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 Transportation Study

FINAL REPORT Vol. III

CTA Transport Improvement in East Sector of Cairo

December 2003

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Pacific Consultants International (PCI)

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Transportation Master Plan and Feasibility Study of Urban Transport Projects in Greater Cairo Region in the Arab Republic of Egypt Phase 2

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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 and Feasibility Study of Urban Transport Project in Greater Cairo Region in the Arab Republic of Egypt
Phase 2

CREATS Phase II : FINAL REPORT Vol. III
CTA Transport Improvement Project in East Sector of Cairo

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LIST OF ABBREVIATIONS

A/C	Air Conditioned
AE	Acid Equivalent
ASG	Assignment Group (Code)
ATMs	Automatic Teller Machines
B/C	Benefit / Cost Ratio
BiH	Bosnia and Herzegovina
BOOT	Build-Own-Operate-Transfer
BOT	Build-Operate-Transfer
Br.	Bridge
C/C	Counterpart Committee
CAIP	Cairo Air Improvement Project
CAPMAS	Central Agency for Public Mobilization and Statistics
CBD	Central Business District
CCTV	Closed Circuit Television System
CDO	Central Development Organization
CDC	Cairo Demographic Center
CEHM	Cairo University Center for Environmental Hazard Mitigation
CIDA	Canadian International Development Agency
CH_4	Methane
CLS	Cordon Line Survey
CMO	Cairo Metro Organization
CNG	Compressed Natural Gas
CO	Carbon Monoxide
CO_2	Carbon Di-Oxide
CORPS	Corniche, Ramses and Port Said Streets
CREATS	Cairo Regional Area Transportation Study
CRR	Cairo Ring Road
CTA	Cairo Transport Authority
CTEB	Cairo Traffic Engineering Bureau
CTP	Common Transport Policy
CTS	Cargo Transport Survey
DANIDA	Danish Agency for Development Assistance
DRTPC	Development Research and Technological Planning Center of Cairo University
DfID	Department for International Development (UK)
EAS	Environmental Awareness Survey
EBRD	European Bank for Reconstruction and Development
EC	European Community
EC	Executive Committee
ECMT	European Conference of Ministers of Transport
EEA	European Environment Agency
EEAA	Egyptian Environmental Affairs Agency
EEIS	Egyptian Environmental Information System
EIA	Environmental Impact Assessment

EIRR	Economic Internal Rate of Return
EIS	Environmental Impact Study
EIMP	Environmental Information and Monitoring Program
EMT	Environmental Management and Technology Fund
ENIT	Egyptian National Institute of Transport
ENL	Effective Number of Lanes
ENR	Egyptian National Railways
EQI	Environmental Quality International
ESCAP	Economic and Social Commission for Asia and Pacific
ESE	Egyptian Stock Exchange
EU	European Union
FLC	Fully Loaded Containers
FDI	Foreign Direct Investments
FIRR	Financial Internal Rage of Return
FRN	French Railway Network
FY	Fiscal Year
GAM	Goal Achievement Matrix
GC	Greater Cairo
GCBC	Greater Cairo Bus Company
GCR	Greater Cairo Region
GDP	Gross Domestic Product
GIS	Geographic Information System
GNP	Gross National Product
GOE	Government of Egypt
GOPP	General Organization for Physical Planning
HBE	Home Based Education
HBO	Home Based Other
HBW	Home Based Work
HC	Hydro-Carbons
H.C.	Higher Committee
HCM	Highway Capacity Manual
HDM	Highway Development and Management System
HIS	Home Interview Survey
HM	Heavy Metals
HOV	High Occupancy Vehicle (Lane)
HRT	Heavy Rail Transit
HSR	High Speed Rail
IAURIF	I'Insitut d'Aménagement et d'Urbanisme de la Region d'Ile-de-France
I/C	Interchange
ICM	Intermodal Concept and Management
ICT	International Cargo Transport
ID	Identification
IEE	Initial Environmental Examination
IHS	Internal Homogeneous Planning Sector
IIA	Independence of Irrelevant Alternative
IM	Inter-Modal

IMF	International Monetary Fund
IRF	International Road Federation
IRMS	Integrated Road Management System
ISO	International Organization for Standardization
ITS	Information Transfer Strategy
ITU	Intermodal Transport Unit
JICA	Japan International Cooperation Agency
JIT	Just In Time
KAP	Knowledge, Attitude and Practice
LAN	Local Area Network
LE	Egyptian Pound
LOS	Level of Service
LRT	Light Rail Transit
MAD	Mean Absolute Difference
M/M	Minutes of the Meetings
MCA	Multi-Criteria Analysis
MEA	Metropolitan Expressway Authority
MENA	Middle East and North African Nations
MHUUC	Ministry of Housing, Utilities and Urban Communities
MOE	Ministry of Environment
MOI	Ministry of Interior
MOO	Metro Operation Organization
MOP	Ministry of Planning
MOT	Ministry of Transport
MP	Master Plan
MRT	Mass Rapid Transit
MS	Mobile Station for Air Quality Monitoring
MSEA	Ministry of State for Environmental Affairs
Mμ	Micrometer
N.A.	Not Applicable/Available
NAT	National Authority for Tunnels
NGO	Non Governmental Organization
NH_4	Methane
NHB	Non Home Based
NMHC	Non Methane Hydro-Carbons
NNL	Nominal Number of Lanes
NO	Nitrogen Monoxide
NO_2	Nitrogen Dioxide
NOx	Nitrogen Oxides
NPV	Net Present Value
NRR	Net Reproduction Rate
NU	National Universities
O_3	Ozone
OD	Origin-Destination
OECD	Organization for Economic Co-operation and Development
O&M	Operation & Maintenance

PCI	Pacific Consultants International
PCI	Pavement Condition Index
PCU	Passenger Car Unit
PHR	Peak Hour Ratio (peak hour volume/daily volume)
PM_{10}	Particulate Matter (particles) less than 10 micro meter (μm)
$PM_{2.5}$	Particulate Matter (particles) less than 2.5 micro meter (μm)
PPP	Public-Private Partnership
PPP	Purchasing Power Parity
PRD	Paris Region Division
PRT	Public Road Transport
PRTC	Parisian Region Transport Company
PT	Public Transport
PTB	Public Transport Bus
PTF	Public Transport Ferry
PTM	Public Transport Metro
PTSR	Public Transport Suburban Rail
PTST	Public Transport Super Tram
PTT	Public Transport Tram
PTXR	Public Transport Express Rail
RCPR	Regional Council of Paris Region
ROI	Return on Investment
RPS	Revealed Preference Survey
S/C	Steering Committee
SCF	Standard Conversion Factor
SE	Socio-economic
SEA	Strategic Environmental Assessment
SLS	Screen Line Survey
SO_2	Sulphur Dioxide
SO_x	Sulphur Oxide
SPS	Stated Preference Survey
TAP	Transport Action Program
TDM	Transport Demand Management
TEN	Trans-European Networks
TEU	Twenty-feet Equivalent Unit
TNI	Traffic Noise Index
TOR	Terms of Reference
TP	Traffic Police
TPA	Transport Planning Authority
TSP	Total Suspended Particulate Matter
TSP	Traffic Safety Program
UAE	United Arab Emirates
UK	United Kingdom of Great Britain and Northern Ireland
USA	United States of America
USAID	United States Agency for International Development
UTPU	Urban Transport Planning Unit
V/C	Volume to Capacity Ratio (Volume divided by Capacity)

VOC	Vehicle Operating Cost
VOC	Volatile Organic Compounds
WB	World Bank (International Bank for Reconstruction and Development)
WHO	World Health Organization

STATION NAME OF SUPRETRAM LINE 1 IN ENGLISH AND ARABIC

Station Name (English)	Station Name (Arabic)
Ramses Station (Terminal)	The Same
Ghamra	The Same
Demerdash	The Same
Mansheyet El Sadr	The Same
Mansheyet El Bakry	The Same
Teacher's College	Koleyet El Moallemeen
Heliopolis Club	Nady Heliopolis
Girl's College	Koleyet El Banat
Marwa City	Madinet El Marwa
Cairo Stadium	Estad El Qahera
Nasr Cinema	Cinema Madinet Nasr
Azhar University	Gameat El Azhar
Osman Building	Masaken Osman
Ebeid Street	Makram Ebeid
Darayeb	The Same
Nasr City Terminal	The Same
Zomor	The Same
Hay El Aasher	The Same
Ring Road Terminal	The Same

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MB Consultants	• Environmental Survey
Namaa For Engineering Testing & Consultation S.A.E.	• Soil Investigation Survey

Executive Summary

INTRODUCTION AND APPROACH

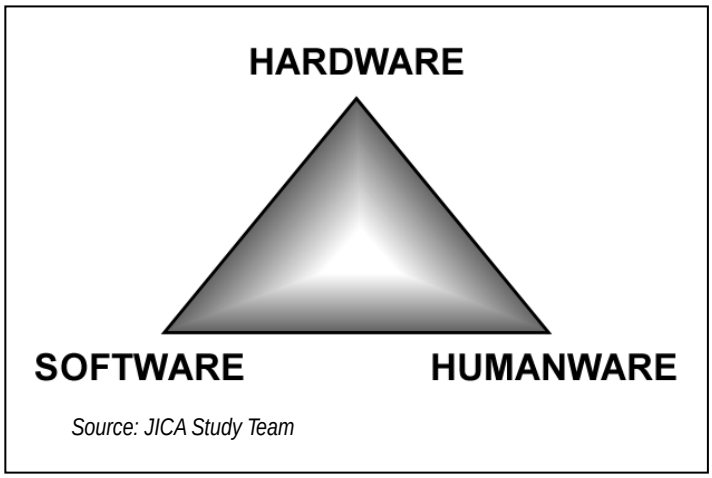
The Japan International Cooperation Agency (JICA) and the Higher Committee for Greater Cairo Transport Planning, Ministry of Transport, are cooperating in the conduct of CREATS - Cairo Regional Area Transportation Study (Transportation Master Plan and Feasibility Study of Urban Transport Projects in 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 which addresses the multi-modal and integrated transport needs of Greater Cairo over the next 20 years. The Transport Master Plan, identified as CREATS Phase I, was completed during November, 2002.

CREATS Phase II was initiated during February, 2003 with the express purpose of conducting feasibility studies of five high priority projects identified within the framework of the Transport Master Plan. These are divided into Programs A and B, containing three and two components, respectively. Program A focuses on 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), as well as traffic management techniques along major roads in Cairo and Giza. Program B: Cairo Transport Authority (CTA) Transport Improvement Project in East Sector of Cairo, the subject of this report, contains two components with specific objectives:

- 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; and, conduct a study of CTA bus route optimization in East Cairo to achieve efficient inter-modal operations in the catchment area of Supertram Line 1.
- Component B-2: formulate an organizational and institutional reform plan for the CTA; develop a human resources training program; and, define the structure as well as staffing needs of the supertram organization.

Further detail regarding project history, objectives and content is presented in Chapter 1 of the main report.

Program B relies on a comprehensive intermodal approach whose outcome is seen as being based on practical and implementable concepts. In other words, an intermodal view on public transport has been converted into an integrated system that simultaneously addresses hardware, software and humanware components, as demonstrated in Figure ES.1. At the hardware level, the elements in Program B focus on the technology and alignment of Supertram Line 1, as well as sitting of terminals and stops. Interlinking the services of the various modes and operators, in particular the integration of CTA bus and Supertram Line 1, constitute the software component of the analyses.



Source: JICA Study Team

Figure ES.1 An Intermodal Approach for Program B

Program B also addresses the humanware component when it formulates plans and recommendations for the organizational as well as institutional reforms of the CTA and proposes the framework for a sustainable and dedicated training program linked with, on the one hand, the actual realization of the supertram concept and, on the other hand, the proposed structural reform of CTA.

This deductive process is detailed in the chapters of the main report; to wit, Chapter 2, which discusses the intermodal framework for East Cairo; Chapter 3, which deals with the hardware considerations of Supertram Line 1 and its supporting systems; Chapter 4, which focuses on software, in particular intermodal enhancements in the form of restructured feeder bus services, modal integration at key terminals and stations, as well as the realization of an integrated ticketing approach; and, Chapter 5, which addresses the humanware issues, in particular as related to the organizational and institutional reform of the CTA and the outline of the necessary training and re-training programs. This Executive Summary provides an overview of broad conclusions, and is intended for those with whom further responsibilities in terms of decision-making rest.

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.

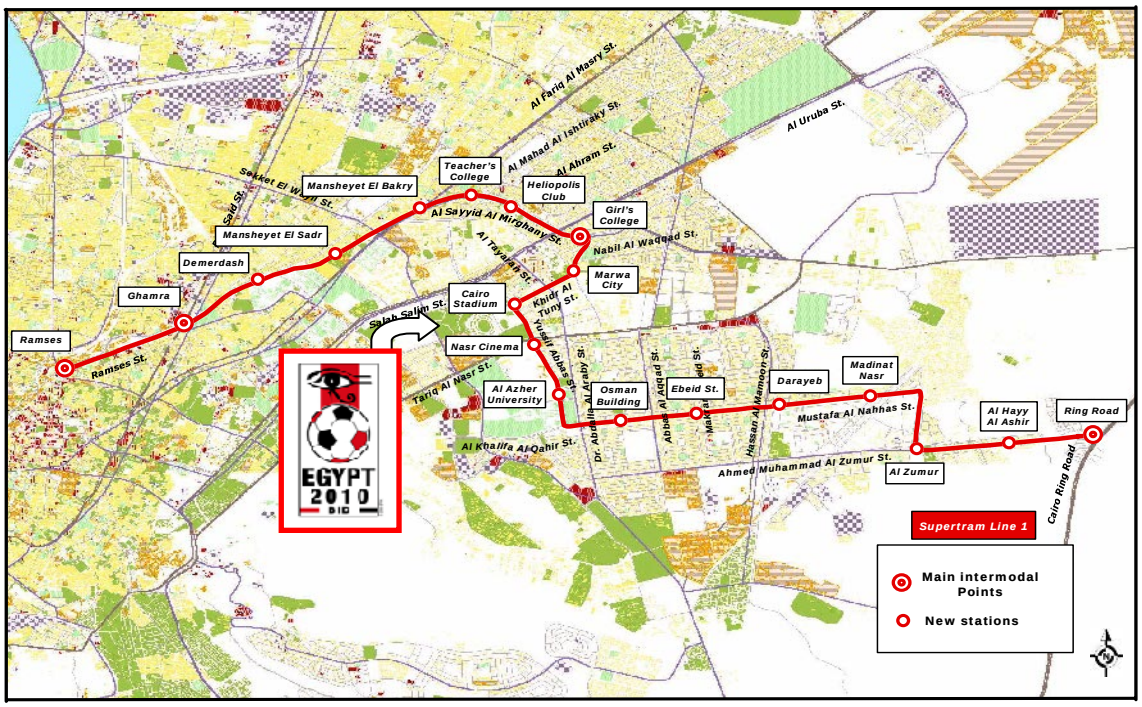


Figure ES.2 Supertram Line 1 Alignment and Station Locations

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 ES.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.

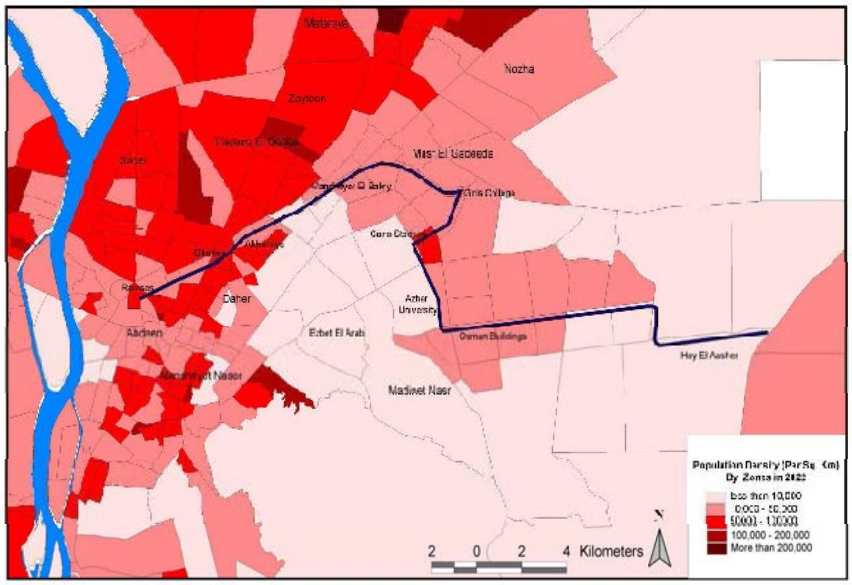


Figure ES.3 Year 2022 Population Density near Supertram Line 1

To minimize delay at road intersections, and maximize speedy 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

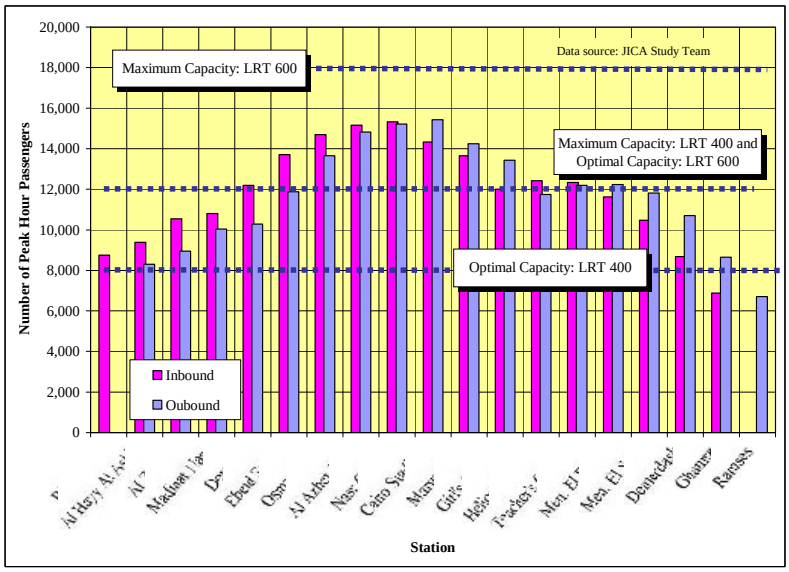


Figure ES.4 Year 2022 Peak Hour Cumulative Directional Loadings

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 ES.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 ES.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 ES.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.

Figure ES.6 Prototype Supertram Median Station

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 ES.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 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 ES.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 ES.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.

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**

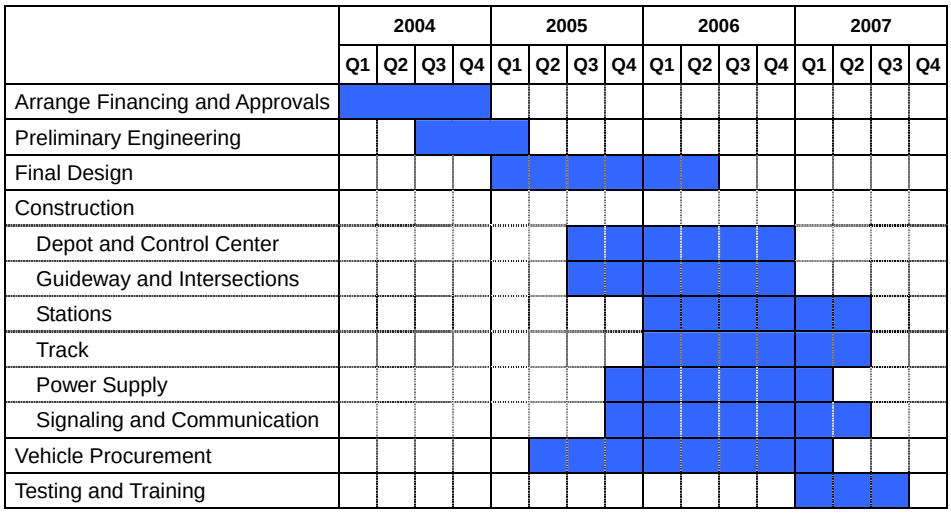
Source: JICA Study Team

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.

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 ES.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).



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 ES.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 an 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 ES.9).

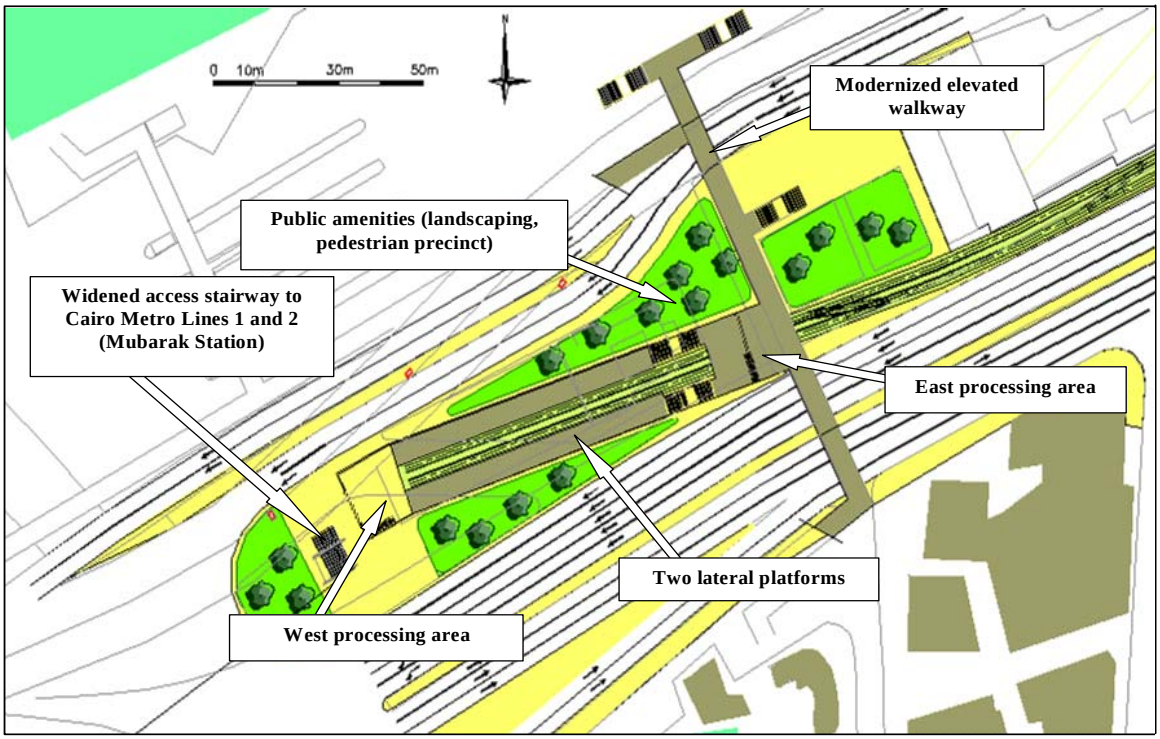


Figure ES.9 Ramses Station and Environs

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 ES.10).

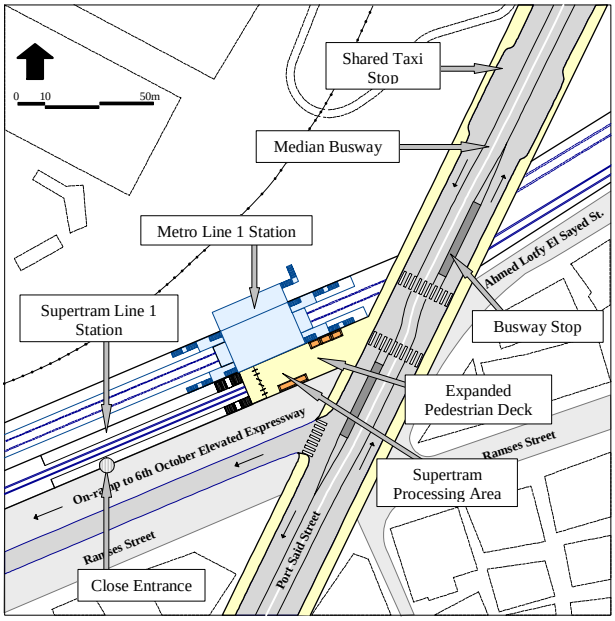


Figure ES.10 Ghamra Station and Environs

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.

