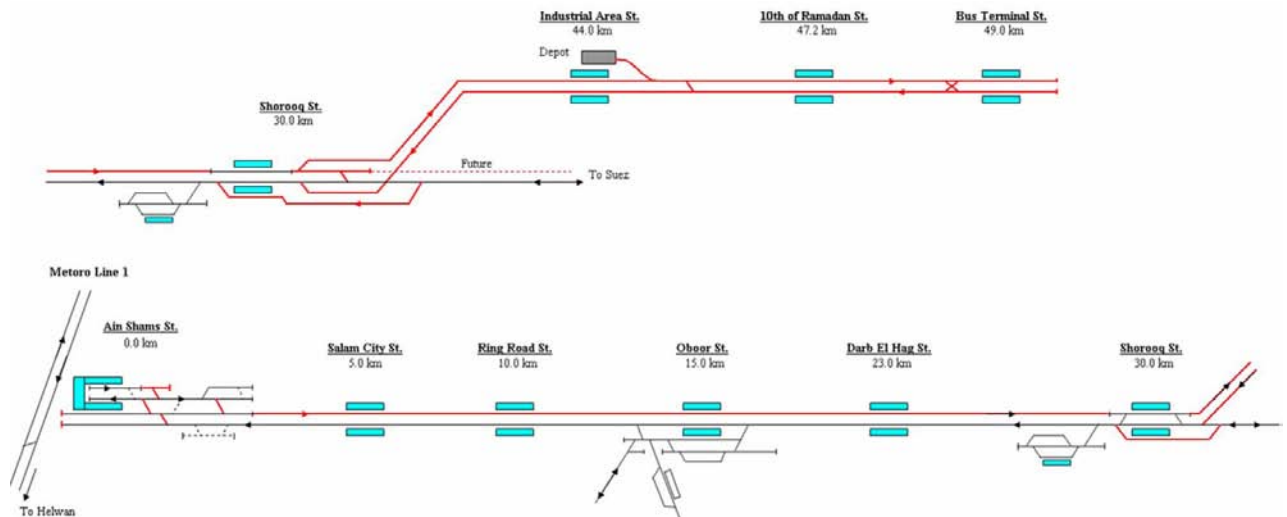


Figure A-1-3 Track Layout of the East Wing

Rolling Stock

All cars of a train are planned as **diesel powered rolling stocks** for the East Wing Line. This type of decentralize power train has advantages of high acceleration, high operation frequency and transport capacity compared to locomotive hauling type of trains. Thus, the decentralized power train is attractive to passengers and has characteristics of high speed and comfortable service. However, the introduction of this type of train needs comparatively high investment as well as expensive maintenance facilities.

It is designed that one train consists of 3 cars in the beginning of operation of the East Wing Line. The 3 cars consist of 2 control cars and 1 intermediate car by considering transport demand and operation efficiency.

- ◆ Gauge: 1,435 mm
- ◆ Coupling Length: 20.0 m
- ◆ Body Length: 19.5 m
- ◆ Body Width: 2,950 mm
- ◆ Weight: Control car: 30.0 tons; and Intermediate car: 27.8 tons



Figure A-1-4 A Typical Diesel Car Train

Train Operation

A train operation plan of the East Wing Line was built, according to the projected peak-hour passenger demand and the transport capacity of a train. Numbers of trains per hour were planned to be 4, 5 and 25 in 2007, 2012 and 2022, respectively. Necessary numbers of trains, based on future planned diagram, are 8 trains with a 3-car train formation in 2007 and 2012, and 24 trains with a 5-car train formation in 2022. The expected travel time between Ain Shams Station and Bus Terminal Station of the 10th of Ramadan is **43 minutes**. Average travel speed will be approximately **68 km/h**.

COST ESTIMATION

Construction Cost

Under the design concept of the East Wing Line, the construction cost was estimated, based on the following assumptions:

- ◆ Civil work includes embankments, cuttings, viaduct structures, realignment of streets and highways. Cost for relocations of utilities and sanitary services are taken into account in contingencies;
- ◆ Stations are to be simply designed and economical in function and design;
- ◆ The system and equipment include double track work, signalling, communication, and ticketing. The track work includes ballast, sub ballast and other track materials;
- ◆ The depot and workshop include capital cost of tracks and equipment cost for maintenance and repair;
- ◆ Land acquisition includes land for new line construction and the depot; and,
- ◆ The Rolling Stock includes costs for initial operation in the year 2007.

The estimated total construction cost for the initial investment accounts for approximately **2.4 billion LE**, as shown in Table A-1-1. Detailed design work is considered to take one year, followed by construction works, which shall be two years. In the beginning of 2007, the East Wing Railway shall be operated. Besides this initial investment, additional rolling stocks shall be purchased to increase the transport capacity in 2013, 2017 and 2020. The total additional investment costs for such an capacity enhancement are estimated to be **722.7 million LE**.

Table A-1-1 Initial Investment Cost of the East Wing Line

(Unit: LE Million at 2003 prices)

| Investment Item | Total Investment | Local Amount | Foreign Amount |
|---|------------------|----------------|----------------|
| Running Track | 1,028.2 | 719.7 | 308.4 |
| Elevated | 444.5 | 311.1 | 133.3 |
| At-Grade (new line) | 237.3 | 166.1 | 71.2 |
| At-Grade (rehabilitation) | 346.3 | 242.4 | 103.9 |
| System Works | 629.9 | 220.5 | 409.5 |
| Track Work (new line) | 168.1 | 58.8 | 109.3 |
| Track Work (rehabilitation) | 185.8 | 65.0 | 120.8 |
| Signal & Communications | 275.9 | 96.6 | 179.4 |
| Station | 85.3 | 56.8 | 28.5 |
| Elevated | 29.0 | 17.4 | 11.6 |
| At-Grade | 56.3 | 39.4 | 16.9 |
| Depot & Workshop | 24.1 | 12.1 | 12.1 |
| Rolling Stock | 152.9 | 4.6 | 148.3 |
| Land Acquisition | 10.3 | 9.8 | 0.5 |
| Sub- total | 1,930.7 | 1,023.4 | 907.2 |
| Engineering and Construction Management | 154.5 | 15.4 | 139.0 |
| Local Administration and Contingency | 314.7 | 210.0 | 104.6 |
| Total | 2,399.8 | 1,249.0 | 1150.9 |

Source: JICA Study Team

Operation and Maintenance Cost

The operation and maintenance cost of the East Wing Railway was estimated based on Japanese experiences on diesel car operation in consideration of Egyptian local conditions such as labor cost, fuel cost and labor productivity and/or efficiency.

Labor costs were estimated, based on a projection of the number of employees necessary for three (3) functions to be held by the operating entity. The necessary numbers of employees were calculated, based on the estimated future **train-km** for the operating function, and **car-km**, for maintenance section. That for the administrative section was based on total number of employees of the operating and maintenance section. As a consequence, the employees will total 1,163 in 2022 for the operation of the East Wing Railway, the number of which is greater by 20% than that derived from an

international standard, considering local conditions. In 2022, when the East Wing Railway will be fully operated, the operation and maintenance cost, including material costs, will be required 219.3 million LE per year.

INTERMODAL TERMINAL AT AIN SHAMS

Intermodal Terminals are planned to facilitate convenient intermodal transfer between public transport modes at four (4) major stations, namely, Ain Shams Station, Salam City Station, Ring Road Station and Industrial Area Station.

The East Wing Railway connects with Metro Line 1 at Ain Shams Station, and will connect with the fourth-coming Metro Line 3 at Salam City Station. The railway should have a functional connection at Ring Road Station with road-based transport modes.

Some physical development schemes, as a sample of intermodal facilities, are illustrated for Ain Shams Station, where Metro Line 1 and the East Wing railway meet, as shown in Figures A-1-5 and A-1-6. The two stations are planned to connect each other with a pedestrian deck to ensure convenient and safe transfer for passengers. Passengers can also overpass the East Wing railway track by using another pedestrian deck to access *safely* and *comfortably* to a newly designed intermodal terminal, which locates adjacent to the station, providing convenient transfer to/from buses, minibuses, shared-taxis, taxis and private cars.



Figure A-1-5 Pedestrian Connection between the East Wing Rail and Metro Line 1 at Ain Shams



Figure A-1-6 The Intermodal Link with Bus and Rail at Ain Shams Station

The **Traffic Management Program** was also planned at the intermodal terminal and its vicinity areas, as illustrated on Figure A-1-7. On-street parking facilities, traffic signals and bus priority lanes are introduced for safe and smooth traffic around the intermodal terminal area.

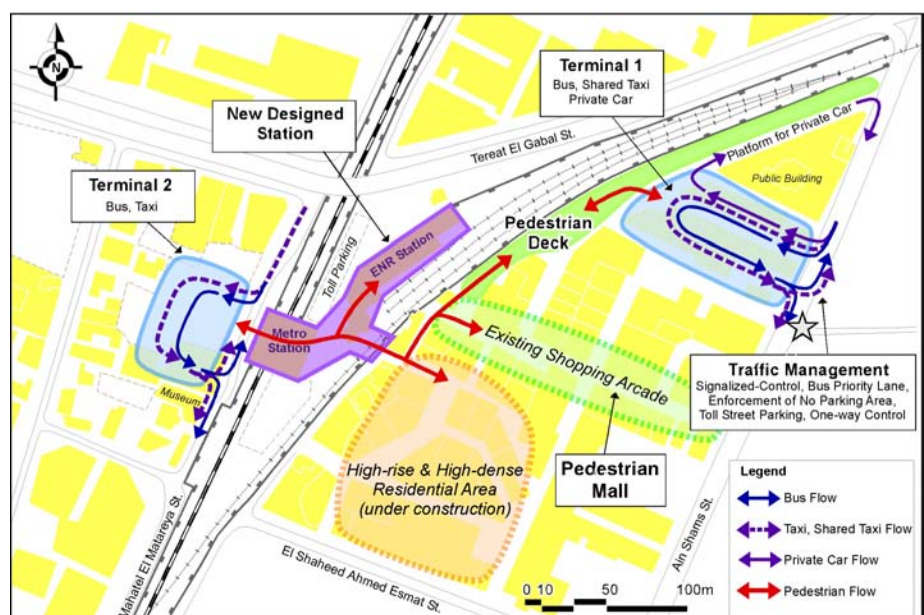


Figure A-1-7 A Concept of Traffic Management System of the Intermodal Terminal at Ain Shams Station

ENVIRONMENTAL IMPACT ASSESSMENT

To ensure sustainability for the East Wing Rail Way Project, a **scoped Environmental Impact Assessment (EIA)** was carried out as part of the feasibility study according to the Egyptian, JICA and other international guidelines and regulations. The EIA indicates the negative as well as the positive environmental impacts that are expected from the East Wing Railway Project. Also mitigation measures, required to alleviate the identified adverse environmental impacts, are provided.

Environmental Surveys and Impacts

As a part of the Environmental Impact Assessment, **Air Quality and Noise Level Surveys** and a **Social Survey** (Social Impact Assessment) were carried out. Their results revealed the present environmental condition of the Project Area, as well as the opinion of residents related to the proposed Project.

Negative environmental impacts, which have been identified for the proposed Railway Project, are minor: split up of neighbourhoods by rail tracks; impact on aesthetics by three flyovers and two elevated stations at 10th of Ramadan City. Furthermore, trees have to be cut over a length of about 5 km at the median of the road (10th of Ramadan City). Most adverse environmental impacts will be temporary during the construction phase.

Mitigations measures are proposed to alleviate the identified impacts, that is, construction of pedestrian-friendly environment to be compensated by landscaping, planting of trees and parks. Additionally, a sound barrier is proposed over a length of 1 km near Ain Shams to improve the noise situation.

Major reasons for the fact that only minor environmental impacts are expected from the proposed Railway Project are:

- ◆ The proposed Railway Project is a public transport project; diesel locomotives consume less energy for the transportation of a certain number of passengers than cars.
- ◆ The Project concerns an activity partly in a city environment and partly in a desert like environment; there is no impact on fragile ecology.
- ◆ The right of way is mainly owned by the government and free of houses and other structures.
- ◆ The identified negative impacts can be mitigated.

Positive environmental impacts expected in the field of economics from the Railway Project are: improved mobility and access for the residents of Greater Cairo; reduced travel time and costs; improved conditions for economic development; enhanced development of tourism. These economic impacts will result in lessening the total environmental burden in Cairo Metropolitan Area. Direct environmental impacts are positively expected in the following aspects:

- ◆ A number of car users will start using the Railway (*less emission, less energy consumption*).
- ◆ There will be less air pollution compared to the situation of not carrying out the proposed Railway Project (Zero Option) (*less emission, less energy consumption*). There will be no significant increase of noise levels.
- ◆ Reduced number of accidents and increased safety for pedestrians.
- ◆ Possibilities for planting of trees / landscaping. For the global environmental impact, the total CO₂ emission of **42,152 tons/year** can be reduced by the introduction of the East Wing Project in 2022. It is generally said that as one litter of gasoline generates **2.30 kg** of CO₂, the CO₂ reduction of about 42,000 tons is equivalent to the reduction of about **18.3 million liters/year of gasoline**, or 108,000 bbl./year.

Overall Evaluation

The conclusions of the scoped Environmental Impact Assessment for the East Wing Railway Project are:

- | |
|---|
| <ul style="list-style-type: none">◆ Major positive impacts are expected.◆ Minor negative impacts are expected, which can be mitigated.◆ The Rail Way Project is sustainable and environmentally feasible. |
|---|

ECONOMIC EVALUATION

The economic evaluation was carried out from a view of whether or not the investment for the East Wing Railway project be feasible in terms of the national economy, based on basic premises such as: prices as of mid-2003; the exchange rate of 1 US\$=6.0 LE; and project life of 27 years from 2004 through 2030.

With and Without the Project

Economic benefits are both calculated as differences between "With the Project" and "Without the Project". For the calculation of economic benefits, the situation of the "Without" case is defined identical to the "Do Nothing Scenario" as examined in the CREATS Master Plan. This scenario is not the same situation as the current condition, but depicts such a situation that all committed projects, including Metro Line 3, the capacity enhancement of Metro Line 1 and a number of flyover projects, have materialized in a planned time framework (see the CREATS Master Plan). ***Metro Line 3 is assumed to be operated in 2017. Thus, it should be noted that even the "Without the Project" case hold inclusion of the Metro Line 3 which is very influential to changes in the transport pattern.***

Economic Capital Costs

According to a planned construction schedule, the economic costs ¹, converted from the estimated financial costs for the East Wing Project, are allocated in the phased manner. The economic cost of the initial investment totals 2,004 Million LE, and the total additional investment cost will be 625 million LE to strengthen the transport capacity in 2013, 2017 and 2020. The economic cost of 664 million LE is allocated for the reinvestment to improve the system in 2026. The residual value of the vested assets is appropriated as a negative cost in 2030.

Economic Benefits

Economic benefits are assumed to be two: savings in time cost and savings in vehicle operation cost (VOC), which are both derived from a difference between "with the Project" and "without the Project". In 2022, the annual time saving is projected to be about 730 million LE, and the annual operation cost VOC saving, 248 million LE. These savings are increasing along with the increasing passenger demand.

Cost-Benefit Analysis

Since the East Wing Project requires a massive amount of initial investments, the Project is inherently sensitive to the passenger demands. A more demand-responsive investment scheme needs to be explored. In this sense, two options in terms of timing of the operation are examined:

- ◆ **Option 1:** The Project be commenced from 2004 and the railway system be operated from 2007; and
- ◆ **Option 2:** The Project be commenced from 2007 and the railway system be operated from 2010.

The results of the cost-benefit analysis are summarized as shown in Table A-1-2.

Table A-1-2 Summary of Economic Evaluation Results for the East Wing Railway Project

| Evaluation Indicators | Option 1 | Option 2 |
|---|--------------------|-----------------------|
| Economic Internal Rate of Return (EIRR) | 11.1% | 13.1% |
| Net Present Value (NPV) at mid-2003 * | - 157.6 million LE | 143 million LE prices |
| Benefit - Cost (B/C) Ratio * | 0.92 | 1.09 |

Notes: * at 12% discount rate

Comparing the two options, it is evident that Option 2 indicates more favorable evaluation indicators than Option 1. Option 1 can hardly assure the economic feasibility, because the Economic Internal Rate of Return (EIRR) is 11.1% which is less than the social discount rate of 12%. Therefore, the Net Present Value (NPV) yields negative value, and the Benefit/Cost ratio (B/C) ratio is 0.92 less than 1.0.

¹ Conversion rates are assumed to be 81% for local currency items as well as 87% for foreign currency (or imported) items. taking into account the Egyptian taxation and labor market conditions.

On the other hand, the EIRR of Option 2 is computed at **13.1%**. This rate is higher than the Egyptian social discount rate of 12%, The NPV accounts for **143 million LE** at the mid-2003 prices and the B/C ratio is **1.09**, given a 12% discount rate. These indicators denote that the Project will bring a considerable amount of economic benefits to the national economy as a whole, therefore it can be evaluated that the Project is economically feasible, or worth being implemented from the national economy point of view.

FINANCIAL EVALUATION

The East Wing Railway Project is evaluated from the financial viewpoint. The following are a summary of the findings.

Assumptions

- ◆ For the sake of checking the financial viability of the Project, the investment schedule of "Option 1" is adopted. Hence, the estimated financial capital costs are allocated in such a way that the railway service will be operated in 2007 and will generate the operating revenues from 2007.
- ◆ The evaluation period is assumed to be the period between 2004 and 2030, and the depreciation of depreciable assets are appropriated with a straight line method under an assumed useful life by asset and the residual value of the invested capitals is considered in 2030 as a negative cost.
- ◆ For the operating revenue, a distance-based fare system (a base fare plus distance-based charge) is adopted as shown below.

Table A-1-3 Assumed Fare Structure for the East Wing Railway Service

| | (at mid-2003 prices) | | |
|--|----------------------|------|------|
| | 2007 | 2012 | 2022 |
| Base Fare (LE) | 0.63 | 0.74 | 1.00 |
| Distance-based (LE/km) | 0.03 | 0.04 | 0.05 |
| An Example Fare (LE) Ain Shams Station ~ 10 th of Ramadan Bus Terminal Station (49km) | 2.10 | 2.70 | 3.45 |

- ◆ Additional incomes accruing from ancillary sources related to the railway service operation, such as advertisement charges and commercial activities at stations, are considered to be 6% of the operating revenue, taking into account experiences being performed in other countries. Since this off-rail revenue rate is significant to the financial feasibility, a sensitivity test will examine the financial conditions with different rates in a range from 6% to 20%.

Summary Result of the Financial Analysis

The results of the financial analysis are summarized in Table A-1-4. The Financial Internal Rate of Return (FIRR) for the East Wing Railway Project is computed at **3.3%**, which implies that the Project will hardly be viable from the financial point of view.

Although the FIRR seems hardly favorable, the Project will not be bankrupted. A positive operating profit will occur at an annual basis in the year 2014, or 7 years after the commencement of the operation; and in the next year, 2015, the net profit after reduction of the interest payment and depreciation will be positive. In the accumulated balance, the Project will recover all the investments in the year 2022, that is, the accumulated net profit will be positive 15 years after the commencement of the operation.

Table A-1-4 A Summary of Financial Analysis for the East Wing Project

| Evaluation Indices | Result |
|---|-----------|
| FIRR (Financial Internal Rate of Return) | 3.31% |
| The First Year of Positive Operation Profit at Annual Basis | Year 2014 |
| The First Year of Positive Net Profit at Annual Basis (after Interest and Depreciation) | Year 2015 |
| The First Year of Positive Accumulated Net Profit | Year 2022 |

Source: JICA Study Team calculations

Sensitivity Tests

The Project would hardly be feasible in terms of the FIRR under the assumed conditions. Therefore, some financing measures to make the Project more viable need to be considered. The following results of "Sensitivity Tests" indicate useful implications for this purpose:

- ◆ Should only the depreciation of rolling stock be considered, the FIRR accounts for **21.2%**. This means that if the capital investments for the infrastructure, other than rolling stocks, could be financed by a government subsidy, the Project would be financially feasible.
- ◆ Given additional revenues from off-rail business activities equivalent to **20%** of the operation revenue, instead of 6%, the FIRR would be **4.5%**, which shows an improvement of its financial feasibility by 1.2 points.
- ◆ Given a 20% reduction in the initial investment cost, the FIRR is improved to **4.7%**.

Financial Evaluation: A Conclusion

Taking into account the above findings through the sensitivity tests, the East Wing Project could be financially feasible, given three key conditions to be assured:

- ◆ Positive involvement of the government sector;
- ◆ Diversification of revenue sources other than railway service revenues; and
- ◆ Establishment of an unique financing and operation mechanism.

AN ALTERNATIVE INVESTMENT SCHEME: A RAIL-BUS JOINT SYSTEM

A Concept of the Rail-Bus Joint System

Based on the proven facts that its economic feasibility is somewhat sensitive to the investment schedule, and that a demand-responsive investment scheme should be explored for the implementation of the East Wing Project, another alternative scheme was examined in terms of the economic and financial feasibilities, that is, the initial investment for the rail system is minimized, being supplemented by the improvement of a bus system to connect with the rail service. This scheme, named "*a rail-bus joint system*", consists of two project components to be integrated with each other:

- 1) Rehabilitation of the section of the between Ain Shams Station and Shorooq Station of the existing Suez Line for the urban railway service; and
- 2) Provision of a feeder service with **an exclusive busway system** between Shorooq Station and new communities such as the 10th of Ramadan.

It is noted that the new rail line construction between Shorooq Station and 10th of Ramadan Bus Terminal Station is not initially considered in this scheme, but this section is to be served by an exclusive busway system which is equivalent to the railway service in terms of transport comfort and travel speed.

For such an exclusive busway system operation, the segregated structure be provided as planned in such a way that the busway can be easily replaced for the railway by layering a rail system on the structure in the time when the passenger demand will assure the feasibility of the railway system.

The basic premises and the methodology are the same as those employed for the previous economic evaluation analysis. It is assumed that the operation service will be available in the year 2007 and the economic benefits will be generated at the same year 2007.

Comparison of Investment Costs

A total of about 2.01 billion LE will be required for the initial investment for the rail-bus joint system. Compared to the original case, the total investment cost of this scheme can be saved by approximately 390 million LE, as shown in Table

A-1-5. This alternative case can reduce the costs for system works and rolling stocks, but increase the costs for additional facilities such as a bus terminal & station plaza and the procurement of bus vehicles.

It should be noted that the cost for the running track is not different from the original case, because it is assumed that the exclusive busway be served with the segregated structure between Shorooq Station and 10th of Ramadan that is designed so as to be converted to a railway structure when it is necessary. However, the busway structure excludes the cost for the signaling and communication facilities which are needed for the railway system.

Table A-1-5 Cost Comparison Between the Alternative Case and the Original Case

(LE million at mid-2003 prices)

| <i>Financial Cost</i> | Alternative Case Rail +Bus | Original Case Option 1 | Difference |
|------------------------------|-------------------------------|---------------------------|---------------|
| | (a) | (b) | (a)-(b) |
| Running Track | 1,028.2 | 1,028.2 | 0.0 |
| System Works | 354.8 | 630.0 | -275.2 |
| Stations | 85.3 | 85.3 | 0.0 |
| Bus Terminal & Station Plaza | 9.3 | 0.0 | 9.3 |
| Depot & Workshop (Rail) | 24.1 | 24.1 | 0.0 |
| Depot & Workshop (Bus) | 6.2 | 0.0 | 6.2 |
| Rolling Stock | 76.4 | 152.9 | -76.5 |
| Articulated Bus Vehicle | 16.2 | 0.0 | 16.2 |
| Land | 16.9 | 10.3 | 6.6 |
| Engineering | 129.4 | 154.4 | -25.0 |
| Local Adm. | 80.9 | 96.6 | -15.7 |
| Contingency | 182.8 | 218.2 | -35.4 |
| Total Cost | 2,010.5 | 2,400.0 | -389.5 |

Source: JICA Study Team

Results of Economic Analysis for the Rail-Bus Joint System

The economic analysis was carried out in accordance with the same methodology and theoretical properties, and the results are presented in Table A-1-6 in comparison with the original cases, Options 1 and 2.

As seen in this summary table, the alternative investment scheme of a rail-bus joint system yields the sufficiently high rate of EIRR, 13.2 %, which means that under this scheme, the East Wing Projects is economically feasible. The NPV accounts for 196.6million LE at mid-2003 prices, and the B/C ratio is 1.16, which means that the Project will bring a considerable amount of economic benefits to the national economy as a whole. It can be assessed that the Project is economically feasible, or worth being implemented from the national economic point of view.

Compared to the originally planned cases of Options 1 and 2, this alternative scheme resulted in the most favorable condition in terms of the economic indicators.

Table A-1-6 A Summary of Economic Evaluation of the Alternative Scheme

| Indicators | Alternative Scheme (A Rail + Bus System) | Original Cases | |
|--|---|----------------|----------|
| | | Option 1 | Option 2 |
| Economic Internal Rate of Return (EIRR) | 13.2% | 11.1% | 13.1% |
| Net Present Value (NPV) : Million LE at mid-2003 prices* | 196.6 | -157.6 | 143.8 |
| Benefit/Cost (B/C) Ratio * | 1.16 | 0.92 | 1.09 |

Notes: * at 12% discount rate.

Source: JICA study team calculations

Economic Evaluation: A Conclusion

The economic evaluation result of the alternative investment scenario, which is to provide a rail-bus joint system for the East Wing corridor, presented economically justifiable indicators, even though the operation will start from the year 2007.

Based on these implications, it is recommended that the East Wing Project should commence with the rail-bus joint system in the initial stage in order to avoid a risk in the front-heavy investment, and then along with the increasing passenger demand, the feeder bus system should be shifted to a new railway system between Shorooq Station and 10th of Ramadan Bus Terminal Station, which is to be constructed after 2010.

Financial Analysis

Based on the same assumptions as the previous analysis in the original case, a financial evaluation was conducted. For the operating revenue, **an integrated fare system** with a distance-based fare system (a base fare plus distance-based charge) is adopted in such a way that passengers can use the service with one ticket for the bus and railway services.

The result of the financial analysis is summarized in Table A-1-7 in a comparison with that of Option 1, because Option 1 stands on the same assumption that the service will be available in 2007. The FIRR of the rail-bus joint system was computed at **5.8%**, which is considerably higher than that of Option 1, **3.3%**. Moreover, the other financial indicators in terms of the years of profit generation, are all significantly improved by shortening the period of "negative balance". The first year when the accumulated net profit becomes positive will be 2017, or 10 years after the operation, being shortened by 5 years, compared to Option 1. Nevertheless, this financial evaluation still indicates a sensitive situation, which requires a thoughtful financial arrangement to assure the financial viability of this Project.

Table A-1-7 A Summary of Financial Analysis for the East Wing Project

| Evaluation Indices | Alternative Scheme (A Rail-Bus Joint System) | Original Case (Option 1) |
|---|---|-----------------------------|
| FIRR (Financial Internal Rate of Return) | 5.80% | 3.31% |
| The First Year of Positive Operation Profit at Annual Basis | Year 2011 | Year 2014 |
| The First Year of Positive Net Profit at Annual Basis (after Interest and Depreciation) | Year 2013 | Year 2015 |
| The First Year of Positive Accumulated Net Profit | Year 2017 | Year 2022 |

Source: JICA Study Team calculations

RECOMMENDED IMPLEMENTATION SCHEME

Three Alternative Scenarios for the Implementation

It is assessed that the East Wing Project is economically feasible but financially less feasible. This implies a need for a well deliberate design for the implementation mechanism. In general, three scenarios are conceivable as follows:

Alternative 1 (Government-Initiative): The government sector (ENR) shall take full responsibilities for the construction and the operation. This option is rational, because the Project itself is economically feasible. In this option, the government subsidy should be injected to some extent.

