Environmental and Social Impact Assessment - Vol. 1 Non Technical Summary

Additional Services for Cairo Metro Line 3 - Phase 3, Environmental and Social Impact Assessment Study (SGN/ACH/2012-014)

Grontmij A/S in association with EcoConServ ENVIRONMENTAL SOLUTIONS

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Additional Services for Cairo Metro Line 3-Phase 3
Environmental and Social Impact Assessment

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Volume 1: Non Technical Summary

September 2012

In accordance with the Terms of Reference for this assignment, this ESIA builds on an existing ESIA developed by the consultancy firm EQI, and puts in place the necessary amendments to bring it in line with international standards. Where EQI's original text is used, it is quoted.

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1 INTRODUCTION

1.1 Background

The European Investment Bank (EIB) and the French Development Agency (AFD) are considering co-financing the construction of Greater Cairo Metro Line 3-Phase 3. As part of these Financial Institution's (FI) requirements, an Environmental and Social Impact Assessment (ESIA) must be developed for the project. An ESIA was prepared by the consultant EQI. It was subsequently determined that certain areas of the ESIA need to be strengthened in order to ensure compliance with the national and FI requirements for ESIAs. In April 2012, AFD contracted Grontmij to finalise the ESIA process for Cairo Metro Line 3-Phase 3.

1.2 Objectives of the Environmental and Social Impact Assessment

An Environmental and Social Impact Assessment (ESIA) is the process whereby the social and environmental impacts of a specific development project are identified, examines the existing social and environmental baseline, and then assesses their significance before detailing proposed mitigation measures.

This ESIA has been developed in accordance with national legislation and EIB and AFD requirements, as outlined in the Environmental and Social Practices Handbook of EIB.

1.3 Format of this ESIA

This ESIA for the Cairo Metro Line 3-Phase 3 project consists of the following volumes:

- ESIA Volume 1: Non Technical Summary
- ESIA Volume 2: Main Document
- ESIA Volume 3: Appendices to the Main Document

Volume 2 contains a description of the existing social and environmental situation in the project area, potential impacts associated with the proposed development and any mitigation measures required to minimise these impacts. These issues are summarised in this Non Technical Summary. Volume 3 contains the Stakeholder Engagement Plan, inter alia with its annexes of the grievance redress mechanism and the public consultation phases.

1.4 The Promoter

The promoter of the Metro Line-Phase 3 project is the National Authority for Tunnels (NAT) based at Ramses Square, Cairo, Egypt.

After final handover of the works, the new assets are transferred for operation and maintenance to the Egyptian Company for Metro Management and Operation (ECM).

1.5 Pre Submission Consultation

As part of the ESIA preparation, EQI held consultation meetings with involved governmental and non-governmental bodies and individuals. At the meetings, presentations were made of the Line 3-Phase 3 development and comments were invited concerning the project. Two further public consultations were held in cooperation with NAT on 7th and 9th August 2012 at El Bohi and Zamalek respectively.

The Non Technical Summary and Resettlement Policy Framework are to be made available in Arabic and English on NAT's website, together with the Stakeholder Engagement Plan in English and a Power Point version in Arabic. In addition, care will be taken by NAT that a project grievance redress mechanism will be put into place.

Records of the pre submission consultation are included in Volume 3 of this report. Appendix 1 is thus the Stakeholder Engagement Plan which provides a record of the 2011 consultations in its Annex 4. The 2011 consultations are further documented in Appendix 3, which presents the participant lists, presentation materials and advertising used in conjunction with those meetings. Appendix 2 presents the Public Consultation Report for the 2012 consultations, which likewise provides detailed records of the participants, presentation materials and comments raised.

The main outcome of the pre submission consultation is further described in detail in the main ESIA document. The final two public consultations did not, however, give rise to new areas of concern regarding the project's Environmental and Social Management Plan.

1.6 Metro Lines and Environmental and Social Benefits

In general, metro lines bring considerable environmental and social benefits:

- The opportunity for a modal shift in means of transportation leads to a reduction in the total distance in kilometres travelled by cars, taxis, shared taxis, minibuses and buses and thereby lead to a reduction in the emissions that would have resulted from fuel combustion in these vehicles
- Job creation and skills development in a variety of economic sectors during the constructions and operations phases
- Enhancement of the circulation between, and the improved connectivity of, communities within urban areas; which in turn may help to enhance the character and cohesiveness of these communities
- Reduction in commuter times to place of work and place of study
- Increased use of community, institutional, educational and recreational facilities
- Improved road traffic conditions and a reduction in road accidents
- Savings in costs related to fuel use, and infrastructure maintenance

1.7 Need for Proposed Development

The current Cairo Metro network consists of two lines with a total length of approx. 65 km and which carry some 2 million passengers daily. The Cairo Metro Project is part of the Ministry of Transport's (MoT) national plans for urban transportation in the Greater Cairo Region (GCR), which started with the realization of the first two lines.

When complete, the Cairo Metro will link various districts of the wider GCR, including New Urban Communities (NUCs), with the city centre.

Line 3 was identified as a priority investment to serve the main transportation corridors of Greater Cairo in the 1999 Transportation Study of the Greater Cairo Region. The 2002 Transport Master Plan confirmed the necessity to implement Metro Line 3 on the route identified in the previous study, serving the Cairo Business District and being an east-west connector through the Greater Cairo region connecting Cairo International Airport in the east with Imbaba-Mohandiseen and the Doqqi/Boulaq El Dakrour/Cairo University area in the west. The construction of a fourth metro line began in 2011 and completion is planned by 2020.

1.8 Site Selection

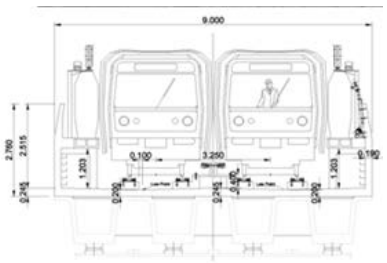
A variety of methods are foreseen deployed to construct the Line 3-Phase 3 metro alignments:

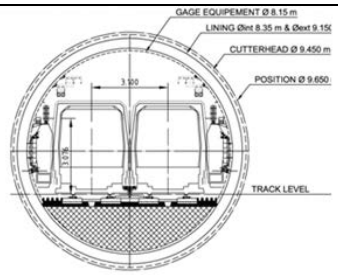
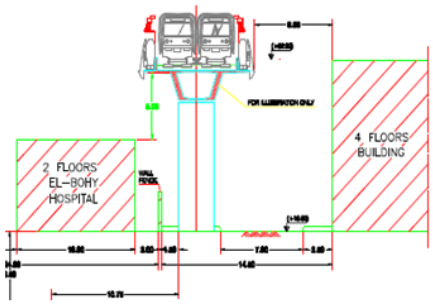
- Bored tunnel
- Cut and cover tunnel
- Open cut tunnel
- Cut and cover ramp (linking underground and above ground sections of the line)
- At-grade metro line sections
- Elevated metro line sections
- Cut and cover stations
- At grade stations
- Elevated stations

The choice between the various methods of construction depends on a variety of parameters including, as presented in Table 1:

- Geotechnical characteristics
- Project environment (integration with urban environment, ground allocation etc.)
- Cost optimization
- Local practice (such as experiences from the implementation of the first 2 phases of Line 3 and local contractors' know-how)

Table 1: Construction Types and Design Principles

At-grade sections • Opportunities provided by the median strip of motorways or streets, or empty spaces (outside urban areas or along ENR track)	

Bored tunnels • Where construction of an independent structure from the surface is not possible due to hindrances such as the River Nile or the route goes underneath building structures • If geotechnical conditions are acceptable	
Elevated sections • Where boring is hindered by interferences with public utilities in the ground • Where cost economic reasons are applicable and the elevated part has sufficient room	

Source: SYSTRA Presentation May 2012

2 THE PROPOSED DEVELOPMENT

2.1 The Alignment

The Cairo Metro Line 3 was initiated in 2005 to connect Cairo International Airport in the east of the city, with Imbaba - Mohandiseen and the Doqqi/Boulaq El Dakrour/Cairo University area in the west (EQI 2012: 28). The estimated daily passengers for the Line 3 in 2022 are presented in Table 1.

Table 2: Forecast Daily Passenger Levels of Line 3 in 2022

Year	Line	Daily passengers (pax/day)	Busiest section
			Location
2022	Line 3	1,580,000	Maspero-Zamalek
	Phase 3A	300,000	Maspero-Zamalek
	Phase 3B	416,000	Kit Kat Square – Sudan
	Phase 3C	255,000	Kit Kat Square - Tawfikia

Source: SYSTRA, Feasibility Study for Cairo Metro Line 3 Phase 3, 2009

The total length of the Cairo Metro Line 3 - Phase 3 will be approximately 17 km of dual track line and will comprise 15 stations, including 8 underground stations, 5 elevated stations, and 2 at-grade stations. Approximately 9 km of the total length will be underground, 5.7 km will be elevated, 1.9 km will be at-grade, and the remaining will be transitional sections between underground and at-grade sections. The rail level at underground stations will be about -20.00m from the ground level.

The eastern extremity of Line 3-Phase 3 will connect with Line 2 and Line 3 Phase 1 at Attaba Station. West of Kit Kat square the Line 3 Phase 3 will split in two branches one veering north and west with the north western station being located at the planned Rod El Farag Corridor in El Bashteel and the other turning southward interconnecting with Line 2 at Cairo University Station. The estimated time to travel between Attaba Station (Line 3 Phase 1) and Rod El Farag Station will be an estimated 18 minutes including 3.5 minutes of waiting time at stations and the estimated time to travel between Attaba Station and Cairo University will be 16.5 minutes including 3 minutes waiting time at stations.

