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Arab Republic of Egypt
Ministry of Electricity and Energy
Egyptian Electricity Holding Company
Egyptian Electricity Transmission Company

Helwan South Power Plant 500 kV Electrical Interconnection Project

Environmental and Social Impact Assessment

FINAL REPORT
Volume – I

May 2013
Project No. 1750

Submitted by:

Engineering Consultants Group (ECG)
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HELWAN SOUTH POWER PLANT
500 KV ELECTRICAL INTERCONNECTION PROJECT

Environmental and Social Impact Assessment

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LIST OF ABBREVIATIONS AND ACRONYMS

CAA	Competent Administrative Authority
CAPMAS	Central Agency for Public Mobilization and Statistics
EAAQLs	Egyptian Ambient Air Quality Limits
EEAA	Egyptian Environmental Affairs Agency
EEHC	Egyptian Electricity Holding Company
EETC	Egyptian Electricity Transmission Company
EGSMA	Egyptian Geological Survey and Mining Authority
EHS	Environmental Health and Safety
EIA	Environmental Impact Assessment
EMS	Environmental Management Staff
ENIT	Egyptian National Institute of Transport
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
EU	Environmental Unit
EUPS	Egyptian Unified Power System
FHWA	Federal Highway Administration, (US)
FM	Finance Manager
GARBLT	General Authority for Roads, Bridges and Land Transport
GEP	Good Engineering Practice
GIS	Gas-Insulated Switchgear

HCM	**Highway Capacity Manual**
HGVs	**Heavy Goods Vehicles**
HSE	**Health, Safety and Environment**
MoEE	**Ministry of Electricity & Energy**
MWRI	**Ministry of Water Resources & Irrigation**
MSDSs	**Material Safety Data Sheets**
NFRA	**National Fire Protection Authority**
NRIAG	**National Research Institute for Astronomy and Geophysics**
OSHA	**Occupational Safety and Health Administration**
PCBs	**Polychlorinated Biphenyls**
PCDA	**Public Consultation and Disclosure Activities**
PIU	**Project Implementation Unit**
RIGW	**Research Institute for Ground Water**
RoW	**Right of Way**
S/ST	**Substation**

LIST OF TABLES

HELWAN SOUTH POWER PLANT 500 kV TRANSMISSION LINE AND SUBSTATIONS PROJECT

Environmental and Social Impact Assessment

1. INTRODUCTION

Engineering Consultants Group (ECG), a private consulting firm (Egypt) was commissioned by the Egyptian Electricity Transmission Company (EETC), a company incorporated in Egypt and Affiliated to the Egyptian Electricity Holding Company (EEHC) to prepare the technical documents and procedures required by the World Bank (WB) concerning the Environmental and Social Impact Assessment of the Helwan South Power Plant 500 kV Transmission Line and Substations Project.

EEHC / EETC is seeking financial assistance from the WB for the construction and operation of this Transmission Line and Substations. This project uses the savings of US$180 million from the ongoing $600 million Ain Sokhna project (IBRD loan 76330) to the Arab Republic of Egypt (Borrower) to upgrade the national transmission grid. , The savings would help finance (i) two 750 MVA, 500/220kV, Zahraa El-Maadi GIS substation (ii) a 500 kV double circuit OHTL South Helwan/ Zahraa El-Maadi with about 100km length ; (iii) 500 kV, double circuit OHTL from South Helwan with 150km length, crossing one circuit from the existing 500 kV, OHTL Samalaut/ Assuit at Assuit Site and (iv) opening the under construction 500 kV, OHTL Tebbeen/ El-Sokhna P.P. and extend it in/out with length 2x30km to Zahraa El-Maadi, (v) 2x 165 MVAR, 500kV, switchable line shunt reactor one in Assuit S.S. and the other in South Helwan Power Project and (vi) Connecting three existing 220 kV lines (Ain Sira/ Tora (2x7 km), Cairo east / Basateen (2x5 km), Katamia/ Tebeen (15 km)) to Zahraa el- Maadi SS. The funding of the expansion of the savings will enable the new Helwan south power plant and the Ain Sokhna power plant as well as other generation plants added to the grid to effectively evacuate their energy into the grid. The proposed project is designated as a Category (B) project under the WB and as a Category (B) project under the Egyptian environmental regulations. Although it does not require a full EIA, but only a screening Form "B", a full Environmental and Social Impact Assessment has been conducted. Financing from WB is conditional upon obtaining the environmental clearance from the Egyptian regulatory authorities and the WB.

1.1 TRANSMISSION SYSTEM RE-ENFORCEMENT

EETC is a Egyptian State-owned enterprise that is responsible for constructing, operating and maintaining 66-500 kV Transmission electricity grid networks.

The Government of Egypt has identified a number of high voltage electricity transmission projects which are urgent and strategically important for providing constant electricity supply to the Egyptian consumers and reliable operation of the Egyptian electricity grid as a whole. Firstly, the strategy of the electricity grid development is directed towards creation of standard conditions for utilization of the capacity from power supply units currently operating as well as from new power supply generators, either thermal or renewable, the commissioning of which is planned by the Government, optimization of the balance structure of the capacity, providing for frequency and voltage regulation.

Amongst these projects is the construction of the 500 kV overhead transmission line, which interconnects the Helwan South Power Plant and its supporting S/Ss. with the national electrical grid. To finance the project, EEHC/EETC is seeking loans from the World Bank (WB).

Figure 1-1, Figure 1-2, Figure 1-3 and Figure 1-4 depict the electrical networks of Cairo, Giza, Beni-Sueif and the El-Minya Governorates and the proposed re-enforcement by the year 2015.

The proposed transmission lines will re-enforce the existing network and allow the evacuation of the power generated at the Helwan South area to the Egyptian electricity national grid. It will also help address concerns about the security of electricity supply within the Upper Egypt region, where the demand is rising. At the same time, grid re-inforcement has the potential to deliver an additional Hundreds MW from new power plants.

The construction of the proposed transmission line and associated S/Ss is anticipated to yield a number of tangible benefits to the electricity system and EEHC, that include:

- **Improved stability of the system** - The reliability of the gird will be significantly improved as additional redundancy will be built into the network that will reduce the need for power cuts in the event of the unplanned breakdown of a major piece of equipment.
- **Optimised supply of power to Upper Egypt**– from being able to exploit all the potential generating capacity established in Helwan South.
- **Increased energy efficiency** - through increased higher levels of energy efficiency in the transmission system.
- **Transfer and dispersion of skills** - to the power generation complex of Egypt from implementing projects of this nature and associated income for contractors and sub-contractors.

Figure 1-1

Electrical Network of the Cairo Governorate Region, 2015

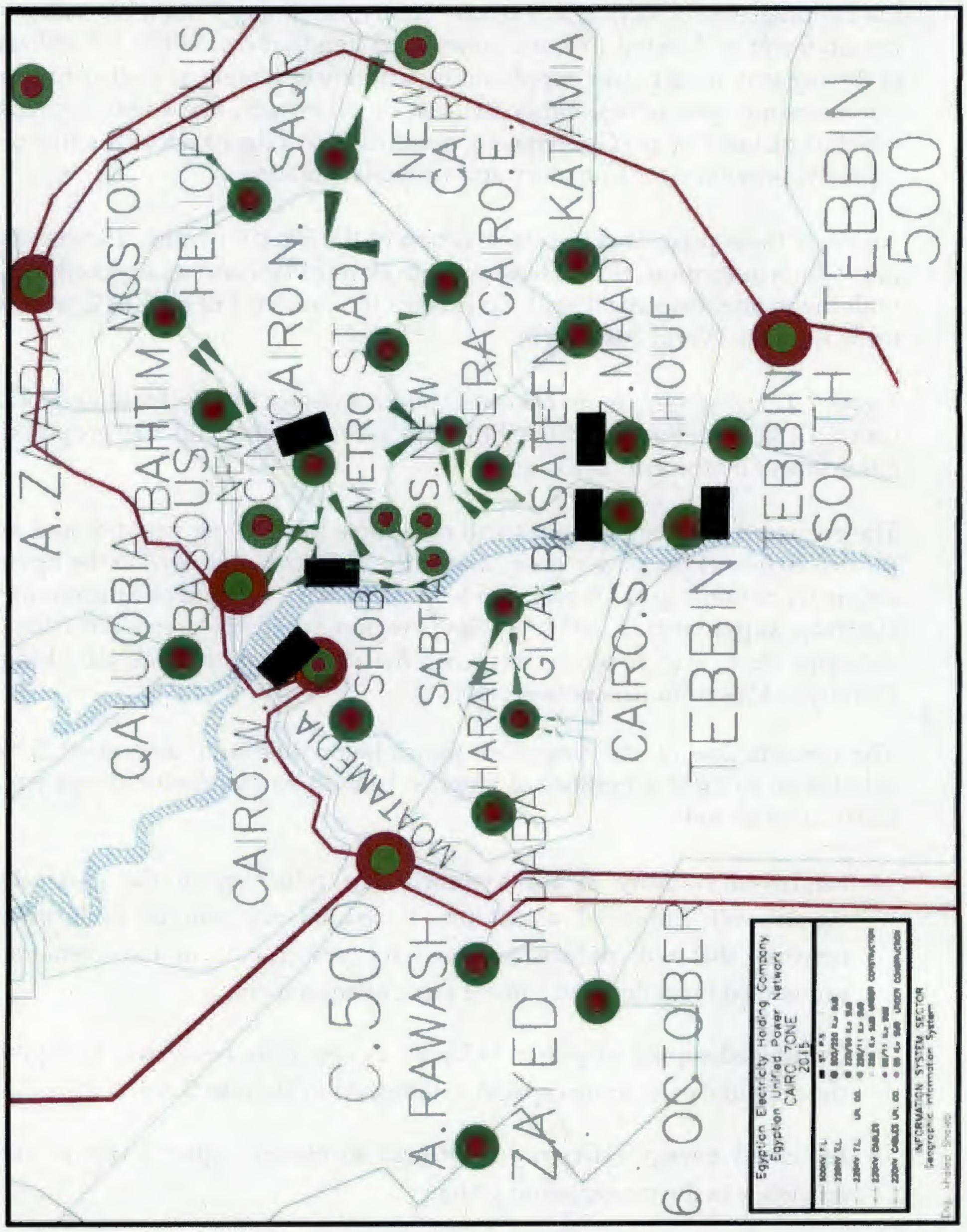


Figure 1-2

Electrical Network of the Giza Governorate Region, 2015

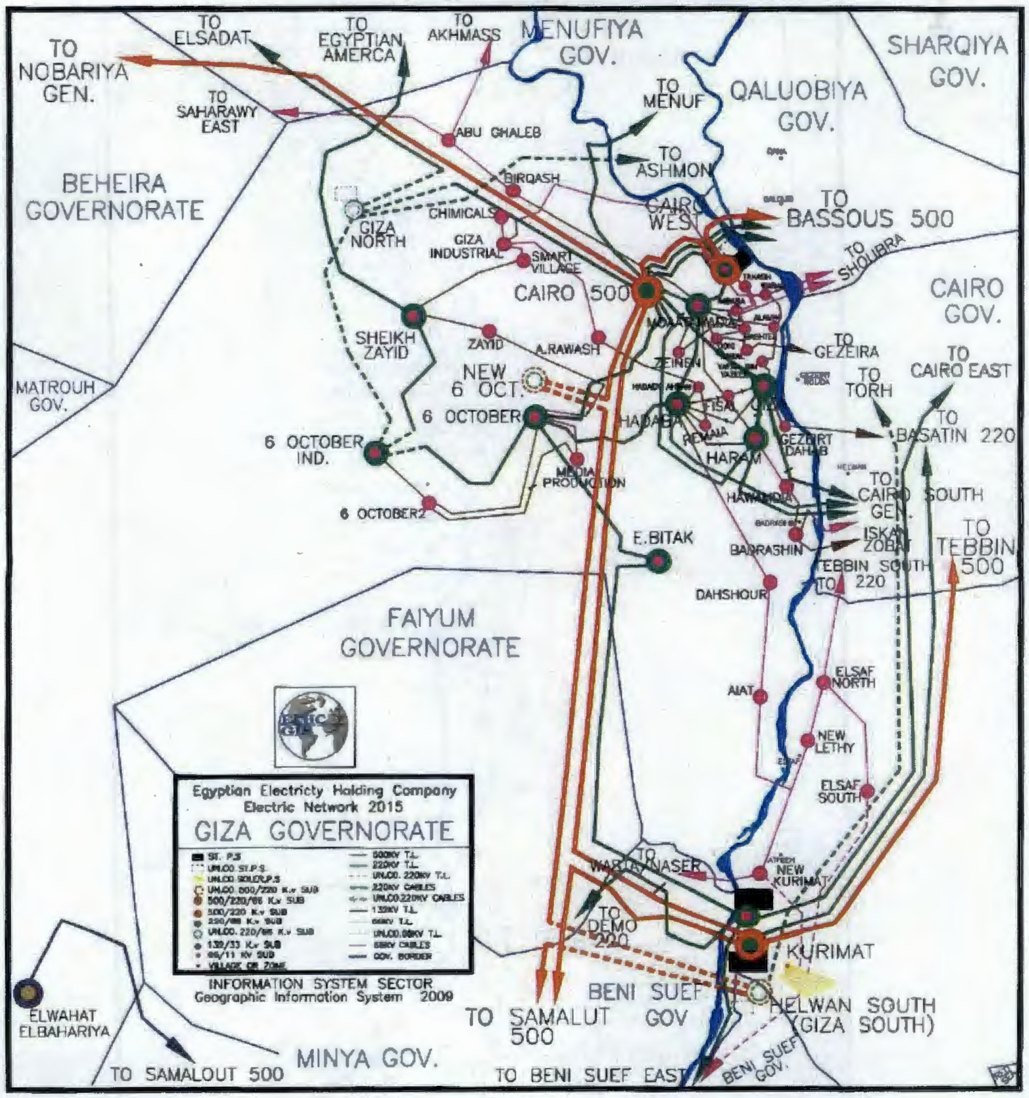
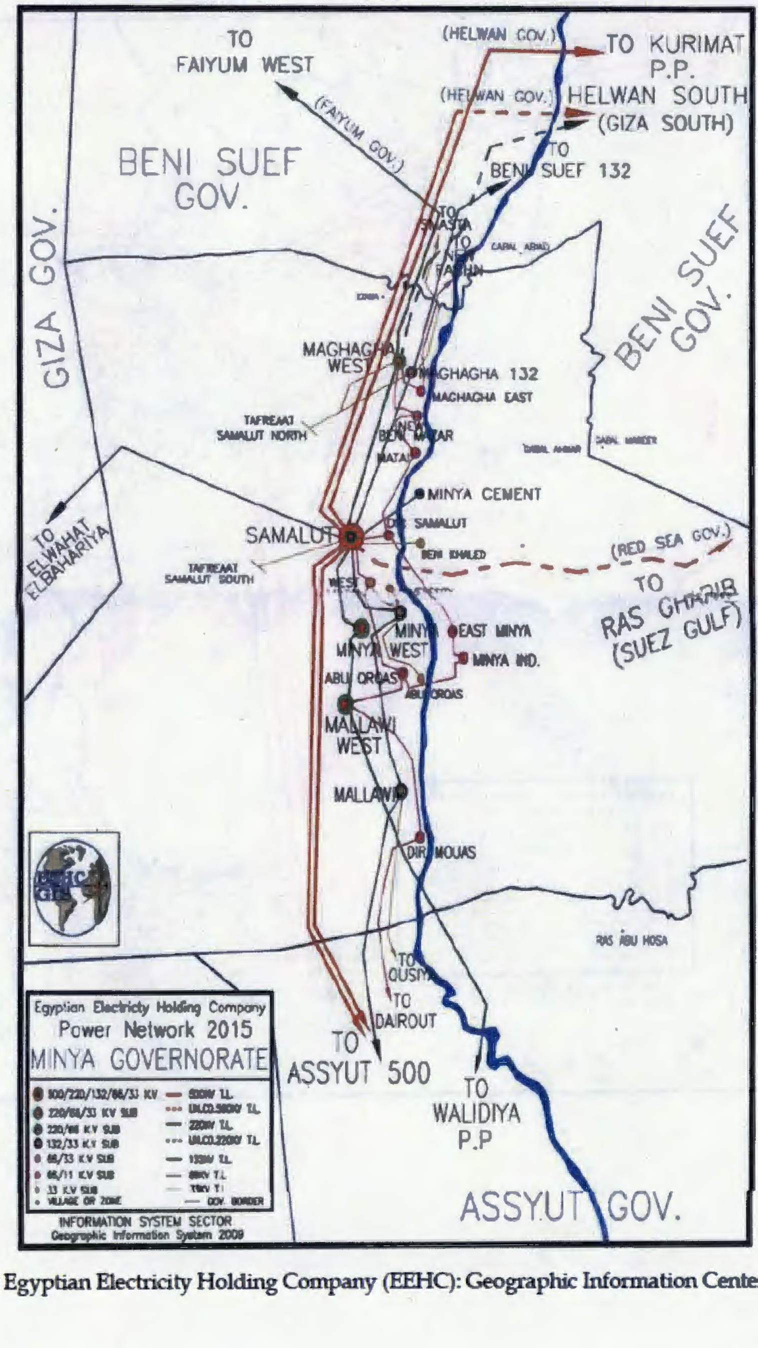


Figure 1-3

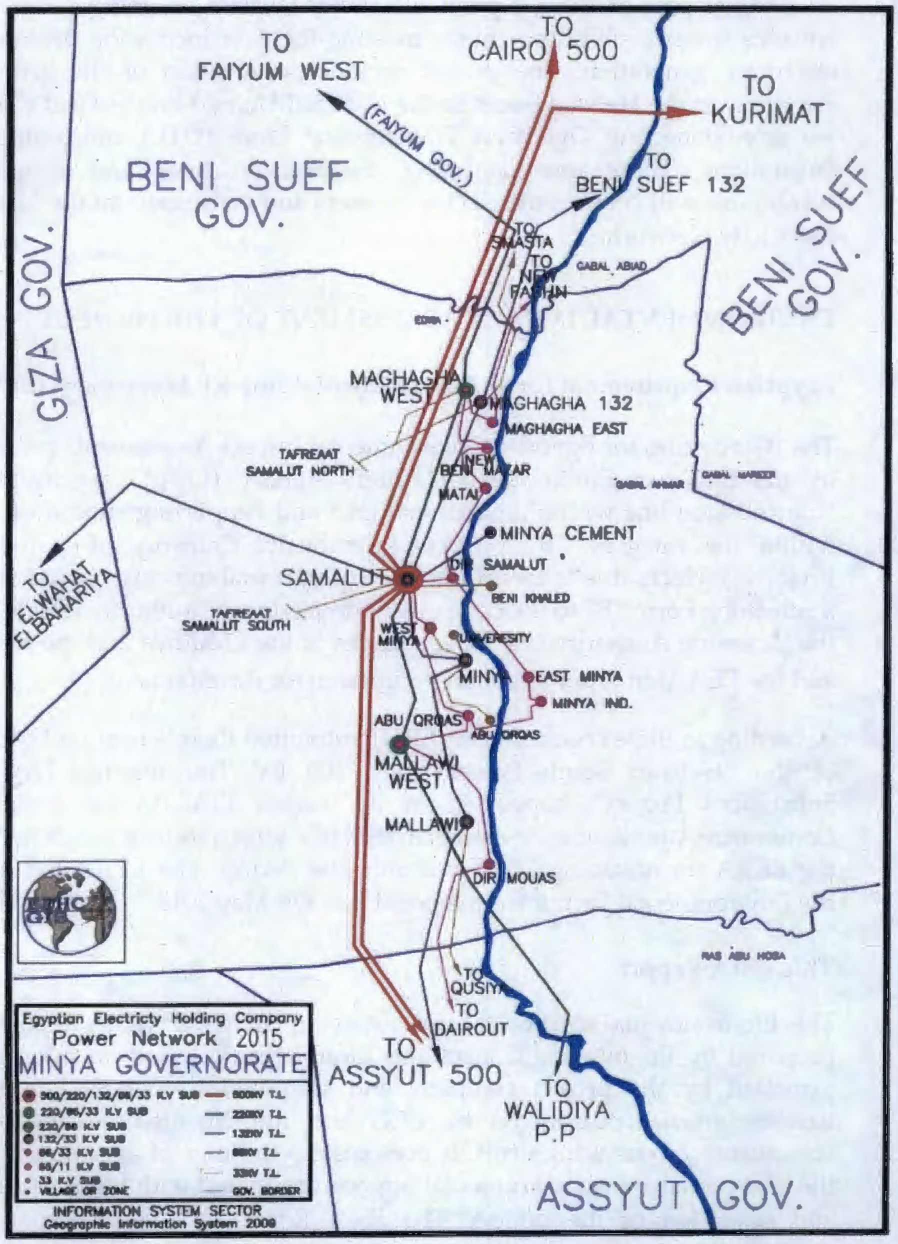
Electrical Network of the Beni-Sueif Governorate Region, 2015



Source: Egyptian Electricity Holding Company (EEHC): Geographic Information Center, 2010

Figure 1-4

Electrical Network of the El-Minya Governorate Region, 2015



Source: Egyptian Electricity Holding Company (EEHC): Geographic Information Center, 2010.

1.2 PROJECT OVERVIEW

The Helwan South Power Plant 500 kV Electrical Interconnection Project is an integral part of the Egyptian Electricity Sector's on-going program to enhance transmission capacity for meeting the ever increasing demand for electricity generation. The project includes evacuation of the generated electricity at the Helwan South to the National Unified Power Grid (NUPG) via interconnecting Overhead Transmission Lines (OTL) and supporting Substations. These interconnecting transmission lines and supporting substations will connect the electricity users and consumers to the National Electricity Network.

1.3 ENVIRONMENTAL IMPACT ASSESSMENT OF THE PROJECT

1.3.1 Egyptian Requirement for an Environmental Impact Assessment (EIA)

The "Guidelines for Egyptian Environmental Impact Assessment" published by the Egyptian Environmental Affairs Agency (EEAA) specify that a "transmission line within the national grid and supporting substations" fall within the category "B" projects (previously: Category of "Grey List Projects") which, due to their limited environmental impacts, should submit a Screening Form "B" to the competent administrative authority (EEHC) and the Licensing Authority (the Governorates of the El-Minya and the Red Sea and the EEAA) in order to obtain permission for development.

According to these requirements, EETC submitted their Screening Form "B" of the "Helwan South Power Plant 500 kV Transmission Line and Substations Project", supported by a "Scoped EIA" to the designated Competent Administrative Authority(EEHC), which in turn submitted it to the EEAA for obtaining The Environmental Permit. The EEAA has issued the Environmental Permit for the project on 17th May 2013.

1.3.2 This ESIA Report

This Environmental and Social Impact Assessment Report (ESIA Report) was prepared by Engineering Consultants Group (ECG) based on information provided by the project company and information contained in many baseline studies outsourced by ECG and implemented by specialized consultants / consulting firms. It presents the findings of an assessment of the likely environmental and social impacts associated with the construction and operation of the project. The ESIA Report has been prepared to accompany the applications for consents from the Egyptian Government and local authorities to construct and operate the project. Also, the World Bank Group statutes and regulations require the World Bank to follow prescribed environmental procedures when involved with international assistance projects. For this, the ESIA report has been prepared to accompany the application for financing too.

1.3.3 Scope of the ESIA

This ESIA covers the main areas that might be affected by the construction and operation of the proposed transmission and substations project. Specifically, this includes ***studying environment and social impacts due to and on***:

- The ***project sites, i.e.*** areas within the domain of the proposed sites;
- Areas immediately bordering and in the vicinity of the proposed sites ***(i.e. surrounding environment and the community)***;
- Terrestrial and aquatic ecosystems that might be affected ***(i.e. farmlands, desert lands, ecology, geology, water bodies, including ground water, .. etc)***;
- Any other areas that might be affected by the proposed project.

1.3.4 Specified Information

The Egyptian Environmental Affairs Agency (EEAA) has published guidelines which require that certain information is provided in an ESIA report (i.e. specified information).

The World Bank, also, set out their procedures and policies with regard to conducting environmental assessment. For instance, the World Bank's Operational Directive 4.01: Environmental Assessment (October 1999), Annex E of the Directive (and its updates) identifies the process by which the level of investigation required in the environmental assessment is determined.

Table 1-1 summarizes the required content of the EIA report, which is indicated by the EEAA guidelines, and establishes where the information is provided within the EIA report. For information purposes, as well as full satisfaction of the World Bank regulations, *Table 1-1* also includes the equivalent requirements for an EIA report from the International Finance Corporation (IFC)/World Bank.

Table 1-1

Location of Specified Information in the ESIA Report

EEAA Guidelines for Egyptian Environmental Impact Assessment	EIB/World Bank Guidance for Preparation of an Environmental Assessment	Section of the EIA Report
Description of the proposed plant and Description of the proposed project:		Section 4
• Location of all related sites • general layout • maps showing general setting • flow diagrams of operations • types of equipment • raw material consumption • construction and operational activities • staffing • support facilities • waste production and storage • emissions to the air • noise generation • required off-site investments • life expectancy	• location of the site(s), including directly linked investments • provision of off-site services (energy, water, transport) • process flow diagram • location of effluent discharge points • emissions to air • emission to water • pollution control technology/treatment systems • alterations during construction (land grading) • clearance, road-building, etc.) • employment • organization of environmental management staff and associated training. • occupational health and safety conditions, programs and training (noise, workplace air quality, hazardous areas, etc.)	

Table 1-1 *(Contd.)*

Location of Specified Information in the ESIA Report

EEAA Guidelines for Egyptian Environmental Impact Assessment	EIB/World Bank Guidance for Preparation of an Environmental Assessment	Section of the EIA Report
2. *Description of the environment, including baseline conditions and any changes expected in the future prior to development:* • geology, seismology, topography and soils • climate, meteorology and winds • air quality and existing sources of air pollution • surface water hydrology and flood risks • coastal features, • water quality, existing sources of water pollution and uses • flora and fauna, sensitive habitats and species of commercial importance • local communities, land use, planned developments, labor market, income distribution, goods and services, recreation and public health • cultural, archaeological and historical sites. • indigenous populations and traditional tribal lands	*Description of the baseline environment using graphical presentation where possible:* • climate and air quality • landform (topography, geology, soils) • hydrology, water quality, groundwater resources • ecology, flora and fauna • land and water resource uses • socio-economic conditions • archaeological, historical and cultural resources • environmental problems related to past or current industrial operations	Section 5
3. Review of legislative and regulatory considerations, including regulations and standards at national, regional and local levels: • environmental quality • health and safety • protection of sensitive areas • protection of endangered species • siting • land use control	Identification and outline of all applicable regulations and standards, including numerical standards: • environmental quality • health and safety • liquid effluents • emissions to air • solid waste management	Section 2

Table 1-1 *(Contd.)*

Location of Specified Information in the ESIA Report

EEAA Guidelines for Egyptian Environmental Impact Assessment	EIB /World Bank Guidance for Preparation of an Environmental Assessment	Section of the EIA Report
4. Determination of the potential impacts of the proposed project, covering short and long term impacts, including (but not limited to): • employment • wastewater • liquid effluent • emissions to air • land use • infrastructure • exposure to disease • noise • traffic • socio-cultural behavior • Terms of Reference for future monitoring studies	• description of potential impacts of the proposed project, including all significant environmental, socio-economic, human health and safety impacts, covering construction and operation, positive and negative, direct and indirect, immediate and long term impacts. • identification of any significant impacts which are unavoidable or irreversible • description of impacts in terms of environmental costs and benefits, assigning economic values where feasible • characterization and explanation of information deficiencies in the assessment	Section 6
5. Description of alternatives to the proposed plant, inducing the "no action" alternative, and comparison of potential environmental impacts, capital and operating costs, suitability for local conditions and monitoring requirements: • siting • design • raw materials • technology • construction techniques and phasing • operating and maintenance procedures	***Comparison of the impacts of alternative sites and processes, and key factors in decisions to select the proposed site and process***	Section 3

Table 1-1 ***(Contd.)***

Location of Specified Information in the ESIA Report

EEAA Guidelins for Egyptian Environmental Impact Assessment	EIB/World Bank Guidance for Preparation of an Environmental Assessment	Section of the EIA Report
6. ***Development of a management plan to mitigate adverse impacts, including potentially significant construction and operational impacts and accidental events:*** • effect of the mitigation measures • proposed work program • budget estimates • scheduling • institutional requirements • staffing and training requirements • support services • compensation for affected parties where no mitigation measures available	***Proposals of mitigation of any significant adverse impacts and plans for ongoing management:*** • description of feasible and cost-effective mitigation measures • budget estimates for capital and recurrent costs • institutional requirements • training requirements • workplans and schedules for mitigation • compensation for affected parties where no mitigation available	Section 7 Section 8
7. Development of a monitoring plan covering the implementation of the mitigation measures and impacts during construction and operation, including budget estimates of capital and operating costs	***Preparation of a detailed plan for monitoring to allow determination of rates and concentrations of emissions and waste discharges, occupational health and safety, effectiveness of mitigation measures, capital and operating costs, including (but not limited to):*** • emissions and ambient air quality • effluents released to surface water • accident frequency and severity • workplace temperature, noise and air quality • socio-economic conditions	Section 8

Table 1-1 ***(Contd.)***

Location of Specified Information in the ESIA Report

EEAA Guidelines for Egyptian Environmental Impact Assessment	EIB/World Bank Guidance for Preparation of an Environmental Assessment	Section of the EIA Report
8. Securing of inter-agency co-ordination and public/NGOs participation, including keeping of records of meetings, other activities, communications and comments	*Consultation with local NGOs, affected communities and other affected groups including keeping of records of steps taken to consult local interested parties, consultation meetings, other activities, communications, comment, key concerns of local interested parties and actions taken to modify the project and EIA in response to public and community inputs*	Section 9 Annex A Annex B
9. Preparation of an Environmental Impact Assessment (EIA) report, organized according to the following outline: • executive summary • policy, legal and administrative framework • description of the proposed project • description of the environment • significant environmental impacts • analysis of alternatives • mitigation/management plan • monitoring plan • inter-agency and public/NGOs involvement • non-technical summary • list of references	*Outline of an Environmental Impact Assessment (EIA) report:* • executive summary • introduction • policy, legal and administrative framework • project description • baseline data for the project site and area • environmental impacts • mitigation/environmental management plan • monitoring plan • references • record of consultations with affected parties	Sections 1-9 Annexes A & B
	References including full citations for published sources and details of unpublished information and personal communications	Section 1-9 Annexes A & B

2. POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

2.1 PERMITS REQUIRED TO CONSTRUCT AND OPERATE TRANSMISSION LINES (TLs) AND SUBSTATIONS (S/Ss)

The key permits required for the construction and operation of the proposed Transmission Line and Substations are set out in *Table 2-1*. These permits set out and regulate the standards to which the Transmission Line and Substations must be designed, constructed and operated.

Table 2-1

Key Permits Required for the Construction and Operation of the Project

Permit	Permitting Authority	Relevant Legislation	Role of Permit	Status
Construction Permit (for constructing substations and transmission line)	Regulatory Body	Presidential Decree of the Arab Republic of Egypt, No. 326/1997, to Establish the Regulatory Body for Electricity Utility and Consumer Protection	Authorization to construct the Transmission Line and Substations project	[Secured]
Construction Permit (for transmission line and S/S Buildings) (including approval of Tourist Development Authority)	Cairo, Giza, Beni-Sueif and El-Minya Local Governing Units; Cairo, Giza, Beni-Sueif and El-Minya Governorates	Law 101 (1996), *"Law for Buildings"*	Authorization to construct the Transmission Line and substations' buildings.	[Secured]
Environmental Permit (including Natural Protectorates administration's approval)	Egyptian Environmental Affairs Agency (EEAA), Ministry of State for Environmental Affairs in conjunction with the Cairo, Giza, Beni-Sueif and El-Minya Governorates and the Egyptian Electricity Holding Company (EEHC)	Law 4 (1994), *"Law for the Environment and its updating Law 9 (2009)"*	Authorization of the environmental effects of development and operation of the project	Issued by the EEAA on 17th September 2012.
Operation Permit	Regulatory Body	Presidential Decree of the Arab Republic of Egypt, No. 326/1997, to Establish the Regulatory Body for Electricity Utility and Consumer Protection	Authorization to transmit electricity	[Secured]

In addition, a number of subsidiary permits will be required related to connection to, and use of, existing services and infrastructure, including the following:

- Electricity Supply Permit (if required) (Cairo North & Cairo South and Upper Egypt Electricity Distribution Companies (CNEDC, CSEDC & UEEPC), Egyptian Electricity Holding Company (EEHC), Ministry of Electricity & Energy);
- Water Supply Permit (Cairo and the El-Minya Local Water Authorities);
- Roadside Occupation (or Construction) Permit (General Authority for Roads, Bridges and Land Transport (GARBLT), Ministry of Transport);
- Transport of Special Loads Permit (Central Administration for Executing and Maintaining Roads and Bridges, Ministry of Transport);

2.2 RELEVANT ENVIRONMENTAL POLICY, LEGAL AND ADMINISTRATIVE ISSUES

The environmental policy, legal and administrative framework which is relevant to the permitting of the TLs & S/Ss comprises the following:

- Requirement to conduct an EIA to accompany the development of the TLs & S/Ss;
- Regional development planning, which must be addressed in the development of the TLs & S/Ss, in particular:
  - land use planning and control;
  - siting;
  - protection of environmentally sensitive areas; and
  - protection of endangered species.
- Environmental standards which must be considered in the design, layout, construction and operation of the TLs & S/Ss, including:
  - emissions to air;
  - generation and disposal of liquid effluents;
  - generation and disposal of solid and hazardous wastes;
  - ambient environmental quality;
  - health and safety.

Each of these aspects is reviewed in the following sections. In each case Egyptian, and International Finance Corporation (IFC) / World Bank (WB) standards and guidelines are considered to reflect the relevant national requirements and those which may be expected from regional or international financial institutions.

2.3 REQUIREMENT FOR AN ESIA

2.3.1 Egyptian Requirement for an ESIA

Beginning in the 1950s, the Government of Egypt has promulgated several laws and regulations concerning protection of the environment.

The Egyptian standards have been drawn from the range of provisions in the following documents:

- Law 4/1994 and the Prime Minister's Decree No. 338 of 1995, which promulgates the Executive Regulations of Law 4.
- Amendment to the Law 4/1994 promulgated by the Prime Minister's Decree No. 1741 of 2005 for modifying some executive regulations of the Decree No. 338 of 1995.
- Law 9/2009, which modifies some articles of the Law 4/1994.
- Decree of the Prime Minister No. 1095 for the year 2011 on Amending Some Provisions of the Executive Regulations of the Environmental Law, issued by the Prime Minister's Decree No. 338 for the year 1995.
- Law No. 93 for 1962 regarding the drainage of liquid wastes, particularly sanitary drainage.
- Law of Labor No. 12/2003.
- Law No. 38/1967 amended by Law No. 31/1976 on public cleanliness and collection and disposal of solid waste.

The Law 4/1994: "Law for the environment" (and its modifying Law 9/2009) has classified development projects into three categories, namely: A, B, and C. Category B projects include transmission lines and substations, which needs to follow the requirements of pre-prepared Form, called Form-B, and require the preparer to provide it with necessary attachments of some detailed data and assessments.

Egyptian EEAA Form-B specify the technical scope or contents of Category (B) projects environmental impact assessment. As a matter of practice, environmental impact assessments for transmission lines and substations projects typically have a scope and organization similar to World Bank Category (B) environmental assessments.

In addition to environmental impact assessment requirements, the Government of Egypt has established air pollution and water pollution limits applicable to all projects. These limits are adhered to alongwith the actual air and water pollution levels expected from the Project.

The development of a new transmission line and substation can only commence if a permit has been granted by the appropriate Competent Administrative Authority (CAA). Egyptian Law 4 of 1994, Law for the Environment (hereinafter referred to as Law 4) stipulates that applications for a license from an individual, company, organization or authority, subject to certain conditions, require an assessment of the likely environmental impacts. .

The Egyptian Environmental Affairs Agency (EEAA) is the authority responsible for determining the type of development that requires an environmental appraisal and the level of detail at which the study should be conducted. The EEAA publication *Guidelines for Egyptian Environmental Impact Assessment* of January 2009 stipulates that *".....transmission line and substations"* falls within the category of "B Listed Projects". This category requires a screening Form "B" to be submitted to either the Competent Administrative Authority (CAA) (which, for electricity development projects, is the Egyptian Electricity Holding Company (EEHC) of the Ministry of Electricity & Energy) or the Licensing Authority (Which, for such type of project in the designated area, is the Cairo, Giza, Beni-Sueif and the El-Minya Governorates) in support of any application for a permit to develop a transmission line and substations. The Screening Form "B" should be supported by relevant drawings and basic data of the project and may be supported, also, by a scoped EIA for a particular salient aspect.

Since the proposed transmission line and substations has been categorized as a "B" listed project, a Screening Form "B" has been prepared supported by a Scoped EIA and submitted to the EEHC for consideration prior to development of the project. The EEHC has submitted the documents to the EEAA and the Environmental Permit for the project was issued by the EEAA on 17th September 2012.

2.3.2 IFC/World Bank (WB) Requirement for an EIA

The IFC follows a policy which stipulates that all operations are carried out in an environmentally responsible manner and that projects must comply with appropriate IFC guidelines or, if these have not been specifically developed, World Bank guidelines.

The World Bank sets out its procedures and policies with regard to conducting environmental assessment in *Operational Directive* 4.01, Annex E, 1999: *Environmental Assessment* (October 1999). Annex E of the Directive identifies the process by which the level of investigation required in the environmental assessment is determined. It provides an illustrative list of Category "A" developments which require a full EIA, which includes thermal and hydro power projects, Also, the Environmental Assessment is to be guided by the World Bank's Pollution Prevention and Abatement Handbook 1998, in addition to the World Bank's Operational Policies (OP 4.01), June 2001.

The World Bank includes environmental impact assessment as an integral part of the evaluations it performs before financing a proposed project. The World Bank's Operational Policy 4.01 (October 3, 1991 and its updates, 1999) provides guidance on the types of assessments that should be performed for different types of projects, and on the scope and content of those assessments. According to

Operational Directive 4.01, transmission lines and substations projects, as classified Category (B) projects, require an EA- the scope of which may vary from project to project but is narrower than the EIA required for Category (A) projects. World Bank Environmental Safeguard Policies provide 10 potential issues that may need to be considered in an EA, depending on the specific characteristics of each project.

No safeguard policies were triggered except for the Environmental Impact Assessment (OP 4.01) and the Involuntary Resettlement (OP 4.12).

Annex B to Operational Directive 4.01 provides an outline of the information that should be included in an EA. This Environmental and Social Impact Assessment follows the scope of Annex B.

In addition to environmental impact assessment guidelines, the World Bank has established guidelines concerning air pollution and water pollution form construction projects (Pollution Prevention and Abatement Handbook-Part III (July 1998)). The guidelines were officially published in 1988; since then, several sets of revisions have been proposed, most recently on March 22, 1996. The most recent update of the World Bank Guidelines, issued in 2008 has been considered.

World Bank's Pollution Prevention and Abatement Handbook-Part III (July 1998) also, provides with principles of construction pollution management, monitoring and air emission & effluent discharge requirements presented in the construction Guidelines.

Public Consultation Process has been designed in accordance with World Bank Guidance for the Preparation of a Public Consultation and Disclosure Plan (January 1996);

Other international banks and financing institutions also follow a similar approach and use the World Bank guidelines as a benchmark for the environmental assessment of international power projects prior to provision of finance. Hence, an EIA of similar scope is likely to be required to obtain commercial funding for the power projects from regional and/or international institutions (such as KFAED, AFESD,...,etc.).

2.4 SCOPE OF THE EIA

The Egyptian Environmental Affairs Agency (EEAA) has published guidelines which require that certain information is provided in an EIA report (i.e. specified information).

The requirements for the scope of the EIA under Egyptian and WB procedures, as described in Section 1.2, include the following:

- description of the proposed project;
- description of the baseline environment at the site;

- identification of the environmental standards which will be applied to the project, including those applying to protection of ambient environmental quality and specific conditions on the construction and operation of the project;
- identification of potential environmental impacts associated with the project;
- description of alternatives to the project, in terms of options for electricity supply in Egypt, design of the project and operating systems;
- development of proposals for mitigation and management of any potential environmental impacts;
- description of monitoring plans proposed to provide surveillance of the environmental impacts of the project during construction or operation; and
- demonstration that consultations with interested parties have been carried out as part of the EIA process.

In addition, Egyptian and IFC/World Bank guidelines specify the broad organization of the EIA report, requirement for a non-technical summary for local, especially public, information and clear referencing of sources of data used in the assessment.

2.5 REGIONAL DEVELOPMENT PLANNING

The guidelines for EIA produced by the EEAA specify that the project should demonstrate compliance with national, regional and local development plans with respect to the following key aspects:

- Land use planning and control;
- New industrial zones, and surrounding developments;
- Siting;
- Protection of environmentally sensitive areas; and
- Protection of endangered species.

While the site of the Helwan South Power Project lies in the Giza Governorate at Dayr Al-Maymoun, the proposed S/Ss sites lie on a land planned for the development of substations facilities by both of the Cairo and the El-Minya Governorates and allocated to the EEHC and EETC at the Zahraa El-Maadi and Samallout areas, respectively. The transmission line extends from Zahraa El-Maadi to Helwan South and from Helwan South to Samallout across the River Nile banks (about 12% of its length from the Nile Banks to Samallout) within cultivated lands and the rest (88%) runs within a bare, uncultivated and uninhabited desert land. The transmission line's route is planned to be extended from Zahraa El-Maadi to Samallout through Helwan South power project and approved for development by all the Governorates Authorities, which it runs through their lands.

2.6 INTERNATIONAL AND NATIONAL ENVIRONMENTAL STANDARDS / GUIDELINES

2.6.1 Introduction

The Egyptian and IFC/World Bank environmental standards and guidelines relevant to the construction and operation of the TLs & S/Ss cover the following issues:

- Atmospheric emissions and ambient air quality.
- Liquid effluent discharges to the surrounding environment.
- Noise emissions and ambient noise levels.
- Solid waste management.
- Hazardous waste management.
- Operation management: health and safety, air quality and noise levels.
- Construction management.
- Other environmental management issues.

The Egyptian standards have been drawn from the range of provisions in *Law 4/1994 and Law 9/2009 and the Prime Minister's Decree No. 338 of 1995*, and its modifying Decree No. 1714 of 2005, which promulgate the *Executive Regulations of Law 4/1994 and Law 9/2009 and their amendments, as well as in the other pertaining laws.*

The equivalent international guidelines have been taken from the IFC *Pollution Prevention and Abatement Handbook - Part III* (July, 1998). Supplementary to the guidelines set out in the IFC *Pollution Prevention and Abatement Handbook*, reference has also been made to the World Bank guidelines as set out in the *World Bank Environment, Health and Safety Guidelines* (1994) and their updates of 2007 and 2008.

2.6.2 Atmospheric Emissions and Ambient Air Quality

The Egyptian Government and IFC/World Bank have established ambient air quality standards applicable to power projects. The Egyptian standards and the IFC/WB guidelines on ambient air quality are shown in *Table 2-2*.

Table 2-2
Ambient Air Quality Guidelines (μgm^{-3})
(Maximum Limits as per the Law 4/1994 and the Law 9/2009, Executive Regulations, Annex 5-PMD* no. 1095/2011)

Pollutant	Averaging Period	Egyptian Standards	WB Guidelines
Nitrogen oxides (NOx)	1 hour 24 hours 1 year	300 150 80	No Limit 150 100
Sulfur dioxide (SO_2)	1 hour 24 hours 1 year	350 150 60	No Limit 150 80
Carbon monoxide (CO)	1 hour 8 hours	30,000 10,000	- -
Ozone	1 hour 8 hours	200 120	- -
Thoracic particles (PM_{10})	24 hours 1 year	150 100	150 50
Total suspended particles	24 hours 1 year	230 125	230 80
Suspended Particles measured as Black Smoke	24 hours 1 year	150 60	- -
Lead	1 year (daily average) in urban areas 6 months (daily average) in industrial areas	0.5 1.5	- -

Notes:
(*) PMD = Prime Minister's Decree.

Egyptian standards and IFC/World Bank guidelines require the Developer to ensure that emission levels (or leakage) during construction and operation do not exceed set maximum limits for pollutant concentrations. Egyptian guidelines for vehicles used for project construction and operation on the maximum limits for pollutants in emissions to the air are shown in *Table 2-3 (A & B)*.

Table 2-3 (A)

Maximum Atmospheric Emission Guidelines

(in Case of using Standby Generator for Electricity) (mg/Nm³)[(a)]

(Maximum Limits as per the Law 4/1994 and the Law 9/2009, Executive Regulations, Annex 6-PMD no. 1095/2011)

Pollutant	Egyptian Standards (Law 9/2009)	WB[(b)] Guidelines (Dec. 19, 2008)
Nitrogen Oxides (NO_x)		
Gas	600 mg/m³	200 mg/ Nm³ (spark Ignition) (400 mg/Nm³ (Dual Fuel[(d)]) [Natural Gas]
Diesel Oil (Sollar)	600 mg/m³	(NDA & DA) 1,460 to 2,000 mg/Nm³[(c)] [Liquid Fuels]
Sulfur Dioxide (SO_2)		
Gas	100 mg/m³	N/A[(e)]
Diesel Oil (Sollar)	400 mg/m³	1,170 mg/Nm³ or Use of 2% or less S fuel (NDA)[(f)] Use of 0.5% or less S fuel (DA)[(g)]
Particulate Matter (PM)		
Gas	50 mg/m³	N/A[(e)]
Diesel Oil (Sollar)	100 mg/m³	50 (NDA) 30 (DA)
Suspended Ashes		
Sources in urban areas or near residential areas [(h)]	250 mg/m³	-
Sources far from inhabited urban areas [(i)]	500 mg/m³	-
Carbon Monoxide (CO)		
Gas	150 mg/m³	N/A
Diesel Oil (Sollar)	250 mg/m³	N/A

Notes:

(a) The Egyptian regulations for fuel burning sources (Law 4, Article 42) do not specifically state whether emission limits refer to emission under standard or actual flow conditions. For consistency with other standards it has been assumed that the limits refer to standard flow conditions.
(b) World Bank guidelines should be achieved for 95% of the operating time of a plant.
(c) 1,460 (compression ignition, bore size diameter (mm) <400); 1,850 (compression ignition, bore size diameter (mm) ≥400); and 2,000 (dual fuel).
(d) MW_{th} = Megawatt thermal input on HHV basis.
(e) N/A = Not Available.
(f) NDA= Not Degraded Airshed.
(g) DA = Degraded Airshed.
(h) Law 4, Article 42 states that emissions of suspended ashes in urban / residential areas should not exceed Ringlemann Chart 1, which Article 42 states is equivalent to an emission concentration of 250 mg/m3.
(i) Law 4, Article 42 states that emissions of suspended ashes far from inhabited areas should not exceed Ringlemann Chart 2, which Article 42 states is equivalent to an emission concentration of 500 mg/m3.

Table 2-3 (B)

Vehicles(*) Powered by Gasoline

(Maximum Limits as per the Law 4/1994 and the Law 9/2009, Executive Regulations, Annex 6-PMD no. 1095/2011)

Production	Before 2003		From 2003 to 2009		From 2010 and beyond	
	HC part per million	CO %	HC part per million	CO %	HC part per million	CO %
The maximum limit	600	4	300	1.5	200	1.2

Notes:
(*) Measurements must be carried out at idle speed of 600 to 900 rotations per minute.

Vehicles Powered by Diesel Fuel

(Maximum Limits as per the Law 4/1994 and the Law 9/2009, Executive Regulations, Annex 6-PMD no. 1095/2011)

Year of manufacture (Model)	Before 2003	From 2003 and beyond
Smoke density factor K(m^{-1})	2.8	2.65

Law 4/1994 and Law 9/2009 also applies specific conditions to the burning of fuels, as follows:

- Fuel / air mixtures and the combustion process should provide full burning of the fuel.
- The use of mazout and heavy oil is prohibited in residential areas.
- The Sulfur content of fuels is restricted to equal or less than 1.5% in or near urban and residential areas. The use of high Sulfur content fuels is permissible in regions far from inhabited urban areas provided that suitable atmospheric factors are present and adequate distances are observed to prevent these gases from reaching residential and agricultural areas and watercourses.
- Emissions of flue gases should be through stacks of sufficient height to ensure that the gases are dispersed before reaching ground level.
- When burning fuel, stack height should reflect the volumetric flow of flue gases. Law 4/1994 and Law 9/2009 state that for emission rates of 7,000-15,000kg hr^{-1} the stack height should be between 18-36m. If emission rates exceed 15,000 kg hr^{-1}, then the stack height should be at least 2.5 times the height of surrounding buildings.

IFC/WB guidelines reinforce the Egyptian requirement by requiring fuel combustors to use stack heights not less than the Good Engineering Practice values.

2.6.3 Liquid Effluent Discharges

Law 4/1994 and Law 9/2009 states that all establishments are prohibited from polluting the marine environment. Subsequently, no permit will be granted for an establishment on, or near, the coastline, which may result in discharges of polluting substances.

Annex 1 of the *Executive Regulations of Law 4/1994 and Law 9/2009* and their amendments sets out the Egyptian standards concerning the concentration of pollutants in effluent discharged to the marine environment. A selection of the standards is shown in *Table 2-4*. In addition, the table also presents the equivalent World Bank guidelines. It should be noted that WB guidelines relate to all liquid effluent discharges, not solely to those to the marine environment.

Decree No. 8 of 1983 promulgating the Implementary Regulations of the Law 48 of 1982 regarding the protection of the River Nile and waterways from pollution provides the standards set by the Ministry of Health for permits to discharge treated industrial liquid effluents into the fresh water bodies and groundwater reservoirs (Article 61). *Table 2-4* presents, also, these standards.

Table 2-4

Water Quality Standards and Specifications Mandated by the Egyptian Laws in Comparison with the World Bank Guidelines (mgl^{-1}) (a)

Parameter	Standards and Specifications Mandated by Law 48/1982 The maximum limits of constituents in treated industrial liquid effluents discharged to (Art. 61)		Limits & Specifications for draining and disposing of certain substances in mandated by Law 4/1994 and Law 9/2009(a) the marine environment	World Bank Wastewater Effluent Guidelines (1996)
	River Nile from its Southern Egyptian Border to the Delta Barrages	Nile Branches, main canals, branch canals, ditches & groundwater reservoirs		
Temperature (b)	35ºC	35ºC	Not more than 10 degrees over existing level	3oC increase above ambient (b)
pH	6-9	6-9	6-9	6-9
Color	No Col. substance	No Col. substance	Free of colored agents	
Biochemical Oxygen Demand (BOD)	30	20	60	-
Chemical Oxygen Demand (COD) (Dichromate)	40	30	100	
Total Dissolved Solids	1200	800	2000	
Fixed (Ash of) Dissolved Solids	1100	700	1800	
Suspended Solids	30	30	60	50
Turbidity			NTU 50	
Sulfides	1	1	1	
Oils and Grease	5	5	15	10
Hydrocarbons, of oil origin			0.5	
Phosphates	1	1	5	
Nitrates	30	30	40	
Phenolates			1	
Fl uorides	0.5	0.5	1	
Aluminum			3	
Ammonia (Nitrogen)			3	
Mercury Compounds	0.001	0.001	0.005	
Lead	0.05	0.05	0.5	
Cadmium	0.01	0.01	0.05	
Arsenic	0.05	0.05	0.05	
Chromium, total	0.05	0.05	1	0.5
Copper	1	1	1.5	0.5
Nickel	0.1	0.1	0.1	0.5
Iron	1	1	1.5	1.0
Manganese	0.05	0.05	1	
Zinc	1	1	5	1.0
Silver	0.05	0.05	0.1	
Barium			2	
Cobalt			2	
Pesticides			0.2	
Cyanide			0.1	
Fecal Coliform Count (No. in 100ml)			5000	
Dissolved Oxygen				
Organic Nitrogen				
Total Alkalinity				
Sulphate				
Synthetic Detergents	0.05	0.05		
Phenol	0.002	0.001		
Selenium				
Chemical Oxygen Demad (Permanganate)	15	10		
Total Heavy Metals	1	1		-

Table 2-4 (Contd.)

Water Quality Standards and Specifications Mandated by the Egyptian Laws in Comparison with the World Bank Guidelines (mgl^{-1}) (a)

Parameter	Standards and Specifications Mandated by Law 48/1982 The maximum limits of constituents in treated industrial liquid effluents discharged to (Art. 61)		Limits & Specificcations for draining and disposing of certain substances in mandated by Law 4/1994 and Law 9/2009(a) the marine environment	World Bank Wastewater Effluent Guidelines (1996)
	River Nile from its Southern Egyptian Border to the Delta Barrages	Nile Branches, main canals, branch canals, ditches & groundwater reservoirs		
Total Residual Chlorine(c)	1	1		0.2 (c)
Total Coliform (MPN/ 100ml)				
Odour				
Tannin + lignin				
Carbon derivatives (chloroform)				

Notes:

(a) Units of mgl^{-1} unless otherwise stated.

(b) The effluent should result in a temperature increase of no more than 5 °C at the edge of the zone where initial mixing and dilution take place. Where this zone is not defined, use 100 m from the point of discharge when there are no sensitive aquatic ecosystems within this distance.

(c) "Chlorine shocking" may be preferable in certain circumstances, which involves using high chlorine levels for a few seconds rather than a continuous low level release. The maximum value is 2 mgl^{-1} for up to 2 hours, which must not be more frequent than once in 24 hours (and the 24 hour average should be 0.2 mgl^{-1}).

Further to these guidelines, Law 4/1994 and Law 9/2009 also applies certain planning conditions for developments along or adjacent to the coastline:

- The discharge of effluents into swimming or fishing zones, or natural reserves, is prohibited to ensure that the economic or aesthetic value of the zones or reserves are not compromised.
- Any measures which are likely to cause changes in the natural coastline (erosion, sedimentation, coastal currents and pollution from the project or associated works) are restricted, except with the approval of the CAA.
- Any development within 200 m of the coast (sea shore) must gain approval from the CAA.

2.6.4 Noise Emissions and Ambient Noise Levels

Law 4/1994 and Law 9/2009 stipulate that a Developer must ensure that an establishment is compatible with the character of its setting. Amongst other issues, this involves limiting the effect of combined noise from all site sources on the surrounding environment to acceptable ambient limits. Guidance levels for ambient noise is dependent upon the land use surrounding the site, and Egyptian ambient noise guidelines are set with respect to five different land use categories. The Egyptian ambient noise guidelines are shown in *Table 2-5*, together with the related land uses.

The IFC/WB ambient noise guidelines differ from those of the Egyptian Government in that they only differentiate between two land use categories, as presented in *Table 2-6.*

Table 2-5

Egyptian Ambient Noise Limits for Intensity in Different Land Use Zones
(Maximum Limits as per the Law 4/1994 and the Law 9/2009, Executive Regulations, Annex 7-Table 2- PMD no. 1095/2011)

Receptor	Daytime (1) dB(A)	Night (2) dB (A)
Industrial areas (heavy industries)	70	70
Commercial, administrative and "downtown" areas	65	55
Residential areas, including some workshops or commercial businesses or on public roads	60	50
Residential areas in the city	55	45
Areas of sensitivity to noise	50	40
Residential areas on roads of width less than 12m, with some workshops, commercial, administrative, or entertainment activities.	70	60

Notes:

(1) Daytime from 7 a.m. to 10 p.m.
(2) Night-time from 10 p.m. to 7 a.m.

Table 2-6

WB Ambient Noise Guidelines for Intensity in Different Land Use Zones

Receptor	Maximum Allowable $L_{Aeq,\ 1\text{-hour}}$ dB(A) (a)	
	Daytime 0.7:00 – 22:00	Night-time 22:00 – 07:00
Residential, institutional and educational	55	45
Industrial and commercial	70	70

Notes:

(a) Noise abatement measures should achieve either the WB guidelines or a maximum increase of background levels of 3 dB (A). Measurements are to be taken at noise receptors outside the project property boundary.

2.6.5 Solid and Hazardous Waste Management

Law 4/1994 and Law 9/2009 stipulate that handling of hazardous substances and waste is prohibited unless a permit has been issued by the competent authority.

The handler of wastes must:

- possess a permit issued by the appropriate CAA to handle wastes;
- store and dispose of wastes in designated sites agreed with the CAA;
- maintain appropriate systems of storage, including packaging and labeling, containers and storage duration;
- operate appropriate transportation systems to authorized disposal sites;
- maintain a register of all hazardous wastes and disposal methods; and
- develop an emergency plan in case of spillages.

Further to the Egyptian guidelines, the World Bank requires that the individual / company constructing and operating the project must ensure that:

- all hazardous materials are stored in clearly labeled containers;
- storage and handling of hazardous materials is in accordance with national and local regulations appropriate to their hazard characteristics; and
- fire prevention systems and secondary containment should be provided for storage facilities, where necessary, to prevent fires or the releases of hazardous materials to the environment.

2.6.6 Occupational Environmental Management and Health & Safety

Workplace Air Quality, Temperature and Humidity

Egyptian regulations require that the developer of the project must ensure that air quality in the workplace is maintained within fixed limits. Accordingly, the developer is obliged to ensure the protection of the work force through implementing health and safety measures on-site, including by the choice of equipment, process substances, types of fuels, ventilation of working areas or other air cleaning methods.

The IFC/World Bank requires that any individual / company managing or operating a development project must:

- conduct periodic monitoring of the workplace air quality with respect to air contaminants relevant to employees tasks;
- maintain ventilation and air contaminant control, and provide protective respiratory and air quality monitoring equipment; and

- ensure that protective respiratory equipment is used by employees when levels of welding fumes, solvents and other materials exceed international, national or local accepted standards.

Egyptian and IFC/World Bank threshold limit values for carbon monoxide, nitrogen dioxide, sulfur dioxide and particulate in the workplace are provided in *Table 2-7.*

In addition to air quality, under Law 4/1994 and Law 9/2009, the developer of the project must also ensure that temperature does not exceed maximum and minimum permissible limits, as set out in *Table 2-8*. In case of work in temperatures outside these limits, the developer must provide suitable acclimatization to workers and/or protective measures.

Table 2-7

Egyptian and World Bank Air Quality Guidelines in the Workplace
(Maximum Limits as per the Law 4/1994 and the Law 9/2009, Executive Regulations, Annex 8-PMD no. 1095/2011)

Atmospheric Pollutant	Egyptian Guidelines (a)	WB Guidelines
Carbon monoxide	55 mg m^{-3}	29 mg m^{-3}
Nitrogen dioxide	6 mg m^{-3}	6 mg m^{-3}
Sulfur dioxide	5 mg m^{-3}	5 mg m^{-3}
Particulate (b)	10 mg m^{-3}	10 mg m^{-3}

Notes:
(a) Egyptian air quality guidelines in the workplace are determined by exposure time. Readings provided are "mean time", the limit to which workers are exposed during a normal working day.
(b) Inert and nuisance dust.

Table 2-8

Egyptian Maximum Air Temperature Limits (a)
(Maximum Limits as per the Law 4/1994 and the Law 9/2009, Executive Regulations, Annex 9-PMD no. 1095/2011)

Type of Work	Low Air Flow	High Air Flow
Light	30.0°C	32.2°C
Medium	27.8°C	30.5°C
Hard	26.1°C	29.8°C

Notes:
(a) In periods of high temperature, workers should be monitored. No worker should work be exposed to heat stress (above 24.5°C for women and above 26.1 °C for men) for more than one continuous hour or one intermittent hour in every two, without acclimatization.

Workplace Noise

Law 4/1994 and Law 9/2009 restricts noise in the workplace to within limits of intensity and exposure time. Egyptian guidelines are shown in the following tables:

- *Table 2-9* presents occupational noise guidelines with respect to continuous exposure to noise below 90 dB (A).
- *Table 2-10* presents occupational noise guidelines with respect to permitted exposure periods to continuous noise in excess of 90 dB (A).
- *Table 2-11* presents occupational noise guidelines with respect to exposure periods to intermittent noise.

It has been assumed that these limits apply at worker positions and will be generally free field noise levels.

In addition to the Egyptian guidelines, the World Bank guidelines require that the individual/ company managing or operating a development project must ensure that:

- noise in work areas is reduced by using feasible administrative and engineering controls (including sound-insulated equipment and control rooms);
- good maintenance practices to minimize noise production from equipment; and
- personnel use hearing protection equipment when exposed to noise levels above 80 dB (A).