Alternative 2 (Privatization): The so-called BOT (Build, Operation and Transfer) mechanism is a possible option in this context under a well-planned concession scheme. However, a BOT scheme is not necessarily recommended for this Project, because of some reasons: (1) the private sector will hardly take a financial risk on such a huge amount of investments constantly required in the long-term; (2) the private sector will claim a sort of government guarantees on the revenue, or a constant subsidy to avoid a risk of ridership, which is dependant heavily on the progress of the development of new communities; (3) the private sector's fund raising capacity for the infrastructure construction is subject to economic fluctuation, therefore, the private sector can hardly guarantee a scheduled construction and operation; and (4) it will normally take long time to reach an agreement between both the government and private sectors, thereby losing the otherwise-could-be-gained benefits.

Alternative 3 (Public-Private Partnership): A sort of Public-Private Partnership (PPP) mechanism shall be pursued. This option is flexible and applicable for the East Wing Project. The government sector (ENR) assumes a responsibility for the infrastructure development, and owns its property, while the private company or a joint venture company with the public and private sectors, shall assume a responsibility for the operation and maintenance including procurement of rolling stocks, leasing the infrastructure from the owner who is the government under a concession scheme. The government may recover the investment cost by the concession fee to be collected from the operator. As this mechanism reinforces both weakness, and integrates both strengths of the public and private sectors, this is suitable for such a project requiring a considerable amount of investment and sophisticated technologies for operation and management. Table A-1-8 shows a basic concept of the recommended PPP scheme.

Table A-1-8 A Proposed Framework of Public-Private Partnership Scheme

| | THE INFRASTRUCTURE OWNER (The Government Sector) | THE OPERATOR (A Private or Joint Entity) |
|--------------------------|---|---|
| Investment | Provision of capital investments and construction of the infrastructures and the systems | Procurement of rolling stocks and related facilities and equipment |
| Tasks & Roles | <ul style="list-style-type: none"> • Issuing a Concessionaire for use of the Infrastructures • Issuing a business operation license with a definite set of rules and regulations • Monitoring the operation and the management | <ul style="list-style-type: none"> • Assuring a proper operation and services • Strengthening the human capacity • Generating operational revenues • Maintaining the Total System |
| Obligations | Recovering the investment by the levied Concession Fees in the long-term | Paying the Concession Fee at an agreed rate of the operation revenue. |
| Accountability | To the public | To the Infrastructure owner as well as the public |
| Access to Funds | <ul style="list-style-type: none"> • Government subsidy • International donor agencies | <ul style="list-style-type: none"> • International donor agencies • Local financing institutions and commercial banks |

Source: JICA Study Team

A Business Model of the Public-Private Partnership Scheme

Under the framework of "Alternative 3", a business model was examined from the cash-flow analysis. For this purpose, two players are supposed in the playground of the Project, namely, the Government (the infrastructure owner) and the Operator (an operating company). Financial assumptions are as follows:

- ◆ The government sector, or the Egyptian National Railway (ENR), be the implementing body of the Project, and invests for the infrastructure facilities. Therefore, the infrastructures belong to the government sector.
- ◆ The cost of the foreign currency portion for the infrastructure shall be procured through an ODA soft loan scheme, while that for the local portion shall be raised internally as a government subsidy. Financial conditions of the ODA soft loan are assumed to be: 3% interest rate; 7 years grace period and 25 years repayment period.
- ◆ The operating company shall maintain all the infrastructure facilities and operate the rail service, with procuring the necessary rolling stock. The operating company should guarantee a good practice for the railway operation business and be capable of commercially managing the total system in a professionally proper manner.
- ◆ It is assumed that the equity, as the initial capital, of the operating company shall be raised at 20% of the initial investment, and that in order to raise the remaining funds, the operating company can have access to an international soft loan equivalent to the amount of the foreign currency portion necessary for the rolling stock procurement and a long-term loan at a commercial bank with a 10% interest rate for local procurement. An annual shortfall, if it occurs, be fulfilled with a short-term loan (one year) at a 13% interest rate at local commercial banks. Needless to say, the gearing ratio (the ratio of the equity against the total investment) is a crucial factor affecting the financial conditions of the company in the start-up period. The assumed rate of 20% seems rational as a rail business entity.
- ◆ It is assumed that the operating company is entitled to run off-rail commercial business such as advertisement and kiosks related to the railway service. Taking into account experiences in the other countries, the off-rail business revenue is assumed to be 6% of the operating revenue, as a possible level.

- ◆ The concession is a key for this business model of the Public-Private Partnership scheme. The government sector receives the concession fee from the operating company at a certain percentage of the operation revenue. The government sector should earmark the levied fees for recovering the initial investment cost in the long-term.
- ◆ The rate of the concession fee that the operator shall pay the infrastructure owner is assumed to be 5% of the operational revenue as a base case, then an appropriate rate is examined so that *both parties' financial situations become favorable, or not worsened at least.*

Through a cash flow analysis based on the above assumptions, the most favourable condition was sought, as tabulated in Table A-1-9. In the base case, given a 5% Concession Fee Rate, the Operator will yield 21.1% of FIRR and 47.2% of ROE (Return on Equity). On the other hand, the Infrastructure Owner (the Government) needs to provide a total of 2,916 million LE, and the accumulated net profit will be -1,846 million LE (negative) in 2030. Thus, this situation is too much favourable for the Operator. Therefore, another assumption on the Concession Fee Rate may be applied.

Should the Concession Fee Rate be 30% of the operation revenue, the Operator can still enjoy a 12.3% FIRR and a 26.6% ROE, while the Infrastructure Owner will provide a total of 1,216 million LE, and can minimize the net loss at 146 million LE in 2030. In conclusion, a scheme with 30% of the Concession Fee Rate will enable both parties to manage the Project.

Table A-1-9 A Summary of Cash Flow Analysis of Option 3

(at mid-2003 prices)

| Condition | The Operation Company | | The Infrastructure Owner (the Government) | | |
|-----------------------------|-----------------------|----------------------|---|-------------------------------------|---|
| | FIRR (%) | ROE ² (%) | Accumulated Subsidy (Million LE) | Average Annual Subsidy (Million LE) | Accumulated Net Profit in 2030 (Million LE) |
| Base (CF ¹ = 5%) | 21.1 | 47.2 | 2,916 | 108 | - 1,846 |
| Case of CF=30% | 12.3 | 26.6 | 1,216 | 45 | - 146 |

Notes: 1. "CF" stands for the rate of Concession Fee to the operation revenue.

2. "ROE": Return on Equity

Recommendations

The result of the cash flow analysis revealed that the scheme with 30% Concession Fee Rate of the operating revenue will enable both parties to manage the Project in such a way that both parties will be able to satisfy their own objectives, that is, the operator will enjoy a sufficient level of profits, while the government will recover the vested subsidy in the long run, providing public transport services for the people. Therefore, it is recommended that this scheme should be further pursued to materialize the implementation in consideration of the following aspects as discussed in previous sections:

- 1) The external resource mobilization is essential for the Project, because the Project is financially sensitive. The assumed financial conditions for procuring the external funds are rational and plausible in general, but depending upon funding institutions of international aid organizations. Therefore, the analysis needs to be further clarified with concrete conditions to be offered by a possible agency.
- 2) Since the Project itself is evaluated economically feasible, the government subsidy for the Project can be justified in the long-term from the national economy point of view. However, the investment schedule should be carefully decided, responding to increasing demands along with the progress of the new communities development.
- 3) In this regard, there are two feasible options: one is that the East Wing Project be implemented targeting at that the full railway service shall start from 2010; and the other is the alternative solution, i.e., **the rail-bus joint system** that the exclusive busway system be developed initially, then shifted to a new railway system between Shorooq Station and 10th of Ramadan Bus Terminal Station, in the time when the railway investment would be financially feasible, maybe after 2010. As either solution will be economically and financially feasible, technical and operational considerations should be given priority for the decision.
- 4) The concept of **the rail-bus joint system** is technically rational but operationally complicated, needing a two step procedure: the intermodal facility development at Shorooq Station at the initial stage and replacement of the busway system for the rail system in the second stage. As a conclusion, it is recommended that the East

Wing Project be started with the concept of the rail-bus joint system, including rehabilitation of the existing Suez Line in the section between Ain Shams Satation and Shorooq Station and the new construction of the structure suitable for the railway system between Shorooq Station and 10th of Ramadan, but that it should be flexible to shift to the full railway system for the new construction section, depending upon the passenger demand in the new communities.

- 5) Under the proposed PPP scheme, some private sector's offers could be invited for the operating entity, through a bidding process, as far as it is assured that the entity can be functionally organized with sufficiently trained staffs. However, the **Cairo Metro Organization (CMO)** is recommended to become the operating entity for the East Wing railway service, being restructured so as to accommodate such new suburban rail services, rather than establishing a new entity. CMO has experienced in running the railway business and has an advantage that the East Wing can be operated in conjunction with Metro Line 1 at Ain Shams Station. This integrated operation, in the future, will be vital when the ENR suburban rail is physically connected with the metro lines.
- 6) CMO may organize this East Wing Company, as a **Private Entity**, through an international bidding process, and the private sector will be given a chance to explore this rail service business as a concessionaire. Both international and local investors may offer their own proposals on how to manage the operating company, bringing their own management know-how and modernized technologies and systems for the operation. The organizational structure is proposed in the following section.
- 7) For such a privatization scheme, the government needs to deregulate the public transport service provision in such a way that the private sector can pursue the commercial operation through the market mechanism as well as promote off-rail business to fulfil an anticipated financial gap or averse financial risks on revenue generation.

ORGANIZATIONAL STRATEGY FOR EAST WING RAILWAY OPERATION

An organizational structure for the East Wing Railway operator is proposed to be applicable for either the private or public sector. It is planned according to the selected technical options and the anticipated passenger demands by the years 2007, 2012 and 2022. The recommended general organization for the operation and maintenance of the East Wing Railways is similar to the metro system organizations used in Cairo, and adjusted in accordance with worldwide experiences in sub-urban railways operation. The staffing of each department has been adjusted according to the selected technical and operational options. The labor productivity and work load are planned at the internationally level, but adjusted in consideration of local conditions.

Organizational Structure

The proposed East Wing Company is structured with five (5) departments under a general management unit as shown in Figure A-1-8. The Board of Directors shall assume comprehensive management responsibilities. The Operation Department includes three divisions relevant to the practical operation. The Safety and Quality Assurance Department is vital in particular to assure the safe and punctual railway service.

Staff Requirements

Staff requirements for each department of the East Wing Railways Operation Company is estimated, based on the following assumptions:

- ◆ An efficiency-oriented commercial operation is the basic employment framework of the organization;
- ◆ Numbers of staffs responds to the planned operation schedule and service volume of the railway system, referring to the current operation of Cairo Metro Organization as well as the international levels of the similar system;
- ◆ Concerning the managers: one person per post, thus highly efficient managerial personnel are expected;
- ◆ Concerning the staff working conditions:
 - Equivalence of 1.5 rest day every 5.5 work day (7/5.5 factor);
 - 1.20 absenteeism factor (holidays, illness, refreshing training, etc.); and
 - For operating staff and post assured 24 hours per day; 3 shifts per day.

The number of staff required for each department is estimated by professional/skill category and by class/grade. The result is tabulated in Table A-1-10. For the operation during the period between 2007 and 2012, or the initial stage, a total of 375 staffs need to be employed. This is the minimum number of staff to operate the railway service.

Along with the increasing passenger demands, the East Wing Railway Company should be strengthened in terms of its operation capability, while its organizational structure is kept being the same. In 2022 when the full operation of the railway system is required, the staff capacity will need to be significantly enhanced with approximately 900 employees at least.

Great increases will be placed in Maintenance Department and Operation Department, while the management side is conservative in its number. It is noted that the proposed staff numbers of Maintenance Department and Operation Department are calculated at the international standard, so local conditions should be flexibly considered in practice.

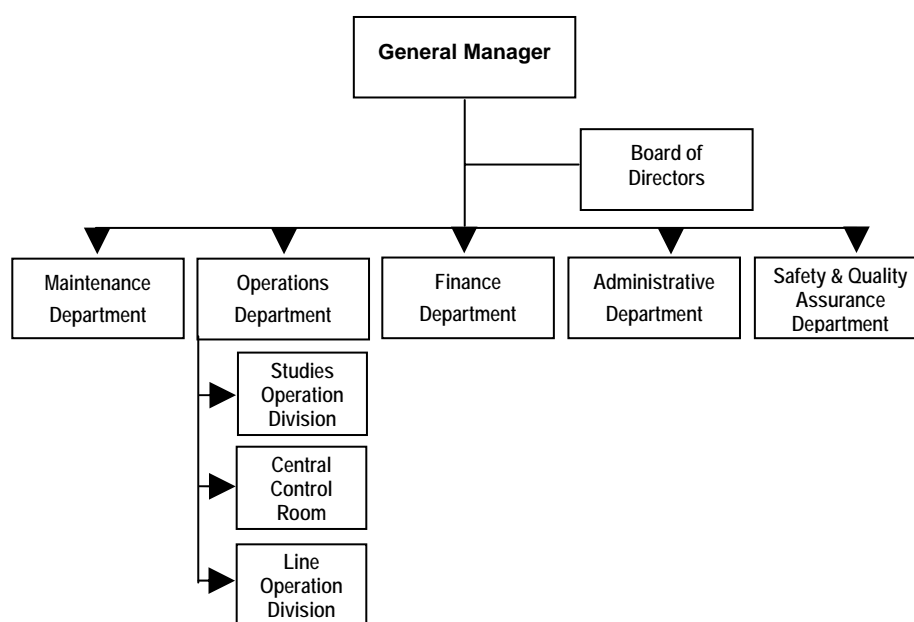


Figure A-1-8 Organization of the East Wing Railway Operation Company

Table A-1-10 A Summary: East Wing Railways Staffing in 2007, 2012 and 2022

| Department | Total | Number of Staff by Grade | | | | | |
|----------------------------------|------------|--------------------------|-----------------|-----------|-------------------|------------|-------------|
| | | Manager | Senior Engineer | Engineer | Senior Technician | Technician | Other Staff |
| Initial stage (2007-2012) | | | | | | | |
| Management | 6 | 3 | - | - | - | - | 3 |
| Safety/Quality | 6 | 1 | - | - | 2 | - | 3 |
| Maintenance | 184 | 1 | 3 | 10 | 24 | 40 | 106 |
| Operations | 135 | 1 | 3 | 4 | 10 | 36 | 81 |
| Finance | 15 | 1 | 3 | 2 | 4 | 1 | 4 |
| Administration | 30 | 1 | 4 | 7 | 6 | 5 | 7 |
| Total | 375 | 8 | 13 | 23 | 44 | 83 | 204 |
| For Operation in 2022 | | | | | | | |
| Management | 8 | 4 | - | - | - | - | 4 |
| Safety/Quality | 7 | 1 | - | - | 3 | - | 3 |
| Maintenance | 461 | 1 | 6 | 21 | 50 | 95 | 288 |
| Operations | 331 | 1 | 7 | 8 | 19 | 82 | 214 |
| Finance | 32 | 1 | 4 | 8 | 6 | 4 | 9 |
| Administration | 63 | 1 | 8 | 12 | 15 | 12 | 15 |
| Total | 902 | 9 | 25 | 49 | 93 | 193 | 533 |

Source: JICA Study Team

A-2

WEST WING PUBLIC TRANSPORT DEVELOPMENT

The development of new communities in the western part of the Greater Cairo will be also a key to mitigate diseconomies due to the excessive concentration of socioeconomic activities in the central areas of Cairo as well as Giza. The CREATS Master Plan addresses the importance of these new communities' growth and proposes to provide a reliable and comfortable public transport system in the West Wing Corridor, by introducing the trunk busway system. Complete discussions on this West Wing Project is provided in Chapter 3, Main Report Volume II.

BASIC CONCEPT AND STRATEGIES

The CREATS Master Plan proposes that the 6th of October Corridor should ultimately be served with a dual-track rail system connecting the 6th of October new community and Ramses Station in 2022 and beyond the year when the demand guarantees the feasibility of the investment for the railway project. In the short- and the medium-term, however, a more cost-effective solution should be pursued, that is, provision of a **trunk busway system** in the existing 26th of July Corridor in such a way that the engineering design may permit the introduction of a rail system within the same right of way. The introduction of a railway system needs to be warranted by a transport demand of more than 15,000 passengers/hour/direction, which will be realized after the year 2017 (Figures A-2-1 and A-2-2).

The 6th of October Busway System is visualized, consisting of two bus lanes with an exclusive alignment and high-order service, which is provided via over-sized, articulated buses operating at frequent headways, depending on transport demands. The busway system is flexible in operation and responsive to demands, thereby providing a cost-effective transport service.

Two types of bus services will be provided in the specified target years based on the passenger demand: a normal bus with air-condition and an articulated bus with a greater passenger capacity. In the first stage, the bus service by normal bus with air-condition will be operated during a few years as long as the passenger demand is still low. In the second stage after 2009, articulated buses can be introduced to meet the increased passenger demand. In the third stage after 2017, a two-lanes busway system or a railway connection as another option, be considered, when the demand will exceed 15,000 passengers/hour/direction.



Figure A-2-1 A Busway System in Colombia

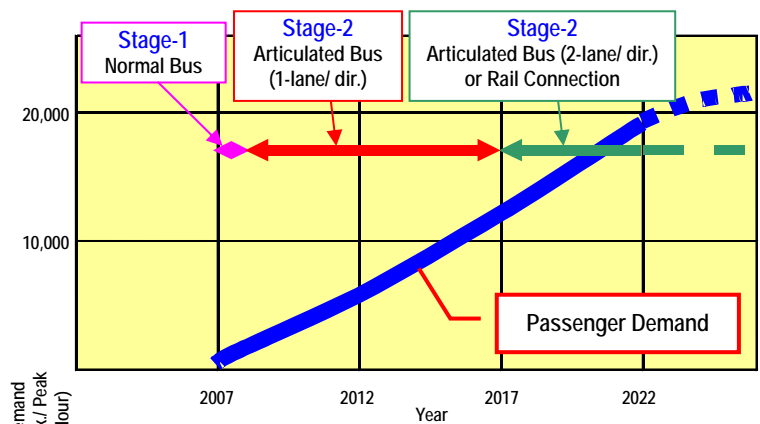


Figure A-2-2 Bus Services Responsive to Passenger Demands

BUSWAY SYSTEM IN THE WEST WING

General Profile of the Busway

Since the West Wing Busway system is expected to be an integral part of the entire mass transit system in the Greater Cairo, it needs an intermodal connection with Metro Lines. The CREATS Master Plan proposes that the West Wing is to be directly linked with the planned Metro Line 3 in the future. However, in order to pursue an effective system in the short-term, the busway is studied to connect with the existing Metro Line 2 in the central area of Giza. In this context, **Cairo University Station** is the focal point as a strategic intermodal point.

Three different types of road structure for the busway system were designed between the bus terminal in the 6th of October City and Cairo University Station of Metro Line 2, namely:

- (1) At-grade bus priority lane system on the central lane;
- (2) At-grade median full segregated busway; and
- (3) Elevated (viaduct) full segregated busway.

The at-grade bus priority lane system is introduced at the same level as that on the existing major streets within the 6th of October City. The at-grade median full segregated busway is suitable for the existing 26th of July Corridor. The viaduct type of full segregated busway needs to be constructed over the space of the 26th of July Road and the canal along ENR, where is located between the Ring Road interchange and Cairo University Station (refer to the road section drawings on Figure A-2-3).

The total length accounts for 38.0km, within which five stations for the busway system are planned at strategic locations along the alignment. Out of them, three station plazas where feeder transport services need to be provided, are proposed to be built outside the 26th of July Corridor, as shown in Figure A-2-3.

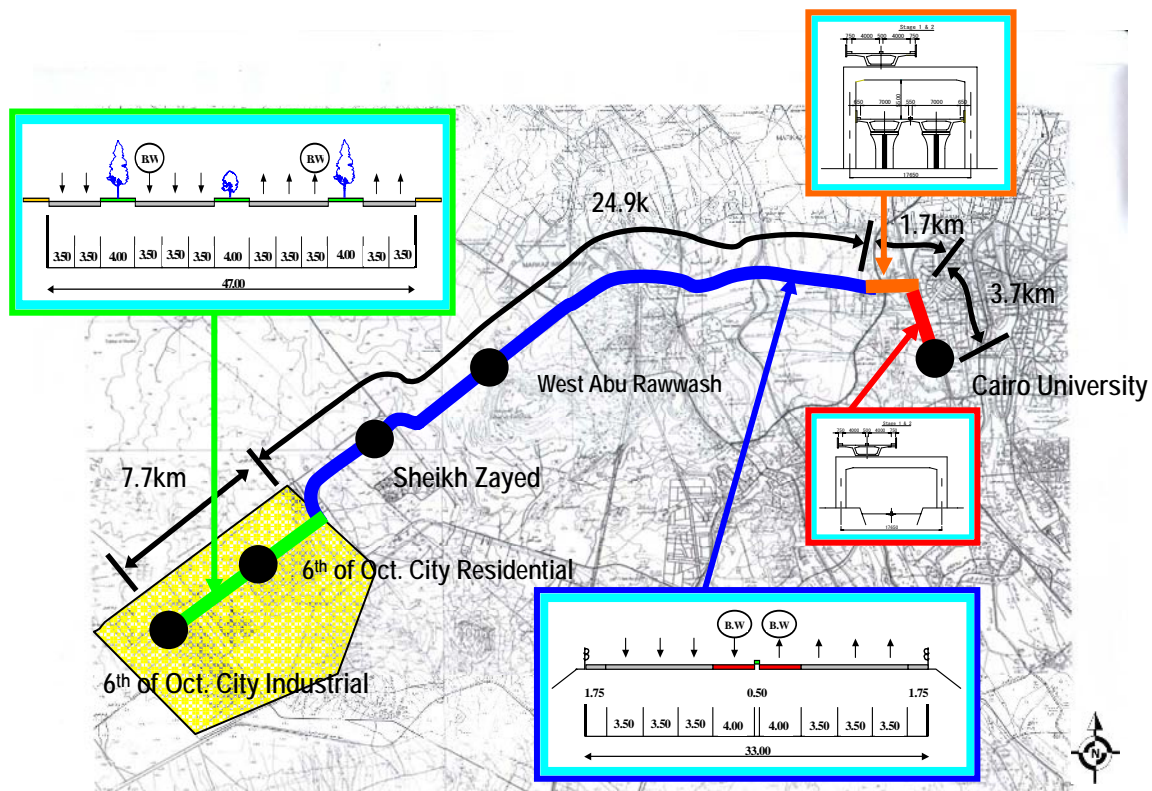


Figure A-2-3 General Profile of the West Wing Busway System

Bus Stops and Station Facilities

Articulated buses will be operated on the bus priority lanes along median in the 6th of October City, and be operated on the full segregated busway on central 2-lanes along the median of the West Wing Corridor. Therefore, the bus stop stations are constructed in the median area of the road. Figure A-2-4 shows a typical cross section of a bus stop on the 26th of July Corridor.

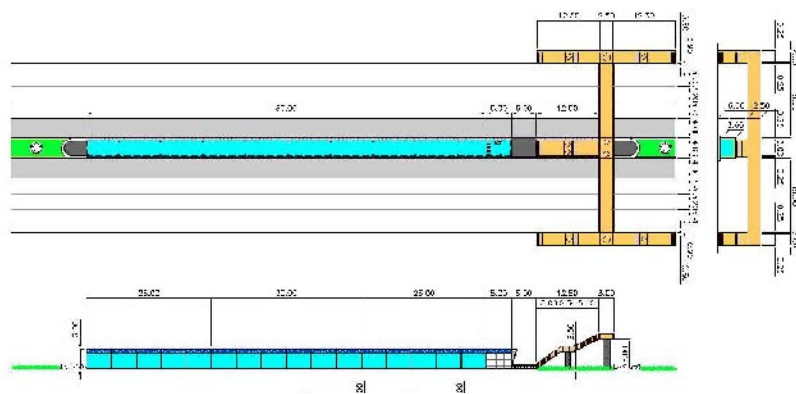


Figure A-2-4 Typical Cross Section of Bus Stop Station

A pedestrian bridge needs to be installed for passengers to approach to the station. The station facility with an off-board and quick ticketing system should be placed on a traffic island.

Bus Terminals and Station Plazas

Station plazas are proposed to be developed near intermediate bus stops in the 26th of July Corridor. The station plaza is constructed, linking to the bus stop station of the trunk busway in order to ease passengers' transfer from the busway to feeder transport services. Three locations of station plazas are proposed: (1) 6th of October City Residential Station, (2) Sheikh Zayed Station, and (3) West Abu Rawwash Station.

Based on the estimate of passenger boarding demands in 2022, the total numbers of berths and land areas for these station plazas were computed as follows (refer to Figures A-2-5 and A-2-6):

- ◆ 6th of October City Residential Station 36 berths (900 m²);
- ◆ Sheikh Zayed Station, 56 berths (10,020 m²); and
- ◆ West Abu Rawwash Station 16 berths (6,050 m²).

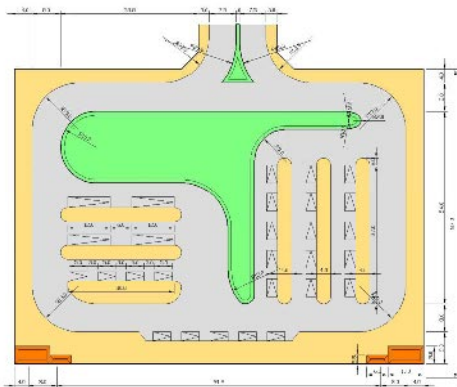


Figure A-2-5 Station Plaza At Sheikh Zayed

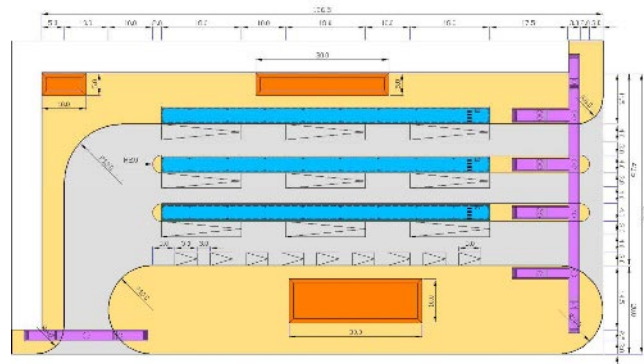


Figure A-2-6 Bus Terminal at 6th of October City

Bus terminals, that shall be located at major intermodal points, have a terminal function to transfer from buses to the other public transport modes. Two locations of these bus terminals are proposed: (1) 6th of October City industrial, and (2) Cairo University Station at Metro Line 2 with the following terminal capacities required in 2022:

- ◆ 6th of October City Industrial 9 berths (5,220 m²); and
- ◆ Cairo University Station 13 berths (8,030 m²).

Bus Passenger Capacity

For a heavy passenger demand, a bus with a larger passenger capacity should be introduced on the busway on West Wing Corridor to offer both lower operation cost and higher service reliability. Although normal single-body buses with a capacity of 100 passengers may be used during the initial stage, articulated buses with a capacity of 200 passengers, as shown in Figure A-2-7, be soon introduced in the second stage.

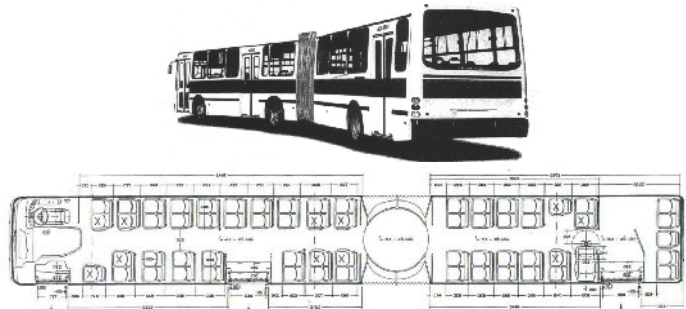


Figure A-2-7 Layout of Articulated Bus

Bus Ticketing System

A main physical constraint to determine the transport capacity and average commercial bus speeds is the ticketing system to be applied. An efficient fare collection system on the busway needs to be introduced in order to reduce dwell time at bus stations. To ensure an efficient shuttle service system between the 6th of October City and the Central Giza area, an electronic fare cards system is recommended to reduce dwell times and optimize boarding and alighting procedures (Figure A-2-8).