2.2 Description of the Proposed Development

The Line 3 Phase 3 is divided into the three sub-phases 3A, 3B, and 3C as presented in Figure 1 overleaf. A general overview of each sub-phase is given below. Detailed descriptions of the designs selected for the underground and elevated stations, the tunnel sections, and the elevated track components can be found in Volume 2 Main Document.

2.2.1 Sub-phase 3A

Sub-phase 3A is nearly 4.4 km long and comprises 4 underground stations. It will consist of 3.395 km of bored tunnel, a 336 m underground diversion structure with two dual track sections, and 658 m of cut and cover underground stations.

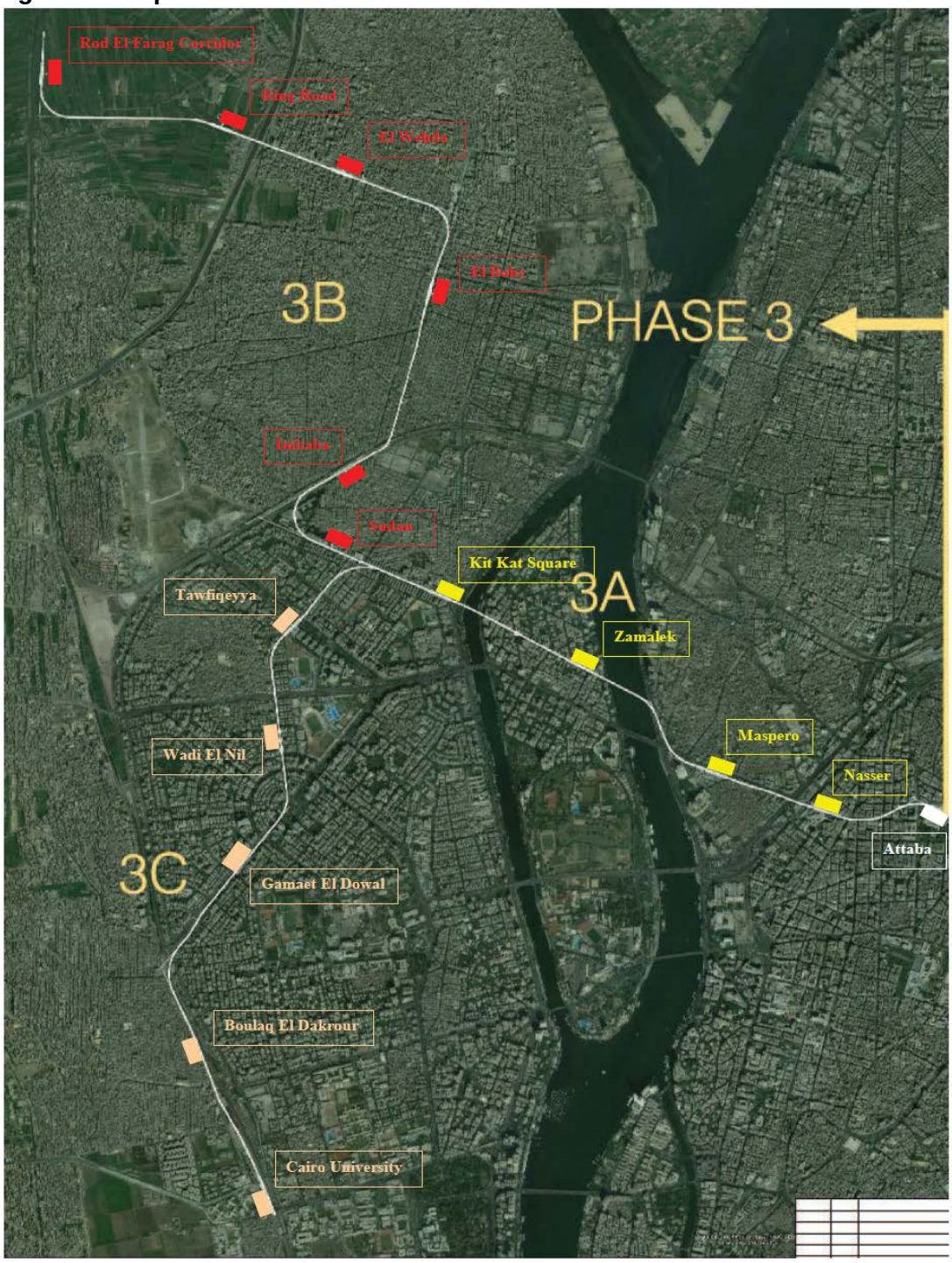
Table 3: Overview of Sub-Phase 3A Stations

Station	Type
Nasser Station	Underground station, type: Mayor Interchange Hub, – interconnection with Line 1
Maspero Station	Underground station, type: Normal
Zamalek	Underground station, type: Normal
Kit-Kat Square	Underground station, type: Intermodal Station

Source: Transport Planning Study, Systra 2009

“The eastern extremity of Phase 3A begins west of the existing Attaba station. This station is already part of Line 2, but there will be an interconnection with Line 3. Within the context of Line 3, Attaba is part of Phase 1. The tunnel will thus extend westward from Attaba station to Nasser under 26th of July St. The easternmost station in Phase 3A is Nasser, near the Cairo High Court and existing Line 1 station. Line 3 will pass under Line 1 and under 6 October Bridge at the intersection with El Galaa Street, following 26th of July St north-westward towards Maspero Station, in the vicinity of the Foreign Ministry building. It will then veer northward to near Kornish El Nile, then passing under district buildings under the Nile east branch (avoiding the foundations of 15th of May Bridge) into Zamalek” (EQI draft ESIA 2012: 28).

Figure 1: Proposed Route of Cairo Metro Line 3-Phase 3



Source: EQI 2012

"Zamalek Station will be located beneath Ismaïl Mohammed St., and the alignment will follow its course in a north-westerly direction under that same street. This is the only station that will be located in such a small, one-way street. The alignment will then cross under the smaller western branch of the Nile to reach Kit Kat Station in Sudan St., which separates Imbaba from Mohandiseen in this general area. From Kit-Kat Square station to the west, Line 3 splits into two branches: one veering north and west through Imbaba (Phase 3B); and the other turning southward, through Mohandiseen and Boulaq El Dakrour (Phase 3C). A diversion structure shall be constructed under Sudan St immediately west of Kit Kat Station, allowing the railway branching into two directions" (EQI draft ESIA 2012: 28f).

2.2.2 Sub-phase 3B

The Sub-phase 3B is the north-western branch of Phase 3, to the west of the diversion structure and Kit-Kat square. It is nearly 6.8 km long and comprises 1 underground-, 4 elevated-, and 1 at-grade stations. It will consist of 0.573 km of bored tunnel, a cut and cover and pen cut tunnel of 0.445 km, and at-grade section of 1.380 km, and 3.502 km of viaduct. In addition there will be 0.150 km of cut and cover underground stations, 0.576 km of elevated stations, and 0.144 km of at-grade stations.

Table 4: Overview of Sub-Phase 3B Stations

Station	Type
Sudan Station	Underground station, type: Normal
Imbaba Station	Elevated station, type Normal
El Bohi Station	Elevated station, type Normal
El Kawmeya Station	Elevated station, type Normal
Ring Road Station	Elevated station, type Mayor Interchange Hub
Rod El Farag Station	At-grade station, type Mayor Interchange Hub

Source: Transport Planning Study, Systra 2009

"The alignment of [the] sub-phase [3B] is divided into 3 sections running first underground, then on a viaduct, and finally at grade. The sub-phase starts [west of the diversion structure] with tracks lying underground, beneath Sudan Street, north-west from Kit-Kat Square. The alignment reaches Sudan Station near the Giza High Court, before turning north and east with the [Cairo – Aswan] Egyptian National Railway (ENR) tracks that border Sudan Street. Passing beneath the ENR, the Metro line will emerge [and rise on a ramp] to the [elevated] Imbaba Station, in the vicinity of Matar St" (EQI draft ESIA 2012: 29).

"Imbaba Station [is elevated and will be built] on the ENR right of way, after carrying out the necessary diversion of ENR tracks. After Imbaba Station, the line will rise [further] on [the] viaduct along the ENR, and turn northward over Matar St. into El Bohy St. The viaduct will then take a more northerly course through El Bohy St. The viaduct will be built over El Bohy's extensive central reservation, as will be El Bohy Station" (EQI draft ESIA 2012: 29).

After El Bohy Station the viaduct will veer to the east and be constructed over the north going traffic lane of El Bohy Street adjacent to the central reservation. Before the roundabout at the northern end of El Bohy Street the viaduct will veer north-west along El Kawmeya El Arabya Street where El Kawmeya Station will be located. On the western edge of Imbaba and at the western end of El Kawmeya El Arabya Street, the viaduct will cross over the Ring Road.

The elevated Ring Road Station will be built over the Ring Road. After the Ring Road station the line will descend to at-grade and go west through agricultural land before turning north till it intersects with the future Rod El Farag highway where the Rod El Farag Station will be located.