Table 2-9

Egyptian Guidelines for Maximum Permissible Limits of Noise inside Places of Work(*) and indoor Premises

(Maximum Limits as per the Law 4/1994 and the Law 9/2009, Executive Regulations, Annex 7-Table 1-PMD no. 1095/2011)

No.	Place and Activity	Proposed Maximum Limit of the Level of Noise Equivalent to dB LAeq	Exposure duration (Hour)
1	(a) Workplaces (workshops and factories) and the like with shifts up to 8 hours (for the establishments licensed before 2011)(*).	90	8
	(b) Places of work (workshops and factories) and the like with shifts up to 8 hours (for the establishments to be licensed starting from 2011).	85	8

Table 2-9 *(Contd.)*

Egyptian Guidelines for Maximum Permissible Limits of Noise inside Places of Work(*) and indoor Premises

(Maximum Limits as per the Law 4/1994 and the Law 9/2009, Executive Regulations, Annex 7-Table 1-PMD no. 1095/2011)

No.	Place and Activity		Proposed Maximum Limit of the Level of Noise Equivalent to dB LAeq	Exposure duration (Hour)
2	Closed halls for weddings and parties (Provided that this level shall not go beyond the boundaries of the hall).		95	4
3	Administrative offices - workrooms for the computer units and the like.		65	-
4	Workrooms for activities which require routine mental concentration - public spaces in banks - control rooms of the industrial activities - restaurants and cafeterias.		60	-
5	Hospitals and clinics, public libraries, museums, post offices, courtrooms, mosques and places of worship.		45	-
6	Universities, schools, nurseries, institutes and the like	inside classes	40	-
		Play areas and educational building yards	55	-
7	Residential building - hotels and the like	inside living rooms	50	-
		inside bedrooms	35	-

Notes:

(*) With regard to item No. 1 (a and b), the exposure duration shall be reduced to the half with the increase of the level of noise at 3 dB (A) in order not to harm the sense of hearing along with wearing the appropriate ear plugs.

The instantaneous level of noise during the period of work shall not exceed 135 dB (A).

The noise shall be measured inside the workplaces and indoor places at the level of LAeq in accordance with the international specifications ISO 9612/ISO 1996 (Parts 1 and 2) or the Egyptian specifications No. 2836 (Parts 1 and 2) and No. 5525 issued in this respect.

The equivalent noise level LAeq is the average of the equivalent sound pressure at the measurement level (A) within a specified period of time. It is expressed in decibels.

Table 2-10

Egyptian Guidelines on Periods of Exposure to Noise

(Maximum Limits as per the Law 4/1994 and the Law 9/2009, Executive Regulations, Annex 7-Table 1-PMD no. 1095/2011)

Noise Intensity (dB(A))	Period of Exposure per Day (Hours)
> 90-95	4
>95-100	2
>100-105	1
>105-110	0.5
>110-115	0.25

Table 2-11

Egyptian Guidelines on Permissible Limits Concerning Intermittent Noise Inside the Workplace

(Maximum Limits as per the Law 4/1994 and the Law 9/2009, Executive Regulations, Annex 7-Table 1-PMD no. 1095/2011)

Noise Intensity (dB(A))	Number of Permissible Noise Events During Normal Working Hours
135	300
130	1,000
125	3,000
120	10,000
115	30,000

Electrical Safety in the Workplace

The Egyptian Code of practice of electrical safety in power systems (issued by the EEHC) requires that any power project management, and the IFC/World Bank requires that any individual / company managing or operating a development project, must ensure that:

- Strict procedures are provided and followed for de-energizing and checking electrical equipment before maintenance work.

- Strict safety procedures are implemented, including constant supervision, when performing maintenance work on energized equipment.
- Personnel training is provided on revival techniques for electrocution.

Working in Confined Spaces

The Egyptian Industrial Codes (issued by the Ministry of Industry (as was)) and the IFC/World Bank require that the individual / company managing or operating an industrial facility must ensure that:

- Prior to entry and occupancy, all confined spaces must be tested for the presence of toxic, flammable and explosive gas or vapors and lack of oxygen.
- Adequate ventilation is available in any confined working spaces.
- Personnel working in confined spaces that may become contaminated or deficient in oxygen are provided with air-supplied respirators.
- Observers are stationed outside when personnel are working in confined spaces which are likely to become contaminated or to be affected by a shortage of air supply.

General Health and Safety

The Egyptian Industrial Codes as well as the Labour Law no. 12 of the year 2003 and its Executive Regulations promulgated by Ministerial Decree no. 211/2003 and the IFC/World Bank require that the individual / company managing or operating an industrial facility must ensure that:

- Sanitary facilities are well equipped with supplies and employees should be encouraged to wash frequently, particularly those exposed to dust, chemicals or pathogens.
- Ventilation systems are provided to control the temperature and humidity of working areas.
- Personnel working in high temperatures or humidity are allowed frequent breaks away from these areas.
- Pre-employment and periodical medical examinations are conducted for all personnel and surveillance programs instituted for personnel potentially exposed to toxic or radioactive substances.
- Personnel are protected by shield guard or guard railings from all belts, pulleys or gears and other moving parts.

- Elevated platforms, walkways, stairs and ramps are equipped with handrails, toeboards and non-slip surfaces.
- Electrical equipment is "earthed", well insulated and conforms with applicable codes.
- Personnel use special footwear, masks and clothing when working in areas with high dust levels or contaminated with hazardous materials.
- Employees are provided with appropriate protective equipment when working near molten or high temperature materials (protective equipment may include, amongst others, non-slip footwear, safety glasses, etc).
- Employees wear eye protective measures when working in areas at risk of flying chips or sparks or where bright light is generated.
- Employees wear protective clothing and goggles in areas where corrosive materials are stored or processed.
- Appropriate eyewash and showers are installed in areas containing corrosive materials.
- A safety program is implemented and regular drills are conducted.

Personnel Training

Law 4/1994 and Law 9/2009, as well as Labour Law 12/2003, stipulate that operators should be trained when using or handling any hazardous waste materials.

In addition, the EEAA Master Plan for Solid & Hazardous Waste Management and the IFC/World Bank require that the individual / company managing or operating a development project must ensure that:

- employees are trained on the hazards, precautions, and procedures for the safe storage, handling and use of potentially harmful substances;
- training incorporates information from the "Material Safety Data Sheets" (MSDSs) for potentially harmful materials; and
- personnel are trained with regard to environmental health and safety matters, including accident prevention, safe lifting practices, the use of MSDS safe chemical handling practices and proper control and maintenance of equipment and facilities.

Monitoring and Record Keeping and Reporting

Law 4/1994 and Law 9/2009, Articles 17 & 18, as well as Labour Law 12/2003, require, for industrial facilities, the operator monitors the site in order to optimize performance. Direct measurement of atmospheric concentrations of pollutants in the exhaust gas is required. Averaging times for direct emissions should be based on regular based measurements.

Law 4/1994 and Law 9/2009 and Labour Law 12/2003 also stipulate that the developer of the development project should maintain an Environmental Register of written records with respect to the environmental impacts from the establishment. The written records should identify the characteristics of discharges and emissions, details of periodic testing and its results, procedures of follow-up environmental safety, and the name of the person in charge of follow-up. The developer of the development project, or its representatives, are responsible for informing the EEAA of any emitted or discharged pollutants deviating from prescribed standards and any appropriate procedures taken to rectify them.

Also, the IFC/WB guidelines require the operator monitors the site in order to optimize performance. Direct measurement of atmospheric concentrations of particulate matter, NOx and SO_2 and heavy metals in the exhaust emissions is preferable. Averaging times for direct emissions should be based on an hourly rolling average.

Law 4/1994 and Law 9/2009 also, as well as IFC/WB guidance, requires the developer/operator to monitor the wastewater discharges. The parameters to be examined and sampling frequency are set out in *Table 2-12*.

Table 2-12

EEAA and World Bank Requirements for Monitoring Wastewater Discharges

Parameter	Proposed Monitoring Frequency
pH	Continuous
Temperature	Continuous
Suspended solids	Daily
Oil and grease	Daily
Residual chlorine	Daily
Heavy metals	Monthly
Other pollutants	Monthly

In addition, the EEAA and the IFC/WB require that the individual / company managing or operating an industrial facility must:

- maintain records of significant environmental matters, including monitoring data, accidents and occupational illnesses, and spills, fires and other emergencies;
- information from the above is reviewed and evaluated to improve the effectiveness of the environmental, health and safety program; and
- submit an annual summary of recorded information to the EEAA (and to the WB if involved).

2.6.7 Construction Management

Law 4/1994 and Law 9/2009 require that guidelines on environmental management and protection, including those related to noise, land, aquatic and atmospheric pollution, waste management and health and safety must be adhered to during the construction process.

In particular, when handling and storing soils and wastes during construction, all organizations and individuals must ensure that storage and transportation is undertaken in such a manner to minimize escape or dispersion into the environment.

2.6.8 Other Environmental Issues

Pesticides and Chemical Compounds

Law 4/1994 and Law 9/2009 state that spraying of pesticides or other chemical compounds is prohibited except after complying with the conditions, norms and guarantees set by the Ministry of Agriculture, the Ministry of Health and the EEAA. The conditions for such use are as follows:

- Notification to the health and veterinary units of the types of sprays being used and antidotes before spraying.
- Provision of necessary first aid supplies.
- Provision of protective clothing and materials.
- Warning of the public in spraying areas.
- Training of laborers conducting the spraying.

Other Chemicals

The EEAA and the IFC/WB require that the individual / company managing or operating an industrial facility must ensure that:

- use of formulations containing chromate's is avoided;
- transformers or equipment that either contain polychlorinated biphenyls (PCBs) or use PCB-contaminated oil are not installed;
- processes, equipment and central cooling systems that use or potentially release chlorofluorocarbons (CFCs), including Halon, are avoided;
- storage and liquid impoundment areas for fuels and raw and in-process materials, solvents and wastes and finished products are designed in such a way to prevent spills and the contamination of soil, groundwater and surface waters.

2.7 NATIONAL LEGISLATION ON NATURAL PROTECTORATES

- Law No. 102/1983 "on the Natural Protectorates".
- Prime Minister's Decree No. 1067/1983 on "Execution of some Articles of the Law 102/1983".
- Prime Minister's Decree No. 240/1990 on "Issuance of Internal Regulation for Natural Protectorates Fund".

2.8 INTERNATIONAL AND REGIONAL CONVENTIONS RELATED TO PRESERVING BIODIVERSITY

Since 1936, Egypt always participates as party in the main international and regional conventions and agreements. Before ratification of the UNCBD, Egypt ratified many agreements and conventions including:

- Convention on the preservation of fauna and flora in their natural state, London, 1933 (ratified in 1936).
- Agreement on establishing general fisheries council for the Mediterranean, Rome, 1951.
- International Plant Protection Convention, Rome, 1953.
- International Convention on preventing oil pollution into the seas, London, 1963.
- Phyto-sanitary Convention for Africa, Kinshasa, 1968.
- African Convention on the Conservation of Nature and Natural Resources, Algeria, 1968 (ratified in 1972).
- Convention for the Protection of the Mediterranean Sea against pollution, Barcelona, 1976 (ratified in 1978)
- Convention on the International Trade in Endangered Species of Wild Fauna and Flora (CITES), Washington, 1973.

- Protocol concerning Mediterranean, especially protected areas. Geneva, 1983 (ratified in 1986)
- Convention on Wetland of International Importance, especially Waterfowl Habitat (RAMSAR), (Rasmsar, Iran, 1972), (ratified in 1988).
- Convention of the Conservation of the Migratory Species of Wild Animals (CMS), Bonn, 1979 (ratified 1982).
- Regional Convention for the Protection the Environment of the Red Sea and Gulf of Aden. Jeddah, 1990.
- Convention on Biological Biodiversity, Rio de Janeiro, 1992. (ratified in 1994). After ratification of the UNCBD Egypt involved in some other related agreements and conventions such as:
- Agreement on the Establishment of the Near East Plant Protection Organization, Rabat, Morocco, 1993 (ratified in 1995).
- International Tropical Timber Agreement. Geneva, 1994 (ratified in 1996).
- Protocol concerning specially Protected Areas and Biological Diversity in the Mediterranean, Barcelona, 1995.

Relevant International Conventions

Egypt is signatory to eight international conventions with ramifications for the environmental protection. These international conventions are listed below:

International Convention	
Convention for the Control of Transboundary Movements of Hazardous Wastes and their Disposal (Basel Convention 1989).	Countries complying with this convention should report in advance the status of the materials carried on board and the countries through which it will be passing.
Convention on Biodiversity (Rio, 1992).	Conservation of biological diversity, the sustainable use of its components, and rights over genetic resources.
Convention on Conservation of Migratory Species of Wild Animals (CMS, Bonn 1979).	Protects species migrating across or outside national boundaries by developing cooperative agreements, prohibiting taking of endangered species, conserving habitat, and controlling other adverse factors.
Convention on International Trade of Endangered Species (CITES).	Restricts trade in specimens of species currently threatened with extinction or threatened by trade, and permits Egypt to seek cooperation of other nations in restricting trade of its wildlife.

2.9 LEGISLATIVE FRAMEWORK FOR RESETTLEMENT IN EGYPT

Resettlement and land acquisition issues under the proposed Project and subsequent subprojects will be addressed under the guidance of the laws governing the Arab Republic of Egypt to this regard and the World Bank's OP 4.12. The RPF represents the reference to be used in managing land acquisition issues and addressing the involuntary resettlement and displacement of people related to WB financed projects. The EETC shall be committed to complying with the national and WB laws and policies and to any future amendments to them.

2.9.1 Institutional Arrangements

Property expropriation and compensation in Egypt is initiated and executed at central, local and, stakeholders levels. On the central level, the governmental agency in charge of the implementation of the expropriation acts issued for public interest is the Egyptian General Authority for Land Survey ("ESA"), except for projects handled by other entities pursuant to a law to be issued in this respect. As mentioned above, ESA is charged with the formation of the expropriation and compensation committees.

Usually the executing body will be the concerned Ministry or Governorate. Accordingly, this executing agency would be responsible for paying the compensation to affected groups through ESA or under its supervision, offering alternative resettlement options, and implementing the resettlement project.

On the local level, several local departments and directorates are involved in the resettlement program which includes:

- *Directorate of Housing and Infrastructure,* this department is to be responsible for setting the alternative resettlement options for the affected group and participate in all operational procedures concerning defining compensation and setting improvement actions within informal settlements.
- *Department of Physical Planning,* this department is to be responsible for preparing the detailed plans for areas subjected to resettlement and provide all detailed maps and documents required to define the affected groups (e.g, roads right-of-ways, Set-backs,..)
- *Department of Amlak,* is to be responsible for providing all required documents for ownerships or tenure status within the affected areas with all attached historical documents for those properties that show the different transactions of the properties.
- *Department of Land Surveying,* is the main responsible body for defining the size, area and locations of different ownerships to be affected by the resettlement. It is also responsible for defining the compensation mechanisms and values in cooperation with ESA and other relevant local bodies.
- *Department of Social Affairs,* is to be responsible for conducting all field surveys required to define the affected groups, their socio-economic status, affordability level, their preference against different resettlement options and compensations mechanisms. Another major role to be played by this department is to mitigate the negative impact of resettlement whether during or after resettlement, through preparing rehabilitation programs for those affected group, and monitoring the impact of the process.
- Department *of Legal Affaires,* to deal with legal issues related to tenure and ownerships and resolve dispute between different involved parties

- *Head of District where the resettlement project takes place,* to manage the overall project

On the stakeholders level the relevant NGOs, CBOs and elected councils together with PAPs play crucial roles in ensuring that the participatory decision making, planning, implementation and monitoring process is inclusive and transparent.

2.9.2 Government of Egypt Relevant Legislation

It is the Government of Egypt's policy to pay compensation or offer assistance to people whose lands and properties are affected by projects undertaken by the Government. This section pertains to the means, causes, and the competent authorities entrusted with the implementation of the provisions and rules of the administrative law, civil law, in addition to the law related to the expropriation of private property for public interest. In addition, this section also covers the restrictions, the conditions of the legality of procedures applied by the administration at its disposal, and the consequences of property expropriation, in addition to the legal procedures for the possession of private property.

1. <u>Property Rights within the Egyptian Constitution</u>

The main objective of the state, represented by its executive authority through the issuance of administrative decisions for the public benefit, is to achieve public interest. The state (administrative authority) uses various means to exercise this diversified activity that is readily perceived in the administrative affairs and reflected in the legal affairs.

The Egyptian Constitution recognizes three main types of ownership. Article 29 of the 1971 Constitution provides that "Ownership shall be under the supervision of the people and the protection of the State. There are three kinds of ownership: public ownership, co-operative ownership and private ownership".

In accordance with Article 34 of the Constitution: "Private ownership shall be safeguarded and may not be placed under sequestration except in the cases defined by law and in accordance with a judicial decision. It may not be expropriated except for the general good and against a fair compensation as defined by law. The right of inheritance shall be guaranteed in it." According to this article, it is understood that procedures for private property expropriation are considered to be exceptional. The competent jurisdiction shall be entitled to take cognizance of the lawsuits raised by individuals against the administration for appropriate compensations.

2. <u>Land Tenure and Related Laws to Land and Structures Expropriation</u>

There are three main forms of <u>land ownership</u> in Egypt:

a) Public or State land[1] (in Arabic *Amlak Amiriya*), which is divided into the State's public domain that cannot be alienated and the State's private domain, which can be alienated generally through sale, lease, *Takhssiss* (i.e. transfer of ownership conditional on meeting certain criteria, such as keeping the land use unchanged and paying the remaining installments of the land price) or through *Haq Intifaa* ,

b) Private land (in Arabic *Mulk horr*), which may be alienated/transferred freely, and

c) *Waqf* land (land held as a trust/endowment for religious or charitable purposes), which is often subject to covenants on transfer or use, and which is typically transferred through leasehold or usufruct.

In addition, there are some areas in Sinai and in the northern coast with implicitly recognized *customary rights* to land to the benefit of Bedouins. In these areas, someone wishing to acquire land often has to make two payments, first to the Bedouin claimant(s) for the right of use and then to the State to regularize and register their land tenure/ownership and be able to obtain services.

It is important to note that the Civil Code (No. 131 of 1948) recognizes *Hiyaza* (i.e. possession of immovable/movable property without ownership) as a legitimate channel to acquire ownership of the property in question through adverse possession, provided that the *Hiyaza* has been "peaceful, unchallenged and uninterrupted" for a period of 15 years.[2] By Law, ownership through adverse possession does not, however, apply to State lands.

3. Egyptian Civil Code

Within the framework of the Constitution, ***the Civil Code, in articles 802-805 concerning private property***, has recognized the private ownership right. Article 802 has stated that the owner, pursuant to the law, has the sole right of using and/or disposing his property. In Article 803, land ownership has been defined as land with all things above and below it and pursuant to the law, the property of the surface may be separated from the property of what is above or below it.

Then, Article 805 provides that "No one may be deprived of his property except in cases prescribed by law and this would take place with an equitable compensation."

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[1] The large majority of land in Egypt is public or State-owned desert land that is for the most part undeveloped (estimated to be 90-95% of the national territory).

[2] The Ministry of Local Administration estimates that 15.7 million Egyptians (22.3% of the population) live in 1,105 informal or squatter settlements, called *ashwa'iyat*, including unlawful urbanization of agricultural lands, unplanned/ unauthorized land subdivisions, and squatting on public or privately-owned lands.

4. Administrative Authority's Decision Making Responsibilities

Main relevant laws governing expropriation and consequent compensation procedures include:

- **Physical Planning Law (Law3/1982)**

Law No. 3, 1982 for Physical Planning, in its Sixth chapter concerning District Renewal (this also applies for slums' redevelopment or resettlement projects) has obliged the concerned local body entitled to renewal to first plan and prepare the proposed relocation sites where the occupants of the original area under renewal or redevelopment, would be resettled. The concerned local body should first prepare these relocation sites to be suitable for housing and proceeding different activities of the relocates prior to their transfer to the new site.

Article 40 of this law stated that it is not allowed to commence with the resettlement before at least one month from officially notifying the PAPs with their new destination. Any occupant, who would be subjected to the resettlement and receives a new housing unit, has the right to complain of its unsuitability within 15 days of receiving the notification to a specialized committee formulated by the concerned governor. The committee should reach its decision concerning the complaint within a maximum one month period. However, the right to complaint does not include the location of the new resettlement site, rather it is only limited to the unit itself.

Law 3/1982 allows compensation by: (i) taking the value of the property; or (ii) postponing the taking of such value in full or in part until all or part of the area in question is sold.

Article 47 of Law 3, 1982 authorized the concerned Governor to formulate compensation committee.

In addition:

- Law 3 of 1982: added to the foregoing list acts aiming at the establishment of green areas and public parking.
- Prime Ministerial Decree No. 160 of 1991 : added to the list the establishment of governmental educational buildings
- Prime Ministerial Decree No. 2166 of 1994: added fishery farms established by ministries, governmental departments, local government units, and public authorities.
- Law 557/54, which was later amended by Law 252/60 and Law 13/62, lays down the provisions pertaining to the expropriation of real estate property for public benefit and improvement.
- Law No. 27 of 1956, which stipulates the provisions for expropriation of districts for re-planning, upgrading, and improvement, and the amended and comprehensive Law No.10 of 1990 on the expropriation of real estate for public interest.

- **Expropriation of Ownership for Public Interest (Law 10/1990)**

Although, the constitution prohibits the expropriation of private property except for public interest against compensation determined pursuant to the law, Law 10 of 1990 concerning the Expropriation of Ownership for Public Interest was issued to reflect this constitutional mandate. In addition, expropriation of property is further regulated by Law 59 of 1979 concerning the Establishment of New Urban Communities and Law 3 of 1982 concerning Urban Planning.

The term **"public interest"** in the context of expropriation has been defined in Article 2 of Law 10/1990. The Article specifies the acts that are considered for public interest. These include:

- Constructing, widening, improving, or extending roads, streets, or squares, or the construction of new districts.
- Water supply and sewage projects, irrigation and drainages projects.
- Energy projects.
- Construction or improvement of bridges, cross roads for railway and tunnels
- Transportation and telecommunication projects.
- Urban planning purposes and improvements to public utilities.
- Other acts considered as acts for public interests mentioned in other laws.

Article 2 of law 10, 1990, further delegates the Cabinet of Ministers to add other acts to the foregoing lists. Expropriation may not be limited to those land or buildings directly subjected to the previous acts but it could includes also any other neighboring properties that are deemed useful for the acts.

The law further stated that expropriation can be exercised only with respect to:

- Real property and not movable property. The term real property means, "Anything that is fixed in its space affirmed therein, which may not be moved without being damaged." Accordingly, real property includes only land (whether agricultural or vacant, whether in urban or rural areas) and buildings above this land.
- Real property belonging to private persons (individuals or corporate) or to State private property.
- State public property may not be expropriated; rather the concerned administrative parties would enter into an agreement with respect to such property either by divesting the property in question from its public characterization or by re-appropriating the said property to another public use or entity.

According to Article 3 of the Executive Regulation of Law 10, a committee will be formed to determine the properties required for the public interest.

Article 6 of Law 10/1990, requires the Minister of Public Works and Water Resources to form a Committee within each governorate to be charged with the determination of compensation.

Article (20) of Law 10/1990 requires compensation to be determined on the basis of prevailing prices at the date of issuance of the expropriation decree.

- Law No. 63 of 1974 concerning safe distances on both sides of transmission lines and prohibited areas around transformers and electrical equipment according to their voltage levels.

The general provisions guiding expropriation of private property (according to Law 577/54, Law No. 27 of 1956, Law No. 252 of the year 1960, and Law 577/54) include the following:

a. Property expropriation shall be only on tangible real estate property, there shall be no expropriation of movable possessions.

b. Applicable only to property privately owned by individuals, thus, public property is excluded from the procedures.

c. The expropriation shall include land and constructions (structures).

d. The purpose of expropriation shall only be for realizing public interest.

e. The administrative authority has the right to assess the circumstances related to expropriation as well as the authority for implementation of property expropriation, which is justifiable by the objective of achieving public benefit. The administrative authority may not be challenged or judged on the grounds that it could have chosen more appropriate real estate property to achieve public benefit than the one that it has already chosen.

f. The administration shall estimate the area it sees necessary for the establishment of a project. This right shall not be only restricted to the real estate property required for the project; but the legislator empowered the administration to also include expropriated property.

According to Article 23 of Law 577/1954: "If the purpose of the property expropriation is the establishment of a squares, streets, or their expansion, modification, demarcation, or the establishment of a new district, or for its improvement/ upgrading or beautification, or for any health related matter; property expropriation may include, in addition to the real-estate property needed for the project, any other real-estate property which the administration in charge sees to be necessary to achieve the project's objective or any other property whose current state (whether in size or form) is not consistent with the required improvement.

Moreover, the first article of Law No. 27 of 1956 allows for the expropriation of districts for their improvement, upgrading, re-planning, and reconstruction. Article 24 of Law 577/54 also stipulates that in case only partial expropriation of real estate property is required, and the remaining un-expropriated part will not be of benefit to the owner; the owner shall be given the right to submit a request within 30 days (beginning from the date of final disclosure of the list of the expropriated property) for the purchase of the entire area.

It should be noted that the new law has not restricted the right to request the purchase the remaining un-expropriated portion of real estate to buildings only, but it was also extended to include land as well.

Law No. 252 of the year 1960, amended by Law 577/54 was promulgated to equilibrate the rights and guarantees for individuals with the rights of the state in expropriating private property. Moreover, this law has stipulated that the assessment of public benefit / interest, which justifies property expropriation, shall be emanated in all cases by a Presidential Decree, while previously it was made by the competent minister.

5. Legal and Administrative Procedures for Transfer of Ownership and Compensation

The procedures taken to this regard are administrative, with no judicial interference except in the assessment of the compensation amount.

Article 1 of Law 252/60 (amended by Law 577/54) states that the determination of public benefit for the expropriation of private real estate property is subject to Presidential Decree. On the other hand, according to Article 2 of Law 27/1956, the determination of public interest for the expropriation of districts for re-planning and upgrading is subject to a Decree from the Cabinet.

Enclosed with the decree is:

- A memorandum demonstrating that the required project shall be considered of public benefit / interest (to be published with the Decree in an official newspaper and in relevant local administrative units).
- A map delineating the project scope.
- Two weeks following the publication and promulgation, the official commissioned to the expropriation property procedures is permitted to enter into the real estates to perform the technical and surveying operations and all the necessary demarcations of the expropriated real estate.

The steps for ownership transfer are highlighted below:

a) Preparation of a census of all property: The census shall be performed by commissions which consist of a delegate of the entity commissioned to perform the expropriation (i.e the Governorate, Ministry of Agriculture, etc.) and one of the local officials from the Governorate. A registered notice shall be sent to notify the concerned person. All owners and those with rights or entitlements to the expropriated property shall meet up with the commission in the project area during the census process in order to guide the commission members with regards to their property rights. The commission shall report the minutes of the procedures, which shall include all property and their owner names and addresses. The members of the commission and the owners shall sign the census report. If anyone refuses to sign, this will be noted in the minutes of the session by justifying the reason for refusal. Entering the expropriated properties from then on shall be subject to the notification of the concerned person.

b) Preparation of statements and evacuation warnings: The expropriating entity shall prepare statements with the number and types of property that shall be expropriated, their size, location, owner's names and addresses, and compensation values (as per the census report). These statements shall be published in an official newspaper. The owners and tenants shall be warned that they must evacuate the property within a period of maximum 5 months. The owners shall be given a period of 30 days (from the date of submission of the statements) to present their complaints or grievances regarding the data in the statement. If the complaints were not submitted during this 30-day period, the data included in the statements shall be considered conclusive and shall not be subject to any litigation or claim, and in this case the compensation amounts indicated in the statements shall be sent to the identified owners.

c) Transfer of ownership: For those owners with no complains or contestations, the transfer of ownership is simply made by having them sign specific forms for ownership transfer. For property which the owners have not signed the proper forms, the competent minister shall emanate a decision to expropriate the property. The forms and the Ministerial decrees shall then be deposited in the relevant Notary Office. This deposit regarding the real estates shall generate the effects caused by the declaration of the sale contract. According to it, the property shall be transferred to the administrative authority that expropriates the property, and the rights incumbent on the real estates shall be transferred to the compensation amounts.

d) Compensation assessment: Property expropriation shall only be made against a fair compensation in accordance to constitutional provisions. The legislator has put forth some principles which should be taken into consideration with regards to compensation assessment:

   I. The compensation assessment for property expropriation shall not include structures, plants / crops, improvements / additions, or tenant agreements if it has been proved that the aforementioned acts were performed in order to acquire higher compensation. The legislator has provisioned that every act taken to this regard, after the publication of the decision for expropriation for public benefit in the official newspaper, shall be considered as an act performed for increasing the compensation value. Accordingly, these acts should be ruled out in the assessment of the compensation amount (Article 25: Law No. 577 of 1954, and Article *7: Law No. 27 of 1956*).

II. If the compensation amount for the un-expropriated part, in projects other than urban planning, increases or decreases (due to activities causing general public benefit), the increase or decrease in amount should be taken into consideration so that the amount to be added or reduced shall not exceed 50% of the compensation value of the expropriated property (Article *19: Law No. 577 of 1954).*

III. If the value of the property subject to expropriation for the upgrading or re-planning of districts /cities is increased as a result of the implementation of a public benefit project, the increase in value shall not be calculated in the compensation assessment if the property expropriation is performed within 5 years from the date of implementation in the previous project (*Article 20: Law No. 477 of 1954*).

IV. For real estate subject to improvement due to public benefit works (district/city replanning and upgrading projects), the owners shall be obliged to pay for the improvements, provided that the payment does not exceed 50% of the actual expenses for establishing or expanding the street or square which resulted in the improvement. This provision shall also be applicable if only part of the property within the district/city re-planning/upgrading projects is expropriated, and the authority in charge has deemed that that keeping part of the real estate by the owner does not conflict with the purpose of the intended project. The assessment of the aforementioned charges made by the authority in charge of organizing affairs shall not be subject to any appeal (*Law No. 577 of 1954*).

In order to avoid delays, which may prevent owners from acquiring their compensation in due, time, Law No. 14 of 1962 has provided for a new provision in Article 21', which states that "Half of the value of the expropriated property that has entered into the improvements areas shall be disbursed, while the second half of the value shall be deposited in the trust funds of the competent authority, until the owner submits a certificate issued from the competent authority that demonstrates the payment in return for the improvements made to the property.

6. Disputes

The procedures for expropriation are administrative by nature and usually rapidly implemented. Accordingly, the abrogation proceedings, compensation disputes, and all actions related to the expropriation property will not stop the expropriation procedures nor prevent its consequences; rather, the owner's right for compensation is addressed (*Article 26: Law No. 577 of 1954*). However, the rapidity of these procedures should not prevent the owners and concerned persons from claiming and ensuring their rights. Accordingly, the legislator has distinguished two different the redress mechanism:

1. For compensations not related to the compensation assessment: Such as those pertaining to the actual right of the expropriation. In this case, the authority in charge of the expropriation process shall be responsible for investigating these disputes in order to pay the due compensation value (*Article 11: Law No. 11 of 1954 and Law No. 11 of 1956*).

2. Disputes over compensation assessment: These disputes are subject to legal jurisdiction as follows: The authority in charge of the expropriation procedures shall refer the disputes over the compensation assessment submitted to court. The court shall examine the complaint quickly and its judgment shall be conclusive.

7. Temporary Expropriation of Real Estate

The right of the public authority to expropriate needed real estate property also includes the right to temporarily occupy / take over this privately owned property. Law No. 577 of 1954, Law No. 27 of 1956, and the new Law No. 10 of 1990 pertaining to property expropriation, include provisions regarding temporarily occupying property:

Summarized below are the legal provisions for particular cases:

1. Occupation of Real Estate Property Prior to Expropriation: If the administration resorts to interim or temporary occupation of privately owned real estate, the time frame should be identified. However, if the temporary occupation is conclusive, the administration shall resort to the regular expropriation procedures (mentioned above). In order to save time, the new legislation has allowed the administration to occupy prior to the completion of the expropriation procedures *(Article 16: Law No. 577 of 1954)*. According to the amendment of Law No. 252 of 1960, "except in emergencies and hasty cases that require the occupation of real estates to perform necessary preparation works, upgrading, and other work, temporary occupation of real estate for public benefit is subject to a Presidential Decree (to be published in an official newspaper). The legislator has included some provisions guiding this case:

   a. The administration cannot resort to this before the issuance of the decision that the expropriation of this specific property is considered to be of public benefit.

   b. The real estate owner has the right to compensation for not being able to get access or use his / her property, starting from the date of actual occupation until the payment of the due compensation as a result of the property expropriation.

   c. The owner of the real estate has the right to dispute / contest the value of the assessed compensation, for preventing him/ her from using or gaining access to his / her property, through the same process for grievance redress on the assessed compensation for property expropriation. In this case, it will not be allowed to remove any structures or buildings (which have been occupied) until the re-estimation of value has been conclusively made.

d. In the case of expropriation of districts, the property and buildings will not be expropriated until alternative dwellings have been provided for those who lost their homes.

e. Temporary Occupation: If the administration needs to manage a real estates for an interim / temporary period that does not justify the expropriation of the property, and accordingly the administration takes over only the management while the ownership remains with its official owner.

Summarized below are the legal provisions for two particular cases:

- Necessity (Hastiness / Rapidity): As stated in Article 17 "...in case of sinking, or severing of a bridge, or the outbreak of an epidemic, and in all emergency cases, it is permissible to temporarily take over / occupy the needed real estates to perform reparation works, prevention, or other kinds of work".
- Public Benefit Project: Law No. 577 of 1954 states that the occupation decision in both cases aforementioned shall be issued by the "Director" or the Governor (Article 17), while Article 2 of the previous law concerning the occupation decisions identified the Governor as the person in charge issuing temporary occupation decisions in case of emergency / hastiness. In any other case, the aforementioned law designates a Presidential Decree for the implementation of temporary occupation.
- Procedures: Real estate temporary occupation only requires that a representative from the competent entity to identify the type of real estate, size, and condition upon occupation. If this is done, the competent entity is then able to occupy the real estates without having to take other measures." To simplify the procedures to the previous figure, that could be justified in the occupation case for emergency or rapidity.
- Compensation: Within a week of the occupation date, the competent authority shall determine the compensation value for the concerned persons / owners in return for losing access and use to their property temporarily. The owners shall have the right to dispute the assessed compensation as previously noted.
- Occupation Period: The maximum period for temporary occupation is 3 years, beginning from the actual occupation date. If the administration deemed it necessary to extend the occupation period for over 3 years, this may be done through agreement with the owner. However, if no agreement is reached the property shall be expropriated and the administration shall be responsible for

returning the property to the owner in its original status, at the time of occupation, along with compensation for any of spoilage or decrease in its value.

8. <u>Introduction of New Articles to the Law on Property Expropriation for Public Benefit No. 10 of 1990</u>

The legislator deemed it necessary to amend the law to reflect new developments that have occurred, beginning from the administrative decentralization process in the local governance system and the transformation of many public entities into separate public bodies, each being a separate legal entity, independent from the state, and a budget, independent from the public budget.

This law was promulgated when the Egyptian Public Entity for Survey, one of the subsidiary departments for the Ministry of Water Resources and Irrigation, was the competent authority for performing the expropriation procedures. It is required that the Entity allocate the compensations values in its budget. The new amendment of this law states that the authority requesting the property expropriation shall be responsible for the payment of compensation value and in representing itself in legal litigations before the jurisdiction.

Article 2 of the Law No. 10 of 1990 has identified public benefit activities to be:

- Construction of roads, streets, squares, or their broadening, modification, paving, or the constructing of entirely new districts.
- Sanitary drainage and water projects
- Irrigation and drainage projects
- Electricity / power projects
- Construction of bridges and the surface paths (slides, lower passages, or modifying them)
- Transportation projects
- Urban / rural planning and improvement of infrastructure
- All activities that are considered to be of public benefit as per any other law
- Other public benefit activities may be added as per Cabinet of Ministries Decree(s)
- The decision ruling public benefit activities shall be in accordance with a Presidential decree and shall have a memorandum of the project enclosed.

The new law has introduced / specified, through Article 6, the members of the compensation assessment commission. The commission is made at the Governorate level, upon a Decree by the Minister of Water Resources and Irrigation (identified by the Law as an issuing body), and consisting of a delegate from the Ministry's Surveying Body (as President), a delegate from the Agricultural Directorate, a delegate from the Housing and Utilities Directorate, and a delegate from the Real Estate Taxes Directorate in the Governorate. The compensation shall be estimated according to the prevailing market prices at the time of the issuance of the Decree for Expropriation.

Expropriation Procedures

According to the Law 10, 1990 the expropriation procedures involves (i) declaration of public interest pursuant to a Presidential Decree accompanied with a memorandum on the required project and a complete plan for the project and its buildings *(Law 59/1979 and Law 3/1982 provide that the Prime Minister issues the decree)* and, (ii) the decree and the accompanying memorandum must be published in the Official Gazette. A copy for the public is placed in the main offices of the concerned local government unit. Based on these procedures, the operational steps go as follows:

a) The entity requesting the expropriation of the ownership of a real property for public interest ("Expropriating Entity") submits a memorandum with the request to the President or the Prime Minister (if a delegation of authority by the President is granted). The Egyptian General Authority for Land Survey ("ESA") has been defined as the Expropriation Entity, except for projects handled by other entities pursuant to a law to be issued in this respect.

b) The memorandum would explain the reasons for the request, stating the compensation to be offered to the concerned owner of the property, together with evidence that the compensation amount has been issued in the form of a bank check in favor of Egyptian General Authority for Land Survey "ESA.

c) The compensation is usually determined in accordance to the prevailing price for land surrounding the expropriated land (the market price). These prices are taken from recorded contracts in the Real Estate & Authentication Offices. However, usually this entails a crucial problem that always faces such expropriation projects, as these prices are, in most cases, not real, since the parties to the contracts usually state lower prices in order to reduce charges and fees decided on the basis of data recorded in the contracts. Also it should be noted that the representatives of Egyptian Survey Authority (ESA) are assumed to be experts in evaluating land prices.

d) If approved, the President or the Prime Minister would issue the required decree declaring the property in question appropriated in the public interest and authorizing taking the property pursuant to direct enforcement procedures by the Expropriating Entity.

e) Once the authorizing decree is published, the concerned Expropriating Entity is authorized to enter into the property in question in the case of long-term projects and after giving notice of its intention to do so for other projects. The objective of such immediate authorization is to conduct necessary technical and survey operations, position landmarks, and obtain information on the property.

f) The Expropriating Entity shall communicate the authorizing decree to ESA, together with the information on the project to be executed and a drawing of the full project and the real property needed in order to take procedures for expropriating the property in question.

g) A committee will be formed to determine the properties required for the public interest. The committee is to be composed of:
   i. A representative of ESA,
   ii. A representative of the local government unit within which jurisdiction the project is located;
   iii. The treasurer of the local area in question.

h) The committee shall declare its activities to the public 15 days prior to the commencement of its works.

i) The land survey department shall verify the information collected by the committee referred to in the preceding paragraph by comparing such information with that found in the official records.

j) The General Department for Appraisal within ESA shall inspect the property of the project in question, examine and complete the appraisal maps and lists of transactions concerning the property within the area of the project. It shall also prepare a consultative report with the estimated compensation for consideration by the Compensation Estimation Committee within ESA.

k) After depositing the compensation amount by the Expropriating Entity within ESA-the concerned local office—lists of all real properties and facilities being identified shall be prepared, their areas, location, description, names of their owners, and holders of property rights therein, their addresses, and the compensation determined by the Compensation Estimation Committee.

l) ESA shall thereafter officially notify the property owners, other concerned parties and the Expropriating Entity with the dates on which the lists prepared in accordance with the preceding paragraph shall be presented to them, at least 1 week prior to such presentation. These lists will be posted for a period of 1 month in the offices of the concerned local government unit and shall also be published in the Official Gazette and two widespread daily newspapers.

m) Owners of the properties and holders of rights therein shall be officially notified with an evacuation request within a period not to exceed 5 months from the date of their notification.

n) The holders of rights include: owners of beneficiary rights, using rights, housing rights, mortgaging rights, concession rights, hekr right holders

o) Court of Cassation decisions have resolved that rights holders are those who hold rights on the tenement and that, accordingly, the holders of leasing rights are regarded as right holders since they are holders of personal rights.

p) It is further resolved that lease agreements are terminated upon expropriation. Examples are: Court of Cassation, session of 1 January 1981 Technical office year 32 and Court of Cassation, session of 25 May 1967 Technical office year 18 no. 167.

q) Article (26) of Law 577 of 1954 states, "All the real suits shall not stop the procedures of the expropriation and shall not stop its results. The rights of the right holders are transferred to the compensation."

2.9.3 Valuation and Compensation Methods

Determination of the valuation methods and compensation to be given to PAPs is made at two separate levels:

- The first is made by the Expropriating Entity in order to meet the requirement that the estimated compensation amount is deposited with ESA prior to proceeding with the remaining formalities as described in the preceding section.
- The second level is a review of that estimated compensation by the Compensation Estimation Committee within ESA.

The first level, as stated in Article 6 of Law 10/1990, requires the Minister of Public Works and Water Resources to form a Committee within each governorate to be charged with the determination of compensation (this contradict with Article 47 of Law 3, 1982 which authorized the concerned Governor to formulate this committee!). The Committee shall be composed of a representative of ESA as chairman and the membership of representatives of certain departments within the governorate: the Agricultural, Housing and Infrastructure, and the Real Estate Tax Departments (in law 3, 1982, the committee is headed by the representative of Housing department and includes representative of Surveying Department, Real Estate Tax Department, Land Registration Department and local unit).

Compensation is determined pursuant to prevailing prices at the time the expropriation decree is issued and the estimated compensation amount shall be deposited with ESA within one month from the date of such decree. It is possible, if approved by the property owners or right holders to obtain in-kind compensation either in full or in part.

The second level is conducted by ESA. The Compensation Estimation Committee within ESA makes a final administrative determination of the compensation to be granted to property owners and rights' holders after having received a consultative report from the General Department for Appraisal within ESA.

All concerned parties, including the Expropriating Entity, have the right to object to the compensation determined in accordance with the foregoing rules before

ESA and, thereafter, to ESA' ruling on the objection before the competent court. The following section describes the objection procedures.

The following rules concerning the determination of the compensation for expropriation of ownership are worth noting:

- Should the value of the un-expropriated part of the expropriated property increase or decrease due to the public interest works in projects other than zoning projects within cities, such decrease or increase shall be taken into consideration when determining the compensation amount.
- Compensation is determined in accordance with Article (20) of Law 10/1990 on the basis of prevailing prices at the date of issuance of the expropriation decree in question. The committee and the courts would look to expert opinion in determining the prevailing prices, taking into account prices stated in recorded contracts.
- Should the value of the expropriated property increase due to prior public interest works in a previous project, such increase shall not be calculated in determining the compensation value if expropriation is exercised within 5 years from the date of executing the previous public interest project.
- Compensation under Law 3/1982 can be in one of two ways: (i) taking the value of the property; or (ii) postponing the taking of such value in full or in part until all or part of the area in question is sold. In such event, the owner or holder of rights deserves compensation equal to the said value in proportion to the total value of the properties in question together with one-half of the difference between the two values after deducting the costs of executing the project.

2.9.4 Grievance & Redress Procedures

The current Egyptian laws and regulation[1] stated that the concerned owners and holders of rights have the right, within 30 days from the date of posting and publishing the lists and information of the expropriated properties, to object to the information contained in such lists. The objection is made to the main offices of the Expropriating Entity or the administration to which it is attached within the governorate in which the property is located.

In case of dispute between several individuals or parties on a single property, each party should present all evidences or documents that proof his/her rights within the next 90 days from submitting the memorandum of objection/ grievance. In case of failing to submit those required evidences, the grievance would be considered as not submitted. The responsible body for expropriation has the right to request additional documents deemed necessary and define proper period for

[1] Hassouna & Abu Ali Law Firm, " Land Development Zones: Analysing Law No. 10/1990 for Expropriating Land for Public Welfare", Participatory Urban Management Programme Working Paper, GTZ and MOP, Cairo 2000.

submitting these documents. Usually in cases of informal settlements or illegal positions as, for instance, in the cases of Hekr Abou Doma or Mit Okba, these documents include:

- Registered contracts
- Cadastre registers, to determine source of ownership (or the history of the properties)
- Real estate tax registers (the compilation of these registers depended on the cadastre registers)
- "Forms of Change," which enabled the authorities to determine the changes in ownership of each property before the date of completing cadastre.
- Any official documents recognizing the rights of the claimers such as court decision "Seha wa Nafaz".

The ruling of the Expropriating Entity on the grievance can be appealed to the court of first instance within whose jurisdiction the expropriated property is located. The appeal must be made within 60 days from the date of notifying the concerned parties with the Expropriating Entity's ruling on their objection.

a) The Expropriating Entity and the concerned owners and holders of rights have the right within 4 months from the last date on which the lists and other information are posted (1 month after the posting date) to object to the determination of compensation by ESA before the competent court of first instance.

b) A list of properties for which no objection or appeal is made shall be prepared. No objection or dispute may thereafter arise with respect to these particular properties. Payment made to the owners and holders of rights in these properties shall be conclusive as to the fulfillment of the Expropriating Entity's payment obligations.

c) Non-objecting concerned persons shall execute and sign transfer of title forms in favor of the Expropriating Entity. For properties for which signed forms cannot be obtained, a ministerial decree declaring such transfer shall be issued in lieu thereof. The signed forms and the ministerial decree shall be deposited with the concerned Real Estate Office. The deposit thereof shall result in the full transfer of title ordinarily associated with a recordation of a deed of sale.

d) The non-deposit of the executed forms or ministerial decree with the concerned Real Estate Office for a period exceeding 2 years from the date of publishing the expropriating decree shall render the decree as null and void with respect to the properties for which the executed forms or the decree have not been deposited.

e) No objection or appeal shall prevent the property owner or holder of rights therein from collecting the estimated compensation amount.

f) Under current law and practice, the Government has wide powers in determining whether a project is a public interest project. This falls within the full discretion of the Government. Accordingly, objections to an expropriation decree cannot interfere with or limit the Government powers in this respect except where there is a clear misuse or abuse of this right that amount to bad faith on the part of the Government. An example of this bad faith is a case where a property is merely expropriated to harm the owner of the property. Allowable objections are usually based on whether the amount of compensation is sufficient or whether the property falls within the area defined under the expropriation decree.

g) The involvement of right holders usually results in one of the following scenarios with respect to objection procedures:

- The holders of rights may object to the amount of compensation in the event that they are of the opinion that the decided amount is not fair and that the title owner has not taken any objection. In such case, the holders of rights may use the right of their debtor (the titleholder) to preserve their interest.

- If the holders of rights decide not to object to the amount of compensation on behalf of the titleholder, they effect an attachment of the compensation amount to repay amounts due to them from the titleholders, if any.

<u>In general, to limit court cases as much as possible, EETC will try to address all grievances arise during determination of compensation by the Compensation Committee. EETC representative within the Compensation Committee will liaise with EETC Chairman, as well as EETC Legal Department on a timely basis to find out an appropriate redress, case-by-case.</u>

It is important that the established grievance redress mechanism ensures that affected farmers are represented and that the opinions of the concerned PAPs are given fair treatment. This process should be carefully documented. This could be handled through an informal committee where both project officials and PAPs are represented which would allow problems to be discussed before they reach the Compensation Committee.

2.9.5 Administrative Mechanisms and Appeal to Court

The Egyptian constitution allows any aggrieved person the right of access to Court of law as described by Law 10/1990 as follows:

1. The concerned owners and holders of rights have the right, within 30 days from the date of posting and publishing the lists and information of the expropriated properties, to object to the information contained in such lists. The objection is made to the main offices of the Expropriating Entity or the administration to which it is attached within the governorate in which the property is located.

2. The ruling of the Expropriating Entity on the objection can be appealed to the court of first instance within whose jurisdiction the expropriated property is located. The appeal must be made within 60 days from the date of notifying the concerned parties with the Expropriating Entity's ruling on their objection.

3. The Expropriating Entity and the concerned owners and holders of rights have the right within 4 months from the last date on which the lists and other information are posted (1 month after the posting date) to object to the determination of compensation by ESA before the competent court of first instance.

4. A list of properties for which no objection or appeal is made shall be prepared. No objection or dispute may thereafter arise with respect to these particular properties. Payment made to the owners and holders of rights in these properties shall be conclusive as to the fulfillment of the Expropriating Entity's payment obligations.

The following are principles set by the Administrative Courts:

- The competent administrative authority has freedom in selecting the appropriate property for expropriation. Accordingly, it was ruled that as long as the administration is not abusing its powers, its decision to select a particular plot to build a hospital is not subject to review. Similarly, the administration selection of a particular site to build a water treatment plant is not subject to review.

- The determination of the exact area (in square meters) to be expropriated is subject to the discretion of the administration and not subject to judicial review.

- Expropriating the ownership of land to extend sewage pipelines underneath it does not prevent the administration from appropriating the surface of the same land for public use.

- Courts have asserted their judicial review authority whenever the administration's exercises of its discretionary powers are for political or personal objectives aimed at spite.

  The State Council opined that the administration might not expropriate property for merely achieving monetary gains. Accordingly, it opined that the expropriation act by the local council of an area adjacent to the location where a new station will be relocated aiming merely at making a profit was void.

2.9.6 Legal Requirements for Disclosure

The Egyptian legal requirements for disclosure as stated in Law 10/1990 can be explained in the following steps:

a) After depositing the compensation amount by the expropriating entity with ESA -the concerned local office- lists of all real properties and facilities being identified shall be prepared, their areas, location, description, names of their owners, and holders of property rights therein, their addresses, and the compensation determined by the compensation estimation committee.

b) ESA shall thereafter officially notify the property owners, other concerned parties and the expropriating entity with the dates on which the lists prepared in accordance with the preceding paragraph shall be presented to them, at least 1 week prior to such presentation. These lists will be posted for a period of 1 month in the offices of the concerned local government unit and shall also be published in the official gazette and two widespread daily newspapers.

c) Owners of the properties and holders of rights therein shall be officially notified with an evacuation request within a period not to exceed 5 months from the date of their notification.

2.9.7 Crop Compensation System

1. **Crop Compensations**

Egypt's agricultural drainage network is a vast one and the Egyptian Public Authority for Drainage Projects (EPADP) has a long-standing history of implementing subsurface drainage networks. During the implementation of these systems on active agricultural lands, farmers are subject to losing crops on part of their land and thus losing income. Consequently, EPADP has developed a well established system for providing affected farmers with crop compensations for land areas temporarily put out of production due to the execution of subsurface drainage systems. This section presents the step-by-step procedures used for providing farmers with due crop compensations as well as the procedures adopted for conducting consultations, providing farmers with timely information as well as the grievance mechanisms in place.

These procedures should apply to any type of projects, including energy projects, when dealing with crop compensation issues.

Consultations and Provision of Timely Information:

The EPADP includes a dedicated department for drainage advisory services and is given the level of a General Directorate. This General Directorate for Drainage Advisory Services (DAS) is represented with each of EPADP's field offices at the regional levels as well as the levels of the general directorates and drainage districts. The overall mandate of the DAS is to increase farmer's awareness with regards to the drainage systems. In this regards, the DAS holds consultations at three progressing levels as follows: (i) consultations at the governorate level, (ii) consultations at the level of the central directorates, and (iii) consultations at the level of the interventions.

First: Workshops / Consultations at the Governorate level. These consultations are attended by EPADP's chairman and/or vice chairman. Senior officials and public persons (e.g. senior Governorate staff, members of parliament...etc) are also invited to attend. These high-level consultations are aimed at community leaders to present them with an opportunity to interact with and present any constraints to senior EPADP staff.

Second: Workshops / Consultations at the level of the General Directorates. These consultations along with those done at the Governorate level and planned annually at the beginning of each fiscal year (Starting 1 July) and are planned mostly on a rotational basis between governorates and directorates in order to maximize coverage by these consultations/workshops in addition to being conducted as needed if any developments occur throughout the planning period. These consultations are intended to raise awareness with regards to the importance of the drainage system, users' roles with regards to the subsurface drainage networks...etc.

Third: Consultations and meetings at the level of the Interventions. This final level of consultations are done for each intervention during its three stages; (i) before implementation, (ii) during implementation, and (iii) post implementation. Such consultations are announced in the agricultural cooperatives and / or through identified community leaders to attract the largest possible audience. These agricultural cooperatives under the supervision of the Ministry of Agriculture and Land Reclamation (MALR) are independent of MWRI and EPADP and their semi-autonomous nature makes them favorable with farmers and thus ensure wide dissemination/access to farmers. Before implementation a series of consultations are typically held at the agricultural cooperatives to inform farmers about the expected work, its impact and benefits as well as potential disturbances and crop compensations procedures. Representatives from other relevant stakeholders (e.g. education, health...etc) are also invited. During implementation these consultations are held in the field to ensure that farmers' opinions are taken into account and to increase their overall level of participation and awareness. The post implementation consultations are mainly directed towards training farmers on simple maintenance activities and on how to maintain the subsurface drainage networks.

DAS activities within EPADP up to 2004 were performed under the mandate of the General Directorate for Regional Affairs and Drainage Advisory. In 2004 a Central Directorate was established for Monitoring and Evaluation of Drainage Maintenance Performance, within this central directorate is a dedicated General Directorate for Drainage Advisory Services. At the central level, DAS is composed of two main departments; (i) Advisory Programs, and (ii) Advisory Materials. The central level office is responsible for the overall management and planning of advisory services and for coordination between the field offices including the development of annual work plans for the scheduling of consultations/workshops and the preparation of annual DAS reports. At the decentralized level, within each of EPADP's five regional field offices (termed "regions") DAS is represented by a DAS Directorate. Each of EPADP's regions is composed of several General Directorates (total of 38 General Directorates), each of which houses a DAS unit. At the lowest level of EPADP's structure are the Districts that report to the General Directorates and within these Districts DAS is represented by field supervisors.

Implementation Procedures:

The procedures for crop compensation resulting from the execution of drainage or irrigation projects is regulated by a series of Ministerial Decrees issued by the Minister of Water Resources and Irrigation. The most recent decree is no. 358 for the year 2008 and is dated 31 July 2008. This decree specifies the procedures to be followed for administering the process as well as the crop compensation unit rates on which the calculations are based (the decree includes a comprehensive list including numerous varieties of summer crops winter crops, vegetables, medical plants, decorative plants, palm trees, fruit trees, forestry and flowers).

During the execution of subsurface drainage systems, any due crop compensations are paid directly by the Contractor to farmers under the supervision of EPADP and in coordination with the relevant agricultural cooperative(s). In order to ensure representation of all concerned parties in the crop compensation process, a Crop Compensation Committee, or more than one if needed, is established at the level of each general directorate responsible for the implementation of subsurface drainage works. This committee is headed by the general directorate's engineer in charge of the drainage project and includes one member from each of the following: (i) representative of the contractor executing the works, (ii) head of the relevant agricultural cooperative from the Ministry of Agriculture and Land Reclamation (MALR), (iii) board member of the agricultural cooperative nominated by the cooperative's board, and (iv) village head in the project area.

The above-mentioned committee is entrusted with the following responsibilities:

- Identification of the agricultural areas affected by the project.
- Calculating the crop compensations due in accordance with the unit rates stated in the Ministerial Decree in effect for each crop (in the remote case of crops not included in the Ministerial decree, the matter is presented to EPADP's board for identifying a suitable crop compensation unit rate).

- The committee delegates to the Contractor to prepare, within a maximum period of 30 days, a crop compensation register in coordination with the agricultural cooperative and village head. This register shall identify affected farmers, area of land affected for each farmer, crop type and date of crop damage.
- The crop compensation register identified to the committee is then publicly displayed at the bulletin board within the relevant agricultural cooperative office as well as within the drainage directorate office and the village local council office. The displayed information is maintained on display for a period of 30 days and identifies affected farmers, area of land affected and crop compensation amount due to each farmer.
- Any grievances related to the posted crop compensation information shall be submitted within 30 days to be investigated by the Crop Compensation Committee within the following 30 days.

The following are the implementation steps followed during the implementation of subsurface drainage works to ensure transparent and timely payment of crop compensations to affected farmers. These steps are included in relevant sections of the bidding documents of all subsurface drainage works and form contractual obligations to both parties, the Contractor and EPADP.

- The contractor is responsible throughout the contract period for compensating crop owners for the loss of crops as a result of temporary removal of agricultural production from the land for the execution of the works. This shall include compensation for loss of crops from lands used for the purpose of constructing subsurface drainage network.
- The cost of compensation for loss of crops in any land that went out of agricultural production due to the contractor's requirements and his storage needs shall be on the contractor's expense.
- In a period not less than 14 days prior to the commencement of any works that may affect the agricultural areas the contractor shall assign a representative to partner with a representative of the Employer and the crop owner to survey the boundaries and areas of land that will go out of agricultural production during the execution period. The value of crop compensation payable depends on the land area put out of production during the execution period, the type(s) of crops in the subject area, and the compensation unit rate as published in the effective ministerial decree as issued by the Minister of Water Resources and Irrigation.
- Agricultural losses are surveyed during the execution period by measuring the length of the losses (the width is calculated to be 10m for collector pipes and 5m. for lateral pipes), identifying the name of farmer, the type of agricultural product and the number of trees damaged in the land as well as the date of damage.
- The surveyed data is recorded in the crop compensation register as per the Employer's instructions.

- The crop compensation register is certified by the agricultural cooperative overseeing the command area within which the execution area is located as well as the village head and/or survey authority representative.
- The contractor provides the Employer with the crop compensation register, the receipts indicating that the concerned crop owners were fully compensated for agricultural losses and a register of the executed works and that during preparation of the ongoing payment certificates covering the executed works that caused crop losses during their execution.
- Providing the Employer with the above mentioned documents is a condition for paying the amounts owing to the contractor and without meeting this condition the payment certificate would not be paid to the contractor.
- Payment of compensations from the contractor to the crop owners must be paid in full before the expected date of selling the damaged crops and receiving payment for it or within four months from damaging the crops, whichever is the earlier date. If the contractor fails to pay to any of the crop owners within the period specified, the Employer shall pay to the delayed crop owners and shall deduct 20% of the delayed compensation costs as a penalty on the contractor plus administrative fees at the rate of 10%.
- The contractor is fully responsible for the completion of the surveying process, preparation of crop compensation registers and following-up on their approval by all the concerned authorities. The contractor shall be responsible for any delay and will be subject to penalties as mentioned in the previous clause.

2. Valuation and Compensation Methods

Crop Compensations:

As mentioned above, the valuation of crop compensation amounts applicable to affected farmers due to the implementation of irrigation and drainage works are regulated by a series of Ministerial Decrees issued by the Minister of Water Resources and Irrigation. The most recent decree is no. 358 for the year 2008 and is dated 31 July 2008. This decree specifies the procedures to be followed for administering the process as well as the crop compensation unit rates on which the calculations are based (the decree includes a comprehensive list including numerous varieties of summer crops winter crops, vegetables, medical plants, decorative plants, palm trees, fruit trees, forestry and flowers). In the remote case of crops not included in the Ministerial decree, the matter is presented to EPADP's board for identifying a suitable crop compensation unit rate.

The valuation of crop compensations areas are measured by field surveys during implementation for measuring lengths of affected areas along the transmission line or pipeline layouts and calculating the area based on a width of 10m. for collector pipes and 5m. for the lateral pipes. The affected area is then multiplied by the applicable unit rate depending on the type of crop to reach the crop compensation amount.

As mentioned under "implementation procedures" above, in order to ensure representation of all concerned parties in the crop compensation process, a Crop Compensation Committee, or more than one if needed, is established at the level of each general directorate responsible for the implementation of subsurface drainage works. This committee is headed by the general directorate's engineer in charge of the drainage project and includes one member from each of the following: (i) representative of the contractor executing the works, (ii) head of the relevant agricultural cooperative from the Ministry of Agriculture and Land Reclamation (MALR), (iii) board member of the agricultural cooperative nominated by the cooperative's board, and (iv) village head in the project area.

Unit rates for crop compensations based on the crop type are updated and issued in consecutive Ministerial decrees related to this matter and issued by the Minister of Water Resources and Irrigation. These updates are prepared by specialized committees established with representation from MWRI's relevant departments, including EPADP, as well as participation of the MALR. Recent practice has been to issue updates of these crop compensation unit rates every three years or as needed depending on major occurrences such as repeated farmer requests.

3. Grievance & Redress Procedures

Once crop compensation registers are developed for a particular project (these registers would identify affected farmers, area of land affected for each farmer, crop type and date of crop damage) they are publicly displayed at the bulletin board within the relevant agricultural cooperative office as well as within the drainage directorate office and the village local council office. The displayed information is maintained on display for a period of 30 days. Any grievances related to the posted crop compensation information shall be submitted within 30 days to be investigated by the Crop Compensation Committee within the following 30 days. In case no grievances are submitted during the grievance period, the crop compensation register is approved by the concerned committee and the relevant directorate is mandated to proceed with the payment of crop compensations to affected farmers at the office of the agricultural cooperative or the village council and in the presence of village leader and representative from the Ministry of Agriculture and Land Reclamation.