Tariff System

As the busway can provide a long-distance shuttle bus service, fares will be determined on a distance-base system under an off-board and quick ticketing system. The CREATS modal envisaged an elastic relationship between fare levels and passengers demands. An optimal fare level was verified through such a sensitivity analysis of revenues and passenger demand with respect to fare levels. **The optimal fare**, which is defined as the level that yields the maximum revenues, is:

- ◆ 0.94 LE base fare plus additional 0.04 LE per Km in year 2007;
- ◆ 1.11 LE base fare plus additional 0.06 LE per Km in 2012; and
- ◆ 1.50 LE base fare plus additional 0.08 LE per Km in 2022.



Figure A-2-8 Electronic Fare Card

For instance, the optimal fare between both end-terminals with 38.0 km is computed about 2.5 LE, which is almost the same as that of the current air-conditioned bus.

Service Frequency

The scheduled service frequency was examined, taking into account the passenger demand and headway during peak hours. During the period between 2007-2009, the minimum operating headway for both normal buses and articulated buses is estimated at approximately 4.0 to 10.5 minutes. During the period 2012-2017, the minimum operating headway will be 2.0 minutes. In practice, the operation with less than 2 minutes headway is difficult to manage for the one lane per direction operation. Therefore, an operation system with two lanes busway per direction will be needed after 2018. Thus, a flexible busway system should be considered, depending on the development of new communities along the West Wing Corridor.

The average commercial speed during peak hours will be 40-50km/h. It can be foreseen that the total travel time is about **45-50 minutes** between the 6th of October City Industrial Station and Cairo University Station even during peak hours.

Necessary Bus Fleets

Based on key operation factors of: 1) commercial speed, 2) bus capacity, 3) minimum headway and 4) number of passengers, the numbers of necessary bus fleets to be allocated during peak hours can be estimated. In addition to these, taking into account 20% of the garage ratio for maintenance, the total number of bus fleets necessary to be procured are: 15 normal air-conditioned buses in the initial stage (2007-2008), and 36-140 articulated buses, for the second stage (2009-2017), and 210 articulated buses, for the third stage (2013-2017). These articulated buses are necessary to be newly procured.

COST ESTIMATION

Premises

The trunk busway system can be developed and enhanced in a phased manner, responding to passenger demands. In the initial stage (up to 2008), normal bus with air-condition may be operated with 1-lane per direction. After then, the busway system will be operated with articulated buses for 1-lane per direction during nine years between 2009 and 2017. Based on the increasing of passenger demand after 2018, given more than 12,000 passengers/hour/direction, a 2-lanes busway per direction will be needed. The construction period for the busway is assumed relatively short, or 1.5 years since the commencement of construction work up to the completion.

Project Cost

The project costs include all those for construction of the infrastructures and facilities, bus fleet procurement, land acquisition, administration for the project management and engineering service costs. These costs are estimated, based on unit cost by work item obtained from a "unit price analysis" in comparison with similar projects in Cairo. As summarized in Table A-2-1, a total of about **506.7 million LE** is necessary to initiate this project and **78.3 million LE** will be additionally required to procure additional bus fleets after 2012. For Stages 1 and 2 (2007-2017), **586.3 million LE** will be needed, including road maintenance costs.

In order to respond to the increasing passenger demand after 2018, a total of **513.1 million LE** will be needed to expand the busway to the 2-lanes system.

Table A-2-1 Estimated Project Cost of the West Wing Busway System

(Million LE at mid-2003 prices)

| Project Cost | Stage 1 & Stage 2 (2007-2017) | | | Stage 3 (2018-2022) | | |
|--------------------------|-------------------------------|--------------|----------------|---------------------|--------------|----------------|
| | Total Investment | Local Amount | Foreign Amount | Total Investment | Local Amount | Foreign Amount |
| 1. Investment Cost | 506.72 | 289.89 | 216.83 | 513.07 | 297.93 | 215.14 |
| 2. Maintenance Cost | 1.22 | 1.22 | 0 | 0.44 | 0.44 | 0 |
| 3. Additional Investment | 78.31 | 0 | 78.31 | 0 | 0 | 0 |
| Total | 586.25 | 291.11 | 295.14 | 513.51 | 298.37 | 215.14 |

Source: JICA Study Team

Operation Cost and Operation Revenue

Table A-2-2 shows an anticipated annual balance between operation costs and operation revenues for the West Wing Busway operation. From the beginning of the operation, the balance will be positive, or a profit of 10.9 million LE will be yielded even in 2007.

Table A-2-2 Operation Cost and Operation Revenue on Busway

(Million LE at mid-2003 prices)

| Item (Mil. LE) | 2007 | 2009 | 2012 | 2022 |
|--------------------------|-------------|-------------|--------------|--------------|
| 1. Annual Operation Cost | 3.3 | 11.9 | 26.1 | 68.2 |
| 2. Annual Revenue | 14.2 | 57.2 | 148.3 | 587.9 |
| Balance (2 - 1) | 10.9 | 45.3 | 122.2 | 519.7 |

Source: JICA Study Team

TRAFFIC MANAGEMENT PROGRAM AT CENTRAL GIZA

Development of the Intermodal Function at Cairo University Station

The terminus of the West Wing linking with Metro Line 2 at Cairo University Station could offer passengers to directly link to other parts of Cairo. From an intermodal point of view, it is required to develop intermodal facilities and provide with a station plaza for feeder transport services facilitate a more convenient and efficient public transport system. Given such a functional intermodal system, approximately 450 thousand passengers per day will directly benefit in 2022.

The West Wing Busway service will benefit about 200 thousand commuters per day to/from the 6th of October City, and 85% of these passengers are expected to transfer to Metro Line 2 at Cairo University Station. **An elevated pedestrian deck system** linking both stations is necessary to assure safety and smooth transfers. Figure A-2-9 illustrated a concept of the physical development of the intermodal facilities connecting with Cairo University Station (Metro Line 2) and the proposed terminal of the West Wing Busway.



Figure A-2-9 Proposed Intermodal Point of West Wing at Cairo University Station

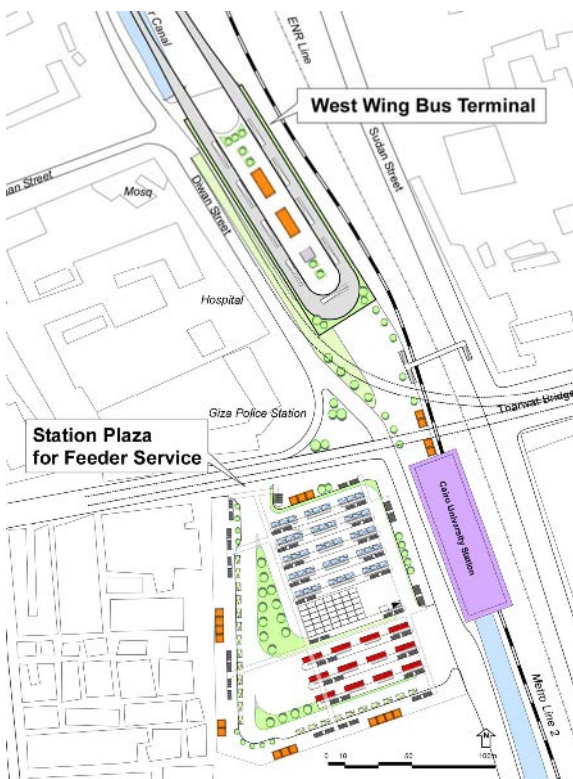


Figure A-2-10 A Conceptual Layout of Intermodal Facilities at Cairo University Station Area in 2022

The existing traffic congestion in surrounding areas of Cairo University Station is caused mainly by blocking at middle of the streets by shared-taxis and taxis due to a lack of terminal facilities. The CREATS Model revealed that 48% of the passengers of Metro Line 2 will transfer to public transport modes such as bus, minibus, shared taxi and taxi at Cairo University Station in 2022. Development of an appropriate intermodal function, including berths of public transport as well as space for a kiss and ride system, is proposed on a long-term vision.

Figure A-2-10 illustrated a planning concept to enhance the intermodal function, including the Cairo University Station Plaza as well as the West Wing Bus Terminal. In order to accommodate necessary numbers of berths and transfer facilities for feeder transport modes, a land area of 21,000 m² will be necessary to be redeveloped in the west side of Cairo University Station. At present, this area is densely occupied by residential and commercial buildings. Needless to say, it would be extremely difficult to execute such an urban redevelopment project in short-term, because of difficulties in relocation of more or less 100 households residing in this area. However, it is recommended that such a redevelopment vision be further explored in the context of an urban development policy in the long-term.

Traffic Management Program

As a short-term solution, a traffic management program is proposed to be introduced in and around the Cairo University Station Area. Since there is no available space for new road construction in the built-up area, it is necessary to increase road traffic capacity through the maximum use of the existing road facilities. The proposed traffic management system to mitigate current traffic congestions around this terminal area includes: 1) formulation of a traffic management plan for smooth traffic circulation ; 2) road widening of the station plaza; 3) a signalized-control system and an one-way circulation system for each street; 4) a on-street parking control system; and 5) installation of pedestrians safety facilities (refer to Figure A-2-11).

The urban environment, where is amenable to **pedestrians**, should be created. This must be a basic planning concept for design of a traffic management program.

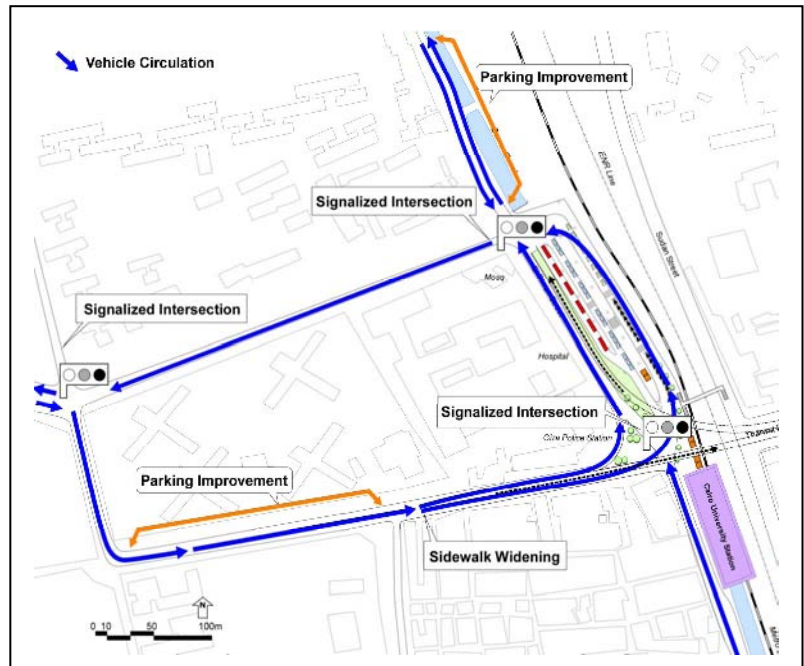


Figure A-2-11 Traffic Management Programs around Cairo University Station Area

ENVIRONMENTAL IMPACT ASSESSMENT

To ensure sustainability for the West Wing Busway Project, a **scoped Environmental Impact Assessment (EIA)** was carried out in the course of the feasibility study according to the Egyptian, JICA and other international guidelines and regulations. The EIA indicates the negative as well as the positive environmental impacts that are expected from the Busway Project. Mitigation measures, required to alleviate the identified adverse environmental impacts, are proposed.

Environmental Survey and Impacts

As parts of the Environmental Impact Assessment, **Air Quality and Noise Level Surveys**, and a **Social Survey** (Social Impact Assessment), were carried out. Their results revealed the present environmental condition of the Project Area, as well as the opinion of the residents on the proposed Project.

Negative environmental impacts, which have been identified for the proposed Busway Project, are: split up of neighbourhoods by bus lanes; and impact on aesthetics by a viaduct and flyovers, blocking the views for residents. When development of the Cairo University Station Plaza is materialized, a social issue for compensations for those who would be enforced to move or relocate will take place.

Mitigations measures are proposed to alleviate the identified impacts: proper compensation and assistance for alternative housing and jobs; construction of bridges and underpasses for pedestrians; compensation by landscaping, planting of trees, parks; additionally, sound barriers are proposed were required to improve the situation.

Major reasons for the fact that only minor environmental impacts are expected from the proposed Busway Project are:

- ◆ The proposed Busway Project is a public transport project; busses consume less energy for the transportation of a certain number of passengers than cars.
- ◆ The Project concerns an activity in the city environment; there is no impact on fragile ecology.
- ◆ The right of way is mainly owned by the government and predominantly free of houses and other structures.
- ◆ The identified impacts can be mitigated.

Positive impacts expected in the urban economy from the Busway are: improved mobility and access for the residents of Greater Cairo; reduced travel time and costs; improved conditions for economic development; and enhanced development of tourism. These economic impacts will result in lessening the total environmental burden in Greater Cairo.

Positive environmental impacts expected from the Trunk Busway are as follows:

- ◆ A number of car users will start using the Trunk Busway (*less emission, less energy consumption*).
- ◆ There will be less air pollution compared to the situation of not carrying out the proposed Busway (Zero Option), especially when the busses are running on gas (*less emission, less energy consumption*). There will be no significant increase of noise levels.
- ◆ Reduced number of accidents and increased safety for pedestrians by the construction of pedestrian bridges are expected.
- ◆ There will be possibilities for planting of trees/ landscaping

For the global environmental impact, the total CO₂ emission of **631,700 tons/year** can be reduced by the introduction of this West Wing Project in 2022. It is generally said that as one liter of gasoline generates **2.30 kg** of CO₂, the CO₂ reduction of about **631,700 tons** is equivalent to the reduction of about **274.7million liters/year of gasoline**, or 1.63 million bbl./year.

Overall Evaluation

The conclusions of the scoped Environmental Impact Assessment for the selected Busway Project (West Wing) are:

- ◆ Major positive impacts are expected.
- ◆ Minor negative impacts are expected, which can be mitigated.
- ◆ The West Wing Busway Project is sustainable and environmentally feasible.

ECONOMIC EVALUATION

The economic evaluation is carried out from a view of whether or not the investment for the West Wing Busway Project be feasible in terms of the national economy, based on basic premises such as: prices as of mid-2003; the exchange rate of 1 US\$=6.0 LE; and project life of 26 years from 2004 through 2030.

With and Without the Project

Economic benefits are both calculated as differences between “With the Project” and “Without the Project”. For the calculation of economic benefits, the situation of the “Without” case is defined identical to the “Do Nothing Scenario” as examined in the CREATS Master Plan. This scenario is not the same situation as the current condition, but depicts such a situation that all committed projects, including Metro Line 3, the capacity enhancement of Metro Line 1 and a number of flyover projects, have materialized in a planned time framework (see the CREATS Master Plan). ***Metro Line 3 is assumed to be operated in 2017. Thus, it should be noted that even the “Without the Project” case hold inclusion of the Metro Line 3 which is very influential to changes in the transport pattern.***

Economic Costs for the Investment

According to a planned construction schedule, the economic capital costs for the West Wing project, which are converted ² from the estimated financial costs as shown in Table A-2-1, are allocated in a phased manner. The total economic cost for the initial investment is 423.5 Million LE, appropriated in the initial phase between 2004 and 2006. Furthermore, the economic cost for the additional investment for the transport capacity enhancement to be allocated in 2012 and during the period between 2015 and 2017, accounts for 496.4 million LE. In addition, in order to maintain the system, a total of 284.2 million LE shall be allocated for the reinvestment for bus fleets procurement, responding to the increasing demand in the years 2016, 2022, 2026 and 2027.

Economic Benefits

Economic benefits are assumed to be two: savings in time cost and savings in vehicle operation cost (VOC), which are both derived from a difference between “with the Project” and “without the Project”. In 2022, the annual time saving is projected to be about **2,420 million LE**, and the annual operation cost VOC saving, **666 million LE** at mid-2003 prices. These savings are increasing along with the increasing passenger demand.

Cost-Benefit Analysis

The results of the cost-benefit analysis are summarized as tabulated in Table A-2-3. The Economic Internal Rate of Return (EIRR) is computed at as high as **48.9%**. Since this rate is significantly higher than the Egyptian social discount rate of 12%, it is evaluated that the Project is economically feasible, or worth being implemented from the national economy point of view.

The Net Present Value (NPV) accounts for **5,243 million LE** at the mid-2003 prices, and the Benefit/Cost ratio is as high as **9.6**, given a 12% discount rate. This means that the West Wing Project will bring a considerable amount of economic benefits to the national economy as a whole.

Table A-2-3 Summary of Economic Evaluation Results for the West Wing Busway Project

| Evaluation Indicators | Value |
|---|-------------------------------------|
| Economic Internal Rate of Return (EIRR) | 48.9% |
| Net Present Value (NPV), at 12% discount rate | 5,243 million LE at mid-2003 prices |
| Benefit/Cost (B/C) Ratio | 9.6 |

Source: JICA Study Team

² Conversion rates are assumed to be 81% for local currency items as well as 87% for foreign currency (or imported) items. taking into account the Egyptian taxation and labor market conditions.

FINANCIAL EVALUATION

The West Wing Busway Project was evaluated from the financial viewpoint. The following are a summary of the findings

Assumptions

- ◆ The costs and revenues are estimated at mid-2003 constant prices;
- ◆ The estimated financial capital costs are allocated in the scheduled time framework up to the year 2030;
- ◆ The planned bus service be operated in 2007 and generate operating revenues from 2007;
- ◆ The evaluation period is assumed to be the period between 2004 and 2030, and the residual value of invested capitals is considered in 2030;
- ◆ For the operating revenue, a **distance-based fare system** (a base fare plus distance-based charge) employed as planned below.

Table A-2-4 Assumed Fare Level for the West Wing Busway Service

| | (at mid-2003 prices) | | |
|--|----------------------|------|------|
| | 2007 | 2012 | 2022 |
| Base Fare (LE) | 0.94 | 1.11 | 1.50 |
| Distance-based (LE/km) | 0.04 | 0.06 | 0.08 |
| An Example Fare (LE): Cairo University Station ~ 6 th of October Bus Station (38km) | 2.46 | 3.39 | 4.54 |

Source: JICA Study Team

- ◆ Additional incomes accruing from ancillary sources related to the bus service operation, such as advertisement charges, are considered to be 6% of the operating revenue, taking into account experiences being performed in other countries.

Results of the Financial Analysis

The results of the financial analysis are summarized in Table A-2-5. The FIRR for the West Wing Busway Project is computed at as high as **22.3%**, which implies that the Project will be very viable from the financial point of view, or that the Project is robust enough against any financial scheme.

Looking at the financial state in the long-term, a positive operating profit at an annual basis, even after reduction of the interest and depreciation, will occur in the year 2008, or in the second year after the operation. The accumulated net profit will be positive in the next year, 2009. Thus, the Project is expected to generate sufficient profits to recover the investment in a quite short-term.

Table A-2-5 A Summary of Financial Analysis for the West Wing Project

| Evaluation Indices | Result |
|---|-----------|
| FIRR (Financial Internal Rate of Return) | 22.3% |
| The First Year of Positive Operation Profit at Annual Basis | Year 2008 |
| The First Year of Positive Net Profit at Annual Basis (after Interest and Depreciation) | Year 2008 |
| The First Year of Positive Accumulated Net Profit | Year 2009 |

Source: JICA Study Team

A RECOMMENDED IMPLEMENTATION SCHEME

Three Alternative Scenarios for the Implementation

Since it is assessed that the West Wing Project is both economically and financially feasible, a wide range of flexibility can be conceivable for the implementation of the Project. Three options are examined as follows:

Alternative 1: The government sector shall take full responsibilities for the construction and the operation. This option is rational, because the Project itself is economically feasible. Even under the currently serious resource constraint, the government investment will be soon recovered financially and yield a considerable amount of profits. A constraint, however, will take place in the operation and management of the bus services, because the government sector has no experiences in operating such modern technologies as required.

Alternative 2: Since a considerable high rate of financial returns can be expected through the Project, a private sector participation scheme may be one of the possible and realistic options. The so-called **BOT** (Build, Operation and Transfer) mechanism is a possible option in this context under a well-planned concession scheme. However, a BOT scheme is not necessarily the best policy to implement this Project, because of some reasons: (1) the private sector will hardly take a financial risk on the investments constantly required in the long-term; (2) the fund raising capacity for the infrastructure construction by the private sector is subject to economic fluctuation, therefore, the private sector can hardly guarantee a scheduled construction and operation; and (3) it will normally take long time to reach an agreement between both the government and private sectors, thereby losing the otherwise-be-gained benefits.

Alternative 3: A sort of Public-Private Partnership (PPP) mechanism shall be pursued. This option is flexible and applicable for the West Wing Project as well. The government sector, or Ministry of Housing, Urban Utilities and New Communities, assumes a responsibility for the infrastructure development. On the other hand, the private company or a joint venture company with the public and private sectors, shall assume a responsibility for the operation and maintenance including procurement of bus fleets, leasing the infrastructure from the owner who is the government under a concessionaire agreement. The government may recover the investment cost by the concession fee from the operator. This mechanism reinforces both weakness, and integrates both strengths of the public and private sectors, and its conceptual scheme is the same as depicted in Table A-1-8 for the East Wing Project in the preceding Chapter.

A Business Model of the Public-Private Partnership Scheme

Under the framework of “**Alternative 3**”, a business model was examined from the cash-flow analysis. For this purpose, two organizations are supposed, namely, the Government and the Operator (an operating company). Financial assumptions are as follows:

- ◆ The Government, or Ministry of Housing, Urban Utilities and New Communities, is supposed to be the implementing body of the Project, and invests the infrastructure facilities. The cost of the foreign currency portion shall be procured through an ODA soft loan scheme, while that for the local portion shall be raised internally as a subsidy. Conditions of the ODA soft loan are assumed: 3% interest rate; 7 years grace period and 25 years repayment period.
- ◆ The Operator is supposed to be an private entity, and shall maintain the whole infrastructure facilities and operate the express bus service, procuring a necessary number of bus fleets. It is assumed that the Operator can access to an international soft loan equivalent to the amount of the foreign currency portion necessary for the procurement, and a long-term loan at commercial bank at a 10% interest rate and short-term loans (one year) at a 13% interest rate, if necessary to fulfil an annual shortfall. The equity (the initial capital) of the Operator is assumed to be 20% of the total initial investment.
- ◆ A rate of the **Concession Fee** that the Operator shall pay the Government is assumed to be 5% of the operation revenue as a base case, then an appropriate level is examined so that both parties' financial situations are not worsened.

Through a cash flow analysis based on the above assumptions, the most favourable condition was sought. The major evaluation indicators are tabulated in Table A-2-6. In the base case, given a 5% concession fee level, the Operator will yield as high as 58% of FIRR and 115% of ROE (Return on Equity). On the other hand, the Government needs to provide a total of 656 million LE, but will be able to gain the accumulated net profit of 239 million LE in 2030. It is assessed that this situation is too much favourable for the Operator, therefore the concession fee rate may be raised.

Should the concession fee rate be even 50% of the operation revenue, the Operator can still enjoy a 37.6% FIRR and a 64.8% ROE, while the Infrastructure Owner will provide a total of 206 million LE, and can gain the net profit of as much as 4,616 million LE in 2030. In conclusion, a scheme with a 50% concession fee rate will be feasible for both parties to manage the Project.

Table A-2-6 A Summary of Cash Flow Analysis for the West Wing Project

| Condition | The Operation Company | | The Government | | |
|-----------------------------|-----------------------|----------------------|----------------------------------|-------------------------------------|---|
| | FIRR (%) | ROE ² (%) | Accumulated Subsidy (Million LE) | Average Annual Subsidy (Million LE) | Accumulated Net Profit in 2030 (Million LE) |
| Base (CF ¹ = 5%) | 58.1 | 114.9 | 656 | 47 | 239 |
| Case of CF=50% | 37.6 | 64.8 | 206 | 15 | 4,616 |

Notes: 1. "CF" stands for the rate of Concession Fee to the operation revenue.

2. "ROE": Return on Equity

Source: JICA Study Team

Recommendations on the Implementation

From the business model analysis of the Public-Private Partnership, it was revealed that the scheme with a concession fee rate of 50% of the operation revenue could enable both parties to manage the Project in such a way that both parties will be able to satisfy their own objectives: the Operator can enjoy a sufficient level of profits, while the Government can recover the vested subsidy in the long-term, providing public transport services for the people. Therefore, it is recommended that this scheme should materialize in consideration of the following aspects:

- 1) Ministry of Housing, Urban Utilities and New Community shall be responsible for the development of the West Wing Busway, then will transfer its ownership to the Giza Governorate. Thus, well coordination between the two governments as well as Ministry of Transport needs to be established to initiate the Project.
- 2) The external financial resource mobilization is not necessarily essential for the Project, because the Project is financially robust enough against even local funding schemes. However, as proven by the business model analysis, the use of some international donor resources will make this project more implementable and practical. Along with this context, technical resources are also expected to be introduced from some experienced institutions to properly manage such new technologies..
- 3) Based on this economic evaluation result, the government's definite decision for initiating the Project should be made in the line with the government policy to facilitate the new community development. Since some successful models of the similar project are already available in Bogota City (Colombia), it is recommended that relevant officials study such advanced examples for their prompt decision-making.
- 4) Under the recommended Public-Private Partnership, the capable operator, or the West Wing Busway Company, needs to be organized with a commercially rational institutional structure. For this purpose, the private sector can be invited to take part in this business area through a concessionaire bidding process. However, it is recommended as a possible and rational option that the Cairo Transport Authority (CTA) shall establish the operating company as a **CTA affiliated entity** under a restructuring scheme towards the commercialization process, as discussed in Program B-2, CTA Restructuring. This will provide with a practical opportunity to reform CTA itself. An organizational structure of the entity is proposed as presented in the following section.

ORGANIZATIONAL STRATEGY FOR WEST WING BUSWAY OPERATION

The organization of the West Wing busway operator is proposed, according to the selected technical options and the anticipated ridership for the period between 2007-2012 and year 2022. The principal management system is based on the following:

- ◆ The organization will not be in charge of the design, construction of the project, but functions as an operating entity of the West Wing Busway service;
- ◆ The staff organization will be in charge of the operation, the maintenance and the management of the system;
- ◆ The general operating principals will be a centralized control of all the different tasks, and

The recommended general organization for the operation and maintenance of the busway is similar to bus system organizations used throughout the world, regardless of its characteristics of a private or public entity. The staffing of each department has been adjusted, base on an optimal commercialized operation system. The labor efficiency, however, is considered for the local conditions to some extent in particular for the operation and maintenance work.

Organizational Structure

The proposed West Wing Company Organization is structured with five (5) departments under a general management unit as shown in Figure A-2-12. Board of Directors shall assume comprehensive management responsibilities. Operation Department, which shall play a core function of the operation, consists of three divisions: Studies Operation Division; Central Control Room Division; and Line Operational Division.