2.2.3 Sub-phase 3C

This sub-phase 3C branches out south-westward from the diversion structure and Kit-Kat Square, at the western extremity of Phase 3A. It includes 3 underground stations, 1 at-grade, and 1 elevated station over nearly 6.1 km, including 3.2 km of bored tunnel, 200 m at-grade, 400 m of cut-and-cover transition zone, 450 m of cut and cover underground stations, 144 m at-grade station, 144 m elevated station, and 1.5 km of viaduct.

Table 5: Overview of Sub-Phase 3C Stations

Station	Type
Tawfikia Station	Underground station, type: Intermodal Station
Wadi El Nil Station	Underground station, type: Normal
Gamaet El Dowal Station	Underground station, type: Intermodal Station
Boulaq El Dakrour Station	At-grade station, type: Normal
Cairo University	Elevated station, type: Mayor Interchange Hub – Interconnection with Line 2

Source: Transport Planning Study, Systra 2009

"The metro railway alignment for [the sub-phase 3C] will start underground from the diversion structure west of Kit Kat Station, very briefly following Sudan Street, before veering south-west under some buildings into Galal El Deen El Hamzawy St. and up to Tawfiqeya station, at the crossing between Ahmed Oraby St. and Wadi El Nil St. The alignment will then follow a southerly course beneath Wadi El Nile St. with a station south of the tunnel crossing beneath 26th of July Corridor.
The station will be built in the middle of the road, close to the crossing with Shehab St. The line will continue south towards Mostafa Mahmoud Square and Gamaet El Dowal Al Arabeya Street.

Upon reaching Mostafa Mahmoud square, the alignment will follow Gamaet El Dowal St. until Sudan St. Gamaet El Dowal station will be located at the Gamaet El Dowal/Shehab St. crossing. The railway will emerge in Boulaq El Dakrour, after having crossed beneath the ENR for Upper Egypt and Sudan St. Boulaq station will be at-grade, but the [..] alignment will then rise immediately after the station, running parallel to the ENR track and east [of] El Zomor Canal S., passing over Tharwat Bridge, Saft El Laban Bridge, and the existing Line 2 station of Cairo University. The Line 3 Cairo University Station will be located to the south of the Line 2 station. Connection between the two lines will be established" (EQI draft ESIA 2012: 30).

2.3 Alternatives

Regarding possible alternatives to the alignments and the station location, the study focuses on the relative environmental and social benefits of elements and activities between the new and former designs. There have been several design changes in the period from November 2009, when a feasibility study was prepared by Systra, and the current final proposal.

The discussion of alternatives within this study concentrates on two "hot spots", which considered a major design change with significant impacts which need to be justified also in front of the population. These two "hot spots" are the now elevated line in El Bohi and El Kawmeya Street and the shift of the Zamalek underground station to the crossing of Brasil and Ismael Mohammed Street

1. Alignment in El Bohi/El Kawmeya Street.

   The Construction of the elevated viaduct and stations of Metro Line 3B – from Imbaba Station on El-Matar Street, to El-Bohy and El-Qawmiya Stations, and ending at the Ring Road Station – will pose challenges to social and community well-being and the environment in El-Mounira and Waraaq El-Arab. Four (4) principal forms of disruption and impact are expected during construction in this area: traffic, public safety, dust, and noise. These disruptions and impacts may continue for up to two (2) years from the start of pre-construction (utilities diversion) to the completion of the elevated stations. Each of these expected impacts are described in the ESIA Volume 2 and for each impact and disruption, proposed plans and steps to mitigate these impacts and disruptions are also presented.

   The construction of the elevated line and stations of Phase 3B offers important advantages over underground construction. These are:

   - Significantly reduced vibration of nearby buildings,
   - Reduced pre-construction time required for utility diversions (very significant on El-Bohy Street where many utility lines are concentrated) and reduced disruption from utility service cuts,
   - No subsidence risk to older buildings from underground tunneling,
   - Greatly reduced risk of building collapses,
   - Greatly reduced waste generation, i.e. removal of excavated soil from tunnels, thus reducing construction traffic, noise and dust generation.
   - Accelerated construction schedule. Above-ground lines and stations can be built more quickly than underground tunnels and stations, thus reducing the duration of disruption during construction.

Beside the alternative of the underground alignment, from the elevated version, the design was changed again during the planning phase, shifting the alignment after the El Bohi station from the middle of the street to the right walkway of the middle stripe. Also this alternative was discussed, applying a score system and was rated in terms of impact criteria. The evaluation of these alternatives - based on described criteria – shows less significant impacts for that alternative which represents the shift of the alignment after the El Bohi station. Nevertheless there is still a need for public consultations to discuss the pros and cons with the affected population and get them acquainted to this possible visual intrusion.

2. The new proposed location for the Zamalek station.

   The station was initially planned on the western side of Ismail Mohammed St. but this location was deemed impractical due to the presence of precious centenary banyan trees, which would have had to be uprooted. The new Zamalek station is located at Ismail Mohamed street in front of the Algerian Embassy and the Spanish Embassy.

   The evaluation of these alternatives - based on described criteria – show no big differences between the impacts these location will cause. These is a slight advantage for the newly chosen alternative location. This choice was underlined by NAT´s negotiations with the Algerian and Spanish embassies, which could reach compromises in using some of their property space for construction purposes.

3 IMPACTS OF THE PROPOSED DEVELOPMENT

The findings of the ESIA developed for Cairo Metro Line 3-Phase 3 are presented in Volume 2: Main Document and Volume 3: Appendices. The ESIA process has led to the identification of the main social and environmental impacts related to the proposed development, and these are considered in detail in the Main Document (Vol. 2).

The range of key issues associated with Cairo Metro Line 3-Phase 3 are listed below and in the ESIA in random order. These are summarised in the remainder of this section:

- Soil
- Solid and Hazardous Waste
- Water Environment
- Air Quality and Dust
- Noise and Vibration
- Visual Intrusion
- Biodiversity and Nature Conservation
- Archaeological Sites
- Public Utilities and Traffic
- Urban Development
- Socio-economic Effect
- Labour Standards and Occupational Health and Safety
- Community Health and Safety

- Involuntary Resettlement
- Cumulative Effect

The ESIA assesses potential impacts associated with the development in relation to:

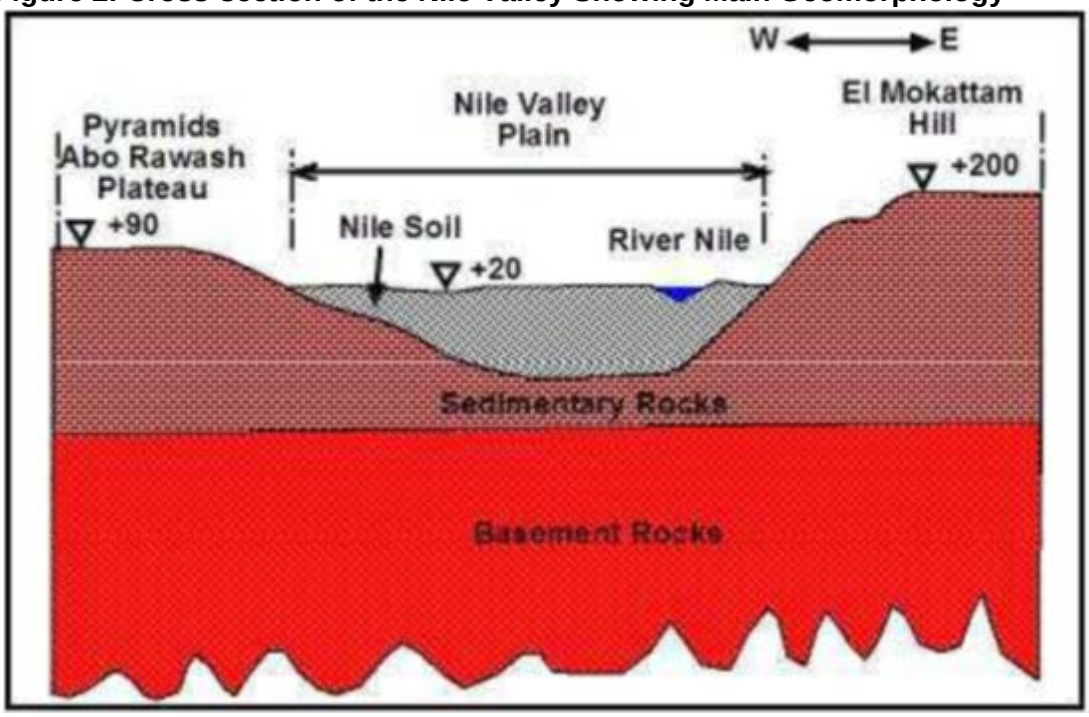
- Assessment and description of potential impacts
- Evaluation of the potential impacts
- Recommended mitigatory measures
- Assessment of residual impacts after implementation of mitigation
- Estimation of cost of applying the proposed mitigation

3.1 Soil

3.1.1 Introduction

"All of Metro Line 3-Phase 3 sub-phases transect areas that have relatively similar and uniform soil profiles. These soils consist of Nile Valley Quaternary deposits where silt and clay layers are underlined by gravel and sand layers" (EQI Draft ESIA, 2012) as illustrated in Figure 2.