In addition to the above-mentioned mechanism, a Grievances Committee is established with the Survey Authority office within the Real Estate Tax Authority at the governorate level. This committee includes representation of the Real Estate Tax Authority as well as the relevant drainage directorates. In cases when a farmer is unable to submit a grievance request within the 30-day period that the crop compensation register is publicly posted, grievance requests can be submitted at anytime at the drainage directorate office or at the office of the Real Estate Tax Authority. These grievance requests are then presented to the Grievances Committee for investigation.

In case payment of crop compensations is not immediately possible due to the inability to legally identify the affected farmer(s) or due to the existence of conflicts that hinder the process, the crop compensation amount is placed in the treasury of the relevant directorate until the issue is resolved. In all cases, farmers are required during the disbursement of crop compensation amounts to submit declarations indicating their legal right to the compensation amounts and that in case they are found not to have the right to these amounts, they are required to pay them back along with interest accrued from the day of disbursement to the day of repayment.

Again, as mentioned in Section 3.4, to limit court cases as much as possible, EETC will try to address all grievances arise during the work of both the Compensation Committee and the Grievances Committee on a timely basis.

4. Legal Requirements for Disclosure

In accordance with the Ministerial decree regulating crop compensations procedures, crop compensation registers identifying affected farmers, area of land affected for each farmer, crop type and date of crop damage are publicly displayed at the bulletin board within the relevant agricultural cooperative office as well as within the drainage directorate office and the village local council office. This public posting, particularly at the agricultural cooperatives, ensures comprehensive dissemination of information to the affected farmers in the area. The displayed information is maintained on display for a period of 30 days.

3. ANALYSIS OF ALTERNATIVES

3.1 CURRENT SITUATION ("NO ACTION" OPTION)

3.1.1 Electricity Demand

Egypt has a rapidly expanding economy that is dependent on the availability of reliable and low cost electric power. The annual average rate of growth of electricity demand in Egypt is expected to range between 6-7% during this decade and beyond. Peak demand is expected to rise from 22,750 MWe in 2009/2010 to 26,600 MWe by 2012 and installed capacity is expected to increase from 23,500 MWe to 30,200 MWe during the same period.

In 2009/2010, about 99% of the population was served by the Egyptian electricity grid. Of total demand of 139.000 TWh on the interconnected system, about 9.25% was met by hydropower, principally the High Dam and Aswan 1 & 2, and the remaining was met with combined cycle plants, of which around 68.24% were supplied from natural gas and 31.76% heavy fuel oil.

The rate of growth in demand for electricity is forecasted to continue at the aforementioned level for the next 5 years before gradually decreasing to a growth rate of 5.7% per year over the subsequent 10 years.

In order to meet the forecasted demand, the Ministry of Electricity & Energy (MEE) estimates that more than additional 20,000 MWe of new generating capacity will be required during the next ten years.

The strategy of the Electricity Sector presently envisages that this additional generation will be met by an increase in all forms of generation, including renewables (particularly large-scale wind power) and this increase in generation will need to be matched by an expansion in the high voltage transmission network.

3.1.2 Electricity Generation and supply

Currently, the Egyptian Electricity Holding Company (EEHC) holds 16 affiliate companies: 6 for power generation, one for electrical energy transmission and 9 for electricity distribution. The Egyptian Electricity Transmission Company owns and operates the high voltage electricity transmission system, and the Electricity Distribution Companies own and operate the electricity distribution system. High voltage electricity transmission through medium voltage transmission system consists of over 38,400 km of 500 kV, 220 kV, 132 kV, 66kV and 33 kV transmission lines. Further expansion of the transmission system is also planned.

In addition to EEHC, the power sector contains a few IPPs selling power to EEHC: New and Renewable Energy Authority (NREA) Suez Gulf wind farms and three privately owned power plants under Build, Own, Operate and Transfer (BOOT) financing schemes, and few IPs selling power in the isolated market.

As mentioned above, the Six Electricity Generating Companies supported in 2009/2010 almost 24,700 MWe of installed capacity. This resulted in 139.000 TWh of generated energy. Over 24 million customers have access to electricity supply, representing about 99% of Egypt's population.

Table 3-1 shows the breakdown on existing installed capacity by fuel/ process type.

Table 3-1

Installed Capacity Corresponding to Fuel Type, 2009/2010

Installed Capacity	MWe	% age
Steam	11,457	46.33
Gas	842	3.43
Combined Cycle	9,136	36.94
Hydro	2,800	11.32
Wind	490	1.98
Total	**24,726**	**100**

Source: Arab Republic of Egypt-Ministry of Electricity and Energy/Egyptian Electricity Holding Company, Annual Report-2009/2010.

3.1.3 The "No Action" Option

The no action alternative will result in lack of power evacuation and transmission to load centers, and consequently in the demand for electricity exceeding supply, with an increasing deficit as demand increases in future years. A lack of a secure and reliable electricity generation and supply system has significant social and economic implications, since it will:

- constrain existing and future economic development and investment through lack of energy resources to meet industrial and social demand;
- restrict socio-economic development through lack of electricity supply, or poor reliability and shortages in electricity supply for domestic users, community and other public facilities and public services;
- inhibit provision of social services, including public health and poverty eradication.

"No Action" Option means, also, loss of all project benefits, which may be summarized as follows:

Improvement in electricity supply reliability

The reliability of the grid operation will be significantly improved as additional redundancy will be built into the network to minimise the need to reduce system demand in the event of the unplanned breakdown of a major piece of equipment.

Similarly the strengthening of the transmission connection between eastern Nile power generation and the rest of the network will minimise the risk of system instability occurring after an unplanned fault in the eastern section of the network.

Improving security of supply

There are concerns about the security of electricity supply within the Upper Egypt region. Grid re-inforcement has the potential to deliver an additional power from Helwan South electricity generation to the Upper Egypt region.

Enhanced prospects for economic development in the Upper Egypt region

Reliable energy supplies are a critical success factor in maintaining the continued economic development. Any loss of confidence in the security of power could have a significant impact on investor confidence and economic growth.

Enhanced prospects for transmission equipment manufacturers and employees

Egypt has a manufacturing base in the provision of both transformers and reactors for substations, tower steel and line conductors for overhead lines along with construction and commissioning skills. Although the project will be subject to international competitive tendering, it is probable that Egypt's relatively low cost base and familiarity with local conditions should assist the domestic industry in winning a proportion of the estimated millions of USDs worth of project work with the associated direct and indirect economic benefits.

As a result, the "no action" option is not a viable or acceptable alternative to the proposed project.

3.2 ALTERNATIVE ROUTES FOR THE TRANSMISSION LINE

The line Route for the Helwan South / Samallout OHTL 500kV (of around 150 km length) starts at Samallout 500 kV substation on a desert land then goes through agricultural area until the Nile River. When it crosses the Nile it goes towards the North through desert lands till Helwan South Power Plant.

When the transmission line crosses the Nile, it goes close to an asphalt road through the desert lands till Helwan South Power Plant. The desert segment of the entire transmission line route is approximately 88% of the total length of the interconnecting lines, which will pass through uninhabited uncultivated state-owned desert land, while the remaining 12% (about 30-32 km), which is around 12% of the total length of the entire interconnecting lines lies on cultivated lands at Samallout area.

The Samallout 500/220/132/66/33 KV substation is located at the desert edge, west of Nile River, this substation will be expanded to house new equipment associated with the construction and operation of new transmission lines.

The Helwan South substation will be located on the most southern part of Giza Governorate. Helwan South substation is about 7.5 km to the south of the El-Kureimat power plant and about 100 km south of Cairo. The area is free of encumbrance and on an uncultivated uninhabited desert lands. The site of the substations and the entire route of transmission line are accessible through the regional road from Cairo to El-Minya.

Three alternative routes for the Nile crossing of the OHTL were studied. The study resulted in recommending the 3rd alignment, as the best option. There are three proposed routes in the green area at Samallout route segment, where:

- The first passes near some housing blocks and crosses the Nile River at 600 m width.
- The second passes through mining area located at the eastern side of the Nile River and constitutes a source of pollution, which may adversely affect the line insulators, in addition to crossing the Nile River at 900m width.
- The third passes far from the mining area, avoiding housing blocks and crosses the Nile River at its narrowest width, 600 m distance.

Economically, the three routes are ranked as follows: route (3), rout (1) and route (2).

Environmentally and socially, the three routes are ranked as follows: rout (3), route (2) and route (1).

Route (3) is the first ranked economically and the first ranked environmentally and socially, thus it should be selected as the best one.

The chosen route (3) avoids all housing blocks that are vulnerable to the first proposed route, and goes far from the mining area that threats the transmission line in case of selecting the second route, in addition to avoiding crossing the Nile River at a width of 900m, in case of selecting route (2).

Figure 3-1 shows the Transmission Line alternative routes for the 500 kV OHTL crossing the Nile river from Samallout. *Figure 3-2* depicts the selected route segment of 500 kV Samallout / River Nile Bank and its intersection with other TLs at Samallout area.

Figure 3-1

The Three Alternative Routes to the Samllout / Eastern Nile Bank Segment

Figure 3-2

Intersection of Samllout / River Nile Bank Segment 500 kV TL with other TLs at the Samallout Area

4. DESCRIPTION OF THE PROPOSED PROJECT

4.1 INTRODUCTION

The Helwan South power project will be connected to the Egyptian Unified Power System (EPS) at Zahraa El-Maady, east of Cairo City, Cairo Governorate in the North and at Samallout, El-Minya Governorate in the Southwest, which are both owned and operated by the Egyptian Electricity Transmission Company (EETC), an affiliate company to the Egyptian Electricity Holding Company (EEHC), via connecting transmission lines of a total length of around 250 km, **in addition to 30 km for connecting the underconstruction 500 kV, OHTL Tebbin/ Al Ain El-Sokhna P.P. to Zahraa El-Maadi S.S.**

The scope of the project is as follows:

- **i. A 2x750 MVA, 500/220 kV Zahraa El-Maadi Substation.**
- **ii. A 100 km, 500 kV double circuit transmission line connecting South Helwan and Zahraa El-Maadi substations;**
- **iii. A 150 km, 500 kV double circuit transmission line connecting Helwan South substation to Samalaut and Assuit substations by an in-and-out connection at Samalaut substation to the existing 500 kV Samalaut-Assuit transmission line.**
- **iv. A 30 km, 500 kV double circuit transmission line connecting Zahraa El-Maadi substation by an in-and-out connection to the 500 kV transmission line connecting Tebbeen and El-Sokhna substations The 500 kV transmission line connecting Tebbeen and El-Sokhna substations is under construction and is financed by EETC; and**
- **v. Two 165 MVAR, 500kV switchable line shunt reactors each to be installed at Assuit and South Helwan substations.**
- **vi. Connecting three existing 220 kV lines (Ain Sira/ Tora (2x7 km), Cairo east / Basateen (2x5 km), Katamia/ Tebeen (15 km)) to Zahraa el- Maadi SS.**

It is not foreseen that any of the activities of the transmission line project, or its attachments, would result in involuntary resettlement, particularly with most of the routing pathways of the main electrical transmission lines (around 88% of its routing pathway) are located within uninhabited uncultivated State-owned desert lands with a very limited pieces of land to be occupied by transmission towers' footings against fair compensation and no alternative proposed routing is envisaged as shown clear in the map of the surveyed routes.

Most importantly, no involuntary resettlement is foreseen due to any activity of the transmission line project between Samallout and the River Nile (the agricultural land) because nobody is inhabited on the green cultivated areas, but in the villages discreted all around. Only crop compensation may be associated with the project activities within this part of the line route.

The current status with regard to transmission lines, substations and access roads is given in the following sections.

4.2 PROJECT LOCATION

In order to evacuate the electrical energy generated at the Dayer El-Maymoun, Helwan South into the 500 kV backbone network, EETC is planning to interconnect the Helwan South at Zahraa El-Maady, east of Cairo City, Cairo Governorate in the North and to Samallout substation at the Nile valley in the Southwest, via installing 500 kV parallel lines of 250 km total length, approximately.

The southern part of the line Route starts at Samallout 500 kV S/ST on a desert land, then goes through agricultural area until the Nile river. When it crosses the Nile it goes to the north direction through desert lands till Helwan South power project. The northern part of the line Route starts at Zahraa El-Maadi 500kV S/ST, east of Cairo City on a desert lands, then goes through desert lands to the south direction till Helwan South power project.

When the transmission line crosses the Nile, it goes close to an asphalt road through the desert lands till Helwan South and continues to the north till Zahraa El-Maady close to an asphalt road through the desert lands, too. The desert segment of the transmission line route is approximately 88% of the total length of the line, while the remaining 12% lies on cultivated lands at Samallout area.

Concerning the transmission line, only small pieces of land for the transmission line's towers' footings all along the route will be acquired.

The land requirements are likely to be limited. No land acquisition is associated with around 88% of the entire route as it passes through uninhabited, uncultivated, State-owned desert land. **The same as for the 30 km in/out that connects the 500 kV, TL Tebbin / El-Sokhna P.P. to Zahraa El-Maadi S/S, where the entire connection line passes through a desert land. Also, the three existing 220 kV lines (Ain Sira/ Tora (2x7 km), Cairo East/ Bassatin (2x5 km), Kattamia/ Tebbin (15 km) that will be connected to Zahraa El-Maadi S/S are all pass through a desert land (see Figures 4-1 "B & C" and 4-2 "B").**

Only in the cultivated area of Markaz Samallout, along the remaining 12% of the route, small pieces (of area around 14x14 m2 each) of the agricultural land (of a total accumulated area of around 3.1 Feddans) will be occupied by TL towers' footings. For these footings, fair land acquisition compensation and crop compensation system will be applied.

A Resettlement Policy Framework (RPF) has been prepared to accompany this ESIA for frameworking the legislative conditions and procedures related to any resettlement that may be resulted from this project. If any resettlement exists, a Resettlement Action Plan (RAP) will be prepared and submitted to the W.B. before the construction of the transmission line starts. For this, a full survey of Project Affected Persons (PAPs) would be conducted as soon as the project's specific location is determined and its land requirement is known.

It must be emphasized that no civil work will start unless land expropriation is completed and compensation is paid (land expropriation is a per-construction phase activity).

The indicative geographical co-ordinates outlining the main routes of the transmission line are provided in *Tables 4-1 and 4-2*. Also, *Figures 4-1 through 4-7* give an illustration for the project route.

Table 4-1

Helwan South / Zahraa Al-Maadi 500 kV OHTL Primary Route

Pt. No	*N*			*E*		
	Deg	*Min*	*Sec*	*Deg*	*Min*	*Sec*
1	29	13	5.4	31	13	15.94
2	29	13	30.53	31	15	36.39
3	29	14	45.61	31	15	42.02
4	29	16	34.17	31	16	1.06
5	29	17	47.34	31	16	44.91
6	29	18	24.34	31	17	1
7	29	20	2.92	31	17	26.91
8	29	22	26.96	31	18	48.9
9	29	23	5.39	31	19	2.28
10	29	24	9.69	31	20	13.78
11	29	24	29.71	31	20	29.45
12	29	25	53.49	31	21	17.72
13	29	27	8.59	31	21	52.41
14	29	29	8.33	31	22	41.85
15	29	31	9.38	31	22	57.82
16	29	31	31.33	31	23	13.76
17	29	32	12.29	31	23	20.52
18	29	34	52.09	31	24	41.16
19	29	38	10.43	31	24	39.87
20	29	39	19.93	31	24	6.43
21	29	40	39.25	31	23	40.55
22	29	42	38.37	31	24	20.68
23	29	43	25.04	31	24	21.75
24	29	44	35.83	31	24	46
25	29	45	35.43	31	24	28.54
26	29	51	46.6	31	24	2.14
27	29	55	25.04	31	22	46.62
A	29	13	18.78	31	13	2.85
B	29	13	11.83	31	13	19.68
C	29	12	53.95	31	13	10.02
D	29	12	59.9	31	12	51.12
Zahraa S.S	29	58	1.43	31	21	31.19

Table 4-2
Helwan South / Samallout / Assiut 500 kV Line Details

Pt. No	N			E		
	DEG	MIN	SEC	DEG	MIN	SEC
1	28	18	29.1	30	35	42.2
2	28	18	23.3	30	35	38.3
3	28	18	16.6	30	35	39.2
4	28	18	12.7	30	35	46.6
5	28	18	14.5	30	35	58.1
6	28	18	26.4	30	36	4.1
7	28	18	31.6	30	36	12.4
8	28	18	43.5	30	36	17.4
9	28	18	53.9	30	36	16.1
10	28	19	19.5	30	36	17.3
11	28	19	26.2	30	36	21.8
12	28	19	31.7	30	36	32.8
13	28	19	35	30	36	45.7
14	28	19	32.7	30	36	58.8
15	28	19	34.5	30	37	13.4

Table 4-2 ***(Contd.)***
Helwan South / Samallout / Assiut 500 kV Line Details

Pt. No	N			E		
	DEG	MIN	SEC	DEG	MIN	SEC
16	28	19	39.8	30	38	43.1
17	28	19	35.8	30	39	50.6
18	28	19	48	30	41	9.7
19	28	20	21.5	30	41	30.2
20	28	20	50.6	30	42	59.7
21	28	21	20	30	43	39.3
22	28	21	51.4	30	44	40.5
23	28	24	7.3	30	46	7.7
24	28	24	16.1	30	47	34.1
25	28	24	25.1	30	48	1
26	28	23	10.6	30	50	18.8
27	28	23	58.26	31	1	28.58
28	28	29	28.35	31	0	56.95
29	28	33	58.7	31	0	52.7
30	28	36	6.41	31	0	21.48
31	28	42	37.89	31	2	14.26
32	28	44	56.26	31	5	27.48
33	28	49	6.24	31	7	28.55
34	28	50	35.5	31	7	47.35
35	28	55	51.09	31	8	24.61
36	28	59	11.26	31	9	26.09
37	29	2	15.58	31	11	19.46
38	29	5	36.62	31	12	48.47
39	29	7	49.83	31	31	29.61
40	29	9	12.15	31	14	4.82
41	29	11	4.12	31	14	53.26
42	29	12	26.01	31	15	18.64

Figure 4-1(A)

Map of Egypt Illustrating Panoramic View for the Helwan South / Zahraa El-Maadi – Helwan South / Samallout 500 kV Transmission Line

Figure 4-1(B)

Interconnection of Zahraa El-Maady Substation
Current Situation

Figure 4-1(C)

Interconnection of Zahraa El-Maady Substation
Target Situation

Figure 4-2 (A)

Topographic Map of the Route of the Helwan South / Zahraa El-Maadi – Helwan South / Samallout 500 kV Transmission Line

Figure 4-2 (B)

Topographic Map of the Route of the Three Existing 220 kV Lines to Zahraa El-Maadi Substation and the 30 km, 500 kV in-and-out Connection to the Tebbin/ Sokhna 500 kV TL.

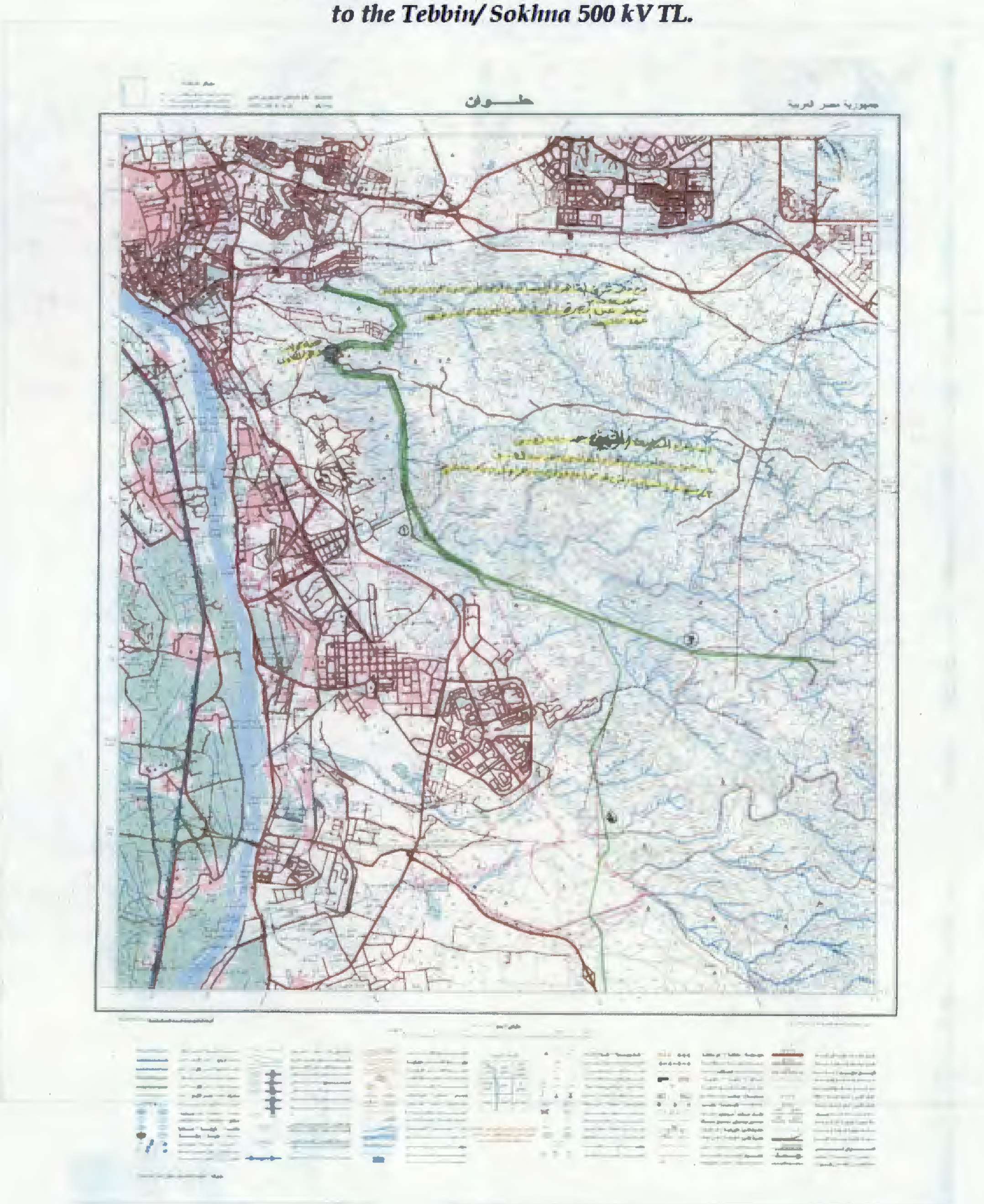


Figure 4-3

Satellite Map Illustrating the Full Routing of the Helwan South / Zahraa Al-Maadi – Helwan South / Samallout 500 kV Transmission Line

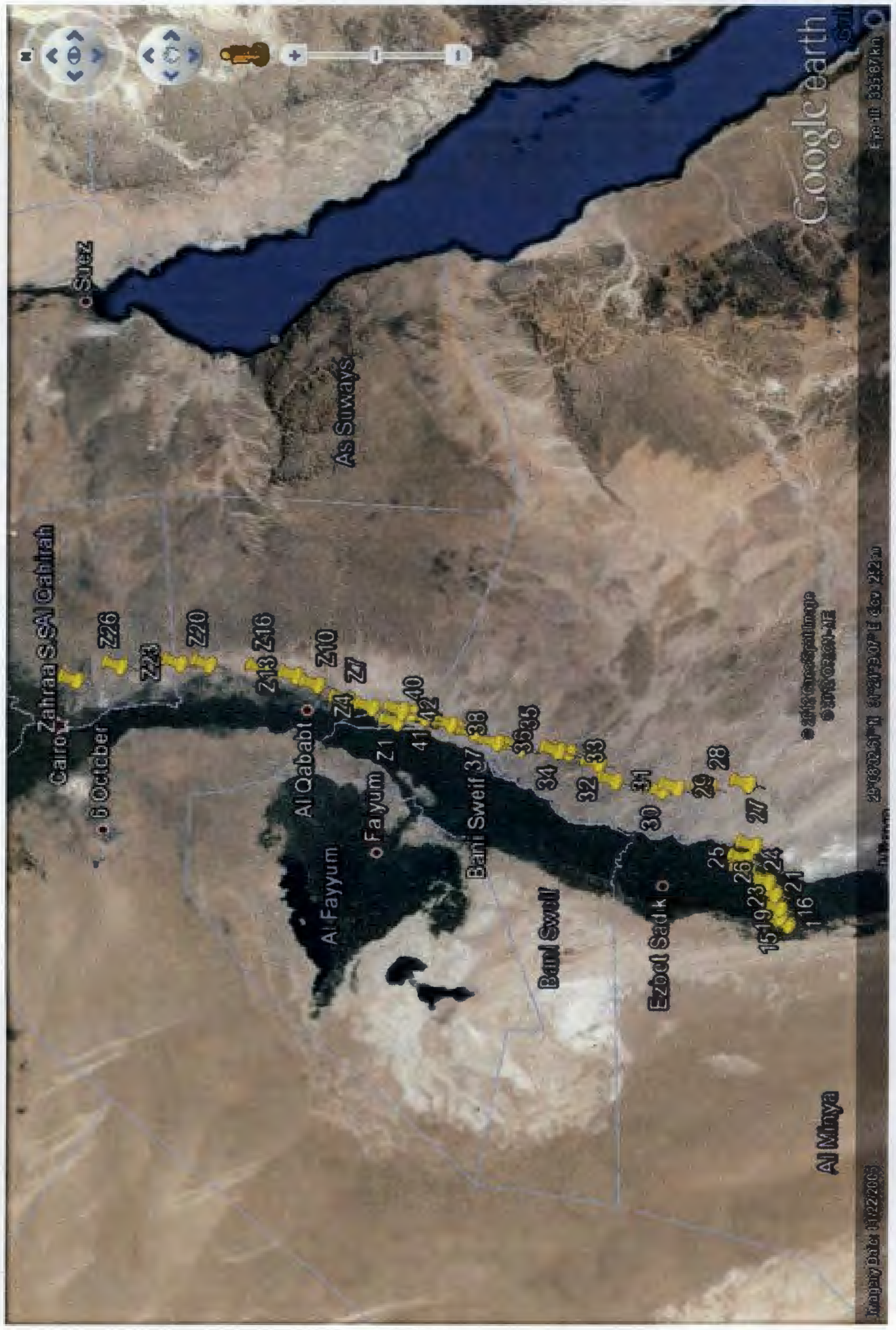


Figure 4-4

Satellite Map Depicting the Northern End of the Helwan South / Zahraa Al-Maadi – Helwan South / Samallout 500 kV Transmission Line

Figure 4-5

Satellite Map Depicting the Southern Line Routing of the Helwan South / Zahraa Al-Maadi – Helwan South / Samallout 500 kV Transmission Line (Helwan South / Samallout)

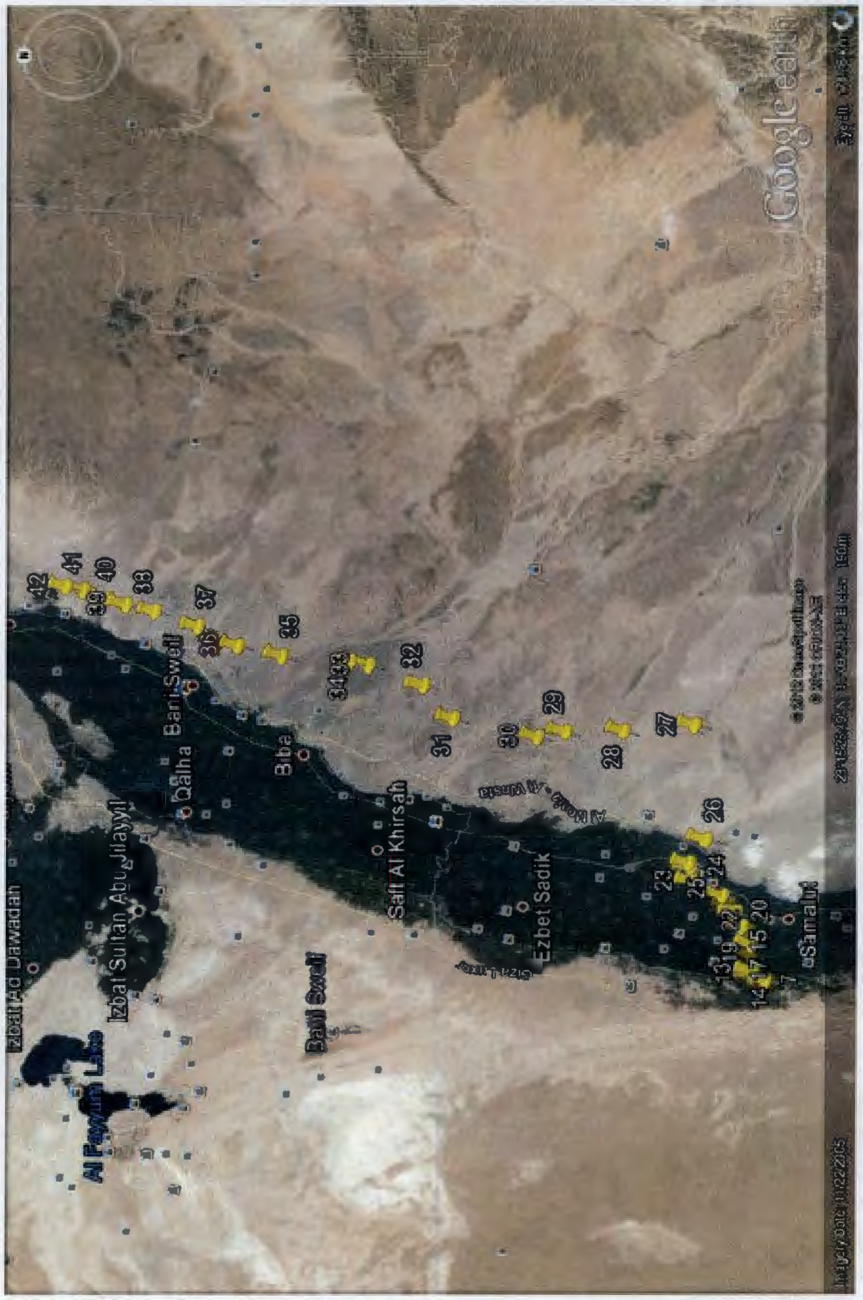


Figure 4-6

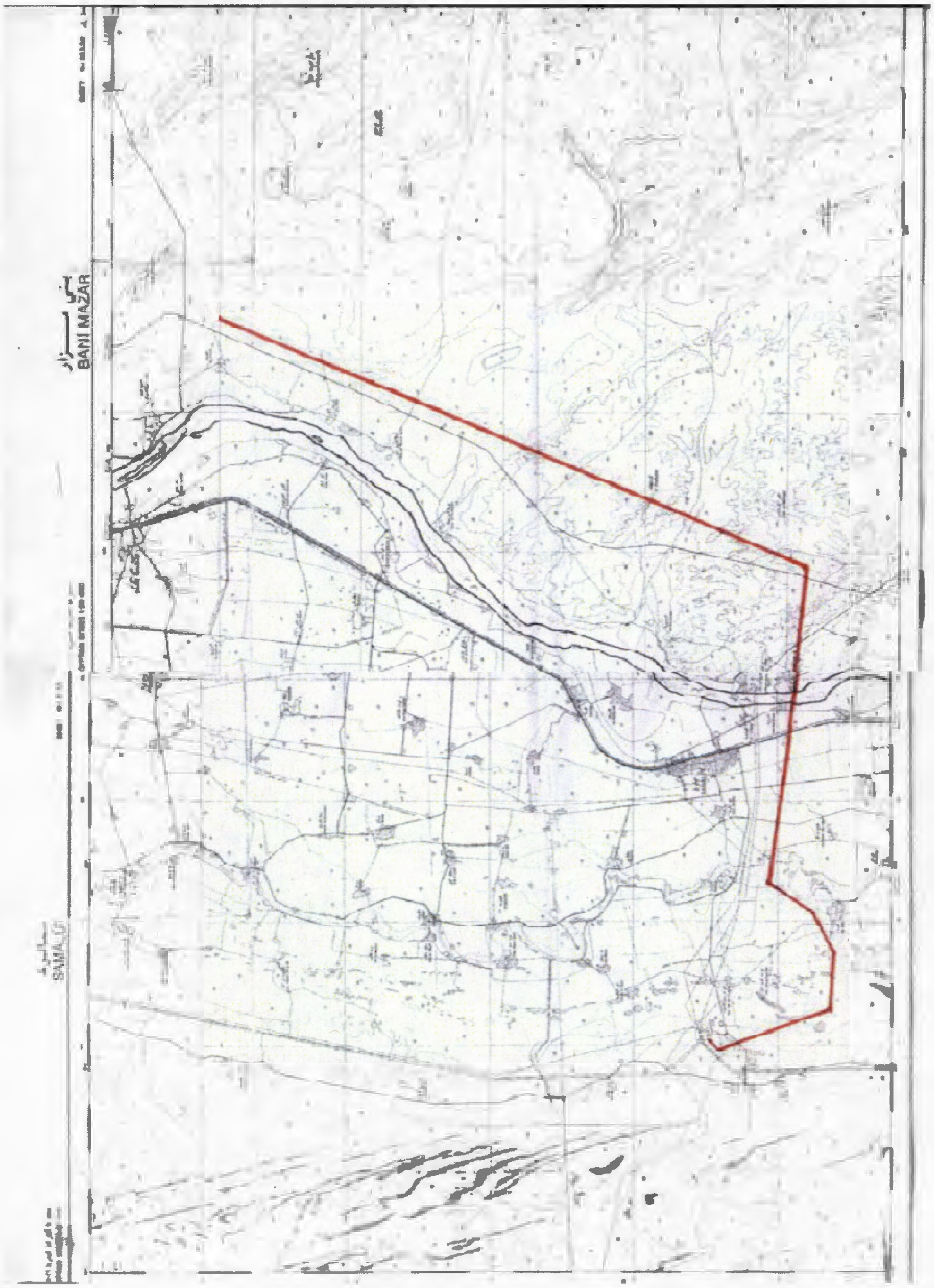
Detailed Map of the Very Southern End of the Helwan South / Zahraa Al-Maadi – Helwan South / Samallout 500 kV Transmission Line

The nearest villages to the TL route in the Samallout segment are shown in *Figure 4-7* and can be identified as follows:

Village	Distance from the Route (km)	Direction
• Naj Abu Sayf al-Ashab	2.5	To the North of the Route
• Naj Abu Abd al-Qawi Salih	1.7	
• Shusha	1.2	
• Dayr Samallout	1.9	
• Al-Awaynah	0.6	
• Al-Sharaynah	0.45	
• At-Tibah	0.5	To the South of the Route
• Ash-Shaykh Abd-Allah	2.1	
• Kawm al-Lufi	3.0	
• Al-Bayahi	0.9	

Figure 4-7

Topographic Map of the Southern End Segment of the Route of the Helwan South / Zahraa Al-Maadi – Helwan South / Samallout 500 kV Transmission Line



4.3 PROFILE OF THE PROJECT ROUTE

The existing profile of the transmission line route is based on the walk over survey to identify the corridor and subsequent detailed survey, which was conducted by EEHC/EETC and their engineering Consultant (EPS) and other Contractors to fix the alignment of the towers.

The transmission line route is to be passed through agricultural and desert lands between Samallout, Helwan South and Zahraa Al-Maadi substations locations. There may be small changes in the alignment to take into account any specific requirement along the route, which may result in some deviations from the proposed route profile.

The transmission line route is divided into many stretches for better administration and management. These stretches include, from the very north to the very south, the following:

> ***Helwan, Es-Saff, Wadi Ar-Rashrash, Jabal Humr Shaybun, Beni-Sueif, Wadi Sannur, Jabal Al-Mirayr, Jabal Al-Ahmar, Beni-Mazar and Samallout.***

Detailed route maps of the transmission lines is given in Chapter 5, *Figure 5-39 through Figure 5-48 (see Section 5.3.3).*

4.4 TRANSMISSION LINE DESIGN

This section provides general technical considerations regarding the design of the 500 kV overhead transmission line double circuits from Helwan South P.P S/ST to both of the Zahraa Al-Maadi 500 kV S/ST in the North and Samallout 500 kV S/ST in the South with an approximate total length of 250 km.

4.4.1 Scope of Work

The technical specifications detail the scope of work that will include:

- Soil investigation, report.
- Calculation and design of Towers:
  - Terminal Towers and Angle Towers.
  - Suspension Towers.
  - Calculation and Design of Foundations.
  - Calculation and Design of Earthing.
- Determination of all equipment and fitting:
  - Insulator strings.
  - Earth-wires (optical fiber), conductors and fittings.
  - Accessories as spacers, dampers, clamps, warning signs, etc.
- Sag and tension calculation.
- Line route profile.
- Supply of all equipment.
- Construction of line.
  - Site preparation.
  - Foundation.
  - Tower assembling.
  - Line stringing.
  - Testing and commissioning.
  - Site cleaning.

4.4.2 Electrical Design

The line electrical characteristics are assumed as follows:

- Nominal voltage of a three-phase system: 500 kV.
- Highest voltage of a three-phase system: 550 kV.

- System design short circuit current: 40 kA.
- Lightning impulse voltage withstand 1.2/50 μs (peak): 1550 kV.
- Rated frequency : 50 Hz.
- Maximum operating conductor temperature: 80 °C.

4.4.3 Creepage Distance

The creepage distance for insulators shall be selected according to Table 4-3 and Figure 4-8 taken into consideration the pollution level in the zone at which the line will be erected.

Table 4-3

Selection of Creepage Distance

Zone No.	Pollution level (layer conductivity) (μs)	Maximum specific leakage path cm/kV	Withstand voltage	Region
I	30	3.0	1.25 Umax/√3	Naga-Hammadi - Aswan No industrial.
II	35	3.5		Minya, Asyout, Naga Hammadi Western, Cairo desert, Sinia, Little industrial.
III	40	4.0		Delta, Cairo
IV	50	4.5		Coast pollution (40 km from sea cost) Red Sea, mid Sea- heavy industrial area.

4.4.4 Environmental Conditions

The environmental conditions listed in Table 4-4 shall apply.

Table 4-4

Standard Environmental Conditions that shall apply for the Design of the Transmission Line

Clause	Description	Value
1.	Pressure mb-annual mean.	1013
2.	Atmospheric Temperature °C :	
	- Maximum mean daily	47
	- Minimum mean daily	-5
	- Yearly mean	30
3.	Relative humidity %	
	- Maximum relative humidity	100
	- Minimum relative humidity	20
	- Average relative humidity	75
	- Daily mean	95
4.	Rain fall mean-annual total (mm)	65

Figure 4-8

Pollution Level for Creepage Distance Calculation

[Creepage Distance for Insulators shall be selected according to Table 4-3 and this Figure]

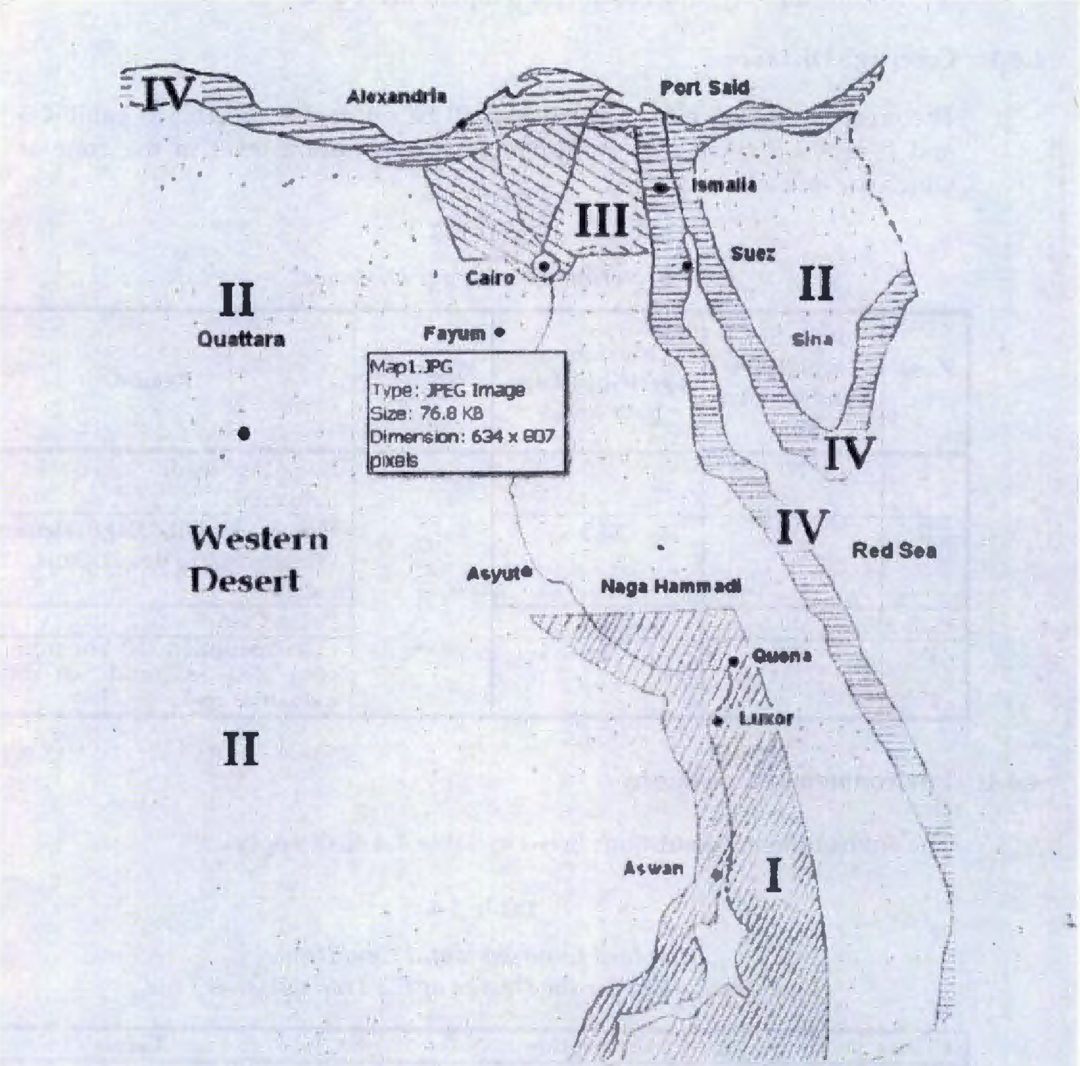


Table 4-4 *(Contd.)*

Standard Environmental Conditions that shall Apply for the Design of the Transmission Line

Clause	Description		Value
5.	Maximum wind speed (m/sec.) at 10m above ground level		35
6.	Soil temperature at a depth of 1.5 m.		25 °C
7.	Solar energy radiation W/m²		≥ 1100
8.	Wind pressure N/m²		766
9.	Absolute black bulb °C max. recorded		75.7
10.	Thunder storms		Occasional
11.	Sand storms	Occur occasionally specially in desert.	
12.	Pollution	Heavy pollution ≥ 50 μS	
13.	Seismic	According to Egyptian Code and attached map.	

4.4.5 Pollution Level

Overhead lines are subjected to conditions that depend on the place in which they are installed. These conditions can vary extensively from a place to another, depending on the characteristics of the region considered. These characteristics make possible that the level of insulation required can vary in the same line, due to the conditions of the pollution are different for all the line. The weather factors influence a very important way on the growth of the pollution levels in region.

According to Egyptian Standard No. (TA05), the map shown in *Figure 4-8* illustrate the different regions with different pollution levels.

For 250 km distance from the Zahraa Al-Maadi in the North to Samallout in the South, most of the line routing in desert areas characterized by no rain for long period and exposed to strong winds carrying sand, pollution zone No. (II) will be considered. The insulators will be designed for a minimum nominal specific creepage distance of 35 mm/kV.

Desert Zone

In some desert zones, the insulators of the electric lines are often subject to the deposition of contaminates substances of the desert. This can cause a serious reduction in the efficiency of the insulator, having as a result the flashover and the electricity supply lack.

Also the storms of sand must be kept in mind. The type of environmental conditions will affect considerably to the insulators. The predominant elements in this type of pollution are the sand and the widespread, salty dust in a dry atmosphere. The desert climate is characterized for sand storms that contain particles that move to a high speed. These particles strike to the surface of the insulator causing the material erosion. The storms of sand are an important factor that causes a decrease of reliability in electrical lines.

In this type of pollution the following aspects are relevant:

- The early morning dew represents the greater source of wetting in the desert zones.
- Storms of sand enlarge the pollution problems. The worst conditions occur when the storms are accompanied by a high humidity.
- Pollution layers accumulated on the insulators during the storms are of larger grain and greater content in salt than the layers formed during the normal atmospheric weather of the desert. The pollution contributed by the storms of sand is normally carried by strong winds of distant regions.

The decrease of pollution will depend on: the type of insulator, the maintenance, the increase of the number of elements in the chains of insulators, the increase of the leakage path, a better design of the insulators.

Right Of Way (ROW)

For the 500 kV AC transmission line, the right of way will be 25 m wide for each side.

4.4.6 Over Head Transmission Line Components

Towers:

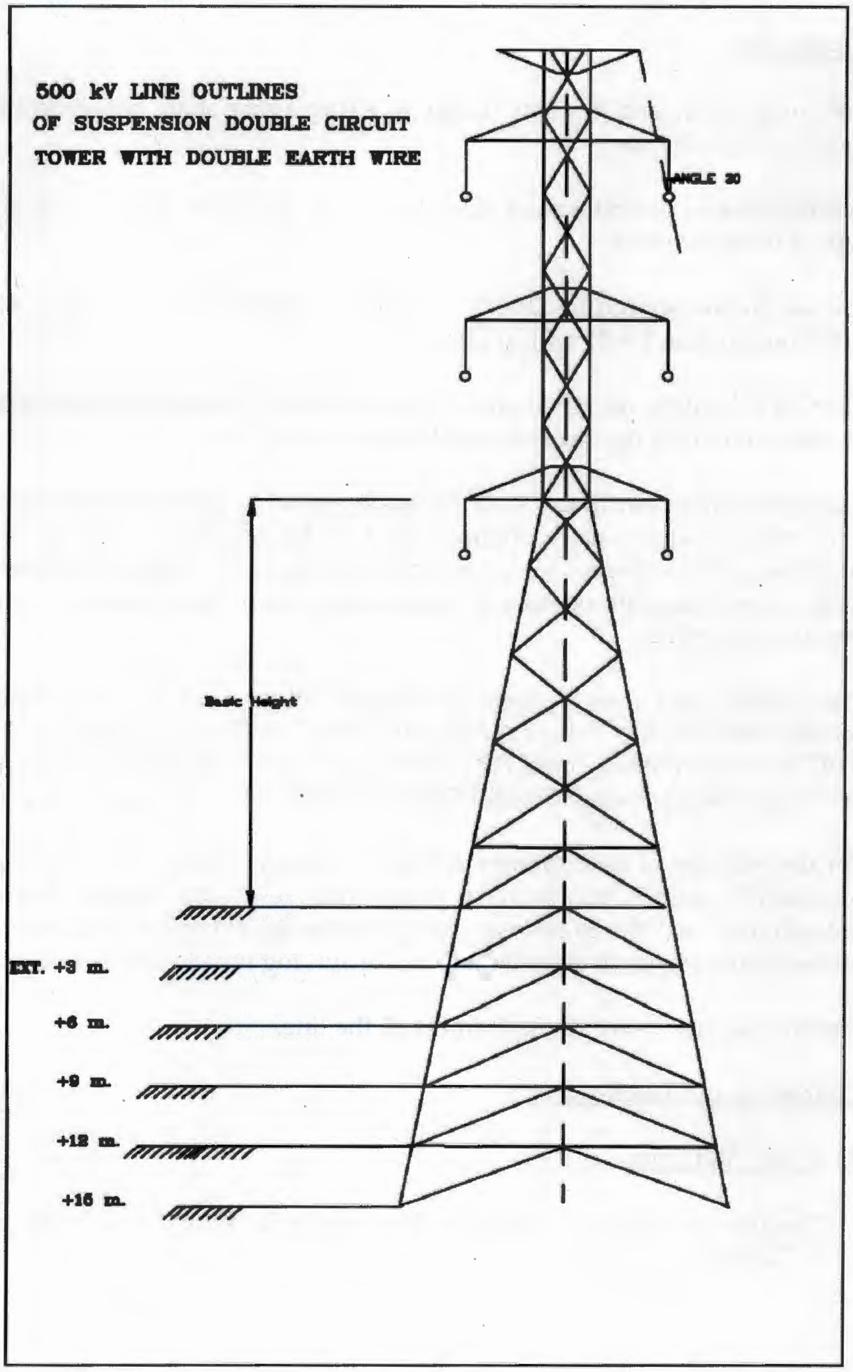
Lattice steel self supporting double circuit towers should be used. The 500 kV tower shape will be designed for vertical arrangement, as illustrated in *Figure 4-9*.

The positioning of the conductors and of the earth-wires on the tower shall be determined considering the following clearances:

- Clearance to ground and obstacles.
- The clearances between tower's live and earthed parts.

Figure 4-9

Typical Tower Design for the Helwan South / Zahraa El-Maadi – Helwan South / Samallout Double Circuit 500 kV OHTL



- The clearances between the conductors and between conductors and earth-wires in mid-span and still air.
- The earth-wire's shade protection angle.
- Clearances between conductors at structures.

Insulators:

The suspension and tension insulator string units shall be of ceramic or toughened glass type.

Within the agricultural area at Samallout S/ST (30-32 km length). The anti fog type is recommended.

The earth-wire should be OPGW. It shall be a slotted core structure or steel tube construction for 24 optical fibers.

The OPGW will be designed and comply with the IEC standard which should be observed in the design, construction and manufacture.

The optical fiber earthwire shall be of design and construction as to ensure long service with high economy and low maintenance costs. It shall be suitable in every respect for continuous operation at nominal parameters as well as in transient operating conditions, under the climatic conditions peculiar to the site.

The OPGW fiber optic system (24 fibers) will support the communication service between the Zahraa Al-Maadi 500 kV S/ST and Samallout 500 kV S/ST through Helwan South P.P. 500 kV S/ST and will be integrated with the existing National Energy Control Center [NECC] telecommunication network.

For the majority of lines (almost 220 km) located in desert areas, open profile type may be used. Open profile type unit have less leakage path compared to the anti fog type. So, to decrease the pollution, it is suggested to increase the leakage path. Hence, it is preferable to use anti fog type in the desert area too.

The anti fog type is recommended for all the line.

Conductor and Earth-wires

A) Line Conductor

The line conductors will be (ACSR) 490/65 mm^2 with characteristics given in *Table 4-5*.

Table 4-5

Conductors and Earth-wire Specification

ACSR 490/65 mm²		
		Specification
Material		ACSR
Cross-section area	mm²	553.9
	Aluminum (mm²)	490.38
	Steel (mm²)	63.51
Overall diameter	mm	30.6
Stranding Aluminum	No x Diameter (mm)	54x3.4
Stranding Steel	No x Diameter (mm)	7x3.4
Weight	Kg/m	1.866
Rated Stranding	kN	150.19
Rated DC resistance 20 °C	Ω/km	0.05896
Standard		DIN 98200

The conductors shall be subjected to type, sample and routine tests according to IEC standard or equivalent.

B) <u>Earth-wires</u>

All towers shall be equipped with two earthwires (Gl & G2) at tower top as follows:
- One classic earthwire.
- One optical ground wire (OPGW) with 24 fibers.

Composite fiber optic overhead ground wire (OPGW) shall be used to serve dual function as optical fiber communication link and shielding wire,

<u>Classic Earth-wire</u>

The earth-wire should be "steel conductors" 10S mm² to be used with 490/65 mm² ACSR (*see Table 4-6*).

Tabled 4-6

Main Characteristics for Steel Conductors 10S mm²

Material		AACSR
Cross sectional area	mm²	108
Overall diameter	Mm	13.4
Stranding - Steel	no x diam. in mm	19x2.68
Weight	kg/km	0.84
Rated tensile strength KN		141

OPGW

The earth-wire should be OPGW. It shall be a slotted core structure or steel tube construction for 24 optical fibers.

The OPGW will be designed and comply with the IEC standard which should be observed in the design, construction and manufacture.

The optical fiber earthwire shall be of design and construction as to ensure long service with high economy and low maintenance costs. It shall be suitable in every respect for continuous operation at nominal parameters as well as in transient operating conditions, under the climatic conditions peculiar to the site.

The OPGW fiber optic system (24 fibers) will support the communication service between the Zahraa Al-Maadi 500 kV S/ST and Samallout 500 kV S/ST through Helwan South P.P. 500 kV S/ST and will be integrated with the existing National Energy Control Center [NECC] telecommunication network.

OPGW Characteristics:

The main requirement characteristics of the selected OPGW arc:-

- Aluminum alloy - steel type.
- OPGW shall incorporate 24 optical fiber.
- OPGW should be designed for a short circuit current of 40 KA.
- Mean conductor length of drum 5000 meters.

4.4.7 Steel Towers and Foundations

EETC already have its own towers design. The towers are lattice steel window type designed to carry 3 phase conductors, one earth wires and one OPGW.

Applicable Standards are as follows:

SN	Standards	Title
1	IEC	International Electro technical Commission
2	ANSI	American National Standards Institute
3	IEEE	Institute of Electrical-and Electronics Engineers
4	NEMA	National Electrical Manufactures Association
5	ASTM	American Society for Testing and Materials
6	DIN	Deutshes Institute Fuer Normung (German Standards)

Type and Size of Towers

Expected dimensions shall be as follows:

Tower type	Angle	Area (m2) (without extension)	Expected Quantity	Height (m) Base tower
G2	Suspension	10 x 10	500	65
G30	30	12 x 12	55	58
G60	60	13 x 13	30	60
GT60+E0	Terminal	14 x 14	2	63
GTR	Transposition		6	62
A0	0	12 x 12	35	55
Nile Crossing		30 x 30	2	150
Special		14 x 14	2	60
Total			632	

Towers shall be self supported steel lattice tower designed to carry the line conductors with the necessary insulators ***(see Figure 4-9).***

Tower foundation shall be insulated footing in case of dessert land. Raft and deep foundation may be used in case of agriculture land.

Tower foundations shall be of reinforced concrete pad & chimney. Each tower type shall have its own foundation design.

Unless otherwise directed, all tower footings shall be designed by the contractor as individual leg footings, footings per towers. Dimensions of all leg footings shall be determined from tower reactions for the maximum down-thrust, uplift, and horizontal shear.

All tower base reactions shall he computed from design structure loading.

The exact bearing capacity has to he found from real soil investigation at the site.

4.4.8 General Construction Methodology may be summarized as follows:

- **Pre - construction Activity:**
  - **Check Survey.**
  - **Soil Investigation**
  - **Foundat on Design**

- **Marking of the Route:**
  - **The route and detailed survey will be done by local specialist company.**

- Clearing of towers sites :

  The contractor is responsible for clearing the tower site after completing his work. EETC shall help the contractor if any problem with the land owner in the agriculture area or with any other authority / agency along the line route would arise.

- Tower Assembly and Erection Method

  The towers shall be erected on the foundations not less than 14 days / 21 days after concreting or till such time that the concrete has acquired sufficient strength. For the convenience of assembling the tower parts during erection operations, each member is marked in the factory to correspond with a number shown in the erection drawing. Any damage to the steel and injuring of galvanizing shall be avoided. No member shall be subjected to any undue over stress during erection.

  There are three main methods of erection of steel transmission towers which are described as below:
  a) Built up method.
  b) Section method.
  c) Ground assembly method.

  a) Built Up Method:

  This method consists of erecting the towers member by member. The tower members are first set out and kept on the ground serially according to erection sequence to avoid time loss due to searching for them as and when required.

  b) Section Method:

  The major sections of the tower are assembled on the ground and the same are erected as units. Either a mobile crane or a derrick / gin pole is used. The derrick / gin pole used is approximately 10m long and is held in place by means of guys on the side of the tower to be erected.

  Sometimes, one whole face of the tower is assembled on the ground, hoisted and supported in position. The opposite face is similarly assembled and hoisted and then the bracing angles connecting these two faces are fitted.

  c) Ground Assembly Method:

  This method consists of assembling the tower on the ground, and erecting it as a complete unit. This method is not useful when the towers are large and heavy and the foundations are located in arable land where assembling and erecting complete towers would cause damage to large areas or in hilly terrain where the assembly of complete tower on slopping ground may not be possible and it may be difficult to get the crane into position to raise the complete tower. This method is only adopted where the availability of good approach roads to tower location exists.

Special Crossing (i.e. Nile Crossing)

The Nile crossing tower is a suspension tower, with average height of 150 meter, its span is 850 meter and excavation is 30 x 30 m^2.

Volume and types of waste

Waste type : soil
It shall be used for back filling for most of the towers.

4.5 SUBSTATIONS

At Samallout, 500/220/132/66/33 substation is located at the desert edge, west of the Nile river. This substation will be expanded to accommodate the new equipment associated with the construction and operation of the new transmission line. No land take or resettlement is associated with this site of Samallout substation.

At Zahraa Al-Maadi, substation areas are allocated to the project by local concerned authorities in the Cairo Governorate according to a Contract signed by the EETC and the concerned authorities.

The land areas of substations are uninhabited, uncultivated desert lands. No land acquisition or resettlement is associated also with these pieces of land.

4.6 ACCESS ROADS

The main transport infrastructure linking both of the Zahraa Al-Maadi Zone and the Samallout zone to the Helwan South area and also all of them to the country main ports facilities is principally based on road network. The site of end points (substations) and along the entire route of the transmission line is accessible through the major Regional Road from Cairo to Helwan South and from Helwan South to El-Minya Governorate. This road directly passes in parallel to the route along its pathway from Zahraa Al-Maadi to Samallout. Actually no major access roads are envisaged to be constructed particularly for the transmission line project and the end point structures associated to it.

5. DESCRIPTION OF THE ENVIRONMENT

This section discusses the current environmental baseline conditions and environmental sensitivities in the wider project area, in order to be able to assess the nature and significance of the environmental impacts arising from the proposed activities. The information presented in this section builds upon information gathered by the baseline studies team during the preparation for the ESIA as well as additional research and site visits aiming at filling any gaps in this information.

5.1 PROJECT LOCATION

The project route is located at four Governorates, namely: Cairo, Giza, Beni-Sueif and El-Minya. It composed of two distinctive sections, the first of them starts from Helwan South power project site at the very south of Giza Governorate and extended to the north through the eastern desert part of Cairo Governorate untill it ends at Zahraa Al-Maadi 500 kV S/ST. The second section of the route is located to the south of Helwan South power project, where it starts, and continue to further south through Beni-Sueif and El-Minya Governorates, approximately parallel to the El-Kureimat/ El-Minya Desert Highway along the eastern bank of the River Nile and changes its direction to the west, crossing the Nile near Samallout, where it ends at the Samallout 500 kV S/ST to the west of the Nile River at Samallout. With the exception of a length of about 30-32 km near the Nile River, where the 250km 500 kV double circuit lines would cross agricultural land, virtually all the rest of the lines, will go through uninhabited uncultivated state-owned desert land. Along the entire route no population or human settlements were observed between the Samallout 500 kV Substation and the Zahraa Al-Maadi 500 kV Substation. The route is far enough from the nearest residential areas.

The study area is located in the stretch between Zahraa Al-Maadi and the west Samallout area in the Nile Valley, along the areas of Helwan, Es-Saff, Wadi Ar-Rashrash, Jabal Humr Shybun, Beni-Sueif, Wadi Sannur, Jabal Al-Mirayr, Jabal Al-Ahmar, Beni-Mazar and Samallout. These areas belong successively to four consecutive Governorates namely, Cairo, Giza, Beni-Sueif and El-Minya.

It is easily to drive along the high way from Zahraa Al-Maadi in the North to Samallout in the Nile Valley in the southwest (North of El-Minya City).

Figure 5-1 depicts the whole route from Zahraa Al-Maadi in the North to West Samallout in the South. *Figure 5-2* illustrates the main 10 areas located in the 4 Governorates, namely (from the North to the South) Cairo, Giza, Beni-Sueif and El-Miya.