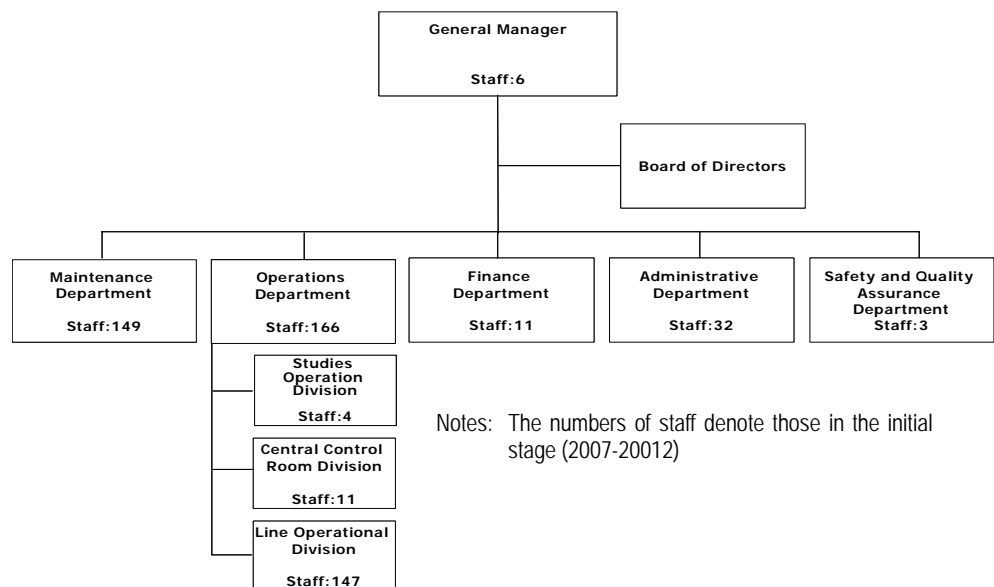


Figure A-2-12 West Wing Company Organizational Structure

Staff Requirements

Staff requirements under the proposed organizational structure are estimated, based on the following assumptions:

- ◆ One manager is assigned per one post.
- ◆ The labor productiveness and efficiency are assumed as follows:
 - Equivalence of 1.5 rest day every 5.5 work day (7/5.5 factor);
 - 1.20 absenteeism factor (holidays, illness, refreshing training, etc.); and
 - For the operating staff and post assured 24 hours per day; 2 shifts per day.

The number of staff required for each department is estimated by professional/skill category and by class/grade. The result is presented in Table A-2-7. For the operation during the initial period between 2007 and 2012, a total of 367 staffs will be employed. Towards the year 2022, in order to meet an increasing demand, the organization needs to be strengthened in term of staff capacity for service expansion, while keeping the same organizational structure. The management unit should be kept conservative in its expansion, however, Safety and Quality Assurance Department as well as Operation Department and Maintenance Department should be further staffed in accordance with the number of actively operating bus fleets in such a way that the work load and the labor efficiency be not worsened. Consequently, a total of 639 staffs will be organized for the operation in 2022.

Table A-2-7 A Summary: West Wing Busway Company Staffing in 2007-2012 and 2022

| Department | Total | Number of Staff by Grade | | | | | |
|----------------------------------|------------|--------------------------|-----------------|-----------|-------------------|------------|-------------|
| | | Manager | Senior Engineer | Engineer | Senior Technician | Technician | Other Staff |
| Initial stage (2007-2012) | | | | | | | |
| Management | 6 | 3 | - | - | - | - | 3 |
| Safety/Quality | 3 | 1 | - | - | 1 | - | 1 |
| Maintenance | 149 | 1 | 2 | 5 | 12 | 28 | 101 |
| Operations | 166 | 1 | 3 | 4 | 12 | 93 | 53 |
| Finance | 11 | 1 | 3 | 3 | 1 | - | 3 |
| Administration | 32 | 1 | 4 | 6 | 6 | 5 | 10 |
| Total | 367 | 8 | 12 | 18 | 32 | 126 | 171 |
| For Operation in 2022 | | | | | | | |
| Management | 6 | 3 | - | - | - | - | 3 |
| Safety/Quality | 7 | 1 | - | - | 3 | - | 3 |
| Maintenance | 253 | 1 | 3 | 8 | 22 | 50 | 169 |
| Operations | 302 | 1 | 3 | 7 | 35 | 107 | 149 |
| Finance | 23 | 1 | 3 | 3 | 5 | 5 | 6 |
| Administration | 48 | 1 | 4 | 7 | 10 | 11 | 15 |
| Total | 639 | 8 | 13 | 25 | 76 | 173 | 345 |

Source: JICA Study Team

A-3

TRAFFIC MANAGEMENT PROGRAM ALONG METRO 4 CORRIDOR

BASIC CONCEPT AND STRATEGY

Definition of the Metro Line 4 Corridor

Metro Line 4 is proposed as a core element of the entire urban mass transit network by the CREATS Master Plan. However, due to limited financial resources as well as a prior commitment of the construction of Metro Line 3, the implementation of Metro Line 4 is likely to be materialized in the second half of the planning horizon. Currently, the Metro Line 4, comprising of Ahram St. and Malek Feisal St. and Port Said St., is of the most heavily utilized transport corridors in the metropolitan area. Effective traffic improvement actions are urgently expected along Metro Line 4. Complete detail is provided in Chapter 4, Main Report Volume II.

Objectives, Approach and Strategy of Traffic Management Program

The objective of the Traffic Management Program along the Metro 4 Corridor is to formulate a short-term transport management program, enhancing the public transport capacity along the proposed Metro Line 4 Corridor with a view to achieving smooth traffic flow on the corridor. This program also aims to shift private car users to public transport modes, thereby mitigating traffic congestion at bottlenecks. The focus of entire efforts is placed on a low cost traffic management solution which are likely to catalyze high benefits in terms of enhanced traffic operations, capacity and safety. Traffic management strategies will also address an interim solution prior to realization of Metro Line 4. Introduction of bus priority facilities, in the form of median bus lanes, emerges as a particularly strong contender in this corridor.

The current traffic status on the Metro 4 Corridor, including identification of traffic congested sections/intersections and causes in the context of traffic engineering, was surveyed by various traffic investigations. It was found that major current traffic congestions are caused by inadequate road usage due to a lack of a well-developed traffic management and control system. Such major causes of traffic congestions along Metro 4 Corridor are: (a) Unsuitable traffic signal control system at intersection; (b) Conflicts of buses and shared-taxis near bus stops; (c) Conflicts at U-turn points; (d) Merging and diverging to/from side roads without signal control; and (e) High occupancy of on-street parking.

From the traffic management point of view, three basic planning strategies are employed: 1) to promote service level of bus transport system; 2) to mitigate traffic congestions; and 3) to create pedestrian-friendly environment.

- Median Bus Lane
- Not Median Bus Lane
- Synchronized Traffic Signal System
- Traffic Circulation System,
- Improvement of Bus Stop
- Grade Separated Intersection
- Prohibition of On-street Parking
- On-street Parking Charge System

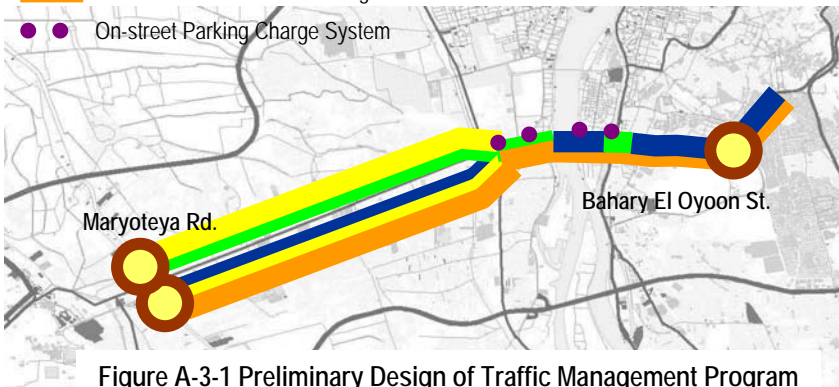
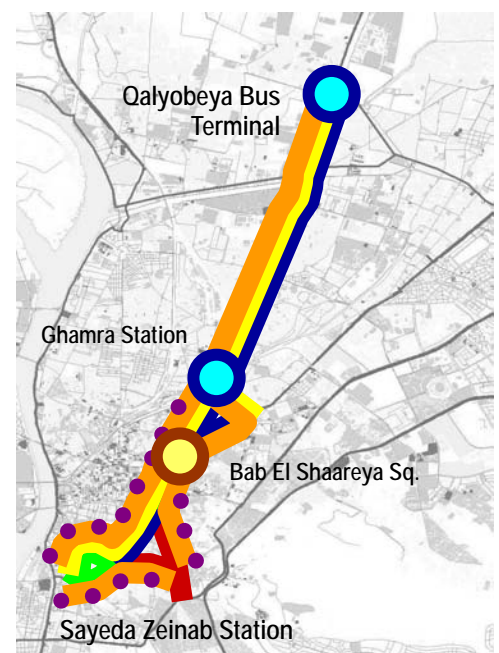


Figure A-3-1 Preliminary Design of Traffic Management Program



TRAFFIC MANAGEMENT AND CONTROL MEASURES

The Traffic Management Program along the Metro 4 Corridor composes of several major components, namely, (1) Bus priority system (median bus lane system, bus priority signal light system; (2) Improvement of bus stop/terminal); (3) Improvement of traffic signal control system (synchronized system, improvement of traffic signal phase system, bus priority system, installation of signals); (4) Improvement of intersections (installation of signal light, traffic channelization); (5) Parking system (on-street parking prohibition; on-street parking charge system); (6) **Pedestrian friendly system** (signal phase for pedestrian crossing), and (7) traffic circulation system (one-way, bus lane system). Figure A-3-1 shows a conceptual allocation plan of these traffic management projects along the Metro 4 Corridor.

Bus Priority System with Median Bus Lanes

The public transport requires road space for its facilities, so a priority of the public space usage must be given to the introduction of a new bus system. The purpose of introduction of a bus priority system is to realize punctual public transportation, improve convenience for bus users and promote car owners to use public bus transportation. The bus priority system is designed with three sub-systems: (1) the Median Bus Lane System; (2) the Bus Priority Signal System; and (3) Improvement of Bus Stops and Terminals. The average operating speed targets at 25km/h.

The median bus lane is generally planned both in the center of road (median) and alongsides (lateral), depending on the road width. The length of bus track running on the center of road is: Port Said St. (10.4km), Salah Salem St. (3.9km), and Ahram St. (6.0km). The one-way bus track system on Bab El Shaareya Sq. is proposed, although a two-way bus lane system can be considered as an alternative option. An average interval of bus stops is designed at 800-1,000 meter, taking into account pedestrians' walking distance limits. Numbers of bus stops are: Port Said St. (20 bus stops), Salah Salem St. (9 bus stops), and Ahram St. (12 bus stops).

Two types of bus stops are considered for the median bus lane system, based on conditions of road width and parking conditions. They are: bus stops by road marking or bus bay on roadside, and bus stops in the center of road (Figure A-3-2).

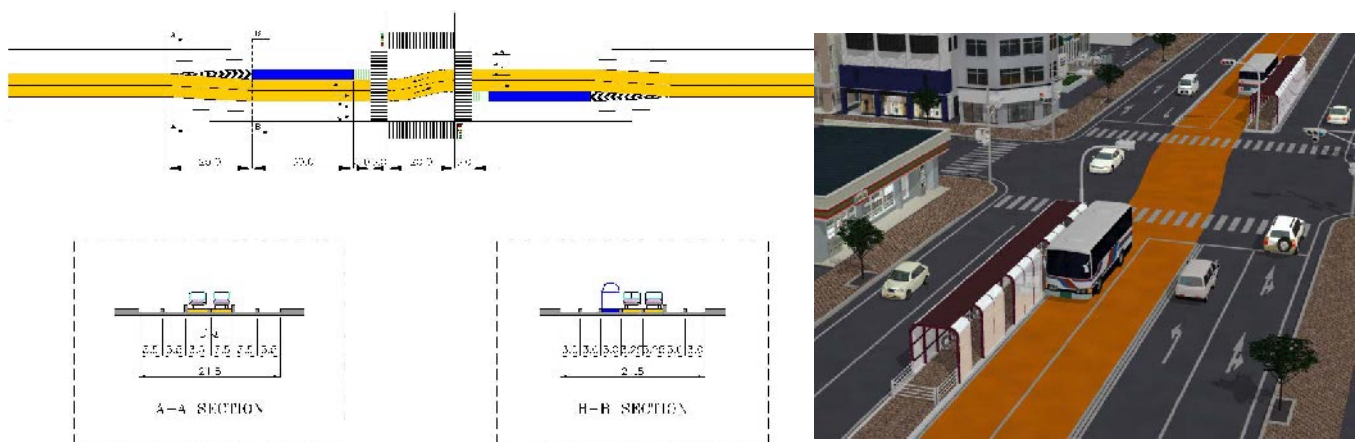


Figure A-3-2 Typical Cross Section of Median Bus Lane System

Bus Priority Signal Control System

In order to ensuring a smooth bus operation, a bus priority signal light system should be introduced on the Metro 4 Corridor, in accordance with the plan of the median bus lane system. The bus priority signal control system shall realize punctual public transportation services, thereby improving convenience for bus users. As a low cost solution, introduction of a synchronized control system for bus priority in association with an independent traffic-actuated control system is proposed.

Traffic Signal Control System

The signal control system is effectively operated when the traffic shows an unstable fluctuation pattern. Some technical improvement of the signal control system at bottlenecks is necessary by introducing a Synchronized System, a Traffic Signal Phase System and a Bus Priority System of traffic signal light, instead of the manual operation by the traffic police. In addition, improvement of a traffic signal phase system (Figure A-3-3) and installation of traffic signal lights should be employed in association with the technical improvement of the existing system (Figure A-3-4).

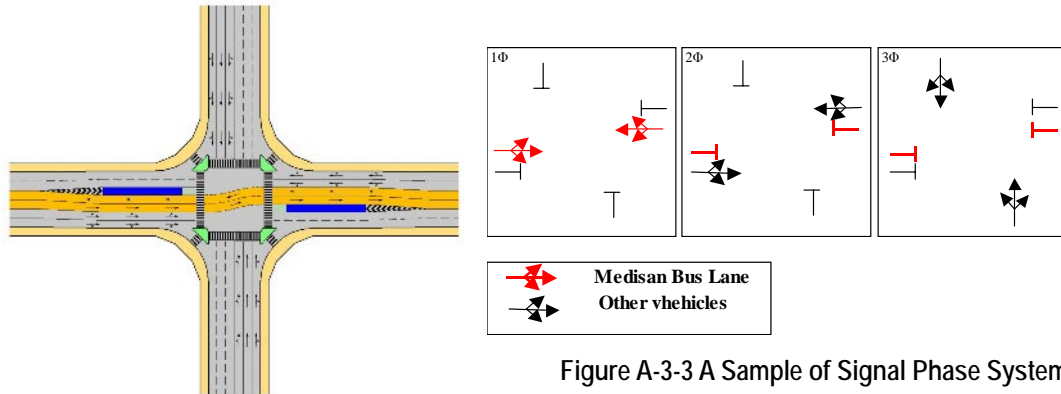


Figure A-3-3 A Sample of Signal Phase System

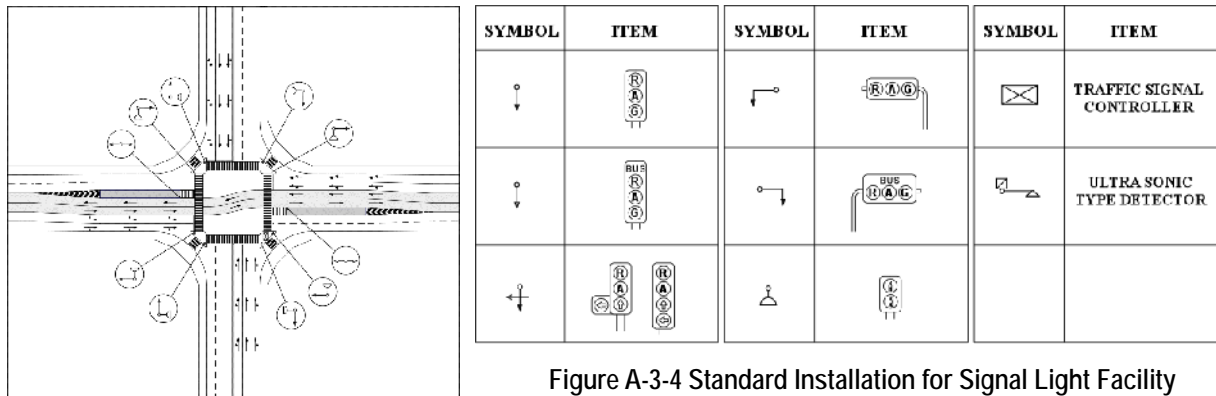


Figure A-3-4 Standard Installation for Signal Light Facility

Improvement of Intersections

Along with the introduction of the bus priority system, improvement of the traffic signal control system and the pedestrian-friendly system, it is crucial to improve intersections that can enhance mutual effects of each system. The channelization plans were reviewed for intersection improvements, taking into account the following factors:

- improvement of pavement markings where lane operation is to be altered;
- addition of exclusive left-turn/right-turn lanes;
- installation of pedestrian crossings;
- improvement of channelizing islands;
- improvement of median;
- improvement of the median bus lane system; and
- improvement of corner cut.

Serious bottlenecks appearing on this corridor will be greatly improved by introducing these traffic measures. As a sample, an improvement plan of the Port Said St.-Sawah St. intersection is illustrated on Figure A-3-5. Currently, this intersection is one of the most serious bottlenecks with long traffic queue due to U-turn system, complex turning movement and long cycle time by manual control.

Parking System

The Metro 4 Corridor has a high parking demand, where the on-street parking occupancy exceeds 90% during peak hours. A rational parking system should be employed in order to enlarge the road capacity as designed. Such a system calls for two types of parking management, namely, one is "prohibition of on-street parking" during 8:00-20:00 and the other is "control of long time parking" by introducing a parking charge system. These two measures ought to be applied at the same time as one system.

Prohibition of on-street parking should be applied along sections with the median bus lane system. The sections of on-street parking prohibition are: Port Said St. (13.7km); Salah Salem St. (3.9km); and Ahram St. (7.2km).

On-street Parking Charge System is proposed in order to increase the parking capacity in the planned corridor. This is effective to increase the parking turnover rate. The parking charge system, employing a parking ticketing system, instead of parking charge machine, is recommended for local conditions. For parking on designated sections, a driver needs to buy a parking ticket from an officially assigned inspector, then has to put it on the dashboard so that it can be seen from outside. Inspectors shall be responsible for sales of parking tickets, patrolling to check for violators and issuing a traffic violation ticket for the offence. The on-street parking charge system is proposed to be designated in four areas along the Metro 4 Corridor: in Bab El Shaareya Sq. (2.1km); Sayeda Zeinab Sq. (5.9km); Giza Br. (1.0km); and Giza Sq. (0.8km). The parking ticketing system is classified into three kinds of tickets: one hour, two hours and three hours tickets. An example of a parking ticket is shown in Figure A-3-6.

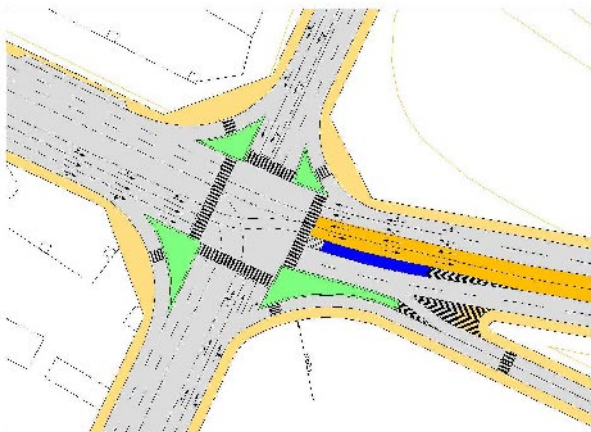


Figure A-3-5 Improvement Plan at Sawah Intersection

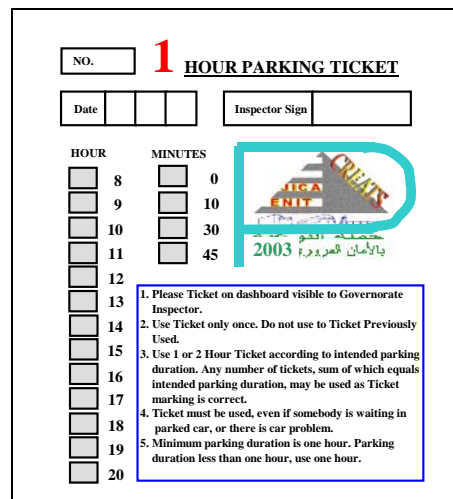


Figure A-3-6 An Example of Parking Ticket

Pedestrian-Friendly System

It is observed that drivers generally pay little attention to pedestrians even when pedestrians are using pedestrian crossings at intersections. This drivers' attitude must be changed through enhancement of "education" and "enforcement" for a social norm of "priority to pedestrian". For this sake, "engineering" measures should be also considered to provide safe and convenient facilities. In order to ensure a safe pedestrian environment, an exclusive signal phase for pedestrian crossing needs to be prepared at signalized intersection (Figure A-3-7).

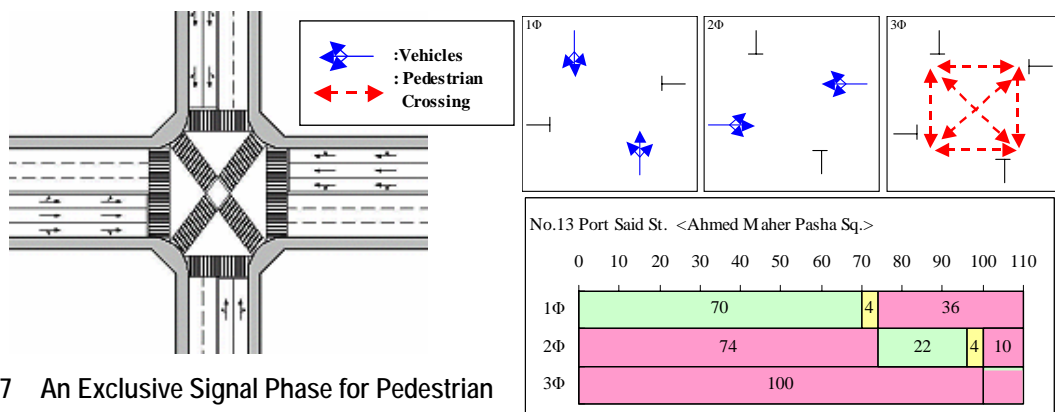


Figure A-3-7 An Exclusive Signal Phase for Pedestrian

Traffic Circulation System

In the area between Sayeda Zeinab Sq. and Qalaa St. where are old, densely built-up areas with narrow streets, a considerable volume of traffic is concentrated, and heavy traffic congestions take place due to mixed traffic with big-size buses. Since it seems difficult to widen the existing streets, a traffic circulation plan is formulated, introducing a system of separate road functions and traffic restrictions. Two alternatives are proposed for one-way system with bus priority on side lane: (a) Sayeda Zeinab Sq.- Qalaa Sq (via Mohamed Qadry Pasha St.) - Ahmed Maher Pasha Sq, and/or (b) Port Said St. - Abdel Baqy St. - Sayeda Aisha St.- Qalaa St.

IMPACTS AND EFFECTIVENESS

The evaluation of the proposed traffic management program was carried out by utilizing the “Dynamic Simulation Model” that was developed by the Study Team. A comparative analysis between the “before” and “after” improvement cases was made in terms of two different quantitative indices, namely, *average vehicle speed* and *total vehicle hour*. The result envisages that a significant improvement will take place after the implementation of the program on the Metro 4 Corridor. Compared with the present case, the proposed program will increase the average travel speed on the total network, by 26% for buses and 13% for other vehicles, and will reduce the total vehicle hours by 21% for buses and 11% for other vehicles, as illustrated on Figure A-3-8.

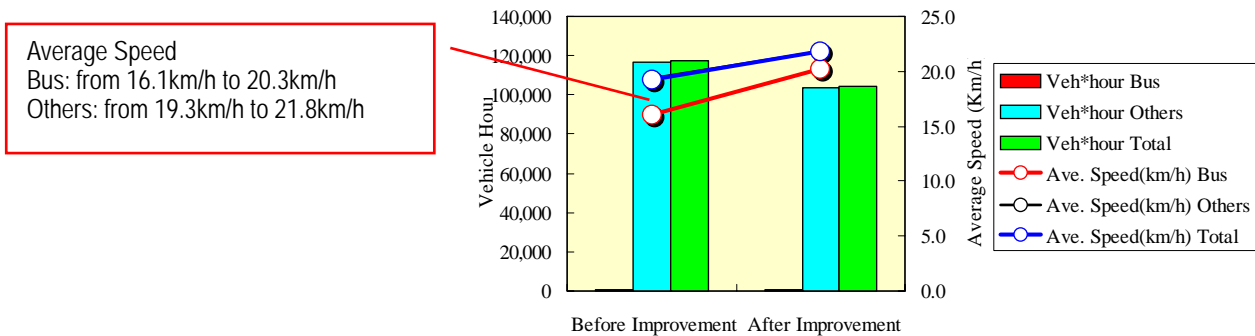


Figure A-3-8 Impacts of Proposed Traffic Management Program (by a Dynamic Simulation Model)

PROJECT COST

The initial investment cost for the proposed Traffic Management Program, consisting of eight (8) project components, will total about **211.0 million LE** at 2003 constant prices, out of which 140.4 million LE, or 66.5%, is the cost of local amount and 70.7 million LE, that of foreign amount, as show in Table A-3-1. The annual maintenance and operating cost are estimated as shown in Table A-3-2.

Table A-3-1 Summary of Initial Investment Cost for Traffic Management Program of Metro 4 Corridor

(Unit: at mid-2003 prices)

| Program Component | Total Cost (million LE) | Local (million LE) | Foreign (million LE) |
|---|-------------------------|--------------------|----------------------|
| 1 Signal Control for Vehicles | 60.554 | 24.543 | 36.011 |
| 2 Bus Priority Signal Control for Median Bus Lane | 1.590 | 0.734 | 0.856 |
| 3 Median Bus Lane System | 61.178 | 47.204 | 13.973 |
| 4 Improvement of Intersections | 2.257 | 1.519 | 0.739 |
| 5 Improvement of Bus Terminal and Bus Stops | 4.802 | 4.335 | 0.467 |
| 6 On-street Parking Charge System | 1.316 | 0.994 | 0.322 |
| 7 Traffic Circulation System on El Qalaa Str. | 0.196 | 0.184 | 0.012 |
| 8 Flyovers Construction (4 intersections) | 80.142 | 60.851 | 19.291 |
| Total | 211.035 | 140.364 | 70.671 |
| (%) | (100.0%) | (66.5%) | (33.5%) |

Source: JICA Study Team

Table A-3-2 Project Cost for the Traffic Management Program

| | (Million LE per Year) | | |
|---------------------|-----------------------|--------------|----------------|
| | Total Investment | Local Amount | Foreign Amount |
| 1. Maintenance Cost | 1.24 | 0.72 | 0.52 |
| 2. Operating Cost | 0.98 | 0.98 | 0.0 |

Source: JICA Study Team

A RECOMMENDED IMPLEMENTATION SCHEME

Funding for the Program Implementation

As discussed above, since it is proven that the proposed Traffic Management Program be significantly effective to mitigate current traffic congestions and increase the public transport capacity of bus services, the Cairo Governorate and the Giza Governorate are recommended to jointly implement the Program as soon as practical. The earlier the Program is initiated, the more economic benefits will take place for the people.

As the Program does not yield financial revenue, except for the On-street Parking Charge System, the private sector's participation in investing for the proposed improvement cannot be considered. Therefore, these local governments need to take full responsibilities for funding, construction, operation and management, based on a fact that the Program is economically feasible. These Governorates may request the international donor community to get technical and financial assistance.