Figure 2: Cross-section of the Nile Valley Showing Main Geomorphology



Source: JICA/NAT/Environics ESIA for Line 4, 2010

A range of activities during the project's phases will cause soil disturbance:

- Pre-construction
  - Digging of trial pits to locate underground pipes where no maps available
  - Rerouting all utilities which coincide with the Metro structure, i.e. potable water and sewage networks, electric cables, telephone lines and gas pipes
  - Removing any structures and buildings which may obstruct the Metro structure
- Construction
  - Excavation in conjunction with cut and cover, tunnel boring, associated facilities such as station buildings etc.
  - Evacuation of the dug materials
  - Soil treatment station to separate the soil and bentonite mixture resulting from tunnel boring operations
  - Storage of dug materials prior to disposal
- Operations
  - General maintenance
  - Monitoring

3.1.2 Potential Impacts

During the Metro construction there is the potential for the following impacts to the excavated soil:

- The excavated soil could come into contact with, and thereby be contaminated by, unmanaged waste effluents or oil spills or other types of hazardous waste that may be generated on-site. The excavated soil could come into contact with storm water run-off which may have been subject to contamination and become polluted. These factors will lead to other indirect impacts when the contaminated soil is handled, stored, dumped or reused. This could take place through leaching into groundwater or through air emissions.
- Mixing the soil layers will limit the opportunities for reusing the soil, for example organic layers at the top may be blended with lower quality soil from lower down.

During the Metro construction there is the potential for the following impacts to the surrounding soil:

- Compaction of soil due to the load of heavy construction equipment and machinery, which may in turn impede plant growth, for example of trees planted to reduce visual intrusion.
- Surrounding soil may become polluted with contaminants such as spent lubrication oil.

During the Metro operation there is the potential for the following impacts to the soil:

- Vibration disturbance from normal operations and during maintenance.
- Leakage of wastewater effluents during maintenance activities or from oily water from the workshop.

3.1.3 Proposed Mitigation Measures

It is assessed that most of the impacts can be prevented by the development and implementation of a waste management plan during both construction and operation of the Metro. This will help ensure that all construction and maintenance wastes are stored, managed, transported, reused or disposed of in an appropriate manner by licensed contractors in accordance with relevant waste legislation and the District authorities.

3.1.4 Conclusion

An assessment of the potential impact on soils was carried out for the proposed development. Systra developed a Geotechnical Investigation Report for Cairo Metro Line 3-Phase 3. The area is defined by the two plateaus of Pyramids-Abou-Rawash and El Mokattam, with the Nile Valley Plain in between. The Metro Line 3-Phase 3 will not cut through the plateaus and will be confined to the Nile Valley deposits.

The impacts to the soil generated by the project are considered to be of minor significance, since they are local, temporary and reversible. The implementation of an appropriate waste management plan during both the construction and operations phases will help to ensure the proper mitigation of these risks.

3.2 Solid and Hazardous Waste

3.2.1 Introduction

The construction of Line 3-Phase 3 will result in considerable quantities of construction waste such as excavated soil, machinery waste, packaging waste etc. The handling, transport and disposal of solid waste can potentially pose environmental risks and risk to human health if not done properly. Furthermore, some solid waste may be contaminated and need special treatment. Hazardous waste types include e.g. dye mud, dye wash, solvent waste, grinding mud, phosphate mud, oil metal mud, waste thinner and varnish sediments, waste batteries, empty chemical packaging, and contaminated fabrics and gloves.

In general there is a lack of an engineered sanitary landfill capacity in Egypt. At present there is only one site for construction waste and soil waste in Cairo Governorate and two for solid waste in Cairo and Giza Governorates. All hazardous waste should be transported to an engineered landfill in Alexandria, which is the only recipient of large quantities of hazardous waste in Egypt. Smaller amounts of hazardous waste can, however, be disposed of at the official solid waste landfills, dependent on their carrying capacity for hazardous wastes.

3.2.2 Potential Impacts

The following potential impacts have been identified related to solid and hazardous waste:

- Ineffective sorting of waste into respective categories targeted to disposal forms during construction and operations leading to contamination
- Uncontrolled dumping of construction waste at unplanned landfills, causing pollution, leaching and fires

- Mixing of solid and hazardous waste fractions causing OHS risks among workers at tipping areas
- Ineffective waste management, collection and disposal during operations phase leading to visual pollution and odours

3.2.3 Proposed Mitigation Measures

The following mitigatory measures are recommended to maximise opportunities for recycling relevant waste fractions, and to ensure that both solid and hazardous wastes are managed and disposed of in an appropriate manner:

- Providing waste management instructions for the contractor on how to handle the specific types of wastes
- Making sure that waste quantities are registered and the final disposal is controlled by Waste Records
- Proposing arrangements for waste storage, transport, recycling and treatment in close cooperation between the responsible Cleansing and Beautification Authorities of the respective Districts, the contractor and NAT
- Storing earthwork and construction wastes separately according to the type of activity and type of waste
- Storage of excavated wet soil separately to avoid cross contamination
- Sorting the waste into the following fractions for their appropriate disposal: recyclable solid waste, non-recyclable solid waste, hazardous waste and domestic waste.

3.2.4 Conclusion

The ESIA has mapped the available landfills and hazardous waste centres in GCR and further afield, and detailed the existing waste management practices in Cairo. Of particular concern is the general shortage of landfills that are capable of handling hazardous waste, and there is therefore assessed to be a risk that all the waste types from the Metro project, including toxic wastes, will be mixed together and disposed of at local landfills.

This risk is deemed to be especially significant during the construction phase, and the resulting impacts are categorised as major impacts in the ESIA. However, with proper management of the waste and arrangements for waste storage, transport, recycling and treatment in place, impacts are expected to be of a minor magnitude.

The impacts related to waste and hazardous waste management during the operations phase are considered to be of minor impact.

3.3 Water Environment

3.3.1 Introduction

The River Nile and its alluvial aquifer supply Cairo’s entire freshwater demand. The Nile cuts through the city from south to north; its flow is dependent on the discharge delivered through the Aswan High Dam, and the water withdrawals along its path.

The Metro Line 3-Phase 3 alignment crosses two branches of the Nile beneath the river bed at Zamalek. In addition sub-phases 3B and 3C will come very close to the Zomor Canal, which is one of the irrigation channels in Giza. The Zomor Canal is severely affected by local community pollution, and it is a receptor for both solid waste and untreated liquid effluents.

Figure 3: Zomor Canal besides Cairo University

Source: EQI 2012: 137

Studies were conducted by EQI of groundwater quality at the planned locations of the Cairo University, Zamalek, Nasser, and Imbaba stations (EQI Draft ESIA, 2012). The complete results of the analysis are available in Appendix 3 of Volume 3:

- Oil and grease content is above the legal limit of 5 mg/l in all samples, and excessively so at the Cairo University (about 25 mg/l), possibly due to the proximity of the Metro 2 terminal station, multiple roads, and large ENR workshop/depot.
- Metals content are for the most part within legal limits, with the exception of Fe and Mg. Cairo University, in particular, has very high Fe concentrations.
- Nitrates are within acceptable limits at all locations, but nevertheless indicate contamination in some areas, such as in Cairo University, which has considerably higher concentrations than the other stations.
- Nitrite is slightly above the acceptable 1 mg/l limit at Nasser, but otherwise concentrations are within acceptable limits.
- BOD and COD and salinity (EC) were largely in excess of national standards at all locations.
- Predictably, microbial analysis revealed high counts of coliforms (E.Coli, Proteus, Salmonella, Enterobacter), indicating heavy contamination from the sewage network.
- The groundwater samples from Cairo University seemed to be of lowest quality, which can be attributed to infiltration from the Zomor Canal, the ENR workshop activity, and the proximity of Boulaq El Dakrour, where the wastewater networks are either lacking, or poorly maintained (EQI 2012: 58).

3.3.2 Potential Impacts

The following potential impacts were identified during construction:

- Nile instability and bathymetric level changes - the proposed Metro line will pass below bed-level of the River Nile between the Kit Kat station in Giza Governorate and El Zamalek station in Cairo Governorate. No investigation has been made into the current depth of the soil sediments and the rate of change of this depth in order to predict potential future variations affecting the Nile system.
- Physical changes to the Zomor Canal may take place, because the at-grade level which will pass in Boulaq El Dakrour may necessitate covering the Canal. This is under investigation with the Ministry of Agriculture. The significance of this impact depends on the current evaluation of the value of the canal water to the nearby residents, to local ecosystems and biodiversity as well as its main function as a water transmission means for irrigation.
- During the construction phase it is likely that some waste, effluent discharge or some oil/hazardous effluents spills reach the surface water, particularly at the Bashteel and Zomor Canals.
- Physical changes in the groundwater geometry and to the existing production and observatory wells since the tunnel construction will necessitate the removal of water saturated soil. This will affect water levels and the flow direction of the surrounding groundwater in the vicinity of the underground structures, potentially affecting the existing foundations of nearby buildings; and since the depth to the groundwater piezometric surface will increase, groundwater wells in the project area may have reduced discharge rates.
- Changes in groundwater quality might take place indirectly as the tunnel construction will involve groundwater level reduction, followed by seepage from nearby surface waters sources into the aquifer. Thus, if the surface water is contaminated, it will pollute the underlying groundwater.

The following potential impacts were identified during the operations phase:

- Contamination of the groundwater for example due to uncontrolled discharge of wastewater and oil from the workshop and the general maintenance activities or from bad waste management practise.

3.3.3 Proposed Mitigation Measures

- Apply all measures recommended previously to mitigate the impacts on the soil quality and waste management. This includes applying competent measures to prevent accidental spills and process discharges. It also includes applying strict measures to protect water courses from any expected pollution due to illegal dumping of waste.
- Carry out geo-technical surveys and modelling (could be done in coordination with the Nile Research Institute) to determine any design or construction-specific measures to counter potential instability in the Nile sediment under Zamalek.
- Monitor groundwater depth and substitute damaged wells if any.
- Install alternative irrigation for agricultural areas should Zomor Canal be covered.