Figure 5-1

Satellite Image showing the Entire Route of the Transmission Lines

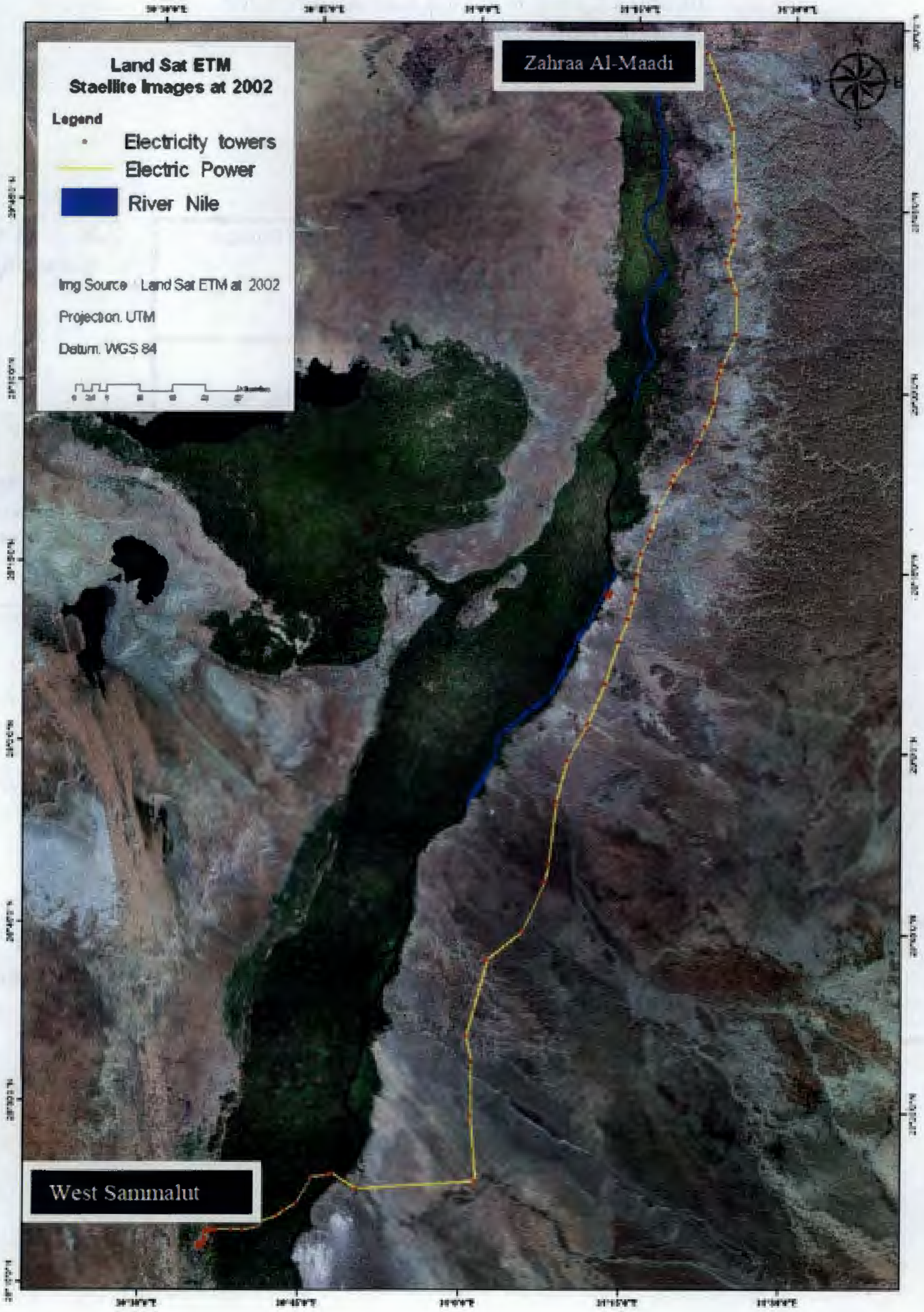
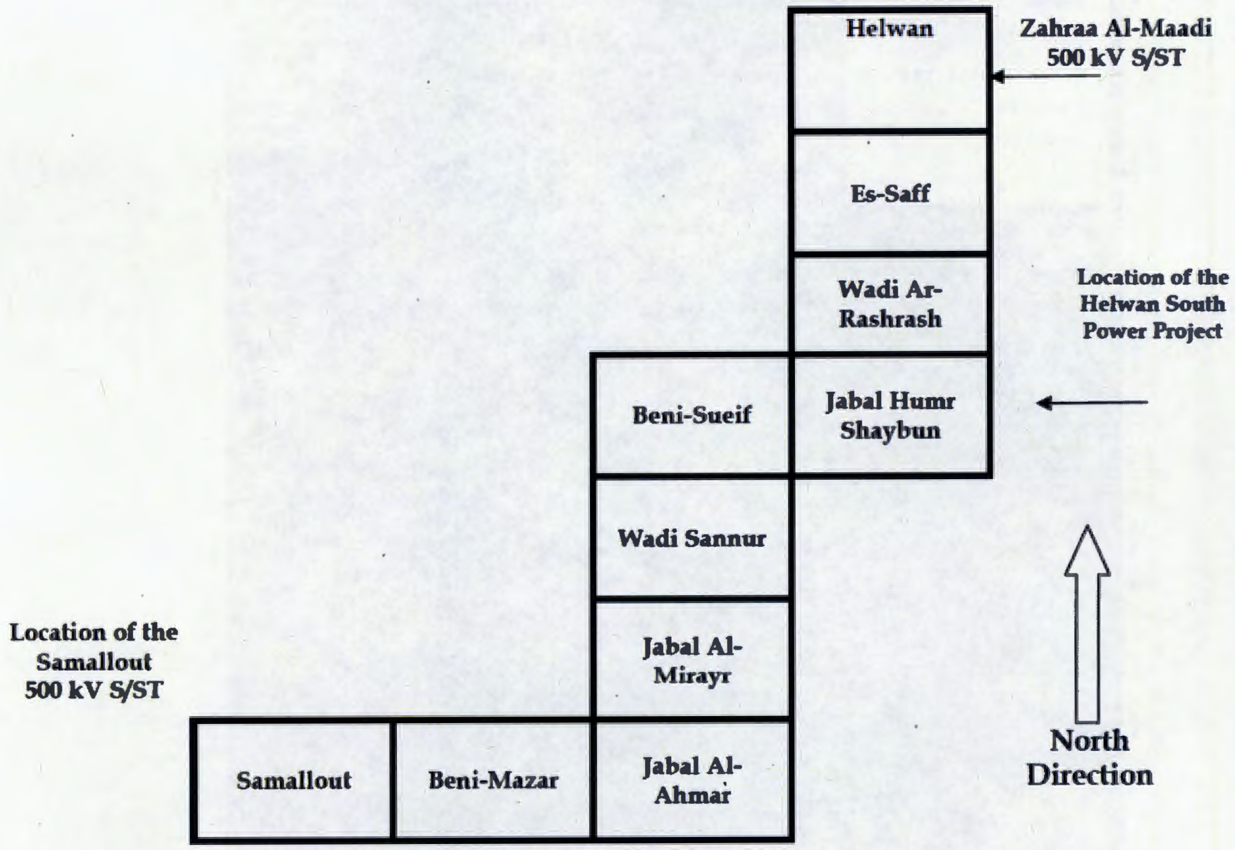


Figure 5-2

Maps Names of the Areas which Accommodates the 500 kV Transmission Lines Routes for Interconnecting Helwan South Power Project



Scale: 1 : 50,000

5.2 PHYSICAL ENVIRONMENT

5.2.1 Regional Climatic Conditions

This section describes regional climatic conditions in the entire area of the interconnecting transmission lines of the Helwan South power project.

The Cairo- El-Minya elongated area is characterized by a sub-tropical desert climate with predominantly very hot summers, mild winters, and generally dry and sunny conditions. Rainfall events are rare and occurrences of gales, thunderstorms, and dust storms are occasional.

The climate of the region is caused primarily by the sub-tropical high pressure belt that is prevalent in this area, leading to clear skies for most of the time. The prevailing winds are northerly and can become strong during the winter. The northerly winds are caused by a sub-tropical high pressure cell in the western desert of Egypt during the winter months and by the western edge of a huge Asiatic low over northwestern India during the summer. The sparse rainfall in this area usually falls in the form of showers during the cold season (December, January, February) while under the influence of cold upper level troughs to the north. The highest temperature generally occurs in June through August when tropical continental air masses arrive from western Syria and Iraq on northeast winds while the lowest temperatures are recorded in January and February as polar continental air masses to the north are dragged down in the rear of winter Mediterranean depressions. Relative humidities remain low for most of the year reaching a maximum in November and December or January and a minimum in April and May or June.

Summaries of climatic variables for the region are available from meteorological data collected at four meteorological stations along the route distance of the electrical interconnecting lines. The meteorological data furnish wind speed, wind direction, temperature, pressure, precipitation and relative humidity information that are considered to be representative of the entire route sites.

A. Cairo District

A 35-year Helwan data base (1975-2010) indicates a prevailing northerly wind at the site (30 percent from North-North-West quadrant) with a secondary maximum of winds from the North quadrant (22 percent) followed by North-North-eastrly winds (18 percent) and winds from the North-West-West quadrant (8 percent) and then westerly-southerly winds (12 percent). Calm and variable winds occur approximately 18 percent of the time. Wind speeds and directions measured for 2010 are shown on the Wind Rose in *Figure 5-3*. Wind speeds are generally light to moderate with an annual-average speed of approximately 3.5 meters per second and rarely exceed 30 m/sec. (*Table 5-1*). The temperature data collected at Helwan for a 35 year period indicate a maximum monthly-average temperature of 36oC in July and a minimum monthly-average temperature of 7.6oC in January. Summertime high temperatures average 35oC while winter lows reach 9.3oC. The annual-average temperatures is 22.35oC with record high and low temperatures of 47 and -2oC, respectively. Rainfall at Helwan averages 13 millimeters per year occurring mostly during the winter months (December-March). Relative humidity remains fairly low throughout the year, maximizing at 55 percent for November through January and reaching a low of 40 percent in April and May (*Table 5-2*). The dryness of this climate is further demonstrated by the fact that nearly 80 percent of possible sunshine is received during the year.

Table 5-1

Wind Speed Information for the Proposed Site (Knots)(1), (35-year monthly average; 1975-2010)
(Based on Weather Monitoring at the Al-Maadi Station)

Month	Av. Monthly Speed (Knots(1))	Highest Hourly Av. (Speed/ Direction)(2)	Date of Occurrence (Day/Year)	Highest Sudden Plast of Wind (2) (Speed/Direction)	Date of Occurrence (Day/Year)
January	5	26/220	17/81	45/240	17/18
February	6	30/190	18/81	50/220	3/92
March	7	28/190	22/85	50/180	22/85
April	8	32/200	16/81	49/340	12/71
May	8	28/280	2/97	54/290	2/97
June	8	20/360	5/77	35/240	13/71
July	7	16/030	3/78	27/010	9/84
August	7	14/010	24/77	23/360	29/69
September	7	20/070	29/77	33/020	11/71
October	7	33/240	9/89	33/240	23/76
November	6	22/240	28/69	38/220	24/76
December	6	25/260	14/77	45/260	14/77
Annual-average	6.83				

Notes:

(1) Knot = 1.85 km/hr.

(2) Highest hourly average and highest sudden plast of wind are provided based on weather monitoring at the Bahtim (northeast Cairo) station.

Table 5-2

Temperature, Humidity and Rainfall Information for the Proposed Site, (35-year monthly average; 1975-2010)

(Based on Weather Monitoring at the Al-Maadi Station)[1]

Month	Av. Temperature (°C)				Humidity	Rainfall (mm/day)	
	Av. Monthly Max.	Av. Monthly Min.	Highest Daily Max.	Lowest Daily Min.	Relative Humidity (%)	Total Monthly	Max. in Single Day
January	19.1	7.6	31.4	-2.0	55	3.2	13.2
February	20.8	8.7	34.1	1.4	51	2.3	25.0
March	24.8	11.6	37.4	2.5	46	2.0	10.4
April	29.1	15.3	42.6	5.6	40	0.8	6.1
May	33.1	18.9	47.0	10.4	40	0.4	1.3
June	35.5	21.5	45.2	14.6	42	Trace[2]	Trace
July	36.0	23.2	45.3	16.5	49	0.0	0.0
August	35.4	23.2	43.4	16.8	52	0.0	0.0
September	33.8	21.7	44.8	13.8	51	0.0	0.0
October	30.6	18.6	40.0	9.0	51	0.1	1.9
November	25.1	13.6	34.9	4.4	55	1.5	18.1
December	20.4	9.3	34.4	2.0	55	2.8	13.0
Annual-average	28.6	16.1			48.8	13	-

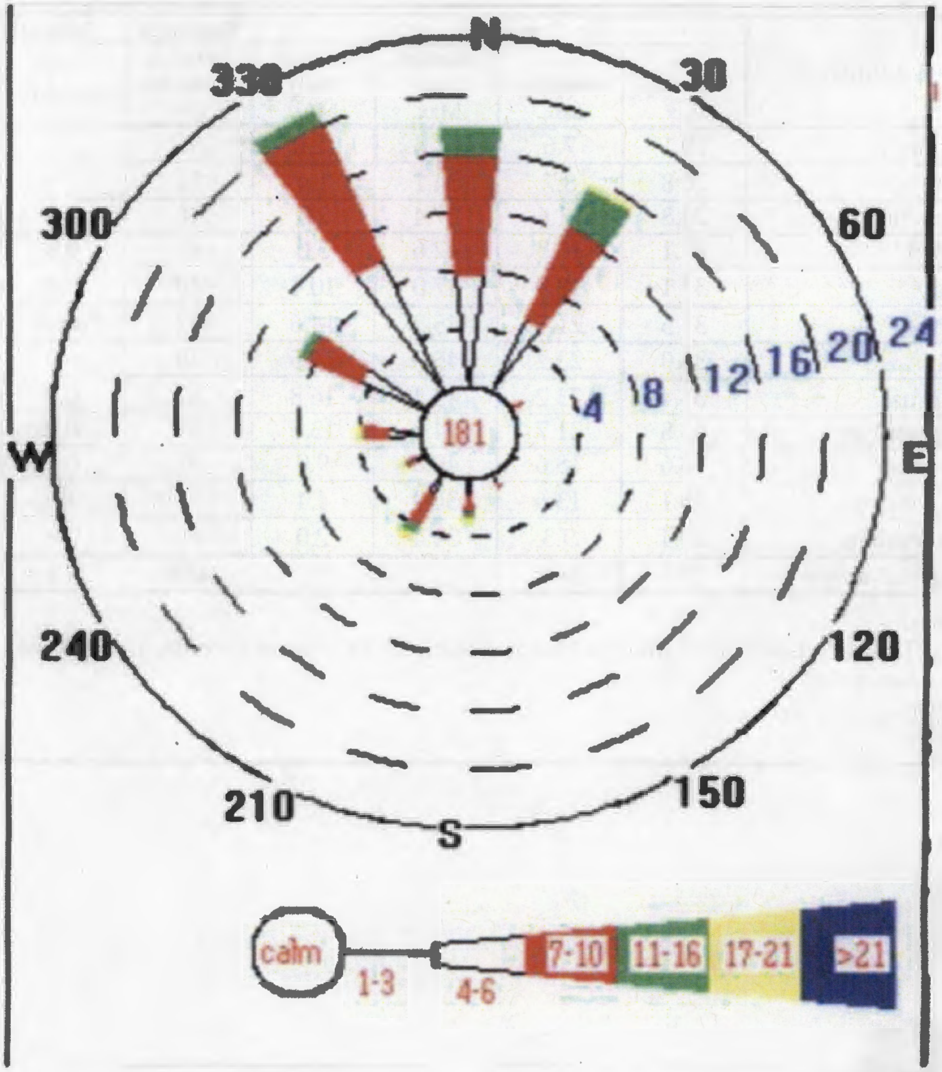
Notes:

(1) This data is extracted from Al-Maadi meteorological station Records, and it covers area of 20 km radius.

(2) Trace = T < 0.1 mm.

Figure 5-3

Wind Rose of East Cairo
(Al-Maadi Area, 2010)



B. Giza District

A 35-year Helwan data base (1975-2010) indicates a prevailing northerly wind at the site (35 percent from North quadrant) with a secondary maximum of winds from the North quadrant (32 percent) followed by North-North-eastrly winds (23 percent) and winds from the North-North-West quadrant (18 percent) and then westerly-southerly winds and other directions (8.4 percent). Calm and variable winds occur approximately 18.6 percent of the time. Wind speeds and directions measured for 2010 are shown on the Wind Rose in *Figure 5-4*. Wind speeds are generally light to moderate with an annual-average speed of approximately 4.23 meters per second and rarely exceed 5.0m/sec. (*Table 5-3*).

The temperature data collected at Helwan for a 35 year period indicate a maximum daily-average temperature of 34.9oC in July and a minimum daily-average temperature of 7.5oC in December. Summertime high temperatures average 34.1oC while winter lows reach 8.6oC. The annual-average temperatures is 21.6oC with record highest and lowest temperatures of 47.5 and 7.5oC, respectively.

Air pressure in the Helwan area remains generally high throughout the year. The mean atmospheric pressure value decreases gradually from December (1019.1 mbar) to July (1008.6 mbar) before rising again to reach 1019.1 mbar during December.

The annual rainfall precipitation does not exceed 25 mm. Rain falls showers and varies considerably from year to year. Generally, the rainfall is scarce over most of the year and occurs occasionally in the form of sudden and short signals associated with the northwest wind.

Annual mean of relative humidity is about 46% with maximum value of 69% in November and minimum value of 46% in May (*Table 5-4*). Relative humidity does not vary greatly through the year, staying between 46-58% at none and between 59-69% in the morning and in the evening.

Natural evaporation rate ranges from 3.9 mm/d in January to 5.8 mm/d in May. It means that the evaporation rate is high from March to October and is low in winter season.

Table 5-3

Wind Speed Information for the Proposed Site (Knots)
(35-year monthly rates, 1975-2010)
(Based on Weather Monitoring at the Helwan Meterorological Station)[1]

Month	Av. Monthly Speed (Knots[2])	Highest Hourly Av. (Speed/ Direction)[3]	Date of Occurrence (Day/Year)	Highest Sudden Plast of Wind [3] (Speed/Direction)	Date of Occurrence (Day/Year)
January	6	26/220	17/81	45/240	17/18
February	7	30/190	18/81	50/220	3/92
March	8	28/190	22/85	50/180	22/85
April	10	32/200	16/81	49/340	12/71
May	10	28/280	2/97	54/290	2/97
June	10	20/360	5/77	35/240	13/71
July	9	16/030	3/78	27/010	9/84
August	8	14/010	24/77	23/360	29/69
September	9	20/070	29/77	33/020	11/71
October	9	33/240	9/89	33/240	23/76
November	8	22/240	28/69	38/220	24/76
December	7	25/260	14/77	45/260	14/77
Annual-average	8.42				

Notes:

(1) This data is extracted from Helwan meteorological station Records, and it covers area of 50 km.

(2) Knot = 1.85 km/hr.

(3) Highest hourly average and highest sudden plast of wind are provided based on weather monitoring at the Bahtim (northeast Cairo) meteorological station.

Table 5-4

Temperature, Humidity and Rainfall Information for the Proposed Site
(35-year monthly rates; 1975-2010)
(Based on Weather Monitoring at the Helwan Meterorological Station)[*]

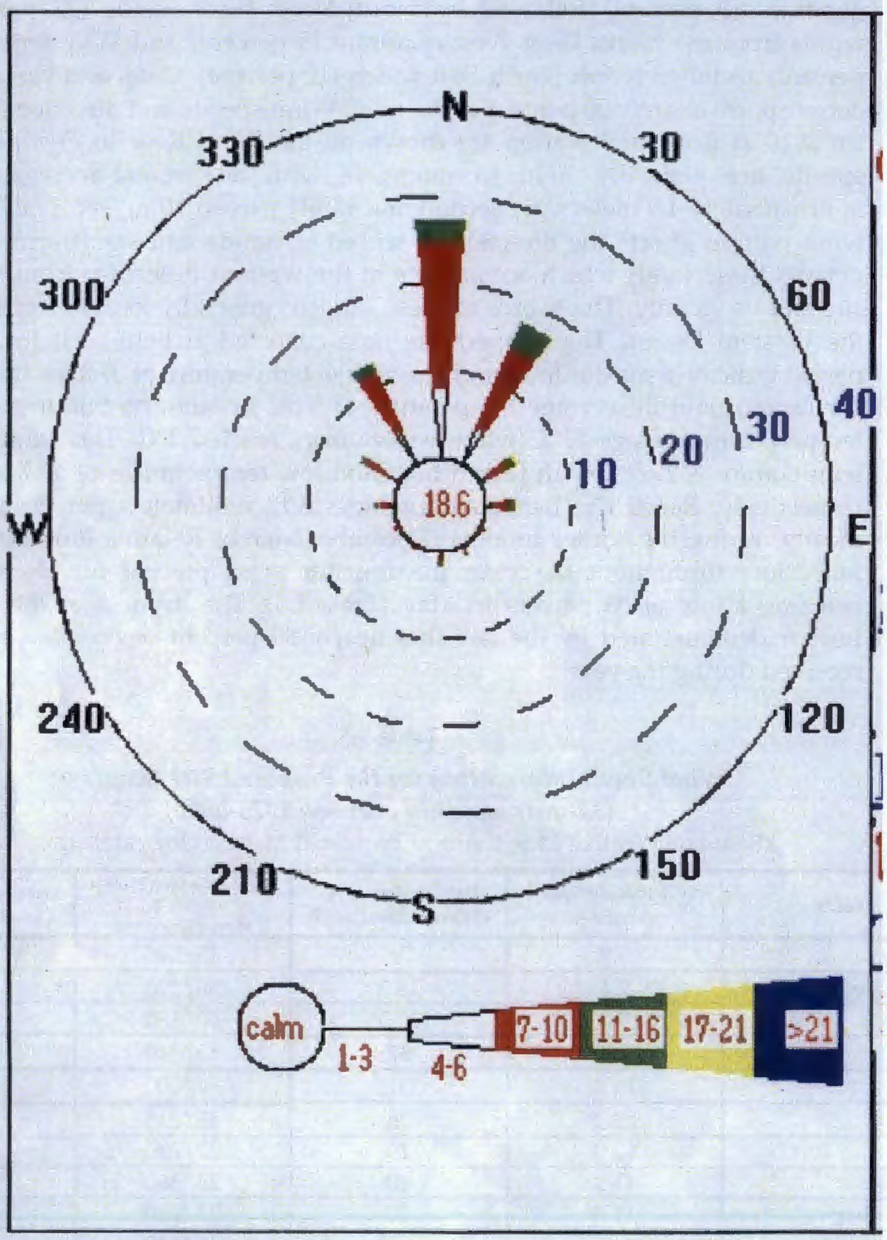
Month	Av. Temperature (°C)				Humidity	Rainfall (mm/day)	
	Av. Daily Max.	Av. Daily Min.	Highest Daily Max.	Lowest Daily Min.	Relative Humidity (%)	Total Monthly	Max. in Single Day
January	18.4	8.4	31.1	8.4	60	3.7	13.4
February	20.1	9.8	34.1	9.8	54	3.7	19.5
March	23.7	12.1	39.5	12.1	50	2.5	11.9
April	28.1	14.3	43.1	14.3	42	0.8	10.4
May	32.4	17.8	46.7	17.8	41	1.6	27.5
June	32.8	19.9	47.5	19.9	44	0.02	1.4
July	34.8	21.3	45.3	21.3	52	0.0	0.0
August	34.9	21.6	43.8	21.6	55	0.0	0.0
September	32.7	20.3	42.4	20.3	55	0.0	0.0
October	29.9	18.3	42.6	18.3	55	0.7	21.7
November	26.2	14.4	37.4	14.4	59	2.6	23.8
December	19.8	7.5	35.0	7.5	60	5.0	32.7
Annual-average	27.81	15.48			59.9	20.62	

Notes:

(*) This data is extracted from Helwan meteorological station Records, and it covers area of 50 km.

Figure 5-4

Wind Rose of Helwan South
(Helwan Meteorological Station, 2010)



C. Beni Sueif District

A 35-year Beni-sueif data base (1975-2010) indicates a northerly wind at the site (63 percent from north quadrano with a maximum of winds from the North-West quadrant (9 percent) followed by North-North-West winds (22 percent) and winds from the North-West-West quadrant (5 percent) and WVesterly winds (3 percent) and then North-North-East winds (12 percent). Calm and variable winds occur approximately 20 percent of the time. Wind speeds and directions measured for 2010 at Beni-sueif Station are shown on the Wind Rose in *Figure 5-5*. Wind speeds are generally light to moderate with an annual-average speed of approximately 4.9 meters per second and rarely exceed 10 m/sec. (*Table 5-5*). The wind pattern affects the direction of stirred-up sands and sandstorm. The wind derives these sands which accumulate in the western desert far from the project site and its vicinity. The source of these sands is generally located further west in the Western Desert. The temperature data collected at Beni-sueif for a 35 year period indicate a maximum monthly-average temperature of 37.4AC in July and a minimum monthly-average temperature of 5.8C in January. Summer time high temperatures average 37°C while winter lows reach 7.2°C. The annual-average temperature is 22.3°C with record high and low temperatures of 47.7 and -0.2°C, respectively. Rainfall at Beni-sueif averages 6.12 millimeters per year occurring mostly during the winter months (December-March) Relative humidity remains fairly low throughout the year, maximizing at 63 percent for December and reaching a low of 38 percent in May (*Table 5-6*). The dryness of this climate is further demonstrated by the fact that nearly 80 percent of possible sunshine is received during the year.

Table 5-5

Wind Speed Information for the Proposed Site (Knots)[1]
(35-year monthly average; 1975-2010)
(Based on Weather Monitoring at Beni-Sueif Meterorological Station)[1]

Month	Av. Monthly Speed (Knots[1])	Highest Hourly Av. (Speed/ Direction)[3]	Highest Sudden Plast of Wind [3] (Speed/Direction)	Date of Occurrence[2] (Day/Year)
January	5.9	36	45/240	17/18
February	7.4	28.5	50/220	3/92
March	9.6	33.5	50/180	22/85
April	9.2	37	49/340	12/71
May	11.6	31	54/290	2/97
June	12.2	26	35/240	13/71
July	12.0	20	27/010	9/84
August	11.1	20	23/360	29/69
September	11.6	20	33/020	11/71
October	9.8	27.5	33/240	23/76
November	8.2	31.5	38/220	24/76
December	5.9	31.5	45/260	14/77
Annual-average	9.54			

Notes:
(1) Knot = 1.85 km/hr.
(2) Available from Bahtim station, around Cairo.

Table 5-6

Temperature, Humidity and Rainfall Information for the Proposed Site (35-year monthly average; 1975-2010)

(Based on Weather Monitoring at the Beni-Sueif Meterorological Station)[1]

Month	Av. Temperature (°C)				Humidity	Rainfall (mm/day)	
	Av. Monthly Max.	Av. Monthly Min.	Highest Daily Max.	Lowest Daily Min.	Relative Humidity (%)	Total Monthly	Max. in Single Day
January	19.6	5.8	30.4	-0.2	59	1.0	7.8
February	21.5	7.0	34.4	0.8	54	0.8	3.5
March	24.8	9.7	3'.0	2.5	49	1.9	8.2
April	30.3	13.8	43.3	0.2	40	0.2	4.1
May	34.2	17.6	47.7	9.5	38	0.1	1.3
June	37.1	20.4	46.8	13.6	40	0.0	0.0
July	37.4	21.9	45.5	18.0	46	0.0	0.0
August	36.9	21.8	44.2	18.4	50	Trace[2]	0.1
September	34.9	20.2	43.8	9.0	51	0.0	0.0
October	31.3	17.1	39.9	10.6	53	0.02	0.8
November	25.4	12.0	36.1	4.5	57	0.9	20.0
December	20.9	8.8	29.9	0.8	63	1.2	8.4
Annual-average	29.53	15.16	-	-	50	6.122	7.8

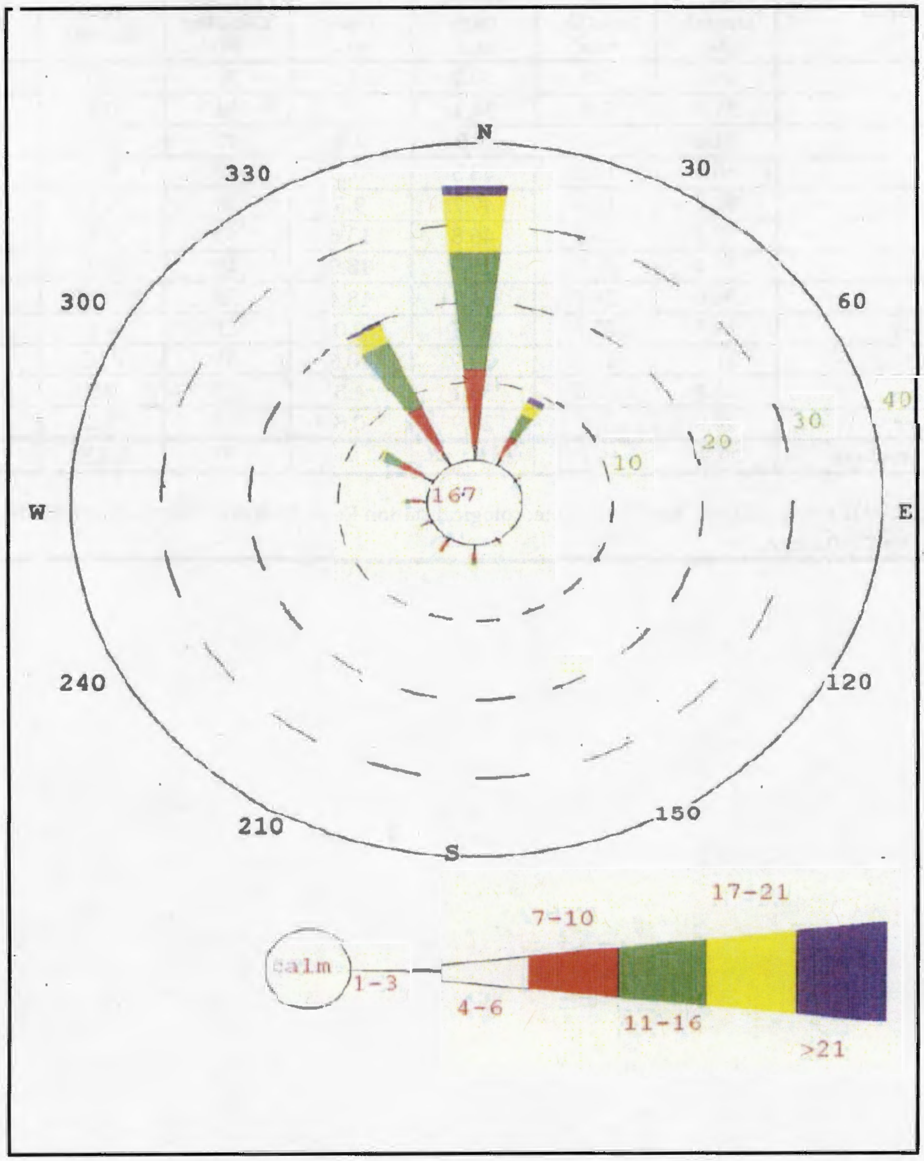
Notes:

(1) This data is extracted from Beni-Sueif meteorological station Records, and it covers area of 50 km.

(2) Tracc = T < 0.1 mm.

Figure 5-5

Wind Rose of Beni-Sueif Zone
(Beni-Sueif Station, 2010)



D. El-Minya District

A 35-year El-Minya data base (1975-2010) indicates a prevailing northerly wind at the site (65 percent from North quadrant) with a secondary maximum of winds from the North-North-West quadrant (12 percent) followed by the North-North-East winds (9 percent). Calm and variable winds occur approximately 14 percent of the time. Wind speeds and directions measured for 2008 are shown on the Wind Rose in *Figure 5-6*. Wind speeds are generally light to moderate with an annual-average speed of approximately 3.34 meters per second and rarely exceed 30 m/sec. (*Table 5-7*). The temperature data collected at El-Minya for a 35 year period indicate a maximum monthly-average temperature of 29.72°C in July and a minimum monthly-average temperature of 4.2°C in January. Summertime high temperatures average 36.13°C while winter lows reach 6.05°C. The annual-average temperatures is 21.57°C with record high and low temperatures of 48.6 and -0.7°C, respectively. Rainfall at El-Minya averages 3.922 millimeters per year occurring mostly during the winter months (December-March). **This explains that there has been almost no precipitation in the area** (see total precipitation in *Table 5-7*). Relative humidity remains fairly low throughout the year, maximizing at 65 percent for December and reaching a low of 37 percent in May (*Table 5-8*). The dryness of this climate is further demonstrated by the fact that nearly 80 percent of possible sunshine is received during the year.

Table 5-7

Monthly Rates (Averages of 35 years 1975-2010) of the El-Minya Meteorological Station Parameters (*)

↓ Parameter / Month →	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Total precipitation (mm/month)	0.5	1.1	0.7	0.2	0.3	-	0	0.002	0.02	0.2	0.3	0.6
Largest precipitation within 24 hrs (mm/day)	6.8	11.4	8.0	10.2	8.4	-	0	0.1	1.2	6.5	5.7	4.4
Occurrence date (day/year)	8/1945	19/1975	21/1991	19/1948	21/1957	3/1963	=	20/1955	20/1957	20/1957	23/1984	30/1944
Total cloud cover (oktas)	1.8	1.5	1.5	1.5	1.2	0.2	0.1	0.1	0.3	0.6	1.2	1.8
Surface wind speed (m/sec.)	2.52	2.88	3.44	3.91	4.27	2.30	3.55	3.03	3.60	3.19	2.88	2.42
Days of thunder storm occurrence (days/month)	0	0.02	0.1	0.1	0.1	0	0	0	0	0.1	0.1	0.02
Days of mist occurrence (days/month)	14.6	9.0	7.2	2.4	0.3	0.3	1.7	5.2	6.3	9.3	13.8	16.4
Days of fog occurrence (days/month)	1.8	0.3	0.1	0	0.02	0	0	0	0	0.1	0.5	2.0
Days of blowing sand occurrence (days/month)	2.2	2.8	4.6	5.5	4.5	2.8	1.1	1.1	2.0	2.2	1.5	1.5
Days of dust/sand storm occurrence (days/month)	0.1	0.02	0.2	0.2	0.2	0	0	0	0	0	0	0
Days of windstorm occurrence (days/month)	0	0.02	0.1	0.1	0.1	0	0	0	0	0	0	0
Days of cloud cover > 6/8 occurrence (days/month)	0.6	0.4	0.8	0.9	0.5	0	0	0	0.02	0.1	0.2	0.6

Notes:

(*) Data obtained from the El-Minya Meteorological Station records and forms. It covers an area of a 50-km radius.

Table 5-8

Monthly Rates (Averages of 35 years; 1975-2010) of the El-Minya Meteorological Station Parameters [1]

↓ Parameter / Month →	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Sealevel atmospheric pressure (hectopascals)	1019.3	1019.9	1012.4	1012.3	1011.6	1007.4	1006.1	1005.5	1010.4	1015.9	1016.2	1018.2
Highest sea level atmospheric pressure (hectopascals)	1027.2	1031.8	1020.6	1019.4	1018.3	1011.2	1010.0	1011.0	1017.9	1021.5	1020.6	1023.8
Occurrence date (day/ year)	31	20	3	17	1	11.4	26	29	30	31	14	31
Lowest sea level atmospheric pressure (hectopascals)	1012.8	1012.9	1003.3	1005.0	1006.5	1003.0	1002.5	1001.2	1005.9	1011.2	1009.0	1011.1
Occurrence date (day/ year)	10	17	28	24	29	20	16	16	6	4	18	21
Maximum temperature (C°)	18.4	21.1	29.1	31.4	34.2	38.5	37.3	38.8	36.6	30.2	27.3	22.8
Minimum temperature (C°)	4.4	5.6	11.7	13.7	18.0	22.3	23.4	24.3	22.3	17.4	13.2	8.9
Highest maximum temperature (C°)	22.4	26.0	40.8	42.6	40.0	43.4	39.6	41.3	40.4	40.0	31.2	29.5
Occurrence date (day/ year)	9	28	24	22	5.12	9	23	22	22	5	8	4
Lowest minimum temperature (C°)	0.0	2.3	6.4	8.7	13.0	20.0	20.0	20.2	19.6	13.5	9.6	5.7
Occurrence date (day/ year)	15.16	19	5	8.3	2	2	4	8	11	15	30	28
Dry temperature (C°)	11.1	13.1	20.0	22.3	26.3	30.7	30.4	31.2	29.3	23.7	19.8	15.3
Relative humidity (%)	67	65	53	50	43	44	49	50	51	58	62	64
Relative humidity per hour 0300 UT[2] (%)	82	82	71	73	65	66	69	71	71	76	78	78
Relative humidity per hour 1200 UT(%)	45	43	33	31	25	27	32	30	32	39	41	45

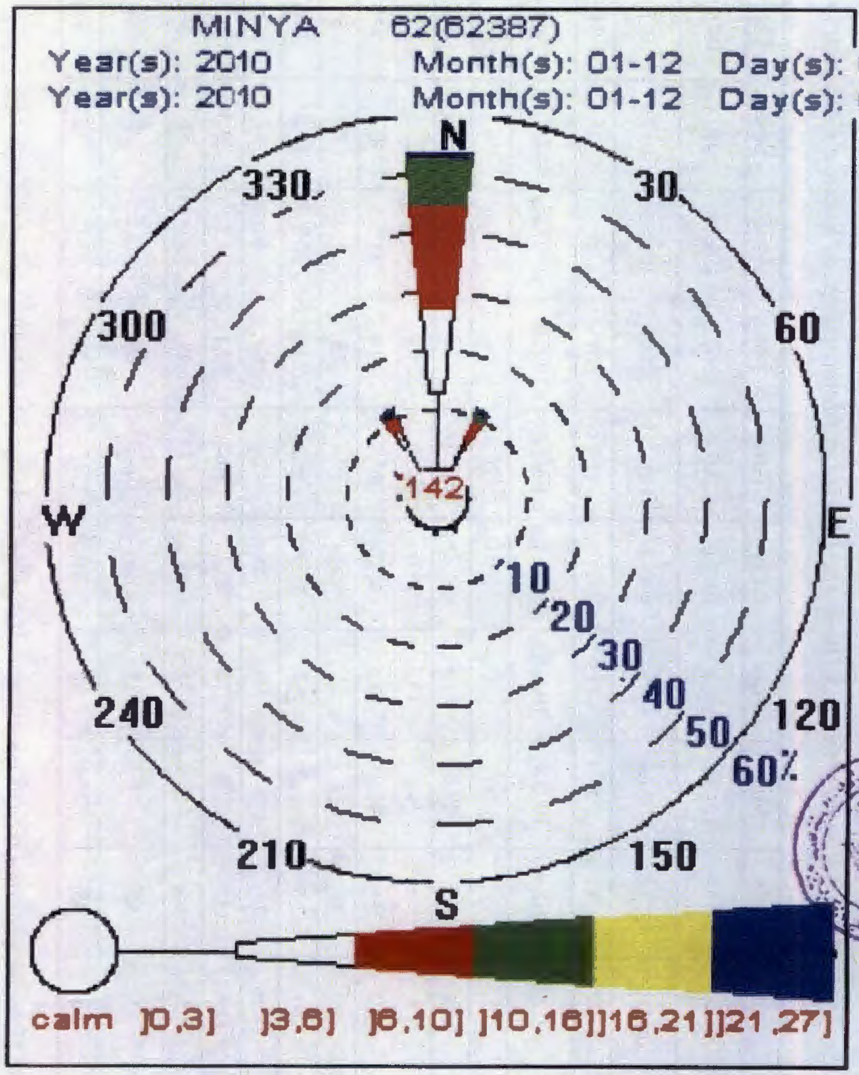
Notes:

(1) Data obtained from the El-Minya Meteorological Station records and forms. It covers an area of a 50-km radius.

(2) UT = Universal Time (2 hours less than local time in winter, and 3 hours less in summer).

Figure 5-6

Wind Rose(*) of the El-Minya Area, 2010



(*) Wind Velocity in m/s.

Source: The Egyptian General Authority for Meteorology, 2011.

5.2.2 Regional Geomorphic Features

The geomorphology of the area under the consideration can be described under the following distinctive areas.

A- Helwan – Kuraimate Stretch:

The area is characterized by the following main geomorphic units:

- **Nile Alluvial Plain:**

It is a flat narrow strip parallel to the Nile Valley. The width varies from 0.5 km. to 1.5 km. It consists of Nile silt and having an elevation varies from 22 m. to 25 m. above sea level.

- **Terraces:**

It forms an undulating surface in the form of isolated patches covered with gravel sheet. It consists of marl and sandy marl. The surface is highly exploited by many gravel quarries.

- **Lower Pediment:**

It is located between contour line 50 m.a.s.l. and contour line 100 m.a.s.l. The surface is gradually sloping and decreases from east to west. It is made of thick limestone sequence of the Middle Eocene Mokattam Formation. Generally, the pediment is occupied by the construction of many factories (Cement, Iron and Steel and others. The limestone pediment is heavily exploited for these industries. The lower pediment is dissected by tributaries of many wadis such as Wadi Garawi, Wadi Hof and Wadi Degla.

- **Upper Pediment:**

The Upper Pediment runs in a northwest-southeast direction parallel to the main scarp which is mainly controlled by faulting system. It covers the area between contour lines 100 m. a.s.l. and 200 m. a.s.l. It consists mainly of limestone, marly limestone and marl.

- **Structural Karstified Plateau:**

It ranges in elevation from a maximum of 600 m.a.s.l. on the highest waterdivide to about 200 m.a.s.l. The surface is highly affected by a fault system oriented mainly NW -SE. It results in a number of elongated, parallel and dissected cueists and some isolated hills.

- **Drainage system:**

The area is dissected by a number of seven main drainage lines (wadis) and heir basins are shown on *Table 5-9*:

Table 5-9

The Main Drainage Basins East and Southeast of Helwan

No.	Wadi Basin	Aera Km².
1	W. Degla	196.4
2	W.Hof	120.04
3	W. Gabow	94.96
4	W. Garawi	322.56
5	W. El-Agel	4.64
6	W. Abu-Selly1	9
7	W. Abu Selly 2	14.6

B- Kuraimate – El-Minya Stretch:

The area can be classified into 3 main distinct geomorphic units namely: 1- Dissected Plateau 2 & Pedimem S & 3 Playa (Nile terraces and Fan-glomerates).

- **Dissected Plateau:**

This plateau overlooks the Nile to the east assuming a relief of 305 m. over the pediments to the west. The plateau is very irregular in outline and striking, generally in a north- south trend. Several embayment's' and their corresponding promontories distinguish the rim of the plateau. The embayment may cut back in the plateau surface for a distance of 3 km. the most important of these embayment's is occupied by Wadi Abu Tarefei which runs west northwest-east southeast for a distance of 3.5 km. Northwards, another major embayment is distinguished which is occupied by Wadi Soraka. Enclosed between these two embayment's a major promontory, known as Gebel Hormret Sheiboun is located. This promontory stretches westward towards the Nile and is separated from its bank by only 7.5 km. Gebel Homret Shaiboun has the highest altitude in the area, 334 m above sea level and has a relief of 171 m. all over the pediment surface (the upper pediment). South of Gebel Homret Shaiboun, the plateau recesses back, eastward, and has a smooth outline displayed as a major are. This arc terminates nearly at the area of Wadi Sanur . Many wadis drain the plateau surface and run along the scarp face crossing the pediments to the Nile, The general trend of these wadis is east-west and the drainage system is parallel to subp-arallel. The plateau is covered by marl and limestone beds, assuming 177 m. in thickness, exposed both over the pediment surface and at the scarp face.

- **Pediments:**

Two main rock-cut pediments are distinguished in the area namely, the upper and the lower pediments.

- **The Upper Pediment** stretches parallel to the scarp face bounding the plateau. The pediment's surface is a barren white limestone with clay intercalations, stretching 3 to 10 km east till it abuts against the scarp face of the dissected plateau. To the west it overhangs the lower pediment, with a relief of 30 m. The western outline of the pediment is very irregular, running in a zigzag line displaying a number of spurs, points, alcoves and indentations. The pediment covers an area of 547.50 km. and opens out considerably to the north, outside the mapped area. To the south, the pediment surface has an altitude of 91 m above sea level.

In the area of Wadi Metein el Bahari, the lower and the upper pediments coalesce forming one surface. This surface stretches southward in the form of a limestone cliff 63 m. above the Nile terraces. In places within this stretch, this limestone cliff may form two steps corresponding to the lower and upper pediments. Over the surface of the upper pediment, several limestone mesas and buttes are encountered. These represent remnants of the surface of a limestone pediment which once was present above the upper pediment surface. These features rise 72m. above the pediment surface and increase generally in a number and area towards the north east, formed mainly of limestone beds. Several east-west wadis dissect this surface. The most important of these are Wadi Leshiab in the north and Wadi Bayad in the south. The wadis incise their channels deeply in the limestone surface and in places the incision may reach up to 30 m.

- **The Lower Pediment** runs nearly parallel to the upper pediment and overlooks the Nile terraces to the west. In few places along its stretch, the pediment forms a scarp of 44 m. high above the Nile terraces. The surface of this pediment is covered by limestone beds which make a flat surface extending towards the Nile. The western side of this pediment is smooth in outline, only where fan-glomerates are present, the outline is irregular. This surface is 13 km wide and rises 72 m above sea level. The main wadi crossing this surface to the Nile is Wadi Leshiab which incised its channels 6 in on the average.

- **Fan-glomerat**: These are found in 3 places in the mapped area, the northern fan is irregular in outline, covering 23.7 km2.This fans has been formed by the coalescence of several wadis which fan out in this area depositing their loads before reaching the Nile. The sediments covering the fan are mainly conglomerates and loose sands.

  In this aspect this fan-glomerate may represent the bajada surface of the zone of deposition (Sparks, 1960). The thickness of these deposits varies from few centimeters along the edge of this fan to 7 m. near its centre and rises 50 m. above sea level and only 10 m. above the Nile terraces.

  The middle fan is oval in outline; covering 10.1 km2.This fan has been formed by the coalescence of some wadi fans depositing their loads, in this area which are mainly conglomerate and loose sands. The thickness of these deposits varies from few centimeters along the edge of the fan to several meters near its centre. This fan rises 47 m. above sea level and only 10 m. above the Nile terraces.

  The southern fan is irregular in outline, covering an area of 10 km^2. This fan is covered by conglomerate and 100 m. sands. Its altitude is 66 m a.s.l. whereas it stands about 5 m. above the Nile terraces to the east.

- **Nile Terraces**: These make a thin strip along the Nile, 0.5 to 1 km. wide. Most parts of these terraces are now cultivated and only very limited rocky places are desert. Nile mud and silt of variable thicknesses are recorded by drilling in these terraces. Attia (1954) described a section, 11, 0 m. thick, west of Beni-Suef. The section is made of alluvial deposits, clays, sandy clays and sands unconformably overlying Pliocene sediment in the east and Pleistocene gravels in the west.

- **Cultivated Lands**:

The site is situated in the edge of the cultivated lands at the eastern bank of the River Nile. It forms the flat area which is a part from the Nile Valley. Many small villages (Ezzab / Kafr) are littered around the area.

- **Sand Dunes:**

It extends in a longitudinal shape from the central part of Wadi El-Rayan Depression to the western margins of the Nile Valley flood plain opposite the Dayrut town in the south for a distance of about 185 km. This field is composed of several parallel compound and complex dune belts extending in a SSE direction. It can be divided according to Embabi, 2004, into two sections; the northern Wadi El-Rayan is dominated by linear dunes while the southern is barchans and barchanoid dunes. Due to the impact of the northwesterly prevailing wind, it is expected that the sand move preferably down slop toward the Nile flood plain. In the western part of the Nile Valley in the stretch between El-Minia and Sammalut, the dune field of the extreme eastern belt are reclaimed and cultivated during the last three decades. However, dune movement and sand encroachment on the cultivated fields along the margins of the Nile flood plain represents a permanent threat to soil productivity and agricultural production in the west Nile Valley area (Kishk, 1990).

5.2.3 Geological Setting

A- STRATIGRAPHY

The exposed rocks fall into the following stratigraphic rock units from base to top (*Figure 5-7*):

The Eocene Rock Units (Te): The rock units exposed east of the Nile Valley can be classified into Middle and Upper Eocene units. In the following a brief description will be given to describe the different formations.

1. Moqattam Formation:

This term was first introduced by Zittel (1883) to describe the limestone and clastic beds at Gebel Moqattam east of Cairo. The Middle Eocene, Moqattam Formation is highly fossiliferous with *Nummulites gizehensis, Lucina pharaonis Ball, Fish teeth, Operculina sp.*, and others. Zittel (1883) subdivided the section exposed at Gebel Moqattam into Lower Moqattam; comprising the limestone beds at the base of the hill making the main scarp face of the Gebel, while to the upper limestone and clastic intercalations he designated the term Upper Moqattam.

Farag and Ismail 1959 divided the Lower Moqattam of Zittel into two units: Gebel Hof Series at base and the Observatory Series at top. Later, Said, 1962 restricted the term Moqattam Formation to the main limestone beds exposed at Gebel Moqattm which, were named by Zittel, Lower Moqattam. The Upper Moqattam was given a new name (Maadi Formation). In the area studied, this unit covers the two pediments at the foot slopes of the main plateau bounding the area to the east. It consists of about 40m. of thick limestone with thin shale and clay intercalation. The limestone is quarried in many places for building purposes. Said (1971) stated that the Middle Eocene can be described in a four units, the Minia Formation, the Sammalut Formation, the Moqattam Formation and the Guishi Formation.

On the eastern bank of the Nile, the Moqattam Formation consists of limestone with thin shale and clay intercalations. The limestone is white, hard fine-grained, forming low scarp which is quarried in many places for building purposes; this quarried part of the section is equivalent to the Building Stone Horizon of Hume (1965).

The following is a stratigraphic section measured at Wadi Metein El-Qibli.

- *Wadi Metein E1-Qibli Section:*

At Wadi Metein E1 Qibli, the Moqattam Formation includes more clayey bands. The thickness of this unit, in this area is residual, the base is not exposed. The following section represents the Moqattam Formation as exposed in the flat pediments west of the main plateau.

Top: Thickness (m)

- Limestone, greyish white, hard, sandy at base, with Nummulites spp. and Operctmino sp.	1.50m.
- Clay, brown, compact, salilerous	0.50m.
- Limestone, greyish white to yellow, hard, massive, crystalline in parts	5.00m.
- Clay, brown, hard, saliferous	0.50m.
- Limestone, white, chalky, hard, with clay thin bands	3.00m.
- Marl, yellowish brown, loliated, hard, salty	0.70m.
- Limestone, yellowish white, sandy, with Nummulites spp.	1.10m.
- Clay, brown, saliferous	0.10m.
- Limestone, yellowish white, hard, sandy at base, including shell debris	1.00m.
- Clay, brown, compact, saliferous	0.30m.
- Limestone, white, hard, massive	1.50m.
- Clay, yellowish brown, saliferous	0.30m.
- Limestone, chalky to yellow, hard and jointed	1.40m.
- Clay, brown, compact, highly saliferous	0.45m.
- Limestone, chalky, white, hard, jointed, nummulitic	4.80m.
- Clay, earthy yellow, hard, saliferous	0.50m
- Limestone, chalky, yellow, hard, forming a ledge	0.70m.
- Clay, green, gypseous and saliferous, hard	0.30m.

- Limestone, yellowish white to chalky, hard.......................... 1.20m.
- Clay, greyish borwn, hard, saliferous.................................. 0.50m.
- Limestone, greyish white, hard. Jointed, crystalline at top with Nummulite sp. and fish teeth.. 1.40m.
- Marl, grey, hard, foliated, containing shell fragments.............. 0.30m.
- Clay, yellowish brown, compact, gypseous............................ 0.40m.
- Limestone, chalky to yellow, hard, forming the base of the section and the floor of the wadi, including Lucina phamonis Ball, and
- Nummulites sp.. 0.50 m.
- Base: unexposed Total thickness = 35.90 m.

The above mentioned sections represent the horizon from which many building stones are quarried in the area under consideration. Most probably, Wadi Metein El-Qibli and Gebel Homret Shaiboun sections are partly equivalent to the Observatory Series of Farag and Ismail (1959) and to the Building Stone Horizon of Cairo. (Hume 1965) On the other hand, the Guishi Formation and the Qurn Formation as belonging to the Upper Eocene. Farag and Ismail (1959) regarded the Qurn Formation as wholly of Upper Eocene age. Thus the Guishi Formation is certainly an upper member of the Moqattam Formation, i.e. Middle Eocene, and most probably correlated with the Observatory Series of Farag and Ismail (1959).

2. The Qurn Formation:

This name was given by Farag and Ismail (1959), to a chalky limestone, sandy marl, and marly limestone, succession at Wadi Hof area near Helwan. Zaghloul 1978 , classified the Upper Moqattam of Zittel (1883) into three units, the Qurn at the base, Wadi Garawi in the middle and Wadi Hof at top. Said (1962) lumped these units under one lithobiostratigraphic unit; Maadi Formation.

In the area studied, we are able to divide the section above the Moqattam Formation into two units which differ considerably in their lithological characteristics. The lower unit can be correlated with the Qurn Formation of Farag and Ismail, while the upper unit is equivalent, most probably, to the Wadi Hof Formation. The conglomerate band recognized in the area under the present study, separates both units and along this hiatus, the middle unit of Farag and Isamil (1959); Wadi Garawi Formation, is missing. The names introduced by Farag and Ismail are given here to the units in the area studied, while the Maddi Formation is considered invalid because of priority in naming rock units (American Commission on Stratigraphic Nonienoclature; Articles nos. 3.10 and 17. 1971).

In the area studied the Qurn Formation makes the slope of the eastern scarp and some patchy hillocks scattered over the pediment surface at the northeastern part of the area. The formation is formed of a succession of shale, marl and limestone.

Figure 5-7

Stratigraphical Composite Columnar Section

Age		Formation	Thick m.	Lithology	Description
Quaternary		Wadi Deposits	5		Sand and gravels
Pleistocene		Nile Sediment	3		Silt, fine sand
		Armant & Issawia	10		Gravel and coarse sandstone
Pliocene		Kom El-Shellul	5		Yellowish brown gritty calc. sandstone
Eocene	**Upper**	Wadi Hof	22		Fossiliferous , calcareous sandstone and claystone
		Wadi Garawi	44		Limestone , marls. and shales, poorly fossiliferous
		Qurn	70		Marly and chalky limestone with shales and sandy marl
	Middle	Observatory	77		White to yellowish y massive limestone ; highly fossiliferous
		Gebel Hof	120		Limestone and chalky limestone with Nummulite gizehensis

The following is the section measured at Gebel Tarboul.

- *Gebel Turboul Section:*

At the area of Gebel Tarboul, the Qurn Formation is separated from the upper unit, Wadi Hof Formation by a conglomerate band, 22 cm thick, which is well noted in Gebel Tarboul section. The Qurn Formation attains a thickness of 53.60 m and is composed of a succession of marls and shale, while its base is unexposed.

3. Wadi Hof Formation:

This is the third and top most unit of Farag and Ismail (1959), given by them to a series of marl and sandy limestone at Helwan area, south east of Cairo. At the area studied, Wadi Hof Formation makes the upper slopes and the top of the north eastern plateau. The formation is made of a succession of chalky limestone, sandy limestone and shale, where it covers an area of 147.20 km2.

- *Gebel Tarboul Section:*

At the area of Gebel Tarboul, the Wadi Hof Formation unconformably overlies the Qurn Formation. The unconformity is well marked by a bed of conglomerate 22 cm thick. This conglomerate bed separates both the Qurn Formation at base and the Wadi Hof Formation at top. The section of Gebel Tarboul consists of at white chalky limestone and shale beds assuming a thickness of 66.50 m.
The following is a description of Gebel Tarboul section:

Top	Thickness (m)
- Limestone, yellowish white, sandy in places, with Ostrea clot-beyi, Nummulites beaumonti d`Archiac and Heime. Nummulites sub-Beaumonti and Operculina sp.	8.0
- Limestone, greyish white, hard, jointed, with gypsum veinlets, including Nummulites beaumonti d'Archiac and Haime, Assiline sp., Milionlla oblonga (Montagu), Miliola a prism d'Orbigny , valves of Ostracoda and shell fragments.	39.0
- Limestone, yellow, sandy, hard, forming a wall, containing dwarfed gastropods, bone debris, shell fragments, Nummulites beaumonti and Haime, Nurmmulites sub-beaumonti, Operculina sp and others.	13.5
- Shale, yellow to yellowish brown, fissile, including Nonionella spissa Cushman, Miliola prisca d'Orbigny, Loxostomum teretum Cushman and Bulimina jacksonensis Cushman.	6.0
Base: Conglomerate, yellowish white to dark brown highly ferruginous, saliferous, with calcareous sandstone, forming a ledge, containing rare badly preserved Operculina sp., Nummulites spp., and other shell fragments.	0.22

4. **Abu-Zabaal Formation (To) :** It consists of basalt flow in the form of basalt dyke west of El-Bahnasa -Ahnasia area and trending in a North-West direction which parallel to the faulting system in the study area. The age was assigned to the Oligocene time.

5. **Umm Raqaba Formation / Kom El-Shelul Formation (Tpl):** This unit makes nearly the whole section of Gebel Umm Raqaba southeast of Beni Sueif which is a conspicuous butte at the southern part of the area covering an extension of 4.70 km^2. The formation is made of alternating conglomerate and sandstone beds unconformably overlying the Qurn Formation. The conglomerate consists of limestone, chert and quartz sand grains bounded together by a clayey matrix. The Umm Raqaba Formation is fossiliferous and the fossils are mainly found at two horizons, best developed at the western part of the area. The contact with the underlying Qurn Formation is clear in the field by virtue of lithological and colour differences between both units, the yellowish brown clastic section of Umm Raqaba overlies a greyish white carbonate Qurn succession. The thickness of the Umm Raqaba Formation at its type section is 23.85 m, decreases to the west where it attains 10.90m. The thickness of this formation is residual since no younger sediments were recorded at its top. The fossils collected, from the sections assign this unit to the Pliocene. Among the collected fossils, reworked Middle and Upper Eocene species are common. However, this does not alter the age assigned to the Umm Raqaba Formation since the fossils are reworked and the lithological characteristics of Umm Raqaba show that conglomerate is a common lithotope. This age assignment was first mentioned in the work of Blanckenhorn (1921) while describing the geology of this area. The Pliocene section known from this area, most probably represents the most southerly marine Pliocene transgression in Egypt, during this epoch. The Pliocene sediments are known from many small and patchy occurrences in different parts of Egypt. At the Red Sea Coast, Beadnell (1924), Cox (1929), Souaya (1963), El-Akkad and Dardir (1966) and Issawi et al. (1971) describe a clastic section with reefal carbonate interbeds which was believed to be of Pliocene age.

   The marine Pliocene exposure around Cairo area occurs as a strip along the cultivation edge. It is especially well developed between Abu Sir and Gizeh on the western bank of the river. The succession of the Pliocene strata at Kom El-Shelul is also worked out by Sandford and Arkell (1939).

   To the east of the Nile, at the foot of Gebel Moqattam as well as to the south of Cairo at Helwan, similar Pliocene exposures bound the cultivation and rest, with depositional dip on the Middle Eocene limestone cliff.

   The Pliocene sediments are recorded only from Gebel Umm Raqaba and covering an isolated faulted patch at Wadi Sannur.

6. **Idfu Formation (Q1):** The Idfu Formation (Gravels) represents the early fluviatile deposits during the Protonile phase. The formation mainly consists of gravels and coarse sands. It has a wide extension on the surface and

limited on the subsurface. The age was assigned to the Early Pleistocene (Said, 1981).

7. **The Qena-Dandara Formation (Q2):** - It is the most extensive and important unit for the groundwater aquifer in the Nile Valley and Delta. It consists of fluviatile sands. The maximum thickness exceeds 250 m. The Qena- Dandara complex was attributed to the Middle Pleistocene (*Figure 5-8*).

8. **Abbassia Gravel (Q2): -** It has a wide extension on the surface and limited extension in the subsurface. It represents the last pluvial period and arid conditions in which the older sediments were eroded by wind. It consists of about 15 m. of thick gravel section. The age was assigned to the Middle Pleistocene (*Figure 5-8*).

9. **The Debira-Arkin Formation (Q3):** - This is the youngest unit which represents the flood plain deposits of the famous fertile alluvial land of the modern River Nile. It is consists of silt, clay and silty clay, sandy silt at the base. The maximum thickness is about 12m. while it is reduced towards the outer portions. It rests over the eroded surface of the underlying units with marked unconformity surface. The age was assigned to late Pleistocene to Holocene (*Figure 5-8*).

10. **El-Khafoug Formation (Q3)**: The dune field of Wadi El-Rayan represents the third cycle of dune movement in west Minia region in which the Aeolian sand dune remains known as El-Khafoug Formation of Said, 1981, inter-finger both the Prenile deposits of the Middle Pleistocene (ending 200,000 BP) and the Neonile sediments of Late Pleistocene estimated to be 12.000-20.000 BP (*Figure 5-8*) .

11. **Aeolian Sand (Qd):** It extends in a longitudinal shape from the central part of Wadi El-Rayan Depression to the western margins of the Nile Valley flood plain opposite the Dayrut town in the south for a distance of about 185 km. This field is composed of several parallel compound and complex dune belts extending in a SSE direction. It can be divided according to Embabi, 2004, into two sections; the northern Wadi El-Rayan is dominated by linear dunes while the southern is barchans and barchanoid. Due to the impact of the northwesterly prevailing wind, it is expected that the sand move preferably down slop toward the Nile flood plain. In the stretch between El-Minia and Sammalut, this dune field of the extreme eastern belt are reclaimed and cultivated during the last three decades. However, dune movement and sand encroachment on the cultivated fields along the margins of the Nile flood plain represents a permanent threat to soil productivity and agricultural production in the west Nile Valley area (Kishk, 1990). .