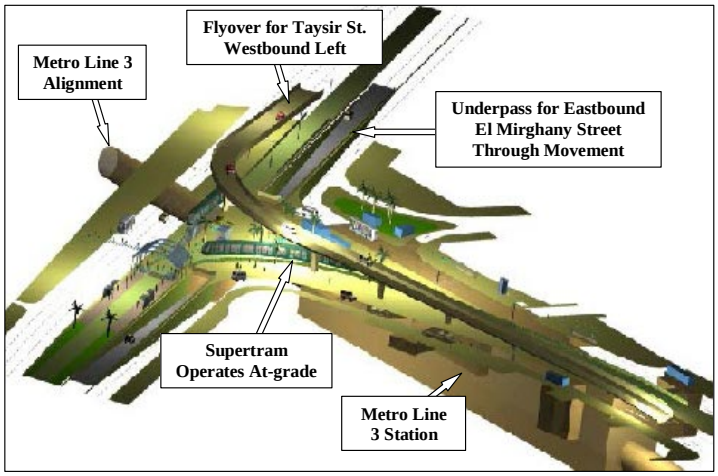


Figure ES.11 Infrastructure Elements

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 ES.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 ES.12).

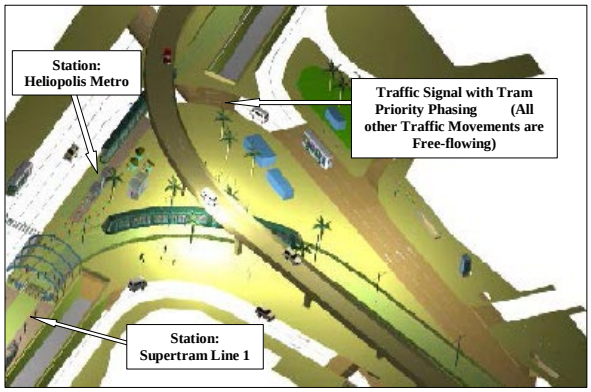


Figure ES.12 Improved Intersection Operations

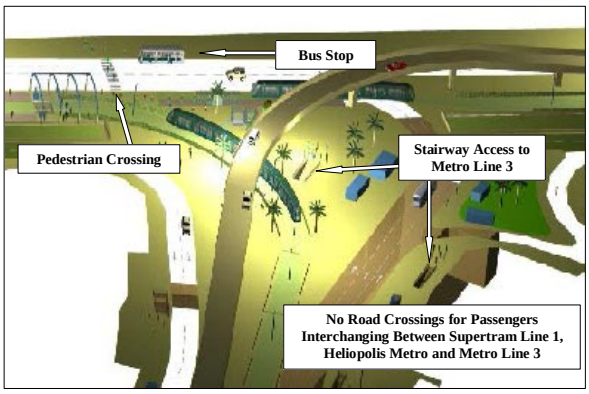


Figure ES.13 Enhanced Pedestrian Precinct

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 ES.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 ES.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 to the south of

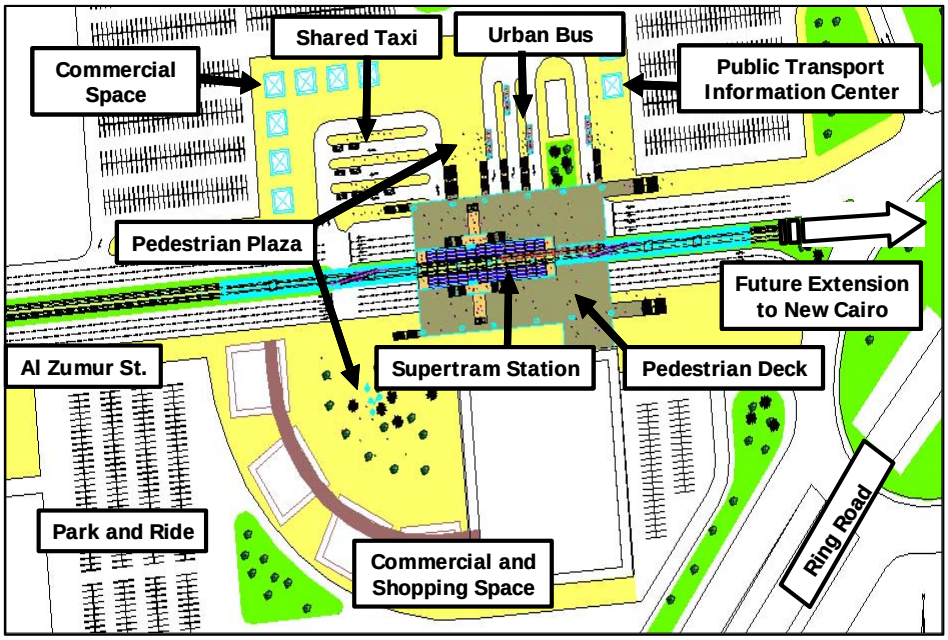


Figure ES.14 Principal Components – Ring Road Station

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 ES.15).

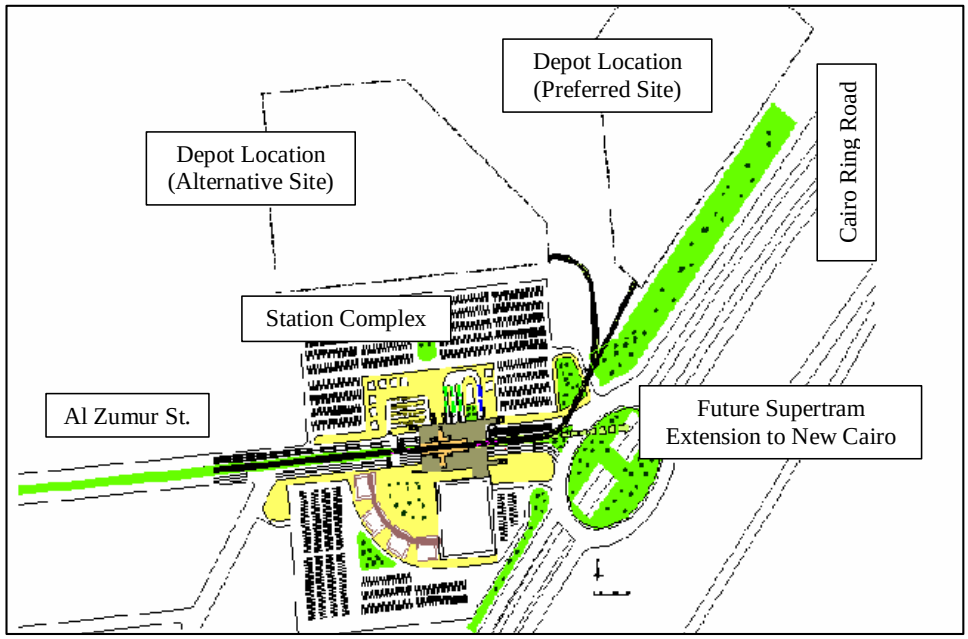


Figure ES.15 Land Requirements for Ring Road Station and Supertram Depot

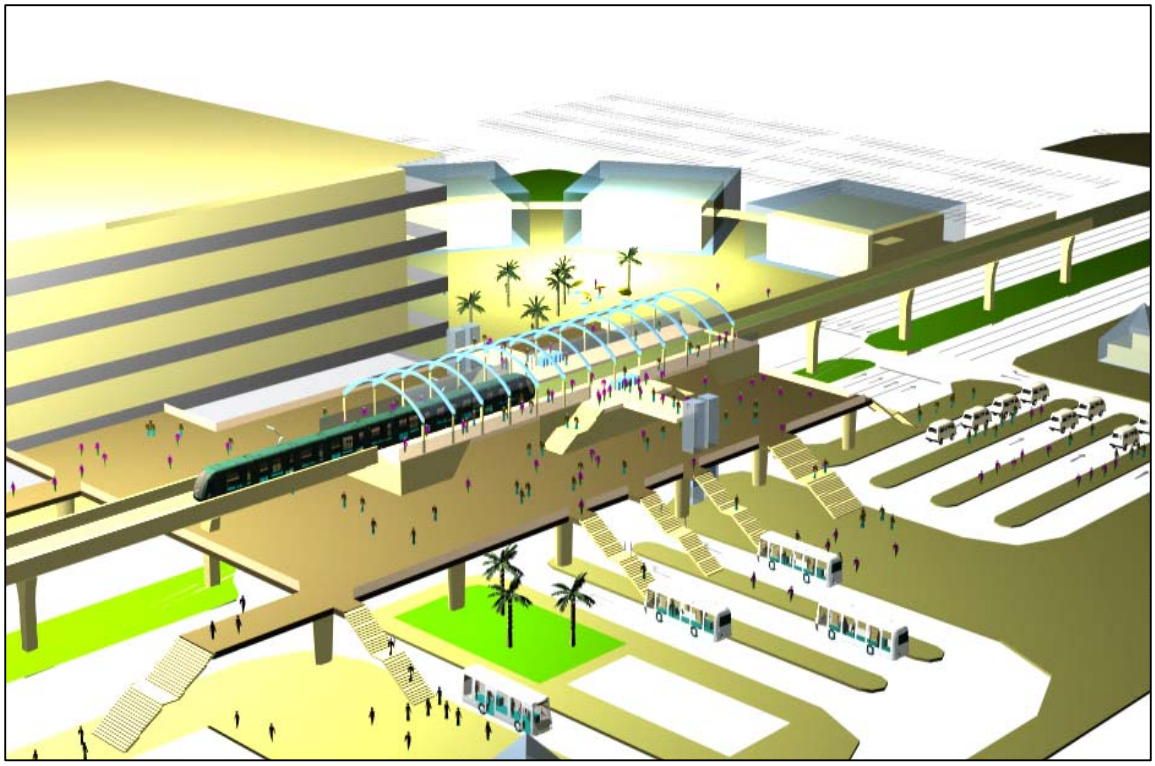


Figure ES.16 Aerial View of the Ring Road Station Multi-use Development

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 ES.17).

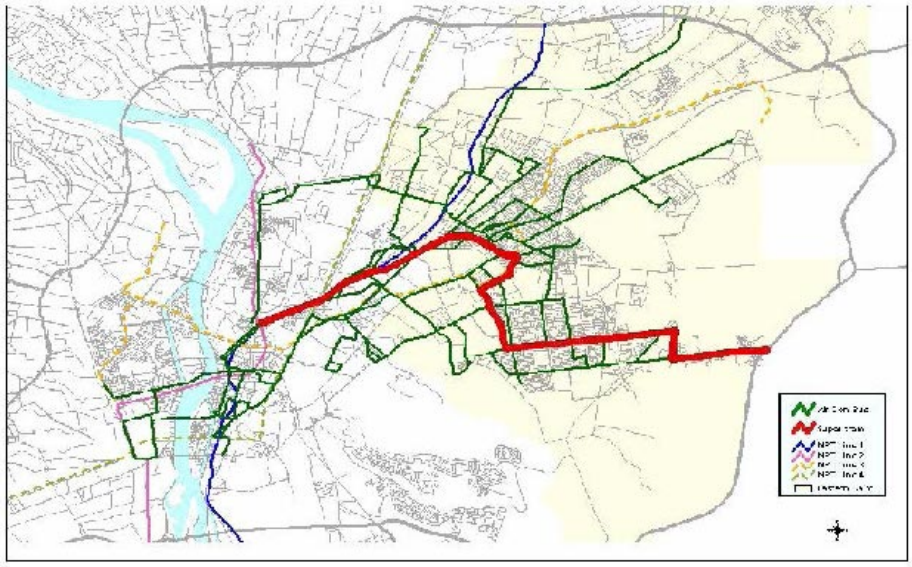


Figure ES.17 Twenty Optimized Bus Routes in East Cairo

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.

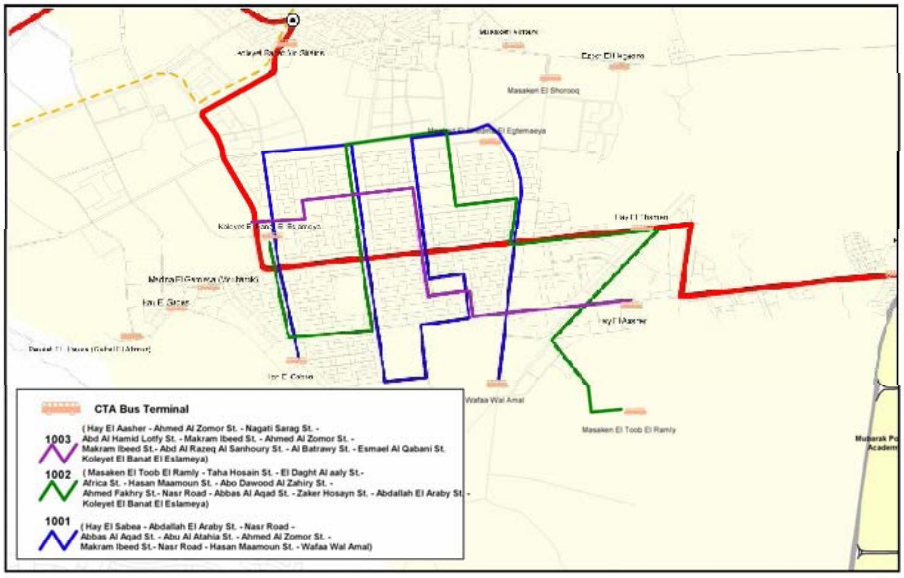


Figure ES.18 Three Shuttle Routes in Nasr City

To encourage utilization of the Supertram, three shuttle routes, anchored to CTA bus terminals, are proposed within this area (Figure ES.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.

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 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 ES.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.

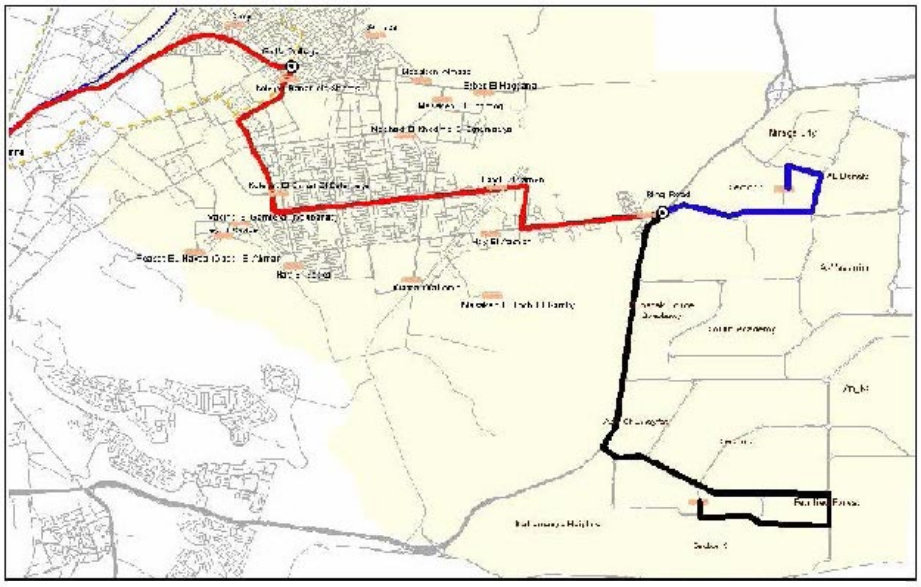


Figure ES.19 New Cairo Feeder Bus Routes (First Stage Minimum)

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 ES.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. 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.

Figure ES.20 Reorganization of Heliopolis Metro

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 wide-spread 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

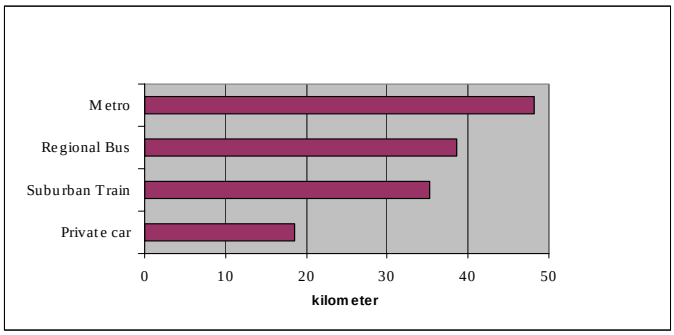
To ensure sustainability for the supertram project, a scoped Environmental Impact Assessment (EIA) has been carried out as part of the feasibility study according to the Egyptian, JICA and other international guidelines and regulations. The EIA indicates the negative as well as the positive environmental 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 ES.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.



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

Figure ES.21 Kilometers a Person can be Carried by One Kilogram of Fuel

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 CO_2 reduction of around 16,000 tons/year in 2022, compared to the "Without" case (Zero Option). It is said that one litter of gasoline generates 2.30 kg of CO_2. Based on this, the reduction of 16,000 ton/year of CO_2 is equivalent to the reduction of about 7.0 million litters/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.

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 stands 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 ES.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 ES.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 ES.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 ES.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 loosing 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 ES.6.

Table ES.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	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	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 *concession fees* in the long-term	Payment of the *concession fees* annually at a certain rate of operating revenue.
Accountability	To the public	To the Infrastructure owner as well as the public
Access to Funds	• Government subsidy • International donor agencies	• 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 he 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

[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.

Accumulated Net Profit in 2030 for the Infrastructure Owner, as shown in Table ES.7. Based on this analysis, the most 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 ES.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 Word Cup Game. The Supertram shall be a symbolic project to support such a promotion activity.

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 ES.22). 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.

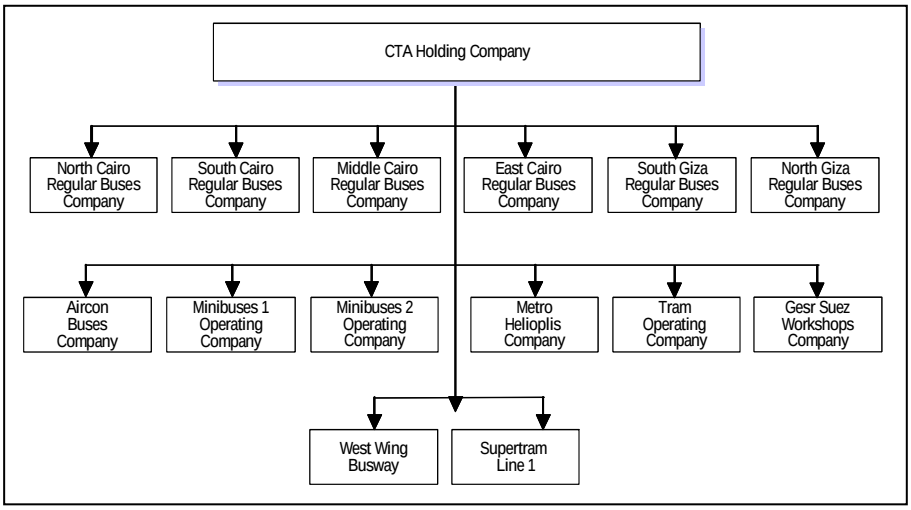


Figure ES.22 New Structure for the CTA

The government has to put into place a performance regulatory framework which will promote competitiveness in the public transport market and organize trans-parent as well as competitive tender pro-cesses 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 franchising[2] 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.

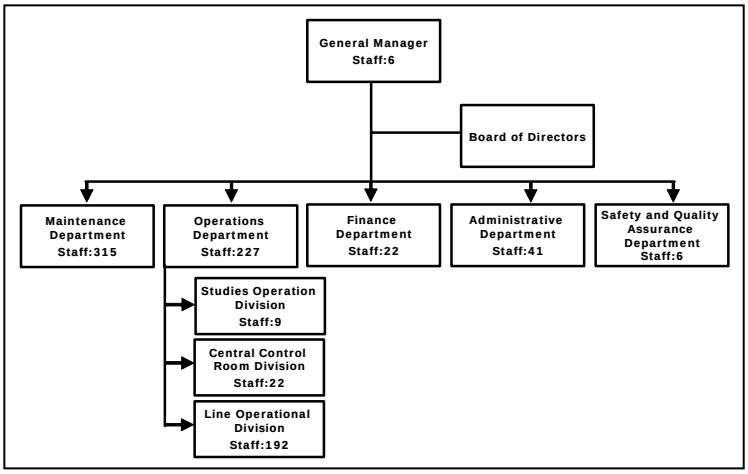


Figure ES.23 Supertram Company Organization; Years 2007 - 12

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 ES.23, Table ES.8).

The staffing total is expected to increase to 768 in year 2022, with the Operations Department again having the largest number of staff (Table ES.9). 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 ES.8 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 ES.9 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 ES.24). 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).

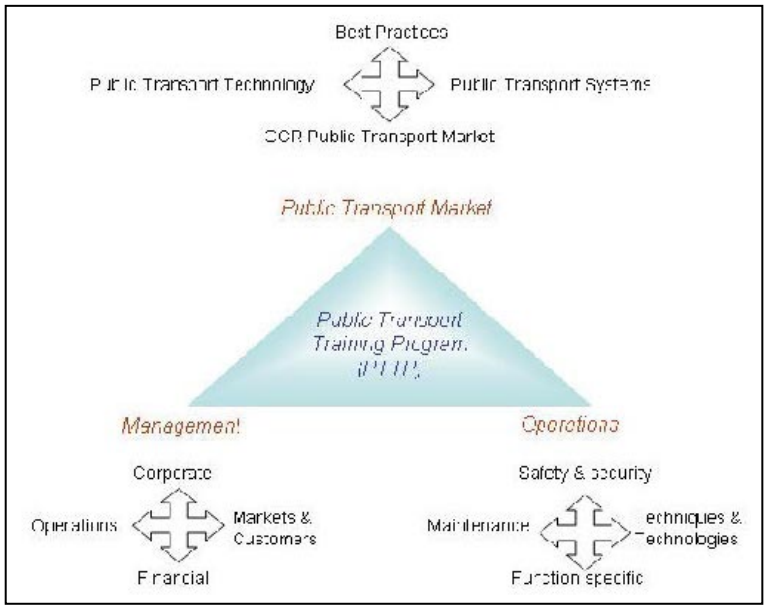


Figure ES.24 Human Resources Development Program Framework

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 ES.25. 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.

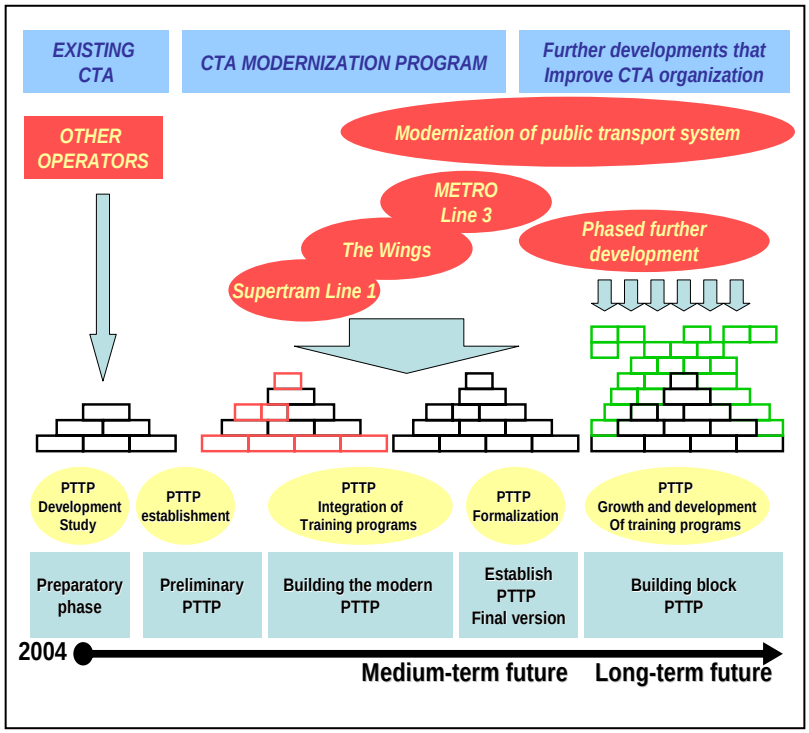


Figure ES.25 Phased Implementation of the PTTP

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.