3.3.4 Conclusion

The Nile and its underlying aquifer supply all drinking water for Cairo, and water quality impacts therefore need to be protected carefully during the project. The potential impacts identified are categorised as minor since they are of local, short term impact and relatively easily mitigated.

The ESIA process has identified that the Zomor Canal may be covered during the construction phase, or permanently. The Canal water is mainly used for agriculture purposes (main function). It has no apparent non-consumptive value such as use for recreation, boating or swimming. In addition, in some areas (e.g. the area of Boulaq El Dakrour) the Zomor Canal is out of use and no longer necessary to be maintained. Based on the results of consultations with the public, its existing value is negative. This is because of the accumulation of wastes which poses diverse health risks. In this context, covering the Canal will induce a positive impact. The only significant consequence would be the cutting off the water to agricultural lands which depends on this water for irrigation purposes. For the latter, the impact can be classified as major and needs an alternative mean of water transportation to be designed and installed prior to project construction.

3.4 Air Quality and Dust

3.4.1 Introduction

The ESIA investigated ambient air quality in GCR. The Egyptian Environmental Authority (EEAA) operates a network of air quality monitoring stations in GCR. In addition, EQI carried out sampling of ambient air quality at 4 station locations: Cairo University, El Kawmeya , Zamalek and Maspero. The results are presented in detail in the Physical Environment section of the Baseline presented in the ESIA Volume 2: Main Document. The most critical parameters for the project are particulate matter and NOx based on the sampling results.

3.4.2 Potential Impacts

One of the most obvious impacts of the construction phase is the large quantities of dust and air emissions including gases, vapours and odours from asphalting, welding and vehicular exhausts. In addition, the local traffic diversions will likely give rise to an increased air pollution load in certain localities.

During the operations phase, the rolling stock will indirectly result in air emissions through the production of electricity, unless that power is sourced from a non-fossil source, for example hydropower. Operations emissions are therefore not considered in detail in the ESIA.

The modal shift in means of transportation will have a positive impact on air pollution levels in GCR since it will lead to a reduction in the number of personal vehicles on the road, which will in turn lead to an incremental fall in air pollution. It has been estimated that the project will result in CO2 savings of 11 million tonnes and 741 tons less particulate matter in the period up to 2052 (Systra, 2009).

3.4.3 Proposed Mitigation Measures

The following mitigation is recommended to be implemented during the construction phase:

- Dust management plan and dust management measures to reduce dust emission during construction activities, storage, and transportation.
- Consideration of adoption of stricter emission requirements with respect to emissions of particulate matter and NOx.
- Use of particle filters and DeNOx technology
- Inspection and maintenance of vehicles and machinery.
- Monitoring of ambient air quality

3.4.4 Conclusion

The main potential impacts are found to occur in the construction phase. These are considered to be major impacts bearing in mind the depleted status of Cairo's airshed. However, it is assessed that the mitigation programme can bring the potential impacts under control, and they are thus assessed to be minor impacts after the application of the mitigation.

Furthermore, the project will result in a significant air pollution reduction since the rolling stock is not a point source emitter of air pollution from combustion.

3.5 Noise and Vibration

3.5.1 Introduction

The ESIA has considered the noise environment in Cairo. EEAA has installed a range of noise monitoring stations in Cairo. The Cairo Governorate has also conducted noise monitoring as part of the National Noise Reduction Plan. The main sources of noise identified in Cairo are:

- Transportation and road noise alongside transport arteries primarily due to annual increase in number of vehicles, neglect of regular car maintenance and poor road pavement. In addition noise emissions from trains found to affect buildings 150 meters away.
- Commercial and human activity noise: noise produced by shops and commercial activities
- Loud speaker noise: use of loud speakers for celebrations, weddings, funeral ceremonies, and outdoor mosques.

Noise level measurements show that the noise levels in Cairo are fairly constant showing little variation between day and night. Despite the Noise Reduction Plan, noise levels in residential, commercial and industrial areas of Cairo are in constant excess of the legislative limits.

EQI conducted a series of 24 hour ambient noise and vibration monitoring at 8 different station locations along Line 3-Phase 3 alignment as part of the ESIA study. Measurements were done over one 24 hour period. The results confirmed that at any time, day or night, the noise intensities at the locations are in excess of the legal requirement. No noise modelling or vibration modelling has been carried out as part of the ESIA process.

Egyptian legislation does not set limits for vibrations, and a systematic compilation of vibration data was not identified in the ESIA process. Vibrations are generally divided into two categories: vibrations that may be damaging to building structures, and vibrations that cause a nuisance to the people living in the buildings.

3.5.2 Potential Impacts

Noise impacts during construction will affect site workers and areas surrounding the construction sites; noise during operations will also affect Metro staff and surrounding areas, especially in the at-grade and elevated alignments. Vibration impacts are associated with activities in the preconstruction, construction and operation phases.

Pre-construction and construction noise and vibration impacts:

- Noise resulting from machinery and vehicles involved in the utility diversion activities and construction activities such as excavation, tunnelling, construction of new concrete structures, demolition activities and track laying. A noticeable noise increase in the range of 3 dB(A) is considered likely.
- Vibrations are expected in the same areas as noise but derive especially from specific activities such as sheet piling in connection with the cut and cover construction sites, and tunnelling.

Operation phase noise and vibration impacts:

- Noise and vibration from rolling stock – the at-grade and elevated sections of sub-phases 3B and 3C will emit noise and vibration very close to residential receptors.

Figure 4: Noise Barriers Along the Existing Metro Line 2 (Cairo University)

Source: Grontmij

3.5.3 Proposed Mitigation Measures

Construction:

- Noise control measures, including:
  - Scheduling of noisy activities in consideration of daytime and night time noise limits
  - Site layout to keep noisier equipment and activities as far as possible from noise sensitive locations
  - Provision and use of temporary noise-insulating barriers
  - Use of equipment modified to reduce noise
- Monitoring of noise impacts

Operation:

- Implementation of an additional study on noise impacts along at-grade and elevated alignments to be carried out
- Implementation of noise barriers along sections where the noise impact study predicts that the noise impacts at receptors are above the established limits
- Monitoring of noise impacts.

3.5.4 Conclusion

The potential noise impacts resulting from construction and transportation activities are considered to be of major significance since they are continuous, highly local and dependent on the specific construction activities at any given time. It is possible to mitigate the noise impacts through careful planning.

Noise from operations of the Metro are also considered to be of major significance since they are continuous though limited to the at-grade and elevated sections of the Metro. The noise receptors in both constructions and operations are considered to be sensitive since the background noise levels are already exceeded. Although a noise study had been done as part of the original EQI ESIA, it was found to be insufficient for the purposes of noise impact modelling, and this has not been possible. It is therefore essential that an additional study on noise impacts along the at-grade and elevated alignments is carried out as soon as possible in order to assess the potential noise exposure and plan any necessary noise mitigation. It is, however, proposed that with the application of noise barriers the noise levels during operations can be reduced to a level that complies with noise standards.

Vibration impacts during constructions are assessed to be of low significance. They are isolated, occur for short periods of time and difficult to mitigate. During operations, the vibrations are also assessed to be of low significance since they are unlikely to occur at a magnitude where they will impact significantly on local receptors. Based on previous Metro experiences and an assessment of the geological conditions, it is likely that the receptors will be less sensitive to vibrations during the construction and operations phases.

3.6 Visual Intrusion

3.6.1 Introduction

The construction of the Metro will result in disturbance of the urban landscape comprised of trees and public spaces. This has been taken into account during the planning phase, for example with regard to the selection of the Zamalek station site. Nonetheless, a large area of planted green space will be removed during the construction process.

Design guidelines for the Metro Stations and the at-grade and elevated sections of Line 3-Phase 3 have been elaborated by Systra and approved by NAT. These are analysed in detail in Volume 2: Main Document.

3.6.2 Potential Impacts

The following visual impacts were identified during construction:

- Temporary loss of public space for example benches and public gardens
- Loss of shade giving and in some cases historic trees
- Visual impacts from piles of construction materials, heavy machinery etc.

The following visual impacts were identified during operation:

- Viaducts supporting elevated sections and the elevated track alignments will remove the relatively open visual lines that are found in the affected areas, and are of considerable importance given the network of narrow alleys behind the affected areas
- The elevated sections will also reduce the external visibility from some of the residences along the alignment, especially where stations and viaducts are close to the existing 4-5 storey houses

3.6.3 Proposed Mitigation Measures

Proposed mitigation measures during construction are:

- Developing plans for re-establishing green recreational areas immediately after construction.

Detailed mitigation measures for each station of the Metro Line 3-Phase 3 are presented in Volume 2: Main Document based on the existing Design Guidelines. It can be seen that there is a heavy emphasis placed on the post-construction beautification of the stations areas through tree planting, reinstallation of public space, optimised transfer between passenger transport modes at the metro stations, and improved station accessibility to pedestrians.

Figure 5: Example of Beautification Plan

Source: SYSTRA 2009

- **Considering plans for design change where the elevated alignment is less than 5 m apart from the nearby buildings**

In cases where this is relevant (e.g. for the alignment between El Bohy Station and El Tawmeya station) a design change procedure is recommended to be applied and to be discussed between the relevant authorities as NAT and the MoT. The procedure and the recommended format to be used are outlined in more detail in the Volume 2, Discussion of Alternatives.