Figure 5-8

Generalized Stratigraphic Column of the Nile Valley in the Study Area
(after E.A. Zaghloul, 1991)

No.	Age		Forma.	Thick. m	Litho.	Description	Notes
VII	Holocene		El-Khefoug	10		Top: Alternating Nile silt and stabilised sand dunes	
VI	Holocene		Dibeira Arkein	30		Silt with thin fluviatile sands of modern nile sediment	
V	Pleistocene		Abbassia	20		Loosely consolidated gravels	
IV	Pleistocene	Middle – late	Qena Dandara	+90		Cross-bedded fluvial sands with minor conglomerate and clay lenses	Aquifer
III	Pleistocene	Early	Idfu	20		Flint gravel and sand of fluvial origin, embedded in a reddish brown matrix.	
II	Pliocene		Kom El-Sheloul	+200		Clay, shale, sandy clay with few limestone and conglomerate thin bands	Aquiclude
I	Middle Eocene					Limestone with brown clay and marl	

A- STRUCTURAL SETTING:

Generally, the Egyptian platform may be subdivided, from south to north into the following four units (*Figures 5-9 and 5-10*), Craton and Stable Shelf in the south, Unstable Shelf in the north and the Hinge Zone at the coastal area .The hing zone is located between the mobile shelf and the miogeosynclinal area.

1. Dip:

The general structural outlook of the area is one of a flat surface with very gentle dips (1- 2) at variable directions. The expected direction of dip of different units is towards the north with a slight deviation to the east or the west. Contrary to this expectation several measurements show directions to the southeast. This is probably due to a main fracture line along the Nile with a northeast-southwest direction.

2. Faulting:

Youssef (1968) recorded a major fault along the Nile at this area which he assumed to have the Gulf of Aqaba trend, i.e. N 15° E. Zaghloul et. al. (1976) work substantiates Youssef's concept. Tertiary sediments which make the table land west of the Red Sea hills were supposed to be dipping away from these uplifted basement hills. The area was affected mainly by two system of faulting:

a. Erytherian trend which extend in a N55°W direction. It is mostly affecting the Eocene limestone plateau. This trend is the younger which affected the older (NE) trend.

b. Tethyan trend having an E- W direction. It affects the northern part of Gebel Mokattam, Cairo Suez road and Gebel Hof.

   In other words the Qurn and Wadi Hof Formations (Upper Eocene) exposed at the eastern part of the area studied with a gentle angle of dip 2 ° to the west were supposed to lie below their present outcrops west of the Nile . Most probably a fault (or several faults) is located near the present Nile channel culminating in the upthrown of the western side. Youssef (1968) indicated that the stresses leading to this faulting movement are parallel to N I0° W, S 10° E. The fault is probably a wrench fault with vertical displacement accompanying a strike-slip movement. The effect of these stresses on the area under consideration lies in the change of the general northerly direction of dip to a southern component. The downthrown block, in the studied area, was dragged down hence the changes in the direction of dip.

   The eastern part of the Nile Valley Plateau was structurally controlled by a group of faults. Upper Eocene at the eastern cliff of the Nile has a relative elevation of 327 m. in comparison with 237 m. at the western cliff. Most probably a group of faults are located near the present Nile channel culminating in the up-thrown of the western side. The main faults are:

- **Gebel Umm Raqaba Fault:** - This fault runs in an N 65 W direction for a distance of about 6 Km. The fault plane swings few degrees to the north as well as to the south. The fault affects both the Upper Eocene and Pliocene sections. The thrown is to the north.

- **Wadi Sannur Fault:** - This fault runs along the southern bank of Wadi Sannur and has a N 48 W direction for a distance of about 8 Km. The thrown of the fault is to the north with an estimated amount of 10 m.

- **Gebel Turboul Faults**: This group of faults comprises three faults. A-A, B- B and C- C . Faults A-A′ and B-B run in a northwest- southeast direction N, 15 W. and N.63° W. for distances of 1.7 and 1.0 km respectively. Both faults are of the normal, gravity, strike and longitudinal type. The downthrown of each fault is ca 20 m. These two faults A- A′ and B-B′ are traced along the slope face of Gebel Tarboul. Two other faults were mapped from the area at southwest of Geblel Tarboul. The first fault has a length of 20 km and trending N. 50° W, while the second fault has a trend N° 32° W, and a length of 1.7 km. Fault C-C′, has a trend N° 33° W. and a length of 2.0 km. The fault is of the normal, gravity, strike and longitudinal type. The thrown of this fault is towards the south with amount of 15 m.

Figure 5-9

Sketch Map of the Structural Aspects of the Nubian-Arabian Shield Margin in Egypt and Sinai
(after Schlumber-jer, 1984)

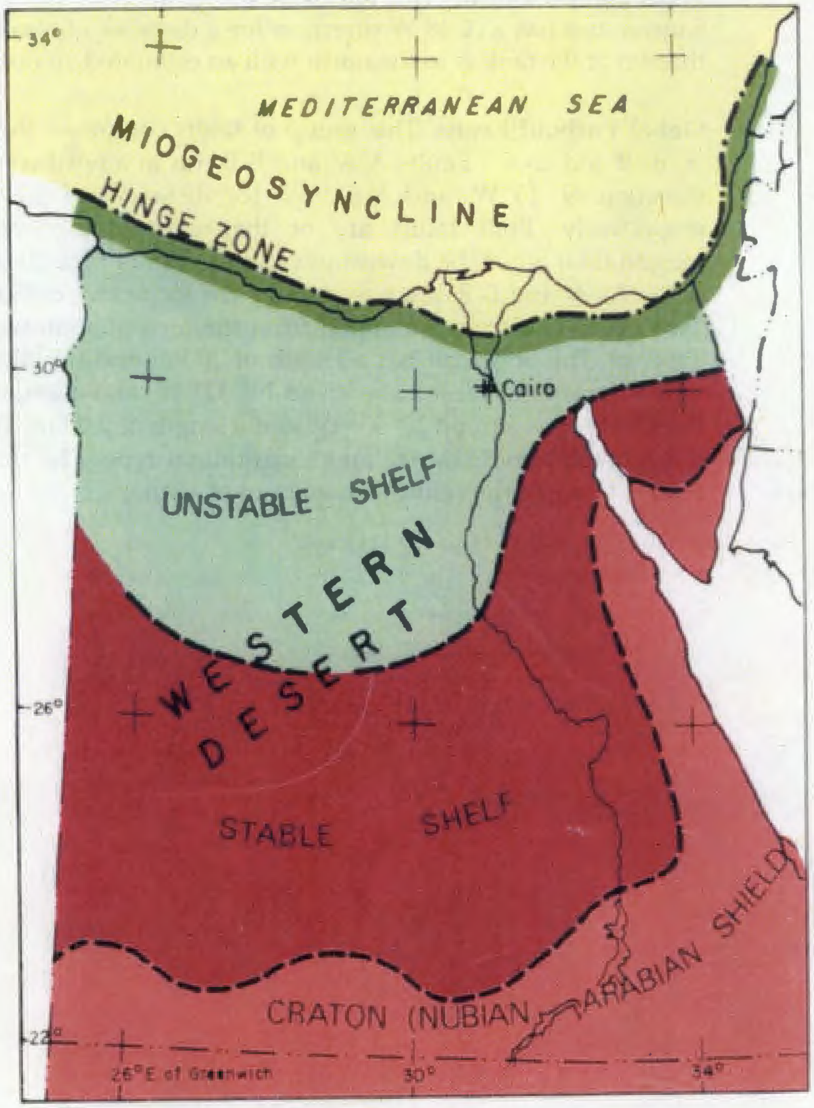
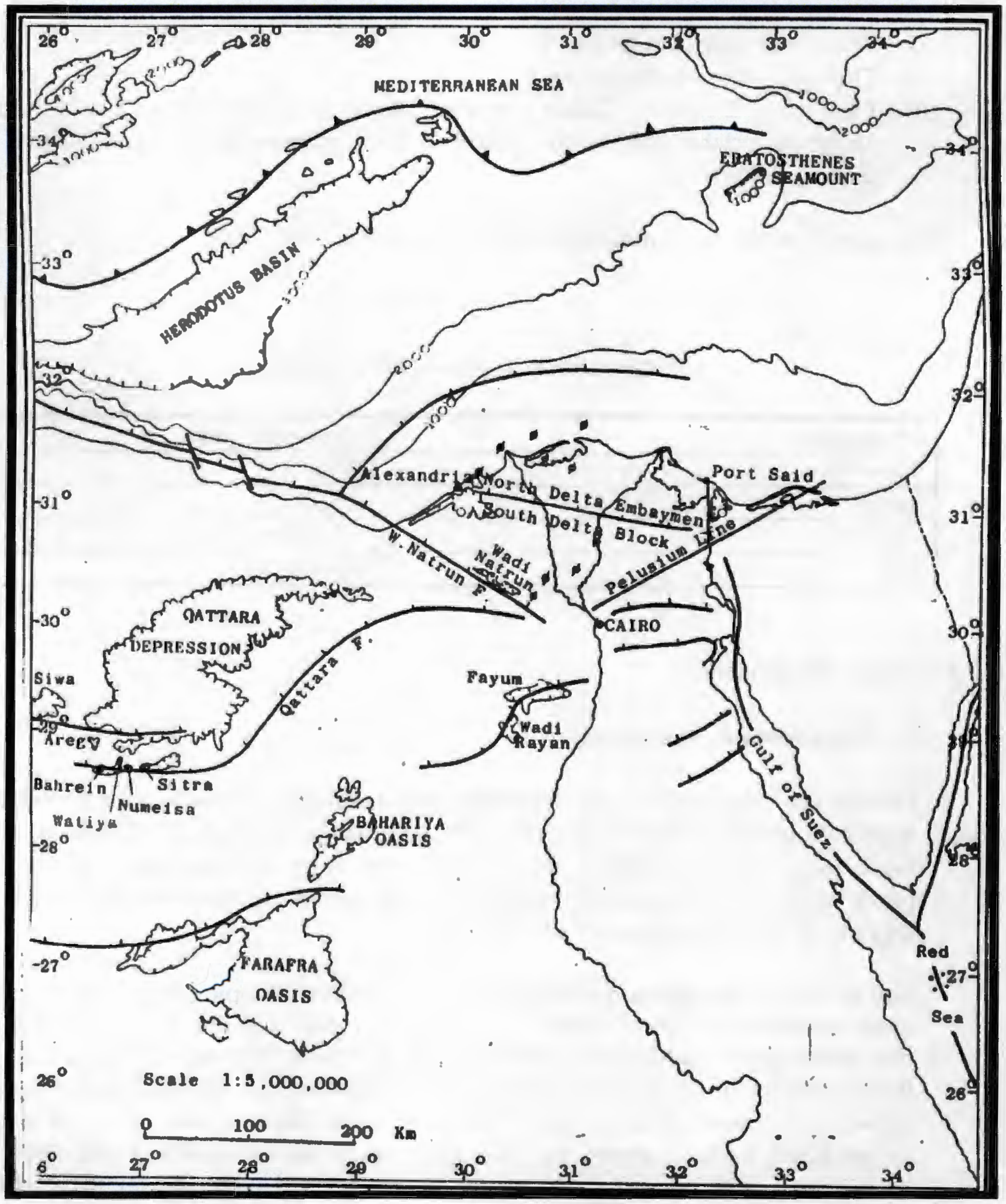


Figure 5-10

Schematic Map showing the Major Tectonic Elements in Northern Egypt



5.2.4 Natural Resources

The natural resources in Helwan – El-Minya Stretch are:

1. The fertile agricultural soil.
2. The Groundwater Resources
3. Limestone; Dolomite, Basalt and clay which quarried and used as a building stone materials, commercial marble, road pavements , cement Brick and Cement industries

The reserve of the main materials is shown in *Table 5-10.*

Table 5-10

The Reserve of the Main Natural Resources

Materials	Reserves \ m^3
Limestone	27.500 m^3
Sands	18.000 m^3
Gypsum	70.000 m^3
Soil	45.000 m^3

5.2.5 Water Resources

1. **Groundwater Resources:**

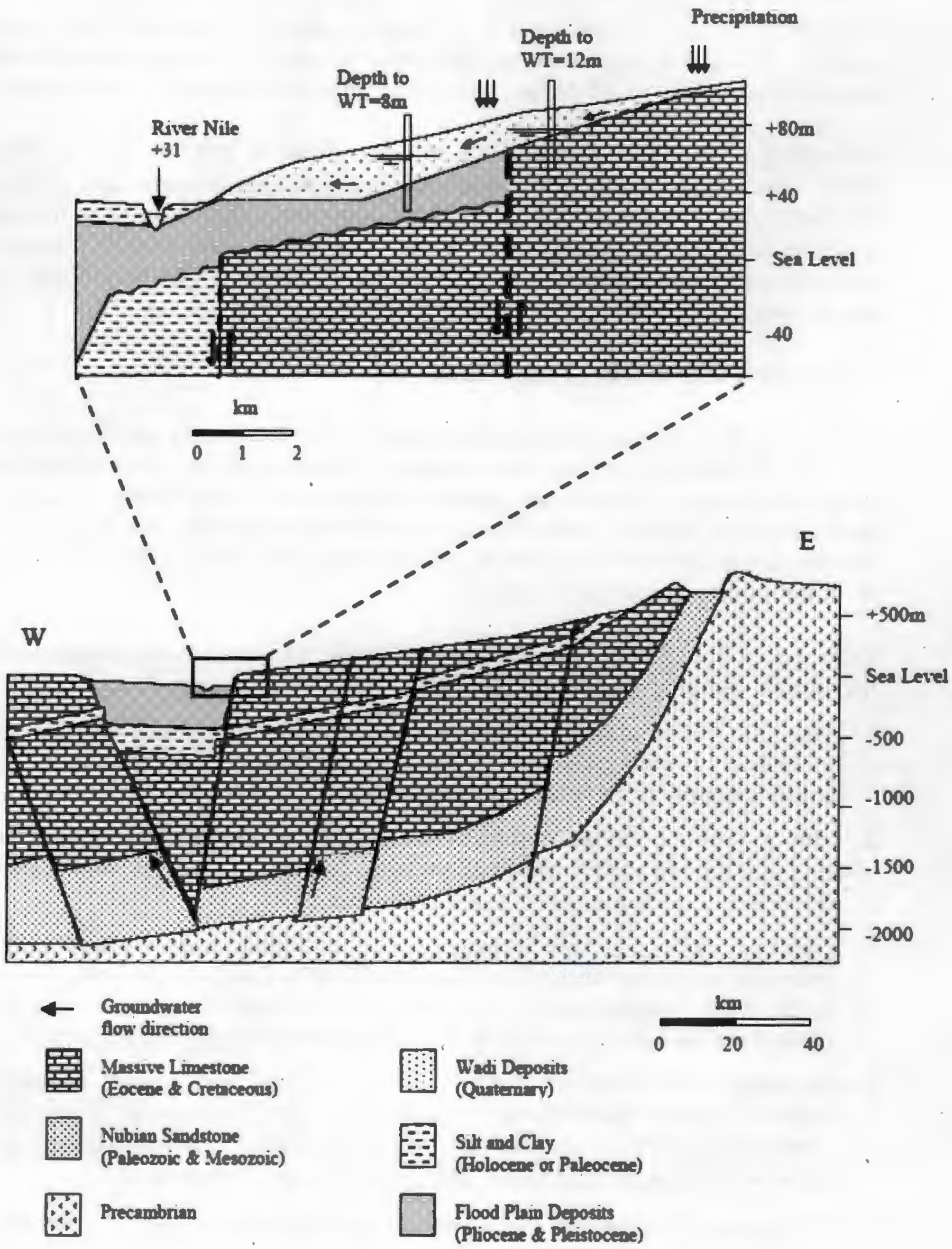
Due to the continuity of the water bearing formation, there is an east-west and west-east groundwater flow from the reclaimed area (high in elevation) to the flood plain aquifer. Little of this flow is intercepted by the drains, so the flood plain aquifer is continuously recharged. This causes upward leakage and water-logging of the original Nile Valley lands.

The Wadi El-Tarfa ground waters (*Figure 5-11*) have isotopic compositions that are quite distinct from those of the Nubian aquifer paleowaters. This result indicates that the samples could be composed mostly of evaporated rainwater, such as flash flood waters that must occasionally infiltrate the shallow alluvial aquifers and the underlying limestone aquifers in the study area. Because the water table in all investigated wells is above the Nile River level (RIGW, 1988) the modern Nile River is unlikely to be the sole source of the ground water under investigation. Tritium (3H), the radioactive isotope of hydrogen, has a half-life of 12.43 y. Tritium was produced during the atmospheric testing of fusion bombs between 1953 and 1964 and is an excellent tracer for recharge, flow, and mixing processes of young ground waters (Plummer et al., 1993).

Figure 5-11

Wadi Tarfa Hydrogeological Cross-Section

(after Sultan et. al., 2005)



2. Occurrence and Distribution of Water Resources:

The extent of water supply depends largely on the direct rainfall, as much of the water occurs in rock-Poole in the upper mountain-valleys. Generally, water is good in winter after the rainfall in the ranges and unpleasantly salty in the summer or during rainless period. For normal drinking purposes, fresh water of salinity up to 1000 p.p.m. can satisfactorily be used, brackish water, of salinity ranging from 1000 to 3000 p.p.m. , is used for limited irrigation in a sandy soil.

According to the hydrological map of Cairo, Scale 1: 100,000 (RGW, 1989) the main water bearing formation consists of Quaternary graded sand and gravel with interbeds of clay lenses. In the fringe of the desert area, the recharge to the ground water aquifer is usually seepage from the Nile. The aquifer is highly productive and the water level ranges from 16m. to 20m. The Total Dissolved Solid (TDS) values range from 1000 to 2000 ppm. (*Figure 5-12*).

3. Groundwater Bearing Formations:

In the vicinity of the flood plain, the main aquifer consists of sand and gravel of the Qena Formation capped with the recent Holocene silt and clay of the Debira-Arkin Formation. The sand and gravel extends to the desert fringes. The aquifer hydrologically connects with the faulted and fractured Eocene limestone. The maximum thickness is about 200 m. in the valley flood plain reducing to about 50 m. at the eastern and western fringes,

Referring to the Hydrogeological Map of Egypt, the groundwater conditions and the aquifer geometry can be summarizing as in the following:

1. The Nile Valley aquifer system (Qena Formation) of semi-confined type is underlain by thick clay beds (Pliocene rock unit) which act as aquiclude. It consists mainly from sands, gravels and silt.
2. The Quaternary fluviatile and fluvio-marine sand and gravel with interbeds of clay and having a thickness of about 60 m. Most of the shallow water wells are restricted to the top most part of this aquifer.
3. Fissured Carbonate Aquifer System: This aquifer is mainly consists of thick fractured limestone and dolomite of the Middle Eocene rock units. The depth to the water bearing beds ranging from 100 - 150 m. from the ground surface while the water level is about 90 m. from the level of the ground surface.
4. Irrigation: The irrigation water is free of charge and readily available for almost all lands that officially declared as agriculture land. The irrigation system in the study area is combined to the gravity and water lifting system. Some wells were located in the new cultivated and Urban areas.
5. Drinking and domestic: All water for drinking and domestic purposes are processed and treated Nile water.

Figure 5-12

Hydrogeological Map of the Study Area
(after RIGW, 1992)

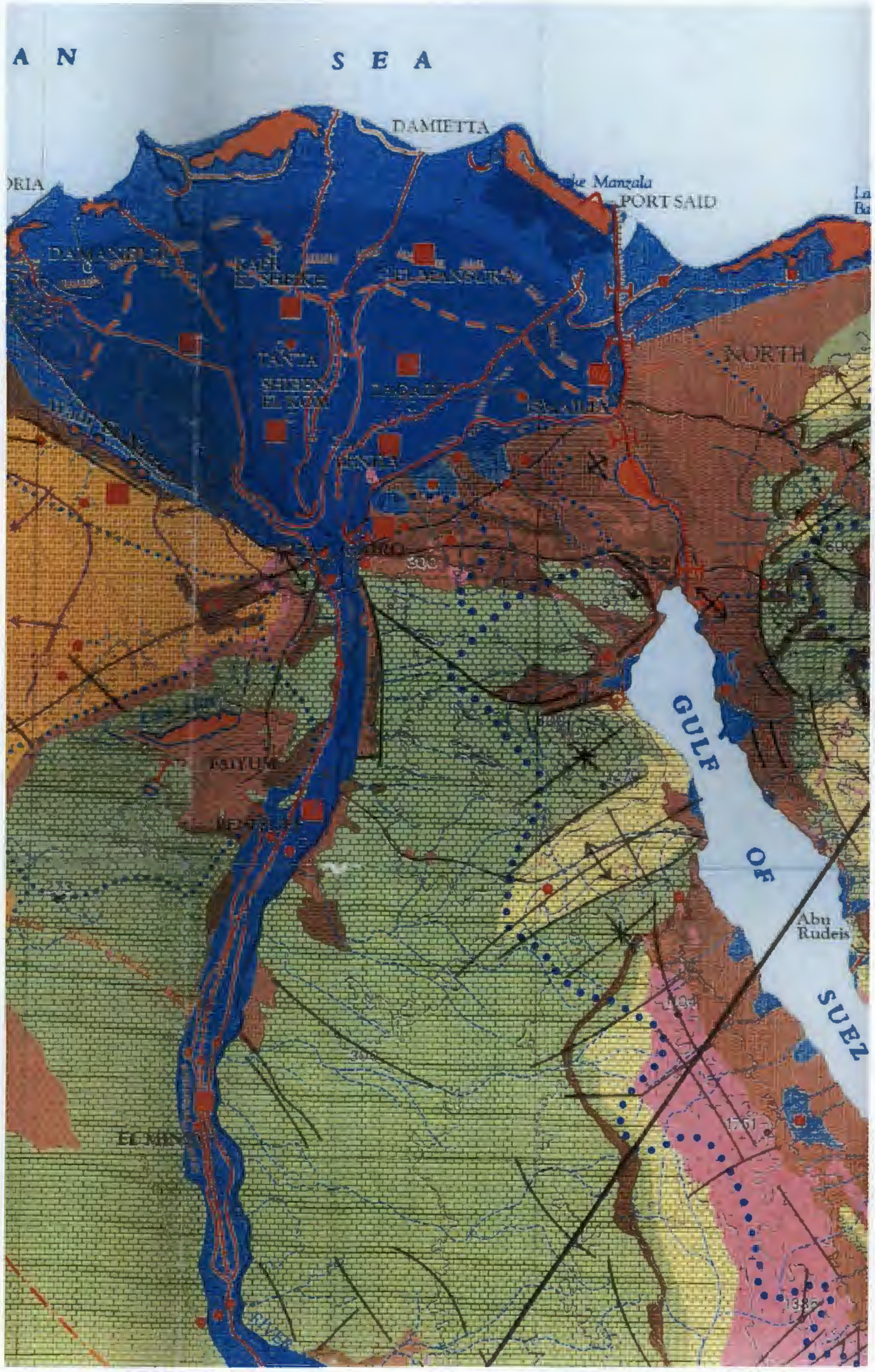


Figure 5-12 ***(Contd.)***

Hydrogeological Map of the Study Area
(after RIGW, 1992)

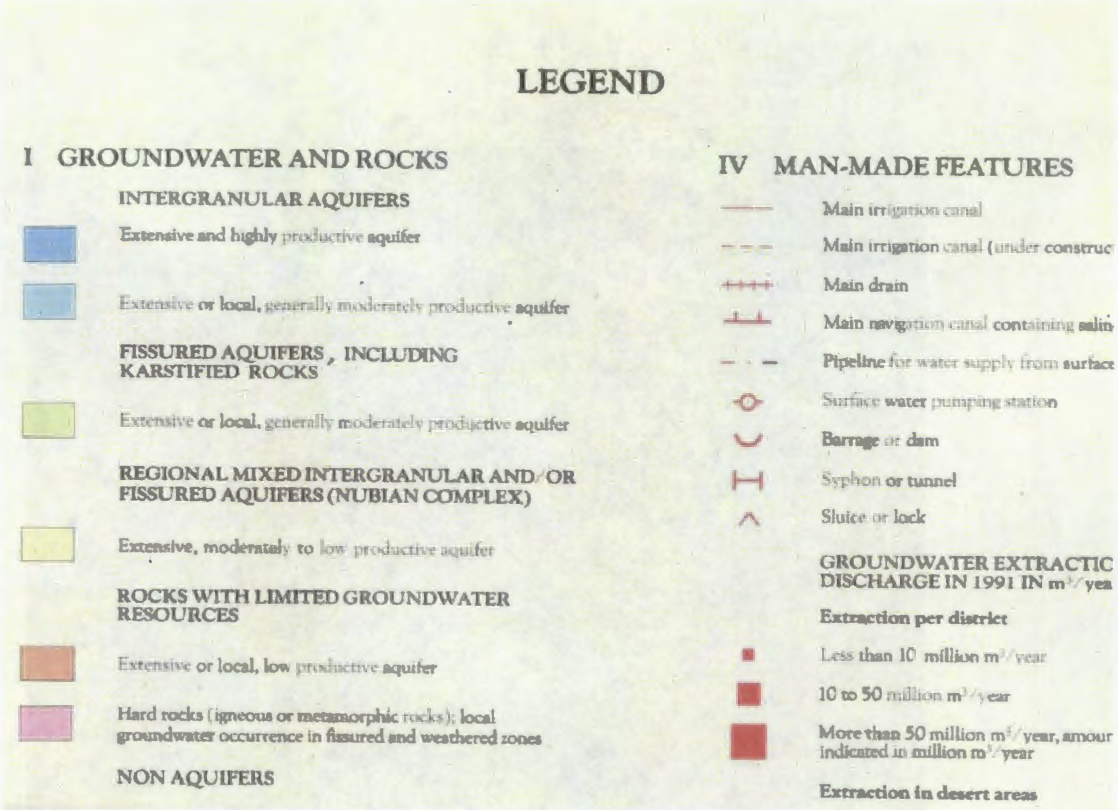
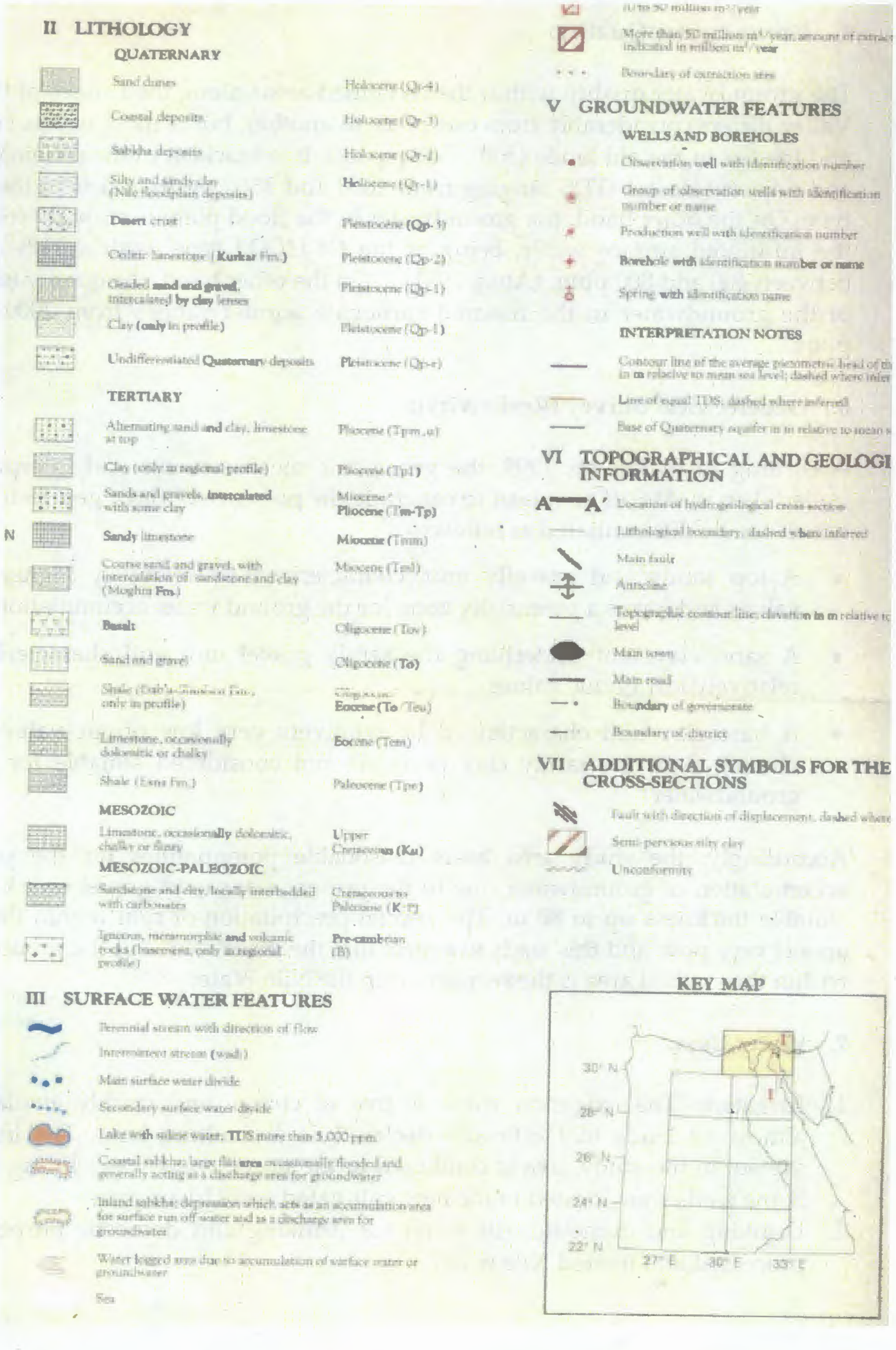


Figure 5-12 (*Contd.*)

Hydrogeological Map of the Study Area
(after RIGW, 1992)



4. Groundwater Level:

The groundwater level in the Quaternary aquifer ranges from 20-50 m. below the level of the ground surface. While in the fractured limestone, the water level is about 90 m. from the level of the ground surface.

5. Groundwater Quality:

The groundwater quality within the reclaimed areas along the fringes of the Nile Valley differs considerably from one place to another, but is more or less constant and fresher in the old lands (300 - 500 p.p.m.). It is brackish in the reclaimed area and adjacent desert (TDS ranging from 1000 and 3500 ppm) and is of the Na-Cl type. On the other hand, the groundwater in the flood plain is strongly related to the infiltrated surface water, being of the Ca-HCO3 type, with a TDS ranging between 400 and 800 ppm. (Attia, 1991). On the other hand, the quality (salinity) of the groundwater in the fissured carbonate aquifer ranges from 2000 - 3000 ppm.

6. Geoelectrical Survey (Resistivity):

According to El-Shayeb, 1999, the geoelectric measurements and interpretation undertaken in Al-Saff area lead to conclude the presence of three geoelectric units which can be differentiated as follows:-

- A top sandy and gravelly unit, characterized by relatively higher ohmic values and forms a potentially zone for the ground water accumulation
- A sand clay unit underlying the sandy gravel unit and characterized by relatively low ohmic values
- A base clay unit characterized by relatively very low ohmic values (> 10 ohmic). Both the sandy clay units are not considered suitable for getting groundwater.

Accordingly, the study area bears reasonable potentialities for the probable accumulation of groundwater due to the presence of sandy-gravel unit having a suitable thickness up to 80 m. The annual precipitation of rain within the study area is very poor and this leads to expect that the main source of the groundwater within the studied area is the seepage from the Nile Water.

7. Water Uses:

1. Irrigation: The irrigation water is free of charge and readily available for almost all lands that officially declared as agriculture land. The irrigation system in the study area is combined to the gravity and water lifting system. Some wells were located in the new cultivated and Urban areas.
2. Drinking and domestic: All water for drinking and domestic purposes are processed and treated Nile water.

5.2.6 Natural Hazards

The area usually suffered and threatens by the main natural hazards; flash flood, earthquake and sand dune encroachment.

A. Flash Flood:

The climate of the Nile Valley is characterized by aridity typified by very low rainfall, high evaporation rate and high summer temperature. Nevertheless, the region is occasionally subjected to heavy rainstorms that commonly followed up by floods. These may cause disastrous impacts on life, roads and settlements.

The system of natural drainage of the area is remarkably simple, but little rain, as is well known, falls in central and southern portions. The rain-channels are dry during the greater part of the year and vary in length according to the season.

1. Flash Flood in Helwan Area:

The study area represents a part of the River Nile megabasin (El-Shazly et.al. 1999). It includes seven drainage basins. They all debouch externally into the flood plain of the River Nile. The water divides between the basins and surroundings trend mostly NW - SE or NE-SW. The dry valleys and tributaries of the network were sculptured during the fluvial period during the Pleistocene and recent times. The identified wadi are Wadi Degla, Wadi Hof, Wadi Garawi, Wadi El-Gabow, Wadi El-Agel, Wadi Abu-Selly-1 and Wadi Abu Selly-2. They are elongated and covered with Middle Eocene Carbonate rocks. The drainage pattern of the study area is predominantly trellis (*Figure 5-13*). In this case, rainwater will have more time to infiltrate and contribute to grollndwater recharge. Basins of long overland flow induce high infiltration rate and have low risk of flash flooding. Wadi Garawi (*Figures 5-14 and 5-15*) is the main wadi which can threaten the site .The catchments area covering about 322.56 Km. The potentiality of flash flood is high (*Figure 5-14*).

El- Kafara Dam was built during the 3rd Dynastic period (2780 - 2280, Old Kingdome). The dam is located some 12 Km. from the Nile Valley to protect the area from high surface runoff in the wadi. The elevation of the dam is about 140 m.a.s.l. and 120 m. above the level of wadi bottom. The slope gradient of the wadi bottom ranges from 85 to 90.

Figure 5-13

East Helwan Drainage Basins, Based on Aerial Photographs of Scale 1:40.000 and Landsat TM Image of Scale 1 : 65.000
(after A. Hamdan, 1999)

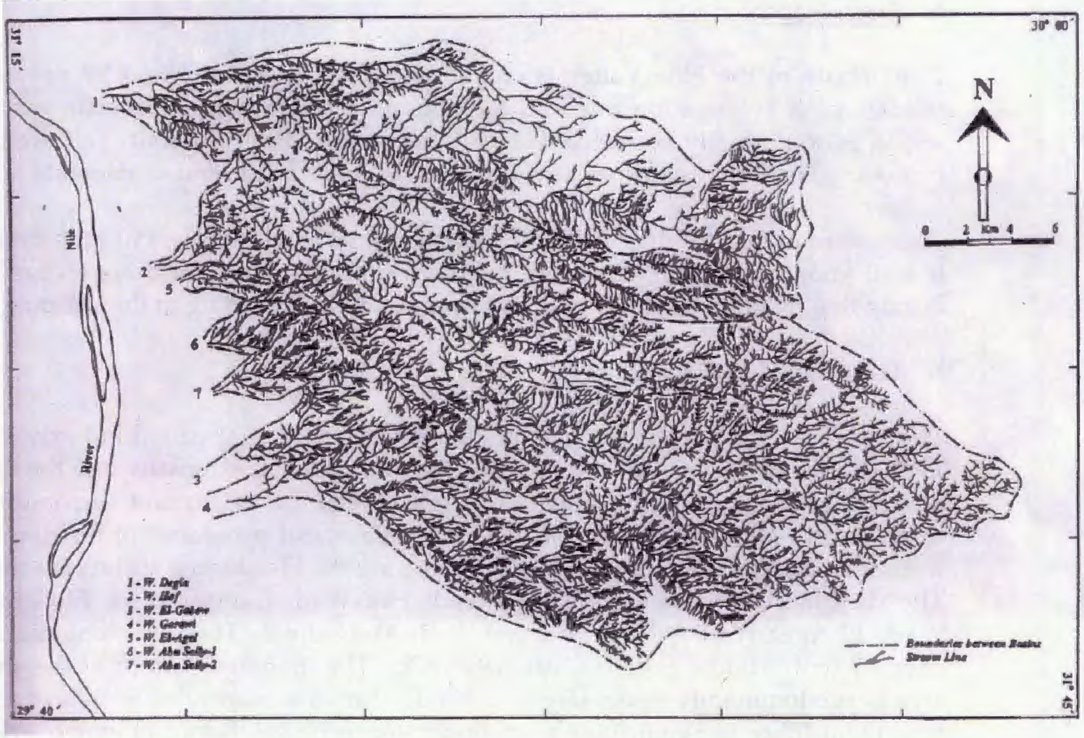
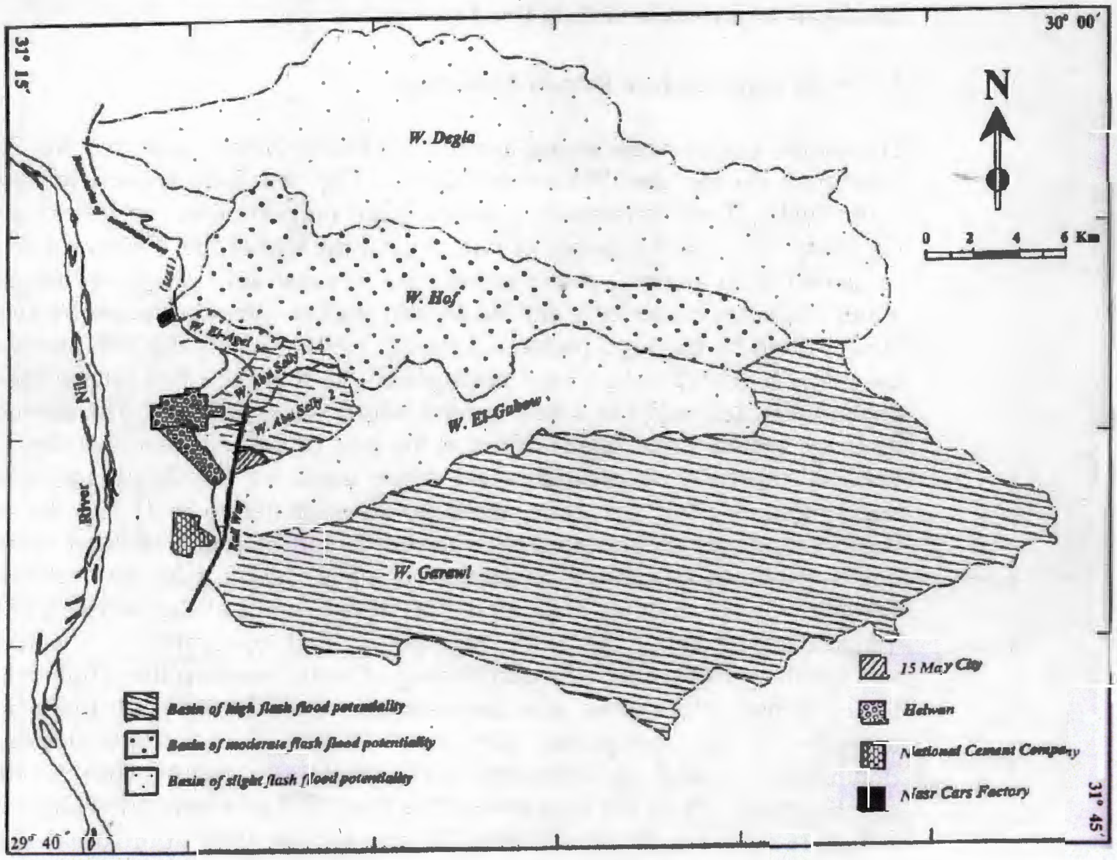


Figure 5-14

Boundaries between Basins and Urban Area and the Flash Flood Potentiality based on the Average Length of Overland Flow as Defined by Horton, 1945

(after A. Hamdan, 1999)



The morphometric analysis only does not lead to a final conclusion of assessment of flash flood hazards. Topography, lithology and structural forms of an area must be considered. Relief, slope, and meandering and the main topographic factors that control the speed of water. Porosity, permeability, and durability of rocks are the important factors of lithology. They control the rate of infiltration and incision of valleys. All these parameters may cause accelerations or deceleration of motion of flash flood waters.

2. Wadi Tarfa Surface Runoff Modeling:

The model results were tested against field observations reported for El-Tarfa watershed during the 1994 event (Naim, 1995) and then applied to the Qena watersheds. These watersheds collect a large proportion of the precipitation in the study area. The frequency of rain storms, the size of the 1994 event was then estimated from archival precipitation data to constrain average annual ground water recharge. Hydrologic and floodplain studies were conducted by using the HEC-1 flood hydrograph package (USACE, 1991). During the 1994 storm event, the major highway (which runs north-south) east of the River Nile at the outlet of Wadi El-Tarfa acted as a dam behind which water collected. The absence of a drainage system under the highway at the time caused a lake to develop. On the basis of the field observations and those made by the Egyptian Geological Survey (Naim, 1995), the area of the lake was estimated to be 3.6 km^2. Its average depth was 0.5 m, as indicated by watermarks left by the 1994 flood event on a building within the lake. The volume of water in the lake was estimated at 1.8×106 m3. Sultan et al, 2005, model predicted runoff at the outlet of Wadi El-Tarfa at 1.9×106 m^3 (*Table 5-11*). The lithology and topography of a watershed's surface area greatly affect the partitioning of water between the estimated initial losses, transmission losses, and downstream runoff. Using Wadi El-Tarfa as an example Sultan, computed the initial losses, transmission losses, and downstream runoff at Although the sub-basins draining into location A constitute only 9% of the total area of the Wadi El-Tarfa watershed (*Figures 5-14, 5-15, 5-16 and 5-17*), the rainfall over this area encompasses approximately 15% of total precipitation over the entire watershed, demonstrating the preferential precipitation over the mountains compared to the downstream areas. The highest initial losses are encountered upstream, in areas largely covered by rocks of high infiltration capacity (Nubian sandstone). In these areas, initial losses amount to approximately 90% of the total precipitation over the sub-basins. Because the downstream and central sub-basins are largely composed of Tertiary outcrops with low infiltration capacity, the initial losses are relatively small (76-78% of precipitation). Transmission losses are relatively large over downstream sub-basins and in the central parts of the watershed, amounting to 16-20% of the total precipitation compared to 3.6% in the upstream area. This pattern reflects the relatively large runoff volumes and the wider and denser mesh of alluvial channels in the downstream and central areas. Conservative estimates of average annual recharge for the examined watersheds were obtained by investigating the frequency of storms that appear comparable to or even more intense than the 1994 event. We identified 16 such events between 1929 and 1983 by assuming that reported monthly precipitation represents a single rain event. Sultan ibid, estimate average annual recharge for the Tarfa, alluvial aquifers at 4.7 × 106 m3, with the assumption that a large storm event of the magnitude of the 1994 event occurs once every 40 months.

Table 5-11

Results of Sultan Hydrology Model for Wadi Tarfa

	El-Tarfa
Precipitation ($x 10^6 m^3$)	76.1
Initial losses $x 10^6 m^3$ (% of total precipitation)	58.4 (76.7)
Transmission losses $x 10^6 m^3$ (% of total precipitation)	15.8 (20.8)
Downstream runoff (% of total precipitation)	1.9 (2.5)

B. Earthquakes:

The area under the consideration is located within the Unstable Shelf. The historical information indicated that many earthquakes caused severe damage in the northern part of Egypt. Some of these events are related to the convergence between the African and Eurasian plates while the others are located within the plate itself. Epicenters of the historical activity are located in some specific areas, which are tectonically active (*Figure 5-18*). Very important information about the tectonics of Egypt can be obtained from the distribution of seismic activity. According to Mahmoud, 2003, Egypt may be divided into eight seismic zones according to its seismicity maps. In the Egyptian territory, the distribution of epicenters of moderate to large and small earthquakes and micro-earthquakes indicates that the earthquake activity tends to occurs along three main seismically active belts and trends. Abou Elenean (1997) divided Egypt into five active seismic zones; the Gulf of Suez-Northern part of Eastern Desert zone, the Southwest Cairo zone, the Northern part of Red Sea, Gulf of Aqaba zone and the Aswan zone .

On October 12, 1992, an earthquake with magnitude mb = 5.9 occurred beneath southwestern Cairo, northern Egypt. The earthquake epicenter was located at coordinates of 29.75°N and 31.13°E, at the outskirts of Dahshour village (*Figure 5-20*), southwest of Cairo, Egypt. Because of the varying shocks of that earthquake, numerous buildings suffered various degrees of damage. A maximum intensity I0 = VIII has been assigned at Manshiyat Fadil village part of GCMA (El-Gammal et al. 1993).

Figure 5-15

The Main Basins and the Type of the Surface Rock Units
(after Sultan et. al., 2005)

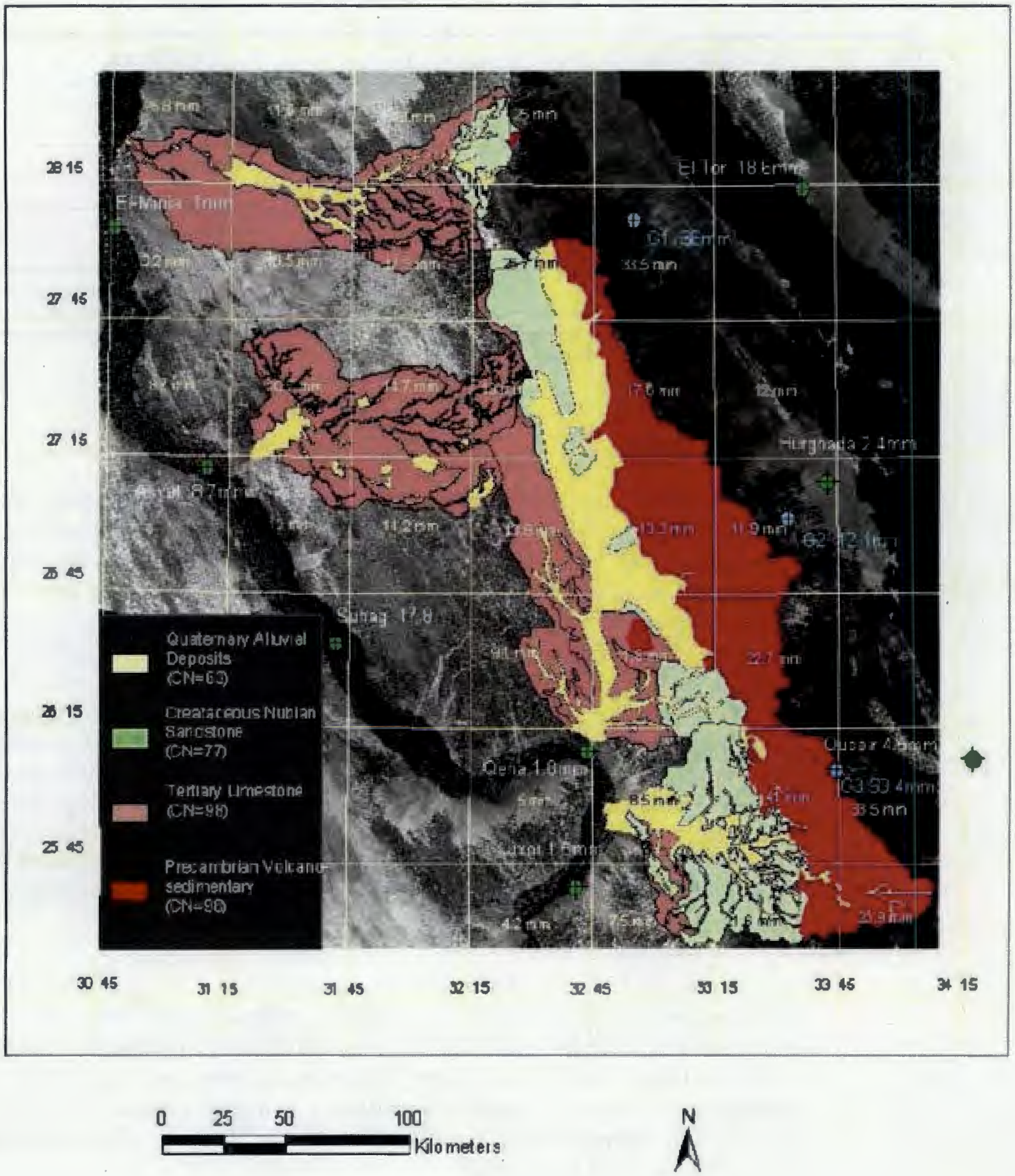


Figure 5-16

Wadi Tarfa Downstream

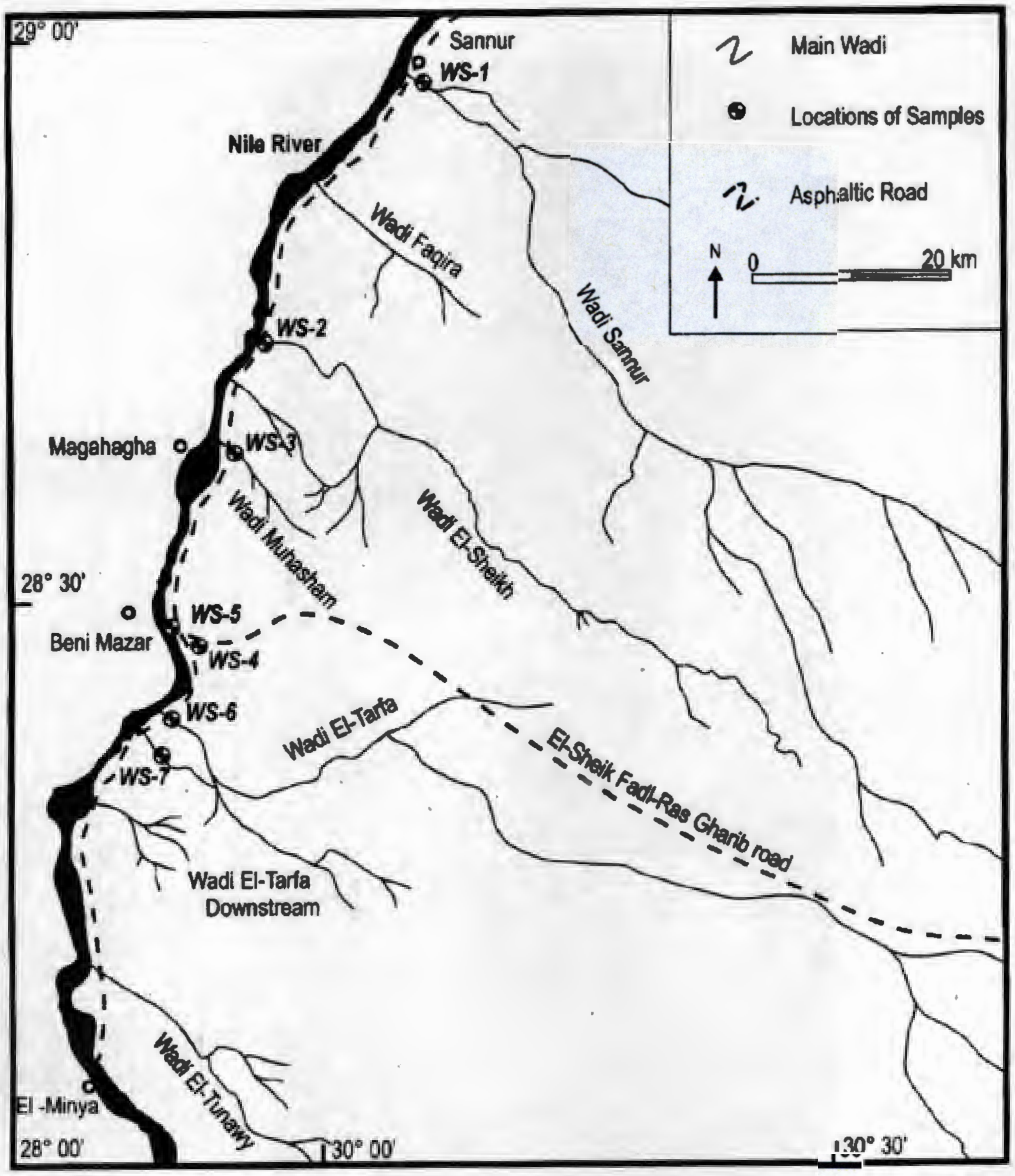
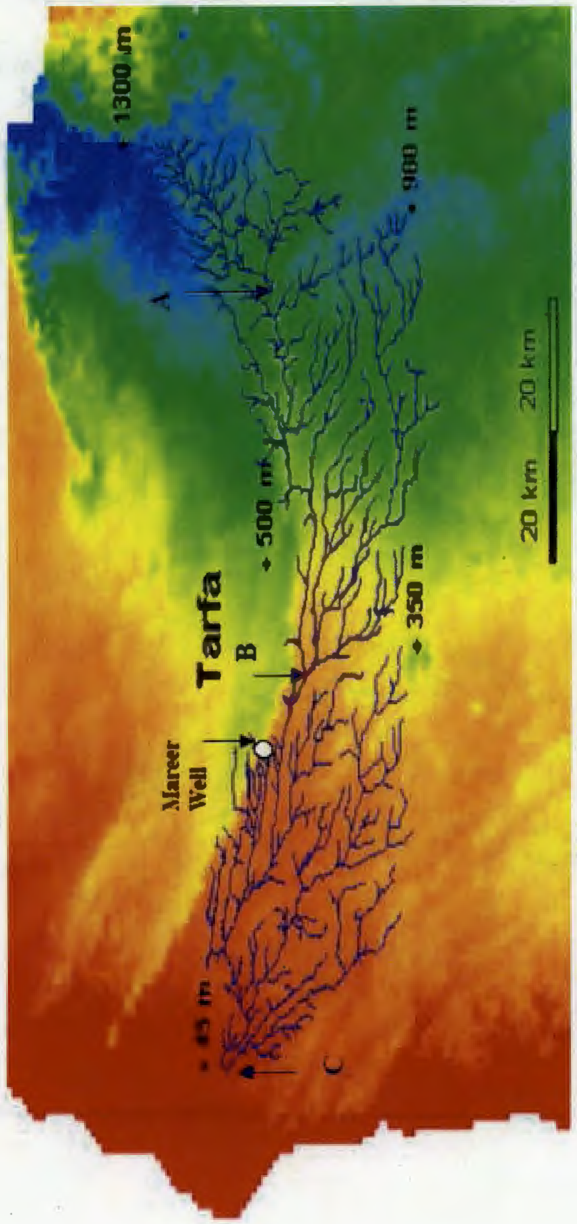


Figure 5-17

Wadi Tarfa Network and Some Hydraulic Parameters
(after Sultan et. al., 2005)



Location	A	B	C
Upstream Area (km^2)	491	3626	5568
Upstream Rainfall m^3 x10^6	11.1	60.9	76.1
Upstream Losses m^3 x10^6	10	48	58.4
Total Upstream Transmission Losses m^3 x10^6	0.4	9.5	15.8
Downstream Runoff m^3 x10^6	0.7	3.4	1.9

Figure 5-18

Wadi Tarfa Downstream Flood Water Accumulation East of Beni Sueif – El-Minia Eastern Highway after the November 1994 Flash Flood

The fault plane solution of the mainshock and the spatial distribution of its aftershocks imply that this earthquake involved normal faulting (*Figure 5-20*) with some strike slip component (El-Hadidy 1993, Maamoun et al. 1993, Hussein et al. 1998, Hussein 1999). In spite of its relatively moderate magnitude, damage caused by this earthquake was large. Maximum damages were reported from Cairo, El-Giza and El-Faiyum which lie near the epicenter and within the Nile Valley (*Figure 5-21*). It was estimated that about 8300 dwellings were destroyed, 561 people were killed, and 6500 were injured. An official investigation revealed that 1343 schools were damaged beyond any repair, 2544 need major repair and 2248 need repair maintenance (Japanese Expert Team 1993, Khater 1992, Thenhaus et al. 1993). The observed liquefaction near the earthquake epicenter occurred in an agricultural area of alluvial Nile deposits . Abu Elenean (1997), used local seismic stations of Egypt Fig. 5. Locations of sand liquefaction and areas seriously damaged during the 1992 Dahshour earthquake (Japanese Expert Team 1993) which are located at Helwan, Kattamia, El Minya , with ten short period portable MEQ stations installed after Dahshour earthquake and few stations in Saudi Arabia, Jordan and Israel for locating the local aftershocks. The depth cross-sections of the aftershock distribution are shown in Fig. 6. In Egypt, there are no strong motion accelerographs installed in Cairo and its vicinity (*Figures 5-22, 5-23 and 5-24*).

C. Liquefaction:

It was very pronounced at Ezbet El Gammal, Aquaz, Atfieh, Massaged Mousa, Menyet El Saff and Helwan (*Figure 5-25*). Water level exceeded one meter over some cultivated area. The trend of cracks (70° and 110°) was also observed on the eastern side of the Nile Valley after the Dahsuer earthquake.