Metro Line 2

Sakket El Wayly St.

Port Said St.

Ghamra Station

Ramses Station

Ramses St.

Metro Line 3

Metro Line 4

Fareeq El Masry St.

Maahad El Eshteraky St.

Sayed El Merghany St.

Girl's College Station

Orooba St.

Nabil El Waqqad St.

Khedr El Toony St.

Yusseff Abbas St.

Tareeq El Nasr St.

Khalifa El Qaher St.

Dr. Abdallah El Araby St.

Abbas El Aqqad St.

Makram Ebeid St.

Hassan Maamoon St.

Supertram Line 1

Mostafa El Nahhas St.

Ring Road Station

Ahmed Mohamed El Zomor St.

Cairo Ring Road

0 0.5 1.0 1.5 2.0 2.5km

Legend

- Main Intermordal Points
- New Stations

Supertram Line 1 in an Intermodal Context

CHAPTER 1

INTRODUCTION

CHAPTER 1: INTRODUCTION

1.1 STUDY SCOPE AND OBJECTIVES

The Japan International Cooperation Agency (JICA) and the Higher Committee for Greater Cairo Transport Planning are cooperating in the conduct of the *Transportation Master Plan and Feasibility Study of Urban Transport Projects in Greater Cairo Region in the Arab Republic of Egypt* (CREATS – Cairo Regional Area Transportation Study), based upon agreements finalized during November, 2000[1]. Pacific Consultants International, headquartered in Tokyo, Japan, is the designated lead consultant for the study.

The CREATS is divided into two phases, with Phase I dedicated to formulating a master plan and Phase II to conducting feasibility studies for selected priority projects/programs identified within the master plan. The Phase I study was completed during November, 2002, and the resultant CREATS Master Plan officially submitted to the Government of Egypt during February, 2003. Phase II commenced during the same month with mobilization of the Study Team to Cairo.

1.1.1 Overview of Phase I Approach to Formulation of The Master Plan

A basic premise of all investigations is that the CREATS is comprehensive in nature, that is, adopt approaches designed to mitigate urban transport problems and contribute to the sustainable development of the Greater Cairo Region. Three key products form the foundation upon which investigative efforts were based:

- Formulation of an integrated, multi-modal transport master plan extending over a twenty year planning horizon (to year 2022), termed the Phase I analysis[2]. Technical efforts related to the Phase I Master Plan formulation were initiated during March, 2001 and completed by November, 2002;

[1] *Scope of Work - Transportation Master Plan and Feasibility Study of Urban Transport Projects in Greater Cairo Region in the Arab Republic of Egypt*, as mutually agreed upon between the Japan International Cooperation Agency and the Higher Committee for Greater Cairo Transportation Planning, November, 2000.

[2] Further detail regarding scope of work, Study Team composition and technical framework is contained in *Inception Report - Transportation Master Plan and Feasibility Study of Urban Transport Projects in Greater Cairo Region in the Arab Republic of Egypt*, prepared for the Japan International Cooperation Agency and the Higher Committee for Greater Cairo Transportation Planning, by Pacific Consultants International, et. al., April, 2001.

- Identification, within the Phase I master plan framework, of high-priority projects whose implementation is to be achieved in the near-term future, and whose merit is determined via more detailed follow-on feasibility studies, termed the Phase II analysis. Technical efforts related to the Phase II Feasibility Studies, the topic of the current study, were initiated during February, 2003; and,
- Implementation of an effective and productive technology transfer program with Egyptian counterparts during both phases of CREATS.

The transport strategy embedded in the Master Plan is designed to concurrently contribute to an efficient economic structure of the region, strengthen linkages with other parts of Egypt as well as neighboring countries, and provide a base for market-oriented transport activity. The components of the Master Plan further diversify beyond the traditional "hardware" concepts associated with infrastructure provision. Additional key elements of the process consist of:

- "software" aspects, that is, available technology, international standards, and multi-modal integration needs (cargo/passenger terminals, transfer points);
- "humanware" needs, or the cultivation of human resources via the designation of training and education programs as well as other requirements for developing expertise; and,
- "sustainability", that is, the notion that the planning process must allow Egyptian stakeholders to participate in visualizing and shaping their own future. This is of substantial importance in terms of ownership building if CREATS is to be adopted and used by the people and their elected officials both during, and following, the conduct of CREATS.

A participatory planning process is one of the most important elements of both CREATS Phases I and II so that the ownership of the plans should be ensured by the Egyptian people.

1.1.2 Priority Projects/Programs Identified in the Master Plan

The CREATS Master Plan proposes a total of 56 projects and programs, as tabulated in Table 1.1.1 to realize the five key strategies to achieve an integrated transport system. The necessary investments or initiatives for the implementation are conceptually allocated into three phases. Priority activities to be rendered in the short-tem are given to those that will initiate the proposed strategies to formulate an integrated transport system as follows:

1. Strengthening of an integrated public transport system featuring MRT, LRT, suburban rail and bus services to improve people's mobility;
2. Economic rationality of the investment;
3. Rehabilitation and revitalization of existing infrastructures;
4. Low-cost solutions with ease of implementation and quick impacts;
5. Essential initiatives to catalyze improvement of efficient, safe and comfortable transport; and

6. Institutional programs required as a prerequisite the implementation of the CREATS Master Plan.

Based on a prioritization process, CREATS identified the highest priority projects for infrastructure (Top 20) and the institutional and humanware programs (Top 10), as shown in Tables 1.1.2 and 1.1.3 respectively. Towards forming the integrated urban transport system, infrastructure projects should be implemented in association with institutional and human-related programs.

Viewing the infrastructure projects, MRT-related projects such as the improvement of MRT Line 1, the extension of MRT Line 2 and the new construction of MRT Line 3, are ranked at the highest places. These have been all committed, therefore, should be executed as scheduled. Metro Line 4, proposed by CREATS, is also at the highest rank, however, it is recommended that this project is commenced soon after the committed MRT projects are accomplished or get started along the right lines.

Other than the MRT projects, three projects are evaluated to be of the highest priority, namely,

- Supertram projects;
- Public bus fleet expansion/modernization project (to proceed hand in hand with commercialization of the CTA); and
- The 6th of October trunk busway project.

These are vital to structure an integrated mass-transit system, therefore, should be initiated at the early phase.

Regarding the institutional and human-based programs, all the programs ranked at the top 10 are equally crucial. Among them, the highest priority is given to the programs for:

- Improvement and restructuring public transport operators;
- Institutional component for “public fleet expansion and modernization”, and
- Institutional strengthening for integrated policy.

Although all the programs listed in the top 10 are related to each other, these may be pursued individually. However, in order to make them successful, definite political decision-making for a comprehensive sector reform is needed. This should start with establishment of an organizational structure for integrated policy formulation, in particular, for CTA, as soon as practical.

It is noted again that the CREATS Master Plan has been formulated with a critical prerequisite that all committed projects, including MRT improvement projects, shall be accomplished in schedule, where MRT Line 3 has been given the top priority to implement.

Table 1.1.1 CREATS Proposed Projects/Programs by Strategy

Strategy 1: Improvement of People's Mobility

Proposed Measure and Project/Program	Short	Mid.	Long
Integrated Public Transport			
- Committed Projects	■	■	■
- Hierarchy of Modes	■	■	
- Improvement of Strategic Intermodal Points/Facilities	■	■	■
- Development of "Park and Ride System"	■	■	
- Complementary Routes Structure for PT	■	■	■
- Introduction of an Integrated Ticketing System	■	■	■
Traffic Demand Management			
- Introduction of measures and Policies	■	■	■
- Truck Traffic Control (Generalized Truck Ban)		■	■

Strategy 2: Optimal Infrastructure Development

Rail-based Public Transport			
- Committed Projects	■	■	■
- New Metro Line 4 (Pyramid Line) Development		■	■
- Heliopolis Metro and Tram Upgrading	■	■	
- Super Tram Introduction	■	■	■
- ENR Suburban Line Improvement	■	■	■
- East-West Wing Lines to New Communities		■	■
- Intermodal Facilities Development	■	■	■
Road-based Public Transport			
- Improvement of Public Bus Facilities	■	■	■
- Public Bus Fleet Improvement	■	■	■
- Priority Bus Facility Development	■	■	■
Roads and Highways			
- Committed Projects	■		
- Primary/ Secondary Roads Development	■	■	■
- Grade Separation Works		■	■
- Expressway Network		■	■
Cargo Transport			
- Truck Terminal Development (3 Locations)	■	■	■
- Expansion of Existing Rail and River Terminals	■	■	■
- Sector Restructuring	■	■	■

Strategy 3: Accessible Transport for All

All Citizens			
- Public Transport Route Structure	■	■	■
- Safe and Comfortable Amenities	■	■	
The Poor			
- Social Welfare Policy for Transport	■	■	■
- Targeted Subsidy	■	■	■
- Area-Specific par Transit Operation	■	■	■
Gender-Based			
- Provision of Clean and Safe Bus Service	■	■	■
- Establishment of a "Gender Auditing System"	■	■	■
Handicapped			
- Improvement of Barrier-Free Facilities at Stations	■	■	■

Strategy 4: Safe and Environment-friendly Transport

Proposed Measure and Project/Program	Short	Mid.	Long
Traffic Management			
- Improvement of Intersections/ Signal System	■		
- Policy Zoning System for Parking Management	■		
- Development of Parking Lots	■	■	■
- Improvement of Bus Safety Facilities	■	■	■
- Public Transport Information Dissemination	■	■	■
- Introduction of Traffic Information System	■	■	■
Human Resource Management			
- Establishment of Egyptian Traffic Safety Council	■		
- Traffic Safety Education & Information Program	■	■	■
- Coordinated Enforcement for Drivers' Licenses	■	■	■
Environmental Measures			
- Enhanced Environmental Monitoring System	■	■	■
- Increased Use of CNG and Unleaded Gasoline	■	■	■
- Enforced Transport Regulations & Operations	■	■	■
- Enhanced Vehicle Inspection System	■	■	
- Introduction of Alternative Fuels/ Hybrid Cars	■	■	■
- Environmental Awareness Campaigns	■	■	■

Strategy 5: Institutional and Financial Mechanism

Institutional Arrangement			
- Establishment of CMTB	■	■	■
Sustainable Financial Mechanism			
- Rationalization of Subsidy Policy and Revision of Public Transport Fare Structure	■	■	■
- Introduction of "User Pay System"	■	■	■
- Stepwise Privatization of Bus Public Transport	■	■	■
- Introduction of "Earmarked Taxation"		■	
Justifiable Investment Human Resource			
- Legalization of Public Private Partnership Scheme for Transport Investment	■	■	■
- Facilitation of Public Awareness of "Safety and Environment"	■	■	■
Improvement/ Restructuring of Operators			
- Capacity Building of Operators for "Good Practice"	■	■	■
- Restructuring of CTA	■	■	
- "Area Franchising System" for Shared Taxi	■	■	■
- Establishment of "Suburban Rail Service Corporation" and "Expressway Development Corporation"		■	

Notes:
1) Measures in "blue letters" represent "institutional, organizational and/or human-based program"; while those in black, physical and/or infrastructure projects.
2) The color gradation in phasing blocks stands for a relative magnitude of investment/ activity of the corresponding project/ program, that is, the darker, the more.

Table 1.1.2 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: 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) terms. Refer in Chapter 11, Volume III, CREATS Master Plan for more precise sectorial scheduling.

Source: JICA Study Team

Table 1.1.3 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: 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) terms. Refer in Chapter 11, Volume III, CREATS Master Plan for more precise sectorial scheduling.

Source: JICA Study Team

1.1.3 Objectives of Phase II: Feasibility Studies

Phase II efforts build upon the humanware, software and hardware conclusions of CREATS Phase I. 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[3]:

Program A: ***Strategic Corridors, Areas Transport Management and Development Program,*** whose key objectives are:

- Conduct feasibility studies to develop public transport systems within the East-West Corridor composed of the East Wing, linking Ain Shams station with 10th of Ramadan City, and the West Wing, linking Giza with 6th of October City;
- 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,
- Formulate short-term traffic management and inter-modal facility development plans in Ain Shams (Area 1) and Central Giza (Area 2). These plans are linked with East Wing and West Wing public transport strategies, with investigative foci being Ain Shams station area and the West Wing terminus point, respectively.

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

- 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;
- Conduct a feasibility study of CTA bus route restructuring for efficient inter-modal operations in the catchment area of Supertram Line 1; that is, those routes most likely to benefit either bus or Supertram operations and patronage in terms of providing enhanced intermodal efficiencies; and,
- Formulate an organizational and institutional reform plan for the CTA.

Both programs (depicted in Figures 1.1.1 and 1.1.2) also include technology transfer to Egyptian counterparts.

[3] Further detail regarding scope of work, Study Team composition and technical framework is contained in *Inception Report (2) - Transportation Master Plan and Feasibility Study of Urban Transport Projects in Greater Cairo Region in the Arab Republic of Egypt*, prepared for the Japan International Cooperation Agency and the Higher Committee for Greater Cairo Transportation Planning, by Pacific Consultants International, et. al., March, 2003.

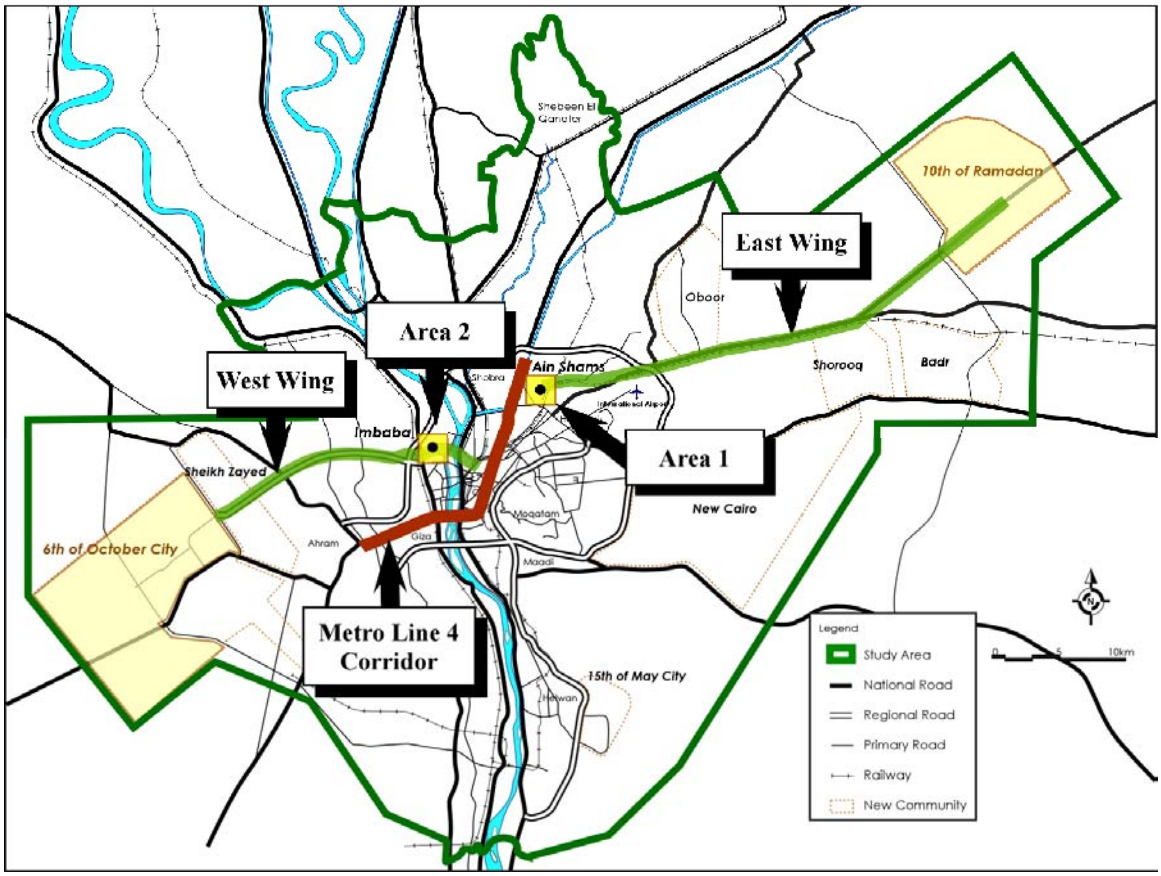


Figure 1.1.1 Program A Project Content

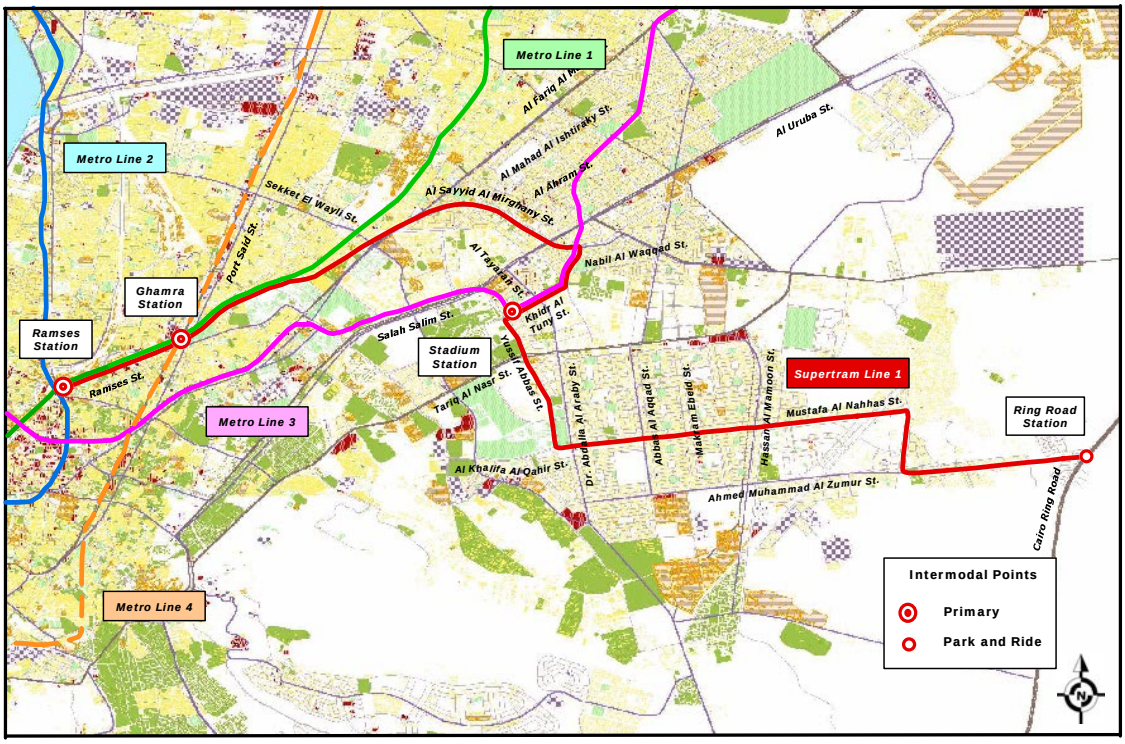


Figure 1.1.2 Program B: Supertram Line 1 in an Intermodal Context

1.2 APPROACH TO THE CONDUCT OF PHASE II

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

The Study Team, housed in the offices of the Egyptian National Institute of Transport, is being strongly assisted by its designated Steering Committee and Higher Committee, as it was during Phase I. 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 for respective Programs A and B. This in effect reorganized the Phase I Counterpart Committee. Thus, continuous and productive technical liaison is being maintained with a number of organizations 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 has also been effected with Universities (University of Cairo, Ain Shams University, Azhar University) and various departments within those learned institutions.

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

Wide-spread information dissemination methodologies are being employed in the study process. These include exchanges of information via periodic focused presentation and discussion programs with study committees and members thereof; conduct of public workshops with a primarily technical orientation with timing roughly in accordance with submission of intermediate milestone reports; conduct of public seminars with a primarily strategic focus with timing roughly in accordance with submission of draft versions of Phases I and II final reports; and, submittal of monthly progress reports to the committees associated with the study. Furthermore, focused pamphlets, press releases and similar task-specific items are prepared in association with conduct of data collection surveys.

1.3 REPORTING METHODOLOGY

A rigorous and systematic reporting approach has been adopted for CREATS.

1.3.1 Phase I: The Transport Master Plan

The Phase I reporting structure adopted by the Study Team incorporates both core reports (contractual obligations specified in the *Inception Report*), and, on an as-needed basis, a series of a supplementary technical reports. Each report is an independent and self-contained document. While a synopsis of the most relevant findings is transferred between reports, the interested reader is urged to consult the specific report in question for desired detailed information. Core reports issued in the Phase I process were:

- *Inception Report,* submitted during April, 2001, contains, as noted previously, detail regarding study methodologies, staffing plan and programmed study outputs. This document was finalized in close cooperation with JICA, committees associated with the study and other local experts.
- *Progress Report (1)*[4], submitted during July, 2001, details approaches and methodologies to be employed during the conduct of surveys. These include a home interview survey, cordon line survey; screen line survey; traffic count survey; interview survey for public transport passengers; travel speed survey; road condition survey; transport networks survey; parking survey; cargo transport survey; and, environmental survey.
- *Progress Report (2)*[5], submitted during May, 2002, quantifies and clarifies study progress to near conclusion of data collection and survey programs. The content of *Progress Report (2)* amplifies, as necessary, technical techniques and methodologies; quantifies findings as to existing conditions, documents results of surveys and highlights early opportunities as well as constraints.
- *Phase I Final Report,* submitted during November, 2002, documents the Master Plan and details sector plans. *The Final Report* consists of four separate volumes:
  - *Volume I: Executive Summary*, contains highlights of recommended strategies, projects and programs;
  - *Volume II: Urban Transport Policy and Strategy,* summarizes the essence of the transport master plan and those policies upon which core plan elements

[4] *Progress Report (1) - Transportation Master Plan and Feasibility Study of Urban Transport Projects in Greater Cairo Region in the Arab Republic of Egypt*, prepared for the Japan International Cooperation Agency and the Higher Committee for Greater Cairo Transportation Planning, by Pacific Consultants International, et. al., July, 2001.

[5] *Progress Report (2) - Transportation Master Plan and Feasibility Study of Urban Transport Projects in Greater Cairo Region in the Arab Republic of Egypt, Volume I (Current Urban Transport Status) and Volume II (Results of Transport and Traffic Surveys)*, prepared for the Japan International Cooperation Agency and the Higher Committee for Greater Cairo Transportation Planning, by Pacific Consultants International, et. al., May, 2002

of hardware (infrastructure), software (technology and institution) and humanware (human aspect) rest;

- *Volume III: Transport Master Plan* presents detailed sector-specific technical analyses and procedural approaches used in the derivation of the Master Plan and its essential elements; and,
- *Volume IV: CREATS Urban Transport Database*, contains the extensive numeric database collected and generated as part of CREATS technical procedures, as well as explanatory documentation regarding its content.

In addition to core reports, the Study Team has, on an as-needed basis, published a series of:

- *Technical Reports*[6], which summarize key technical issues, or milestone events, which are seen as being of particular relevance and which may be of interest to project participants outside of guidelines imposed by the *Inception, Progress* and *Final Reports*.