3.6.4 Conclusion

Visual impacts caused by the removal of greenery and urban landscape facilities are expected to be greatest during the construction and operation of the elevated sections, they can be considered to be a minor impact, since they are of local, short term impact and relatively easily mitigated.

Different is the situation for the visual impact caused by the viaduct itself, in those areas where it is approaching close to the existing buildings. Here the impact will be a long-term, direct, local, irreversible and severe impact once erected. Mitigation measures in this case have to be considered already in the pre-construction phase.

The construction work will require the use of large areas of land, much of which was previously planted with trees and shrubs, and therefore had both aesthetic and amenity value. In addition, spaces that have been previously used for recreational purposes, such as the central reservation in El Bohy Street, will be occupied during construction. It is important that these areas are replanted and recreated post construction. The Metro project is an opportunity to re-green and re-organise the urban environment in the affected areas. Detailed plans are largely in place though some need to be updated to take into account recent changes to the alignment. The general visual intrusion is therefore considered to be a minor impact.

3.7 Biodiversity and Nature Conservation

3.7.1 Introduction

Metro Line 3-Phase 3 runs through areas of high intensity building, characteristic of the urban inner city areas. No natural habitats of biodiversity value were identified.

3.7.2 Potential Impacts

No significant biodiversity and nature impacts are foreseen.

3.7.3 Proposed Mitigation Measures

The aforementioned mitigation measures proposed to counter visual intrusion will help to re-establish the affected biodiversity.

3.7.4 Conclusion

No threatened habitats or endangered species will be affected by the project. Since the Metro is being constructed in high intensity urban areas, any species present are highly adapted to the urban environment. Potential biodiversity impacts are therefore considered to be of minor significance.

3.8 Archaeological Sites

3.8.1 Introduction

According to Egyptian law, approvals must be obtained during the pre-construction phase of the project from both SCA and NOUH. These organisations assess whether the project will have a negative effect on sites of historic significance and sites of architectural significance. During the construction of Metro Line 3-Phase 3, extensive excavation will be carried out, which could lead to the finding of antiquities or buried artefacts. The possibilities for such chance-finds may be high in some locations.

3.8.2 Potential Impacts

Potential key impacts on archaeological sites are mainly expected during the construction phase, and can be identified as follows:

- Total or partial expropriation
- Structural impact in the forms of cracks, tilting or other forms of structural instability
- Total or partial structural failure during the construction phase.
- Visual intrusion at the areas where the metro line passes at grade or at an elevated grade level
- Such chance-finds generally need special care in handling so as to keep their condition that will support the cultural value it represents, therefore in the unlikely finding of such objects the Ministry of Tourism and Antiquities should be informed so as to adequately handle this object.

Potential impacts on Chance-Find buried Artefacts include:

- Total or partial damage incurred to buried artefacts
- Prevention of future exploration possibilities at new archaeological sites

3.8.3 Proposed Mitigation Measures

In order to avert the risk of impacts on archaeological sites, it is recommended that:

- Additional study required to perform a thorough investigation of the potential impact on historical buildings, and buried monuments.
- Implementation of a chance-find procedure including stopping works if an artefact is discovered, and notifying the relevant authorities.

3.8.4 Conclusion

Due the high tangible and intangible value of sites of historic and/or architectural significance, the risk of potential impacts on them is considered to be major and should be mitigated. The impact of potential damage to chance finds is also considered to be of major significance and the necessary mitigatory measures should be put in place.

3.9 Public Utilities and Traffic

3.9.1 Introduction

Public utilities such as gas pipelines, water mains, sewers and electricity cables will be affected by the Metro project in areas where they conflict with the Metro alignment. These will require alternative routings of the public utilities, and it is expected that these measures will mainly occur in the pre-construction phase. Traffic disruption will be greatest during the construction phase, when roads will be closed off for the necessary construction sites access.

3.9.2 Potential Impacts

Public utility impacts (pre-construction) are likely to include:

- Disruption of utility services
- Risk of pollution from incorrect techniques during diversion process
- Risk of accidents to workers and general public in the vicinity if appropriate safety measures are not taken

Potential traffic impacts (construction):

- Traffic diversions around construction sites leading to delays in transport time
- Transportation of construction materials, excavated soil for disposal, waste products etc. leading to delays in transport time
- Pedestrian disturbance through difficulties in access to residential and public buildings
- Effects on traffic-based public services such as waste collection and emergency services
- Effects on road safety caused by poor planning of diversions, loss of pedestrian walk ways and reckless driving

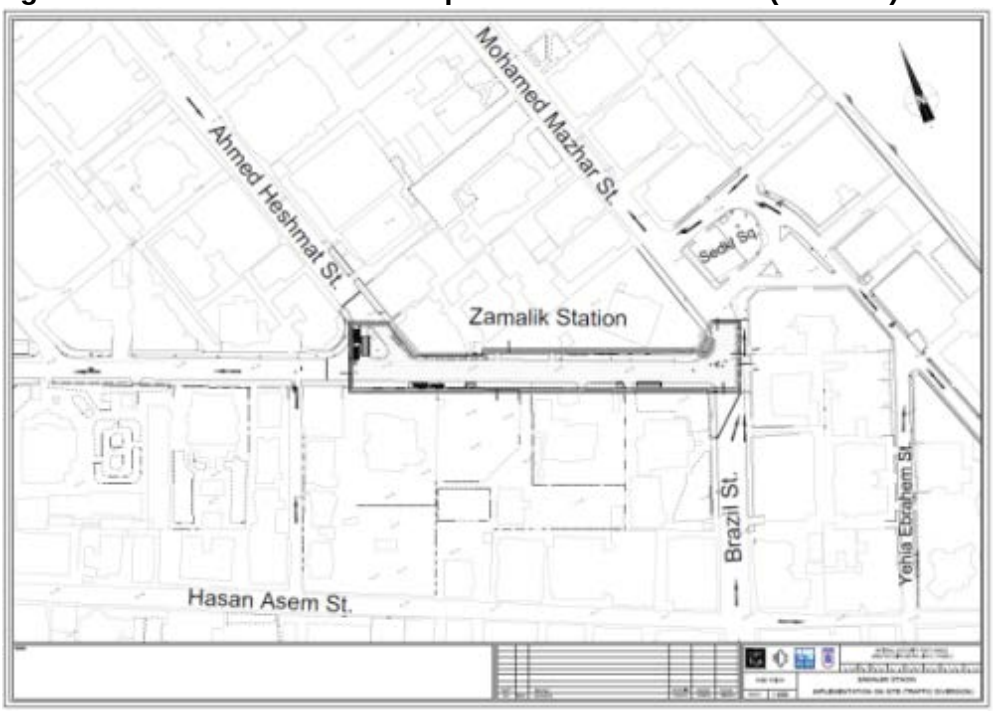
3.9.3 Proposed Mitigation Measures

Systra has elaborated mitigation measures for public utilities in the Feasibility Study for Metro Line 3-Phase 3.

Systra has elaborated detailed traffic diversion plans for the following sub-phase components:

- Sub-phase 3A
  - Nasser station
  - Maspero station
  - Zamalek station
  - Kit Kat station and diversion shaft
- Sub-phase 3B
  - Sudan station
  - Imbaba station
  - El Bohi station
  - El Kawmia station
  - Ring road station
  - Rod El Farag station
- Sub-phase 3C
  - Tafikia station
  - Wadi El Nil station
  - Gamat El Dowal station
  - Boulaq El Dakrour station
  - Cairo University station

Figure 6: Traffic Diversion Example - Zamalek Location (Phase 3)



Source: SYSTRA, Greater Cairo Public Transport Study Update and Line 3 Phase 3 Design Study, 2010

In addition to the traffic diversion plans, there is a need for an effective traffic management strategy to ensure their successful implementation. Key elements of the traffic management strategy include:

- Close coordination between the responsible agencies and other traffic mode carriers
- The development of a route management strategy for each affected station
- An information strategy to communicate the plans to the affected communities
- A plan for contingency measures
- Mitigating any problems arising during the first weeks of the traffic diversion and
- A monitoring tool to ensure that disruption is minimised to the extent possible

3.9.4 Conclusion

Careful planning has been spent on the utility diversion and traffic diversion aspects of the projects. NAT is well experienced in the construction of metro lines, and it is therefore considered that the utility diversion will be managed in an appropriate manner, and that the resultant impacts will be minor.

The need for traffic diversion is obvious and is considered to be a major impact. It is critical that the traffic diversion plans are managed in a satisfactory manner, including communication with all stakeholders involved. For this reason a traffic management strategy is essential.

3.10 Urban Development

3.10.1 Introduction

Through applying different site visits and reviewing the EQI draft ESIA report, it was notable that the land use in the project areas is diverse according to the different urban character of the areas. The stations and alignments are located in high density, urban mixed use residential areas, industrial areas, commercial areas, suburban residential areas and rural and open spaces and therefore will have a different impact on the community.

3.10.2 Potential Impacts

The provision of a new Metro line will influence the land use pattern, the character of the affected communities and influence the real estate market.

Land use

The main land use impact is expected to occur in the semi-urban area on the Ring Road and El Farag station. The impacts of these stations on the land use development will likely be manifest by the rapid conversion of agricultural land into residential area.