Figure 5-19

Seismicity Map of Egypt
(after Sieberg , 1932)

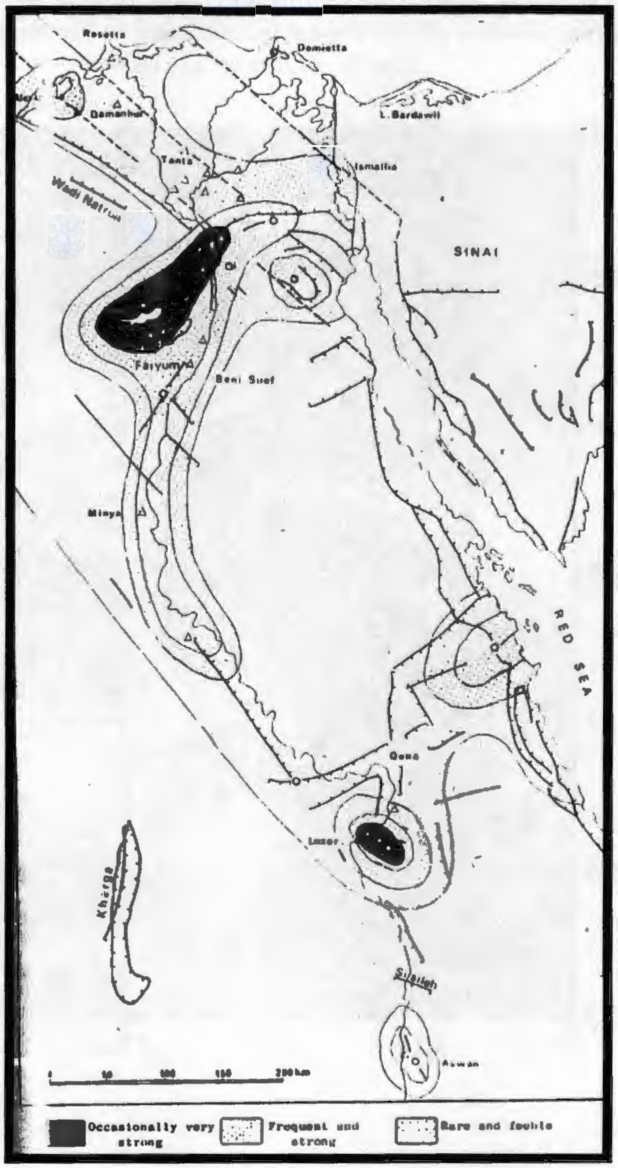


Figure 5-20

Digital Elevation Regional Map showing Border of the Greater Cairo Metropolitan Area (rectangle), the Epicenter (star) of the 1992 Dahshour Earthquake, Main Cities and Towns (squares), and the Recording KEG Station Site (triangle) Used in this Study. Colour Version of this Figure is Available in Electronic Edition Only
(after Moustafa et. al., 2009)

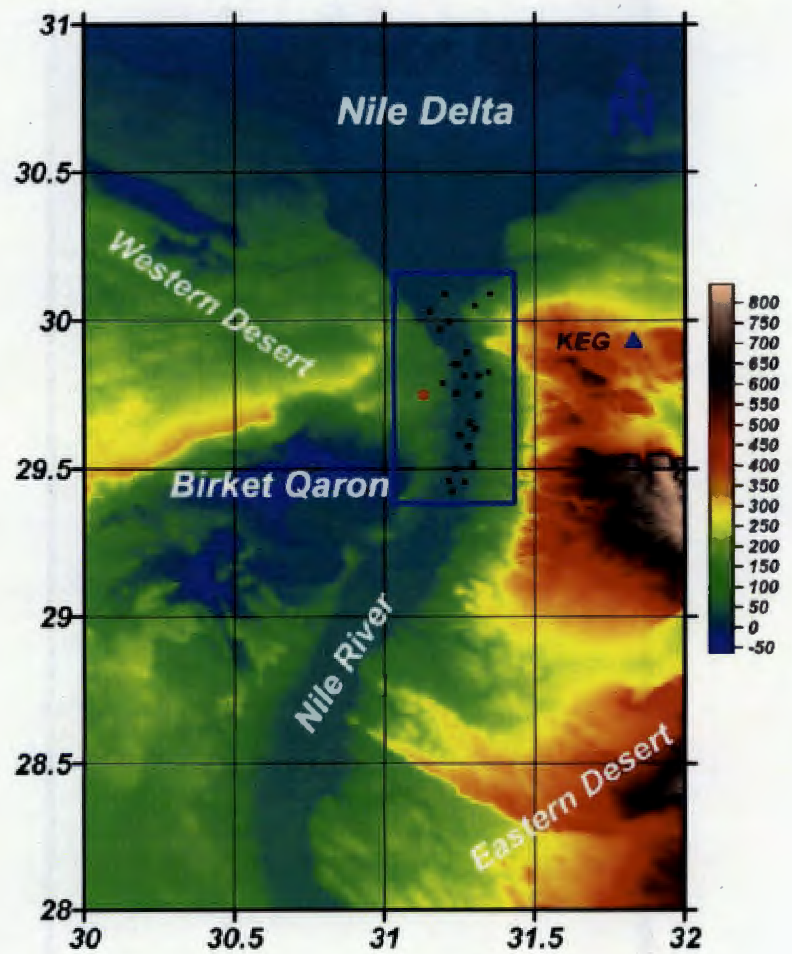


Figure 5-21

(a) Regional Geological Map of Study Area.
(b) The Surface and Subsurface Faults of Egypt
(Both Plots after the Egyptian Geological Survey and Mining Authority 1981)
(after Moustafa et. al., 2009)

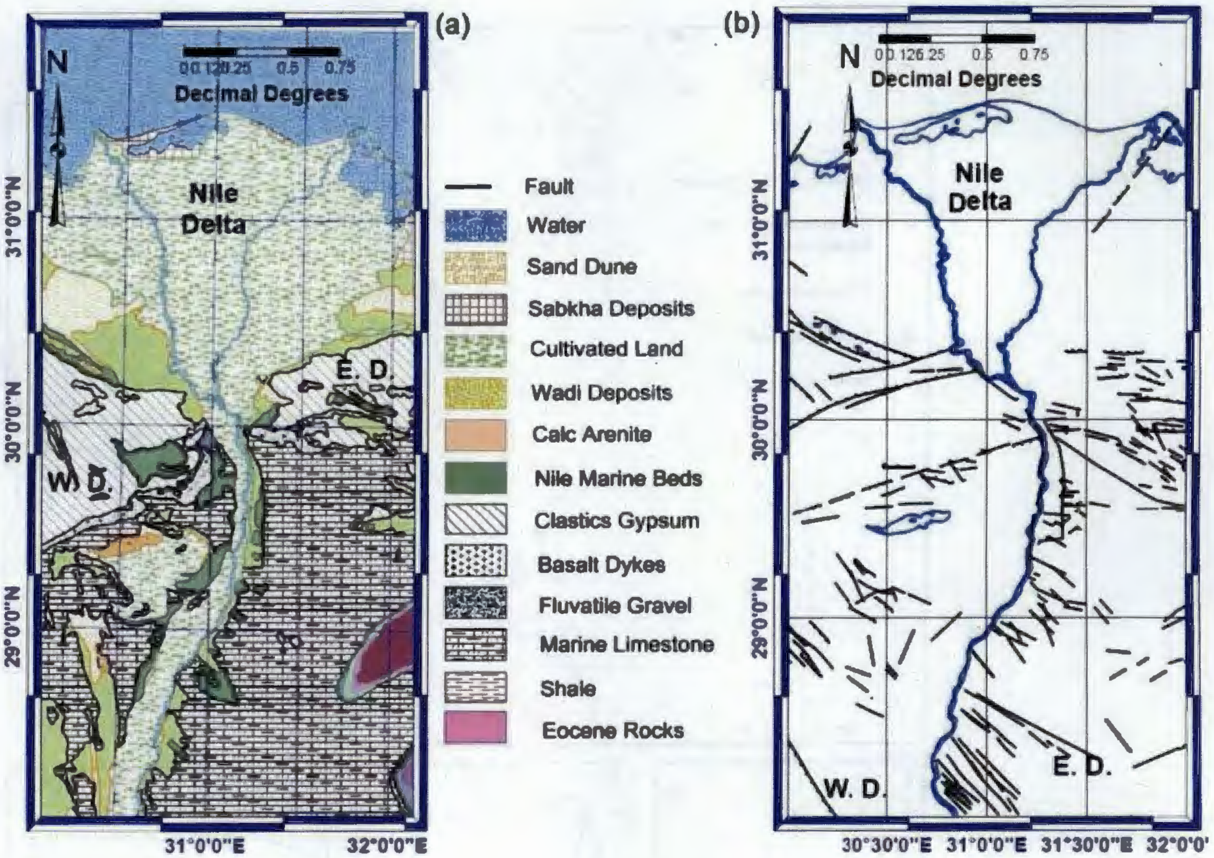


Figure 5-22

Epicenter Distribution of Varying Magnitude Earthquake,
Focal Mechanism of Principal Earthquakes and Active Seismic Trends
(A, B, C and D after Kebeasy 1990, and E after Maamoun and El-Khasab, 1978)

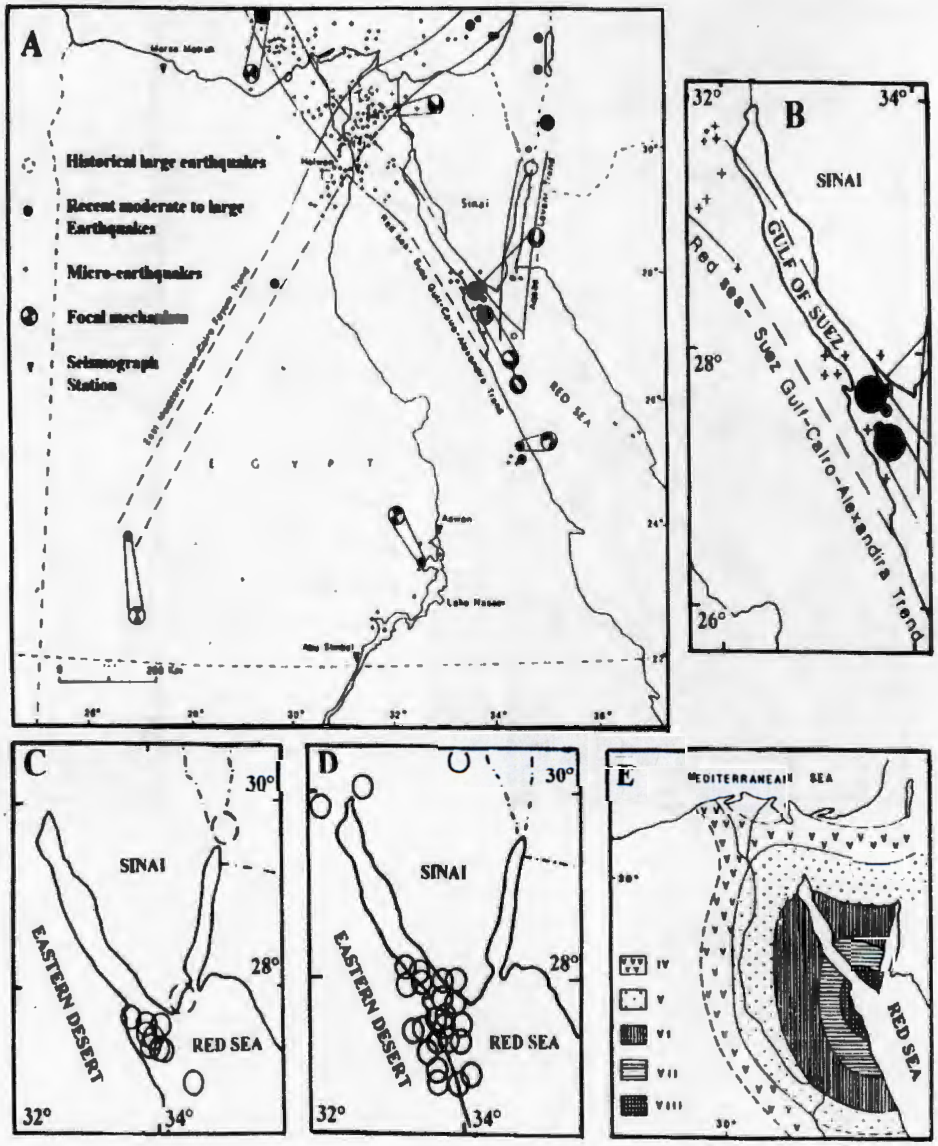


Figure 5-23

Earthquake Activity of Northern Part of Egypt from August 1997 to February 2008. The Arrow Points to the Location of the 12 October 1992 Dahshour Earthquake Epicenter, while the ball shows the Focal Mechanism of that Event
(after Hussein 1999)

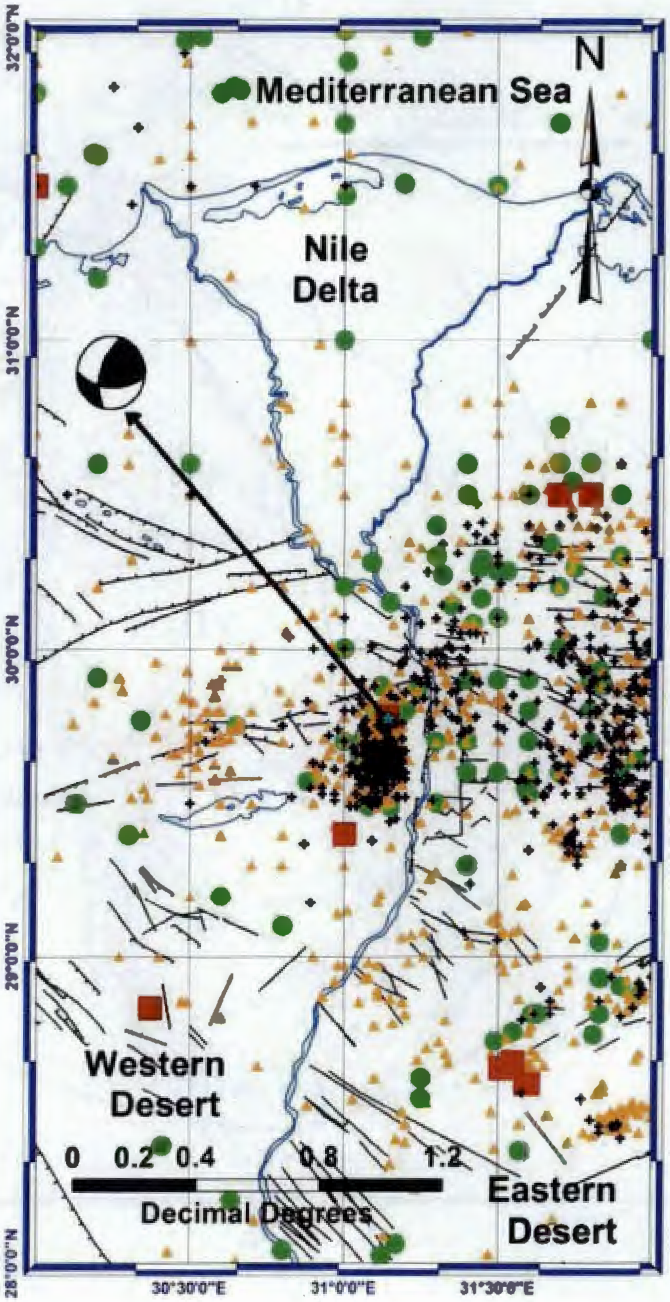


Figure 5-24

Modified Mercalli Intensity (MMI) Distribution of October 12, 1992, Earthquake
(after Thenhaus et al. 1993; credit: U.S. Geological Survey)
[Grey Areas Represent Agricultural Lands while Dark Grey area is Urban Region]

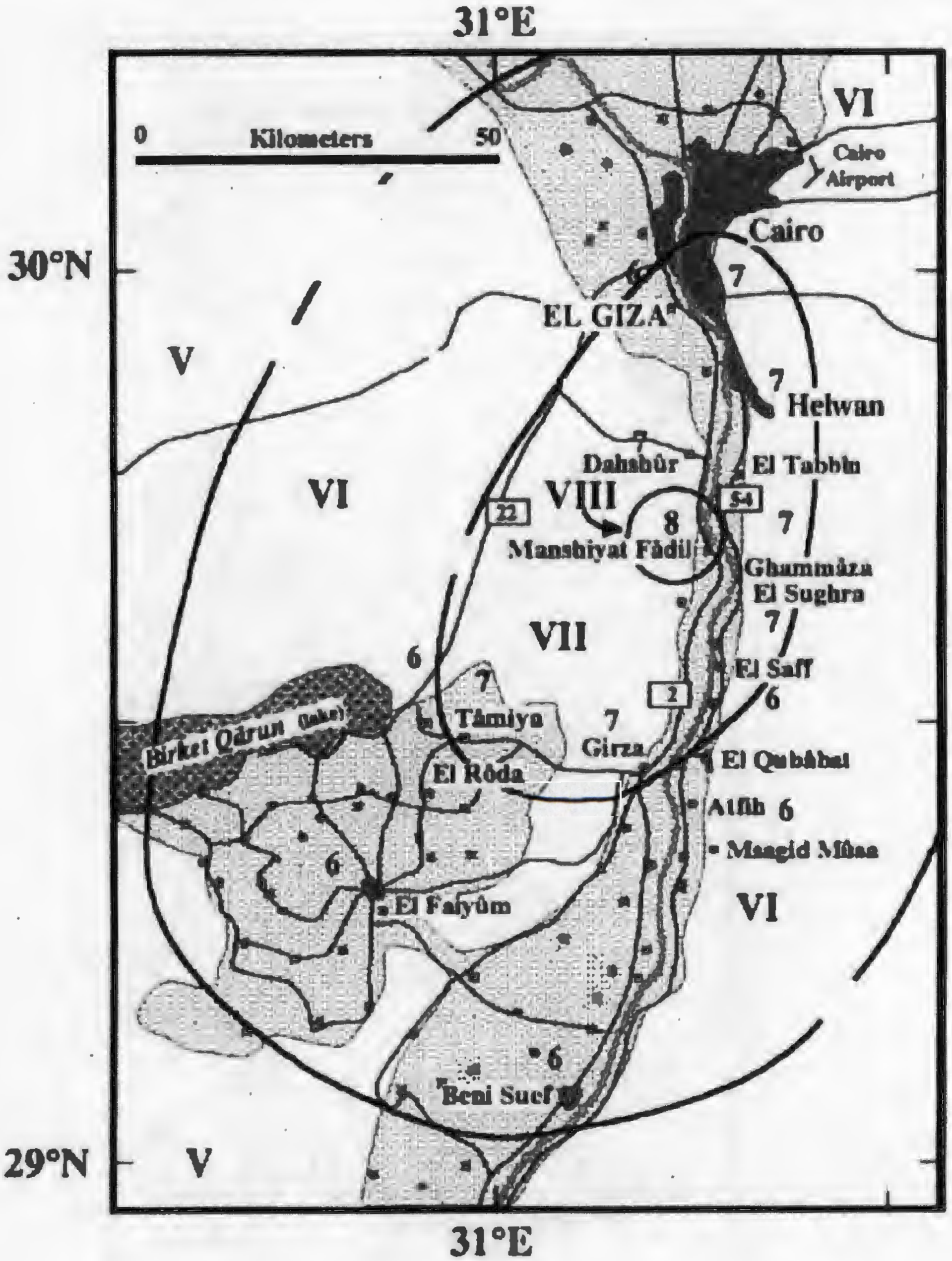
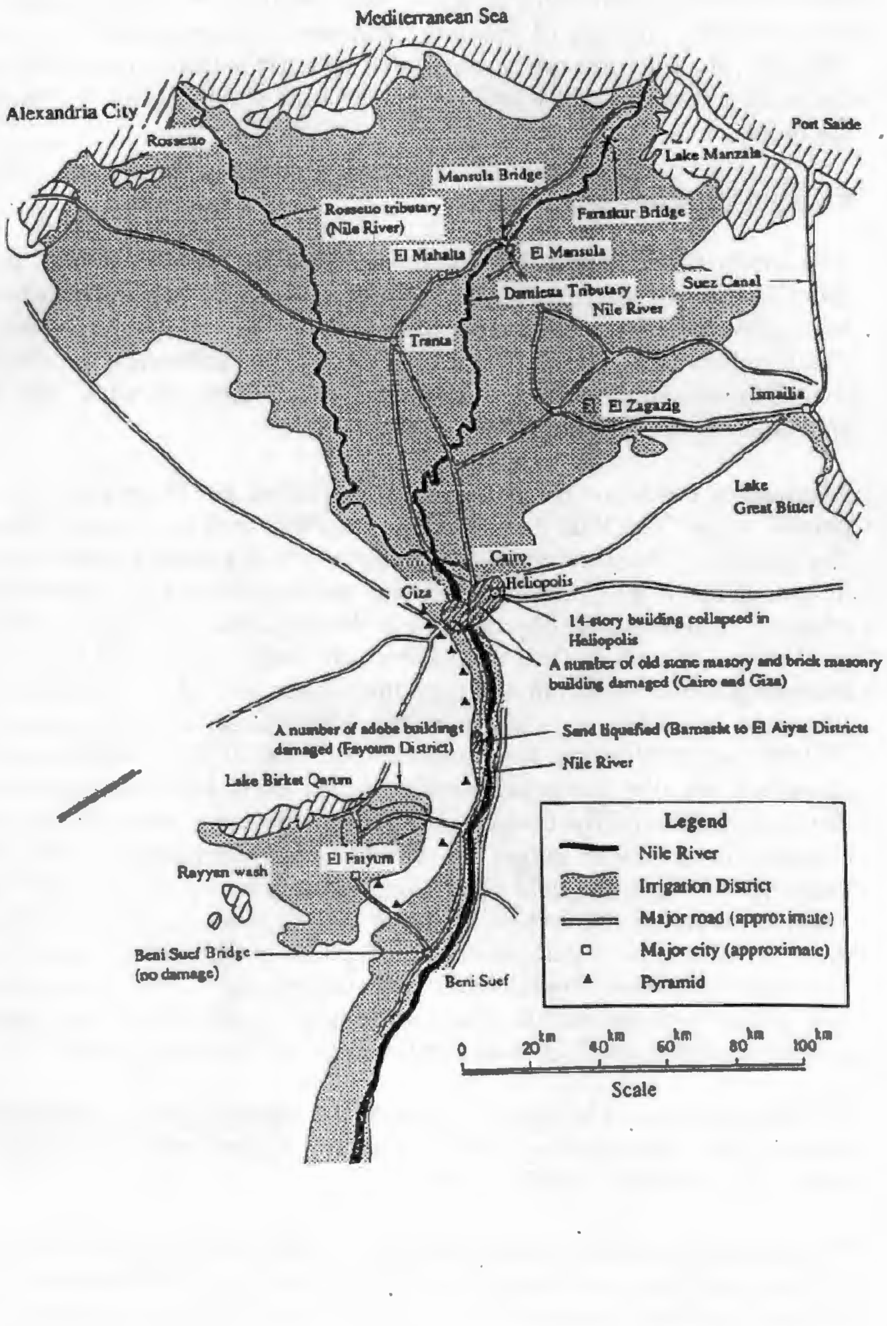


Figure 5-25

Locations of Sand Liquefaction and areas Seriously Damaged during the 1992 Dahshour Earthquake

(Japanese Expert Team 1993)



D. Karst and Pot-Holes:

Due to groundwater seepage and surface water infiltration in Wadi Garawi basin, the water stored within the joints and the fracture of the carbonate rocks. The dissolution process resulting in the formation of pot-holes and karst features. Some negative geotechnical problems are locally known that adversely affected buildings and other engineering structures in Helwan and 15 rd May City including cracking of buildings and roads. In several parts all over the 15 May City, the fractures are accompanied by karst features that resulted from the chemical action of vadose and deeper ground waters through planes of these fractures.

E. Sand Dune Encroachments:

Abd Moati (1993) stated that the linear dune, of Wadi El Rayan, is relatively short (10 km) and narrow (0.1–0.2 km) organized in three parallel belts and apart from a few bones is concentrated in the eastern part of the depression. El Gindi (2000) stated that the inter dune area of the extreme eastern belt in this dune field is reclaimed and is cultivated during the last three decades, and the dunes appear as captured by cultivated land.

A group of barchans and elongated sand dunes are located in N–S direction, parallel to the Nile Valley and close to the cultivated land, west of Samalut city (*Figure 5-26*). These sand dunes represent a natural hazard to the cultivated land, in an area subjected to development and settlements in Egypt; therefore it needs scientific studies elucidating the genetic development and characteristics of these sand dunes as well as their risk. The study dunes are part of large dune fields extending about 150 km in a longitudinal shape from the depression of Wadi El Rayan to the western margins of the Nile Valley; it lies between Latitudes 28°15'N and 28°21'N and Longitudes 29°30'E and 30°35'E. This dune field is built of several parallel compound and complex dune belts extending in the SSE direction. Landsat ETM images and topographic maps show that the dune form changes from linear ridges to barchan and barchanoid belts. From the topographic maps, the field can be divided into two parts: the northern part in Wadi El Rayan is dominated by linear dunes, while barchans and barchanoid occur in the southern part outside the depression.Said (1981) named this stretch of aeolian sand dune remains as El Khafoug Formation, inter-finger both the Pre-Nile deposits of the Middle Pleistocene (ending 200 000 BP) and the Neo-Nile sediments of the Late Pleistocene sediments to be 12 000–20 000 BP.

The Western Desert of Egypt is part of the driest region on the earth for this reason wind is the main agent of erosion and deposition in a completely aeolian environment (El-Baz and Wolf, 1981).

The main feature in the southern section of these dune fields is that the eastern arm of most barchans extends southwards more than the western one, making the form of linear dune or "Draa" (arm). The length of these Draa varies from 0.30 to 3 km and with a mean direction of 150°. The evolution of the linear dunes out of the eastern born of barchans and ultimately growing into an independent longitudinal dune is not only caused by NNW winds as indicated by the mean wind pattern but also by the stormy wind component blowing even more from the west. The slope of the terrain is from west to east towards the Nile Valley and thus the sand moves preferably down slope. The dune movement and sand encroachment on the cultivated fields along the margins of the Nile flood plain represent a permanent threat to soil productivity and agricultural production in this region. Dunes move at rates that have been variously estimated from 10 to 100 m/year (Bagnold, 1941); the rates are proportional to the length of duration of the effective wind as well as to the size, angle of slope and length of the windward side of the dune. The dune movement is controlled not only by the mean wind pattern but also by the stormy wind component blowing even more from the west. The slope of the terrain is from west to east towards the Nile Valley and thus the sand moves preferably down slope. The dune size is expressed by the surface (area) of the dune as estimated from the image by the Arc GIS software (*Figure 5-26*) m. They are larger towards the east and smaller towards the west (*Figure 5-27*); the relation is an almost perfect linear relation. The same dunes tend to be also larger towards the south, but with a less perfect linear relation. In general, it can be concluded that the dunes are generally larger in the down wind direction (SE direction).

Figure 5-26

Sand Dune Change Detection
(after El-Gammal , 2010)

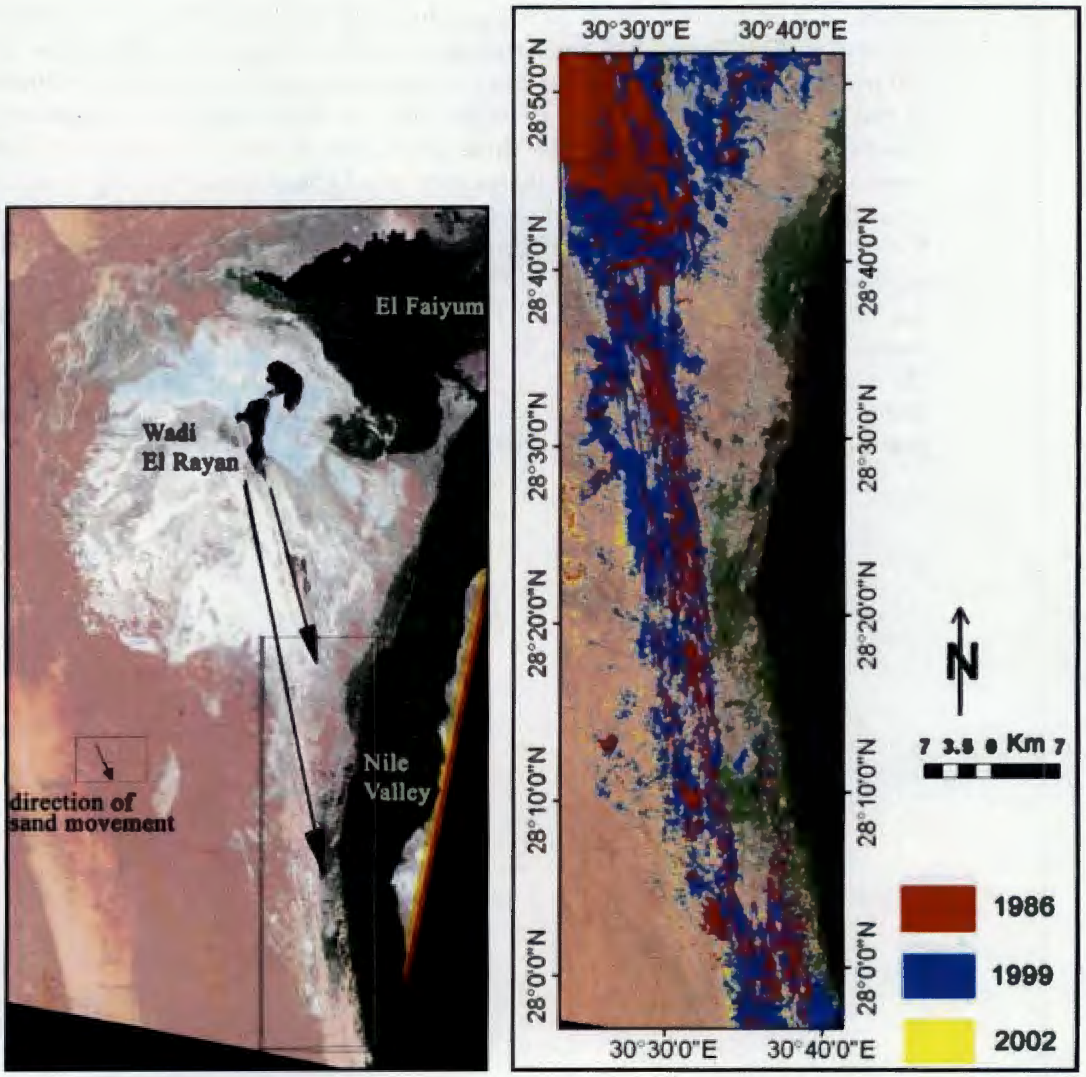


Figure 5-27

Sand Dune Encroachment in the West Sammalut Area

5.2.7 Background Air Quality

Air Quality Monitoring along the Entire Route

Concentrations of ambient pollutants vary according to both time and location. They are affected by many factors, the most significant being the size, number and location of emission sources and the prevailing weather.

Air quality monitoring at the proposed site was undertaken by the Air Pollution Preclusion Department, National Research Center during February 2012 on behalf of ECG. Monitoring took place at Nine monitoring sites along the entire route, namely Helwan, Es-Saff, Wadi Ar-Rashrash, Mid-area between Jabal Humr Shaybun & Beni-Sueif, Wadi Sannur, Jabal Al-Mirayr, Jabal Al-Ahmar, Beni-Mazar and Samallout (*see Figure 5-28*).

Continuous measurements, over a period of 24 hours, were taken for nitrogen oxides (NOx), carbon monoxide (CO), carbon dioxide (CO_2), sulfur dioxide (SO_2), aldehydes (HCHO), hydrogen sulfide (H_2S), smoke and total suspended particulates (TSP). The results of this monitoring are shown in *Table 5-12 and Table 5-13* below. Comparison with Egyptian Threshold Limit Values (TLVs) (as stipulated in Law 4/1994) show that the concentrations of gaseous pollutants in ambient air along the proposed route are within the TLVs for 24 hour averages.

Table 5-12

Mean Concentrations of Gaseous Air Pollutants along the Entire Route

No.	Site	CO mg/m³	CO_2 mg/m³	SO_2 µg/m³	NO_2 µg/m³	HCHO µg/m³	H_2S µg/m³
1.	Helwan	1.16	13.54	14.61	9.13	17.36	11.31
2.	Es-Saff	1.14	64.15	17.97	26.62	28.31	8.33
3.	Wadi Ar-Rashrash	2.22	69.32	32.66	46.3	20.21	30.95
4.	Jabal Humr Shaybun/Beni-Sueif	0.95	59.02	61.28	58.32	26.4	6.86
5.	Wadi Sannur	1.91	44.11	35.13	27.12	25.12	9.18
6.	Jabal Al-Mirayr	2.17	31.12	32.17	21.15	47.31	14.18
7.	Jabal Al-Ahmar	1.88	41.77	29.41	23.62	57.11	15.17
8.	Beni-Mazar	2.11	35.17	22.81	26.55	61.33	13.11
9.	Samallout	1.17	48.30	27.18	28.59	68.61	4.75
	EEAA TLV(*)	10 (8-hr mean)	-	150	150	-	-

Notes:

(*) According to the Environment Law #4 (1994) modified by the Law #9 (2009).

- Not listed in the law.

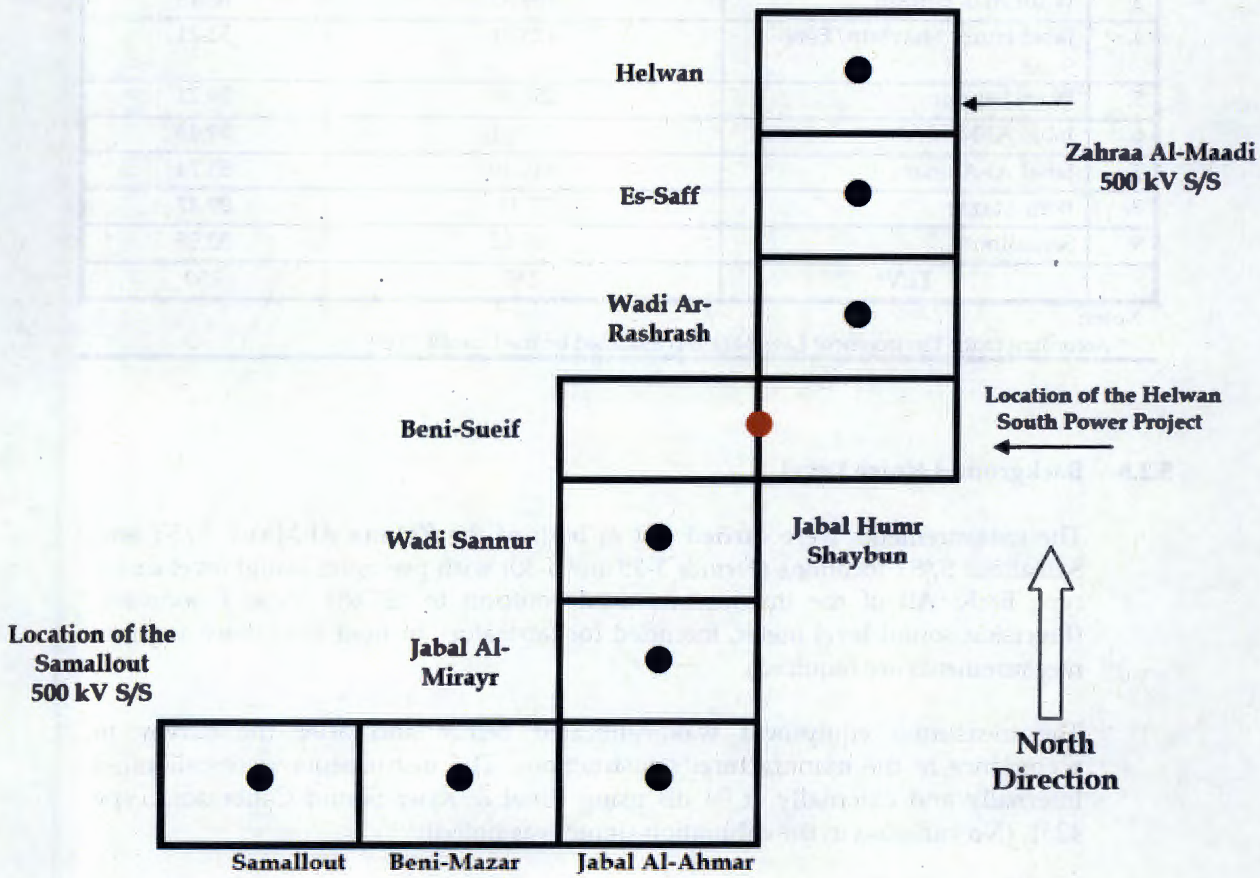
CO= Carbon monoxide　　CO_2=Carbon dioxide

SO_2= Sulphur dioxide　　NO_2=Nitrogen dioxide

H_2S= Hydrogen Sulphide　　HCHO=Aldehydes

Figure 5-28

The Entire Route Areas and the Selected Monitoring Locations



Scale: 1 : 50,000

Table 5-13

Mean Concentrations of Solid Air Pollutants along the Entire Route

No.	Site	Total Suspended Particulate μg/m³	Smoke μg/m³
1.	Helwan	177.85	45.11
2.	Es-Saff	211.91	89.53
3.	Wadi Ar-Rashrash	199.33	68.13
4.	Jabal Humr Shaybun/Beni-Sueif	123.51	52.21
5.	Wadi Sannur	155.83	59.71
6.	Jabal Al-Mirayr	115.91	39.43
7.	Jabal Al-Ahmar	145.49	53.74
8.	Beni-Mazar	77.18	29.47
9.	Samallout	115.62	33.95
	TLV*	230	150

Notes:
* According to the Environment Law #4 (1994) modified by the Law #9 (2009).

5.2.8 Background Noise Level

The measurements were carried out at both of the Zahraa Al-Maadi S/ST and Samallout S/ST locations (*Figures 5-29 and 5-30*) with precision sound level meter type B&K. All of the instruments used conform to IEC651 Type 1 accuracy. (Precision sound level meter, intended for laboratory or field use where accurate measurements are required).

The measuring equipment was calibrated before and after the survey in accordance to the manufacturer's instructions. The instruments were calibrated internally and externally at 94 dB using Bruel & Kjaer Sound Calibrator, Type 4231. (No variation in the calibration signal was noted).

For all the measurements, the sound level meter was mounted on a tripod 1.5m above the ground. The microphone was always fitted with a windshield during the noise measurements duration. The time weighting was fast, and the frequency weighting was A.

Noise level was recorded at the locations by a series of spot measurements.

Measured Quantities

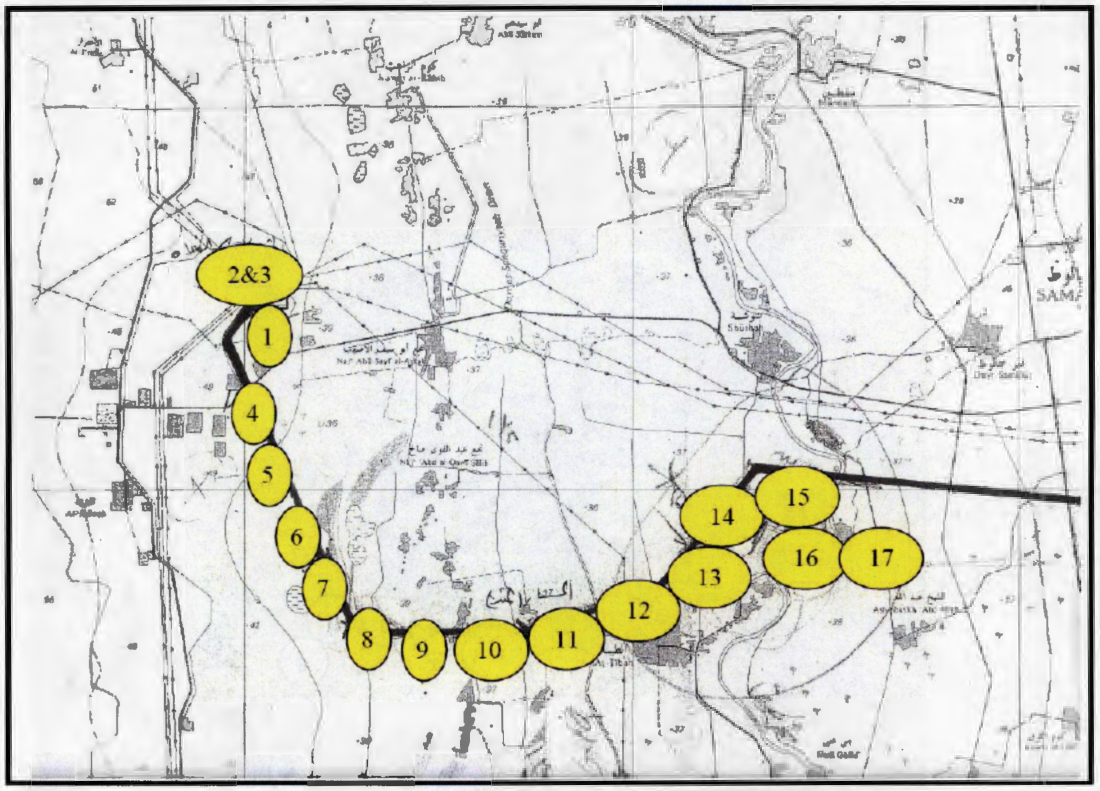
- All measurements and quantities are A-weighted.
- The instruments quickly provide time histories of the frequency weighted noise levels from which the Equivalent Continuous Sound Level LAeq is determined as well as all other needed variables.
- The standard statistical parameters and criteria (LAeq, LAFMax, LAFMin, LAF01,

Figure 5-29

Measurement Locations at Zahraa Al-Maadi Area

Figure 5-30

Measurement Locations at Samalluot Area



- LAF10, LAF50 and LAF90)
- Sequential analysis in terms of 1/3 octave frequency bands (spectrum) was recorded as function of time.

All precaution comply to ISO 1996-2:1987(and 1998) and BS 4142.

Summary of Results

1. Zahraa Al-Maadi S/ST Area

The results of the noise measurements are presented as follows:

- Measured parameters for different locations (*Table 5-14*).
- Third-Octave analysis for the noise signals (*Figure 5-31*).

Figure 5-32 depicts some measurement photos.

Table 5-14

Main Parameter Values over the Measured Redings at Zahraa Al-Maadi S/ST Location

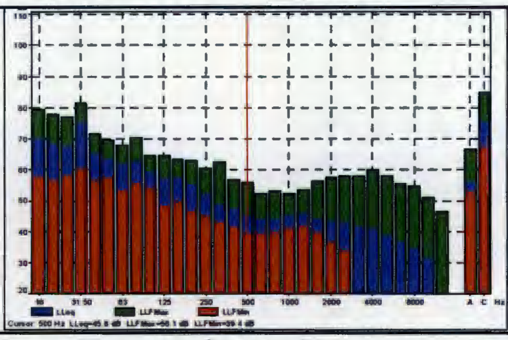
Location	LAeq	LASMax	LASMin	LAF1	LAF5	LAF10	LAF50	LAF90	LAF95	LAF99
1	56.51	62.37	52.93	62.05	58.92	58.08	55.82	54.23	53.92	53.50
2	59.13	67.04	55.85	63.91	62.10	60.94	58.19	56.48	56.17	55.57
3	59.54	72.37	51.79	71.69	64.64	61.60	55.26	52.94	52.41	51.59
4	53.74	62.27	52.85	51.53	52.02	50.31	55.44	53.83	53.54	53.06
5	54.62	61.4	59.03	50.26	57.96	56.68	53.94	51.73	50.64	58.94
6	55.41	53.58	59.61	53.53	57.94	57.01	54.30	52.79	52.08	50.84
7	54.41	50.07	50.55	59.35	57.05	56.12	53.90	51.73	51.17	50.47
8	52.47	54.95	58.6	55.28	54.18	53.73	52.35	50.87	50.68	50.41
9	51	54.46	58.07	54.78	53.17	52.42	50.47	59.49	59.23	58.74
10	55.65	59.28	53.79	59.57	57.83	57.19	55.20	54.20	53.99	53.66
11	57	70.69	51.84	60.20	58.33	57.84	55.83	52.62	52.23	51.61
12	58.68	70.28	53.62	70.23	63.75	60.22	55.52	53.85	53.58	53.14
13	54.87	66.29	55.78	54.50	51.41	59.42	59.37	56.58	56.10	55.64
14	51.08	59.73	48.19	55.99	53.81	52.90	50.12	48.65	48.41	48.05
15	54.63	60	50.87	60.52	57.57	56.56	53.71	51.86	51.62	51.26
16	58.15	67.56	53.2	68.00	63.75	58.82	55.56	53.89	53.53	52.93
17	57.44	63.53	54.82	62.80	59.99	58.88	56.80	55.40	55.13	54.41
18	54.9	61.42	56.49	51.59	50.62	59.78	50.63	58.05	57.26	56.45
19	58.89	50.19	57.76	50.19	57.17	51.03	52.16	59.21	58.21	57.53
Average	55.69									

Measurements Conclusion

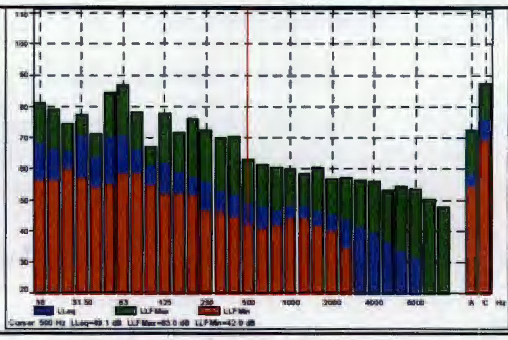
- For the current situation the sources is very limited only noise communing from the wind.
- All 1/3 octave analysis indicate normal reading for the noise level not exceeding the expected values around the area.
- The direction of the wind will help reducing noise level.

Figure 5-31

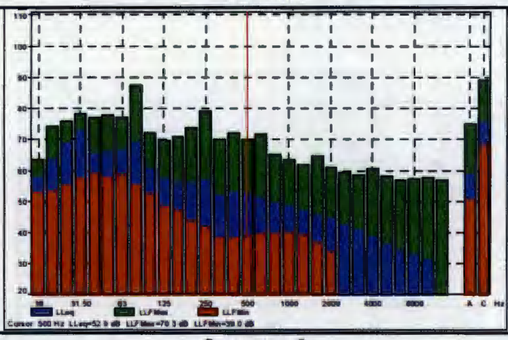
Spectrum Graph of Values of Sound Levels for Each Third Octave Band at Zahraa Al-Maadi
(Locations 1 through 6)



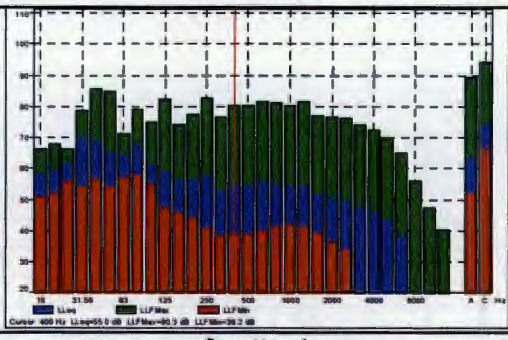
Location 1



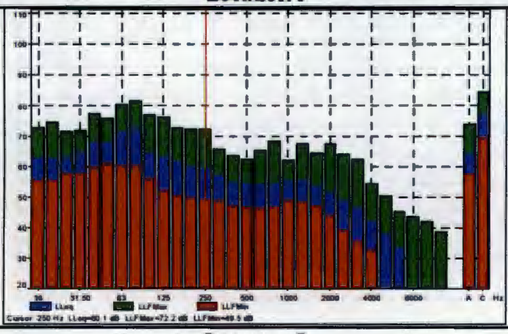
Location 2



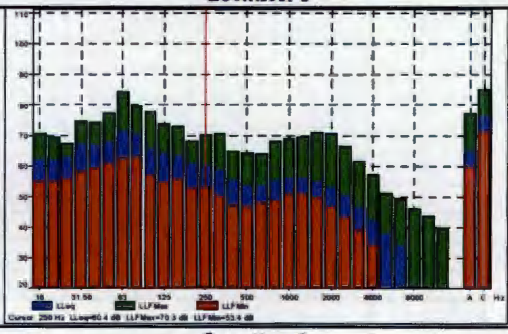
Location 3



Location 4



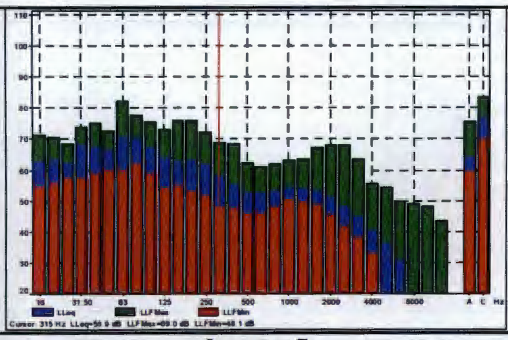
Location 5



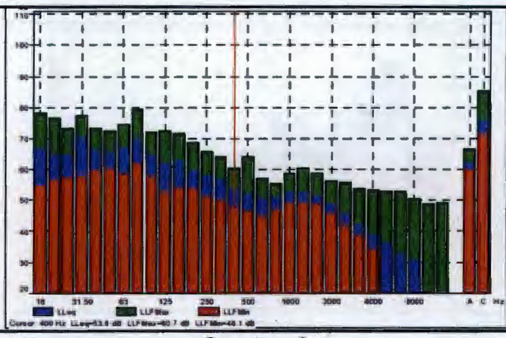
Location 6

Figure 5-31 *(Contd.)*

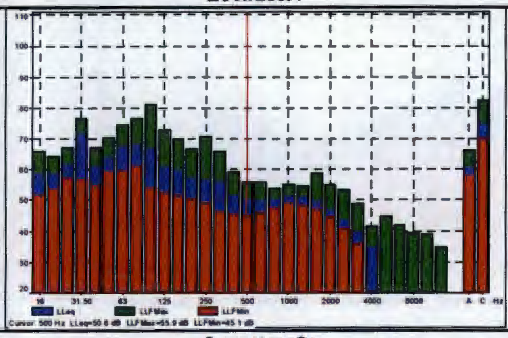
Spectrum Graph of Values of Sound
Levels for Each Third Octave Band at Zahraa Al-Maadi
(Locations 7 through 12)



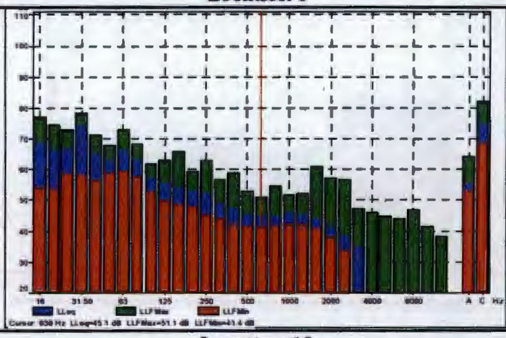
Location 7



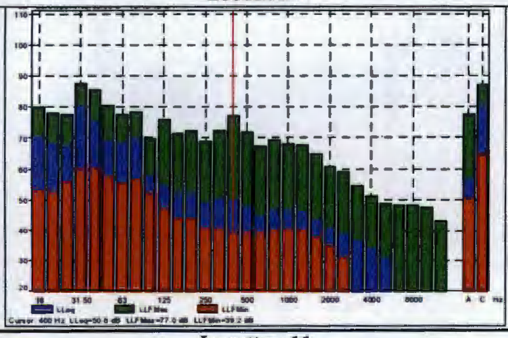
Location 8



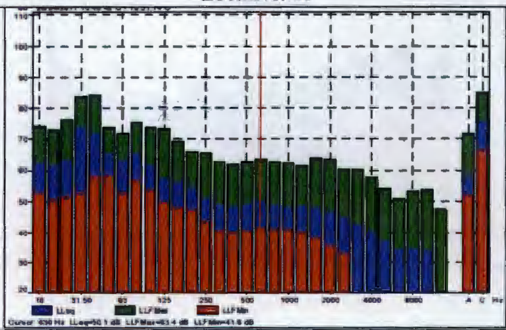
Location 9



Location 10



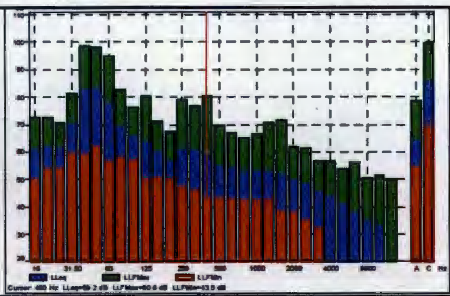
Location 11



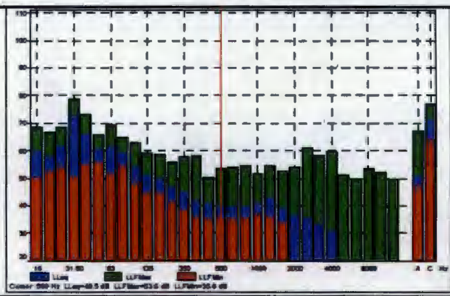
Location 12

Figure 5-31 ***(Contd.)***

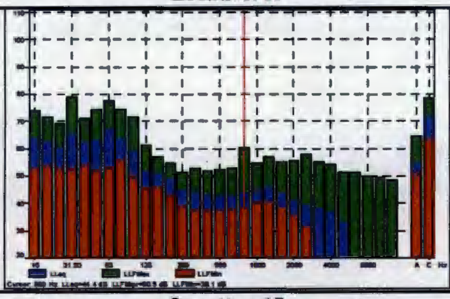
Spectrum Graph of Values of Sound Levels for Each Third Octave Band at Zahraa Al-Maadi
(Locations 13 through 19)



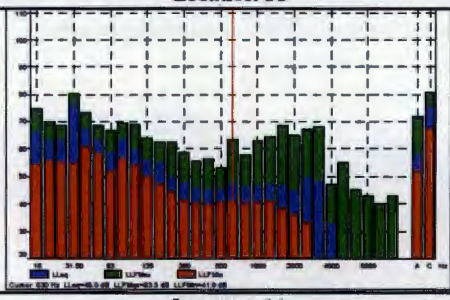
Location 13



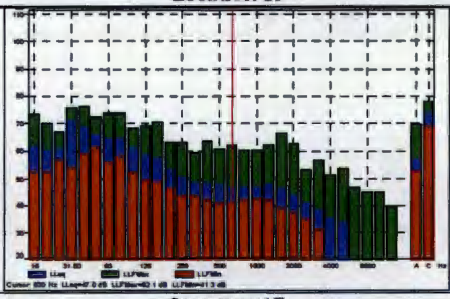
Location 14



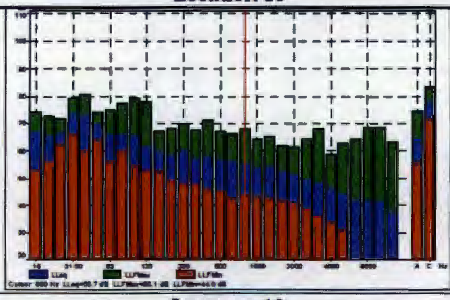
Location 15



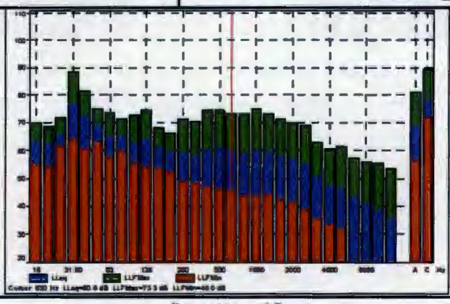
Location 16



Location 17



Location 18



Location 19

Figure 5-32

Some Measurement Photos at Zahraa Al-Maadi Area

2. Samallout S/ST Area

The results of the noise measurements are presented as follows:

- Measured parameters for different locations (*Table 5-15*).
- Third-Octave analysis for the noise signals (*Figure 5-33*).

Figure 5-34 depicts some measurement photos.

Table 5-15

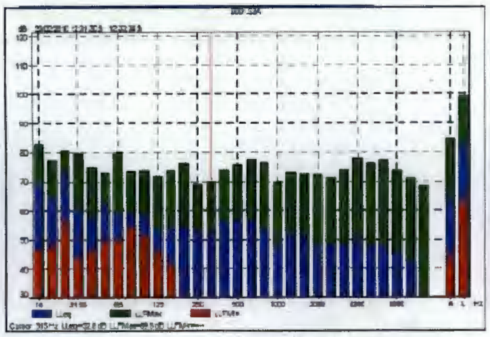
Main Parameter Values over the Measured Readings at Samallout S/ST Location

	Location	LAeq	LAFMax	LASMin	LAF1	LAF5	LAF10	LAF50	LAF90	LAF99	Remarks
Samallout Area	1	62.95	75.74	47.68	*	*	*	*	*	*	During measuring there was continues heavy trucks and petroleum helicopters.
	2	74.1	83.74	60.22	83.24	80.71	77.72	70.86	61.48	60.01	
	3	68.1	80.62	64.3	76.36	72.75	71.06	65.18	64.44	64.10	
	4	64.83	73.27	62.35	67.60	65.83	65.29	64.68	64.19	63.75	
	5	67.56	81.57	62.72	78.80	70.56	67.70	65.31	64.48	61.90	
	6	74.01	88.37	59.79	84.23	79.76	77.48	70.68	61.49	57.51	
	7	73.91	82.04	56.68	81.65	80.28	77.31	72.02	59.17	55.59	
	8	55.77	73.23	43.58	67.85	62.86	58.64	47.79	43.75	42.32	
	9	53.73	74.05	43.83	67.63	56.44	53.07	47.02	44.58	42.94	Normal reading no trucks or helicopter.
	10	57.54	80.89	46.48	71.25	59.11	55.88	48.83	45.99	44.60	The dynamic range was low.
	11	66.59	86.98	46.19	80.72	68.08	64.89	51.53	46.61	44.96	There was a heavy truck on the servant road.
	12	72.48	86.65	51.31	*	*	*	*	*	*	Normal reading no trucks or helicopter
	13	73.38	87.4	57.07	*	*	*	*	*	*	
	14	66.81	81.11	53.51	76.52	72.61	70.86	62.39	56.90	53.26	
	15	73.2	89.25	55.64	81.13	78.72	77.59	68.46	61.28	53.03	
	16	75.6	85.64	54.29	84.05	81.43	80.05	72.41	60.19	54.13	
	17	76.46	90.1	54	*	*	*	*	*	*	

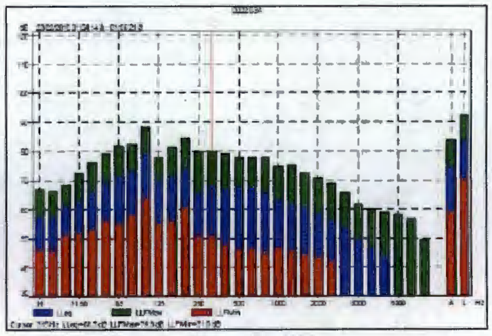
* Out of dynamic range.

Figure 5-33

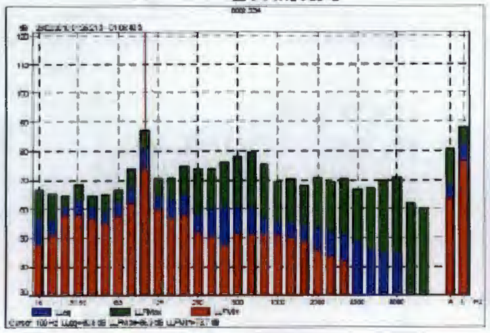
Spectrum Graph of Values of Sound Levels for Each Third Octave Band
(Locations 1 through 17)



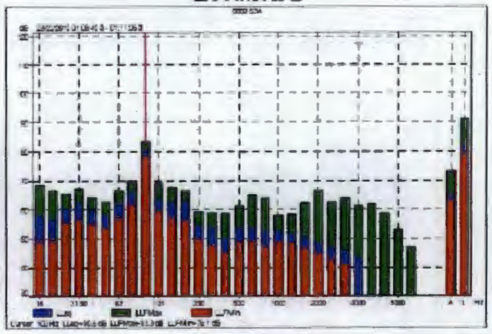
Location 1



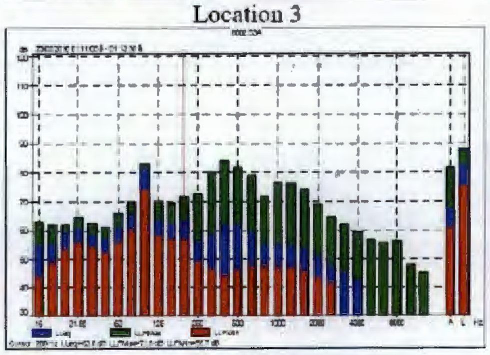
Location 2



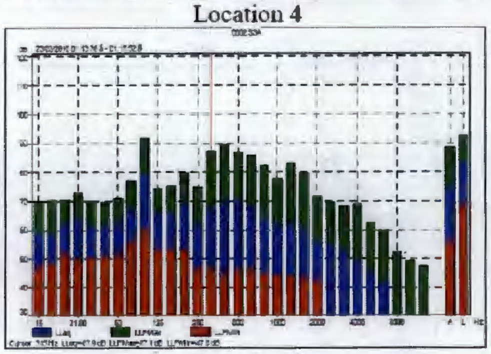
Location 3



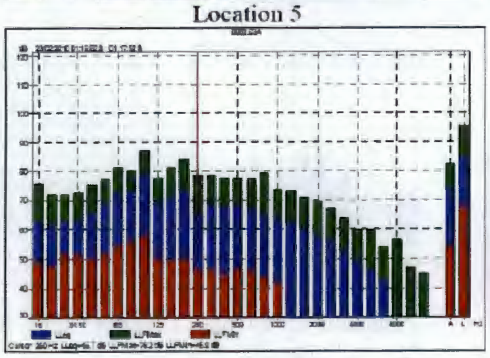
Location 4



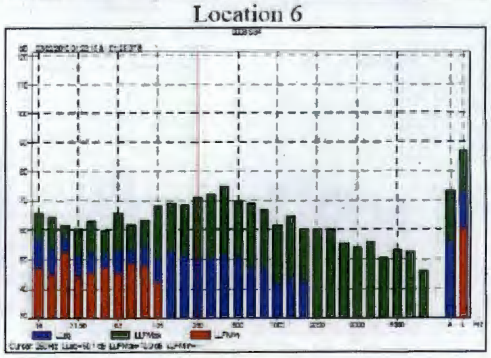
Location 5



Location 6



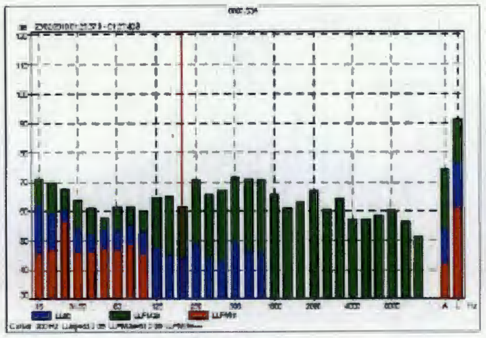
Location 7



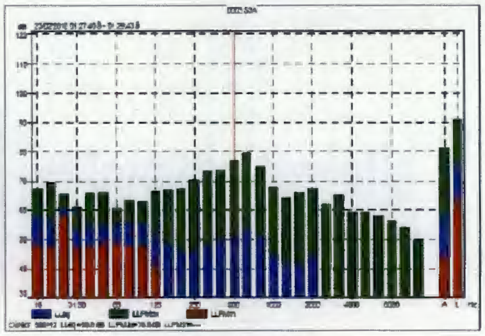
Location 8

Figure 5-33 ***(Contd.)***

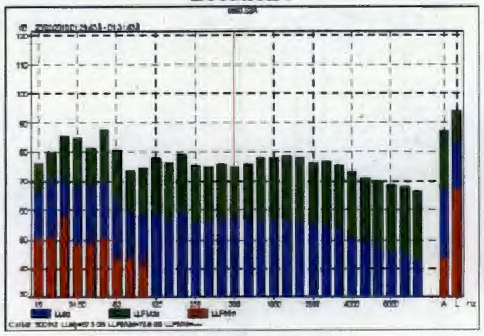
Spectrum Graph of Values of Sound Levels for Each Third Octave Band
(Locations 1 through 17)



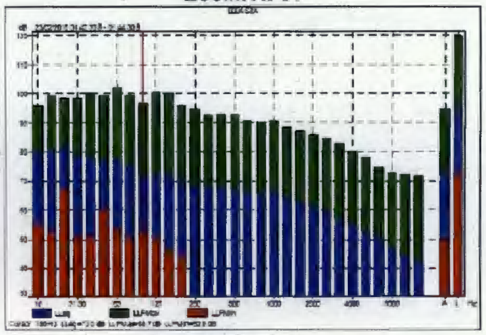
Location 9



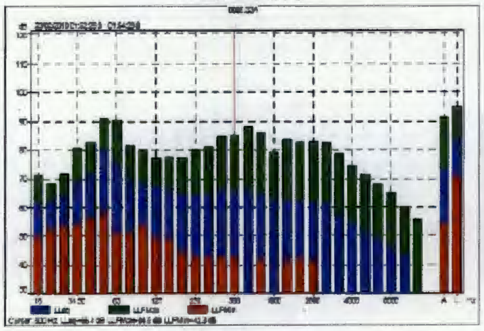
Location 10



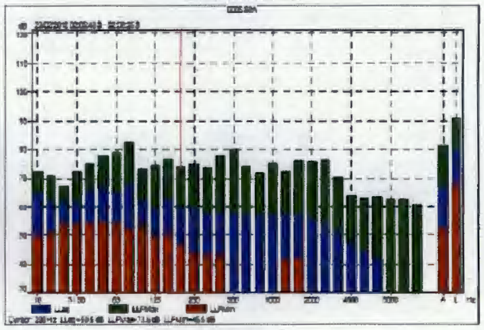
Location 11



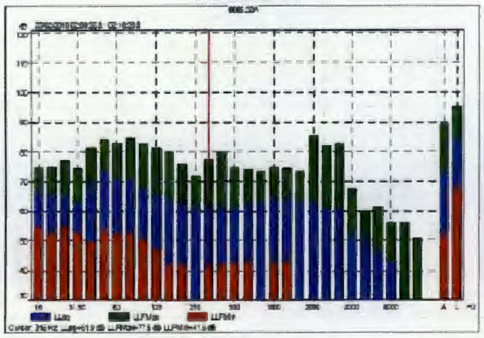
Location 12



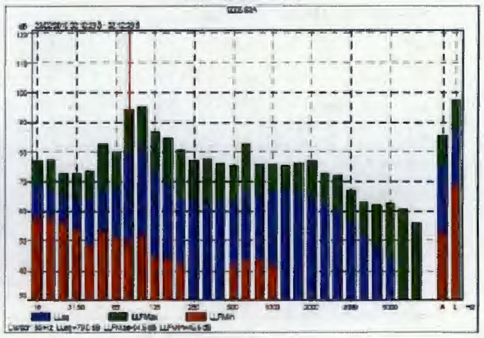
Location 13



Location 14



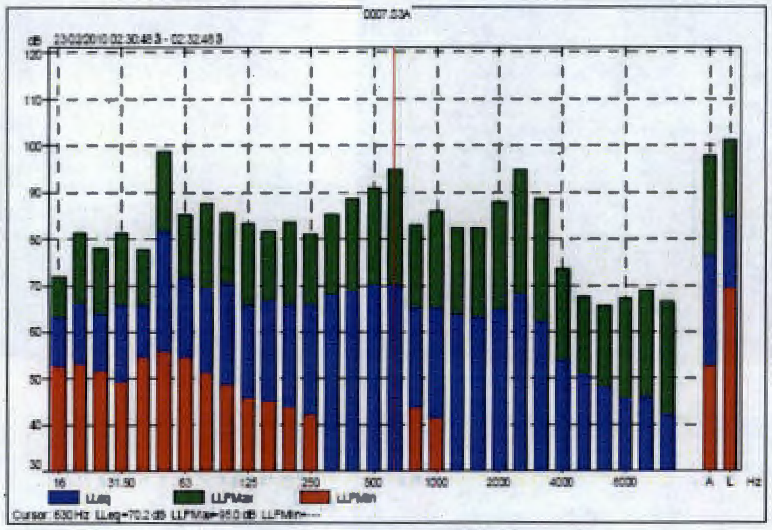
Location 15



Location 16

Figure 5-33 *(Contd.)*

Spectrum Graph of Values of Sound Levels for Each Third Octave Band
(Locations 1 through 17)



Location 17

Figure 5-34

Some Measurement Photos at Samallout

Measurements Conclusion

- For the current situation based on the nearby activity the sources is basically noise communing from the traffic.
- The area down to the proposed line have some small village is considered to be a residential area having some framers that works in villages.
- All 1/3 octave analysis indicate normal reading for the noise level not exceeding the expected values around the area. apart from low range generated from irrigation equipments.
- The direction of the wind will help reducing noise level on that villages
- There will be no effect on the power line on the residential area from noise point of view.
- Most line alignment are some distance from residential areas.