1.3.2 Phase II: Feasibility Studies

Three core reports are published during Phase II. These are:

- *Inception Report (2)*, submitted during March 2003, contains, as noted previously, detail regarding study methodologies, staffing plan and programmed study outputs. This document was finalized in close cooperation with JICA, committees associated with the study and other local experts.
- *Progress Report (3)*[7] quantifies and clarifies study progress to approximately May/June, 2003. Methodologies, findings, analyses and preliminary conclusions appropriate to that time frame are presented. It is emphasized that the intent of this report is as the name implies; a statement of progress at a particular point in time. The ultimate disposition of any topic addressed in *Progress Report (3)* is presented in the *Phase II Final Report*.
- *Phase II Final Report* which documents findings of the *Phase II Feasibility Studies* and provides detail for the two programs, and projects therein, in terms of approaches and methodologies; investigative efforts; evaluation of alternative solutions; conduct of economic, financial and environmental investigations; and, formulation of implementation strategies[8]. *The Final Report* consists of four separate volumes:

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[6] Refer *Technical Report (1)*, July 2001; *Technical Report (2): Framework of the Transport Model*, January, 2002; *Technical Report (3): Urban Public Transport Perspectives*, May, 2002; and, *Technical Report (4): Traffic Safety and Environmental Programs*, September, 2002; all under *Transportation Master Plan and Feasibility Study of Urban Transport Projects in Greater Cairo Region in the Arab Republic of Egypt*, prepared for the Japan International Cooperation Agency and the Higher Committee for Greater Cairo Transportation Planning, by Pacific Consultants International, et. al.

[7] *Progress Report (3) - Transportation Master Plan and Feasibility Study of Urban Transport Projects in Greater Cairo Region in the Arab Republic of Egypt*, prepared for the Japan International Cooperation Agency and the Higher Committee for Greater Cairo Transportation Planning, by Pacific Consultants International, et. al., June, 2003.

[8] The draft version of the *Phase II Final Report* was submitted during October, 2003. Following receipt and

- *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;
- *Volume III: Program B Feasibility Studies*, **the current report,** 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; and,
- *Volume IV: Technical Appendix*, containing four separate attachments featuring elements common to both Volumes II and III. These describe three aspects: the nature of the CREATS transport model and its refinement during Phase II (Chapter 1); intermodal theory and background (Chapter 2); and, a discussion of potential financing mechanisms within the Egyptian context (Chapter 3).

The Study Team also continued its Phase I approach to issuing *Technical Reports*[9], which summarize key technical issues, or milestone events, seen as being of particular relevance and which may be of interest to project participants outside of guidelines imposed by the *Inception, Progress* and *Final Reports*.

1.4 STRUCTURE OF THIS VOLUME III OF THE FINAL REPORT

The structure of the *Phase II Final Report* is consistent with essential formats and tenets voiced in *Inception Report (2)*, as well as guidance received from the studies committees. This Volume III of the *Phase II Final Report* consists of four chapters, in addition to this *Introduction*, which describe Program B techniques, methodologies, findings and conclusions:

- *Chapter 2: An Intermodal Framework for East Cairo* defines the strategic focus that has been adopted for the improvement of East Cairo public transport. This approach relies strongly on developing an integrated system in which individual modes cooperatively provide services to the public, centered on major intermodal terminals and using enhanced practices such as coordinated services and integrated ticketing.
- *Chapter 3: A New Role for the Heliopolis Metro* details investigations related to alternative configurations for the proposed Supertram Line 1, as well as detailing of the preferred system. Facets of this include reviews of existing

incorporation of comments from the Egyptian and Japanese sides, the final version of the *Phase II Final Report* was submitted during early 2004 via the diplomatic channel.

[9] *Technical Report (5): CREATS Transport Model User Manual*, under *Transportation Master Plan and Feasibility Study of Urban Transport Projects in Greater Cairo Region in the Arab Republic of Egypt*, prepared for the Japan International Cooperation Agency and the Higher Committee for Greater Cairo Transportation Planning, by Pacific Consultants International, et. al., July 2003.

facilities; alternative alignments and service philosophies; operating criteria, demand forecasts, operating costs and revenues, capital cost, economic and financial feasibility as well as environmental assessment.

- *Chapter 4: Network Optimization and Integration in the East Sector* supports the proposed role of Supertram Line 1 by proposing various intermodal efficiencies in East Cairo. These pertain to optimized bus operation within the supertram catchment area, a strategic re-orientation of shared taxi operations, conceptual design for major terminals at Ramses, Ghamra, Girl's College and Ring Road stations, as well as various intermodal concepts.
- *Chapter 5: Organizational and Institutional Reform of the CTA* presents the framework for instituting the commercialization of the CTA. These analyses are presented at various levels of detail. Initially, an organizational and institutional reform framework is defined for the CTA as an entity. Subsequently, an organizational plan for Supertram Line 1 is defined based on a commercialized approach to the provision of public transport services. The supertram organization, conceived within the jurisdictional umbrella of Cairo Governorate, can be seen as a staged element along the path to full CTA commercialization. A human capacity building program, with the intent of developing a cadre of dedicated professionals capable of operating more complex modes of transport such as the supertram, is also defined.

The Study Team, and members of the committees associated with CREATS, stand ready to discuss technical content of this report in additional detail at any mutually convenient time.

CHAPTER 2

AN INTERMODAL PERSPECTIVE FOR EAST CAIRO

CHAPTER 2: AN INTERMODAL PERSPECTIVE FOR EAST CAIRO

2.1 INTRODUCTION

The future development of Supertram Line 1 offers an interesting opportunity for Cairo to introduce intermodality and integration into the public transport system. During the Phase II analyses, the JICA Study Team applied the intermodal transport definition of Prof. Dr. Gerhard Muller which was adopted during Phase I of CREATS. This definition reads: "***the concept of transporting passengers and freight on two or more different transport modes in such a way that all parts of the transportation process, including the exchange of information, are efficiently connected and coordinated***"[1].

But a theoretical concept needs at one point in time to be translated from a theoretical view into a practical implementation plan. This transformation implies that the intermodal view on public transport needs to be converted into an integrated system that simultaneously addresses hardware, software and humanware components [2], as demonstrated in Figure 2.1.1. At the hardware level, the elements in Program B focus on the technology and alignment of Supertram Line 1, as well as siting of terminals and stops. On the software level, interlinking the services of the various modes and operators, in particular the integration of CTA bus and Supertram Line 1, constitute the software component of the analyses.

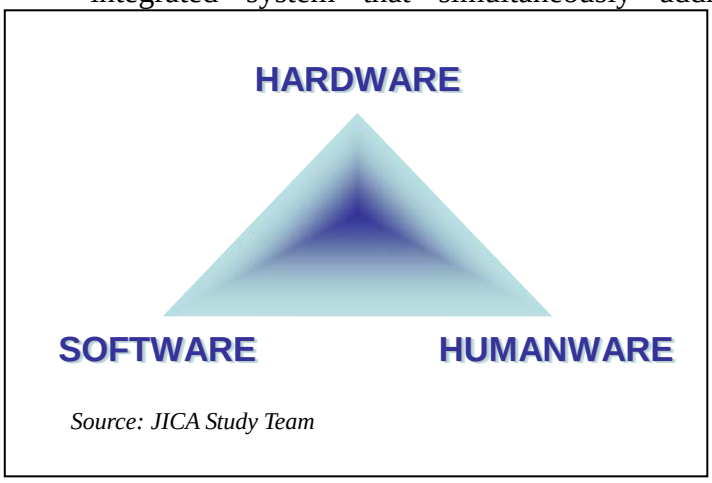

Figure 2.1.1 Integration Components

Program B also addresses the humanware component when it formulates plans and recommendations for the organizational as well as institutional reforms of the

[1] Prof. Dr. Gerhardt Muller: *Intermodal Freight Transportation - 4th Edition*; ENO Transport Foundation; 1999.

[2] A detailed discussion of the difference between intermodal public transport and integrated public transport systems can be found in Annex C of this report.

CTA and proposes the framework for a sustainable and dedicated training program linked with on the one hand the actual realization of the Supertram concept and on the other hand the planned reform of CTA.

This deductive process is detailed in subsequent chapters of this report, in particular Chapter 3, which deals with the hardware considerations of Supertram Line 1 and its supporting systems; Chapter 4, which focuses on software, in particular intermodal enhancements in the form of restructured feeder bus services, modal integration at key terminals and stations, as well as the realization of an integrated ticketing approach; and, Chapter 5, which addresses the humanware issues, in particular as related to the organizational and institutional reform of the CTA and the outline of the necessary training and re-training programs.

For purposes of further clarification, *Chapter 3, Volume IV* presents a broader perspective for key features of an urban transport intermodal and integrated system.

2.2 INTERMODAL FOCUS AND MODAL INTEGRATION

Program B of Phase II includes both the development of Supertram Line 1 and, within an appropriate catchment area, the restructuring of urban bus (in particular the CTA) operations. A common objective in both components is the ***improvement of public transport services***. Although the restructuring of CTA operations will contribute in achieving this goal, the ***intermodal and integrated perspective*** of Supertram Line 1 will be an important success-factor[3].

For that reason, intermodal efficiency of Supertram Line 1 received particular attention in addressing a number of critical issues:

- ***Infrastructure Integration*** In the formulation of the Supertram Line 1, particular attention is given to the intermodal components of engineering. This includes allowing Supertram Line 1 to interconnect at the technical level with other public transport services and infrastructure. But the focus in Program B did not remain limited to the technical integration. One important element that received particular attention, and that is directly related with the infrastructure is the stable frequency and speed of Supertram Line 1. Stability of frequency and speed is addressed at different levels. First, by ensuring that the alignment to be as much as possible segregated from other (private car) traffic and with priority for the supertram at road intersections whenever total segregation is seen as not being practical. Secondly, the design of each of the individual stops and terminals, in particular the designated intermodal terminals, was such as to meet the particular interconnectivity requirements at each location. Thirdly, the number of stops has been optimized to reflect the relationship between passenger activity, operating speed and system performance.

[3] Applying an integrated public transport perspective when designing Supertram Line 1, will not only contribute to the success of Supertram Line 1, but will also pave the way for a future expansion of intermodal services over the entire public transport system in the Greater Cairo Region. Supertram Line 1 will be an excellent test-case for evaluating different technologies, techniques and practices.

- ***Service Integration*** Time tables, ticketing systems and integrated fare structures should be organized in such a way that commuters are offered a simple and affordable system, making public transport attractive. Because high-risk capital investments should be avoided in the beginning, a paper-based and magnetic strip ticketing system will be proposed when initiating operations in year 2007. Software technology and automation can in a later stage be introduced, once the necessary expertise is available to control and operate an interconnected and automated ticketing distribution and validation system.

- ***Management Integration*** Interconnectivity to other public transport services is also a point of attention in developing Supertram Line 1 given that the management of the Supertram, independent of its structure, will have to cooperate with other bodies, responsible for the various public transport services such as the Metro and ENR. Component B-2 addresses (parts) of the managerial integration in the recommendations related to the restructuring of CTA. However, implementing the restructuring recommendations of CTA is only a part of the necessary measures at the managerial level. More importantly, a complete physical restructuring of the public transport sector will (ultimately) be necessary to achieve full public transport integration throughout the Cairo metropolitan area.

In summary, the efficiency of Supertram Line 1 will be optimized via the future development of a ***fully integrated intermodal public transport system***. This means that in the final design and during the development of Supertram Line 1, continued and specific attention will not only have to be paid to right of way for Supertram Line 1 and to the design of the intermodal terminals and stops, but also to the conditions and requirements for service integration and management efficiency.

Each of these components is previewed in following sections. More detailed information and analyses can be found in Chapters 3 through 5 of this volume.

2.3 THE RIGHT OF WAY

The alignment of Supertram Line 1 mostly coincides with that of the Madinet Nasr Line of the Heliopolis Metro and features a combination of fully segregated and partly segregated rights-of-way:

- The fully segregated section starts at Ramses Station and extends roughly as far as the western extent of Roxy. Tracks are independent from other transport infrastructure and no road crossings hinder the operation of the Supertram.

- The rest of the line is partially segregated and mostly located in the road median, separated from other elements of the traffic stream via curbstones or fences. The partly segregated section starts at Sayed El Merghany Street and continues to Madinet Nasr Terminal. This alignment will be further extended to the Ring Road Terminal (refer Chapter 3 of this report for a more detailed discussion).

Guaranteeing the operational speed of Supertram Line 1 is a critical success factor. In practical terms, this means that Supertam Line 1 should be separated from other traffic whenever and wherever possible.

Given the present high accessibility to the tracks, particular attention has been devoted to limiting this access for both pedestrians and vehicles of all kinds. This attention will not only contribute in guaranteeing operational speed of Supertram Line 1, but will also increase traffic safety within the corridor.

In finalizing the Supertram concept, two possible solutions were addressed:

- Keep the existing situation with segregated and partly-segregated alignment; or,
- Segregate, as much as possible, the alignment of Supertram Line 1.

The most efficient solution is to separate as much as possible the supertram from other vehicles and pedestrians along the entire alignment. This option requires finding individual solutions for intersections along the alignment. Three general solutions are available:

- Constructing flyovers and/or underpasses at the major intersections;
- Installing signal lights with tram priority schemes at medium sized intersections which accommodate modest traffic; and,
- Closing smaller intersections/slip lanes.

The first option is the optimal solution but it is at the same time the most expensive one. The solution has several advantages which can be taken into account when comparing the different options:

- *Mobility advantages*: there is no conflict between supertam and other traffic, thereby guaranteeing efficient and on-time travel of supertram and improving the traffic situation at intersections through which the current alignment of the Heliopolis Metro passes;
- *Environmental advantages*: the fully segregated option will reduce congestion at major intersections and therewith positively influence air pollution. It will also have a high positive impact on traffic safety but a price has to be paid in terms of aesthetics (flyovers).
- *Economic advantages* : the reduction in congestion will indirectly reduce time losses, hence generate economic gain. Because it is not necessary to control the intersections, operational benefits for Supertram Line 1 will also be achieved since there is no need for physical or automated control at intersections.

The second option of a partly segregated alignment requires rigid and permanent control/enforcement at the intersections to guarantee the operational speed of the supertram. Priority schemes need to be installed at all intersections and must be supported by effective and on-going enforcement. The system needs to give priority at all times to the supertram if it will guarantee the reliability of the service and boost attractiveness. In a first phase, the control and management can

be physically executed by specialized persons but in time, a real-time automated control system should be installed with a Supertram Priority Signal Control System.

In case of mixed traffic at intersections, the need for efficient intersection control with public transport priority systems has been clearly demonstrated in the EU-funded project TABASCO[4]. In that project, public transport priority was evaluated and the benefits for public transport and private traffic were clearly demonstrated. According to the study results, public transport journey times were estimated to be reduced by 10%, delays for public transport vehicles were reduced by 54%, and delays to passengers by 57%. Furthermore, public transport journey times were more reliable. It was estimated that for a network of 20-30 intersections, the benefit to cost ratio would be in the order of 19:1[5]. However, it should be noted that this demonstration project was executed under optimal conditions within a European transport environment where the level of control is very high and infrastructure users accept and follow automated controlling measures.

Closing intersections is the third solution, but is only applicable for minor intersections, slip lanes and cut-throughs. In case an intersection is closed, rerouting traffic has to be considered in order not to overly disturb traffic flows in the area.

2.4 INTERMODAL TERMINALS AND STOPS

In order to avoid excessive reductions in operational speed of the Supertram, the number of stops and terminals is limited to 19 along the entire alignment. The different locations are depicted in Figure 2.4.1, and discussed in detail in Chapter 3.

From an intermodal perspective, there are different terminals and stops according to their location and function[6]. Based upon their functional classification, the line will have four intermodal terminals and 15 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 (bus, tram, shared taxi and metro).

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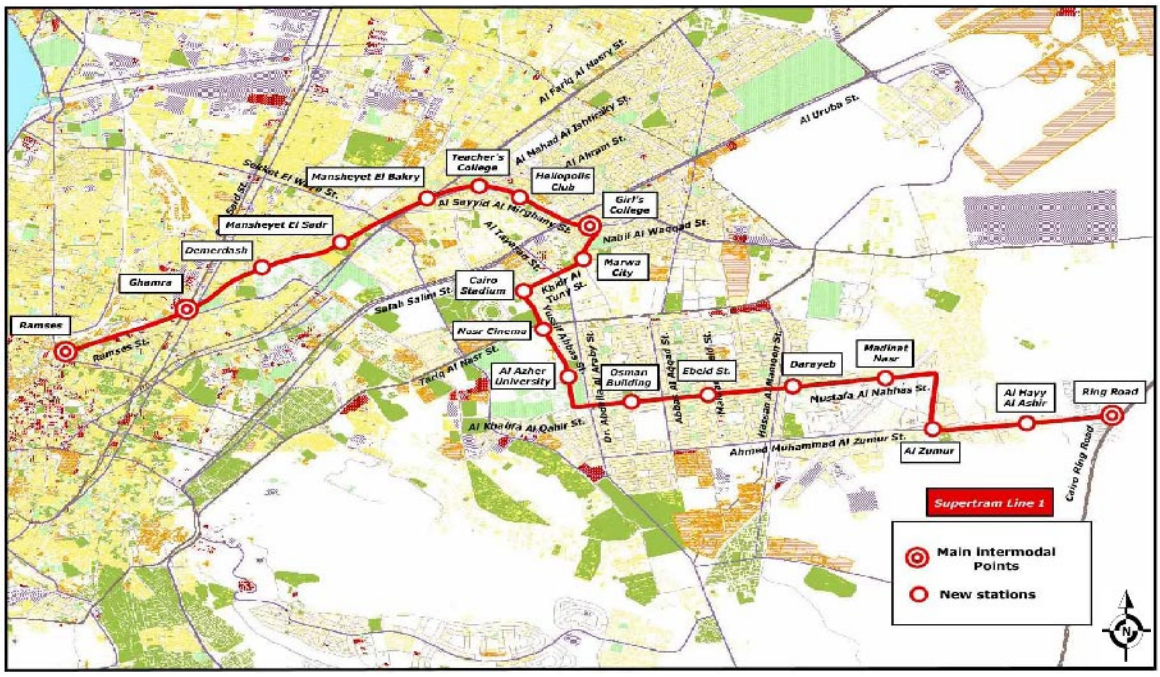
[4] *TABASCO* is a European demonstration project (Project number TR1054) involving multi-modal information and control systems as a contribution towards solving transport problems in cities and their surrounding regions. Demonstrations were performed in Munich, London and Glasgow.

[5] *Network and Traffic Management*: Final Area Report, CODE, Brussels, Feb 2000 p. 7.

[6] See for a more detailed discussion on the types of Intermodal terminals: *Transportation Master Plan and Feasibility Study of Urban Transport Projects in Greater Cairo Region in the Arab Republic of Egypt - Phase I Final Report, Volume III – The Transport Master Plan*, op. cit.



Source: JICA Study Team

Figure 2.4.1 Supertram Route Alignment and Station Locations

During CREATS Phase I, four types of intermodal terminals were identified. A *primary interconnecting point* constitutes a central point in the various public transport networks and incorporates all public transport services. A s*econdary interconnecting point* is similar to the primary type but the number of connections is less. A *network interconnecting point* links two different networks, for example the Cairo Metro to inter-city bus service. Finally, at the extremes of the Cairo public transport networks, there are the "*park and ride interconnecting points"*. These terminals offer the possibility to private vehicle owners to abandon their cars at secured locations and commute to their final destinations by public transport.

The four designated intermodal terminals of Supertram Line 1 and their functional classifications are:

- Ramses Terminal as primary interconnecting point;
- Ghamra Station as primary interconnecting point;
- Girl's College Station as secondary interconnecting point; and,
- Ring Road Terminal as park and ride interconnecting point.

In addition to the engineering components, each of these four terminals has been examined in detail based on their interconnectivity with other public transport systems. The final objective is to streamline Supertram Line 1 with the different available and future public transport services along the Supertram Line 1. Conceptual designs for the four intermodal terminals are presented in Chapter 4 of this volume.

The efficiency of intermodal terminals in terms of passenger transport is an important topic as demonstrated in European transport research programs. Various European studies demonstrated that as regards the intermodal terminal design and functioning, there is a general agreement across all stakeholders about the high importance of safety/security, information transfer to passengers and car parking facilities (park and ride). But some differences can also be noted, depending upon the stakeholders' position. Infrastructure design experts and operators emphasize the aspects of terminal layout, location and the physical quality of connections, while public transport users have more uniform concerns across all characteristics of interchange efficiency, with a particular focus on comfort and safety issues[7].

The next example demonstrates the importance of efficient intermodal terminals. The Chief Executive Officer of Greyhound, Craig Lentzsch, recently pointed out two different reasons why intermodal services for longer-distance trips are facing difficulties in the United States. The overall lack of well-located intermodal facilities is the first hurdle faced by companies that want to provide intermodal services. While bus and rail services are linked at a number of terminals across the nation, linkages with airports and urban public transport networks are fewer and at farther between-distance. Without more dedicated and adapted terminals, efficient intermodal services will, according to Mr. Lentzsch, be difficult to achieve in the United States[8].

2.5 INTEGRATED FARE POLICY AND TICKETING

2.5.1 Introduction

The discussion on integrated public transport in this report made clear that efficient public transport cannot be achieved with infrastructure development alone. When implementing Supertram Line 1, particular attention will have to be paid to

- Its function vis-à-vis higher-order systems such as the metro (mass rapid transit);
- The way operations will be linked with the CTA tram sister-system; and,
- The relationship with supporting feeder services by public bus and shared taxi systems.

In the *Final Report (Volume III)* of Phase I, three supporting measures were discussed that were considered critical success factors for the quality and the efficiency of the future public transport system for the Greater Cairo Region. These measures are:

[7] *PIRATE (Promoting Interchange Rationale, Accessibility and Transfer Efficiency)* is a European RTD project, funded by the European Commissions 4th Framework Research Program. It started in January 1998 and ended in the middle of 1999.

[8] Statements of Craig Lentzsch, Chief Executive Officer, Greyhound Bus Lines, July 27, 2000, taken from *Progress in Intermodal Passenger Transportation: Private Sector Initiatives*; Andrew R. Goetz and Timothy M. Vowles; 2000, Department of Geography and Intermodal Transportation Institute; University of Denver, USA

- Integrated fare policy and single ticketing;
- Integrated timetables as practical and possible; and,
- Internal and external information dissemination.

In the same report, it was also pointed out that these measures need to be supported by well organized and integrated managerial and operational structures, where staff at all levels has the necessary expertise to efficiently execute their individual tasks, aware of their role and importance in the integrated public transport system as a whole.

The idea of establishing integrated time tables, coordinated fare policies and single ticketing for public transport is not a new concept for Cairo. A detailed and clarifying study on this subject was conducted in the mid-nineties[9]. In that study, it was argued that a simplified and (better) integrated fare policy with single ticket options will make the public transport service more attractive to commuters. The study argued that in a first phase, integration could be achieved on specific corridors or for specific target groups. But the results also demonstrated that the concept should in time be expanded to cover the entire public transport system in the Greater Cairo Region.

In that view, the planned development of Supertram Line 1 represents an excellent opportunity to introduce and physically test such a scheme. A particular promising opportunity is linking of Supertram Line 1 and designated feeder buses, both of which (at present) are under the control of the CTA. Introducing an integrated system will not only generate high quality integration of the supertram (LRT) service with other public transport modes, but will also provide valuable expertise and know-how, therewith paving the way to gradually expand the integration concept to the entire public transport system.