Warrants for the Sustainable and Successful Implementation

It is noted that a successful traffic management system, as widely recognized, requires three "Es", namely, **Engineering**, **Education** and **Enforcement**. The proposed measures in this Program are all related to the engineering aspects. The other two "Es" should be concomitant with this engineering improvement. In this sense, an educational campaign program for the general public as well as drivers with respect to traffic safety, as proposed in the CREATS Master Plan, should be facilitated, and at the same time, a capacity building program for traffic enforcers is needed to be enhanced along with introduction of the signaling systems at major intersections and the bus priority operation, otherwise, the capital investment for such measures would be useless for the local conditions. It is also stressed again that the **pedestrian-friendly traffic environment** is really necessary to be created in the Cairo Metropolis.

Proposed Implementing Mechanism

Planning and implementation of the Program should be conducted with the deliberate implementing procedure and staff organization. To this end, the following mechanism is recommended to be established:

- ◆ It is desirable that the Cairo Traffic Engineering Bureau (CTEB) be in charge of the implementation of the propose program as a whole, because CTED is responsible for overall traffic management planning and policy implementation. With the same functions, the Giza Governorate should newly organize the Giza Traffic Engineering Bureau (GTEB).
- ◆ Regarding the operation of the parking ticket system, CTED needs to be further strengthened in its staff capacity for planning, designing, operation and monitoring, recruiting more staffs, and GTEB should be sufficiently staffed for these tasks.
- ◆ The Traffic Police should be in charge of enforcement. Inspectors, who are officially assigned by the Traffic Police shall patrol once every hour to check if there are violators. The inspectors should be well educated through technical training courses.
- ◆ It is also recommended that, at the initial stage, this new system be introduced in the most important areas as "A Pilot Project", and its impacts should be carefully monitored. As people become gradually accustomed to the new system, it could be expanded to other areas, and any modifications necessary to make it more suitable for the Egyptian way of life should be implemented.
- ◆ Regarding the traffic signal control system, in order to respond to traffic flow conditions, the traffic control parameters of signal lights should be monitored and updated periodically.

B-1

SUPERTRAM LINE 1: ALIGNMENT, SYSTEM & OPERATION

The evolving role of the Heliopolis Metro must be seen in the context of recommendations contained in the Phase I CREATS Master Plan and the list of 20 priority projects. This list includes, in addition to the Cairo Metro network, enhancing transport between suburban sub-centers and the **realization of three Supertram lines**. These lines are to function as light rail transit (LRT) systems in their own rights-of-way. Project prioritization procedures employed during Phase I confirmed that Supertram Line 1 is the line exhibiting highest priority, and was thus selected for further feasibility reviews during the current Phase II investigations. However, it is important to note that the committed projects in the priority list of CREATS Phase I concerning Metro Line 3, and extensions of Metro Lines 1 and 2, are to be implemented first. Complete detail regarding Supertram Line 1 is provided in Chapter 3, Main Report Volume III.

ALIGNMENT AND SERVICE CATCHMENT

The alignment of Supertram Line 1 follows the current Heliopolis Metro service between Ramses Station and Nasr City. One of the essential tenets of the Master Plan has therefore been met; that is, cost effective utilization of available assets, in particular right-of-way. The existing alignment between roughly Ramses Station and Roxy is already totally segregated and free from any vehicular interference; between Roxy and the Nasr City terminus the line alignment is situated within road medians. While the Heliopolis Metro is an invaluable asset in terms of urban transport potential, modal capabilities remain vastly underutilized due to outdated rolling stock, antiquated systems and widespread delay at intersections. Supertram Line 1 will, to penetrate the eastern Nasr City and New Cairo population catchments, extend beyond the current Nasr City terminus of the Heliopolis Metro along Mostafa El Nahhas Street and Ahmed Mohamed El Zomor Street to the Cairo Ring Road. This extension will continue to rely on a cost-effective alignment within existing road medians.

Supertram Line 1, a modern LRT system, embodies many desirable characteristics: human-scale planning, environmentally friendly operation, convivial image, medium-capacity urban transit capability and cost efficiency. It is seen as the optimum solution to meeting transport demands and criteria promulgated in the CREATS Phase I Master Plan. The total line is 22 kilometers in length and includes 19 stations, including four intermodal points. At these locations, intermodal connection with other forms of urban transport are facilitated to include the Cairo Metro, ENR suburban rail, trams, buses, shared taxis, and private modes of transport such as park-and-ride. Conceptual designs of the intermodal terminals are presented in a later section of this Executive Summary.

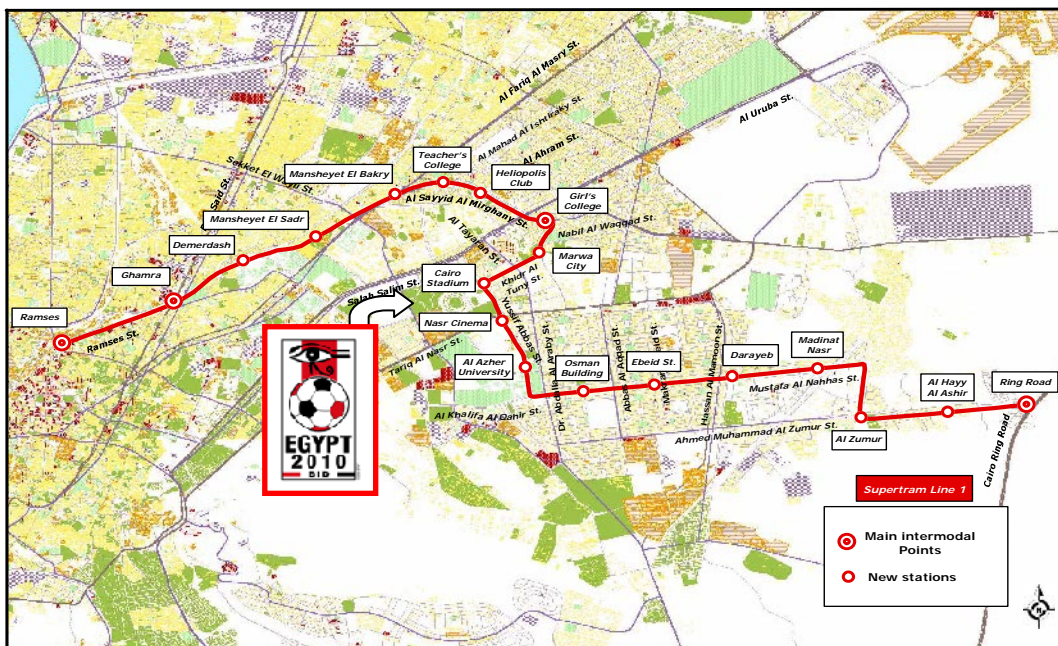


Figure B-1-2 Supertram Line 1 Alignment and Station Locations

The supertram links major centers of urban activity to include, in general, central Cairo, Roxy, Heliopolis, Nasr City and the rapidly expanding new community of New Cairo. Highest year 2022 population densities (persons per square kilometer concentrations) are, as expected, noted along the western end of the system as it approaches central Cairo. However, strong settlement is also indicated within Heliopolis, Nasr City and, to the east of the Ring Road, New Cairo (Figure B-1-3), which is anticipated to ultimately reach a total population of some three-quarters of a million persons. By year 2022, about 206,000 households will be located within 800 meters of the supertram alignment, or in excess of one million persons population. In addition, numerous employment opportunities, schools and hospitals are situated within vicinity of the supertram. These can be served efficiently and cost effectively by the supertram. It is also of interest to note that the entire eastern segment of the supertram lies within some of the highest income areas found in Cairo; this carries important implications in terms of supertram financial sustainability.

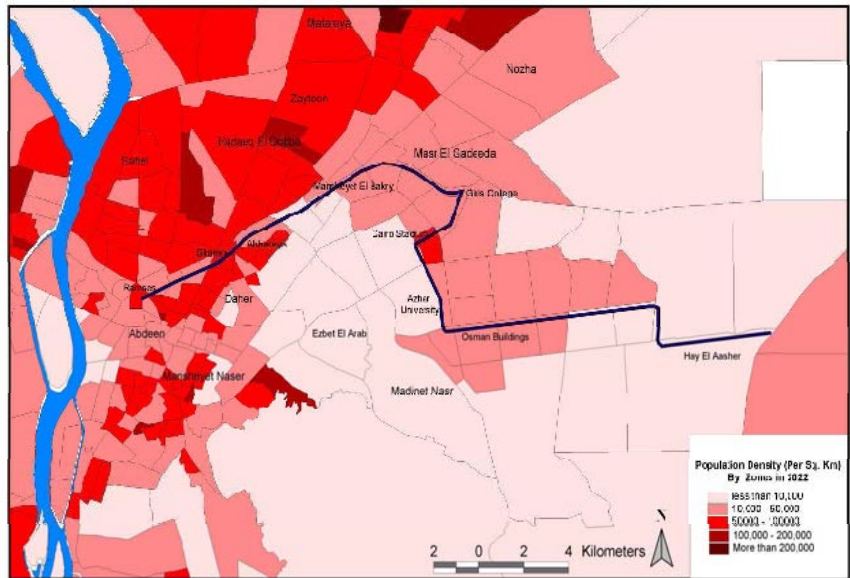


Figure B-1-3 Year 2022 Population Density near Supertram Line 1

To minimize delay at road intersections, and maximize speed as well as reliable LRT operation, grade separation will be necessary at major intersections. In order to reduce costs, grade separations at intersections will be focused on the road mode for which flyovers or underpasses can be constructed more efficiently than for tracked systems. Such actions can concurrently be integrated with other enhancements of the urban structure to ensure a convivial form of urban transport. The entirety of the supertram line will remain at-grade, with only the eastern terminus (Ring Road station) lying within an elevated alignment.

PASSENGER DEMAND

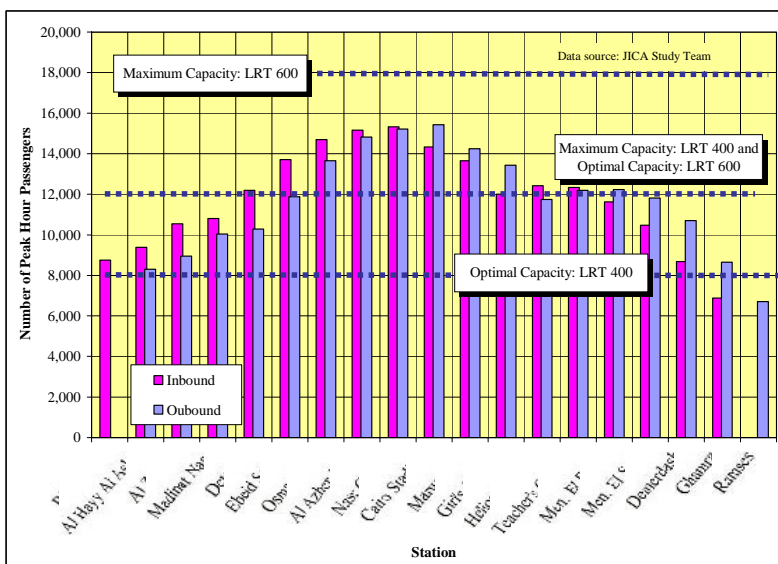


Figure B-1-4 Year 2022 Peak Hour Cumulative Directional Loadings

Findings of the demand forecasting process confirm that the proposed supertram configuration will catalyze strong future patronage. Daily ridership is estimated at some 284 thousand persons per during 2007, gradually increasing to 430 thousand persons during year 2022. Conversely, during the peak hour, directional demand is indicated at some 9,500 and 15,500 persons per hour per direction during years 2007 and 2022, respectively. Year 2007 passenger loadings suggest that station activity will mirror existing patterns, that is, Ramses station continues to be the most heavily utilized boarding point in the system. However, over time, Ring Road station will emerge as the highest activity point. These patterns reflect the evolving socio-economic pattern within the supertram catchment area, the emergence of New Cairo as a population center, and

changes in transport infrastructure. The cumulative summation of boarding and alighting demand yields a use profile and identifies points of maximum passenger accumulation. By year 2022, directional peak loadings approach 16,000 persons per hour per direction. This implies rolling stock capable of carrying near 600 persons (Figure B-1-4).

ROLLING STOCK

Cost of rolling stock is an important consideration in the selection of a preferred technology. Vehicle configuration, floor type, tractive power, speed, furnishings and other specifications all play a role in this regard. The Study Team has taken a practical and conservative approach in order to minimize outlays. A modular design, capable of being expanded with additional modules in line with evolving passenger demand, is a preferred solution (Figure B-1-5). This approach reduces costs and space compared with the selection of more traditional dual-powered car sets linked as trains. It is also easy to upgrade, and keeps maintenance and repair costs low. In terms of interior layout, mixed floor design is sufficient for the needs of the supertram.



Figure B-1-5 Potential Configuration of Supertram Rolling Stock

STATION CONFIGURATION

The majority of stations, with exception of intermodal terminals will retain their current focus: that is, located within the median of roadways. However, several changes will have to be instituted from current station designs. These relate not only to providing a more passenger friendly environment appropriate to a modern LRT system, but also ticketing and security issues. The preferred ticketing approach is to move ticket purchase and validation off-vehicle.

It is further concluded that a barrier free design, or honor system, in which no barriers to system entry or exit exist, is not appropriate for local conditions and in light of potential fare evasion. Thus, some form of barrier system is required. Magnetic strip ticketing, with turnstile platform ingress and egress, is deemed the most logical approach in the near term. Figure B-1-6 depicts a prototypical median station. Barriers control platform access by pedestrians, while turnstiles control system ingress and egress. A pleasant, pedestrian friendly station with sufficient



Figure B-1-6 Prototype Supertram Median Station

considerations of the handicapped and elderly is seen as totally appropriate and fitting in light of the modern, convivial image presented by the supertram. The station features passenger amenities, ticket sales booth, limited seating, protection from the elements and information. Possibilities exist for the presence of vending machines. Bus stops should be strategically sited to facilitate interchange between the supertram and its designated feeder bus services (or any bus, for that matter). Pedestrian crossings, possibly signalized, are needed to ensure that passengers can reach the supertram station safely and quickly.

COST ESTIMATION

The cost for the Supertram has been arrayed under two major categories. Firstly, project cost, which will likely be funded via some form of international financing and secondly, partnership cost, which will likely be funded via an Egyptian governmental entity, or local public-private partnership group.

Project Costs

Project costs may be considered outlays necessary for realization of the supertram such as new infrastructure, systems, rolling stock, depot, control center, ancillary improvements, engineering, construction management, administration and contingencies. This total is estimated at 2,332.64 million LE (Table B-1-1). When expenditures are arrayed by National Five-year Planning Period, project expenditure subdivides into 1,651.54 million LE, 166.25 million LE, 328.23 million LE and 186.62 million LE for planning periods ending years 2007, 2012, 2017 and 2022, respectively.

Partnership Costs

Partnership costs may be considered outlays for feeder bus fleet and facilities, land acquisition (supertram depot and Ring Road station are the only land acquisition needs of the supertram project), upgrading of remaining elements of the Heliopolis Metro, park and ride facilities, engineering, construction management, administration and contingencies. This total is estimated at 297.33 million LE (Table B-1-2). When expenditures are arrayed by National Five-year Planning Period, partnership expenditure subdivides into 187.42 million LE, 107.84 million LE and 2.06 million LE for planning periods ending years 2007, 2012 and 2017, respectively.

Project cost, which comprises 89 percent of the 2.63 billion LE total cost, is estimated at having 35 percent local content, that is, domestic sourced, and 65 percent foreign content. Partnership cost, which comprises the remaining 11 percent of the 2.63 billion LE total cost, is estimated at having 86 percent local content and 14 percent foreign content. The grand total outlay is therefore valued as having 60 percent foreign content, and 40 percent local content. However, the dominant role of rolling stock must be noted. The amount for trains, calculated at 980.63 million constant year 2003 LE, comprises 37 percent of the total cost. Fully 95 percent of rolling stock outlay is foreign-sourced. When considering the composite project total but without rolling stock, local content of the supertram project now accounts for 61 percent, and foreign content 39 percent.

Table B-1-1 Supertram Project Cost

| Item | | Million Constant Year 2003LE by Cost Source | | |
|-----------------------|---|--|-----------------|-----------------|
| | | Local | Foreign | Total |
| Infrastructure | Track, Viaducts Stations Utilities, | 178.93 | 42.40 | 221.34 |
| Systems | Power, Signaling, Fare Collection, Communication | 133.63 | 203.70 | 337.33 |
| Rolling Stock | Trains | 49.03 | 931.60 | 980.63 |
| Facilities | Depot, Control Center | 128.87 | 65.65 | 194.52 |
| Roadworks | Road and Traffic Improvement | 134.11 | 8.70 | 142.81 |
| Engineering | Design, Supervision, Administration, Contingencies | 182.19 | 273.83 | 456.02 |
| Total | | 807.09 | 1,526.55 | 2,332.64 |

Source: JICA Study Team

Table B-1-2 Supertram Partnership Cost

| Item | | Million Constant Year 2003LE by Cost Source | | |
|----------------------------------|---|--|--------------|---------------|
| | | Local | Foreign | Total |
| Ring Road Station | Parking, Transit Facilities, Land Acquisition | 74.13 | 3.90 | 78.03 |
| Feeder Buses | Fleet and Amenities | 37.77 | 25.01 | 62.78 |
| Depot | Land Acquisition | 24.23 | 1.28 | 25.51 |
| Heliopolis Metro Updating | Rolling Stock, Track Shaping, Stations | 79.10 | 5.57 | 84.67 |
| Engineering | Design, Supervision, Administration, Contingencies | 41.29 | 5.07 | 46.36 |
| Total | | 256.50 | 40.83 | 297.33 |

Source: JICA Study Team

IMPLEMENTATION CONSIDERATIONS

Construction Schedule

The Study Team is of the opinion that Supertram Line 1 can be operational by the last quarter of year 2007 (Figure B-1-7). Within this schedule, one year is provided for arranging financing and obtaining necessary Egyptian approvals of the project. This period is perhaps the largest unknown in terms of planning a construction schedule. It is achievable if the Government adopts a progressive and persistent approach toward project implementation. The nature of the project has several advantages, one being that, for the most part, tasks involve removal of old equipment and installation of new equipment within an existing right-of-way. Thus, over-lapping, or fast track, design and construction procedures may be followed. Construction of the depot and control center can proceed largely independently of mainline work, and can be initiated during 2005. Similarly, rolling stock procurement, which will involve somewhat lengthy tendering procedures, obtaining the fleet and shipping to Egypt, should proceed as early as possible. This is shown as beginning early 2005 in the construction schedule, but can proceed immediately after project financing is "locked". Testing and training is shown in 2007 and will rely on actual "hands on" activities. Human resources development will proceed prior to that time (refer also Component B-2 in this Executive Summary for a further discussion of human resources development).

| | 2004 | | | | 2005 | | | | 2006 | | | | 2007 | | | |
|---------------------------------|------|----|----|----|------|----|----|----|------|----|----|----|------|----|----|----|
| | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 |
| Arrange Financing and Approvals | ■ | ■ | ■ | ■ | | | | | | | | | | | | |
| Preliminary Engineering | | | ■ | ■ | ■ | ■ | ■ | ■ | | | | | | | | |
| Final Design | | | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | | | |
| Construction | | | | | | | | | | | | | | | | |
| Depot and Control Center | | | | | | | ■ | ■ | ■ | ■ | ■ | ■ | | | | |
| Guideway and Intersections | | | | | | | ■ | ■ | ■ | ■ | ■ | ■ | | | | |
| Stations | | | | | | | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| Track | | | | | | | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| Power Supply | | | | | | | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| Signaling and Communication | | | | | | | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| Vehicle Procurement | | | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| Testing and Training | | | | | | | | | | | | | ■ | ■ | ■ | ■ |

FigureB-1-6 Supertram Construction Schedule

Operating Cost and Revenue

The estimated operating cost, which includes staff, energy, maintenance and spare parts, reaches 15.4 LE per train kilometer at constant year 2003 prices. It is important to underline at this stage that the supertram maintenance must be based on international standards. While this invariably implies higher maintenance costs than current local experience, the important objective nevertheless is to maintain the system in good operating conditions for an extended period. This increase in maintenance cost will, in the longer term, be offset by a reduced need for capital-intensive system renewal costs. Annual operating costs are calculated as ranging from 47 to 63 million LE at 2003 constant prices.

Estimated revenue is based on a unit average fare per passenger paid, plus a modest system-wide accounting for incomes from ancillary sources. This is, based on international experience, calculated at six percent of fare revenue. Annual operating revenue of the supertram is calculated as ranging from 64 to 149 million LE at 2003 constant prices. The coverage ratio, or revenue divided by costs, is estimated as being greater than unity during all benchmark years (Table B-1-3). This confirms that, from a perspective of operations, and excluding depreciation and interest, the supertram is capable of generating an operating profit.

Table B-1-3 Supertram Operating Cost and Revenue

| Item | 2007 | 2012 | 2022 |
|--|-------------|-------------|-------------|
| Annual Operating Cost (Mill Constant 2003 LE) | 47 | 47 | 63 |
| Annual Revenue (Mill Constant 2003 LE) | 64 | 76 | 149 |
| Coverage Ratio | 1.36 | 1.62 | 2.37 |

Implementing Entity

The Heliopolis Metro, hence the supertram, falls under the jurisdictional umbrella of the Cairo Transport Authority (CTA); that is, Cairo Governorate. The operating entity will be the supertram company, whose structure is rational and efficient in commercial operation. A proposal for such an organizational setting is shown under Component B-2, "Supertram Company Organization", in this Executive Summary. A need for effective coordination is anticipated with a number of governmental organizations, including the Ministry of Transport and the Ministry of Housing, Utilities and Urban Communities.

INTERMODAL SYSTEM

An intermodal system needs to be formulated in association with the development of the Supertram system. The system requires: 1) rational development/improvement of intermodal centers (stations); 2) feeder service systems of bus and other trams; and 3) integrated ticketing strategy.

Supertram Line 1 features 19 stops; from an intermodal perspective, four are designated as intermodal terminals and the remaining 15 as regular stops. While the regular stops have a limited intermodal function, the four terminals are each important interconnecting points with other major public transport services or private modes of transport. The four intermodal terminals are Ramses, Ghamra, Girl's College (Koleyet El Banat) and Ring Road stations. Conceptual drawings of these centers are presented in this section. Further detail is presented in **Section 4.5** Main Report Volume III.

Ramses Station

Located at the western extreme of Supertram Line 1 within Ramses Square, Ramses Station is seen as a critical element in terms of operational success of the proposed LRT system. A number of transport facilities exist within Ramses Square including one of the main ENR stations, elevated pedestrian walkways, and entrances to the underground Cairo Metro (Mubarak Station, Metro Lines 1 and 2). At time of writing, a series of changes are being implemented under the auspices of Cairo Governorate involving road closures and the relocation of shared taxi and CTA bus facilities from within the Ramses Square area to a new public transport terminal located immediately north of the ENR rail tracks. Major road facilities within the square include Ramses Street and the elevated 6th of October Expressway to include westbound on and eastbound off ramps

The location of the existing Heliopolis Metro tram station is inadequate for the needs of a modern LRT station. The westward extension of the track is therefore the preferred solution; concurrently the statue of Ramses II should be relocated as per pre-existing approvals, and two existing slip-roads (now used for a variety of purposes) closed. The result is a public transport-friendly design under which Supertram passengers have direct access to the Cairo Metro via a widened stairway connection adjacent to the LRT station, while interchanges with other modes can be achieved via a modernized elevated walkway. No person need cross any road. This design also creates a pedestrian island with numerous opportunities for pedestrian precincts, landscaping and other amenities; in short, is expected to considerably beautify Ramses Square (Figure B-1-9).

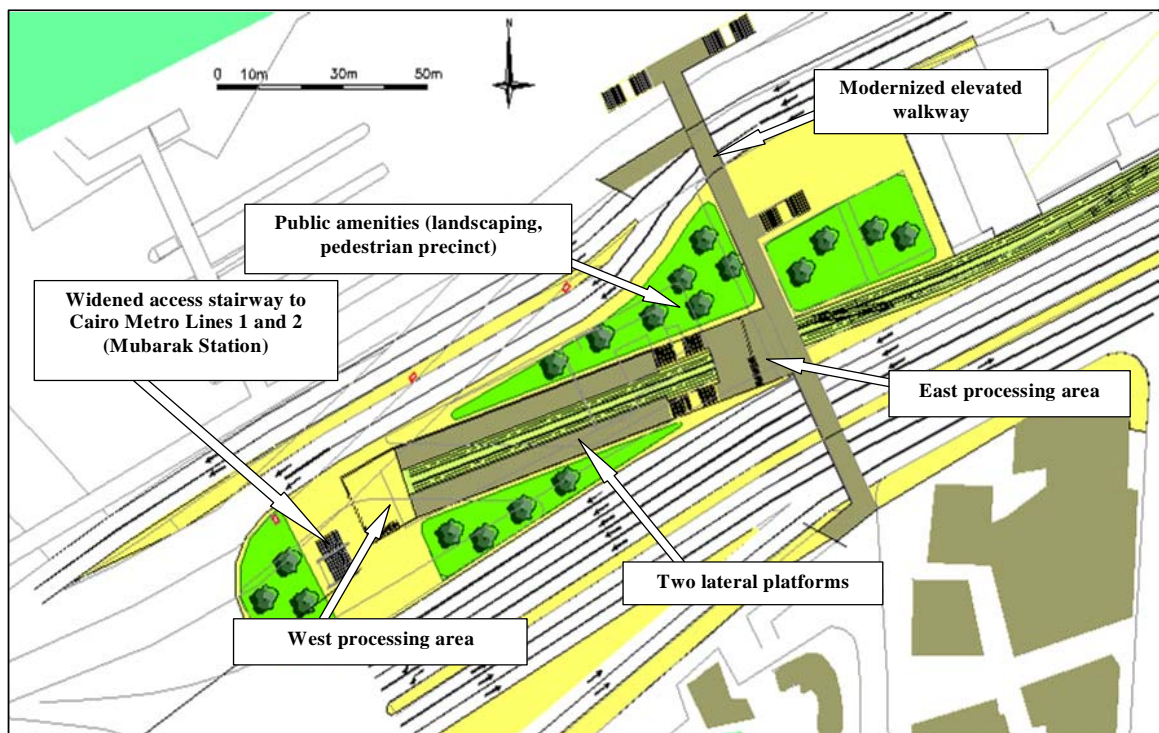


Figure B-1-9 Ramses Station and Environs

Ghamra Station

Located near the western extreme of Supertram Line 1, Ghamra Station links Metro Line 1, Supertram Line 1 as well as bus and shared taxi services operating along Port Said Street. It will also serve, in the longer-term future, the proposed Metro Line 4. The Supertram station physically abuts the Ghamra station of Metro Line 1. Severe physical constraints preclude any major changes in facilities at this location without considerable financial expenditure. The Supertram station is constrained on the south by a walled on-ramp to the 6th of October Expressway, and on the north by the alignment of Metro Line 1. Vertical constraints also exist due to the Port Said road bridge, as well as structure and supports of the elevated 6th of October Expressway. The recommendations for Ghamra Station of Supertram Line 1 are fully consistent with recommendations of the road improvement and traffic management strategies derived within the framework of Program A, that is, implementing an series of traffic improvement measures designed to enhance road operations within the Metro Line 4 corridor which includes, of course, Port Said Street. The cross-section of Port Said Street is modified to provide for a median busway, with directional stops near Ghamra Station. Recessed shared taxi bays are also provided. An expanded pedestrian deck enhances connectivity between the Supertram and the metro as well as buses and shared taxis. The processing area for Supertram Line 1 is located on the pedestrian deck (Figure B-1-10).