Noise Prediction Code for Samallout Area

The work procedures for noise prediction at Samallout included the following steps:

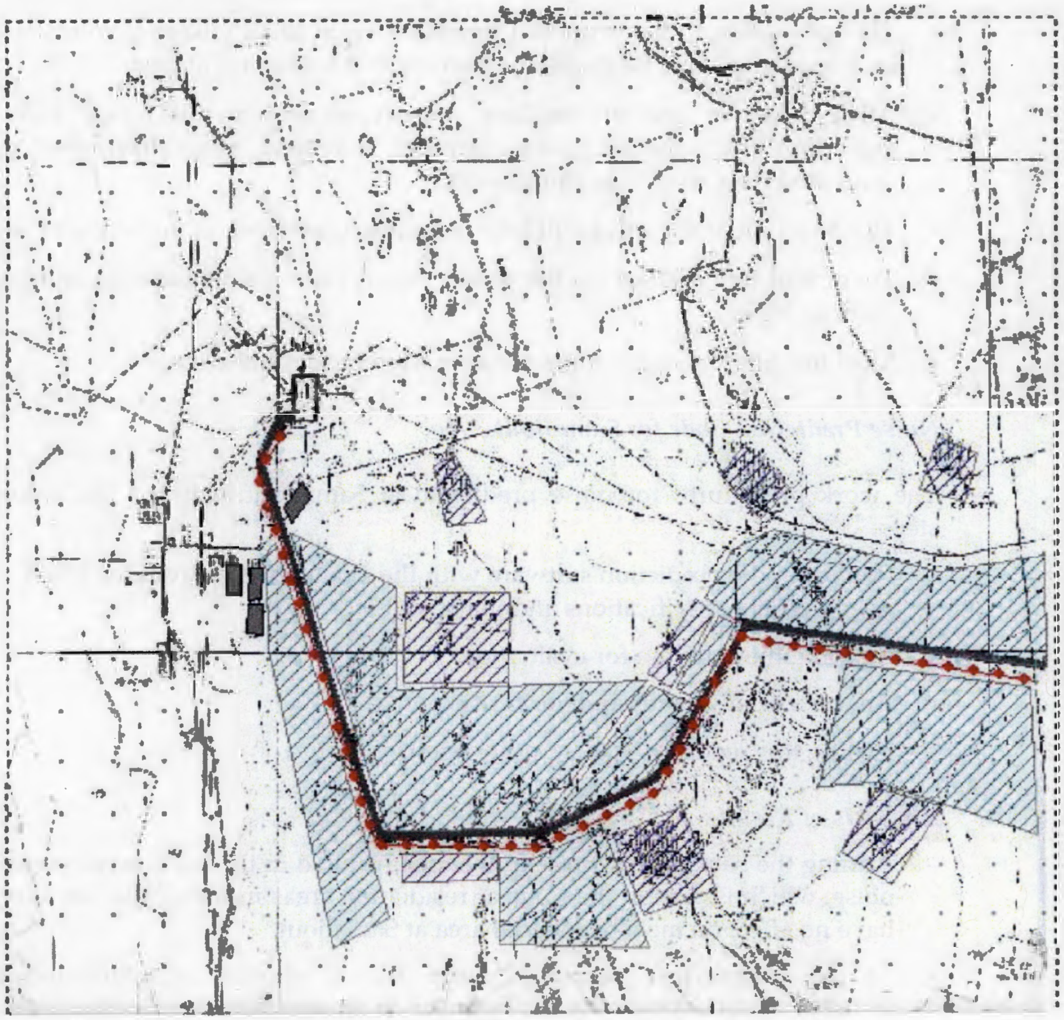
- Providing the prediction software with the available data from the EEHC such as equipment specifications and the layout.
- Running the software for evaluation.
- Analysis of the results and verification.
- Issuing this report with the output results.

Analysis of Results

- Adding the background noise in the area resulted in the cummulative effect of noise, which is exactly the same at residential areas meaning that the line will have no effect on most residential area at Samallout
- At the transformer station a noise survey should be conducted after installation of the new cells (*see Figures 5-35 through 5-38*).

Figure 5-35

Main Line Routing and Main Residential Blocks at the Samallout Area (2D view)



Building.
Housing Region (villages).
Foliage Region.

Figure 5-36

Noise Gradient Contours for Samallout Area in Lden

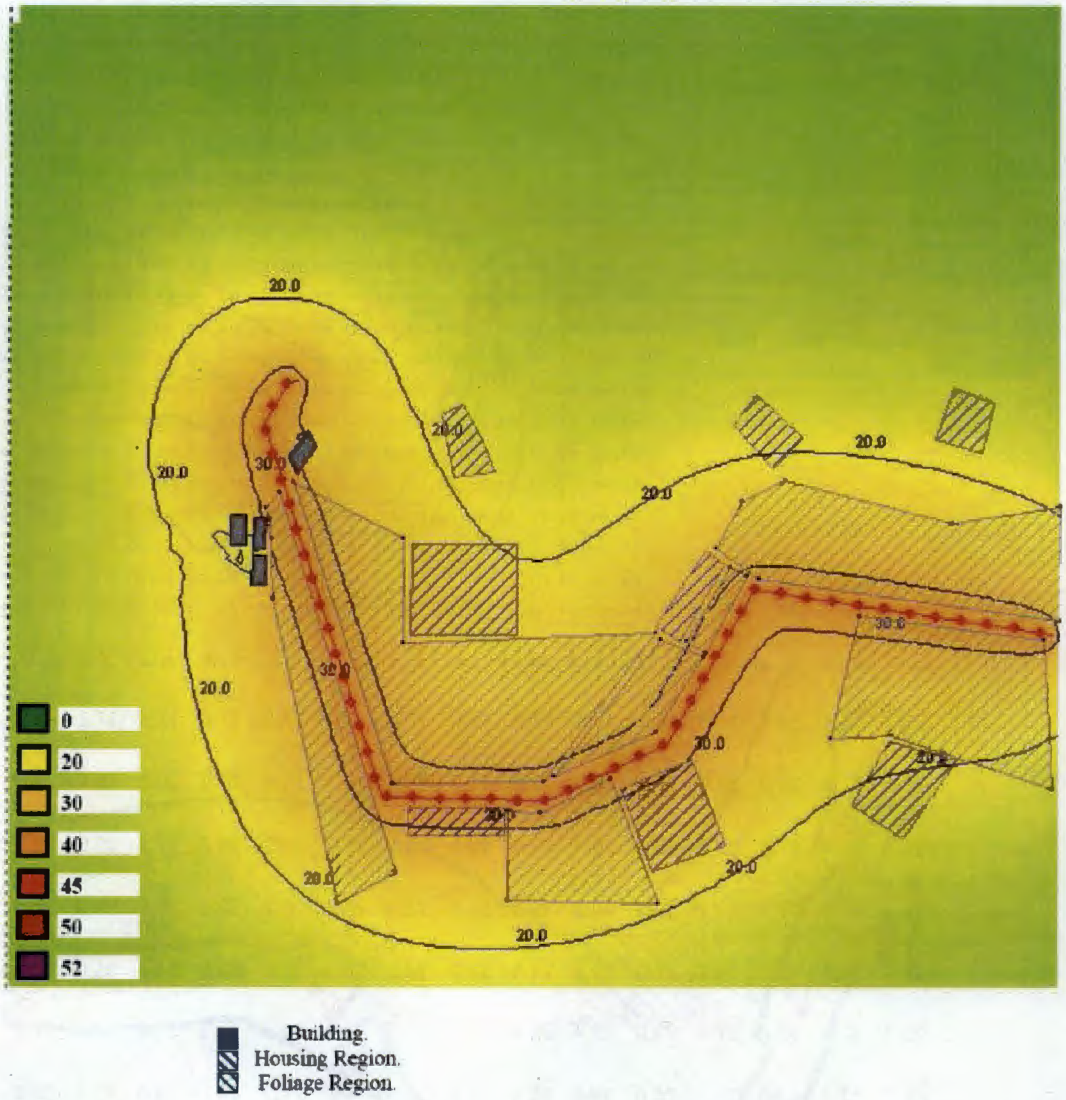


Figure 5-37

Noise Levels for Samallout Area in Lden

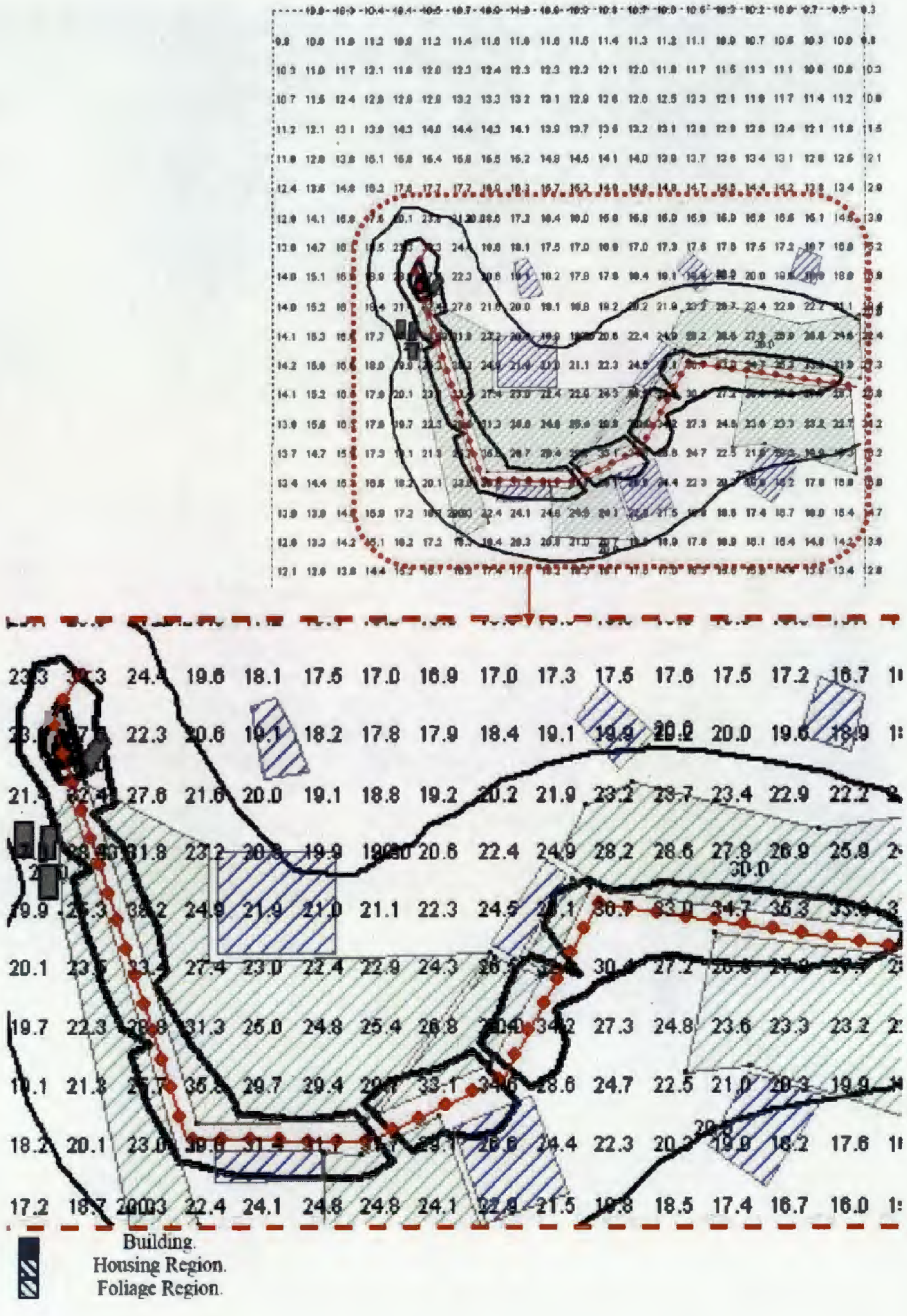
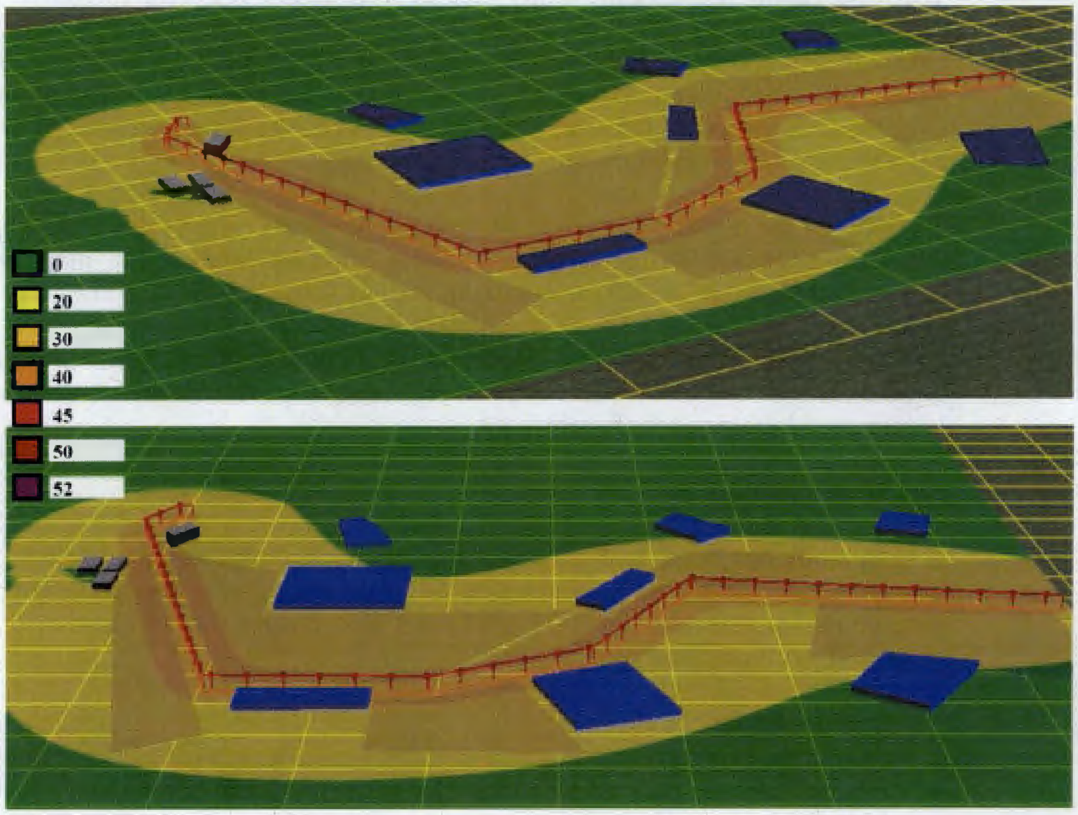


Figure 5-38

3D View Noise Gradient Contours for Samallout in Lden



5.3 LAND -USE / LAND-COVER

The topographic maps of the study area at scale 1: 100 000 were converted into digital format using AutoCad 2002S/W, and then converted into ARCL/INF coverage. The three Landsat TM scenes acquired in 1987 and 2002 were processed using ERDAS Imagine 8.6 S/W. Projection parameters for these datasets (Universal Transverse Mercator, Zone 36, and WGS 84 Datum) were used as the basis for which to register the subsequent datasets.

To facilitate the digitizing process, all topographic maps were scanned using the A0 scanner of 300.00 dpi resolution. These scanned topographic maps were inserted into the Arc GIS 0.9 for digitizing various feature classes (*Figure 5-39*).

The representation of continuous elevation values over a topographic surface by a regular array of z-values, referenced to a common datum. DEMs are typically used to represent terrain relief, (Figure 5-40).

Field Investigation:

A field study has been conducted to record the current development activities at the project site and collect samples of the different natural and anthropogenic environmental features. The GPS was used also during the verification of the produced land-use/land-cover maps.

Field Methodology

- Visiting representative locations for ideal geoenvironmental features (including vegetation, areas of instability, ridges, sand dunes, faulted mountains features, the main flood wadis outlets, plateau, faulted scrap margins.
- Determining the coordination of the visited sites using GPS
- Allocating the collected identified sites.
- Recording the different features by field photographs to prepare different panoramic views reflecting the environmental features

Output

- A field study has been aimed to record the current development activities in the study area and collect samples of the different natural and anthropogenic environmental features that occurred during last decades due to human activities. The GPS was used also during the verification of the produced land-use/land-cover maps.
- A field trip have been conducted for ground truthing of the satellite image processing and collect the field observations, regarding most recent human developments activities and document the findings.

Figure 5-39

Topographic Sheet of the Proposed Project Site

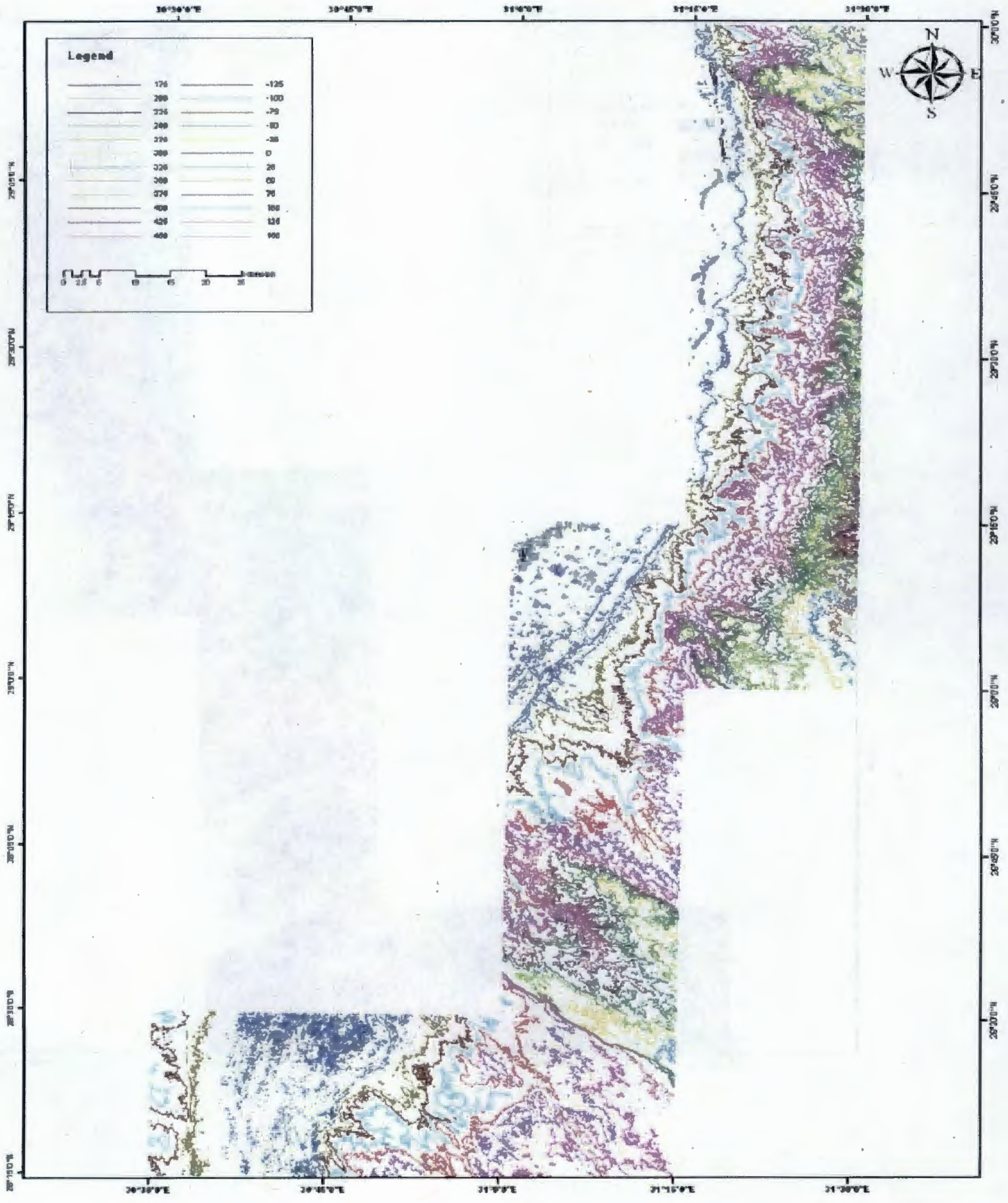
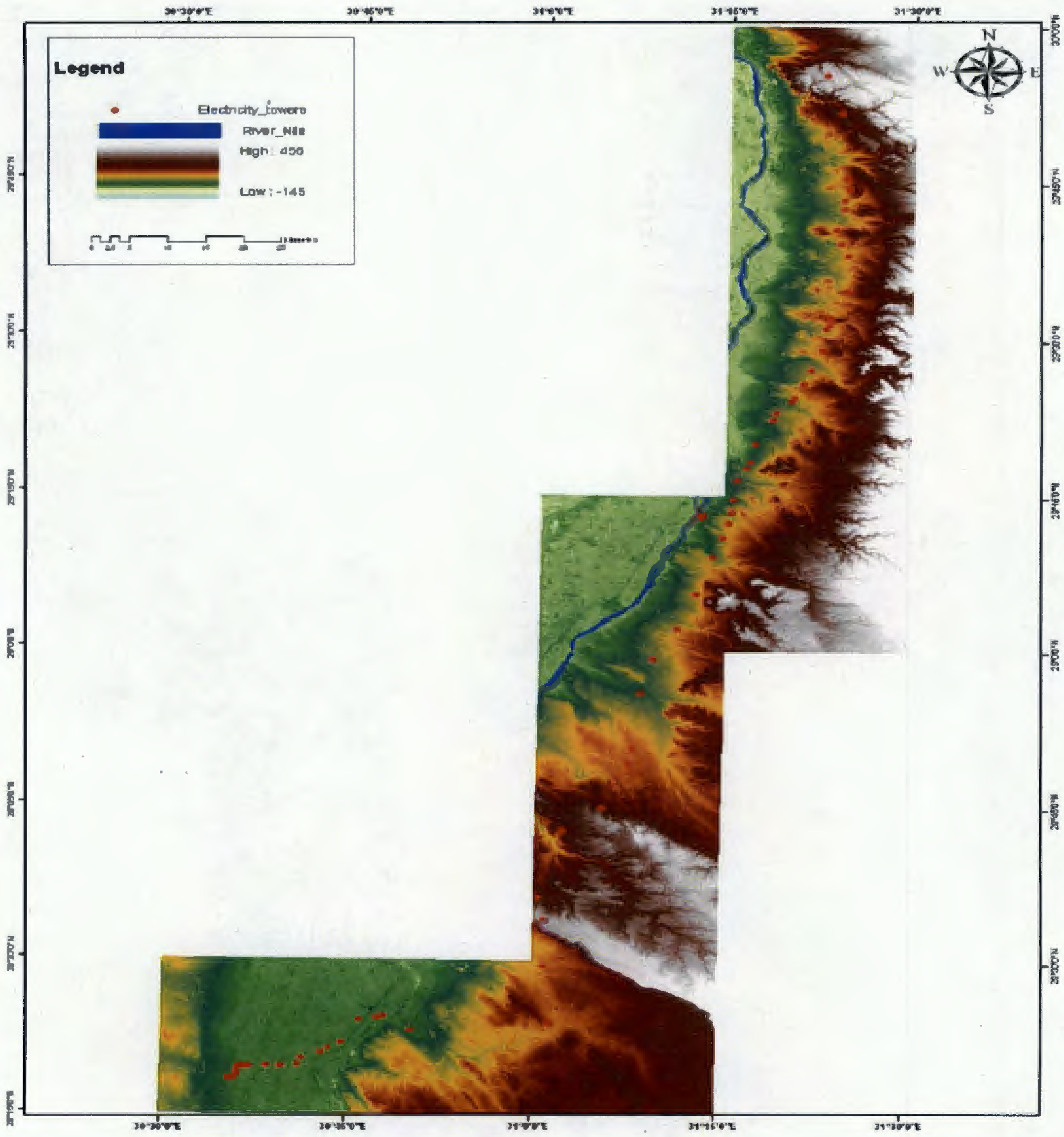


Figure 5-40

Digital Elevation Model for the Study Area



- The main output of this mission was to monitor observations and samples of the different natural and anthropogenic environmental features that occurred in the study area due human activities and environmental changes such as sand dunes movements and to photographically document them. This help to determine the main changes putting in consideration the updating of land use and to expect the environmental risk.

The main field work outputs are summarized in the following points

- The ground truth of the prepared network maps of different basins, contour maps, and.
- Checking up and photographing of the different environmental features.
- Recording the current development activities along the Nile valley.
- Photographing and recording the current and the constructed mitigative measures of natural hazards.
- Ground truth for the evaluated hazards near or that crossing the main wadis outlets.

Geographic Information System

The using of GIS in this study gives the ability to link spatial data with descriptive information about a particular feature on a map. It incorporates a database management, so it is a powerful tool to visualize, model, analyze and query the database. It is a structured framework for organizing and displaying large quantities of remote sensing data and other data in map form. In this system, quantitative values can be retrieved in table form. Several data sets also may be displayed at once according to the parameters of interest.

Several pre-processing steps were required to standardize and correct the various datasets. The data processing and techniques are used to produce the land-use/land-cover maps that are shown in *Figures 5-41 through 5-46*.

In the present work, Landsat imagery data dated 1987 and 2002 that were covering the area have been digitally processed, analyzed and interpreted to produce a land-use/land-cover map at a scale of 1: 100.000, (*Figures 5 – 41 and 5-42*). The main classes of recognized land use (activities) and land cover (resources) at this scale are shown in the figures. This is based mainly on the multilevel land-use/land-cover classification system for use with remote sensor data adopted by the U.S. Geological survey (Anderson *et al.*, 1976). Landsat image, clearly displays the major classes of land-use and land-cover of study area. *Table 5-16* gives the main classes of land-use / land –cover, interpreted from Landsat-TM Images, Scale 1:100.000.

Table 5-16

Main Classes of Land-use / Land-cover

Category	Class	Type
100 Buill-up	110 Residential 120 Industrial 130 Transportation 140 Recreational 150 Mixed	111 Towns and Settlements 112 Touriste Villages 121 Mimes and Quarries 131 Airports 132 Port Facilities 133 Highways and Roads 134 Desert Tracks 141 National Parks 142 Archeological Sites 151 Land being developed within Urban Areas
200 Cultivation	210 Agriculture Land 220 Shrubs and Brush land	211 Croplands 212 Reclaimed Lands 221 Desert Shrubs/ Grasses 222 Coastal Brushland
300 Water	310 Marine Water	311 Open Sea Water 412 Bays and Embayment 313 Coastal Reefs
500 Barren Land	510 Plain Land 520 Mountainous Land	511 Beaches, Sand and Gravel 512 Wadi Deposits & Alluvium 521 Rock Exposures

Change Detection in Land Use/Land Cover during the period 1987-2002

Geographical Information System application and digital analysis of Landsat TM data of years 1987 and 2002 have been utilized in this study to recognized and defined land use in study area. The different steps involved in this work could be explained as, a) defining a comprehensive legend according to the scale of Landsat TM image and b) field checking and necessary modification of the primary maps applying the auxiliary data and extant maps to promote the formation depicted on the land use / land cover maps. Measurement of land unit surface by applying geographical information system (GIS) facilities to accomplish the work.

During the current study two images were selected to perform this analysis belonging to the years 1987 and 2002, collecting of these two dates is due to the greening coverage on the surface of study area have to be detected at same time. The data obtained from the two images were subjected to analysis including spatial vegetation patterns and assessment of soil dynamics. Furthermore, this biophysical parameter is a key remote sensing observation related to several important biospheric properties including the proportion of photo synthetically absorbed radiation and leaf area index were also used.

Results of image processing in different dates allow identifying the natural environmental condition and forces affecting the project site and detected the major changes for ecological components. The major distinct land use changes occurring in the study area due to the extension of urban, agriculture activities and protectorates which develops along the study area from North to South. The present status of land use-land cover in the districts of the Helwan- samlot areas evaluated by digital analysis of satellite data indicates that majority of areas in these districts are used for development purpose.

Considering the change detections, there are many classes changes such as urban activities, agricultyre and soil area which indicated the river water - land penetration. This is clear in the soil and vegetation cover. Development of anthropogenic input reflected the constructed roads, which occurred mostly for the urban and transporting fringe of Helwan-Samlot areas. These changes mostly are related to changes due to natural and resources found on barren and wet land in the desert plain, which are recognized as an environmental impact (*Figures 5-43 and 5-44*).

Urban: This GIS layer comprises urban areas of intensive land-use where much of the study land is covered by buildings, structures and streets (*Figure 5-43*). With the expanding urban development in Helwan - Samlot cities as indicated in years 1987 and 2002, several other activities have been constructed particularly at the fringes of urban land along River

Agriculture: This layer includes both lands with agriculture activities and those with natural vegetation. Accordingly, it was subdivided into main classes, (*Figures 5-41 and 5-44*); the agriculture of the desert land is confined to the drainage system (run-off desert). It shows a mosaic pattern and distinct seasonal changes. Main future activities planned for the study area are related to the nature of the desert study area and its natural resources. The proposed development project is also consistent with nature of the study area and ecological status sustainability, *(Figure 5-45).*

Figure 5-41

Example of the Agriculture Land Covered the area around the Nile River Parallel to the Transmission Line

Figure 5-42

Example of the Urban land Covered the area around the Nile River Parallel to the Transmission Line

Figure 5-43

Urban Development areas between 1987 and 2002 at the Eastern Side of the Nile River of the Study Area

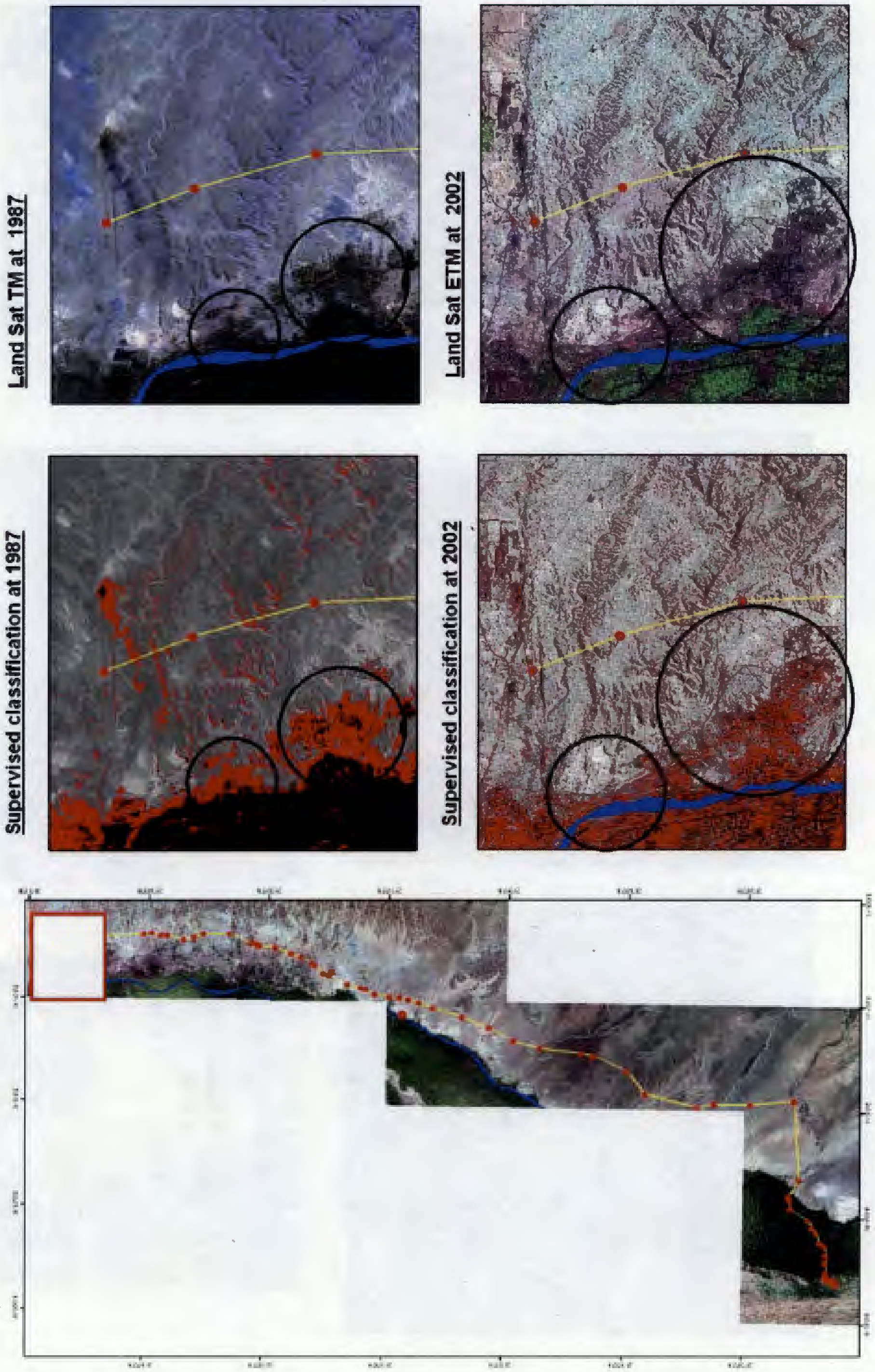


Figure 5-44

Agriculture Development Areas between 1987 and 2002
Along the Nile River of the Study Area

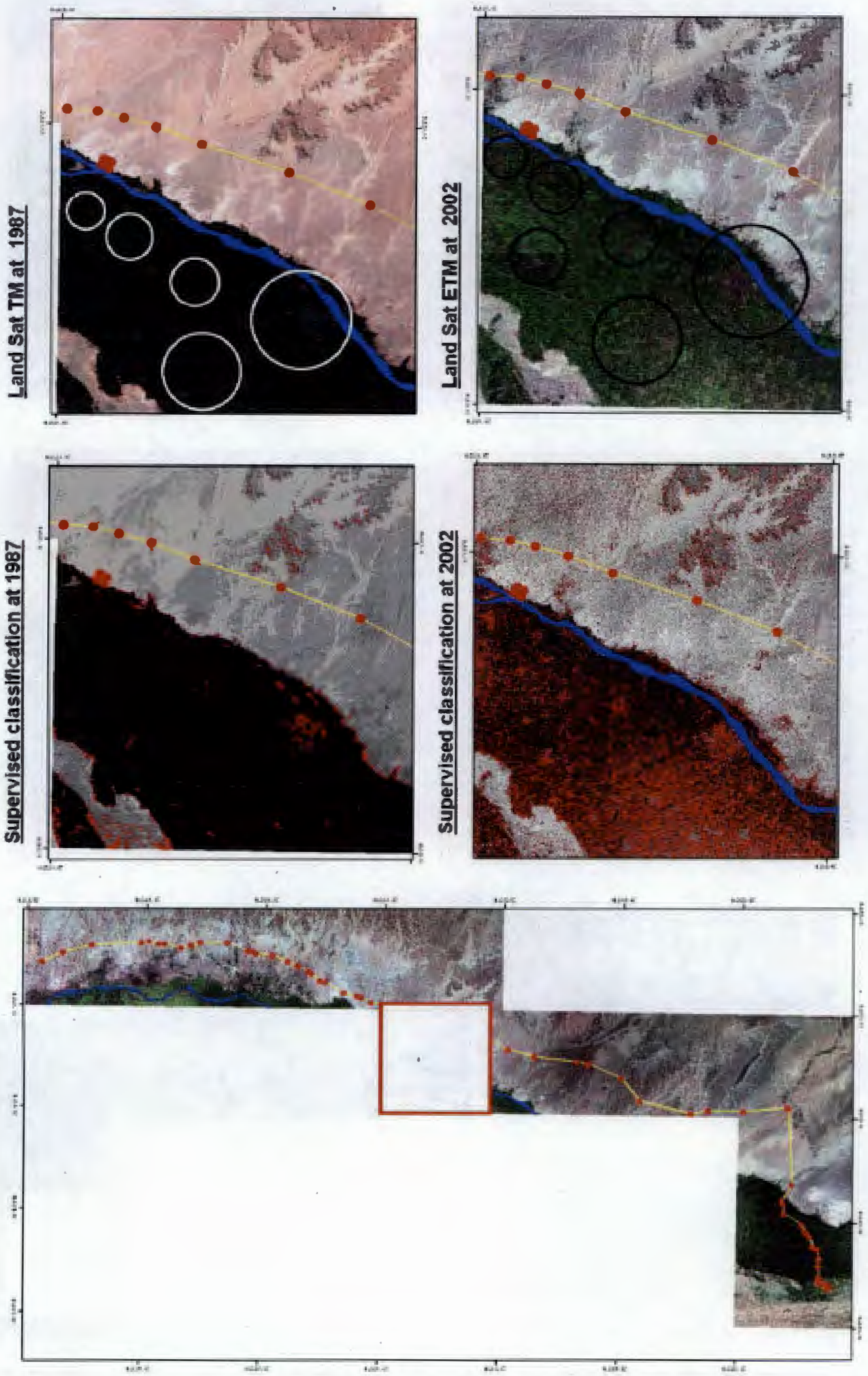


Figure 5-45

Development Croos Section of the Transmission Line Along the Nile River of the Samllout Study Area

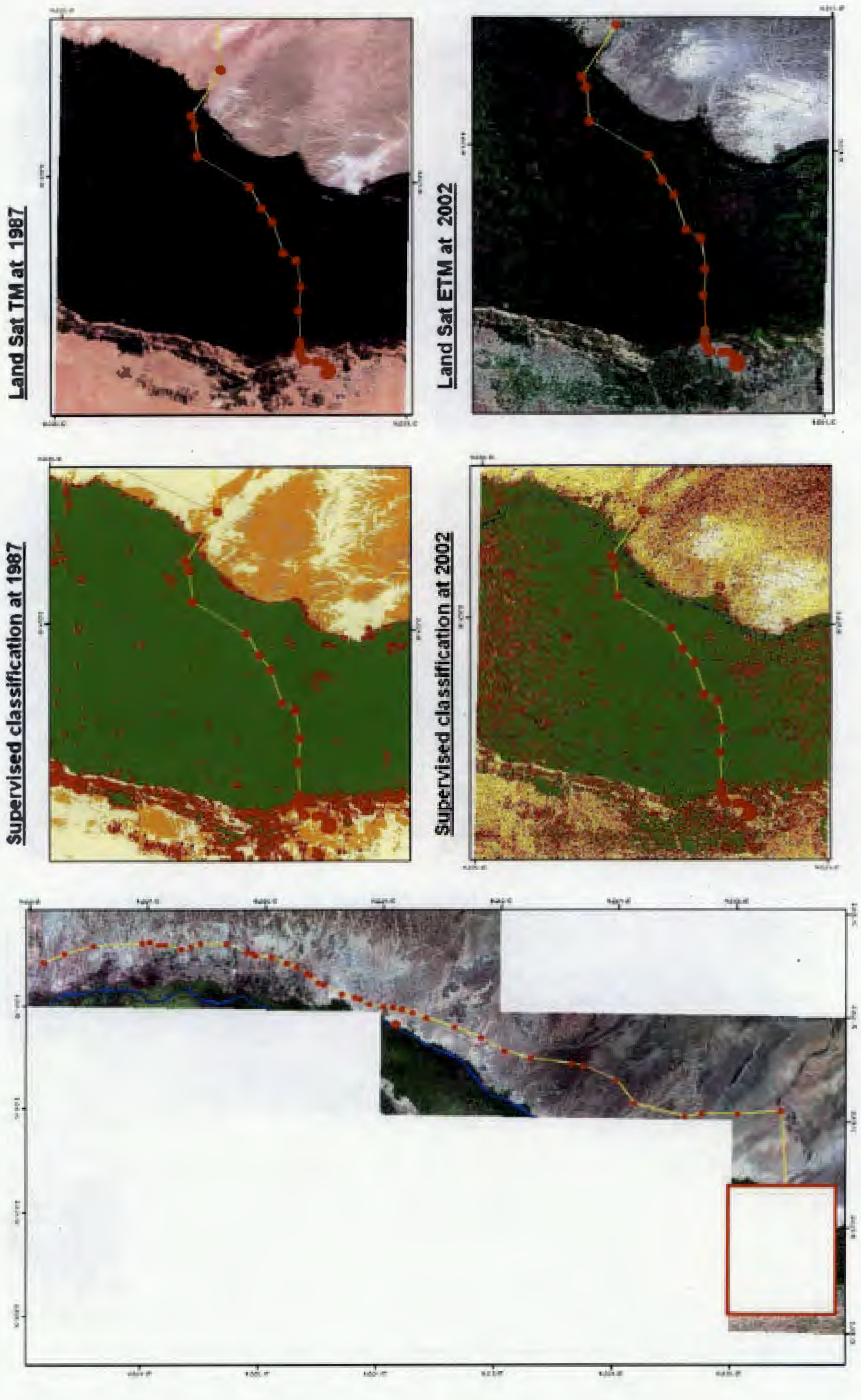
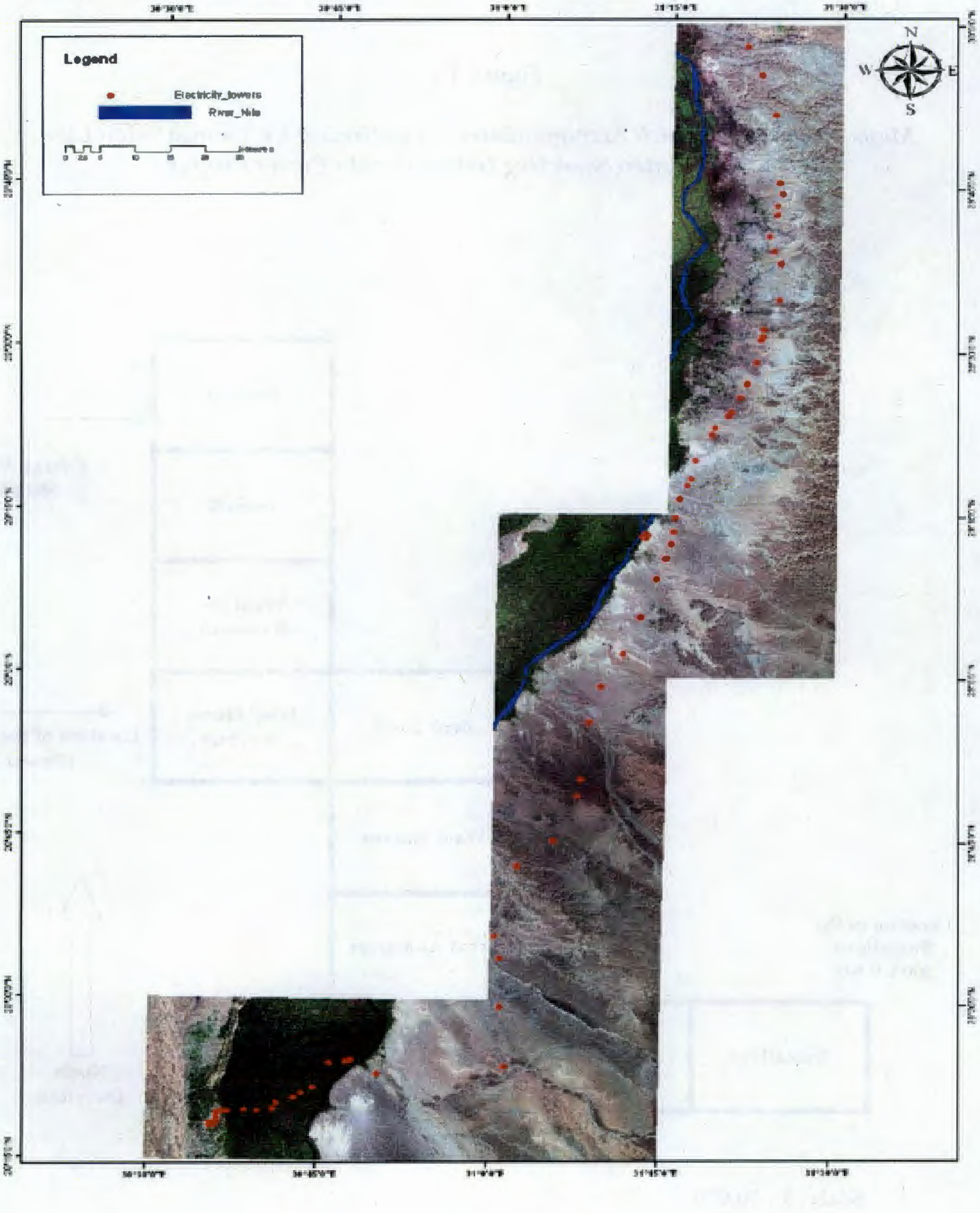


Figure 5-46

Example of the Transmission Line Covered the Study Area

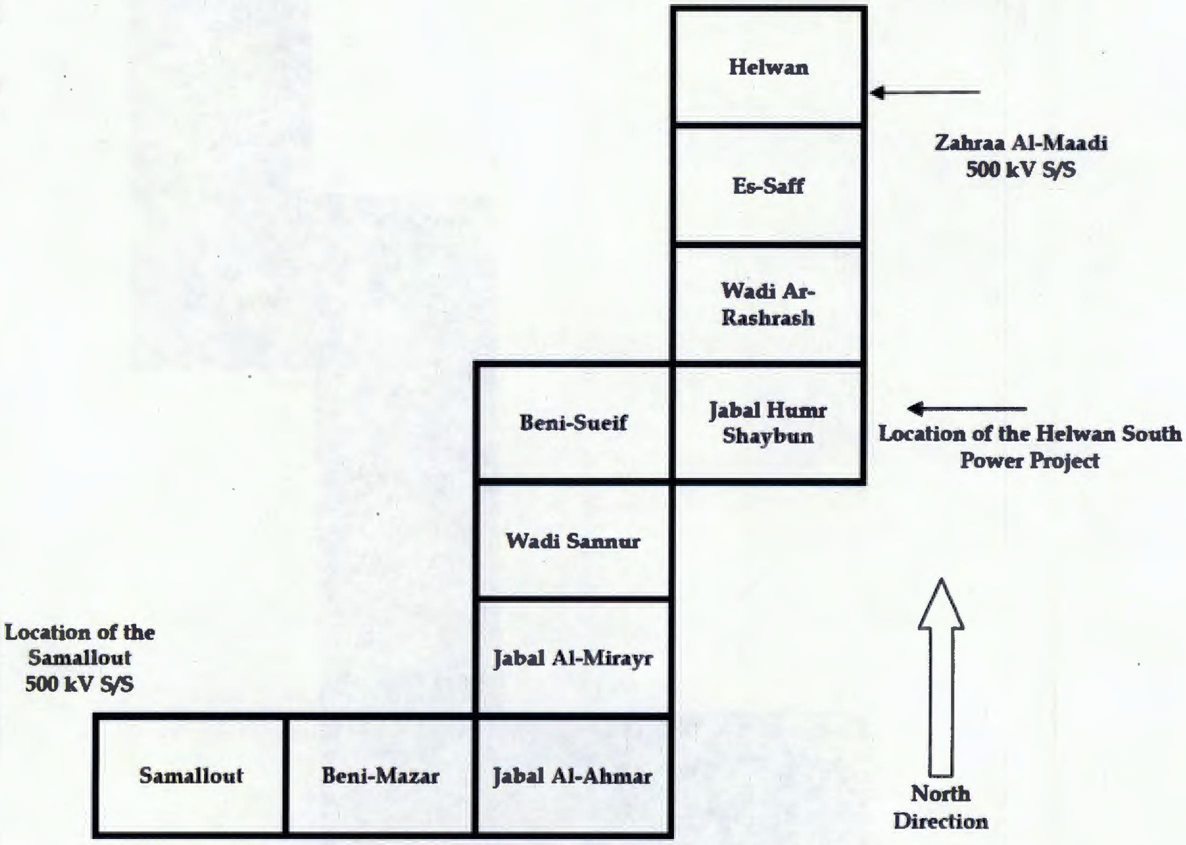


5.4 ROUTE'S BACKGROUND SETTING OF THE TRANSMISSION LINE

Detailed route maps of the transmission line are given in *Figure 5-47 through Figure 5-57.*

Figure 5-47

Maps of the Areas which Accommodates the Entire 500 kV Transmission Line Route for Interconnecting Helwan South Power Project