2.5.2 Integration: The General Vision

Supposing that time tables between the Supertram and other (selected) public transport modes are integrated and coordinated, passengers should not lose time in stations and stops to purchase tickets for the connecting modes. Integrated fares and unified ticketing will therefore be(come) the software efficiency cornerstone of Supertram Line 1. The efficiency contribution of the integrated intermodal ticket is no longer doubted. Many studies demonstrated the effectiveness of this system for both operations and operators' revenues[10].

A recent study in Germany concerning efficient urban transport concluded in that respect: "…*attractive fares are just as important as an attractive urban transport infrastructure and good quality of service. Transport operators all over Germany have invested considerable efforts in the systematic and consistent development of their fare concepts. It is a well-known fact that the need to purchase single tickets*

[9] *Final Report: Greater Cairo Public Transport Fare Policy Study*; prepared for the Ministry of Transport, Transport Planning Authority, by Development Research and Technological Planning Centre (DRTPC), Cairo University in association with SYSTRA (Paris, France), December, 1995.

[10] See for a more detailed discussion: Attachment C to this report

each time they enter a train or a bus is a constraint preventing people from using public transport more frequently. Due to the negative economic impacts on public transport operators in terms of low fare revenues caused by this so-called "out-of-pocket effect", they seek to offer comparatively low-priced season tickets. Another very important strategy for minimizing the necessity of monetary outlays for passengers is to offer through tickets that are valid in all means of public transport in a given city or an entire metropolitan area. It is certainly not convenient for people to buy several tickets every day, e.g. first a train ticket to the main station, then an underground ticket, and finally a bus ticket, and then, in the evening, the whole thing vice versa. Buying a season ticket that allows the utilization of all different public transport vehicles in the range during its period of validity (usually one month) is much more suitable. This concept of integrated public transport associations with simple and clearly designed fare structures is nowadays commonly applied all over Germany and other European countries (e.g. Switzerland, the Netherlands, Denmark etc.)"[11].

But "*Urban transport exhibits a fundamental paradox. How can a sector with such an obvious excess of demand over supply and with such a heavy involvement of private suppliers of service fail so completely to meet the aspirations of both politicians and citizens? Why has it not been possible to mobilize commercial initiative to yield the kind of revolution in service quality and cost that has been achieved in the telecommunications, water, and energy sectors?*"[12].

According to the World Bank, "*Technical measures alone are unlikely to resolve the fundamental paradox of a sector's combining excess demand with inadequately financed supply. Improvements in the efficiency of roads, vehicles, public transport operations, and traffic management can undoubtedly improve the efficiency of urban transport. This will not be enough…. What is required, therefore, is an integrated package of strategies for infrastructure pricing, service pricing, and urban transport system financing, founded in well-designed institutions within an appropriate political framework*"[13], a conclusion that is also echoed in the most recent European public transport policy[14].

Integrated ticketing schemes can be found in Asia, the United States and numerous European countries, including East and Central European countries (e.g., Paris, Madrid, Brussels, Zurich, Vienna, Prague, etc.). Common in the approach is that in addition to the single ticket and passes, most of the operators gradually introduce automated ticketing services (ultimately via smart card technology) that include purchasing and ticket validation machines[15].

A particularly interesting example can be found in Luxemburg where integration of public transport is achieved at the country level[16]. A single ticket is operational

[11] *Urban Transport Strategy Review: Experiences From Germany And Zurich*, Deutsche Gesellschaft fuer Technische Zusammenarbeit, January, 2001; p. 32
[12] *Cities on the Move, a World Bank Urban Transport Strategy Review*, The World Bank, 2002.
[13] *Ibid*, p 18
[14] *Transport Green Paper: The Citizens Network*, European Commission; Brussels, 02/1996; *Transport White Paper: "European transport policy for 2010: time to decide*.
[15] See for a review of several examples Section 4.4 of this report.
[16] A brief discussion of modern integrated ticketing technologies, including additional examples in several

in the entire country on all national public transport networks. The basic integrated ticket offers limited access to the entire public transport network[17]. But also more elaborated tickets are available, for example the "*Oeko-Pass*" which is available at railway stations throughout the country, and at the airport. It covers unlimited travel on all forms of public transport (city buses, trains and country coaches) for one day throughout the country. The purchase price of a single ticket is 4.40 €. The ticket can also be purchased in a block of five tickets for a 20% reduction on single issue tickets. The "Oeko-Pass" ticket can also be used in first class accommodation (available on trains, but not on buses), by paying a supplement. Other forms of network tickets in Luxemburg include monthly tickets, where people over 65 years of age and large families can benefit from a reduction of 50%.

2.5.3 Integration: The Cairo Case

The realization of a balanced and multi-modal environment presents a continuing challenge for Cairo. Coordination among the different public transport modes and between public transport and private cars is minimal. Independent scheduling, uncoordinated route structure, and independent fare structures do not facilitate interchange among the various urban public transport modes. Thus, services tend to be duplicative leading to inefficient application of increasingly stressed resources. Two significant barriers seem to prevent such coordination. First, there is little institutional cooperation among the different agencies planning and operating public transport services. Secondly, current fare policies of the individual modes do not facilitate cooperation among the various operators. Fares and subsidy structures of the different modes are set in isolation of each other. A number of previous studies have addressed this issue, in particular the recently completed *Fare Policy Study*[18]. A number of relevant recommendations were developed jointly between that Study Team and providers of public transport services. These include, among other recommendations, a staged approach to achieving a degree of modal integration, fare optimization and joint ticketing strategies. Unfortunately, none of the recommendations have, to the CREATS Study Teams knowledge, been permanently implemented to-date. It is further noted that of the three major transport planning efforts carried out to-date in Cairo (based on data from years 1971, 1987 and 1998)[19], recommendations regarding public transport systems have not, by and large, been implemented with notable exception of the metro, a mode traditionally seen as being very capital-intensive (albeit warranted from a demand perspective). A further, if modest, success story is the result of the Cairo Metro Interchange Study[20], which examined physical, schedule and institutional integration for all urban modes in Greater Cairo. Based

countries and cities are provided in Attachment C of this report.

[17] The integrated ticket is valid for a period of one hour after validation

[18] *Greater Cairo Public Transport Fare Policy Study*; op. cit.

[19] *Greater Cairo Transportation Planning Study*, by SOFRETU, 1973; *Greater Cairo Region Transportation Masterplan Study in the Arab Republic of Egypt*, for the Government of the Arab Republic of Egypt, by Japan International Cooperation Agency, 1989; *Greater Cairo Public Transport Study*, for Ministry of Transport, National Authority for Tunnels, by Systra, August 2000

[20] *Cairo Metro Interchange Coordination Study*, by Development Research and Technological Planning Centre (DRTPC), Cairo University in association with SYSTRA (Paris, France), 1987.

on that study, the Sayeda Zainab Metro Line 1 Station was declared one of five Strategic Metro Stations for integration and it is now finally being built for that purpose, after years for legal effort for gaining the right of way.

Changing the existing fare structure was investigated during Phase I of the CREATS study and quantitative sensitivity analyses performed. The findings "…***imply that continuation of the current approach to providing public transport services will see a growing domination by private sector (shared taxi, cooperative minibus) services. Yet, findings also suggest that shared taxis and similar operations fulfill a valuable role and that, if properly integrated into an intermodal network, can provide a notable contribution toward meeting the mobility needs of Cairenes.***"

CREATS "***… findings carry three important implications for the public sector; namely that (a) the use of a common fare policy is likely beneficial in terms of ridership; (b) that a distance-proportional fare applied uniformly to all public operators can be a catalyst for increased ridership, and (c) that opportunities exist for increasing (commercializing) absolute fare levels with modest impacts upon ridership.***"

The CREATS study thus demonstrated the potential for fare change and fare integration, but also stressed that sufficient consideration should be given to the way integration is achieved and to operational and managerial conditions.

These conclusions confirm and complement the results of the *Fare Policy Study*, in which the need for fare changes in the Greater Cairo Region was made explicit[21]: "*Renovation of light rail (LR) system the tram (T) and Heliopolis Metro (HM) is very important. … When LR lines and services in GC are modernized, then a change in fare values can be realistically introduced*".

The proposed change in the fare structure of public transport also opened doors for introducing what the *Fare Policy Study* called "***multimode tickets***" which "… *for the first time mode integration in GC*". Although the study investigated multimode tickets (and passes) for metro and bus (and to some extent park and ride ticket), the ideas are valid at present also for supertram/metro, supertram/bus and even supertram/bus/metro, as already discussed during Phase I of CREATS, and in Chapter 4 or the current report. The multimode ticket and pass was examined in the *Fare Policy Study* and included both a multimode ticket and multimode pass. The fare principle that was proposed for multimode tickets/passes was the flat/sectional fare with a reduction for the multimode ticket as compared to the cost of two separate tickets. So there is a clear advantage for the users of public transport. Scenario testing indicated that there are also clear advantages for the operators that consist of increased ridership and higher revenues.

However, automatic ticketing (required for multimode tickets) "… *is not acceptable in the near future [and] … sharing revenues between operators is difficult without appropriate management structures*".

[21] *Greater Cairo Public Transport Fare Policy Study*, op. cit

According to the *Fare Policy Study*, the introduction of new tariffs and multimode tickets should be seized as an opportunity to:

- Improve the image of the bus, which might imply introducing buses with higher standards of comfort and enhanced transfer facilities;
- Offer users reduced overall travel time at an acceptable price;
- Rationalize bus and minibus networks by creating feeder lines, allowing significant savings in operational costs; and,
- Take better advantage of available capacity within the public transport network.

The *Fare Policy Study* provided and in-depth review of managerial, operational, legal and institutional consequences of introducing multimode tickets and passes, but stops short from arguing the need for a clear-cut re-organization of the public transport operators. This need is pursued more rigorously by CREATS, with detail presented in Chapter 5 of the current report.

2.6 INTEGRATED MANAGEMENT

2.6.1 Introduction

The CREATS Transport Master Plan emphasized the need to **integrate** the existing public transport services in the Greater Cairo region. The feasibility study for Supertram Line 1 under Program B (as well as the study for the development of the East and West Wing public transport system under Program A) can be considered as a first attempt to integrate the existing public transport offer with a new and innovative public transport service.

As already frequently discussed during this study, both Program A and Program B offer a real opportunity to analyze in detail the feasibility of public transport integration; to identify the conditions and requirements to achieve effective integration and to assess its impact on the public transport system.

In particular the feasibility study for Supertram Line 1 is the perfect opportunity to set out the path towards public transport integration and to test and evaluate technologies, techniques and structures which could be implemented on the Supertram Line 1 and in a later phase, imposed on the entire public transport system in the Greater Cairo Region.

This chapter has until this paragraph elaborated on the conditions for the efficient integration of Supertram Line 1 in the total public transport offer. But in addition to traditional hardware and software components, the Study Team also emphasized on many occasions the need for specific attention to the humanware component. The humanware component of the feasibility study focuses on two specific components which are closely related. The first point of attention relates to the restructuring of CTA. The second therewith related humanware component addresses in detail the organizational structure, the operations and the expertise of personnel necessary to efficiently operate Supertram Line 1.

The relationship between both components is important and obvious. First, the integration goal of Supertram Line 1 prompts the need for an efficient management structure and therewith associated expertise, capable of operating the new service. Independent whether a new managerial structure is established or whether the management of supertram service is integrated into the existing CTA organization, the new public transport service will require structural changes within the CTA organization as well as structural changes in the public transport system as a whole. Given that CTA is an important operator, responsible for various public transport services inside the Greater Cairo Region, it is logical that the process of structural change initiates with this organization and that the proposed changes are directly assimilated into the managerial and operational structure of Supertram Line 1.

2.6.2 Integrated Management: The General Vision

In a keynote address by the Director of Programmes and Studies of the International Union for Public Transport (UITP), Mr. Mohamed Mezghani expressed his vision on achieving efficient public transport:

"*In order to offer a genuine alternative to the car, public transport must be able to offer the most comprehensive and flexible service possible. In addition to increasing investment in public transport in such a way that it at least matches investment in roads, it is vital that integrated networks be developed between the various modes and various operators. In the eyes of users, the network must appear unique and offer total solutions. Whatever the number of operators or modes, guaranteeing the network's physical and operational continuity, a single ticketing system and a single source of information about timetables and services are vital elements. Recent developments in terms of information and communication technologies should favour the integration. The ultimate goal of integration is to facilitate public transport use. To do this, the system in its entirety must be efficient, not just each individual component. Consistency between the various modes and intervening parties is therefore vital. This raises the issue of how institutions coordinate urban mobility. Institutional coordination is vital since without it there can be no lasting integration. The integrating body, be it the organising authority, main operator or a third-party organisation, must have the means to ensure the transport system's oneness and continuity in partnership with all actors in order to achieve seamless mobility at all levels: physical, operational, fares, information, and so on. This is the price to be paid in order to safeguard the quality of life in our cities, and public transport has the opportunity to play a central role in producing urban spaces that are fit for people to live in.*"[22]

As a critical condition, Mr. Mezghani argued that consistency between the various stakeholders is vital and a critical condition for lasting integration. He further made a case that this consistency requires institutional and organizational coordination. According to Mr. Mezghani, a single (integrated) responsible body

[22] *From Public Transport to Integrated Mobility*, Mohamed Mezghani, Director of Programmes and Studies of UITP, Belgium, in Public Transport International, 2/2003.

should be operating with the necessary means to ensure the transport system's oneness and continuity in partnership with all bodies.

The integrated approach is implemented in an increasingly larger number of cities in both the developed and developing world[23], and should consequently be adopted by the public decision makers in Cairo as ultimate goal for the future public transport system.

The reason why the humanware component is integrated from the beginning in the feasibility study for Supertram Line 1 can be best explained by the words of Sharon Curciarello of the United Nations Department of Economics and Social Affairs: "*The current system of assessing a future transportation infrastructure project is largely based on the financial implications of implementing the project, and categorises any other areas of impact, such as environmental and social, into an externalities group. The problem with this process is that these externalities are only considered in the final stages of the assessment process and therefore the impacts of implementing a transport infrastructure project upon these areas are not fully accounted for within the design stages. Ultimately this often results in negative impacts upon important areas such as … social well-being*."[24]

The above observation clearly expresses the vision that when designing transport systems (including public transport), it is imperative to consider human expertise and management efficiency from the start of the process, in other words from the first stages of the feasibility study. Without efficient management and therewith related human expertise, the Supertram Line 1 will, according to the above vision, underachieve and therewith reduce the overall benefits of the necessary investments.

The Study Team considered it therefore imperative that the way Supertram Line 1 will operate was considered from the beginning and therefore paid equal attention to the hardware, humanware and software components of Supertram Line 1.

2.6.3 Integrated Management: The Case of Supertram Line 1

Managing Supertram Line 1 will require considerations both at the organizational level and the operational level, and particular attention will have to be devoted to the expertise building requirements at both levels.

A first study of this kind in Egypt was attempted in 1995 during the Greater Cairo *Public Transport Fare Policy Study*[25]. That study evaluated the potential of introducing a new fare policy and integrated ticketing system for public transport. The study rightly paid substantial attention to non-hardware implications of such important change and consequently, analyzed the managerial implications and formulated recommendations for necessary managerial and operational changes.

[23] See Attachment C for additional details

[24] *Multi-Criteria Integrated Transport Assessment*; S. Curciarello, paper presented at 4th Global Forum on reinventing government, Panel 4; November 2002; United Nations Department of Economics and Social Affairs.

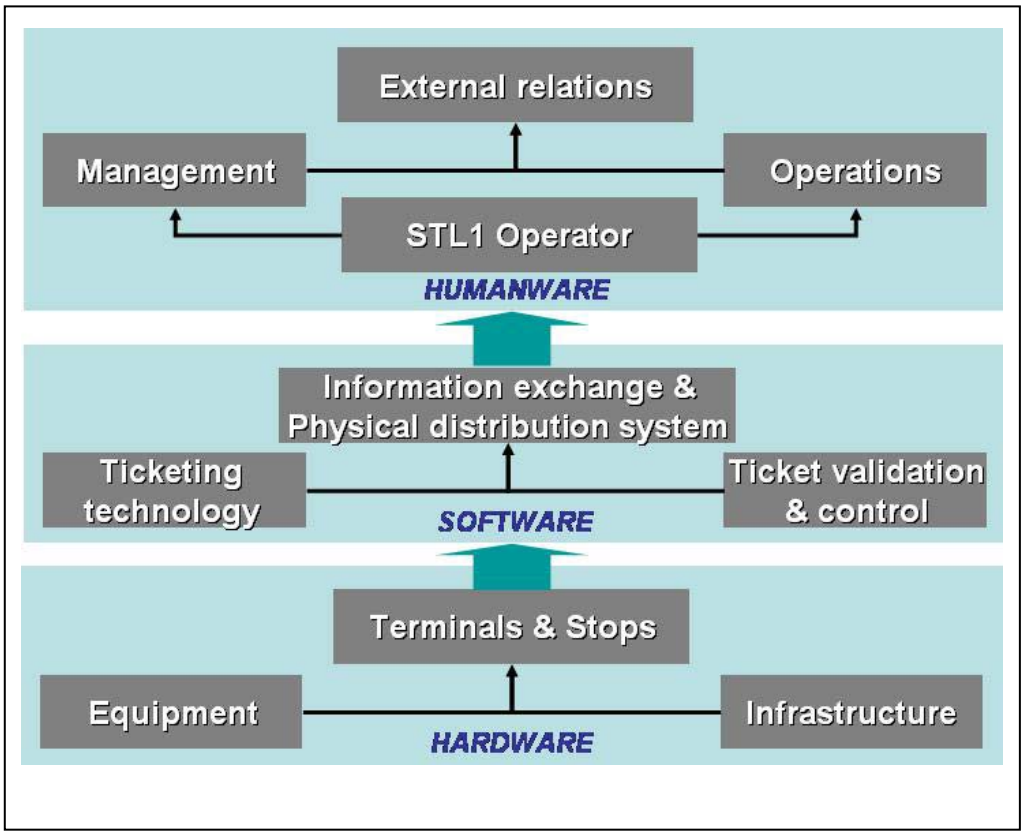
[25] *Greater Cairo Public Transport Fare Policy Study*, op. cit.

Drawing upon these important results and taking into account the conditions for in time integrate Supertram Line 1 into the total public transport offer; the managerial and operational conditions to operate and manage the supertram will be investigated during the feasibility study. The results of this assessment will directly contribute to identify human expertise building needs. This integrated and comprehensive approach is depicted in Figure 2.6.1. As is clearly shown, the humanware component constitutes an integral part of the Supertram Line 1 project and builds upon decisions taken at the level of the hardware and software. Given that both hardware and software technologies have been selected, a new and innovative managerial structure to operate Supertram Line 1 is indispensable. The future operator, its managerial and operational structure as well as its relation to other public transport service providers thus needs to be clearly defined if the supertram will ever become a success. This issue is further addressed in Chapter 5 of this volume.

The framework of managerial change depictured in Figure 2.6.1, and the consequent human resources building requirements can be summarized in the three "A" principles of public transport efficiency:

- Accessible: The accessibility to the system is a critical factor and requires efficient links between the different public transport offers. The efficiency of the links is not only determined by the equipment used, the infrastructure and the location of stops and terminals, but even more by the way people can transfer from one mode to another without difficulties. The latter refers to the ticketing and timetables which have to be integrated to minimize delays at transit stations. Introducing these technologies requires adapted managerial and operational structures which can only function efficiently if the necessary expertise is available at all relevant levels.

- *Affordable*: The new system has to be affordable for both the users and the operator(s). The former needs to be attracted to the service via a good price setting, the latter needs to provide a service which is economically and financially feasible; in other words, fiscally sustainable. From a managerial and operational perspective, this means that the introduction of new technologies and services should not generate a need for additional resources, but should be complemented by managerial and operational reforms that allow personnel to be re-allocated to the new service. Consequently, the overall burden of personnel can be reduced in spite of the increase in services.



Source: JICA Study Team

Figure 2.6.1 Analyzing the Managerial Framework

- *Acknowledgeable*: An efficient public transport system can only be successful if public transport users are aware of the services and are convinced that it offers a reliable and efficient way of transport. Information to the public is therefore an important element of success. This information relates not only to the launch of new services, but more importantly, to the way the individual components of the public transport system operate and are integrated into the total public transport offer. Timetables, network schemes and other user information are therefore necessary to assist commuters in using the supertram during their travel as an integrated public transport mode. Although not evident, managerial and operational efficiency is also in this domain a critical factor and will depend upon the efficiency of managerial and operational control over both individual operations and the public transport system as a whole.

In order to identify optimal operational conditions for Supertram Line 1, the feasibility study therefore considers simultaneously and in a coordinated manner the hardware (infrastructure, equipment and intermodal terminals), the software (integrated ticketing and routing as well as timetables and information management) and the humanware components (integrated management and operations, personnel allocation and re-allocation, expertise building).

2.7 HUMAN RESOURCES DEVELOPMENT

It has been frequently repeated in previous paragraphs that the level of expertise of personnel is a critical success-factor at all operational and managerial levels. This issue is frequently overlooked when developing public transport systems, in developing countries causing in many cases new systems to operate below capacity.

This is particularly true when developing rail-based public transport infrastructure. "*It should be noted … that institutions for urban transport policy making and administration are relatively weak in developing countries. There is a lack of sufficient staff with technical and financial competency in both the public and private sectors. Policies are often not well coordinated; bus services may compete with railways. … Public railway management is not very efficient, and in most cases, operating costs are not recovered… In the face of these constraints, strategies for the development of urban rail in developing countries may include: (i) involvement of the private sector (domestic or foreign) to introduce technology and efficient management, although public financing of railway construction may be necessary if private sector undertakings are to be financially viable; (ii) granting of property development rights along the corridor to cross-subsidize part of the railway construction cost; (iii) improvement of existing rail system by removing level crossings, and construction of intermodal transfer facilities; (iv) securing of rail rights-of-way at an early stage of urbanization—the right-of-way can be used, for example, for a dedicated busway until demand warrants the construction of a fixed track system; and (v) provision of technical assistance to promote policy coordination and training of staff capable of planning, design, and public financing.*"[26]

As clearly expressed above, policy coordination and training of staff are important and integrated components of a successful public transport development strategy. The Padeco Study provides several examples of successful public transport development initiatives and each of these examples includes a component related to human resources development and expertise building, in addition to a wide range of technical, technological and managerial issues.