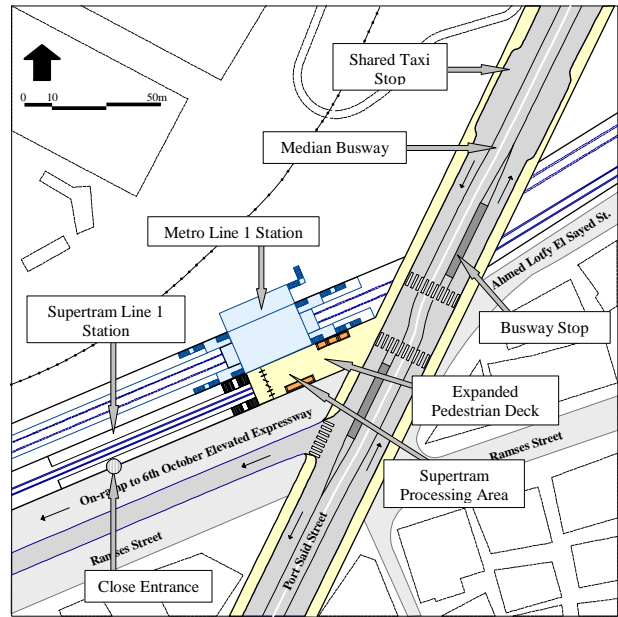


Figure B-1-10 Ghamra Station and Environs

Girl's College Station (Koleyet El Banat)

The existing station at Girl's College is served by both the Heliopolis Metro and CTA Tram. Tracks, which are located within the road median, diverge at this intersection with service direction Nasr City branching from Sayed El Merghany Street and continuing along Ahmed Tayseer Street. Since the modern LRT technology of the Supertram is not compatible with the outdated rolling stock of the current tram system, Girl's College station emerges as a major intermodal point with a critical issue being how to plan for the transfer of passengers between the Supertram and remaining elements of the tram network. Furthermore, Metro Line 3 will pass under this location in a roughly north-south direction, with a station located under the intersection complex. Any treatments at this location must therefore be consistent with the alignment and design of Metro Line 3.

Grade separation for road traffic is accomplished by elevating the westbound left turns from Merghany Street to southbound Tayseer Street, and constructing an underpass to accommodate eastbound through movements along Merghany Street. Both treatments can be achieved within constraints posed by the subterranean Metro Line 3 alignment (Figure B-1-11). Concurrently, to realize these treatments, a redesign of road space within the intersection is needed resulting in the absorption of frontage lanes and loss of parking within the immediate intersection area. Road traffic will, under the proposed plan, enjoy free-flow conditions for all movements passing the intersection, with one exception. That is the northbound left turn movement along Tayseer Street, which intersects with the westward extension of the Heliopolis Tram track, then merges with westbound flow along Merghany Street. This can readily be handled via the installation of a traffic responsive tram priority signal system (Figure B-1-12).

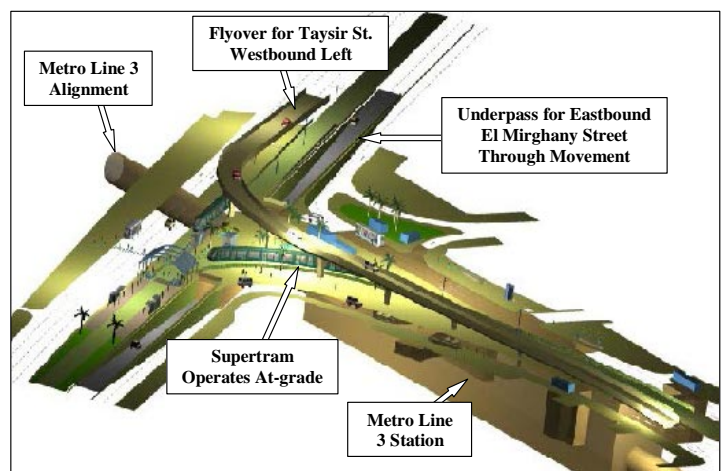


Figure B-1-11 Infrastructure Elements

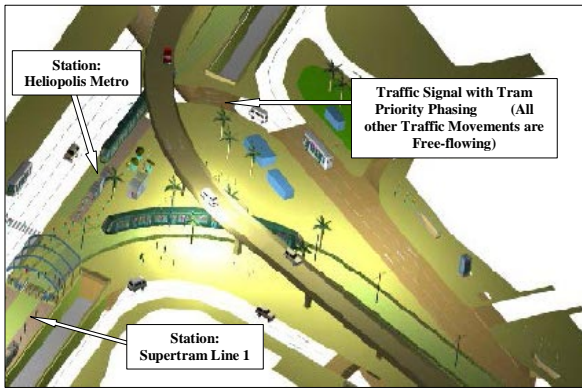


Figure B-1-12 Improved Intersection Operations

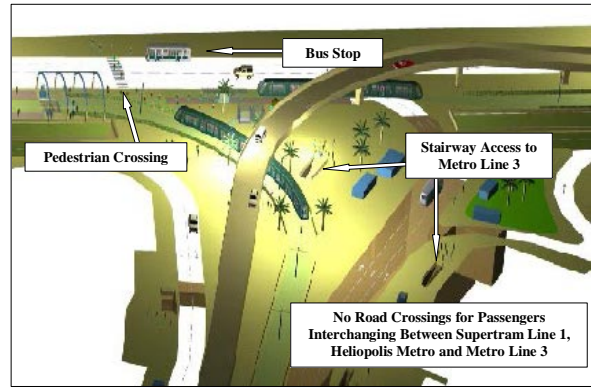


Figure B-1-13 Enhanced Pedestrian Precinct

The entire core area has, with the inclusion of landscaping and pedestrian amenities, been transformed from the present anarchic state to a pedestrian-friendly precinct free from conflict with road traffic. Public transport interchange is optimized. Passengers transferring between Supertram Line 1, Heliopolis Metro and Metro Line 3 can do so totally within the pedestrian precinct without crossing any roads. The provision of zebra crossings (or possibly pedestrian bridges) will further enhance interchange with adjacent bus stops and facilitate road crossings by pedestrians (Figure B-1-13).

Ring Road Station

Ring Road station is the eastern terminus of Supertram Line 1, and is located in what is now vacant land in eastern Nasr City near the intersection of Ahmed Mohamed El Zomor Street with the Cairo Ring Road. The Study Team considers Ring Road station as an excellent opportunity for realizing a multi-use development combining both transport and commercial functions. An innovative new approach to financing and implementing Ring Road station will facilitate realization of this flagship undertaking. The core Supertram facilities (tracks, station, fixtures, systems, etc) would, for example, be provided for within project costing, potentially sourced via international donors or lending agencies. A governmental entity, or public-private partnership group, would provide financial resources for land, parking and public transport feeder facilities. The private sector, in turn, would be responsible for commercial development. Finally, joint development (“transit oriented development”) principles should be applied in terms of asset development, management, revenue sharing and sustainability.

The station concept (Figure B-1-14) includes the principal road facilities (Zomor Street and the Ring Road) as well as public transport facilities encompassing the Supertram station, shared taxi terminal, urban bus terminal and public transport information center. Parking is provided via park and ride spaces, as well as parking spaces for commercial activities. Planning for the convenience and comfort of pedestrians has been a major input to station design. Facilities include a pedestrian deck, pedestrian plazas north and south of Zomor Street, stairways and elevators linking various activity precincts, landscaping and other pedestrian amenities. In short, moving between different elements of the station can be done with minimum interaction with road traffic. Finally, the bulk of commercial and shopping space is allocated

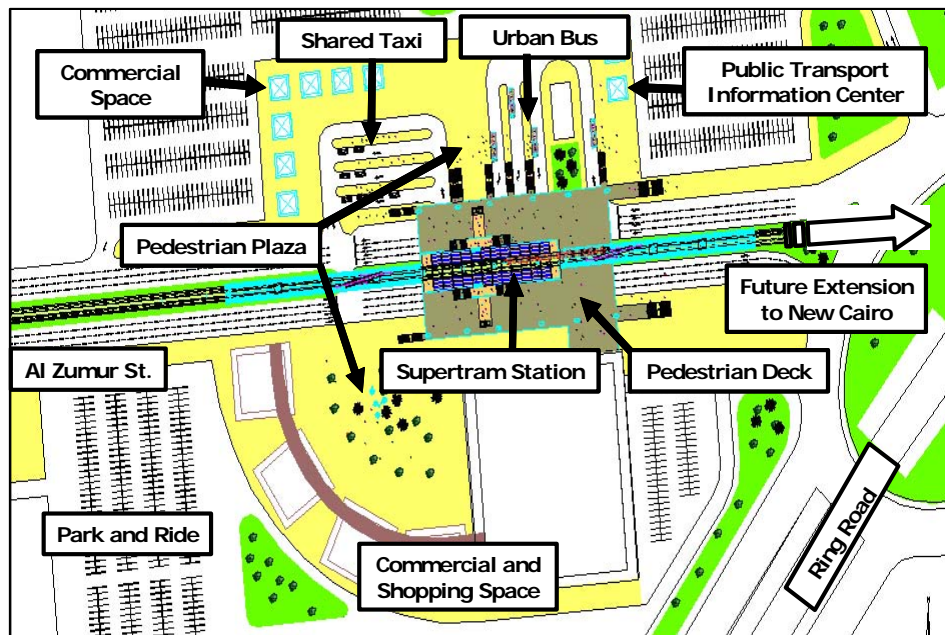


Figure B-1-14 Principal Components – Ring Road Station

to the south of Zomor Street. To the north, and near the bus/shared taxi terminals, are a series of small-scale commercial establishments.

In light of the rapid expansion now occurring in southeastern Nasr City, there exists a need for the immediate reservation of land for the Supertram depot and Ring Road station. These are the only instances where land acquisition is needed for the Supertram project. Based on a series of meetings and discussions, it is understood that approximately 300,000 square meters of now-vacant land, large enough to accommodate both the Ring Road station complex and the Supertram depot, could possibly be made available in vicinity of the station site. Reservation of requisite land is urged (Figure B-1-15).

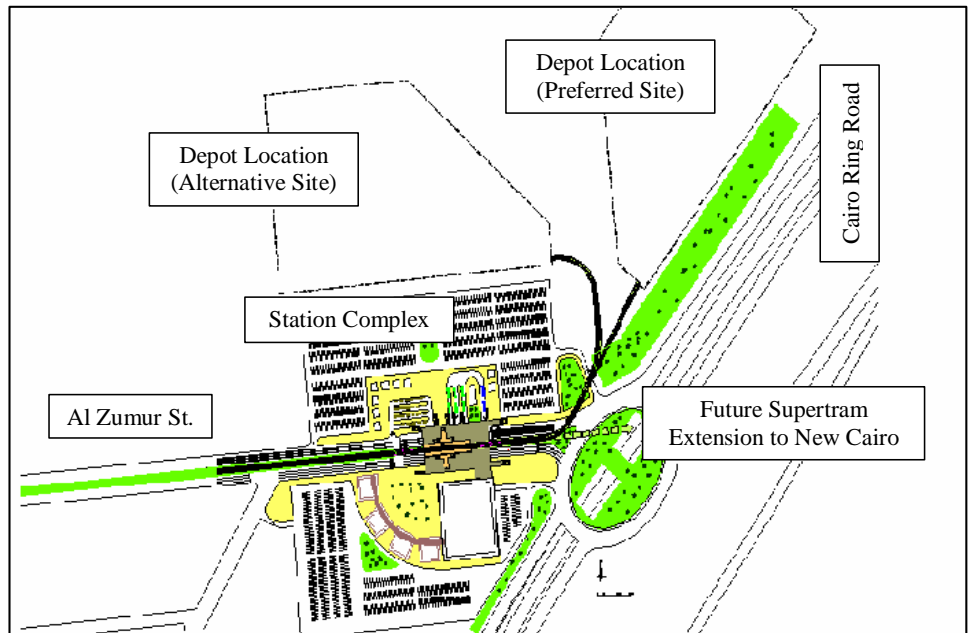


Figure B-1-15 Land Requirements for Ring Road Station and Supertram Depot

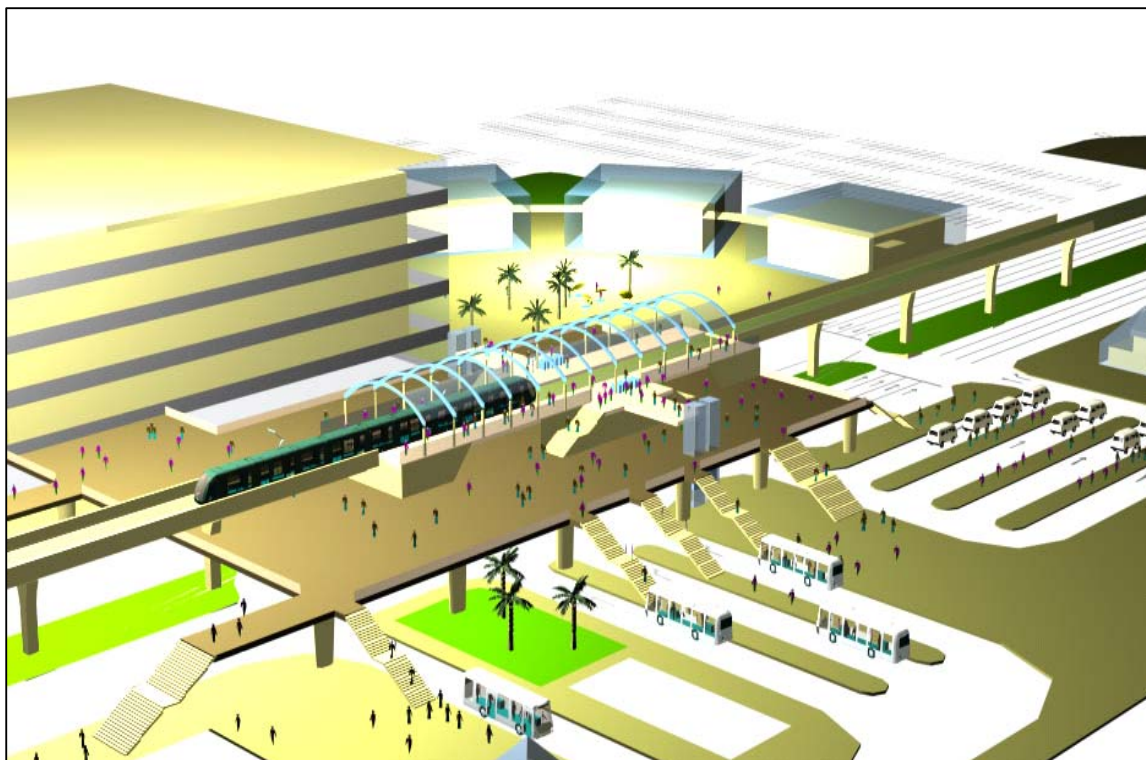


Figure B-1-16 Aerial View of the Ring Road Station Multi-use Development

PUBLIC TRANSPORT COORDINATION

The realization of Supertram Line 1 implies a concurrent need for change in other elements of the East Cairo public transport network, in particular urban bus services and the disposition of remaining elements of the Heliopolis Metro. Further detail is provided in Sections 4.1 through 4.3, Main Report Volume III.

Optimization of Urban Bus Services

The recommended plan for bus optimization in East Cairo includes three elements related to East Cairo in general, the Nasr City/Heliopolis area and New Cairo in particular.

Firstly, technical reviews confirm the merit of optimizing 20 bus routes within East Cairo. In light of various considerations, new air conditioned services using full size buses, at the standard 2 LE fare, should be layered onto the identified existing 25 Piaster routes. This is consistent with governmental objectives in that premium services may be offered assuming that transport options for low-income residents of the metropolitan area are not jeopardized. The proposed routes are intended to serve both East Cairo and to enhance intermodal connectivity with the Supertram; thus, realization can proceed at the earliest opportunity (Figure B-1-17).

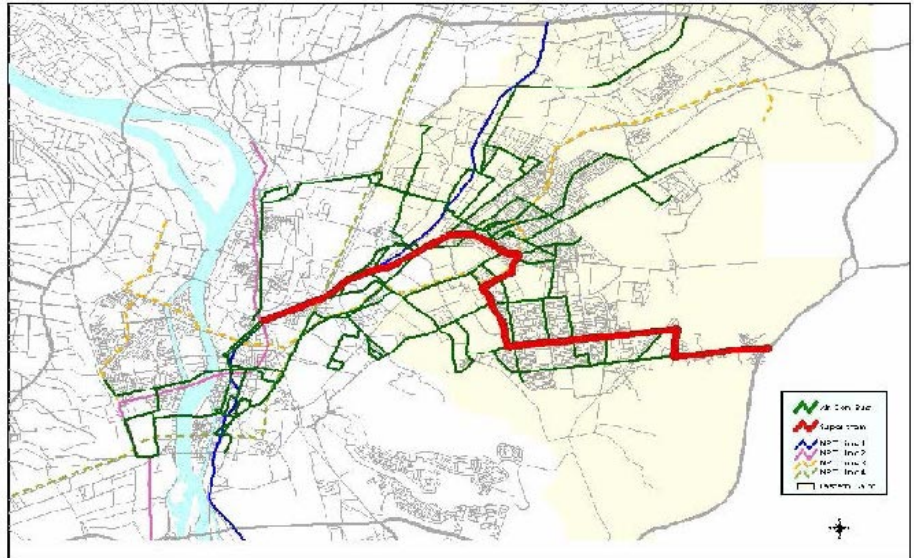


Figure B-1-17 Twenty Optimized Bus Routes in East Cairo

The second element is a feeder service network connecting directly with the Supertram Line 1. The residential part of Nasr City lying roughly between Abbas El Aqqad Street and the Ring Road is slated for rapid population growth. Indeed, new housing developments, and intensification of existing residential pockets, is already accelerating.

To encourage utilization of the Supertram, three shuttle routes, anchored to CTA bus terminals, are proposed within this area (Figure B-1-18). Service would likely be via air conditioned mini buses. The intent of the proposed routes is to enhance Supertram access, although passengers could also use these services for traveling between various precincts of Nasr City/Heliopolis. Implementation of the shuttle routes would likely be more linked with actual implementation of the Supertram, although could be earlier should government reach a policy decision in terms of enhanced public transport service.

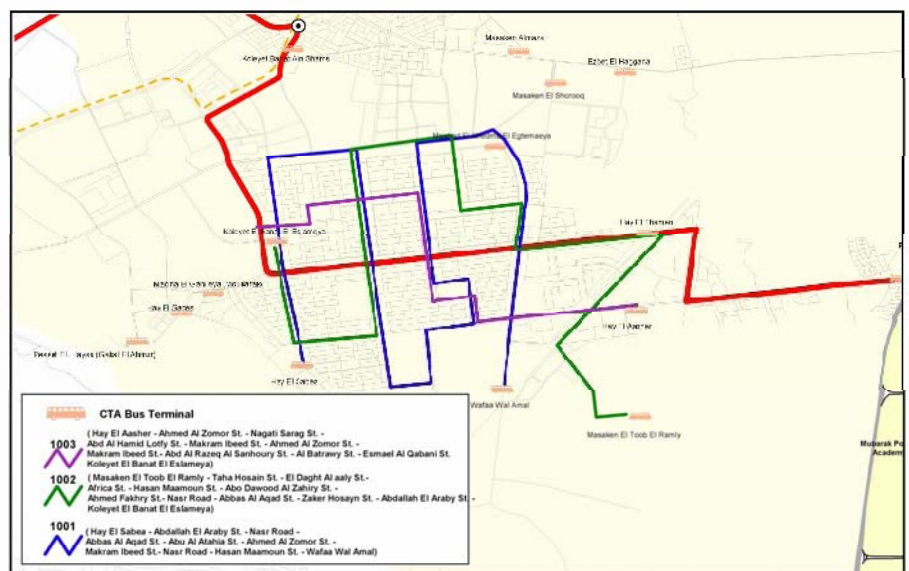


Figure B-1-18 Three Shuttle Routes in Nasr City

The third element of the recommended plan relates to New Cairo. This urban conurbation, whose size is expected to ultimately reach approximately three quarters of a million persons, obviously represents a considerable impact upon Supertram ridership. However, the speed of New Cairo population growth, and indeed the spatial distribution thereof, remains flexible and subject to market mechanisms.

From the perspective of the Supertram, two issues are obvious. Firstly, the Ministry of Housing has expressed considerable interest in the extension of the Supertram beyond its current Ring Road station into New Cairo. Secondly, until such an extension is complete, an interim series of feeder bus services must be implemented to serve the residents

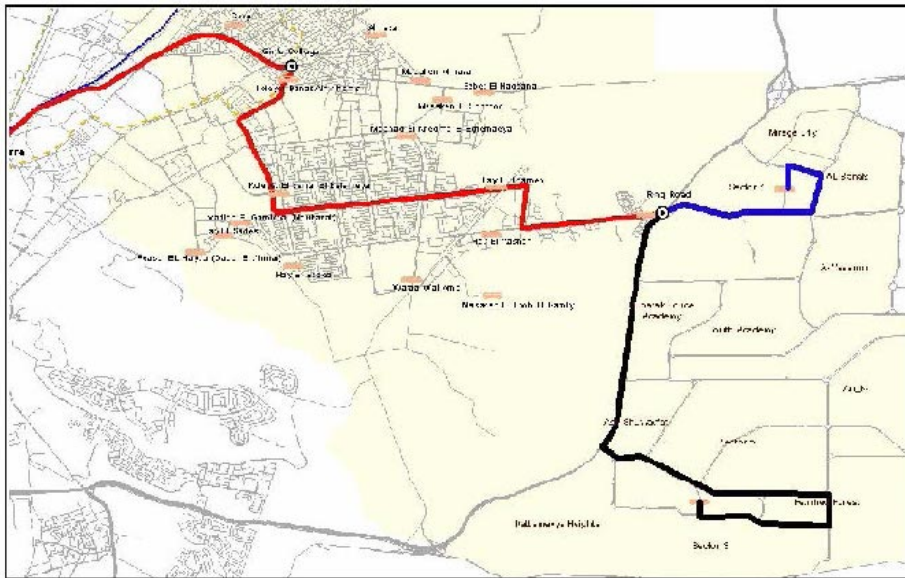


Figure B-1-19 New Cairo Feeder Bus Routes (First Stage Minimum)

of New Cairo. At present, limited bus service is provided from the existing Ring Road bus terminal (which will be incorporated and enlarged within the LRT Ring Road station concept) into New Cairo; private operators also link some areas, such as Rehab, with Nasr City and Heliopolis. The extent of the feeder bus activity, as stated, will be totally dependent upon actual New Cairo development by year 2007 (the assumed Supertram opening year). Thus, it is assumed that, in the first instance and as an absolute minimum, air conditioned feeder bus services are needed which mirror the

existing routes (Figure B-1-19). Given that implementation of the New Cairo feeder routes are totally dependent upon actual implementation of the Supertram, any final decision regarding the extent and intensity of services can only be taken at a later time.

Network Integration with Heliopolis Metro

As existing lines use outdated technology, the rolling stock of the remaining elements of the Heliopolis Metro and CTA Tram will not be able to use the new state-of-the-art Supertram facilities. The existing lines that overlap the Supertram line on the common sections from Ramses Station to Ahmed Tayseer Street and from Sayed El Merghany Street to Nasr City terminal will therefore be curtailed and reorganized so as to feed the more efficient Supertram line at specific points: Teacher's College (Koleyet El Moallemeen), Heliopolis Club (Nady Heliopolis), and most important, Girl's College (Koleyet El Banat) (Figure B-1-20). Girl's College station can therefore be seen as a major intermodal point for Supertram Line 1, the tram lines and, ultimately, Metro Line 3.

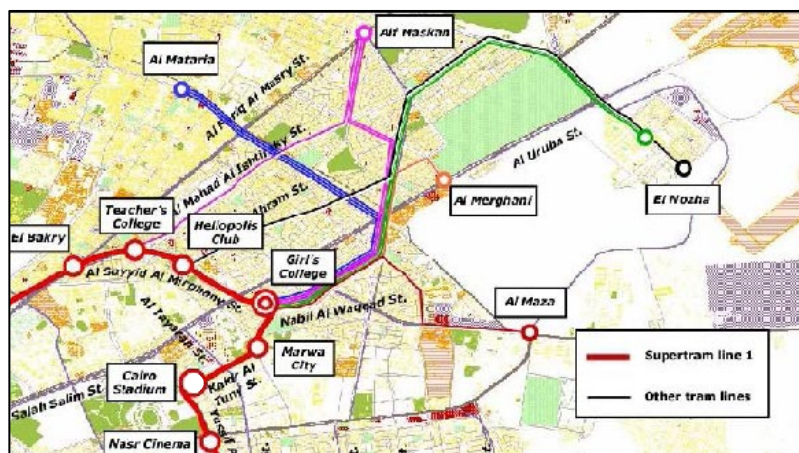


Figure B-1-20 Reorganization of Heliopolis Metro

Within the spirit of the tram reorganization, the Study Team recommends that remaining elements of the tram system also be upgraded in order to provide a better and more punctual service. This would include rehabilitation of rolling stock, track shaping and modernization of stops.

INTEGRATED TICKETING SYSTEM

There exists, at present, no organized integration of the public transport system in Greater Cairo. While CREATS has previously, on one hand, pointed out this shortcoming, the absence of an integrated system, on the other hand, offers a unique opportunity for Cairo in that highly efficient state-of-the-art technologies could be introduced over time under largely controlled conditions. This also paves the way for developing a public transport system that takes full advantage of private sector participation. However, it should be understood that the full extent of these advantages will only become apparent over the long-term and will require further detailed analysis and study as regards the specific implementation. But it cannot be denied that the development of Supertram Line 1 offers, in that context, an interesting first step in the right direction.

The essential first element in this process is designing of a year 2007 system which (a) links the ticketing strategies for the Supertram and its designated feeder bus system, (b) is achievable and practical when viewed through the prism of existing realities; and (c) retains potential for a transition in future to more high-tech approaches. Further detail is provided in **Section 4.4** Main Report Volume III.

Fare Collection System

- ◆ The fare collection system for the Supertram must reflect two realities. Firstly, in case of (feeder) buses, it is unlikely that on-board automation of fare collection equipment will occur in the near future. Thus, the issuance of paper tickets (receipts) is likely to continue. Secondly, for the Supertram, passenger convenience and maximized revenue (minimized fare evasion and fraud) are core targets. Since Supertram stations are fixed, some form of barrier system is realistic. A likely choice for tickets is a magnetic technology, similar to that currently used by the Cairo Metro. For trips involving a transfer, and if for example the feeder bus is boarded first, the driver will issue, upon receiving payment of the unified fare, a (likely color coded) receipt for the bus portion of the trip plus a magnetic strip ticket used for boarding of the Supertram (the latter from a supply of pre-issued tickets carried on the bus).
- ◆ Secondly, an organizational strategy needs to be taken into account. The Supertram and the designated feeder buses would be considered part and parcel of the same system, and are placed under the control of a single operating entity, regardless of jurisdictional umbrella. Thus, revenue sharing is not a concern as all income flows into "the same pot".

Supertram Fare

- ◆ Two types of commercial tickets are seen as being realistic for the Supertram: a single-journey ticket and a multi-journey ticket/pass. The single trip ticket would, as the name implies, permit a single boarding of services. Two types of multi-journey tickets could include weekly (or say 12 boardings) and monthly (or say 50 boardings) passes.
- ◆ Current investigations suggest that the initial year 2007 Supertram single-journey fare should be set at a flat rate of 75 Piasters expressed in terms of constant year 2003 currency. But when viewed in year 2007 terms, it is very likely that the single-journey Supertram fare, expressed in terms of a year 2007 (the anticipated year of opening) base, would be on the order of 1 LE or 1.25 LE. It is strongly urged that, as the opening date of the Supertram draws closer, further reviews be conducted as to the actual fare implemented. This review should be sensitive toward then-existing economic realities, competition from other modes and market conditions. Any form of interference, such as a political cap on fare structure, is discouraged in the strongest possible terms unless, as part of that capping, revenue streams are guaranteed which replace lost marginal income.
- ◆ Multi-journey tickets would be sold at a reasonable discount from single-journey prices, possibly 10-15 percent for weekly (or say 12 boardings) tickets, and 20-25 percent for monthly (or say 50 boardings) tickets on a per-ride basis.