Figure 7: Ring Road Agricultural Lands with View to New Buildings

Source: EcoConServ

Figure 8: Old Building in the Ring Road

Source: EcoConServ

This type of rapid urbanization might have a mixed impact as the livelihood of community will change rapidly. On the one hand, this can be seen as a positive effect, since agricultural land will likely increase in value from 600 EGP to 3000 EGP per m^2. The owners of one floor mud houses will also benefit from selling their property and can expect a high price. On the other hand, the loss of the most fertile arable agricultural land reduces the possibilities for local food production and may increase unemployment among farmers.

The planned new urban structures of the Imbaba Airport project and the inter-connection of the Metro line with the existing Ring Road and the planned Express Highway will accelerate land use change especially in the Phase 3B area.

Community change

It is anticipated that the change of the community behaviour is important in sub-urban and rural areas, where the Metro line will stimulate the development of new settlements, commercial activity and new traffic routes. The community will change their life style and can communicate easier by improved traffic possibilities.
As a negative impact, there is a fear from some residents in Zamalek that the community character of Zamalek might be changed. A positive reaction might be expected from the Boulac El Dakrour area, with its informal settlements. Here the acceptance of the Metro line is expected to be high, because it provides a cheap and comfortable transport means, increases business and improves accessibility between Boulac and the Giza area.

3.10.3 Proposed Mitigation Measures

Regarding the negative impacts from the change of land uses from agriculture land into residential use, a proper land use plan especially for the northern part of the Metro Line 3, Phase 3B is recommended, combined with an improved control of construction activities in this area.

Regarding the community change behaviour, information campaigns for the population, especially in Zamalek is essential to increase the acceptance of the Metro station in this area. The proposed public consultations – as outlined in the Stakeholder Engagement Plan – are a first step into this direction.

3.10.4 Conclusion

In relation to the potential impacts of the Cairo Metro Line 3-Phase 3 development, the potential impacts resulting from land use change are assessed to be of minor significance.

3.11 Socio-economic Effect

3.11.1 Introduction

The ESIA has analysed the potential positive and negative socio-economic effects of the project.

3.11.2 Potential Impacts

The potential positive socio-economic impacts during the construction phase include:

- Enhancement of the source of income among those living in the Ring Road area through the establishment of small businesses (small restaurants, cafes) to serve the potential workers
- Regarding job creation, it is estimated that the Metro Line 3-Phase 3 development will require over 2000 workers of different types, skilled, unskilled, technicians and engineers

The other positive socioeconomic impact that might result during the operation might include:

- Provision of source of income for those who will operate the metro and work on permanent basis in the Metro 3. Based on rough calculation for the direct jobs to be provided, it will exceed 1500 job.
- Reduction in road traffic congestions and positive indirect impact on different sectors i.e. tourism, trade and other sectors. Not only that but the expected modal shift will improve mobility (access to jobs, education, commerce, etc.) to the local community especially in the poor and densely populated areas.
- Access to basic services and utilities is one of the main important benefits that might work for the enhancement of those living in poor areas in particular.
- Potential change in the microbus and tuk tuk drivers' income was one of the main unpredictable positive impacts as it was anticipated that they might lose their source of income. But based on interviews conducted with them in different areas they reported that they suffer due to the congestion.

The potential negative socio-economic impact is related to the construction phase, whereas negative impact during operation is limited. The negative socio-economic impact that might result during the operation might include:

- The source of income (i.e. shops, vendors and clinics) might be temporarily reduced due to temporary closing during the construction activities.
- Old people employed by expropriated shops might not have an alternative place to work
- Access to basic services (water, supply, electricity, health services etc.) might be affected in the areas during the construction phase.
- Impact on health status due to noise and dust

- Impact on houses and dwellings due to vibration.

3.11.3 Proposed Mitigation Measures

With respect to potential negative socio-economic impact the key mitigation measures include:

- Fair market price based compensation should be paid to cover lost income.
- Alternative areas should be given to vendors.
- For the old people, there should be some type of arrangement with the Social Insurance Department to provide them with a monthly financial support.

A more comprehensive range of mitigation measures are presented in the ESIA Volume 2: Main Document.

3.11.4 Conclusion

The socio-economic effects of the Metro project are found to be mainly positive in nature. Some of the environmental impacts presented in the above sections are also found to have negative socio-economic effects, and the implementation of the necessary mitigation measures will thus also reduce the socio-economic effects of the project.

3.12 Labour Standards and Occupational Health and Safety

3.12.1 Introduction

Egypt has ratified the core ILO labour conventions on collective bargaining, non-discrimination, abolition of forced labour and abolishing the worst forms of child labour. There are some sectors within which these conventions have not been fully implemented.

Occupational health and safety (OHS) risks are intrinsic to all large scale infrastructure projects such as the Cairo Metro.

Systra will manage procurement of labour for the construction of the Metro, using the FIDIC Standard Conditions of Contract for Construction. The tendering will be done through six main lots:

1. Civil works
2. Track works
3. Power supply and workshops
4. Signalling
5. Rolling stock
6. Fair collection

Figure 9: OHS Site Regulations Displayed at Construction Site Entrance, Line 3 Phase 2 in Heliopolis

Source: Grontmij, Photo from existing Metro site under construction

3.12.2 Potential Impacts

There is a risk that the contractors involved during the construction of Metro Line 3-Phase 3 do not live up to national and international standards regarding management of labour and working conditions. This could have a variety of impacts including worker injuries and fatalities.

3.12.3 Proposed Mitigation Measures

Appropriate labour and working condition requirements need to be included in the tendering for the construction work and related activities. FIDIC includes a number of requirements related to OHS which are to be incorporated into the contracts. Furthermore, Systra has undertaken a study on corporate social responsibility (CSR) and incorporated CSR requirements into the contracting procedures including compliance to the ILO core labour standards. Importantly, contractors commit to a number of measures to ensure their social performance including:

- Implementation of a human resources policy
- Upholding exemplary health and safety standards on site and
- Ensuring that training and dissemination of safety instructions are given to employees

A range of specific OHS mitigation measures are put forward in the Volume 2: Main Document.

3.12.4 Conclusion

The OHS and labour standards are considered to be a direct impact of likely occurrence on an individual level. The duration is long term and possible to mitigate. The impact of labour and working condition risks is therefore categorised as being of major significance.

Of utmost importance for decreasing the labour standard risks of the project is Systra's initiative to incorporate adherence to ILO core conventions in constructor contracts, and the individual employee contracts to include working hours, remuneration and overtime premium, emphasising the employees right to a living wage.

3.13 Community Health and Safety

3.13.1 Introduction

The design, alignment and construction of Line 3 – Phase 3 of the Greater Cairo Metro system will directly and indirectly affect hundreds of thousands of metropolitan households and residents, daily commuters and frequent travellers, local small and medium businesses, farmers and property owners, local government, transportation and other public service providers proximate to the new line. Transportation and traffic flows, recreational areas and markets, schools, medical and religious facilities, access to neighbourhoods and buildings, personal safety and well-being through exposure to increased noise, disruption and pollution will all be significantly affected by the planned design, alignment and construction of the Metro line and stations in the highly-congested urban neighbourhoods of Line 3 – Phase 3.

3.13.2 Potential Impacts

The following areas have been identified as sources for potential impacts on community health and safety:

- Community acceptance
- Noise and vibration
- Hazardous materials and waste
- Air quality
- Traffic disruption
- Visual intrusion
- Expropriation
- Security personnel requirements

3.13.3 Proposed Mitigation Measures

The guiding principle to mitigate impacts to communities during construction is to establish and sustain an open and transparent dialogue between NAT and the affected communities. The mechanism for this is the Stakeholder Engagement Plan presented in the ESIA Volume 3: Appendices.

The mitigation measures identified under the sections on noise, air quality, waste management and traffic deviation, will all minimize the potential negative impacts for communities. Additionally the following mitigation measures addressing community health and safety are suggested during the construction phase:

- Timely and appropriate dissemination of information on the planned design, alignment and construction in affected communities along the alignment;
- To invite, listen and respond properly to community concerns;
- Timely and appropriate information on traffic deviation plans to affected communities;
- Timely and appropriate information on the grievance mechanism established in NAT for this project to affected communities;
- Satisfactory resolutions for each legitimate complaint and grievance;
- Timely and appropriate information disclosure, including stakeholder information on the NAT website;
- All resettlement issues are properly addressed and the Resettlement Action Plan (RAP) is enforced, including communication to affected communities.

Figure 10: Fencing of Construction Site, Line 3 Phase 2 in Heliopolis

Source: Grontmij

3.13.4 Conclusion

The main impacts to community health and safety during the construction and operations phases are found to mainly derive from noise, air quality and dust for the communities alongside the alignment. These are found to be of major significance. The implementation of the mitigation measures outlined for these specific aspects, together with timely and appropriate community liaison by NAT, will mitigate these impacts.

3.14 Involuntary Resettlement

3.14.1 Introduction

Construction activities may lead to the disruption of livelihoods, commercial activities and social services for some Project Affected People (PAPs) on different sections of the Line 3-Phase 3 development. Any livelihood activity taking place within the pre-construction or construction areas, or any roadside shops, regardless of their legal status, may need to be temporary interrupted or permanently relocated, resulting in temporary or permanently loss of income generation opportunities, needing special attention.

A Resettlement Policy Framework (RPF) has been developed and is presented in the ESIA Volume 3: Appendices, in line with EIB requirements for projects involving large scale resettlement.