The CREATS approach in this feasibility study follows the same principles and pays the necessary attention to the human factor, both in terms of managerial and operational efficiency and of available know-how and expertise building. In Chapter 5 of the report, attention is therefore paid both to the restructuring of the CTA and defining an organizational structure for the supertram company. Recommendations for change are formulated with the objective of increasing efficiency and improving quality while reducing at the same time operational and managerial (overhead) costs. The framework conditions for sustainable human resources development are also investigated. These framework conditions do not only consider the direct needs in terms of expertise building and know-how, but also relate these training programs to relevant indirect issues such as the effects of

[26] *Study on Urban Transport Development - Final Report*; Padeco Co. Ltd, Japan, August 2000, , Chapter I, p. 19

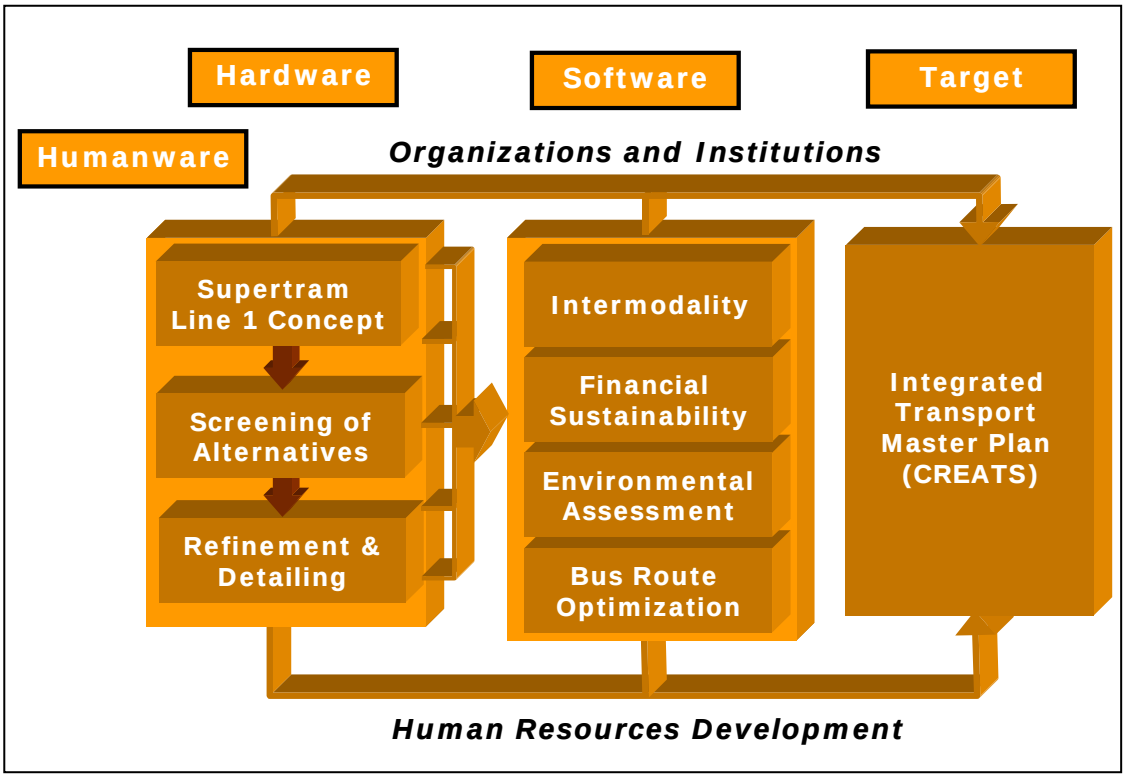
the restructuring program for CTA and the need in time for total integration of the public transport system in the Greater Cairo Region.

CHAPTER 3

A NEW ROLE FOR THE HELIOPOLIS METRO

CHAPTER 3: A NEW ROLE FOR THE HELIOPOLIS METRO

This chapter sets forth recommendations regarding a new role for the Heliopolis Metro, with a particular view to Supertram Line 1. The underlying analytical approach is based on a series of interrelated and cascading work tasks which combine core requirements of hardware, software and humanware (Figure 3.0.1).



Source: JICA Study Team

Figure 3.0.1 Integrated Analytical Framework

Several points are noted in this regard:

- First and foremost, the CREATS Transport Master Plan, and the multi-modal projects as well as programs it embodies, serves as both the basis within which the supertram concept is defined, as well as the target in terms of providing a modal opportunity that meshes with an integrated transport strategy.

- Supertram Line 1, the hardware element, has its roots in the Phase I Master Plan. During the course of Phase II feasibility investigations, a series of "bookend" alternatives were first defined and screened using such parameters as technology, alignment, stations, demand, costing and revenue. Results of the screening process are presented in Sections 3.1 through 3.4 of this chapter. Following extensive discussions with committees associated with the current study, local experts and various governmental entities, a preferred concept evolved which was refined and detailed as presented in Section 3.5. It is noted that three over-riding preferences were conveyed to the Study Team; namely, that the supertram concept should rely on maximized segregation from road traffic at major intersections along its alignment (hence, by implication, a minimum reliance on enforcement); that the concept should be realistic from a capital cost point of view; and, that supertram operation should be financially sustainable. These concerns are fully integrated with technical efforts documented in Section 3.5.
- Supertram Line 1 is also seen from the software perspective. These investigations, documented in Chapter 4, pertain to optimized bus operation within the supertram catchment area, a strategic re-orientation of shared taxi operations, conceptual design at major terminals such as Ramses, Ghamra, Girl's College and Ring Road stations, as well as intermodal concepts such as integrated ticketing
- The final ingredient relates to humanware. These analyses are presented at various levels of detail. Initially, an organizational and institutional reform framework is defined for the CTA. Subsequently, an organizational plan for Supertram Line 1 is defined based on a public-private partnership approach to the provision of public transport services. The supertram organization, conceived within the umbrella of the CTA, can be seen as a staged element along the path to full CTA commercialization. A human capacity building program, with the intent of developing a cadre of dedicated professionals capable of operating more complex modes of transport such as the supertram, is also defined. Humanware elements are presented in Chapter 5 of this report.

It must further be stated that several of the recommendations promulgated in this volume are dependent on political will. Those technical adjustments in transport practices which require changes in current policies or regulations can only be realized if political will for such change exists at appropriate levels of Government.

- Thus, in the final analysis, the impetus for implementation of Supertram Line I, and its related projects and programs, rests with the Egyptian people and those persons elected to lead them.

The Study Team is confident that appropriate action will be taken.

3.1 EXISTING TRAM NETWORK

3.1.1 Supply

Heliopolis Metro currently operates six tramway lines. The characteristics of these lines are shown in Table 3.1.1. The average commercial speed of all the lines is approximately 15 km/h under optimal operating conditions. In practice the speed is however closer to 12 km/h in average due to regular interferences of cars on the tracks.

The rolling stock capacity of the Heliopolis Metro is 550 persons per tram, among which 144 are seated and 406 are standing (7 pers/m^2). As the average peak-hour headway of the trams is 15 minutes, the maximum available capacity in each direction is 2,200 passengers per hour. The potential capacity is however 11,000 pass/h/direction when considering a minimum headway of 3 minutes, which is readily obtainable for a tram system.

Table 3.1.1 Year 2003 Heliopolis Metro Line Characteristics

Line	Line Name (origin / destination)	Length (km)	No. of stops (*)	Average distance between stops (m)	Average comm. Speed (km/h)	Rounds per day	Average peak and off peak hour headway (min)	Average delay (min)
1	Nozha – Ramses Sq.	15.93	38	443	17	54	12/15	10
2	Merghany – Ramses Sq	12.40	16	653	17	52	12/15	10
3	Abd Aziz Fahmy – Ramses Sq.	11.32	17	596	17	52	12/15	10
4	Madinet Nasr – Ramses	18.16	29	586	15	42	20/25	20
5	Almaza – Ramses Sq.	12.50	22	568	17	28	20/25	10
6	Almaza – Matareya Sq.	6.70	17	394	15	65	15/20	20
Totals and averages		77.01	141	540	16	293	15/19	13

Source : Heliopolis Metro

According to European standards the potential capacity of the Heliopolis Metro would be approximately 7,520 pass/h/direction, based on the norm of 4 standing passengers per m^2.

Delays of the system are considerable. In case of line 4 and 6, the noted average delay is 20 minutes. Basically, this means that the services are totally unreliable. Much of this is attributed to dilapidated equipment, and interference from road vehicles at intersections, where traffic operations tend to be largely chaotic. It is no surprise that ridership on this attractive mode continues to suffer given such operating externalities.

Important problems such as low commercial speeds and bad comfort could be improved, on the one hand by reducing the number of stops, and on the other hand

by replacing the rail infrastructure, which is very irregular, and by renewing the rolling stock.

3.1.2 Demand

The ridership of the Heliopolis Metro network is shown Table 3.1.2.

Table 3.1.2 Heliopolis Metro Network Demand

Line Number	Line Name (origin / destination)	Average number of passengers per day	Average occupancy rate
1	Nozha – Ramses Sq.	23,717	14%
2	Merghany – Ramses Sq.	23,253	16%
3	Abd Aziz Fahmy – Ramses Sq.	25,664	18%
4	Madinet Nasr – Ramses Sq.	15,537	12%
5	Almaza – Ramses Sq.	9,588	11%
6	Almaza – Matareya Sq.	13,055	7%
Total and average		110,814	13%

Source : Heliopolis Metro, year 2000 operations.

The five tramway lines which serve Ramses carry in average 19,552 passengers per day, which normally would correspond to a load of approximately 2,000 passenger per hour and per direction on the most loaded section during the peak hour. This figure is below the before mentioned maximum load of 2,200 passengers/hour/direction. However, as they are radial lines, the loadings related to commuting accumulate in the tramway vehicles as they approach Ramses Station, which is one of the main public transport attraction areas in Greater Cairo. The tramways thus obtain a very high peak load and are in reality completely packed during the rush hour at Ramses Station.

Refer also to Table 3.1.5 for peak period ridership at each Line 4 station.

3.1.3 Technical Characteristics

The principal technical characteristics of the fleet are as shown in Table 3.1.3. The rolling stock was made by Mitsubishi over 20 years ago. Only 9 out of 47 tramways are below 15 years age within the Heliopolis Metro and none are less than 10 years. The technical characteristics are good but the vehicles are totally worn down due to lack of maintenance and should be replaced although they normally should have lasted 35 years, which is the standard life expectancy of a tramway. The comfort is therefore minimal and the attractiveness of the system very low.

Table 3.1.3 Heliopolis Metro Fleet Characteristics

Item	Value
Total fleet	47 trains of 3 cars (37 in operation)
Average age of fleet	Over 20 years
Capacity per train (7 pass/m^2)	550 passengers : 144 seated and 406 standing
Total length	50 m.
Maximum theoretical speed	65 km/hour
Formation	3 units per train
Acceleration	1.1 m/s²
Deceleration	1.0 m/s²
Traction	Dual electrical and diesel

Source : Heliopolis Metro

The principal infrastructure characteristics of the network are shown in Table 3.1.4

Table 3.1.4 Heliopolis Metro Network Characteristics

Item	Value
Gauge (width)	1000 mm
Voltage	DC 600 V
Number of lines	Six
Length of the physical network	60 km (entire Heliopolis network except Esko – Matareya section) 7.2 km (fully segregated) 51.3 km (semi-segregated 1.5 km (mixed)

Source : CTA

According to Heliopolis Metro, there are considerably technical problems in Madinet Nasr due to recurrent power shortages, which influence the regularity of

the tram and decreases the average commercial speeds. However, the situation might soon improve as a new power station is planned.

3.1.4 Characteristics of the Fixed Installations

(1) Gauge System

The present tram network in Cairo is built to a 1,000 mm (meter) gauge. One of the issues regarding Supertram is whether to retain meter gauge or change to standard gauge (1,435 mm). In Europe, standard gauge has become the norm; however, meter gauge is more prevalent in some countries, among them Japan. The gauge issue will be discussed in more detail in a later part of the study. It must be noted, however, that gauge is not the core issue regarding the realization of Supertram; both gauge options are likely to function effectively, and selection can ultimately be guided by externalities such as provider and cost. However, it must be accepted that Supertram requires a state-of-the-art technology, which suggests, in the first instance, a largely whole-sale replacement of existing tram system assets.

Providing efficient intermodal connections solves the question of interoperability with both the existing tramlines and eventual future Supertram lines. This issue is examined in more detail in a subsequent section.

(2) Station Locations and Naming Convention

The existing stations and distances on Heliopolis Metro Line 4 (Ramses-Madinet Nasr, which coincides with Supertram Line 1 alignment) are shown in Table 3.1.5. As expected, heaviest peak hour passenger activity is noted at Ramses Stations, where five of six Heliopolis Metro lines currently terminate.

Presently, the average station spacing is 630 meters, which is clearly not sufficient for a higher capacity transport system where the speed is a key factor. It should be noted that people in general are prepared to walk up to 800 meters to reach their transport mode, which leads to a median station spacing of 1,130 meters. Using this longer station spacing will allow for maximizing the commercial speed of the Supertram system.

The restructuring of the CTA buses with the aim to feed the Supertram line will provide for the elder and disabled people that eventually feel that the stations are too far away.

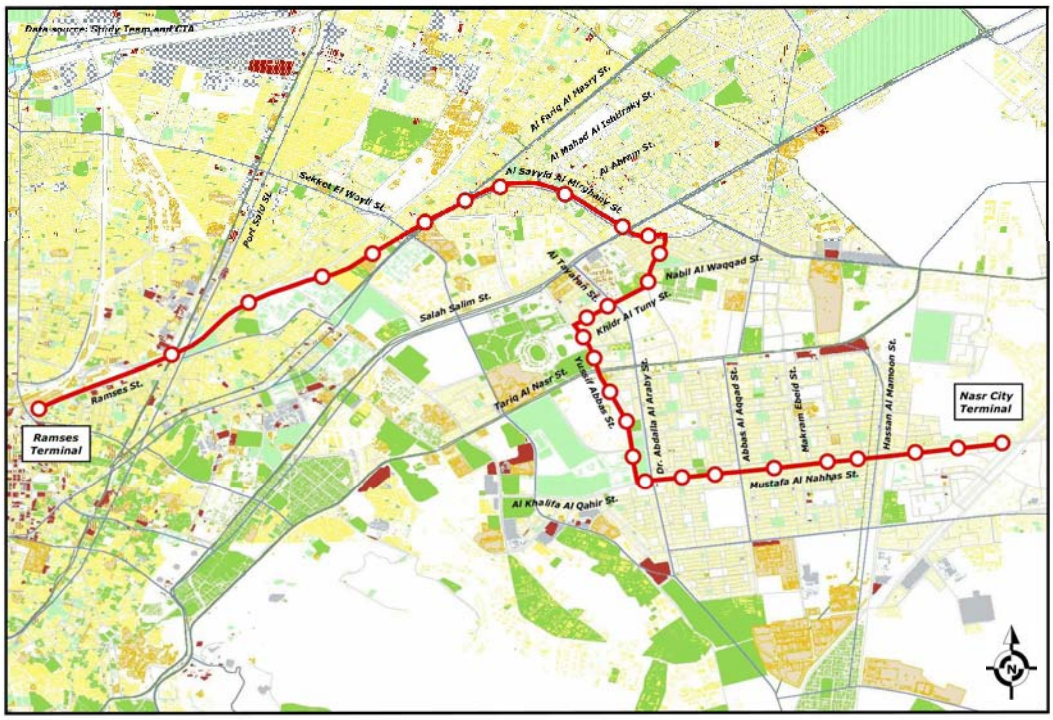
The locations of the present stations of the line 4 in the Supertram corridor are shown in Figure 3.1.1.

Table 3.1.5 Heliopolis Metro Stations and Ridership: Madinet Nasr Line

Station Number and Name[1]			Chainage (km)	Peak Periods Pass Activity [2]			
No.	English Naming Convention	Arabic Naming Convention		Outbound		Inbound	
				On	Off	On	Off
1	Ramses Terminal	Ramses Terminal	0.00	13,260	0	0	7,160
2	Ghamra	Ghamra	1.72	3,579	610	405	2,944
3	Demerdash	Demerdash	1.09	1,004	595	176	635
4	Mansheyet El Sadr	Mansheyet El Sadr	1.21	1,471	2,379	1,879	1,452
5	Qobba Bridge	Kobry El Qobba	0.81	513	357	356	650
6	Mansheyet El Bakry	Mansheyet El Bakry	1.51	868	695	727	698
7	Teacher's College	Koleyet Moallemeen	0.87	2,862	2,513	1,769	795
8	Khalifa Mamum Street	Khalifa Mamum	0.18	852	527	194	453
9	Heliopolis Club	Nady Heliopolis	0.40	394	529	258	472
10	Orooba Street	Orooba	0.77	130	537	468	107
11	Girl's College	Koleyet El Banat	0.35	110	2,989	1,028	803
12	Ard El Golf	Ard El Golf	0.34	590	741	436	1,009
13	Marwa City	Marwa City	0.43	146	189	101	145
14	Tayaran Street	Tayaran Street	0.50	190	657	661	160
15	Cairo Stadium	Cairo Stadium	0.64	185	476	54	119
16	Madinet Nasr Company	Nady El Zohoor	0.30	149	169	134	131
17	CAMO	Rabaa El Adaweya	0.30	319	445	468	283
18	Nasr Cinema	Cinema Madinet Nasr	0.59	42	97	73	56
19	Taaminat Hospital	Taameen El Sehhy	0.38	36	338	132	74
20	Azhar University	Gameat El Azhar	0.30	107	368	193	75
21	Islamic Faculty	Koleya El Eslameya	0.48	182	863	842	150
22	Al Hay El Sabea	Al Hay El Sabea	0.28	585	208	357	261
23	Osman Building	Masaken Osman	0.52	150	201	126	173
24	International Park	Abbas El Aqqad	0.43	239	575	352	178
25	Ebeid Street	Makram Ebeid	0.62	111	775	427	119
26	Haramein	Haramein	0.54	130	187	133	102
27	Darayeb	Darayeb	0.77	186	826	763	144
28	Manhal	Manhal	0.68	61	291	260	17
29	Madinet Nasr Terminal	Madinet Nasr Terminal	0.61	0	465	396	0
Total length of line (km)			**17.62**				
Average distance between stations (km)			**0.63**				

(1) Source: CTA (Arabic naming convention).

(2) Source: JICA Study Team, April 2003. Combined morning (0700 to 1000) and afternoon (1300 to 1600) weekday peak period counts. Outbound is Ramses Station to Madinet Nasr Station. It is noted that the number of operating lines at the stations varies from five at Ramses Station to one at Madinet Nasr Station.



Source: JICA Study Team and CTA

Figure 3.1.1 Heliopolis Metro Stations: Madinet Nasr Line

(3) Track Alignment and Existing Constraints

Two types of right-of-way already exist on the major part of line 4, which is to become the Supertram's route alignment. They are as follows :

- At grade or retained cut with lateral right-of-way without any road conflicts between Ramses station and Abdel Al-Magid Salim bridge (Figure 3.1.2),
- At grade with central segregated right-of-way crossing road intersections between Abdel Al-Magid Salim Bridge and the Madinet Nasr terminal (Figure 3.1.3).

At grade lateral right-of-way

Retained cut lateral right-of-way

Figure 3.1.2 Right-of-way between Ramses Station and Abdel Al-Magid Salim Bridge

Figure 3.1.3 Typical central Right-of-way between Abdel Al-Magid Salim Bridge and Madinet Nasr Terminal

The major constraints met along the Supertram line 1 alignment are listed in Table 3.1.6.

Table 3.1.6 Supertram Line 1 Route Alignment Constraints

Supertram line Sections	Road intersections	Others
Ramses station to Heliopolis sporting Club	• Khalifa El Maamoon/Merghany	 Water infiltration
Heliopolis sporting Club to Cairo Stadium	• Merghany / Khed El Toony • Khedr El Toony / Tayaran • Khedr El Toony / Yoosef Abbas	Interfaces with Metro line 3 and Supertram 2 to be integrated
Cairo Stadium to Madinet Nasr	• Nasr Road / Yoosef Abbas • Yoosef Abbas / Khalifa El Qaher • Aly Ameen / Sheikh Mahmoud Shaltoot • Aly Ameen / Abbas El Aqqad • Mostafa El Nahhas / Makram Ebeid • Major intersection with ST3	Major utility located under the right-of-way between Makram Ebeid and Madinet Nasr Terminal
Madinet Nasr to New Cairo (Cairo Ring Road).	• Intersection with arterial roads linking New Cairo	Street refurbishing

Source: JICA Study Team

3.2 TECHNICAL FEASIBILITY OF SUPERTRAM LINE 1 ALTERNATIVES

3.2.1 Objective

This study outlines the alignment and operation characteristics as well the costs and advantages of the Supertram line 1. This is done in order to evaluate at a more global level the interest of the proposed Supertram alternative in Greater Cairo.

In this feasibility study we will analyze two types of alignments for the Supertram system : partial segregation and full segregation.

3.2.2 Background and Description

An important finding of the CREATS Master Plan was the need for introducing three Light Rail Transit Lines (LRT), called the "Supertrams". These systems are planned to revitalize the deteriorating tram system of Heliopolis Metro, and will take advantage of the present invaluable right-of-ways in an optimal way. This will be achieved with modern LRT rolling stock, operating in as extensive segregated tracks as possible. The Supertrams will hereby offer the low headways and high speeds that are required for meeting the important transport demand identified in various corridors of the Heliopolis Metro network.

The analysis of the demand flows in Cairo in 2012 and 2022, in the Phase I Master Plan, led to the identification of the following lines :

- Line 1 : Ramses Square – Roxy - Madinet Nasr – Ring road (with extension plans to New Cairo),
- Line 2 : Sheraton – Nozha – Uruba – Salah Salem – Ataba station,
- Line 3 : Madinet Nasr – Heliopolis – Port Said Street.

Supertram line 1 was chosen as the priority line for Phase II investigations and involves a complete modernization of the current line 4 of Heliopolis Metro. This line runs from Ramses Square via Heliopolis to Madinet Nasr and ultimately ends by the Ring Road at the border of New Cairo.

There are six major incentives for considering Supertram line 1 :

1. **Respond to the demand.** The Supertram line 1 corridor is forecast to carry the heaviest traffic loads on the tramway network in 2012 and 2022, as well as having a good overall coverage of population, employed, students and mixed income areas.
2. **Serve New Cairo.** The Supertram line 1 alignment can be extended to New Cairo, in coherence with the plans of CTA and the MHUUC to achieve the same goal with the present line 4 of Heliopolis Metro.

3. **Capitalize the existing right-of-way.** The Supertram line 1 will bring to a halt the continuous suppression of Heliopolis Metro right-of-ways, which due to poor exploitation, are losing grounds under the pressure of the increasing car traffic. The right-of-ways represent invaluable capital for the future development of a LRT network in Cairo.
4. **Make operations profitable.** Thanks to the extensive right-of-way in the Supertram line 1 corridor, a high-quality transport system can be obtained at a very low cost. With the proper management, the Supertram line 1 has sufficient attractiveness for creating a profitable business.
5. **Integration.** The Supertram line 1 allows for good interchanges with all existing and planned metro lines, CTA buses, in addition to a park & ride facilities for commuting to the city centre.
6. **Repeated history.** Last but not least, the Supertram line 1 project strongly resembles that of a previous success story in Cairo : Metro line 1, which was the result of a complete modernization of a deteriorating rail line.

The above incentives will need to be established and thus lead us to the present feasibility study of the Supertram line 1.

The Supertram line 1 description, street by street, is provided in Table 3.2.1.

Table 3.2.1 Supertram Line 1 Alignment

Supertram line Sections	Route description	Length (m)
Ramses station to Heliopolis sporting Club	Ramses square→ Ramses street along Metro line 1 till intersection with Port Said street→ Ahmed Lufti El Sayed street till intersection with Ismail El Fangary street → Sayed El Merghany street	7,790
Heliopolis sporting Club to Cairo Stadium	Sayed El Merghany street till its intersection with Khedr El Toony street → Khedr El Toony street its intersection with Yoosef Abbas street (in front of the Cairo Stadium)	3,030
Cairo Stadium to Madinet Nasr	Yoosef Abbas street (in front of the Cairo Stadium) till its intersection with Khalifa El Qaher street → Aly Ameen street → Mostafa El Nahhas street till Madinet Nasr (Existing terminal).	6,800
Madinet Nasr to New Cairo (ring road).	Madinet Nasr (Existing terminal) → Maspero → Ring road (New Cairo intermodal interface)	4,380
Total		**22,000**

Source: JICA Study Team

On a technical and operational level, the main advantages of upgrading the existing Heliopolis Metro network into a LRT, are as follows :

- The track represents an irreversible investment in local transport infrastructure and becomes a positive factor in long-term land use planning. Tramways are in a similar class to railways in this respect.
- The Supertram will represent a major improvement in the overall supply level (time, comfort and safety) compared to the existing tram system
- The balance of high infrastructure costs and low running costs favors long operating hours and as fast and frequent a service as possible.
- A predictable rail-guided path gives safe operation in pedestrian areas and gap-free level boarding at stops.
- Rail guidance leaves virtually no gap at a level loading platform, making access easy for all users, in particular disabled people.
- The smooth running surface allows a high proportion of standing passengers in safety, which maximizes profits during peak times.
- The track layout may be planned to avoid traffic jams and thus results in a more reliable service.