Coordinated Fare

If history teaches any lessons, it is that integrated ticketing between separate operators is problematic within a Cairo context, despite best efforts. However, in the case of the Supertram, a unique opportunity for integrated ticketing between the Supertram and its feeder buses, both of which are foreseen at present as being under the jurisdictional umbrella of the CTA. Thus, initial efforts in this regard should be seen as the first step in that intra-agency integrated ticketing can be adopted, paving the way for more widespread application among different operators. Three types of interactions are foreseen for 2007 in terms of single journey tickets (multiple journey tickets/passes would, as in the case of the Supertram price structure, enjoy a proportionate discount from the single journey rate):

- ◆ A trip without transfer. If the journey involves only the Supertram, the indicated price structure (75 Piasters in year 2003 terms, possibly 1 or 1.25 LE in year 2007 terms) applies. If the journey involves only a designated CTA air conditioned feeder bus (these are also accessible to passengers which do not desire to use the Supertram), a single ticket price of 2 LE would apply as per current practices.
- ◆ A trip involving one transfer, either feeder bus to Supertram, or Supertram to feeder bus. The cumulative fare, in 2003 terms, would be 2.75 LE. However, it is tendered that, as a feeder bus service, additional ridership is gained for the bus mode due to the convenience of a Supertram interchange, attractive fare and premium service. Thus, the one-transfer fare should be capped at the premium bus service fare, that is, 2 LE. An approach for revenue sharing will be needed between bus and Supertram, if desired on organizational grounds. Alternatively, if the Supertram and its feeder buses function as a single operational entity, revenue sharing is no longer a core issue.
- ◆ A trip involving two transfers, say feeder bus to Supertram to feeder bus. The cumulative fare, in 2003 terms, would be 4.75 LE. Few passengers are likely to use the double interchange option, but nevertheless some form of pricing incentive should be applied. For purposes of the current presentation, 3 LE is suggested.

A trip involving a carrier other than the Supertram and its designated feeder bus system. Until such time as more widespread public transport and fare integration are realized metropolitan-wide, fare payment is likely to continue following current practices. That is, separately by mode.

Indexed Fare Adjustment

While public transport fares have increased over the past decade, the rate of increase has considerably lagged that of the consumer price index. The revenue base for public transport operators therefore continues to erode in real terms concurrent with increasing absolute operating costs. This is highly problematic for public transport operators when, on one hand, ticket revenue is stagnating (indeed declining in real economic terms) while, on the other hand, costs for maintenance, spare parts (particularly those purchased overseas in hard currency) and other labor-intensive activities continue to increase in absolute terms.

Supertram and coordinated fares should be linked with the consumer price index, or annual inflation rate, to ensure that the operator revenue base does not erode temporally in real monetary terms.

Adjustments in fares might be accomplished every three years. This has the advantage over an annual approach in that a sense of continuity is maintained and, in a more practical sense, single trip fares can be more readily fine-tuned to the most commonly used supplies of coins and notes.

Concession Ticketing for Privileged Passengers

A further consideration relates to concession tickets, that is, privileged passengers whose price structure reflects their status, employment, age or physical condition. Such discounts are widely available at present, although not uniformly for all operators. The goals are understandable; the Government of Egypt strives to give certain benefits to some segments of society, or to its (underpaid) employees. However, the Study Team would disagree that passing this responsibility unilaterally to public transport operators, as is being done at present, is an equitable or efficient approach. In terms of the Supertram, it is proposed that the nominated ticket structure (commercially priced single journey or multiple journey tickets) serve as the basis of operation. In that light, any organization, whether private or public sector, Ministry or not, is free to negotiate a contract of carriage for its employees or its charges with the Supertram operator based on commercial, competitive prices. A fairly direct way of addressing this is for the purchaser (say a Ministry) to purchase a given quantity of commercially priced tickets from the Supertram operator. These would possibly be given some amount of bulk discount, the final total of which is subject to ultimate negotiation between Supertram operator and purchaser. The purchaser would then distribute these tickets to its employees or its charges either free or for some discounted amount; that is a matter of internal company policy.

ENVIRONMENTAL IMPACT ASSESSMENT

To ensure sustainability for the supertram project, a scoped Environmental Impact Assessment (EIA) has been carried out as part of the feasibility study according to the Egyptian, JICA and other international guidelines and regulations. The EIA indicates the negative as well as the positive environmental impacts that can be expected from the supertram project. Also mitigation measures, required to alleviate the identified adverse environmental impacts (if any), are noted. Further details are provided in **Section 3.6**, Main Report Volume III.

Environmental Impacts

Parts of the Environmental Impact Assessment were Environmental Surveys. An **Air Quality and Noise Level Survey**, and a **Social Survey** (Social Impact Assessment), were carried out. Their results revealed the present environmental condition of the Supertram influence area, as well as the opinion of the residents on the proposed project.

Negative environmental impacts, which have been identified for the proposed Supertram Line 1, are minor: split up of neighbourhoods by rail tracks and impact on aesthetics by road flyovers. Most adverse environmental impacts will be temporary during the construction phase. Major reasons for the fact that only minor environmental impacts are expected from the proposed Supertram Line 1 are:

- ◆ The project is a public transport project; LRT vehicles consume less energy for the transportation of a given number of passengers than cars (Figure B-1-21).
- ◆ The project concerns an activity in a city environment; there is no impact on fragile ecology.
- ◆ The right of way is mainly owned by the government and free of houses and other structures.
- ◆ The identified impacts can be mitigated.

The positive impacts expected in the field of economics from the Supertram project include improved mobility and access for the residents of Greater Cairo; reduced travel times and costs; improved conditions for economic development; and enhanced tourism activities.

Positive environmental impacts expected from the Supertram Project are:

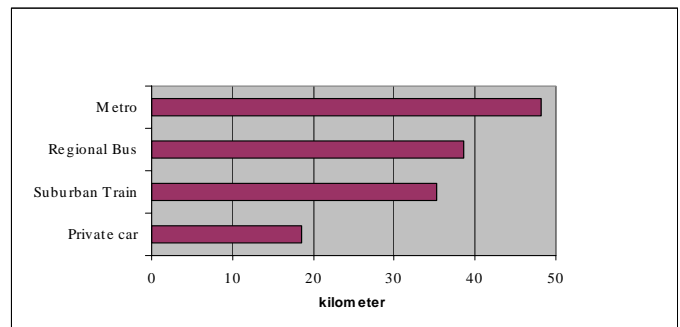
- ◆ A number of car users will likely mode-switch to the Supertram (less emission, less energy consumption);
- ◆ There will be less air pollution compared to the situation of not carrying out the proposed supertram project (Zero Option) (less emission, less energy consumption) ;
- ◆ There will be no significant increase of noise levels;
- ◆ Reduced number of accidents compared to the use of cars for an equal number of passengers (increased safety) and increased safety for pedestrians by the construction of pedestrian grade separations; and
- ◆ Possibilities for enhancement of the urban environment through the implementation of pedestrian precincts, planting of trees and installing of landscaping.

In terms of the impact on the global environment, the Supertram Line 1 Project would provide a significant CO₂ reduction of around **16,000 tons/year** in 2022, compared to the "Without" case (Zero Option). It is said that one liter of gasoline generates 2.30 kg of CO₂. Based on this, the reduction of 16,000 ton/year of CO₂ is equivalent to the reduction of about 7.0 million liters/year, or 43,800 bbl./year of gasoline.

Overall Assessment

The conclusions of the scoped Environmental Impact Assessment for the Supertram Line 1 project are:

- ◆ Major positive impacts are expected.
- ◆ Minor negative impacts are expected, but which can be mitigated.
- ◆ The project is sustainable and environmentally feasible.



Source: International Association of Public Transport, Brussels, May 2001

Figure B-1-21 Kilometers a Person can be Carried by One Kilogram of Fuel

ECONOMIC EVALUATION

The economic evaluation for the Supertram Line 1 Project was carried out from the national economy point of view. The detailed discussions are provided in **Section 3.7**, Main Report Volume III.

Basic Premises

For the economic and financial evaluation, the following assumptions are held.

- ◆ Pricing data: as of the mid-2003
- ◆ Foreign Exchanges: 1 US Dollar = 6.0 LE
- ◆ Project Life: 27 years from 2004 through 2030.

Economic Investment Costs

According to a planned construction schedule, the capital costs, converted from the estimated financial costs for the Supertram by using conversion rates (81% for local currency and 87% for foreign currency), are allocated in a phased manner. The investment costs are divided into: 1) **initial investment**; 2) **additional investment** which will be necessary to respond to increasing demands; and 3) **reinvestment** which is needed to maintain the system in a good condition. It is assumed that the operation starts in year 2007.

Economic Benefits

Economic benefits are assumed to be two: savings in operation costs and savings in time cost, which are both derived from a difference between "with the Project" and "without the Project" for the national economy.

The costs and benefits are calculated as differences between "with" and "without" the Project. The "with" case denotes a situation of how the transport conditions could be in the entire Study Area, given the Project. While, the "without" case does not stand for nothing happened on the current situation, but represents a situation of how the transport conditions would be in the entire Study Area, given only the committed projects completed as scheduled. This "without" situation includes Metro Line 3, capacity enhancement of Metro Lines 1 and a number of flyover projects, have materialized in a planned time framework (see the CREATS Master Plan). It should be noted that **Metro Line 3 is assumed to be fully operated in 2017 in the "without" case**, which is very influential to changes in the transport pattern.

Cost-Benefit Analysis

The results of the cost-benefit analysis are summarized as tabulated in Table B-1-4. It is noted that the analysis is made within a time framework up to the year 2030, and the residual value of the invested assets is considered in 2030. The Economic Internal Rate of Return (EIRR) is computed at 12.2%. Since this rate is higher than the Egyptian social discount rate of 12%, it is evaluated that **the Project is economically feasible**, or worth being implemented from the national economy point of view.

The Net Present Value (NPV) accounts for 32.9 million LE at the mid-2003 prices, and the Benefit/Cost ratio is 1.02, given a 12% discount rate. These mean that the Project will bring a considerable economic benefit to the national economy as a whole.

Table B-1-4 Summary of Economic Evaluation for the Supertram Line 1 Project

| Evaluation Indicators | Value |
|---|------------------------------------|
| Economic Internal Rate of Return (EIRR) | 12.2% |
| Net Present Value (NPV), at 12% discount rate | 32.9 million LE at mid-2003 prices |
| Benefit/Cost (B/C) Ratio | 1.02 |

Source: JICA Study Team

FINANCIAL EVALUATION

The Supertram Line 1 Project was evaluated from the financial viewpoint. The following are a summary of the findings. The detailed discussions are provided in **Section 3.7.4**, Main Report Volume III.

Assumptions

A number of assumptions are employed for the financial analysis as follows:

- ◆ The estimated financial capital costs are allocated in the scheduled time framework so that the system can be operated in the end of 2007;
- ◆ The evaluation period is assumed to be the period between 2004 and 2030, and the residual value is considered in 2030;
- ◆ For the operating revenue, the fare level is assumed to be initially 0.65 LE per passenger with a flat system, and adjusted in accordance with the price indices, that is, 0.75 LE in 2012 and 1.00 LE in 2022; and
- ◆ Additional incomes accruing from ancillary sources related to the Supertram service operation, such as advertisement charges and commercial activities at stations can be considered to be 6% - 30% of the operating revenue. As a base case, 6% is initially assumed, taking into account experiences being performed in other countries, and its variation is examined in the sensitivity test.

Financial Cost-Benefit Analysis

Under the above assumptions, the Financial Internal Rate of Return (FIRR) for the Supertram was computed to be negative, which implies that the Project will hardly be viable from the financial point of view, or that the investment funds should be procured at a significantly low interest rate or that government subsidies should be injected in order to make the Project financially feasible.

However, it should be noted, as shown in Table B-1-5, that despite that the FIRR is not necessarily favorable, the Project will not be bankrupted. A positive operating profit will occur at an annual basis in the year 2019, or 11 years after the commencement of the service operation; and in the next 5 years, or 2024, the net profit after reduction of the interest payment and depreciation will be positive. In the accumulated balance, the Project will recover all the investments in the long-term beyond 2030.

Table B-1-5 A Summary of Financial Analysis for the Supertram Project

| Evaluation Indices | Result |
|---|-------------|
| FIRR (Financial Internal Rate of Return) | Negative |
| The First Year of Positive Operation Profit at Annual Basis | Year 2019 |
| The First Year of Positive Net Profit at Annual Basis (after Interest and Depreciation) | Year 2024 |
| The First Year of Positive Accumulated Net Profit | Beyond 2030 |

Source: JICA Study Team

Sensitivity Test

In order to make the Project viable, a thoughtful mechanism needs to be developed. To this end, the following implications derived from "Sensitivity Tests" are useful:

- (a) Should only depreciation of rolling stock be considered, FIRR accounts for 3.6%. This means that if the capital investment for the infrastructure, other than rolling stocks, could be financed by a government subsidy, the Project could be financial feasibility;
- (b) Given additional revenues from off-rail business activities equivalent to 20% of the operation revenue, instead of 6%, the FIRR would be 1.3%;
- (c) Given an unit system of 1.0 LE per passenger from the beginning of 2007, instead of 0.65 LE, the FIRR improves to be 3.1%;
- (d) Should the initial capital cost be reduced by 20%, the FIRR would be 1.0%, thus, minor improvement is anticipated.

- (e) Given a composite condition with (b), (c) and (d), FIRR is computed at 6.7%, which means that its financial feasibility is considerably improved.

Financial Evaluation

Taking into account the above findings through the sensitivity tests, the Supertram Project could be financially feasible, given four (4) key conditions to be assured:

- 1) Positive involvement of the government sector through provision of subsidies for the infrastructure development;
- 2) A flexible fare system with a flat system of 1.0 LE per passenger from the beginning of the operation;
- 3) Diversified revenue sources other than railway operation revenues in commercial and business activities related to the system operation;
- 4) Establishment of **an unique financing and operation mechanism** workable and implementable to satisfy the above conditions.

A RECOMMENDED IMPLEMENTATION SCHEME

As proven above, the Supertram Line 1 Projects is economically feasible, however, it requires **an unique financing and operation mechanism** in order to be financially feasible. Based on this finding, a scheme is recommended as follows. Further details are provide in **Section 3.8**, Main Report Volume III.

Pursuance of A Public-Private Partnership Mechanism

Three options are conceivable for the implementation of the Supertram Line 1 Project as follows:

Option 1 (Government Initiative): The government shall take full responsibilities for the construction and the operation. This option is rational, because the Project itself is economically feasible. However, the government will be reluctant to shoulder all the budgetary burdens under the currently serious resource constraint.

Option 2 (Privatization): A private sector participation scheme shall be pursued in an appropriate manner. The so-called BOT (Build, Operation and Transfer) scheme is an option in this context. However, the BOT scheme is not recommended for this Supertram Project, because of some reasons: (1) the private sector will hardly take a financial risk on such a huge amount of investments constantly required in the long-term; (2) the private sector will claim some sort of government guarantee on the revenue, or a constant subsidy to avoid ridership risk which is heavily dependent on the further progress of new communities development such as New Cairo; (3) a fund raising capacity by the private sector is subject to the economic fluctuation, therefore, the private sector can hardly guarantee a scheduled construction and operation; and (4) it will normally take long time to reach an agreement between both the government and private sectors, thereby losing the otherwise-be-gained benefits.

Option 3 (Public-Private Partnership): A sort of Public-Private Partnership (PPP) mechanism shall be pursued. This option is flexible and applicable for the Supertram Project. The government sector assumes a responsibility for the infrastructure development, and owns its proper, while the private company or a joint venture company with the public and private sectors, shall assume a responsibility for the operation and maintenance, leasing the infrastructure from the owner, or the government under a concession agreement. The government may recover the investment cost by the concession fee from the operator. As this mechanism reinforces both weakness, and integrates both strengths of the public and private sectors, it is suitable for such a project requiring a huge amount of investment and sophisticated technologies for operation and management as the Supertram.

A proposed framework of the PPP scheme, based on Option 3, is conceptualized as shown in Table B-1-6.

Table B-1-6 A Proposed Framework of Public-Private Partnership Scheme

| | THE INFRASTRUCTURE OWNER (The Government Sector) | THE OPERATOR (A Private or Joint Entity) |
|-----------------|--|---|
| Investment | Provision of capital investments and construction of the infrastructures and the systems | Procurement of rolling stocks and related facilities and equipment |
| Tasks & Roles | <ol style="list-style-type: none"> 1) Issuing a concessionaire for use of the Infrastructures 2) Issuing a business operation license with a definite set of rules and regulations 3) Monitoring the operation and management | <ol style="list-style-type: none"> 1) Assuring a proper operation and services 2) Maintaining the total system 3) Strengthening the human capacity 4) Generating operational revenues 5) Running off-rail business to strengthen the financial structure |
| Obligations | Recovering the investment by the received <i>concession fees</i> in the long-term | Payment of the <i>concession fees</i> annually at a certain rate of operating revenue. |
| Accountability | To the public | To the Infrastructure owner as well as the public |
| Access to Funds | <ul style="list-style-type: none"> • Government subsidy • International donor agencies | <ul style="list-style-type: none"> • International donor agencies • Local financing institutions and commercial banks |

Source: JICA Study Team

A Business Model of the Public-Private Partnership (PPP) Scheme

The Study Team examined a business model of the recommended PPP scheme, from a cash-flow analysis of the dual entity mechanism where two organizations enter the playground: the infrastructure owner and the operator. For the cash-flow analysis, the following financial conditions are assumed as premises:

- ◆ The government sector, or Cairo Governorate, is supposed to be the implementing body of the Project, and invests for the infrastructure facilities. The cost of the foreign currency portion shall be procured through an ODA soft loan scheme, while that for the local portion shall be raised internally as a subsidy. Conditions of the ODA soft loan are assumed: 3% interest rate; 7 years grace period and 25 years repayment period.
- ◆ While, the operating company is supposed to be "the Supertram Company (STC)". STC shall maintain the whole infrastructure facilities and operate the Supertram service, procuring a necessary number of rolling stocks.
- ◆ STC shall raise the initial capital funds through the equity of the company, from potential investors, equivalent to 20% of the initial investment costs. For the remaining funds, STC can access to an international soft loan for the procurement of the facilities and equipment at foreign currency portion with the same conditions as above, as well as a long-term loan with a 10% interest rate at local commercial banks. STC is also able to access to short-term loans (one year) with a 13% interest rate to fulfil annual shortfalls, if necessary, at local commercial banks.
- ◆ STC shall run the business, costing repayments of the loans, depreciations of capital assets, recurrent operating expenses and a concession fee which should be paid to the infrastructure owner for its use. While, the government sector, as the infrastructure owner, receives the concession fee from the operating company which should be earmarked to recover the initial investment cost in the long-term.
- ◆ A rate of the concession fee that the operator shall pay the infrastructure owner is assumed to be 5% of the operation revenue as the base case, then an appropriate level is examined so that both parties' financial situations are mutually favourable, or not worsened.

Through a cash flow analysis based on the above assumptions, a number of cases(7 cases from A to G) were tested with different conditions related to the Supertram operation in terms of: **FIRR** (Financial Internal Rate of Return) and **ROE** (Rate of Return on Equity) ¹ for the Operator (STC); and Accumulated Subsidy, Average Annual Subsidy and Accumulated Net Profit in 2030 for the Infrastructure Owner, as shown in Table B-1-7. Based on this analysis, the most

¹ **ROE:** A measure of how well a company used reinvested earnings to generate additional earnings. It is used as a general indication of the company's efficiency; in other words, **how much profit it is able to generate given the resources provided by its stockholders. Investors usually look for companies with returns on equity that are higher and growing more than any interest rate of deposits at commercial banks.** For this analysis, ROE is computed as a percentage of the average annual returns on the initial investments during the period of the project life.

favorable condition for both parties, which was defined as that the Operator can gain a moderate return, while the Infrastructure Owner can minimize the total subsidy and the negative profit (loss), was sought out.

As the result, **Case G**, as seen in this table, is the best solution which should hold three conditions, that is, (1) the fare starts with 1.0 LE in 2007; (2) Revenue from off-rail business is more than 30% of the operation revenue; and (3) the concession fee rate is 20% of the operation revenue.

Table B-1-7 A Summary of Cash Flow Analysis

(at mid-2003 prices)

| Case | Basic Condition | The Operation Company | | The Infrastructure Owner | | |
|--------|--|-----------------------|-----------------------|--------------------------------|-----------------------------------|---|
| | | FIRR (%) | ROE ¹⁾ (%) | Accumulated Subsidy (Mill. LE) | Average Annual Subsidy (Mill. LE) | Accumulated Net Profit in 2030 (Mill. LE) |
| Case A | CF ²⁾ =5% | 3.6 | 2.4 | 1,589 | 59 | -955 |
| Case B | Fare = LE1.0 on the Flat Fare System ³⁾ | 8.8 | 16.9 | 1,527 | 57 | -893 |
| Case C | Off-rail Revenue = 20% ⁴⁾ | 6.2 | 10.0 | 1,589 | 59 | -955 |
| Case D | Off-rail Revenue = 30% | 7.3 | 13.1 | 1,589 | 59 | -955 |
| Case E | Combination of (B) + (C) | 11.6 | 24.2 | 1,527 | 57 | -893 |
| Case F | Combination of (B) + (D) | 12.9 | 27.6 | 1,527 | 57 | -893 |
| Case G | Combination of (F) + CF=20% | 11.0 | 22.5 | 903 | 33 | - 269 |

- Notes: 1) "ROE": Return on Equity.
 2) "CF" stands for the rate of Concession Fee to the operation revenue.
 3) The fare level at the opening time of the Service.
 4) Percentage of the operating revenue

Source: JICA Study Team

Recommendations on the Implementation

The result of the cash flow analysis revealed that there exist an appropriate scheme that will enable both parties to manage the Project in such a way that both parties will be able to satisfy their own objectives: the Operator will enjoy a sufficient level of profits, while the Infrastructure Owner (the Government) will recover the vested subsidy in the long run, providing public transport services for the people. Therefore, it is recommended that this scheme should materialize in consideration of the following aspects:

- 1) Since the Project itself is evaluated economically feasible, the government subsidy for the Project can be justified in the long-term from the national economy point of view. Therefore, the government or the Cairo Governorate is recommended to initiate the Supertram Project as soon as possible.
- 2) The external resource mobilization is essential for the Project, because the Project is financially sensitive as discussed in the financial evaluation. The fund of the foreign currency portion shall be procured through an ODA soft loan scheme, while that for the local portion shall be raised internally as a subsidy. Financial conditions of the ODA soft loan or the external funds through international aid institutions needs to be further clarified, depending upon the institution that is interested in the financial support.
- 3) As for the operating entity, a possible option is that the operating company is "the Supertram Company (STC)" arrayed within the commercialized CTA Holding Company scheme as proposed under the CTA Restructuring Program. STC can also be organized in a joint venture form with private investor(s). Given this setting due to its semi-governmental public entity, STC could have access to an international soft loan for the procurement of necessary facilities and equipment such as rolling stocks.
- 4) The most appropriate scheme is defined as that the Operator can gain a moderate return, while the Infrastructure Owner can minimize the total subsidy and the negative profit (loss). As the result, it can be said that three conditions are necessary, that is, (1) the fare starts with LE 1.0 per passenger with a flat fare system; (2) Revenue from off-rail business is more or less 30% of the operation revenue; and (3) the concession fee rate is 20% of the operation revenue.

- 5) In order to fulfil the three conditions, the Operator should be entitled to run some commercial and business activities related to the Supertram service at the stations and/or in their vicinities to make the operating business more profitable and financially sustainable through a cross-recovery system. Such an incentive scheme must be attractive for the investor to participate in this business.
- 6) Revenues from "off-rail business" seem possible and practical, taking into account the location advantage of the Supertram Line 1, the catchment area of which is highly urbanized areas having a wide variety of business and commercial opportunities. For instance, a shopping center business may be commercially viable at **Ring Road Station** that is an intermodal point gathering a considerable number of customers.
- 7) It should be noted again that all the arguments for the economic and financial evaluation are based on the hypothetical setting where **Metro Line 3** will be available in 2017, because Metro Line 3 is treated as a given condition. This Supertram Line 1 cannot function as a substitute for the Metro Line 3, but both are dispensable for Cairo to develop a modern urban transport system.
- 8) The Supertram Line 1 can greatly enlarge a transport capacity with a state-of-art urban transport system to/from the National Stadium where will hopefully host **the 2010 World Cup Game**. The Supertram shall be a symbolic project to support such a promotion activity.

B-2

CAIRO TRANSPORT AUTHORITY RESTRUCTURING

Previous discussions have dealt with the hardware and software aspects of transport improvements in the East Sector of Cairo, with a particular focus being the implementation of Supertram Line 1. Component B-2 addresses the third element of an integrated approach - humanware issues - presented within a context of institutional and organizational changes related to commercialization of the CTA. The underlying structural, institutional, organizational and human resources components of an integrated approach to change are inexorably linked. Structural changes within the organization, critical in terms of transforming the Authority, are closely tied to the possible way this relates to the formation, in terms of organization and staffing, of the company ultimately responsible for operating the new Supertram Line 1, possibly under the jurisdictional umbrella of a commercialized CTA. The development of expertise among the personnel of CTA, supertram and other modes, having always been seen as a vital need, assumes an even more central role as part of the restructuring process. Further detail is presented in **Chapter 5 Main Report Volume III.**

STRUCTURAL REORGANIZATION OF THE CTA

Findings and recommendations regarding institutional and organizational restructuring of the Cairo Transport Authority (CTA) are **presented in Sections 5.2 through 5.4 of the main report.**

Under Decree N°141/1971, Cairo Governorate has the authority to take any decisions concerning the CTA. The main CTA constraints are:

- ◆ CTA is overstaffed with a ratio of more than 10 employees per operational bus, one of the highest ratios in the world based on a review of international bus operators.
- ◆ The CTA recovered only some 50 percent of operational expenses via income derived from ticket sales during fiscal year 2002. The recovery rate dropped to between 30 and 40 percent if interest and depreciation are included in cost accounting. All operating entities, under all definitions of cost, are incurring losses. The only exception is air conditioned buses, where a modest positive cash flow is achieved but only if depreciation and interest are excluded.
- ◆ The financial performance of the CTA is low compared to expectations based on a review of international public transport operators.
- ◆ A decline in ridership, in combination with growing costs, is catalyzing a need for ever-increasing subsidies for the CTA from public coffers.
- ◆ The number of operational buses in the total fleet are not sufficient due to a shortage of spare parts.
- ◆ CTA does not have enough drivers. Many drivers, after their training is paid by the CTA, migrate to the private sector where salaries are more substantial.
- ◆ Some 15 percent of buses and minibuses cannot operate, due in part to a high rate of absenteeism among drivers.
- ◆ CTA is facing financial problems and insufficient support from the Government. During the three most recent fiscal years, the amount of budget allocated to operate CTA was 71.6 percent, 52.8 percent and 63.7 percent of the budget shown as being needed.
- ◆ Inadequate management in the Operational Central Departments, a lack of modern record-keeping and insufficient supervision by CTA headquarters.

Thus, CTA is facing many financial and organizational problems that prevent the company from operating efficiently. It is becoming urgent for the Egyptian Government to start the organizational and institutional reform of the CTA.

Three areas of reform are proposed to improve public transport service operation through restructuring of the CTA: new organizational form; deregulation of CTA business; and rationalization of employment.

New Organizational Form

The Study Team is proposing a new structure for the CTA in the form of a CTA Holding Company (Figure B-2-1). The affiliated enterprises in the Holding Company will be the present (restructured) Operational Central Departments. A CTA Holding Company would provide more flexibility for the Government to decide about the future of the affiliated companies: privatization, concession, franchise, license, performance contract or management contract. These affiliated enterprises will not suffer anymore from the present constraints and will become more performance-oriented through competing against each other and in the general public transport market.