The project resettlement is summarized as follow:

- El Bohy street would induce the higher probability of causing the land acquisition and resettlement due to the station construction. The potential expropriated lands are located in the middle of street (market and a mosque). The market contains 166 shops rented from the governorate under Right to Benefit
- Maspero cut and cover station will result in land acquisition for some shops and a cinema
- 28 Feddan in the Ring Road will be expropriated
- A parking area close to Dar El Qadaa will be also expropriated

Figure 11: Cinema in the Maspero Station Area

Source: EcoConServ

3.14.2 Potential Impacts

The following are the unfavourable impacts resulting from expropriation and resettlement activities:

- Community disturbance
- Changing the environment of children, particularly, schooling and other recreational places allocated for them
- Transferring the affected persons to different locations might affect their living conditions/quality of life and business (owners of shops)
- Applying the resettlement activities by force might cause conflicts with the communities
- Loss of arable lands in the Ring Road might affect the community people as well, the land there is moving rapidly into construction lands. The compensation will not be addressed based on its new nature but it will be based on being an arable land
- Compensation might be of a low market price or the units provided as alternative units might be of a different social, standards.

3.14.3 Proposed Mitigation Measures

The mitigation measures necessary for the resettlement process are described in general in the Resettlement Policy Framework.

A Resettlement Action Plan will be developed for the Cairo Metro Line 3-Phase 3 that will guide the resettlement process resulting from the project.

3.14.4 Conclusion

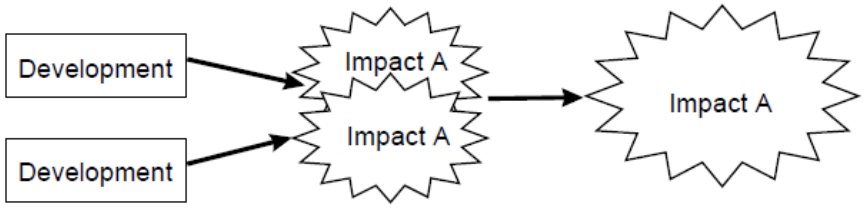
The resettlement, disruption of livelihoods, commercial activities and social services for people along the alignment is found to be a critical impact unless managed in an appropriate manner with due diligence. Even with the appropriate mitigation, this impact is found to be of major importance.

3.15 Cumulative Effects

3.15.1 Introduction

In line with EIB standards, the ESIA has also assessed the cumulative effect of the Cairo Metro Line 3-Phase 3 project. Here the term cumulative effect is used to cover the impacts that result from incremental changes caused by other past, present or reasonably foreseeable actions together with the project, as portrayed in the schematic below.

Figure 12: Cumulative Impacts



Source: EC, Guidelines for the Assessment of Indirect and Cumulative Impacts and Impact Interactions, May 1999

3.15.2 Potential Impacts

Potential impacts were sought after within the following categories: physical effects, biological effects and socio-cultural effects.

In terms of the physical effects, the project will contribute positively to the overall cumulative effect that the Cairo Metro has in terms of reducing air emissions from vehicular traffic. Although there will be localised visual impacts, these are not assessed to contribute to the cumulative effect since it will not be possible to see other elevated metro lines in the so-called “hot spots”.

In general, there is very little biodiversity in Cairo to be affected by the project. The inner city is intensively urbanised with little green space. Those trees that will be removed will be replanted as part of the beautification plan. There is also likelihood that animals, birds and plants will use the at-grade metro sections, especially on the outskirts of the city, as natural green corridors facilitating their movements and conservation.

The project will have both positive and negative socio-cultural effects. The positive effects will come through improved quality of life to commuters, improved health levels due to reduction in harmful air pollutants and job creation during construction and operations. As with all metros, Line 3-Phase 3 will require land, which will result in both temporary and permanent economic displacement and resettlement. A study shows that none of the affected areas along Line 3-Phase 3 have already been affected by resettlement as a result of the other existing Metro lines i.e. have been exposed to a cumulative effect. Furthermore, the Promoter has optimised the design of the at-grade and elevated alignments to reduce the need for resettlement to a minimum.

3.15.3 Proposed Mitigation Measures

No mitigation measures were identified.

3.15.4 Conclusion

The project is not assessed to contribute to significant cumulative effects.

4 ENVIRONMENTAL AND SOCIAL MANAGEMENT AND MONITORING PLAN

An environmental and social management plan (ESMP) is to be prepared. The ESMP consists of a set of mitigation, management and monitoring measures to be taken during implementation of the project to avoid, reduce, mitigate, or compensate or offset any adverse social and environmental impacts.

5 STAKEHOLDER ENGAGEMENT PLAN AND GRIEVANCE MECHANISM

The design, alignment and construction of Line 3 – Phase 3 of the Greater Cairo Metro system will directly and indirectly affect hundreds of thousands of metropolitan households and residents, daily commuters and frequent travellers, local small and medium businesses, farmers and property owners, local government, transportation and other public service providers proximate to the new line. These are the immediate stakeholders of this project.
The design, alignment and construction of the Metro project over several years in specific locales can be an enduring hardship, hazard to safety and well-being, or permanent detriment. It is important then that the design, alignment and construction aim to mitigate these negative impacts and community disruptions to the extent possible and feasible.

In mitigating these impacts, the project should establish and sustain sincere, open and transparent dialogue including grievance mechanism with these immediate stakeholders.

An in-depth description of the immediate stakeholders of the project including a Stakeholder Engagement Plan (SEP) and grievance mechanism is presented in the ESIA Volume 3: Appendices, Appendix 1 Stakeholder Engagement Plan.

6 SUMMARY AND CONCLUSIONS

The ESIA has identified both positive and negative social and environmental impacts resulting from the construction and operations of the proposed Metro Line 3-Phase 3 development. A review of the ESIA shows that although significant impacts are identified, some of which are categorised in the major impact and critical impact category levels, these impacts can be mitigated successfully if they are managed in an appropriate manner by the Promoter.

The effects on soil and the water environment are considered to be low during the construction and operations phases. Biodiversity impacts are also considered to be low since the proposed route runs through urban areas or peripheral areas that have been heavily influenced by anthropogenic activity. Land use change is found to be a minor impact since it is localised to the Ring Road and El Farag area, and will most likely benefit the small land owners.

The realisation of Metro Line 3-Phase 3 will bring about visual impacts resulting from the removal of trees and shrubs. These are considered to be unavoidable and the Promoter has approved beautification plans around the stations that include tree planting and the recreation of green spaces. Visual impacts will also be derived from the elevated track which is supported by viaducts. These will impair the view out of, and the light access into, the affected properties and has to be considered by a recommendation for a design change of the elevated alignment between El Bohi and El Kawmeya station In addition – but of minor relevance - the viaducts will have a detrimental effect on the aesthetic quality of the streets through which they run – many of these streets are an open area in themselves, offering some space to the residents in the narrow alleys behind them. For this reason the visual impacts from the elevated sections are assessed to be of major significance.

Waste management requires careful planning in order to avoid major social and environmental impacts resulting from exposure to contaminated and toxic wastes. With proper management of waste and arrangements for waste storage, transport and recycling, impacts are expected to be reduced to minor magnitude.

Air quality impacts are found to be of major importance during the construction phase and a range of mitigatory measures have been identified in order to reduce effects on the community and the environment. During operations the Metro Line 3-Phase 3 will play a significant role in the reduction of the air emissions from traffic in Cairo.

Noise and vibrations have been assessed. Noise levels generated during construction and operations are major impacts that need to be carefully managed using the mitigation measures proposed. Operational noise levels are of particular concern at the elevated sections. In order to better understand and plan noise mitigation, it is essential that a noise impact study takes place, and the modelling carried out, to assess the noise impacts at buildings close to the elevated track sections. Vibrations were not found to be of major significance during either construction or operations, based on experiences from previous metro projects and the nature of the geology.

Cairo’s cultural heritage is of global importance and potential damage to historic sites – both known and unknown – as well as chance find artefacts are assessed to be of major significance. Cooperation with the relevant authorities is essential and a cultural heritage study is recommended. A chance find procedure needs to be implemented to ensure the correct management of artefacts uncovered during excavation works.

As with all large scale infrastructure projects in major cities there will be profound impacts on public utilities and traffic. NAT has already planned for utility diversions and traffic diversions in detail. It will, however, be necessary to put in place a robust management system to ensure that the traffic diversions are actually working, and in close dialogue with the relevant stakeholders.

The Promoter has put in place a strong CSR-based framework to manage the contractors involved in the construction and commissioning phases of Metro Line 3-Phase 3. This is integrated into the tender process and should ensure that the labour and working conditions are in line with national legislation and international standards. The main community health and safety impacts are found to stem from air quality, dust and noise during construction and from the noise levels during operations. These impacts will be mitigated through the measures outlined for the specific environmental impacts.

A critical aspect of the project is the resettlement that must be managed in an appropriate manner. A Resettlement Framework Policy has been developed to guide this process, and a concrete Resettlement Action Plan shall also be developed and implemented by the Promoter.

Positive attributes of the project as regards metro line operations in general include:

- Reduction in commuter times
- Reduction in road traffic accidents
- Reduction in road traffic congestion
- Reduction in air pollution due to modal shift in transport
- Increased mobility between city zones facilitating education, recreation and health care

Provided the recommended mitigation measures and management plans are implemented, the environmental impacts associated with this development in the immediate area would be considered low.

The regional and national impacts associated with this project would be regarded as significantly positive in terms of increased sustainability of traffic and urban planning in Cairo.