One of the most important advantages of the LRT is its low operating cost compared to that of a bus, especially for higher passenger volumes. The LRT allows for increasing the capacity more cost-effectively, and attracts more passengers than buses, for a given level of service due to better speed, safety and comfort.

Furthermore, the LRT can be coupled in trains, usually between 2 and 4 cars in length. This allows for significant cost savings as only a single train and operator is required for carrying many passengers, instead of many bus drivers.

3.2.3 Configuration of the Supertram Line 1

(1) Station Relocation

The achievable running time is determined in an important degree by the number of stations to be served and by their average spacing. High acceleration/deceleration capabilities help to mitigate (but can never eliminate) the impact of frequent station stops. Preliminary studies indicate that station spacing on the Supertram system will vary from 580 meters in dense areas to 2.3 kilometers on the section parallel to Metro Line 1.

Supertram Line 1 includes an extension of 4.4 km from Madinet Nasr terminal to the Ring Road. The line thus measures 22 km in total. In order to reach the target of a minimum commercial speed of 28 - 32 km/h of the Supertram system, depending on the segregation alternative, the average distances between stations shall be increased to 1.2 km. This leads to a number of 19 stations that have been located along the line. This task has been carried out in close collaboration with Heliopolis Metro with regard to the following criteria :

1) Conservation of existing important stations :
   - Ramses Station
   - Ghamra Station of Metro Line 1
   - Mansheyet El Sadr Station by Ain Shams University
   - Azhar University Station (Gameat El Azhar)

2) Interchanges with existing tramway :
   - Girl's College (Koleyet El Banat)
   - Heliopolis Club (Nady Heliopolis)
   - Teacher's College (Koleyet El Moallemeen)

3) Interchanges with planned lines :
   - Supertram line 2 and Metro line 3 at Girl's College (intersection between Sayed El Merghany St. and Ahmed Taysîr St.), and at Cairo Stadium (intersection between Yoosef Abbas St. and Khedr El Toony St.)
   - Supertram line 3 at Darayeb Station (intersection between Mostafa El Nahhas St. and Hassan Ma'mûn St.)
   - Metro Line 4 at Ghamra station

4) Identification of new stations along the extension from Madinet Nasr terminal until the Ring Road

5) Lower distances between stations in dense areas (min. of 500 meters)

6) Longer distances between stations in less dense areas or already served by Metro Line 1 (up to 2.3 km on the section between Ramses Station and Khalifa El Maamoon/Merghany).

The result of this analysis is shown in Table 3.2.2 , with station names listed in their interchangeable English and Arabic names. In terms of naming conventions, this volume relies on the English format.

Table 3.2.2 Proposed Supertram line 1 Stations

Supertram Line 1 Station			Chainage (km)
No.	**English Naming Convention**	**Arabic Naming Convention**	
1	Ramses (Terminal)	Ramses (Terminal)	0.00
2	Ghamra	Ghamra	1.72
3	Demerdash	Demerdash	1.09
4	Mansheyet El Sadr	Mansheyet El Sadr	1.21
5	Mansheyet El Bakry	Mansheyet El Bakry	2.32
6	Teacher's College	Koleyet El Moallemeen	0.87
7	Heliopolis Club	Nady Heliopolis	0.58
8	Girl's College	Koleyet El Banat	1.12
9	Marwa City	Madinet El Marwa	0.77
10	Cairo Stadium	Estad El Qahera	1.14
11	Nasr Cinema	Cinema Madinet Nasr	1.19
12	Azhar University	Gameat El Azhar	0.68
13	Osman Building	Masaken Osman	1.28
14	Ebeid Street	Makram Ebeid	1.05
15	Darayeb	Darayeb	1.31
16	Madinet Nasr	Madinet Nasr	1.29
17	Zomor	Zomor	1.60
18	Hay El Ashir	Hay El Aasher	1.39
19	Ring Road (Terminal)	Ring Road (Terminal)	1.39
Total length of line (km)			22.00
Average distance between stations (km)			**1.16**

Source: JICA Study Team in consultation with Heliopolis Metro

These station locations are used for the traffic forecast on the Supertram line 1 for the years 2012 and 2022. As it can be seen from the table, the Supertram line is proposed to include two phases :

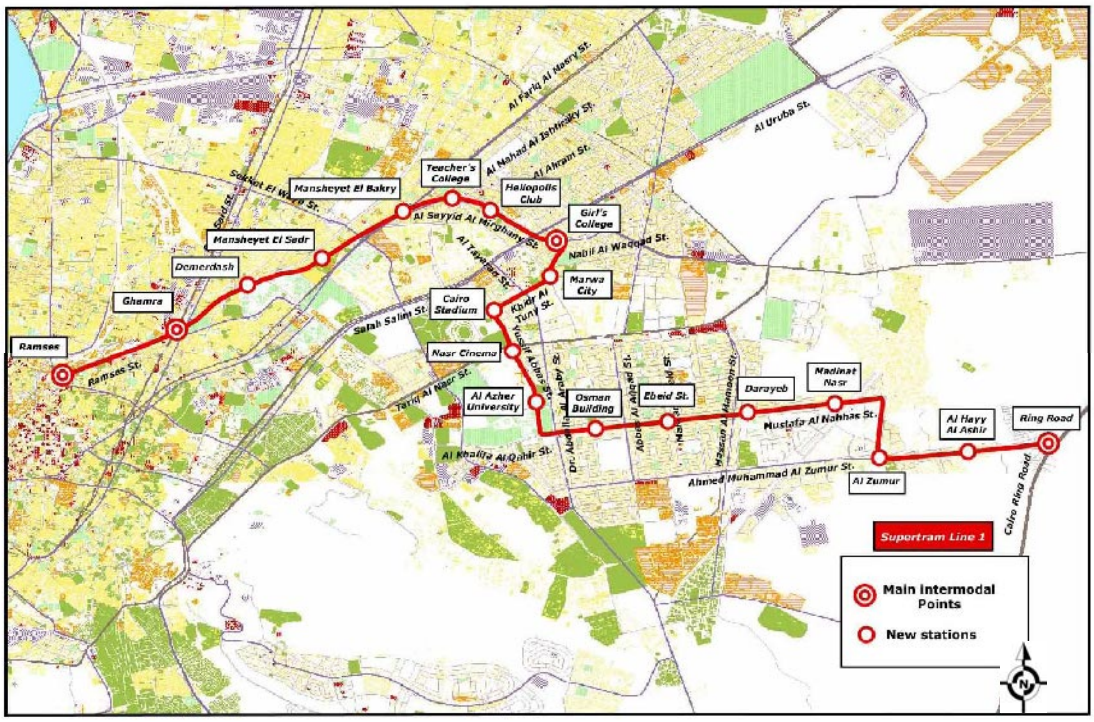
- upgrading of the existing line between Ramses Station and Madinet Nasr Terminal and extension (1.6 km) until Zumor Station (the latter is a new station)
- extension from Zumor Station until the Ring Road (2.78 km).

The four identified intermodal terminals of Supertram Line 1 and their functional classification are (please refer to Section 4.5 for conceptual designs):

- Ramses Terminal as Primary Interconnecting Point;
- Ghamra Station as Primary Interconnecting Point;
- Girl’s College Station as Secondary Interconnecting Point; and,
- Ring Road Terminal : Park and Ride Interconnecting Point.

From an intermodal perspective, there are different terminals and stops according to their location and function. Thus, Supertram Line 1 will have four intermodal terminals and 15 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 (bus, tram and metro) (Figure 3.2.1).



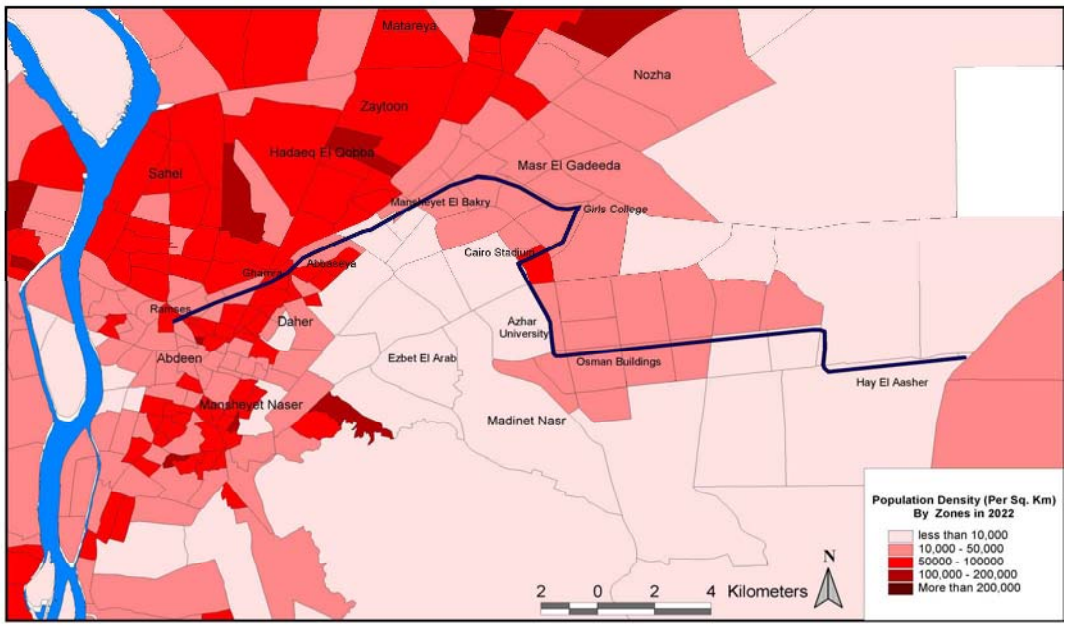
Source: JICA Study Team and CTA

Figure 3.2.1 Supertram Line 1 Stations in an Intermodal Perspective

(2) Urban Form

The alignment of Supertram Line 1, regardless of technology selected, is based upon existing rights-of-way and is thus fixed. No new acquisition of land is foreseen with the likely exception of depot locations and, in some instances, adjustments within the transport right-of-way in case of viaducts or underpasses. An overview of anticipated urban form, as defined within the framework of the CREATS master plan, provides interesting insight into the Supertram catchment area.

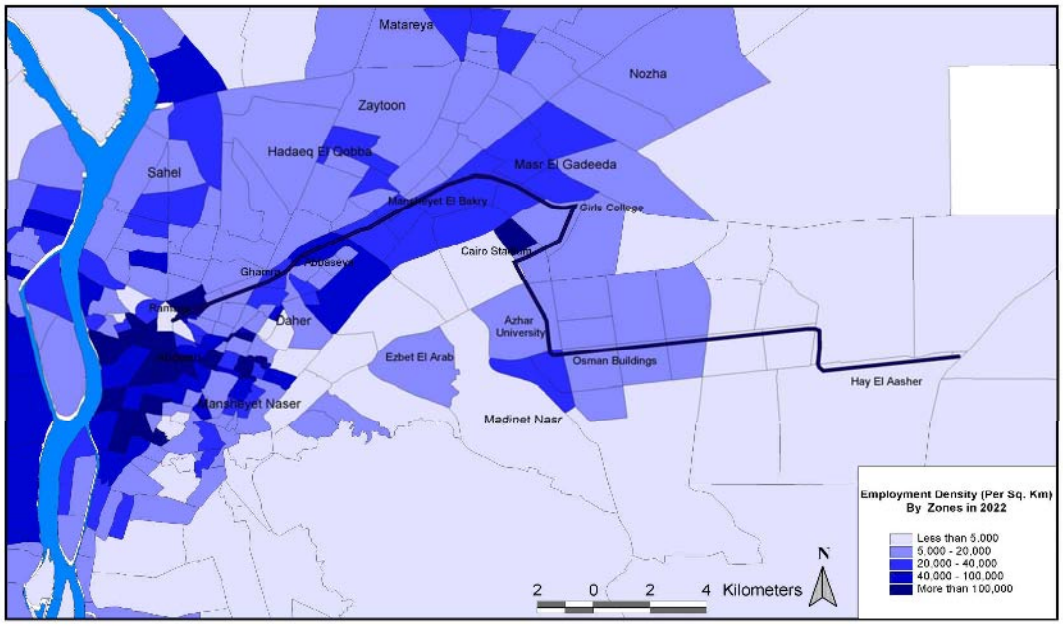
Highest year 2022 population densities are, as expected, noted along the western end of the system as it approaches central Cairo. However, strong settlement is also indicated throughout Heliopolis, Madinet Nasr and, to the east of the Ring Road, New Cairo (Figure 3.2.2).



Source: JICA Study Team

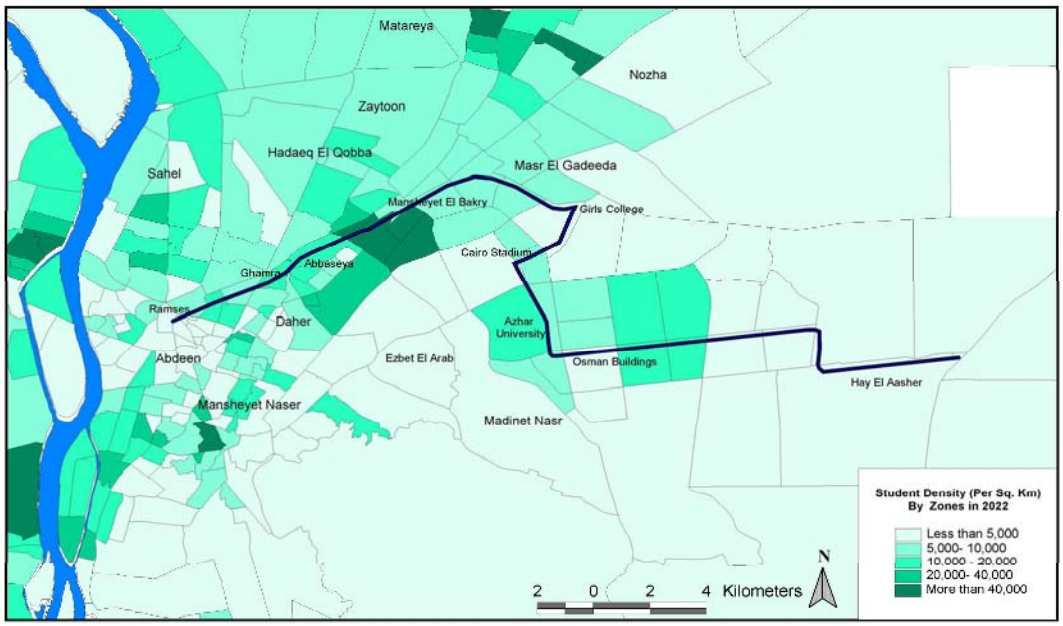
Figure 3.2.2 Year 2022 Population Density in Supertram Line 1 Catchment Area

In case of employment density, the western system segment again emerges predominant in year 2022, along with the Roxy area, Heliopolis and western Madinet Nasr (Figure 3.2.3). Student densities are well distributed, with a particular dense concentration noted in the vicinity of the Ain Shams Medical School complex (Figure 3.2.4). These patterns, when viewed in parallel with population densities, reinforce the strength of the catchment area in terms of ridership potential.



Source: JICA Study Team

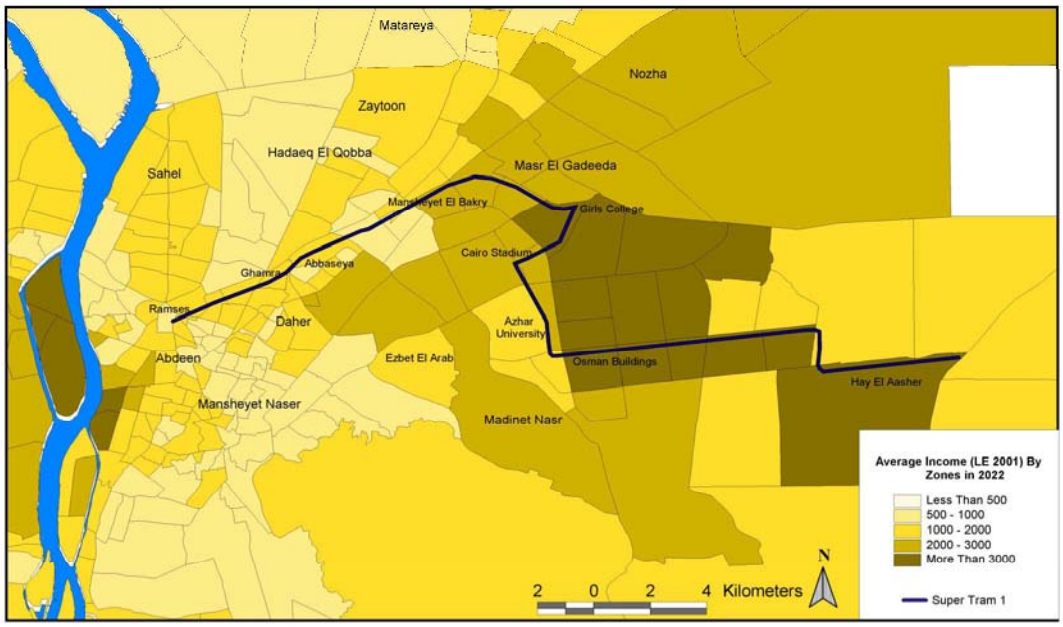
Figure 3.2.3 Year 2022 Employment Density in Supertram Line 1 Catchment Area



Source: JICA Study Team

Figure 3.2.4 Year 2022 Student Density in Supertram Line 1 Catchment Area

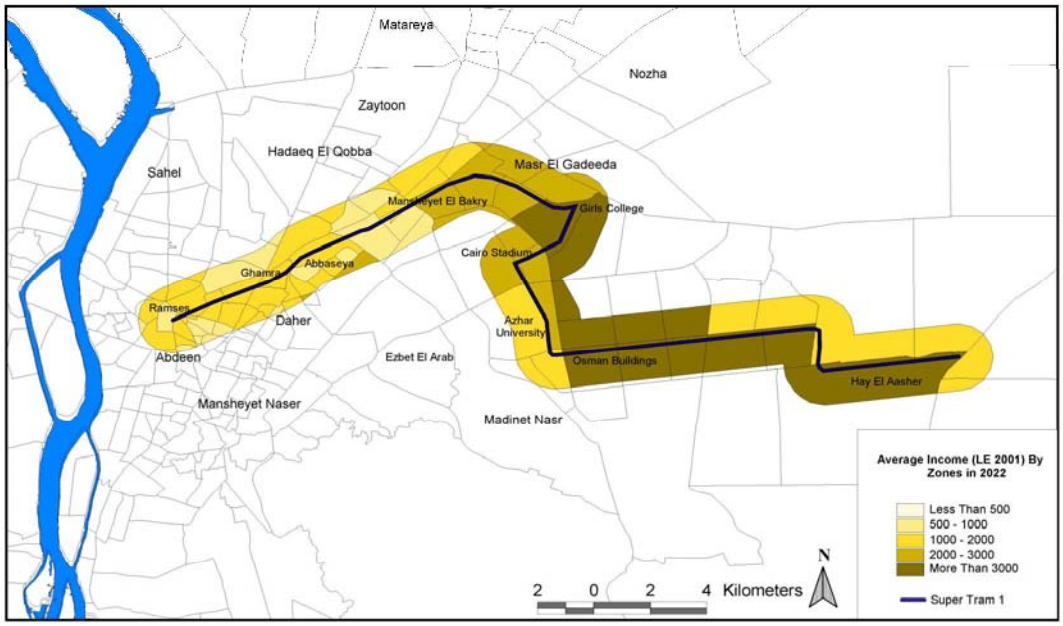
It is of particular interest to examine the distribution of year 2022 household income within the catchment area. As expected, the entire eastern segment of Supertram Line 1 lies within some of the highest income areas found in Cairo. Significant portions of Heliopolis and Madinet Nasr fall within the highest average income range adopted by CREATS: more than 3,000 LE per month (Figure 3.2.5).



Source: JICA Study Team

Figure 3.2.5 Year 2022 Household Income in Supertram Line 1 Catchment Area

A distance of 800 meters is widely used as an acceptable walking distance for access to a higher-order and attractive public transport system such as Supertram Line 1. A review of anticipated year 2022 household income within this area (Figure 3.2.6) suggests that , of some 208,000 households, none fall into the lowest income category, 21 percent into the 500-1,000 LE category, 46 percent into the 1,001-2,000 LE category, 13 percent into the 2,001-3,000 LE category and 20 percent into the more than 3,000 LE category. Thus, the anticipated average household income pattern suggests that affordability, in terms of average fare for use of the Supertram, can be considered above average within the Supertram Line 1 catchment area.



Source: JICA Study Team

Figure 3.2.6 Supertram 800 Meter Walking Distance

(3) Heliopolis Metro and CTA Tram reorganization

As existing lines use outdated technology, the rolling stock of Heliopolis Metro and CTA Tram will not be able to use the new state-of-the-art Supertram line. The existing lines that overlap the Supertram line on the common sections from Ramses Station to Ahmed Tayseer St. (HM metro) and from Sayed El Merghany St. to Madinet Nasr terminal (CTA Tram) will therefore be curtailed and reorganized so as to feed the more efficient Supertram line at specific intermodal points (Tables 3.2.3 and 3.2.4).

Table 3.2.3 Reorganization of Conventional Heliopolis Metro Lines

Line	Line Name (origin / destination)	New length (km)	Curtailed section	New intermodal point
1	Nozha – Ramses Sq.	8.1	Ramses Station to Heliopolis club (7.8 km)	Heliopolis Club
2	Merghany – Ramses Sq.	3.5	Ramses Station to Girl's College (8.9 km)	Girls College
3	Abd Aziz Fahmy – Ramses Sq.	4.1	Ramses Station to Teacher's College (7.2 km)	Teacher's College
5	Almaza – Ramses Sq.	3.6	Ramses Station to Girl's College (8.9 km)	Girls College
6	Almaza – Matareya Sq.	6.7	None	None
Total		**26.0**		

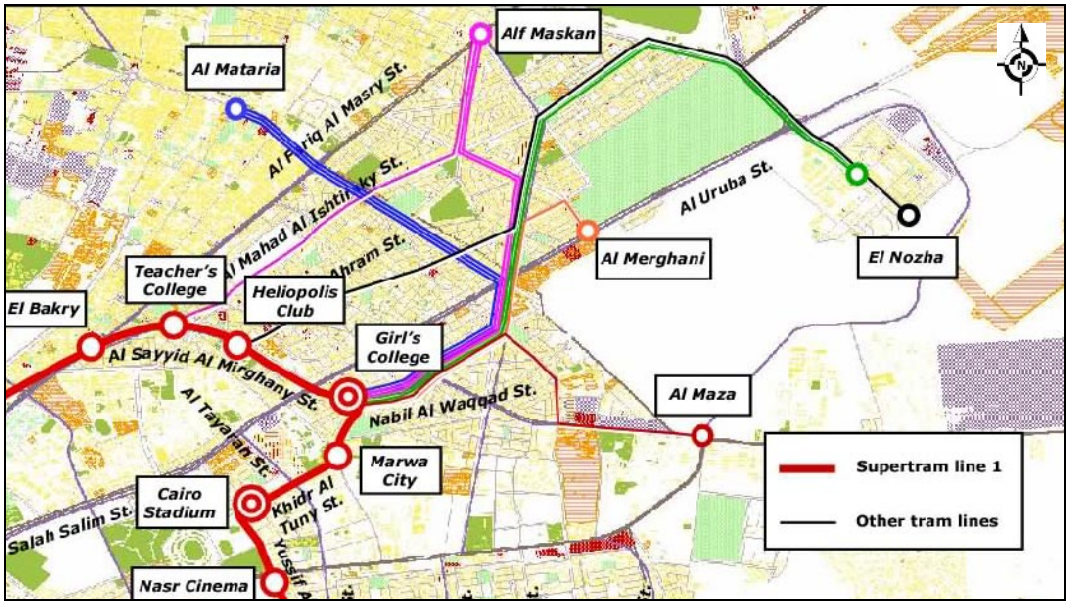
Source: JICA Study Team

Table 3.2.4 Reorganization of CTA Tram Lines

Line	Line Name (origin / destination)	New length (km)	Curtailed section	New intermodal point
34	Sheraton – Abbaseya	6.8	Girl's College to Cairo Stadium (2 km)	Girl's College
35	Matareya – Abbaseya	4.5	Girl's College to Cairo Stadium (2 km)	Girl's College
36	Matareya – 10th region	5.7	Girl's College to Madinet Nasr terminal (8.7 km)	Girl's College
36'	Matareya Station - 8th Region	5.2	Girl's College to Ebeid St (6.1 km)	Girl's College
5	Ismailia Square – Esko	10.2	None	None
12	10th Region – Alf Maskan	5.3	Girl's College to Madinet Nasr terminal (8.7 km)	Girl's College
32	10th Region – Sheraton	7.6	Girl's College to Madinet Nasr terminal (8.7 km)	Girl's College
33	Abbaseya – Alf Maskan	4.3	Girl's College to Cairo Stadium (2 km)	Girl's College
Total		**49.6**		

Source: JICA Study Team

Figure 3.2.7 shows the reorganization of the HM and CTA tram networks with intermodal points at Teacher's College, Heliopolis Club and Girl's College.