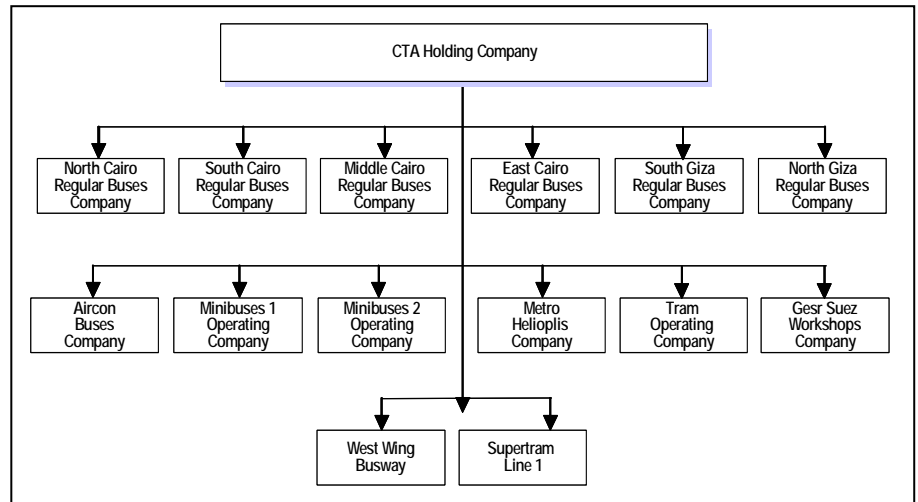


Figure B-1-1 New Structure for the CTA

The government has to put into place a performance regulatory framework which will promote competitiveness in the public transport market and organize transparent as well as competitive tender processes for the procurement of services from public transport operators. Thus, subsidy is allocated only when required on performance or social grounds. This regulatory framework will also provide assistance to the CTA Holding Company in determining the future of the affiliated enterprises.

Deregulation of CTA Business

Under the holding company structure, CTA business territories need to be more flexibly expanded into related commercial businesses other than regulated bus and transport services, thereby enhancing the competitiveness of the CTA. This calls for deregulation, including to:

- ◆ lift bans on the CTA entering into commercial, real estate and leisure services, among others;
- ◆ introduce efficiency-oriented management to reduce operations/maintenance cost to the affiliated companies;
- ◆ approve a more flexible fare policy which is responsive to competitors' strategies as well as price indexes; and
- ◆ pursue flexible schemes for privatization, concession, franchise, license, performance contract or management contract, as deemed appropriate, for each affiliated company.

Employment Rationalization

Besides all activities of designing a business plan for the companies of the CTA Holding Company, special attention has to be paid to the social aspects of this turnaround, in particular to soften the negative aspects of the expected redundancy of employees. A Labour Adjustment Plan will facilitate diminishing the negative effects of this reality. Special emphasis should be given to all kind of measures which help the redundant employees find a new source of income. There are certain limitations to be taken into account for the measures to be considered, one being that all changes must be voluntary. A reason for this is the strong job security position of public employees, and the absence of social benefits in case of unemployment. Employee lay-offs without any income would bring poverty to those employees and, possibly, social unrest to society.

On the other hand, all the technical employees, and part of the supertram organization, have to be recruited outside the CTA. The CTA Operational Central Departments have no significant overstaffing, thus suggesting that the Supertram Company cannot hire redundant technicians. The other CTA Central Departments have a large excess number of employees, mainly non-qualified administrative people. Among these employees it may well be possible to recruit a considerable number of staff needed in the supertram organization under the classification "Other staff": basic maintenance, basic administrative works and similar job categories.

Four schemes are recommended for rationalization of employment, all of which are based on previous restructuring of public enterprises completed in Egypt:

- ◆ **Early Retirement Scheme:** There will be a large number of employees who will prefer to be included in the early retirement scheme (50 years and above for men and 45 years and above for women) so as to receive financial compensation. The amount of money to be paid will be related to the age of the employee and the labor position/salary group. The payment can be spread over an extended period to make this scheme more attractive.
- ◆ **Incentive Scheme:** Workers will likely also be interested in leaving the CTA through an incentive scheme and earn income from other activities such as alternative forms of employment or starting their own business. This scheme focuses on men less than 50 years, and women less than 45 years, of age. The participants will need different kinds of training programs to find another job and acquire the necessary skills to set up their small enterprise (business plan, access to credit). They could receive a lump sum or, alternatively, an income spread over a number of years. To be part of the incentive scheme, potential participants need to make a proposal which has to be accepted. The financial compensation has typically been smaller than that allocated under the early retirement scheme.
- ◆ **Self-employment Scheme:** Self employment is also a solution for redundant employees. It may logically be expected that many employees selecting this option already have a business in a preliminary form. The goal would therefore be to bring these shops and enterprises into the official economy or to set up their own business. Participants will receive financial compensation and can be interested in training programs to present a business plan for obtaining further bank loans and provide assistance to define the viability of the business. The types of enterprises can include, for example, trade, handicraft, bookkeeping and tourist services.
- ◆ **Outplacement Scheme:** Outplacement is an activity which supports individual employees by enhance his or her chances in the open labor market. A training program will help redundant employees in presenting themselves to new potential employers.

Implementation Strategy

A strong commitment by the central government as well as Cairo Governorate is essential for implementation of the CTA restructuring process. The following administrative setting is recommended under such a political initiative:

- ◆ **Establish a Technical Support System:** It will be difficult to restructure CTA without a pool of experts who would have three main functions:
 - a) To provide technical assistance for the restructuring and the organizational development of the CTA Holding Company. The restructured companies must have a clean start without any burden from the past.
 - b) To assist the implementation of the employees rationalization program with specific financial assistance.
 - c) To organize training programs.
- ◆ **Utilize the Social Fund for Development:** Another limitation is the availability and possible use of existing facilities and financial schemes (early retirement scheme, incentive scheme, enterprise development program). These financial schemes are supported by the Social Fund for Development which is, in turn, financed by the donor community.
- ◆ The Social Fund for Development was established in 1991 and has been mainly providing loans for small enterprises and financial compensations for early retirement programs. This Social Fund for Development can provide assistance to the CTA in its restructuring and its employee rationalization program. A Labor Adjustment Committee would be established to implement the appropriate scheme and to assist staff in terms of early retirement, finding another job or setting up a small enterprise through the Small Enterprises Training Program.
- ◆ **Encourage Private Sector Participation:** A competitive market in the provision of public bus services is a fertile ground where both the CTA and private operators can pursue more rational as well as cost-efficient operation and management. Such actions will inevitably benefit the general public. One of the Study Team recommendations is franchising² to attract private investors since this approach offers a good level of flexibility for the franchisee, but with freer reign to maximize attractiveness to the private sector.

² The initial steps in such a strategy have commendably already been taken by the CTA, although the Team is of the opinion that room for enhancement of the relationship exists. The Manufacturing Commercial Company (MCV), a private sector company, is a pioneer in operating minibuses as of July 2003 in Cairo under the supervision of the CTA. The franchise is based on a daily fee paid by MCV to CTA. MCV has signed a five year franchise contract with the CTA, under which the fees paid by MCV will be revised each year according to certain parameters, for example, the price of spare parts. MCV is, at time of writing, operating two bus lines, the first being some 17 kilometers in length served by 12 minibuses, and the second about 15 kilometers in length and served by eight minibuses. Thus, the MCV is operating a total of 20 minibuses. CTA operates its minibuses and regular buses on the same lines; CTA and MCV are therefore competitors in the corridors served by those lines.

SUPERTRAM COMPANY ORGANIZATION

The Study Team has indicated in the previous section the potential for including new enterprises under the jurisdictional umbrella of the CTA Holding Company, in particular the West Wing Company and Supertram Line 1 Company. These are included for obvious reasons: the West Wing will, for a number of years, operate as a busway while inclusion of the Supertram (LRT) is a logical extension of current practices under which the Heliopolis Metro (tram) is the responsibility of the CTA. However, this is not meant to imply that it must necessarily be so, or that the CTA must necessarily operate these systems. The Study Team is merely suggesting that inclusion under the jurisdictional umbrella is a possibility, subject to the previously indicated flexibility for the Government to determine the future of enterprises affiliated with the CTA Holding Company in terms of commercialization. Regardless of the final political decision in this regard, what is clear is that the Supertram Company cannot replicate the recent historic trend, that is, evolve toward a bloated, inefficient organization. Instead, the company organizational structure must be refined within a streamlined chain of command, with staffing based on technical needs and requirements.

This section presents a summary as to the structure and number of staff associated with a Supertram Company that can operate the Supertram under an efficient management system, and in line with the spirit and intent of the Holding Company concept. This organization is proposed according to the selected technical options and the anticipated ridership by the years 2007 - 2012 and 2022. Further detail is presented in **Section 5.5 Main Report Volume III**.

General Organization

The recommended general organization for the operation and maintenance of the Supertram is similar to that of an LRT system per international experience. The staffing of each department has been adjusted according to the selected technical and operational options. The general operating principals will be a centralized control of all the different tasks.

The staff organization will be in charge of operation, the maintenance and the management of the system. While the organizational structure itself is identical during all years of the Supertram, staffing levels will increase from the near term (years 2007-2012) to the long term (year 2022) future due to, in general, additions to rolling stock and depot facilities. Thus, in the near term future, a total staff of 617 persons will be required, with the largest entity being the Operations Department with a staff of 227 (Figure B-2-2, Table B-2-1).

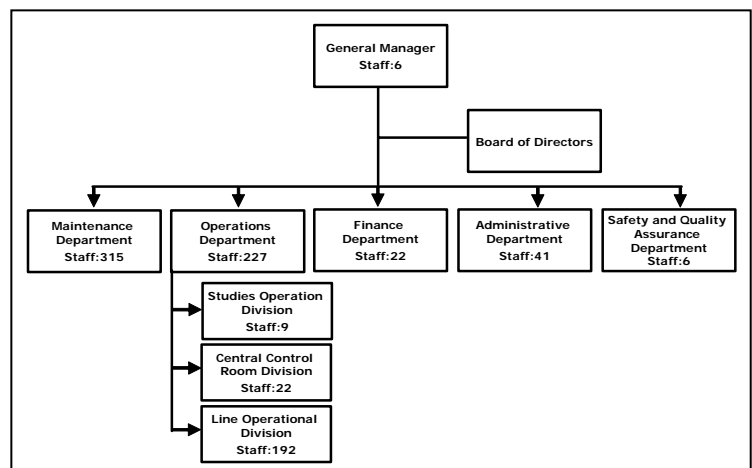


Figure B-2-2 Supertram Company Organization; Years 2007 - 12

The staffing total is expected to increase to 768 in year 2022, with the Operations Department again having the largest number of staff (Table B-2-2). The repair of certain equipments can be performed under a service contract like components repairs and overhauls which are not time-critical to passenger operation. Cleaning or guarding could be also performed under a service contract.

Department Tasks and Responsibilities

Each department should assume main tasks and responsibilities as follows:

Board of Directors: The functions and responsibilities of the board of directors normally include:

- ◆ The annual budget;
- ◆ The monthly and annual management and financial report;
- ◆ The basic functional and operations policies;
- ◆ The right to hire and approve the General Manager; and
- ◆ The right to approve the persons selected to head of the finance department.

General Manager (GM): The supertram will be under the responsibility of a General Manager, supervised by a board of directors, who will be responsible for the management of all activities. It will be the General Manager's responsibility to define goals and policies for the system and to oversee their implementation. The GM will review the budget and will control major expenditures. The GM will also be involved in any negotiations with the city or with manufacturers and subcontractors. The GM will have under his/her responsibility all supertram departments.

Table B-2-1 Staffing Total; Year 2007 - 2012

| Department | Number of Staff by Grade | | | | | |
|-----------------------------|--------------------------|-----------------|-----------|-------------------|------------|-------------|
| | Manager | Senior Engineer | Engineer | Senior Technician | Technician | Other Staff |
| Management | 3 | | | | | 3 |
| Safety/Quality | 1 | | | 2 | | 3 |
| Maintenance | 1 | 4 | 14 | 51 | 83 | 162 |
| Operations | 1 | 3 | 7 | 28 | 78 | 110 |
| Finance | 1 | 3 | 3 | 4 | 5 | 6 |
| Administration | 1 | 4 | 7 | 8 | 7 | 14 |
| Total Staff by Grade | 8 | 14 | 31 | 93 | 173 | 298 |
| Supertram Total | 617 | | | | | |

Maintenance Department: The maintenance department will include four main functional units: Rolling Stock, Track and Civil Work, Computerized Systems and Electrical Systems.

Table B-2-2 Staffing Total; Year 2022

| Department | Number of Staff by Grade | | | | | |
|-----------------------------|--------------------------|-----------------|-----------|-------------------|------------|-------------|
| | Manager | Senior Engineer | Engineer | Senior Technician | Technician | Other Staff |
| Management | 3 | | | | | 3 |
| Safety/Quality | 1 | | | 3 | | 3 |
| Maintenance | 1 | 4 | 15 | 63 | 102 | 197 |
| Operations | 1 | 3 | 7 | 35 | 107 | 149 |
| Finance | 1 | 3 | 3 | 5 | 5 | 6 |
| Administration | 1 | 4 | 7 | 10 | 11 | 15 |
| Total Staff by Grade | 8 | 14 | 32 | 116 | 225 | 373 |
| Supertram Total | 768 | | | | | |

Operations Department: This will consist of three main functional units (a) Studies Operation Division, which will carry out studies concerning operation methods, (b) Central Control Room Division, which will carry out line train traffic control from the Central Control Room, power supply, managing all the centralized information (defects to the equipment, management of the central control room staff), and (c) Line Operational Division, responsible for management of the line staff (supervisors, drivers, ticketing staff, etc.), maneuvers on the yard operational tracks, train driving, passenger relations and ticket selling.

Finance Department: Provision of all accounting and financial management services required by the organization. Salary payments and the maintenance of all financial accounts are seen as being among the main tasks of this department in addition to:

- ◆ Preparation of a draft budget proposal for review by management and the provision of monthly and yearly financial performance reports;
- ◆ Preparation and execution of all approved purchase orders for equipment, materials, and supplies for the Supertram system and the maintenance of detail procurement records; and
- ◆ Establishment of a library of vendor information and specifications.

Administrative Department: This department should include:

- ◆ Personnel administration: maintenance of employment records, recruitment and staffing, administration health and other benefit plans;
- ◆ Provision of training for employees in non-technical disciplines;
- ◆ Establishment of a comprehensive safety program: safety education, and the enforcement of safety procedures throughout the organization; and
- ◆ Public Relations.

Safety and Quality Assurance Department: This department is to inform, advise and assist the various operational units of the Supertram system regarding quality and safety, within the limits of the legislation in force, including:

- ◆ Review and approval of permanent as well as temporary operating and maintenance procedures proposed by the concerned services;
- ◆ Carry out incident inquiries with safety personnel in the concerned service;
- ◆ Check the compliance of operating and maintenance procedures through audits; and
- ◆ Keep the General Manager informed about the measures that have been introduced.

HUMAN RESOURCES DEVELOPMENT PROGRAM

Public transport has become very complex; different levels of expertise are necessary to cope with the future introduction of innovative techniques and technologies. Expertise building can no longer be limited to the existing training program(s), but has to be replaced and complemented by a sustainable training program for all relevant persons active in public transport. This encompasses not only the proposed commercialization of the CTA, but extends to new systems such as the supertram and, ultimately, other public transport operators in Cairo. In-depth study will be required to determine the conditions of establishing a sustainable and module-based Public Transport Training Program (PTTP) and to identify the implementation schedule in accordance with the modernization of the public transport system in Cairo (building block principle). Further detail is presented in Sections 5.6 and 5.7 Main Report Volume III.

Phased Development Plan for the Public Transport Training Program

It is proposed that the CTA undergo a restructuring and reorganization program. But also Cairo's public transport system should soon engage in a vast modernization and expansion program as noted in the CREATS Master Plan. This implies, over time, the introduction of new technology, such as the supertram; new intermodal techniques among them modern ticketing technology; as well as the restructuring of existing and introduction of new transport services. The time is now right for introducing a comprehensive public transport training program which supports these dramatic changes. Fostering excellence of human resources at all levels will benefit not only the present and future Cairo public transport system and its users, but will also facilitate and support new systems, services and organizational changes.

Public Transport Training Program

The PTTP should encompass all relevant components of the public transport system, both at the operational and managerial levels (Figure B-2-3). The determining factors for the PTTP at initial start-up are the expertise needs of the CTA once the restructuring process is set in motion and when Supertram Line 1 can become operational. The modular approach of the PTTP allows the gradual introduction of training modules which meet not only the needs of these two determinants, but also to dynamically expand in line with the needs of the overall public transport system. This is achieved by layering new training modules onto the initial training program (building block principle).

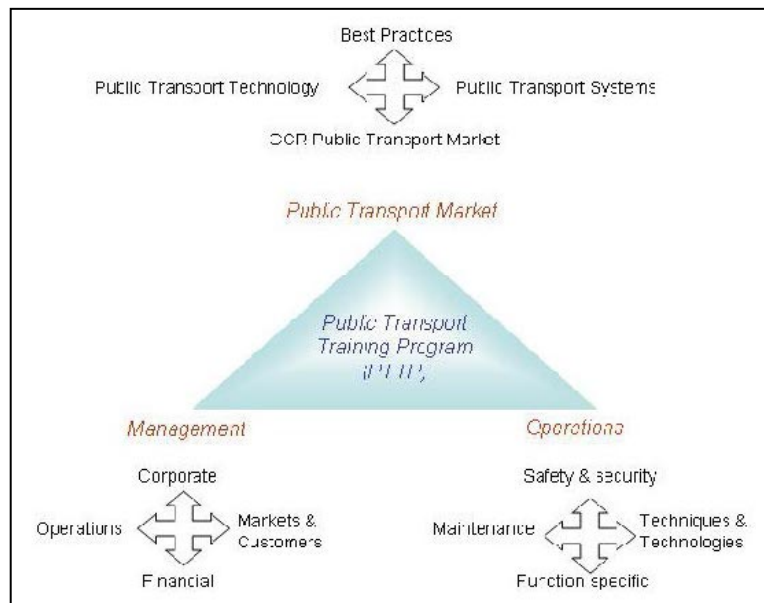


Figure B-2-3 Human Resources Development Program Framework

The future modernization and expansion of the public transport system in the Greater Cairo Region can only be really successful if it is supported and sustained by a comprehensive human resources development program. This program will have to be developed and, over time, adapted in accordance with the existing and future needs of the public transport sector. The future needs will have to be determined in detail based upon the transformation of present public transport into a modern and integrated public transport system.

Developing human resources should, however, not be seen as a goal in itself but as a core element supporting the gradual transformation and modernization of the public transport system of Cairo. Therefore, training modules have to be installed only and whenever the need emerges. This is the true spirit of the "building block principle".

Implementation Strategy

The establishment of the PTTP requires first of all a practical study that consists of several sequential phases:

- ◆ Identification of the framework components and Resources Needs Assessment Program;
- ◆ Establishment of a Roll-Out Plan;
- ◆ Human Resources and Expertise Building Program; and
- ◆ Technical Assistance Program.

The identification of the framework components phase allows formulation of the specific structural and regulatory conditions for establishing and operating the PTTP and to determine the specific role and functions thereof. The Resources Needs Assessment component determines the necessary hard- as well as software elements and details required investment as well as the annual operating costs. The assessment also specifies required professional expertise. Based upon the results of this first phase, a detailed Roll-Out Plan can be developed that describes in detail the individual steps and processes for a concrete implementation of the PTTP. During the Human Resources and Expertise Building Program, the necessary expertise will be determined and the quality conditions for a sustainable training program specified. The fourth phase foresees an ongoing Technical Assistance Program to assist local experts and responsible persons in establishing and starting up the PTTP.

In order to efficiently respond to a constantly changing public transport environment, and to react to explicit needs of various operators (both existing and new ones emerging in future), the entire structure of the PTTP must be correspondingly flexible, hence the recommendation for a “building block structure” as noted in the illustrative overview depicted in Figure B-2-4. The first step is to conduct a detailed study during which all issues relevant to the PTTP are identified, analyzed and categorized. By considering the resultant detailed information, the study can then establish a detailed road-map for use as a structural guideline in establishing the PTTP and fostering its evolution over time in response to changing transport stimuli.

But most of all, it is important to establish as quickly as possible the PTTP as an operational entity, even if the legal and structural frameworks of the PTTP are not yet formally established or totally clear. This pre-PTTP will be a first step in the rationalization of training for the public transport sector. Once the PTTP has been established in its first constellation, the initial set of training programs can gradually be expanded in two complementary ways. The first is to continue integrating existing training programs which in the beginning phase have not been included and re-adjust the original program whenever this is deemed necessary to optimize the training courses. The second method is to start developing training programs that are not yet available but which are considered necessary for increasing the efficiency of operations. One of the initial sets of training programs that could intuitively be considered relate to the public transport market and “safety on the job”. Developing training programs that deal with the market conditions of public transport, and with the public transport market of Cairo in particular, are needed, given that these themes are generic and beneficial to all relevant personnel working in the public transport sector, independent of their affiliation to one or another operator and/or organization. These training programs could be used as a preparatory phase to the CTA restructuring program, or to the modernization of the metro, the development of Supertram Line 1 and the introduction of modern technologies and techniques such as a step-wise approach to integrated ticketing.

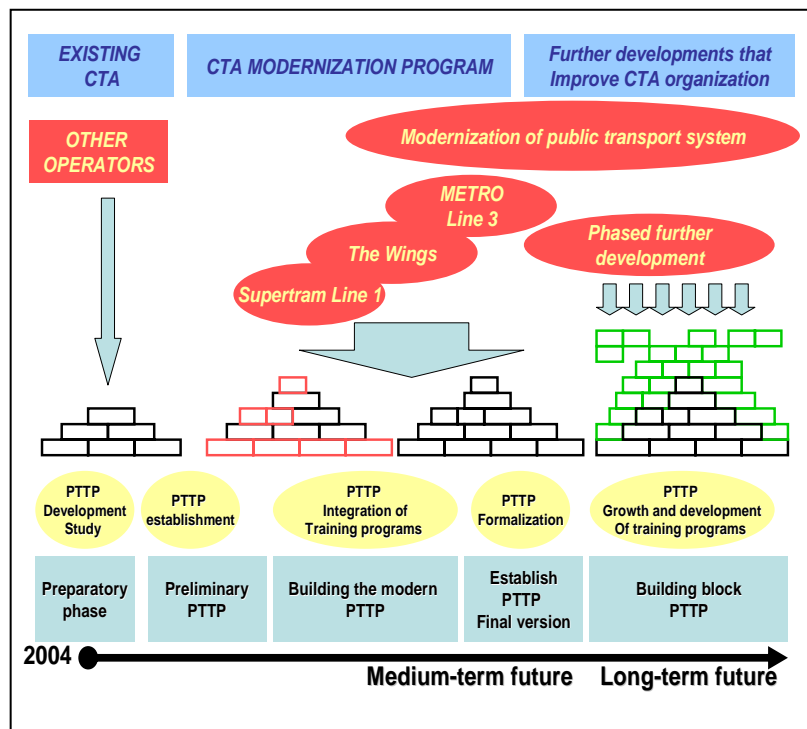


Figure B-2-4 Phased Implementation of the PTTP

Once the PTTP has been established in its first constellation, the initial set of training programs can gradually be expanded in two complementary ways. The first is to continue integrating existing training programs which in the beginning phase have not been included and re-adjust the original program whenever this is deemed necessary to optimize the training courses. The second method is to start developing training programs that are not yet available but which are considered necessary for increasing the efficiency of operations. One of the initial sets of training programs that could intuitively be considered relate to the public transport market and “safety on the job”. Developing training programs that deal with the market conditions of public transport, and with the public transport market of Cairo in particular, are needed, given that these themes are generic and beneficial to all relevant personnel working in the public transport sector, independent of their affiliation to one or another operator and/or organization. These training programs could be used as a preparatory phase to the CTA restructuring program, or to the modernization of the metro, the development of Supertram Line 1 and the introduction of modern technologies and techniques such as a step-wise approach to integrated ticketing.

THE WAY FORWARD

CREATS is a comprehensive effort which integrates approaches designed to mitigate urban transport problems and contribute to the sustainable development of the Greater Cairo Region. The transport strategy embedded in the Master Plan is concurrently intended to support an efficient economic structure of the region, strengthen linkages with other parts of Egypt and provide a base for market-oriented transport activity. Economic expansion within Egypt is 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 20-year planning horizon.

Through the CREATS Phase 2 study, feasibilities of the four new transport system development projects, selected as priority actions based on the Master Plan, have been confirmed, that is, all the projects are technically, environmentally and economically feasible, therefore, those are all worth being implemented from the national economy point of view. Technical documents, environmental impact assessment and a series of economic and financial analyses have been prepared, hence, all are now ready for the implementation.

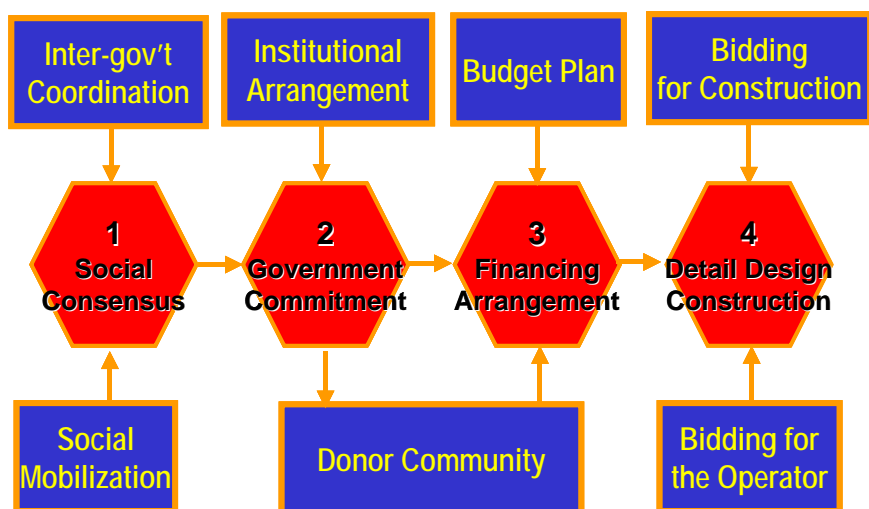
The Phase 2 effort also reveals that the CTA restructuring program should be further examined, focusing on a holding company structure as an initial action towards full privatization in the long-term. This program, including a labor adjustment plan, is indispensable to make the CTA public transport service more efficient and more sustainable, thereby bearing economic benefits to the general public as a whole.

The path to success will not be easy; many difficult decisions lie ahead. It is therefore, as are other elements of Egyptian society, influenced by political processes. Towards the implementation, a thoughtful process needs to be developed with dedicated supports of the people. First, social mobilization is needed to recognize the social significance of the projects. Intergovernmental coordination is a crucial factor to promote the social consensus building. Secondly, once unified policy and financial responsibilities are properly set in place based on such a social support, it is possible to create institutional and financial arrangements which better reflect the complex interactions within the policy of the urban transport sector. Thus, a firm and clear-cut government commitment must be an engine to drive a vehicle of CREATS Master Plan on the way forward.

Thirdly, needless to say, proper financial arrangement is critical for the realization. Since the proposed projects include a sizable amount of foreign procurements, international funds should be sought for the foreign component. Donors are always ready to discuss for its financial supports, as far as the Egyptian Government makes a firm official commitment for the financial request.

Different from the traditional funding mechanism, the Study Team delineates an innovative mechanism, involving the private sector's contribution in operating the new transport services. Such a mechanism definitely calls for a deregulation process in the public transport sector. More commercialized operation, efficient-based management and multi-sector business promotion may be employed in conjunction with the public transport service.

With all the efforts, the way to success can be envisaged.



Necessary Actions on the Way Forward