Source: JICA Study Team and CTA

Figure 3.2.7 Reorganization of HM and CTA Tram Lines

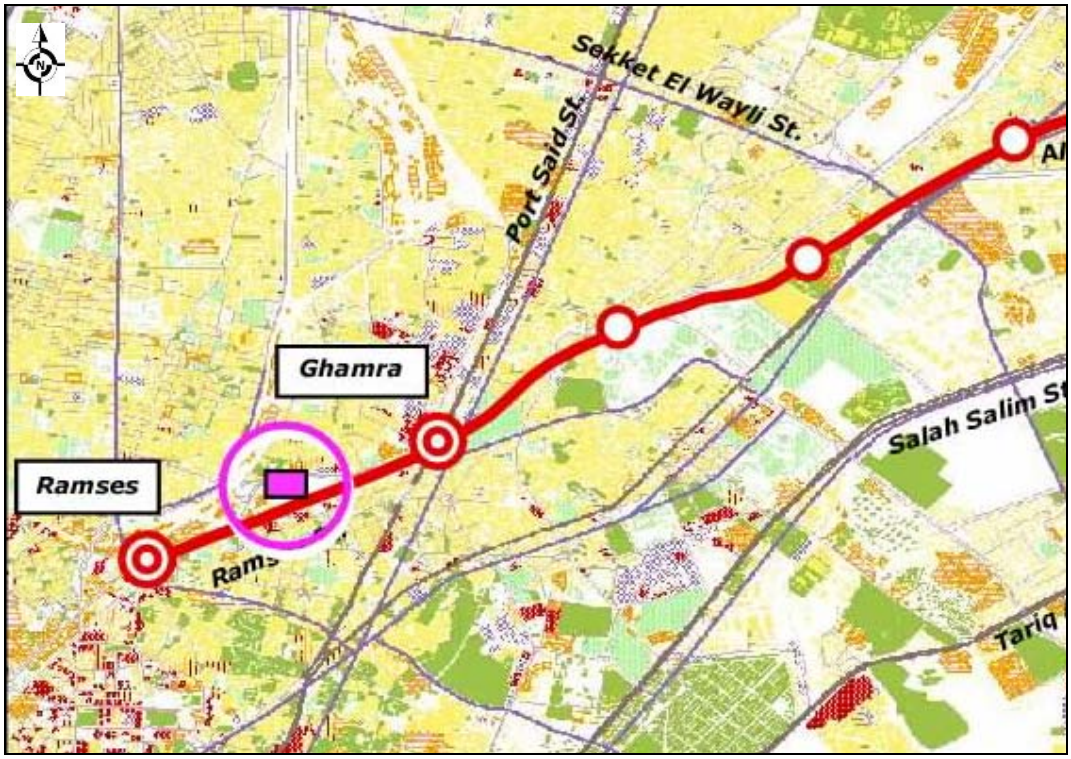
(4) Depot location

The minimum surface required for the Supertram depot is 5 hectares. This has been estimated on the basis of :

- the number of trains in operation and their size, and,
- surface required for maintenance facilities and office space.

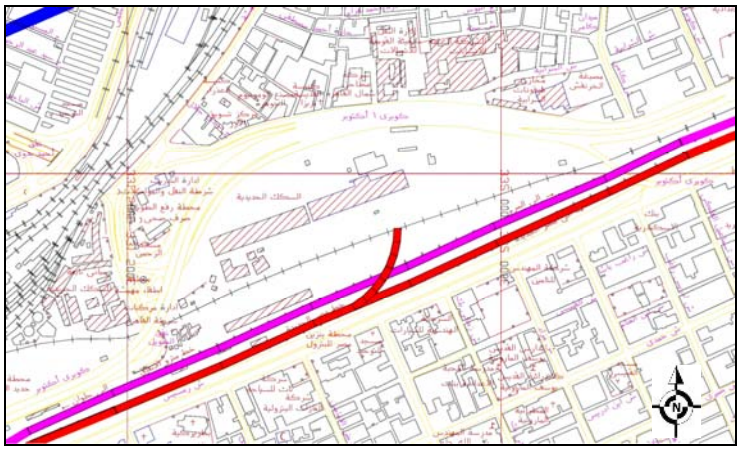
The depot can be separated in a workshop and storehouse at two different locations if sufficient surfaces cannot be located in a single area. Each potential locations carries various benefits and disbenefits.

One possible location for the Supertram depot is on the present grounds of ENR near Ramses station (Figures 3.2.8 and 3.2.9). The main disadvantage of this location is that the Supertram vehicles will have to cross the Metro Line 1 in order to reach the depot area. This can only be done with a tunnel or elevated structure to go across Metro line 1 and will incur an important cost.



Source: JICA Study Team and CTA

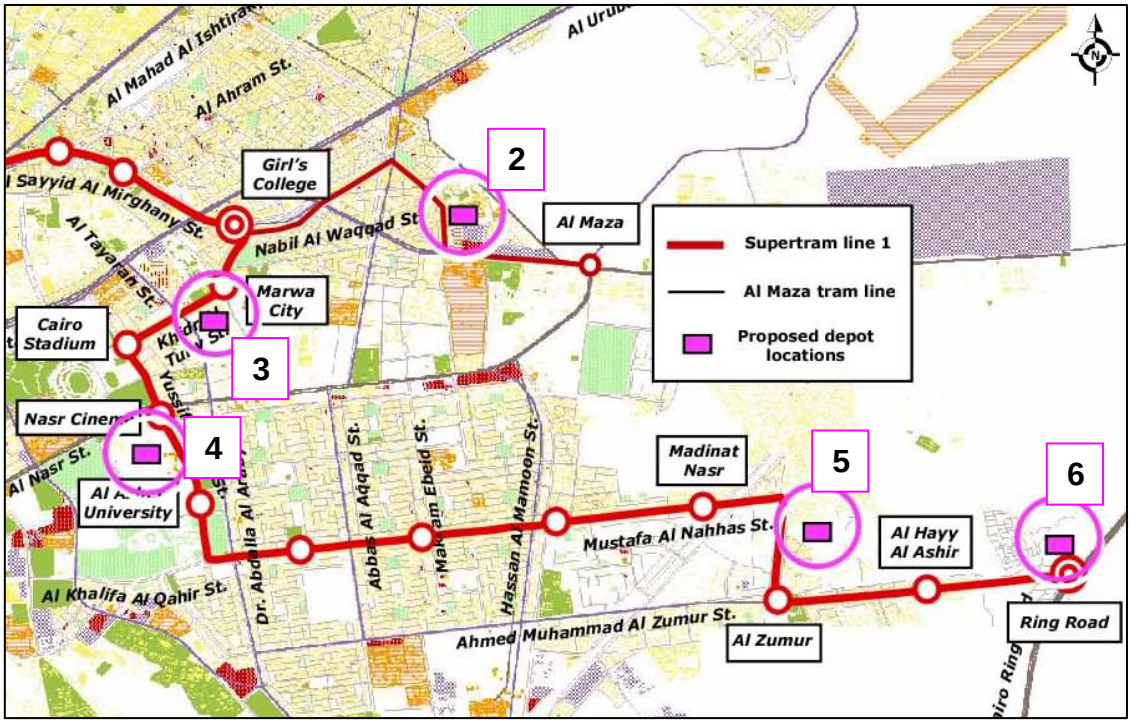
Figure 3.2.8 Possible Depot Location (West section)



Source: JICA Study Team

Figure 3.2.9 Possible Depot Site on ENR Grounds near Ramses Station

Five additional possible depot locations have been identified within the eastern precincts of the Supertram Line 1 alignment (Figure 3.2.10).



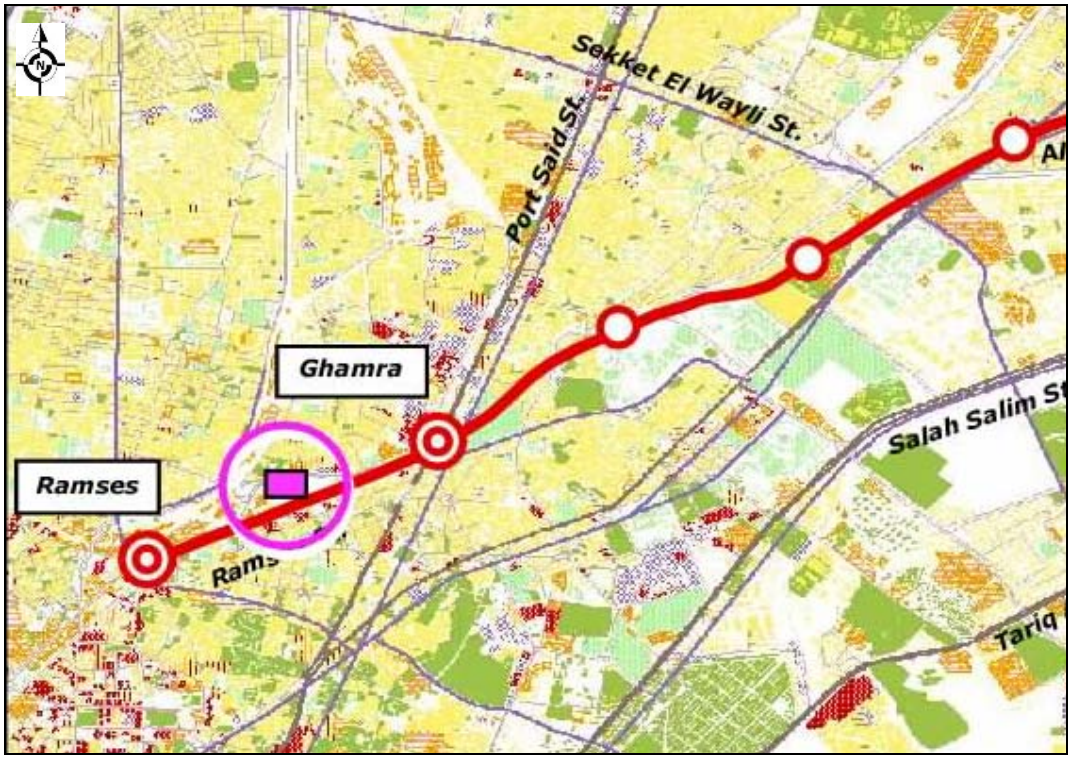
Source: JICA Study Team and CTA

Figure 3.2.10 Possible Depot Locations (East Section)

Option 2 is located on the present grounds of Heliopolis Metro. The main disadvantage of this option is that an upgraded Supertram single track would need to be constructed next to the Almaza line from Girl's College to the HM grounds. Construction of this approximately 2 km long line would be complicated due to the lack of space in the road, and it would thus incur important costs. To avoid this problem, another possibility would be to cancel the present Almaza line and to use the present right-of-way for the new link to the depot.

Options 3 and 4 are located on the military grounds by Khedr El Toony St. and by Azhar University respectively. These two locations would be ideal due to their midpoint location on the Supertram line. The advantages here are :

- the time required to send the Supertrams to the terminals in the morning, and to send them back to the depot in the evening, will be half as long; this has an important outcome on the operation cost,
- in case of construction, repair works or other interferences on the tracks, the service does not risk to be hindered from running on the whole line, e.g. if the depot is at the Ring Road and the tracks are blocked in front of this terminal, the service will be totally blocked,
- construction of the Supertram line becomes more efficient, as the works can proceed in two directions,
- implementation staging can commence on the most loaded sections of the line with higher riderships,
- in case of train breakdowns, the operator will avoid sending the trains along the full length of the line in order to return them to the depot.



Source: JICA Study Team and CTA

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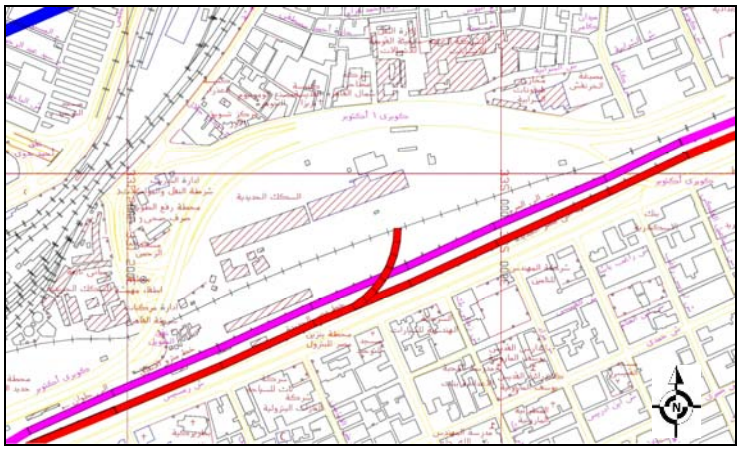

Source: JICA Study Team

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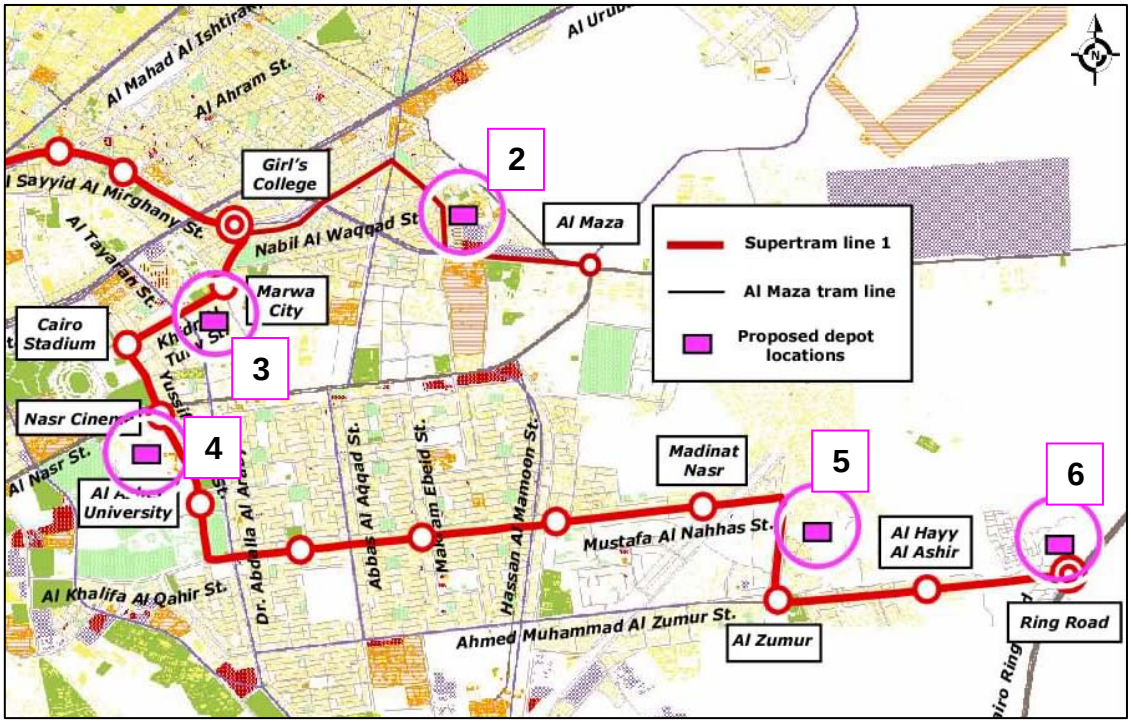


Source: JICA Study Team and CTA

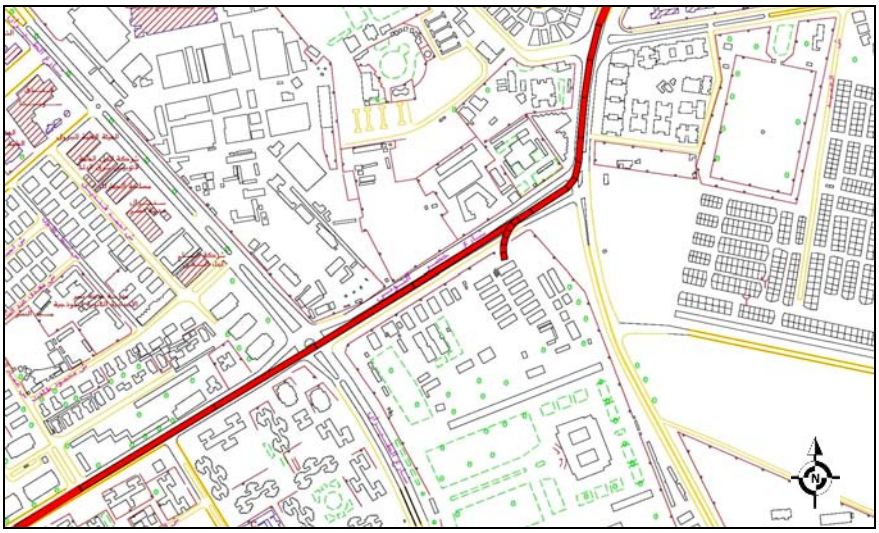
Figure 3.2.10 Possible Depot Locations (East Section)

Option 2 is located on the present grounds of Heliopolis Metro. The main disadvantage of this option is that an upgraded Supertram single track would need to be constructed next to the Almaza line from Girl's College to the HM grounds. Construction of this approximately 2 km long line would be complicated due to the lack of space in the road, and it would thus incur important costs. To avoid this problem, another possibility would be to cancel the present Almaza line and to use the present right-of-way for the new link to the depot.

Options 3 and 4 are located on the military grounds by Khedr El Toony St. and by Azhar University respectively. These two locations would be ideal due to their midpoint location on the Supertram line. The advantages here are :

- the time required to send the Supertrams to the terminals in the morning, and to send them back to the depot in the evening, will be half as long; this has an important outcome on the operation cost,
- in case of construction, repair works or other interferences on the tracks, the service does not risk to be hindered from running on the whole line, e.g. if the depot is at the Ring Road and the tracks are blocked in front of this terminal, the service will be totally blocked,
- construction of the Supertram line becomes more efficient, as the works can proceed in two directions,
- implementation staging can commence on the most loaded sections of the line with higher riderships,
- in case of train breakdowns, the operator will avoid sending the trains along the full length of the line in order to return them to the depot.

Depot locations of options 3 and 4 are shown in Figures 3.2.11 and 12.



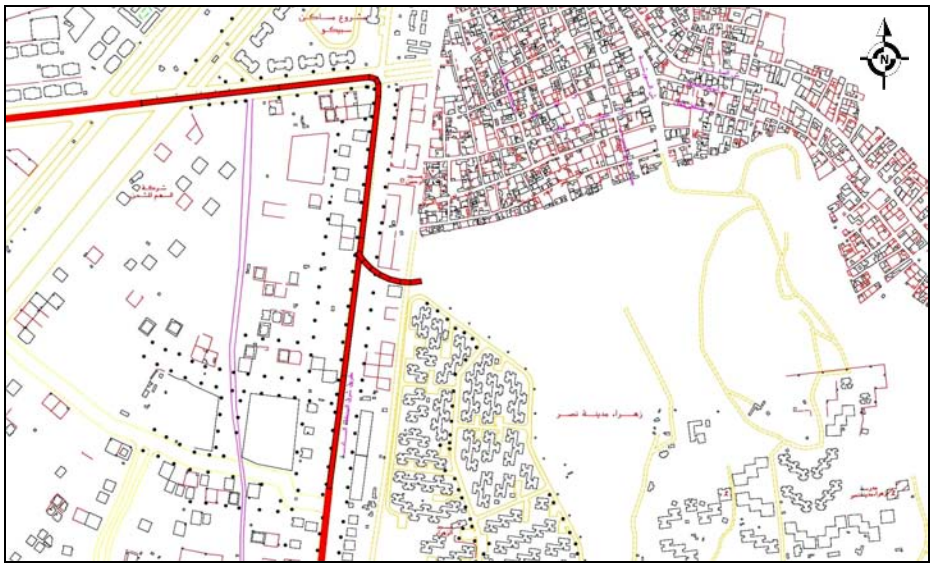
Source: JICA Study Team

Figure 3.2.11 Possible Depot Location on Military Ground by Khedr El Toony St.

Source: JICA Study Team

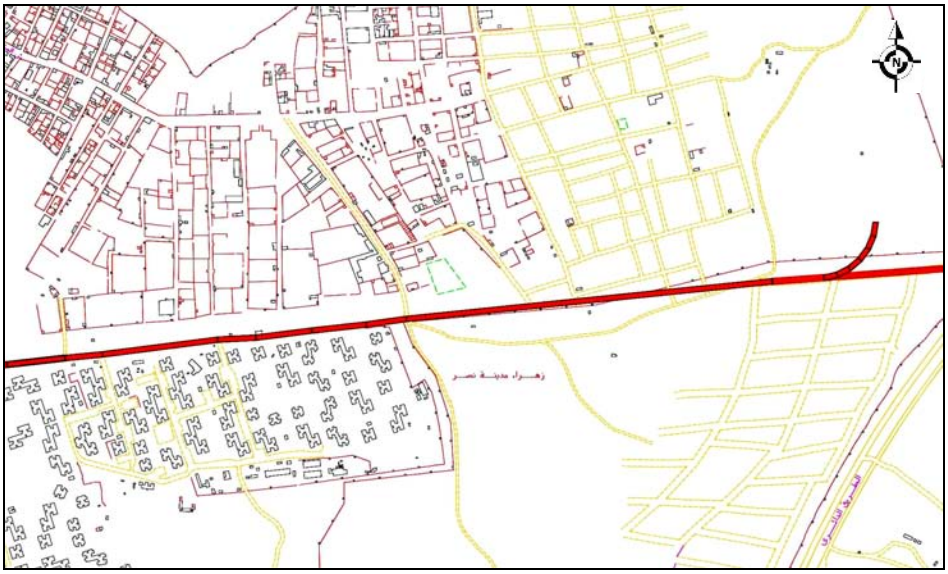
Figure 3.2.12 Possible Depot Location on Military Ground by Azhar University

The Supertram depot options 5 and 6, are located at the new area of Zahraa Madinet Nasr and the Ring Road respectively. The main advantage of these locations is the relatively low land cost. Close-ups of the depot locations of options 5 and 6 are shown in the Figures 3.2.13 and 14.



Source: JICA Study Team

Figure 3.2.13 Possible Depot Location at Zahraa Madinet Nasr



Source: JICA Study Team

Figure 3.2.14 Possible Depot Location by the Ring Road

The advantages and disadvantages of the various Supertram depot locations are summarized in the following Table 3.2.5.