Scale: 1 : 50,000

Figure 5-48

Map of the Helwan Area

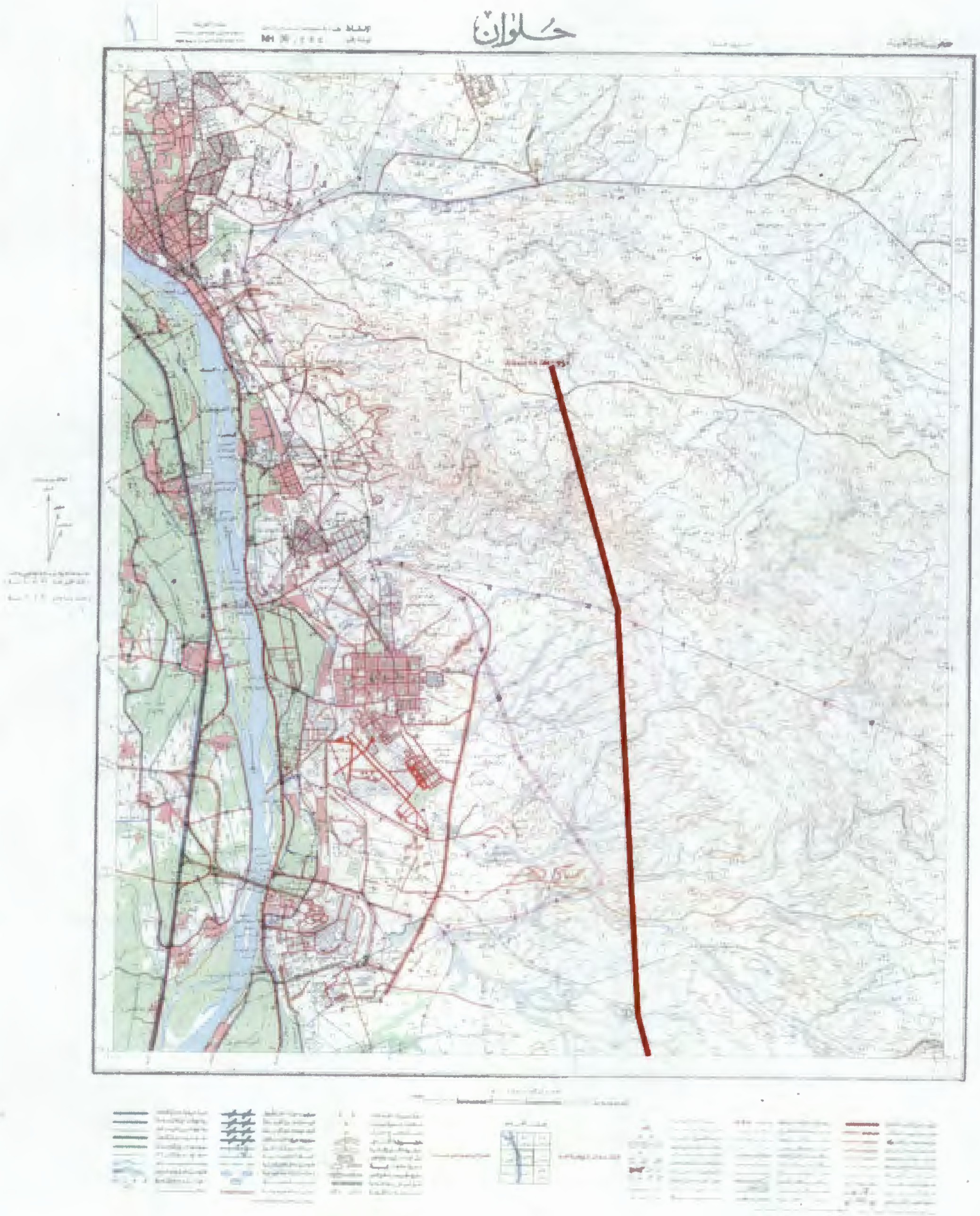


Figure 5-49

Map of the Es-Saff Area

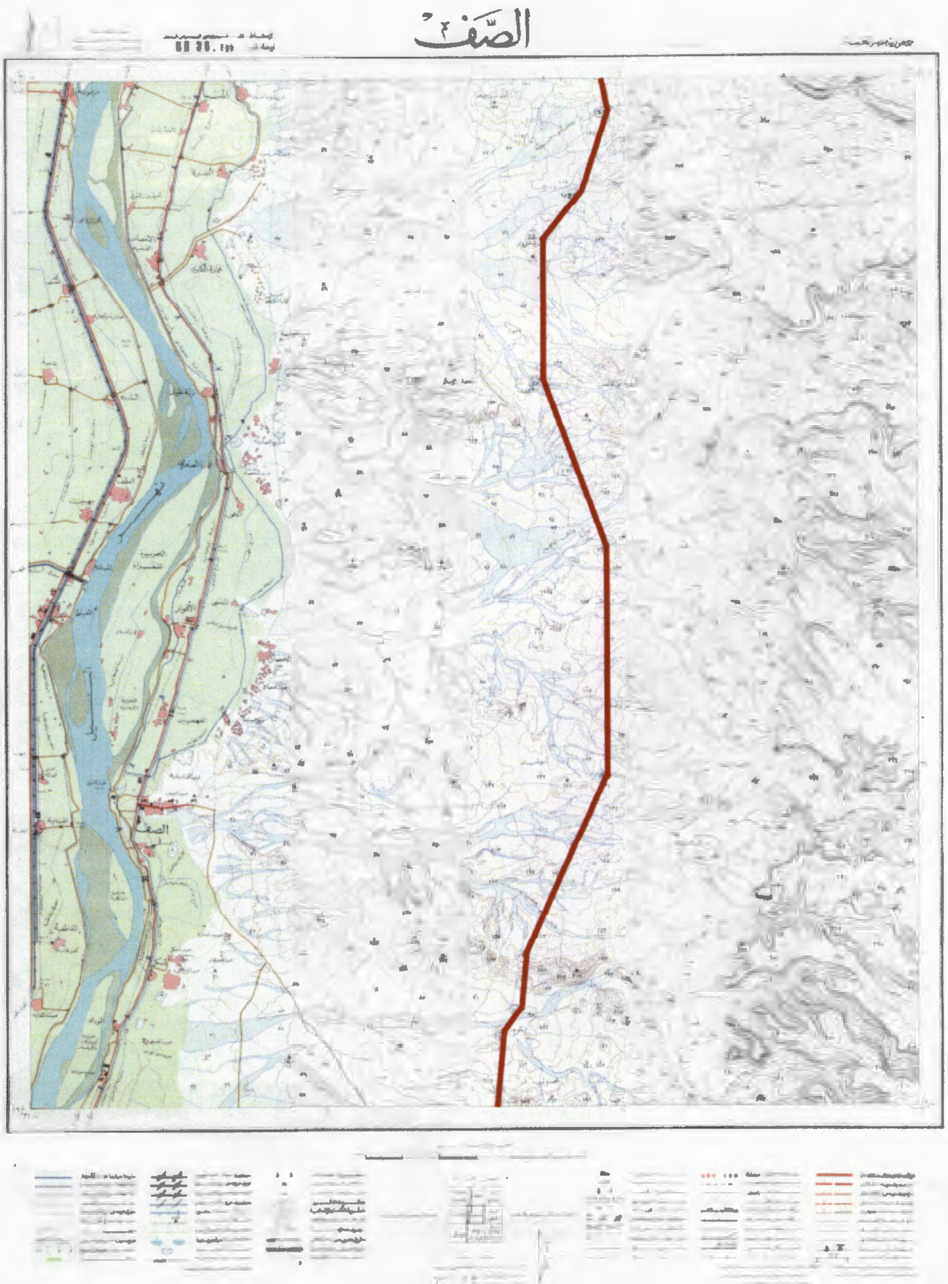


Figure 5-50

Map of the Wadi Rashrash Area

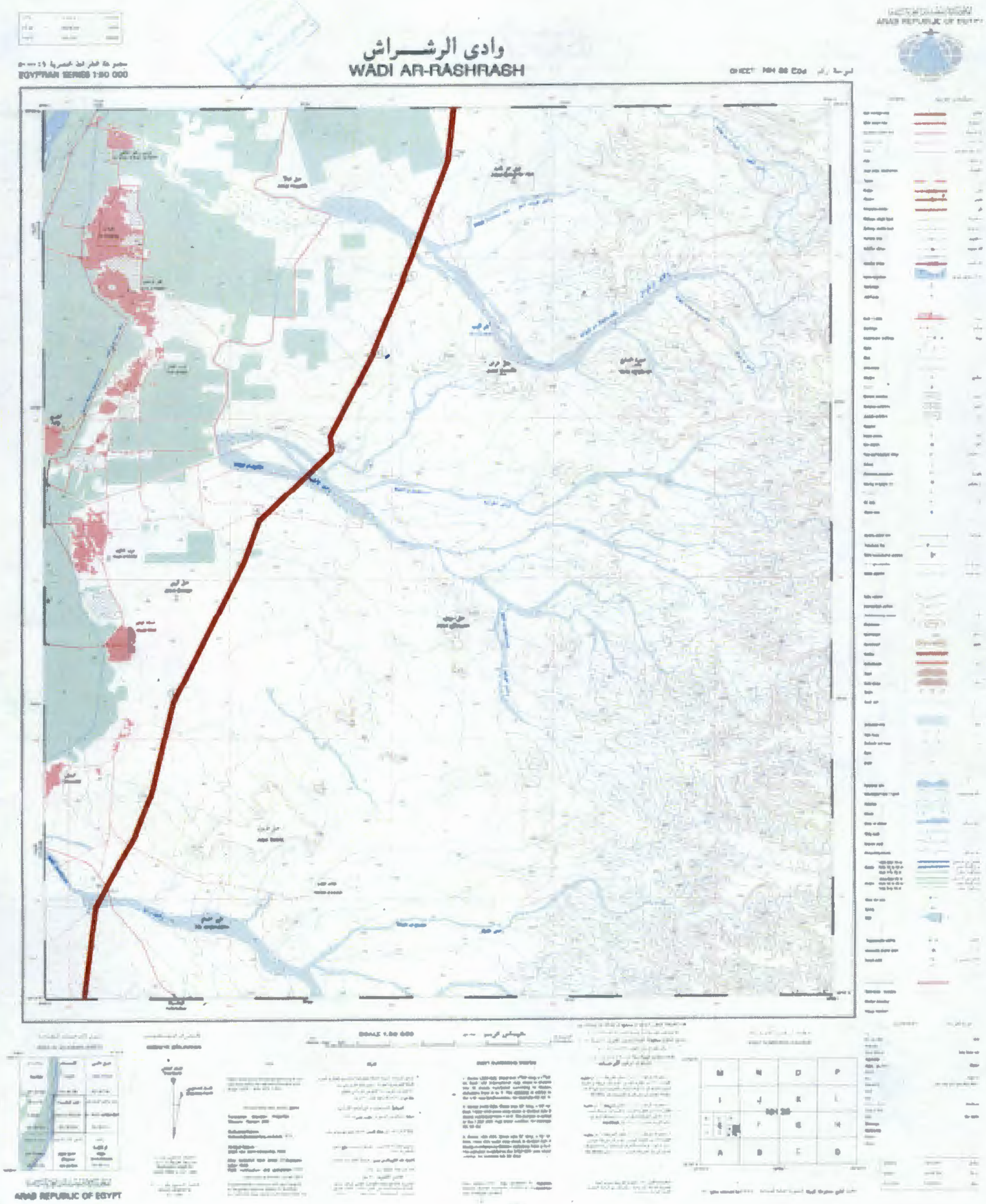


Figure 5-51

Map of the Jabal Humr Saybon Area

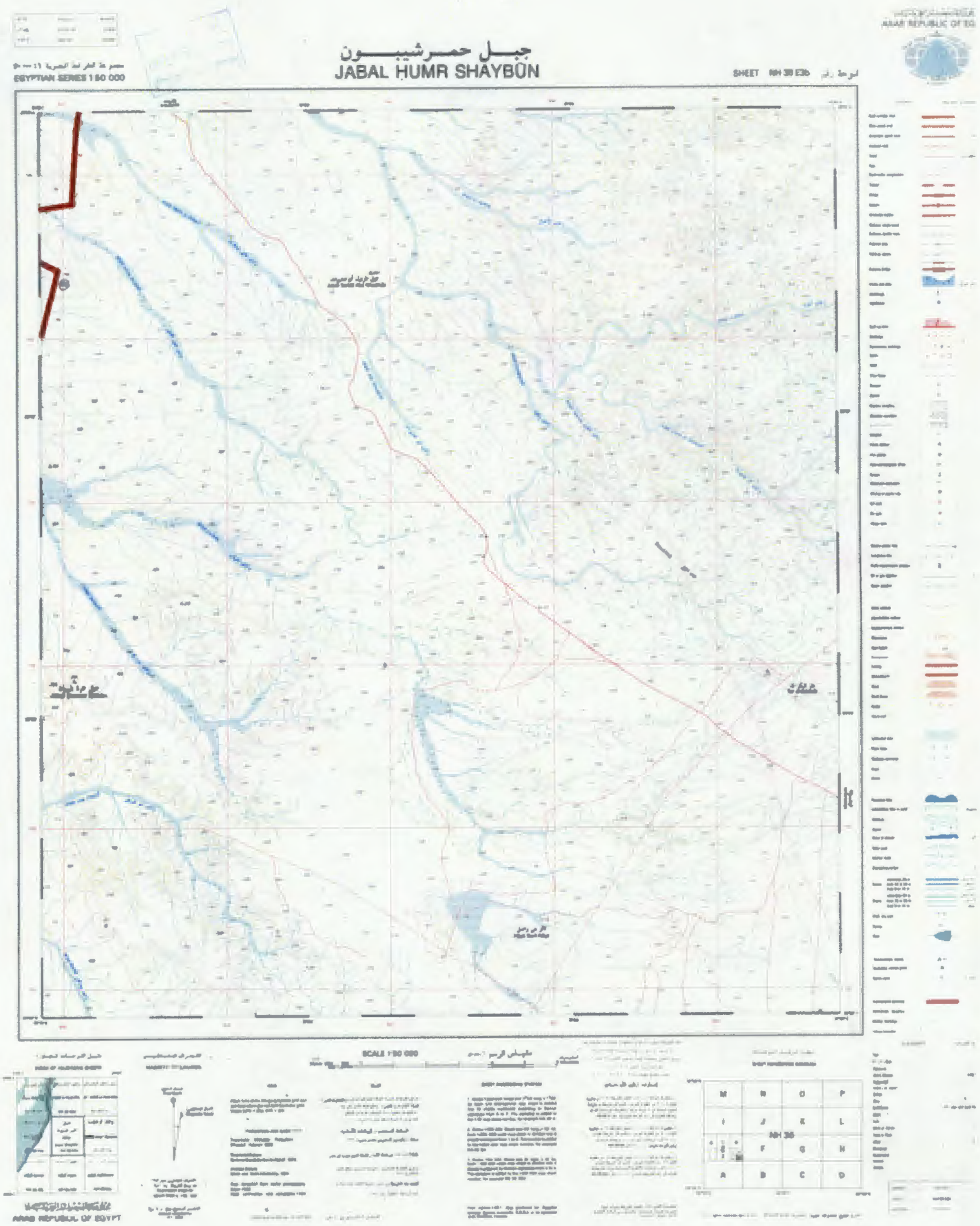


Figure 5-52

Map of the Beni-Sueif Area

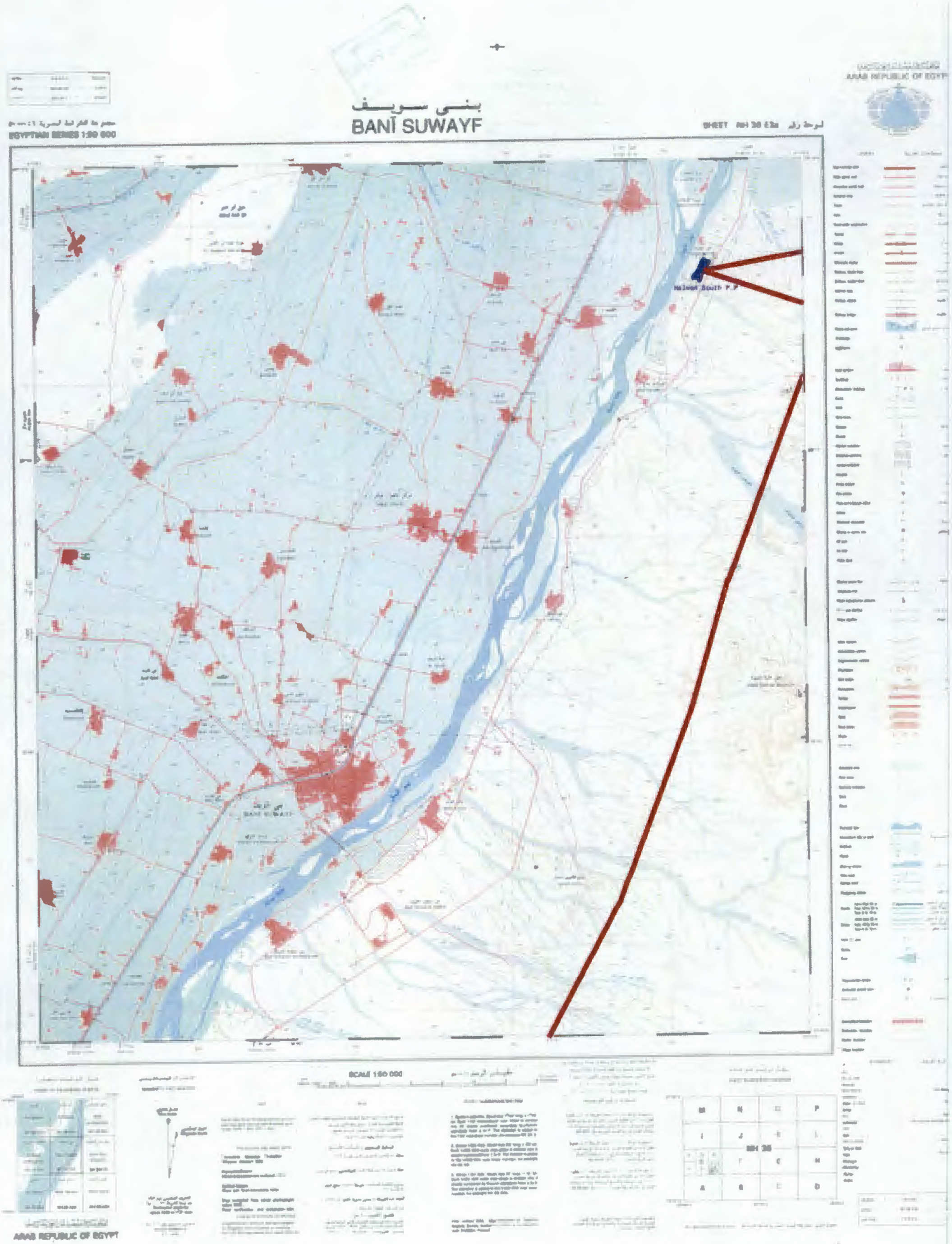


Figure 5-53

Map of the Wadi Sannur Area

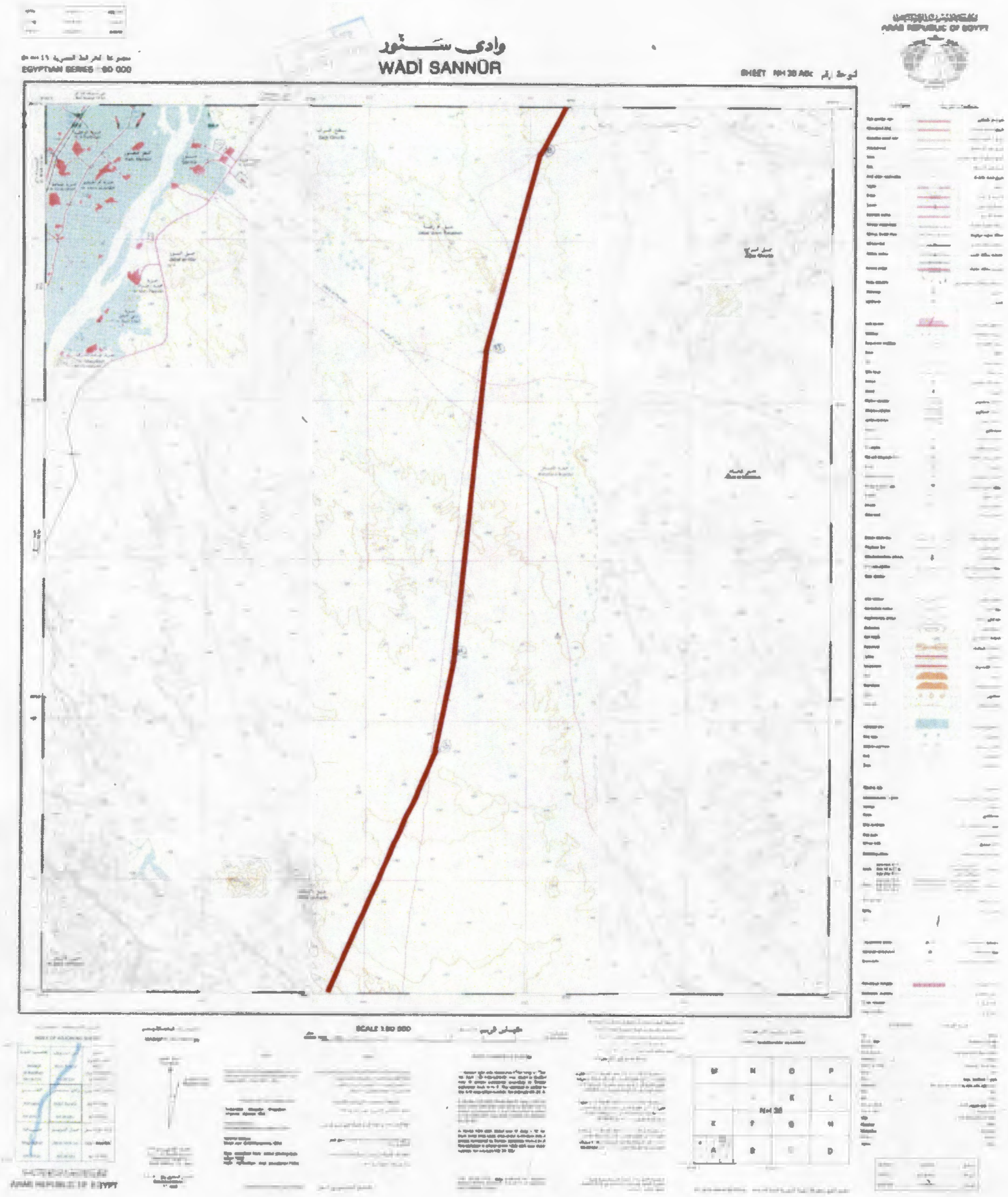


Figure 5-54

Map of the Jabal Al-Mirayr Area

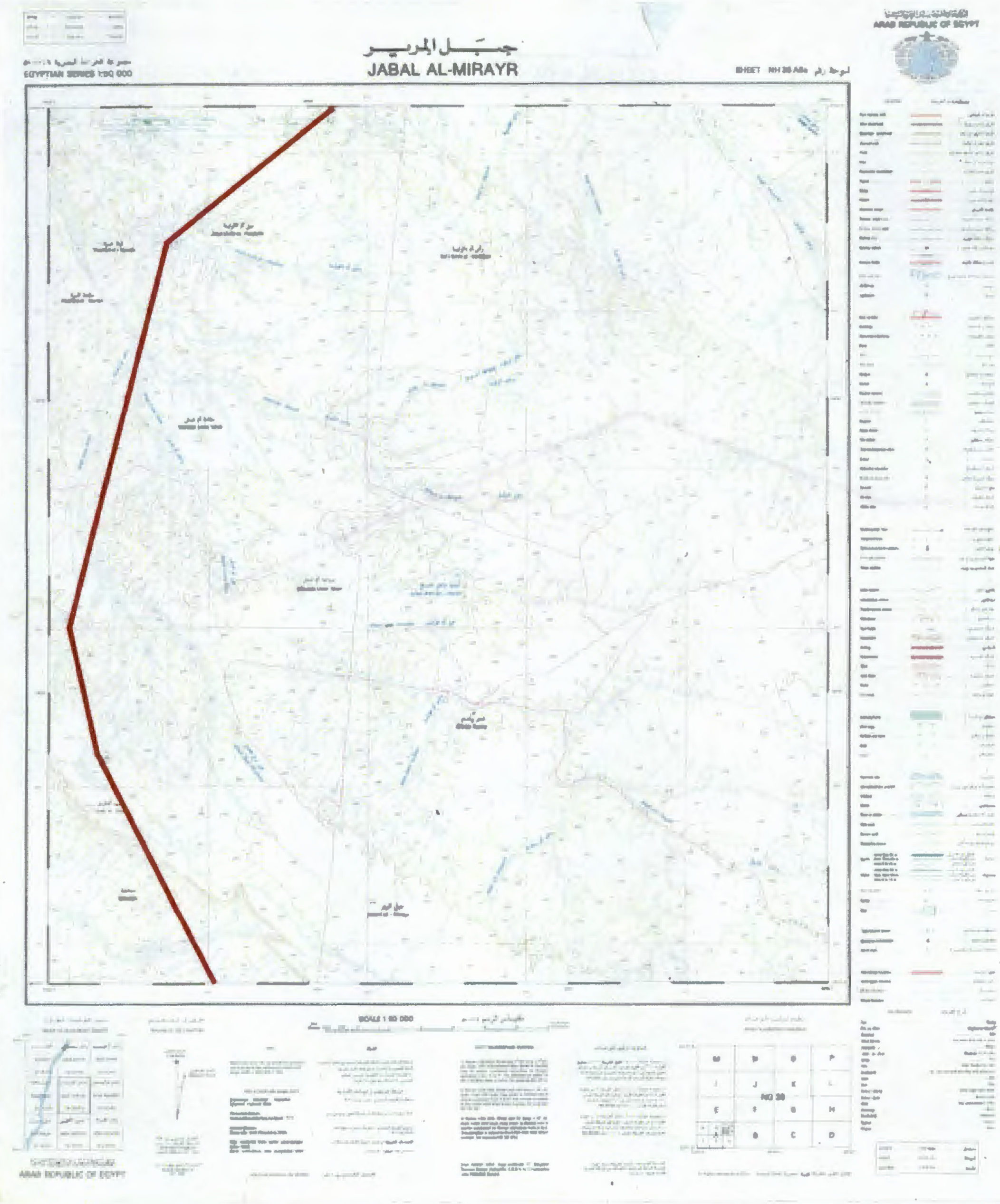


Figure 5-55

Map of the Jabal Al-Ahmer Area

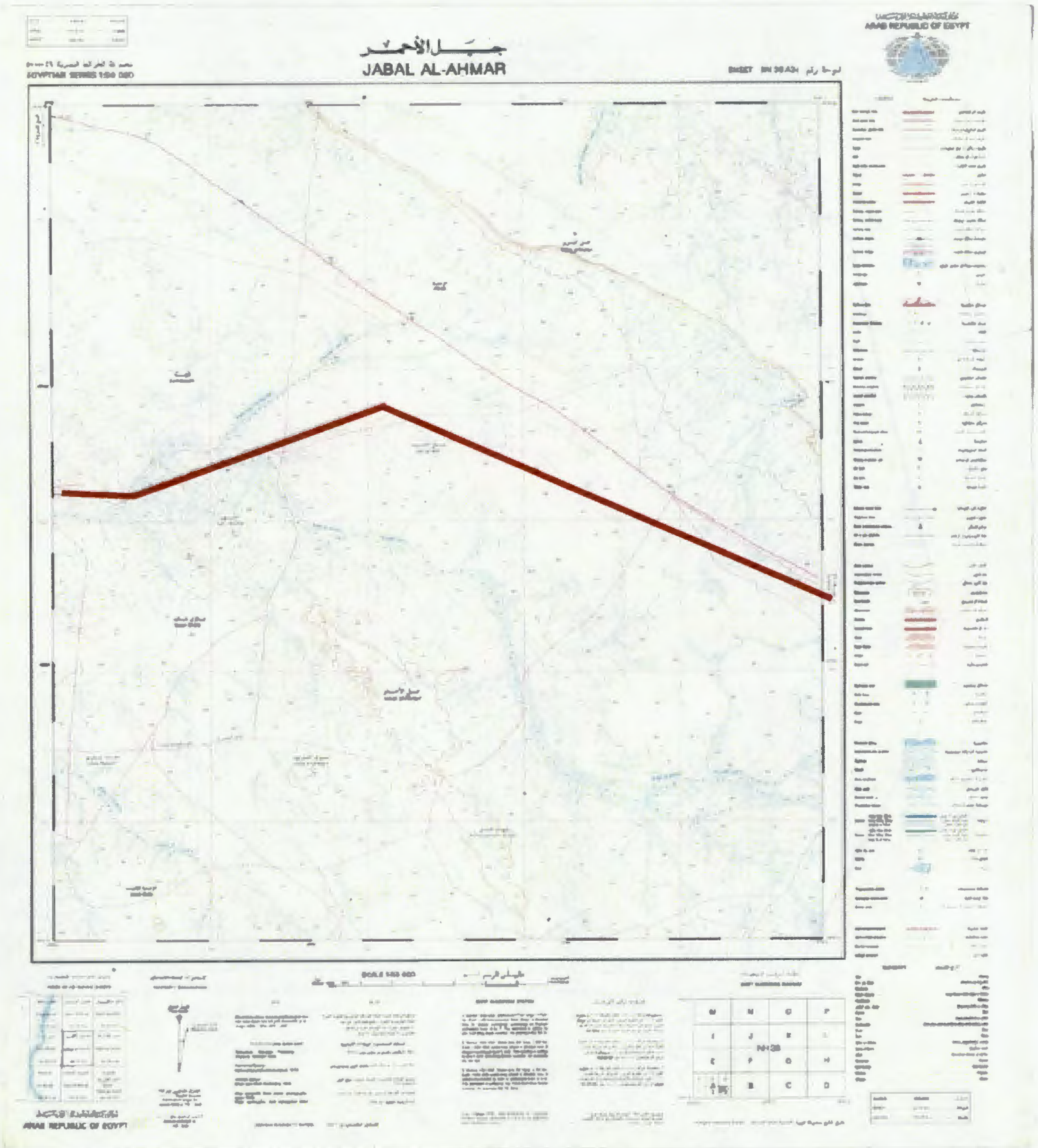


Figure 5-56

Map of the Beni-Mazar Area

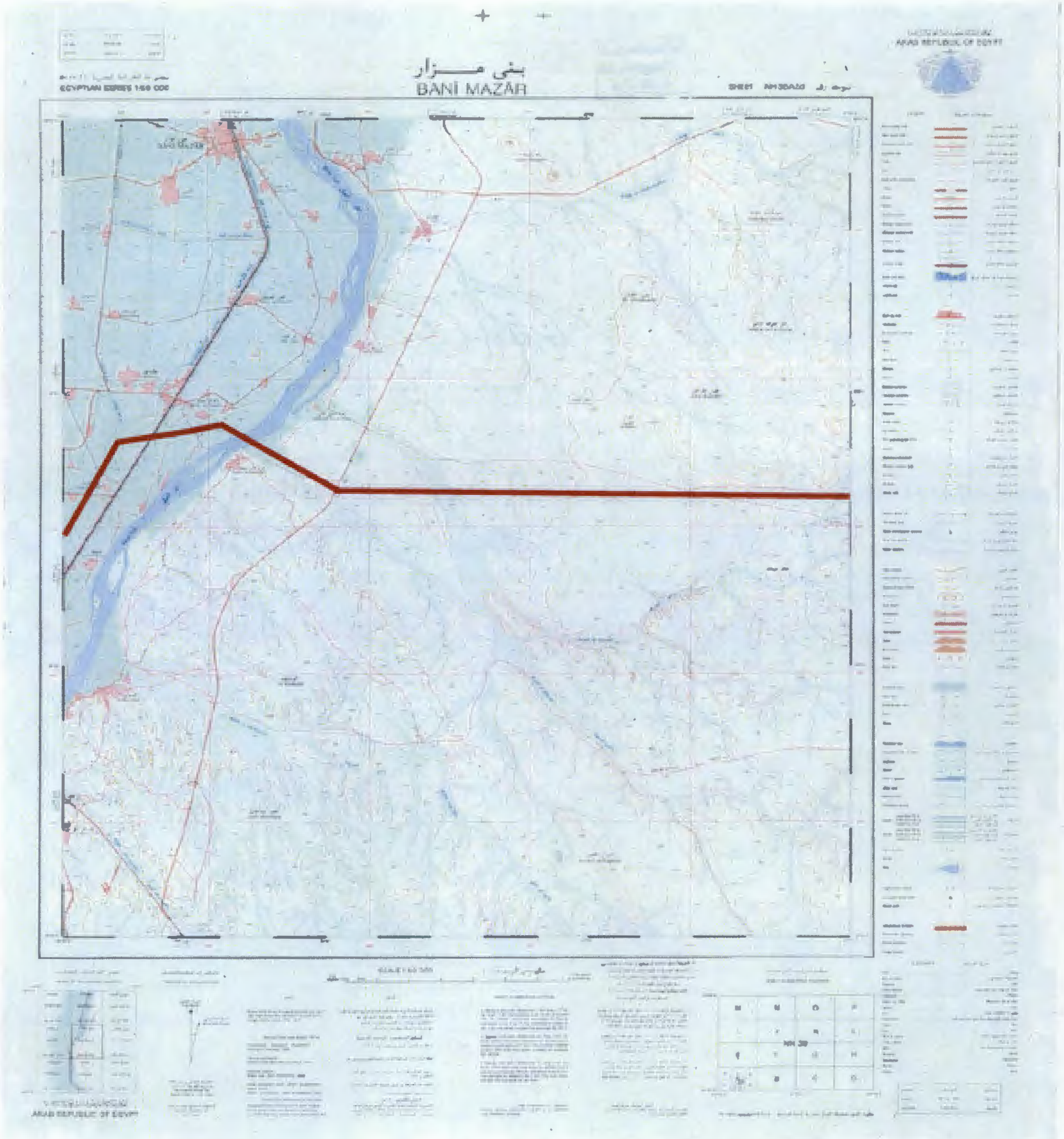


Figure 5-57

Map of the Samalloutn Area

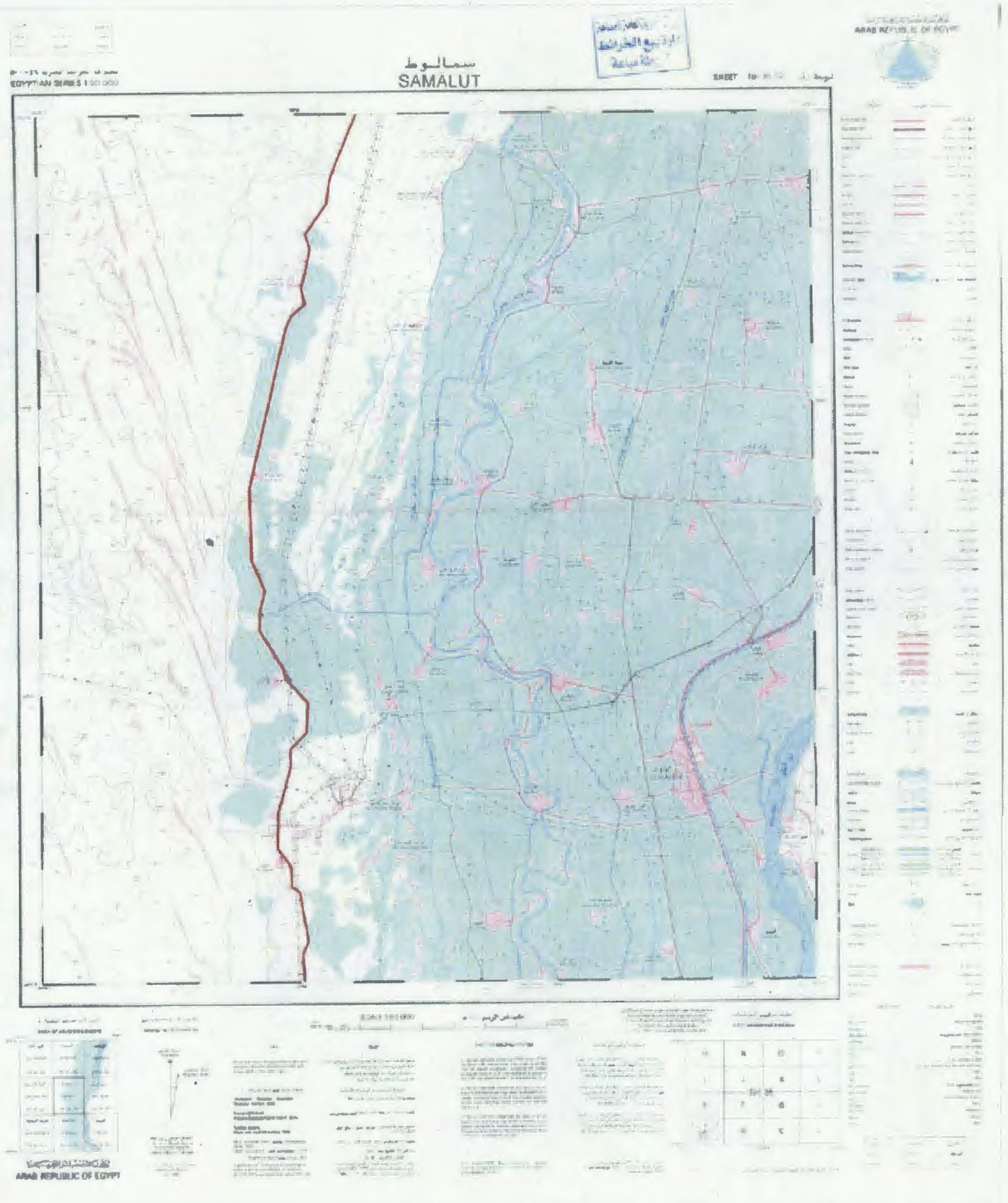
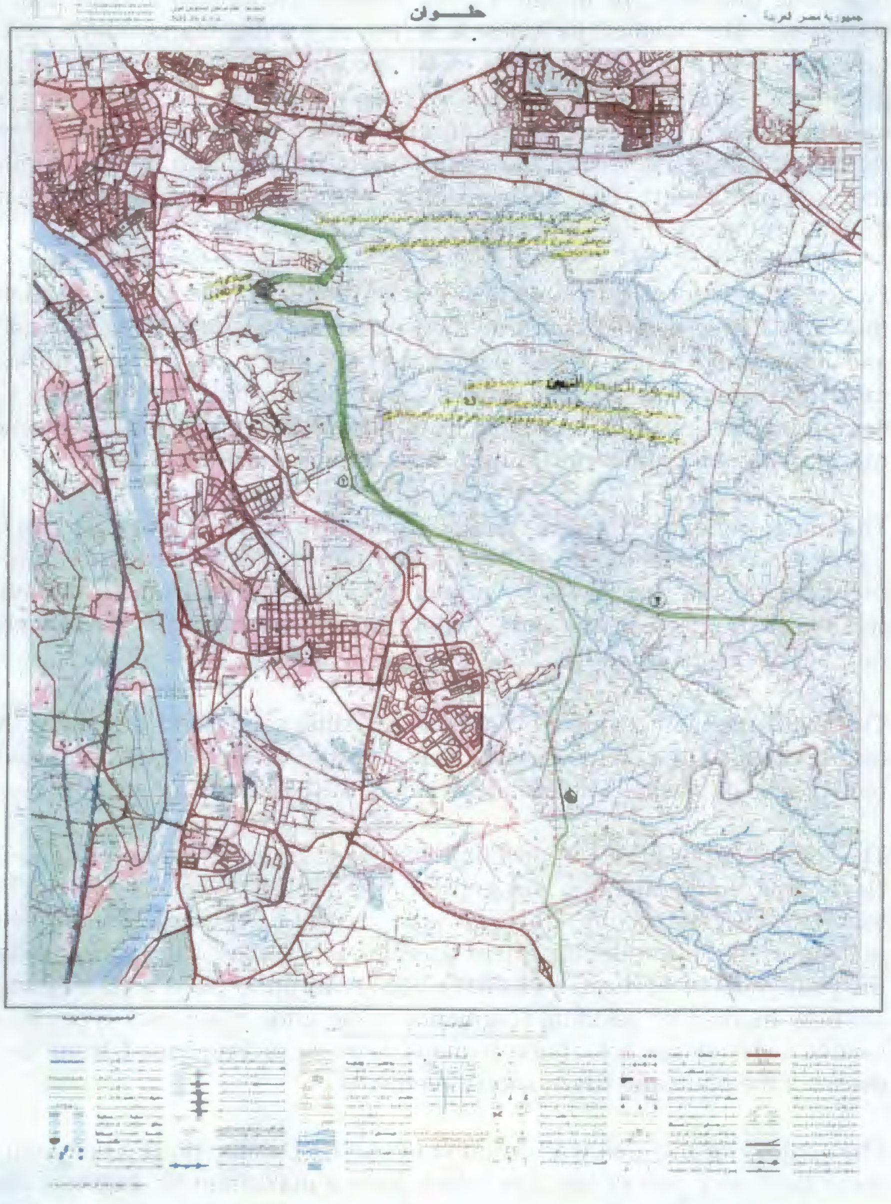


Figure 5-57

Map of the Route of the Three Existing 220 kV Lines
to Zahraa El-Maadi Substation
and the 30 km, 500 kV in-and-out Connection
to the Tebbin/ Sokhna 500 kV TL.



5.5 BIOLOGICAL ENVIRONMENT

5.5.1 Geography of the Study Area

The major sector of the studied site (*Figure 5-58*) consists essentially of an intensively dissected sedimentary limestone plateaus. The formations of these limestone plateaux are mainly Upper Eocene (Bartonian) and Middle Eocene (Lutetian). The former includes a series of sands, marls, clays and marly limestone which are softer, more easily eroded, and contain larger amounts of gypsiferous and ochreous materials. The Middle Eocene formations include various types of limestone which are more solid and contain a number of hard dolomitic bands. They form the main bulk of the northern limestone plateau of the Egyptian Desert. This Eocene desert adjoins on its north border sand and gravel formations of the Oligocene.

Palaeodeposits formed in situ cover extensive areas of the sandstone plateaux in this area. These deposits form erosion pavements described by Kassas (1953b) and Kassas and Girgis (1964), hamada desert, and rocky erosion surfaces. The sand and gravel desert that extends east of the Nile to the Suez Canal is composed of fluviatile palaeodeposits which belong to the Oligocene, non-marine Miocene or Pliocene (Shukri, 1953; Shukri and Akmal, 1953).

The most pronounced geomorphological feature of the whole Eastern Desert of Egypt is its dissection by valleys and ravines. While eastward drainage of highlands to the Red Sea is by numerous independent wadis, channels of the westward drainage to the Nile Valley mostly coalesce into a relatively small number of extensive wadis.

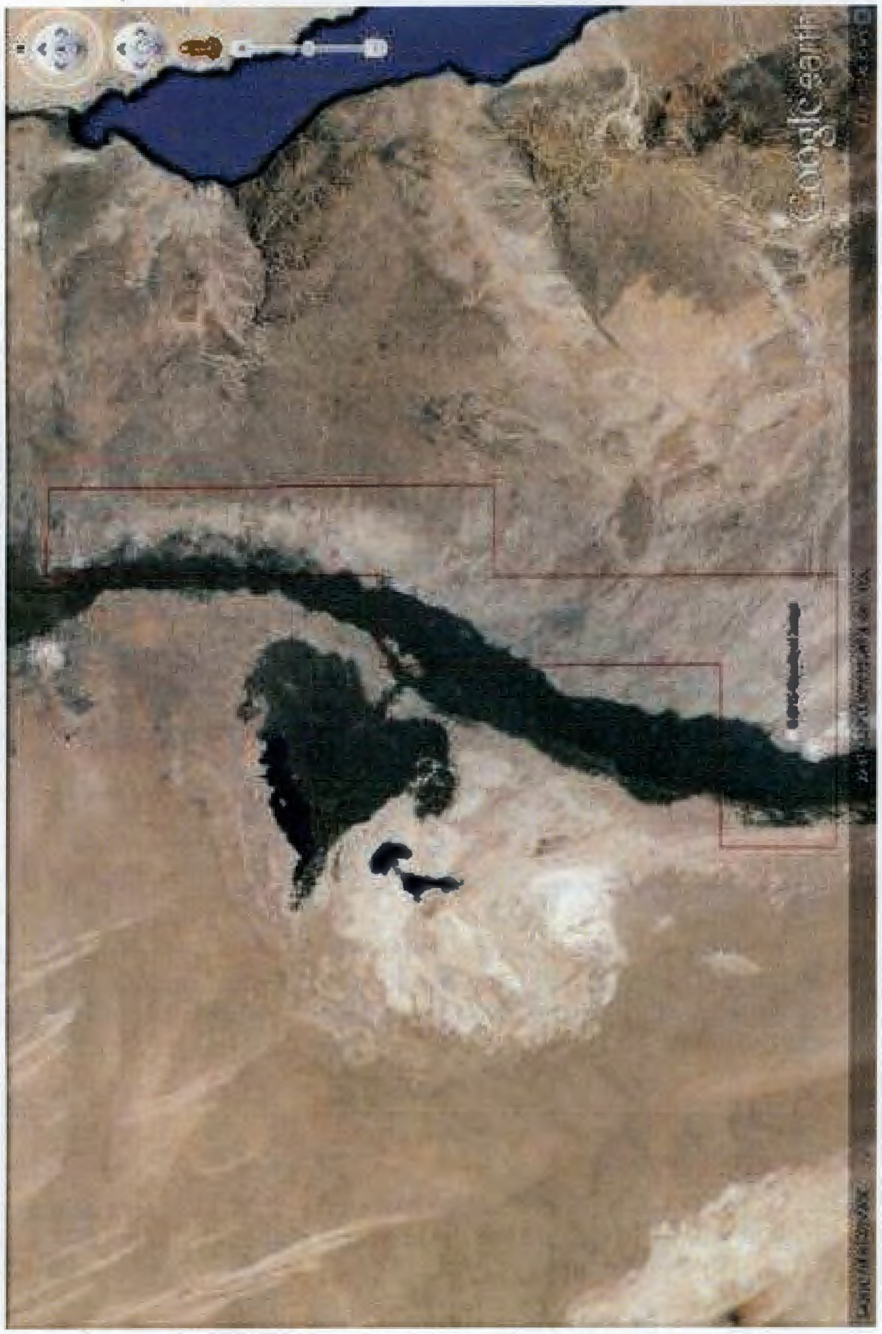
The main plain is covered by a series of silts, sands and gravel of fluviatile origin, often with a stony surface. In places, this stony surface is hurried under blown sand or washed silt. Mobile dunes of the barkhan type are sterile.

The Recent deposits rest upon Plio-Pleistocene beds of limestone, shales, marls, clays, grits, conglomerates and gypsum; the Pli-Pleistocene beds form low flat-topped hills projecting through the recent deposits. These beds rest uncomfortably upon the basement complex rocks. Along the western margin of the plain, hills of Archean rocks have been reduced to plain level by erosion and are now marked by residual fragments of the underlying rock type. This forms locally a desert surface of the hamada type as distinguished from the gravel desert of the plain and the erosion pavements .

The geology of the area was outlined by Abdel-Daiem (1971). Quaternary strata cover the major part of the area which have a maximum thickness of about 240 m, and are developed into aeolian sands as well as into fluviatile sands and gravels.

Figure 5-58

The Entire Study Area



Tertiary- strata occupy much of the area; they are essentially developed into lime facies with thin intercalations of clayey sand, and are formed under shallow marine conditions. Pliocene strata are exposed at the fringe of the Nile Valley and are referred to as marine Pliocene composed of sandy limestone and marl packed with *Ostrea cucullata* with a rich foraminiferal content.

According to this sequence, it is postulated that arms of the Pliocene gulf that occupied the Nile Valley penetrated into erosional valleys of the main wadis, which were originally formed towards the end of the Miocene. At the end of the Pliocene and in the Early Pleistocene continued rising of the land surface in the south and the flow of fresh water into the Pliocene gulf filled this gulf with ferruginous material. Pleistocene to Holocene times was marked by continual building of the Delta, the piedmont plains and eventually the flood plains. With the advent of aridity the landscape took most of its present shape.

A variety of habitat types are found in this extensive desert area. These include the sand dunes, extensive area of gravel desert, and the low reaches of numerous west-flowing wadis draining the limestone.

5.5.2 General Field Observations

The field observations that describe the general conditions of the aquatic and terrestrial investigated area are as follow:

- The terrestrial investigated area is generally characterized by low vegetation and some desert wild plants, while most of the area was planted by many crops.
- The River Nile bank is divided into three habitats; the slope, the water-edge and open-water of the Nile. Each of these habitats has its specific flora.
- Most of habitats in the region are very common with very poor biodiversity and no sensitive ecosystems.
- No protected areas for their conservation value are located on, or in the vicinity of the project area.

5.5.3 Protected Areas

No protected areas for their conservation value are located on the proposed project area. The proposed route itself and the surrounding land are poorly vegetated with much of the area having been disturbed by mine clearance (*see Figure 5-59*).

5.5.4 Wild Life

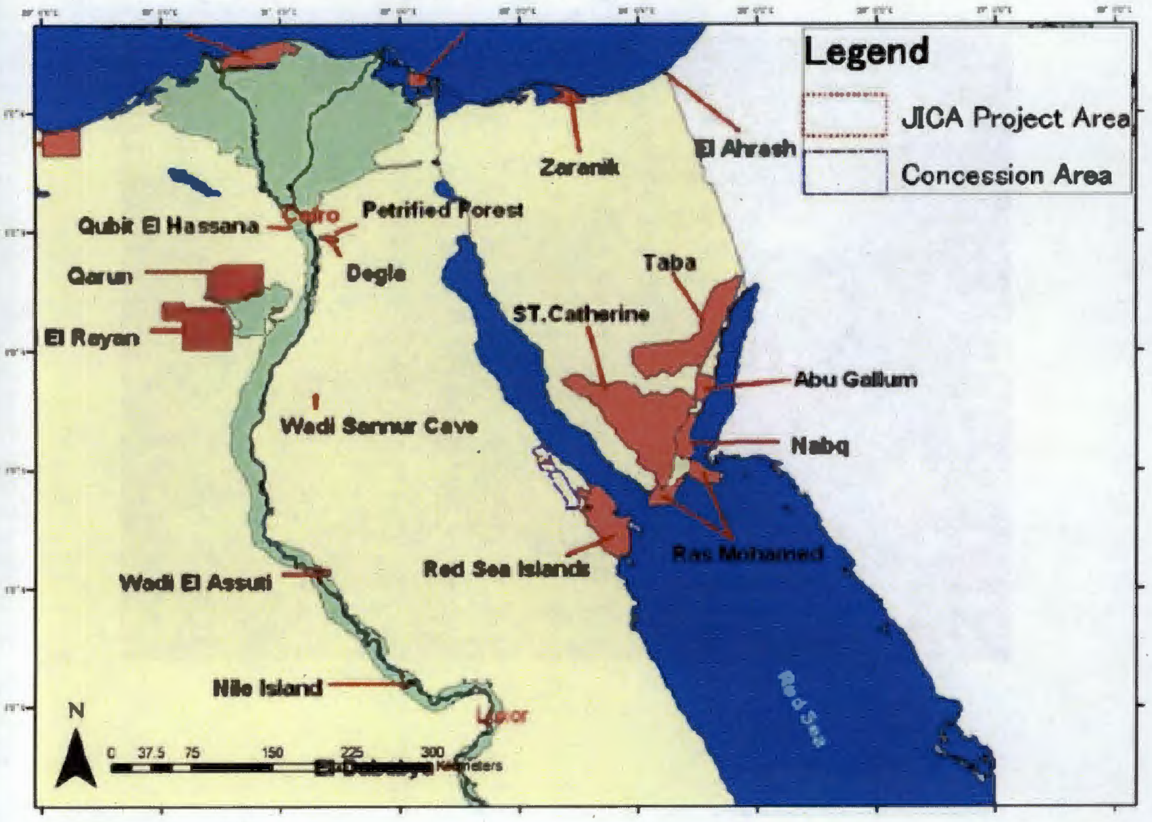
A. Plants and Vegetation:

The area of the study is generally characterized by low vegetation and some desert wild plants, while most of the area was planted by many crops (*see Figure 5-59*).

The soil appears generally dry sandy with some salt affected area. This sand layer covered by dry loose sand in depth ranges from 10-800cm. The dominant plant species are salt excreting as *Tamarix tetragyna* (*Figure 5-60*), or succulents as *Cornulaca monacantha*, these species can adapt such environmental conditions.

Figure 5-59

The Natural Protectorates Map of Egypt



Source: Egyptian Environmental Affairs Agency (EEAA), 2012.

Figure 5-60

General View of the Study Area
Shrubs of Tamarix Tetragyna Appear in Sparse Community

Wild Plant Species

- *Tamarix tetragyna* (Tamaricaeae), perennial shrub up to 5m, grow in sandy soil, salt marshes, wet lands, and edges of saline waste lands. This species is the dominant species in the studied area (*Figure 5-61*).
- *Sarcocornia fruticosa (Chenopodiaceae)*, Small shrub up to 80 cm high. Succulent salt tolerant species *(Figure 5-62)*.

Plant species on canal bank

- *Phragmites australis*(Gramineae), rhizomatous plant grow around olive and maize cultivations in the study area. It generally grow and dominates the wet lands, waste lands and salt affected areas as the reclaimed areas 7 km from the studies site (*Figure 5-63*).

- *Pluchea dioscoridis* (Compositae), Perennial tree up to 3m high. The plant traced at the cultivation edges in the reclaimed land near the studies site (*Figure 5-64*). Generally the species grow in canal banks, wet lands, waste lands and salt affected areas.

- *Alhagi graecorum (Leguminosae)*, Perennial tree up to 80 cm high. The plant is a common species under olive and palm trees in addition to the cultivation edges in the reclaimed land near the studies site (*Figure 5-65*). Generally the species grow in the Nile and canal banks, wet lands, waste lands and salt affected areas.

- *Cynancum acutum (Asclepiadaceae), The plant is a co-dominant species to Alhagi* graecorum under olive and palm trees.

- *Cornulaca monacantha* (Chenopodiaceae), shrub up to one meter high Succulent salt tolerant *species (Figure 5-66)*.

B. Reptiles

Many reptilian species are known to occur in this area. In the relatively flat, sand or gravel desert around the studied site, Saber (1989) listed 30 desert dwelling reptilian species. Most abundant of these were Acanthodactylus scutellatus, A. boskianus, Trapelus flavimaculatus, Scincus scincus, Chamaeleo chamaeleon, Varanus griseus, Psammophis schokari, Spalerosophis diadema and Cerastes viper a. In wadis draining the limestone plateau in the northern sector of this desert, common reptiles include Ptyodactylus guttatus, Acanthodactylus bos-kianus, Uromastyx aegyptius, Chamaeleo camaeleon, Coluber rhodorhachis, Walterinnesia aegyptia and Cerastes cerastes .In the southern part of this inland desert Ptyodactylus hasselquistii, Pseudotrapelus sinaitus, Trapelus flavimaculatus, Uromastyx ocellatus, Mesalina guttulata, M. rubropunctata and Cerastes cerastes are the characteristic reptiles (*Table 5-17*) (*see Figure 5-69 through Figure 5-74*).

Figure 5-61

General View of the Study Area

Figure 5-62

A- Tamarix Tetragyna Shrub ***B- Magnified Branch***

Figure 5-63

Plant Species on Nile and Canal Banks

A- Sarcocornia Fruticosa Shrub

B- Magnified shrub

Figure 5-64

Phragmites Australis at the Reclaimed Land

Figure 5-65

Pluchea Dioscoridis

Figure 5-66

A- Alhagi Graecorum Shrub | *B- Magnified Branch*

A

B

Figure 5-67

Cornulaca Monacantha Community

Table 5-17

Reptiles Recorded at the Study Area

Latin name	English name	Arabic name
Acanthodactylus boskianus	Bosc's Fringe-toed Lizard	سقنقر خشن
Acanthodactylus scutellatus	Nidua Fringe-toed Lizard	سقنقر الرمل الكبير
Acanthodactylus schreiberi		
Chalcides ocellatus	Ocellated Skink	سحلية دفانة
Chamaeleo africanus	African Chameleon	حرباء أفريقيا
Chamaeleo chamaeleon	Common Chameleon	حرباء
Eryx jaculus	Javelin Sand Boa	دساس بلدى
Hemidactylus turcicus	Turkish Gecko	برص منزلى
Mabuya quinquetaeniata	Bean Skink	سحلية جرابة
Mabuya vittata	Bridled Skink	سحلية جرابة مخططة
Malpolon monspessulana	Montpelier's Snake	ثعبان خضارى
Naja haje	Egyptian Cobra	كوبرا مصرى
Psammophis sibilans	African Beauty Snake	ابو السيور
Sphenops sepsoides	Audouin's Skink	سحلية نعامة

C. <u>Birds</u>

Many birds of resident avifauna of this desert is composed of y species of 'true desert birds (Baha el Din and Saleh, 1983) *, such as Hirundo rustica savignii, Motacilla flava pygmaea, Galerida cristata maculate, Lanius collurio collurio, Acrocephalus arundinaceus arundinaceus, Prinia gracilis gracilis, Phylloscopus sibiatrix, Sylvia curruca curruca, Ficedula parva parva, Oenanthe oenanthe oenanthe Cursorius cursor, Pterocles coronattus, P. senegallus, Ammomanes cincturus, A. deserti, Alaemon alaudipes, Oenanthe lugens, O. leucopyga, Scotocerca inquieta, Corvus ruflcollis, Bucanetes githa-gineus and Emberiza striolata (Table 5-18) (see also Figure 5-75 and Figure 5-76).*

Falcon Birds are rarely observed in the study area, however mitigation measures are to be taken to prevent bird collision with the OHTL (see Chaptre 7).

Table 5-18

List of the Bird Species Recorded at the Wider Study Area
[*: Denotes the endemic species, b: breeding species]

Scientific name	Family	English name
Tachybaptus ruficollis ruficollis	Podicipediae	Little Grebe
Ardea cinerea cinerea	Ardeidae	Grey Heron
Ardeola ralloides	Ardeidae	Squacco Heron
Nycticorax nycticorax nycticorax	Ardeidae	Night Heron
Ixobruchus minutus minutus[b]	Ardeidae	Little Bittern
Egretta alba alba	Ardeidae	Great White Egret
Egretta ibis ibis	Ardeidae	Cattle Egret
Egretta garzetta garzetta	Ardeidae	Little Egret
Anas penelope	Anatidae	European Wigeon
Anas clypeata	Anatidae	Shoveler
Anas querquedula	*Anatidae*	*Garganey*
Aythya ferina	*Anatidae*	*Pochard*
Aytha nyroca	*Anatidae*	*Ferruginous Duck*
Elanus caeruleus caeruleus	*Accipitridae*	*Black-Shouldered Kite*
Circus aeruginosus aeruginosus	*Accipitridae*	*Marsh Harrier*
Falco tinnuniculus tinnuniculus	*Falconidae*	*Kestrel*
Porphyrio porphyrio madagascariensisb	*Rallidae*	*Purple Gallinule*
Fulica atra atra	*Rallidae*	*Coot*
Charadrius hiaticola tundrae	*Charadriidae*	*Ringed Plover*
Charadrius alexandrinus alexandrinusb	*Charadriidae*	*Kentish Plover*
Hoplopterus spinosusb	*Charadriidae*	*Spur-Winged Plover*
Calidris minuta	*Scolopacidae*	*Little Stint*
Calidris alpina alpina	*Scolopacidae*	*Dunlin*
Philomachus pugnax	*Scolopacidae*	*Ruff*
Lymnocryptes minimus	*Scolopacidae*	*Jack Snipe*
Tringa totanus totanus	*Scolopacidae*	*Redshank*
Actitis hypoleucos	*Scolopacidae*	*Common Sandpiper*
Larus ridibundus	*Laridae*	*Black-Headed Gull*
Larus genei	*Laridae*	*Slender-Billed Gull*
Larus fuscus fuscus	*Laridae*	*Lesser Black-Racked Gull*
Larus argentatus cachinnans	*Laridae*	*Yellow-Legged Gull*
Chlidonias hybrida hybrida	*Laridae*	*Whiskered Tern*
Chlidonias leucoptera	*Laridae*	*White-winged Black Tern*
Sterna albifrons albifronsb	*Laridae*	*Little Tern*

Table 5-18 (*Contd.*)

List of the Bird Species Recorded at the Wider Study Area

[*: Denotes the endemic species, b: breeding species]

Scientific name	Family	English name
Sterna albifrons albifronsb	*Laridae*	*Little Tern*
*Streptopelia senegalensis aegyptiaca**	*Columbidae*	*Palm Dove*
Streptopelia decaoclo decaoclo	*Columbidae*	*Coilered Turtle Dove*
*Centropus senegalensis aegyptius*b*	*Cuculidae*	*Senegal Coucal*
Cuculus canorus canorus	*Cuculidae*	*Cuckoo*
Ceryle rudis rudisb	*Alcedinidae*	*Pied Kingfisher*
Merops orientalis cleopatra	*Meropidae*	*Little Green Bee-eater*
Upupa epops epops	*Upupidae*	*Hoopoe*
Hirundo rustica rustica	*Hirundinidae*	*Swallow*
Riparia riparia riparia	*Hirundinidae*	*Sand Martin*
*Calandrella rufescens nicolli*b*	*Alaudidae*	*Lesser Short Toed Lark*
*Galerida cristata nigricans**	*Alaudidae*	*Crested Lark*
Anthus cervinus	*Motacillidae*	*Red-Throated Pipit*
*Motacilla flava pygmaea**	*Motacillidae*	*Egyptian Wagtail*
Motacilla flava flavissima	*Motacillidae*	*Yellow Wagtail*
Motacilla cinerea cinarea	*Motacillidae*	*Grey Pied Wagtail*
Lanius collurio collurio	*Laniidae*	*Red-backed Shrike*
Sturnus vulgaris vulgaris	*Sturnidae*	*Starling*
Corvus corone cornix	*Corvidae*	*Hooded Crow*
*Prinia gracilis deltae*b*	*Sylviidae*	*Graceful Warbler*
Scotocerca inquieta inquieta	*Sylviidae*	*Scrub Warbler*
Passer domesticus niloticus	*Passeridae*	*House Sparrow*
Emberiza calandra calandra	*Emberizidae*	*Corn Bunting*
Emberiza shoeniclus intermedia	*Emberizidae*	*Reed Warbler*
Milvus migrans		

Most of the line routing locate on the desert areas (88%), where no nesting locations exist atall. The rest of the route (12%), which is located in the agricultural area of the Samallout zone, dosen't include nesting locations as it is totally extended on the green flat cropland.

D. Migrant Birds

The Nile Valley with its abundance of water and food available for birds, provide an important, relatively, easy and safe route for trans-Saharan, Palearctic migration. Huge numbers of individuals of many species utilize this route during both spring and autumn migrations (*see Figures 5-68*). The region also provides wintering habitats for large populations of many Palearctic migratory species (Goodman *et al.,* 1989).

However, most of TL route is not located on the migration route of migrating birds. Only a very limited part crossing the Nile River at the Samallout zone may intersect the TL route. A recent JICA study is conducted for identifying bird migration characteristcs in El-Minya area and the outcome of this study is expected to be announced by the end of 2013. These outcomes of the study will be put into consideration regarding TL operation in the Samallout Zone.

E. <u>Mammals</u>

Rodents form the largest mammalian group of the area (Table 5-19), being represented by many species and the most common species - besides of course the normal cats and dogs- are the Field Rat *Arvicanthis niloticus* and the Black Rat *Rattus rattus*, which are nocturnal and feed on vegetables and seeds. Burrows are shallow and usually under shrubs.

Many Foxes were recorded in areas around the River shore. Individuals and their tracks were seen throughout the area, where it seems to inhabit date and fruit groves, cultivated areas and suburban gardens, commonly seen during daylight hours. It feeds on birds, rodents and insects. It is widespread around drains of Nile banks and Valley. However, wild carnivores have suffered a great deal of decline in the recent years as a result of secondary poisoning with pesticides widely used to control *Arvicanthis niloticus* and other rodent pests.

The Giant Musk Shrew; *Crocidura flavescens deltae*, was also recorded in many areas around the lake shore (*Tabgle 5-19*) (*see also Figure 5-77 through Figure 5-81*).

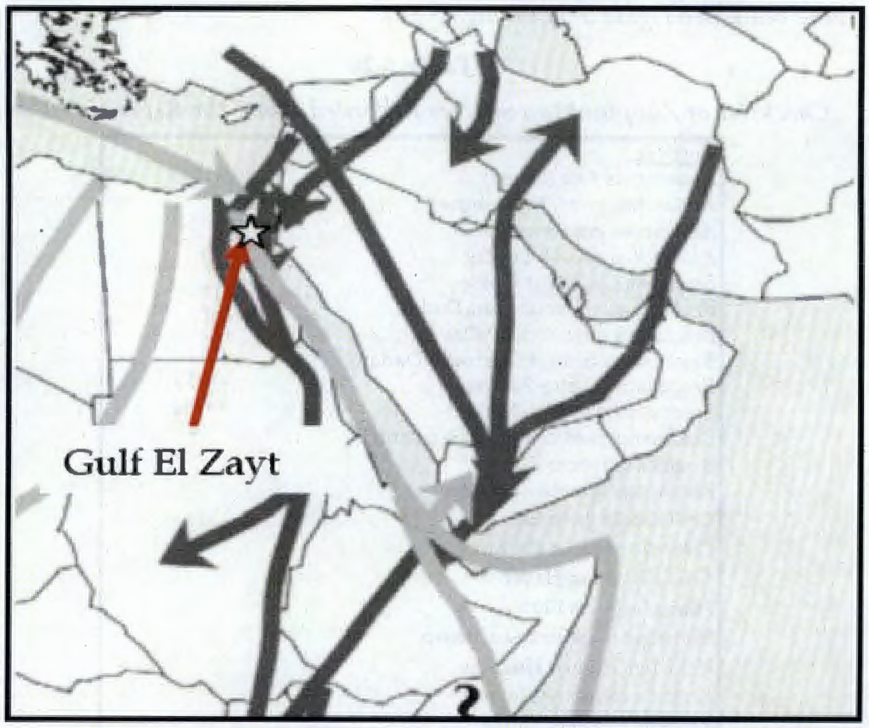
Table 5-19

List of the Mammals Recorded at the Study Site

Order	**Family**	**Species**	**English name**	**Arabic name**
Insectivora	Erinaceidae	*Hemiechinus auritus*	Long eared hedgehog	قنفذ
	Soricidae	*Crocidura flavescens*	Giant musk shrew	عرسة
Rodentia	Cricetidae	*Gerbillus andersoni*	Anderson's Gerbil	بيوضى
		Psammomys obesus	Fat sand rat	جرذ
	Muridae	*Arvicanthis niloticus*	Nile or field rat	فأر الغيط
		Rattus rattus	Black rat	جرذ اسود
		Rattus norvegicus	Brown rat	جرذ المجارى
		Mus musculus	House mouse	سيسى - فأر
		Acomys cahirinus	Cairo spiny mouse	عرسة
Carnivora	Mustelidae	*Mustela nivalis*	Weasel	ابن عرس
	Viverridae	*Herpestes ichneumon*	Egyptian mongoose	نمس

Figure 5-68

The Most Important Routes for Migratory Birds along the Egyptian Lands



Source: *"Conservation of soaring migratory birds in the eastern sector of the Africa-Eurasia flyway system (Rift Valley and Red Sea flyways)" UNDP, 2006.*

5.5.5 Aquatic Fauna

A. Zooplankton

Table 5-20 gives the Checklist of zooplankton species recorded along the River Nile bank (*see Figure 5-82 through 5-86*).

Table 5-20

Checklist of Zooplankton Species Recorded along the River Nile Bank

Rotifera
Anuraeopsis fissa (Gosse)
Asplanchna girodi De Guerne
Asplanchna priodonta Gosse
Asplanchna sieboldi Leydig
Brachionus angularis Gosse
Brachionus budapestinensis Daday
Brachionus calyciflorus Pallas
Brachionus caudatus (Barrois &Daday)
Brachionus falcatus Zacharias
Brachionus plicatilis (Müller)
Brachionus quadridentatus Hermann
Brachionus rubens Ehr.
Brachionus urceolaris (Müller)
Cephalodella gibba Ehr.
Colurella adriatica Carlin
Colurella obtusa Haver
Filinia longiseta Ehr.
Harringia rouseleti Beauchamp.
Hexarthra oxyuris Hudson
Keratella cochlearis Gosse
Keratella quadrata Müller
Keratella tropica Apstein
Keratella vulga Ehr.
Lecane arcula Harring
Lecane bulla Gosse
Lecane closterocera Schmarda
Lecane luna Müller
Lecane lunaris Ehr.
Philodina roseola Ehr.
Polyarthra ramata Skorikow
Polyarthra vulgaris Carlin
Proalides sp.
Rotatoria sp.
Synchaeta oblonga Ehr.
Synchaeta pectinata Ehr.
Testudinella patina Hermann
Trichocerca cylindrica Imhof
Trichocerca gracilis Tessin
Trichocerca pusilla Jennings
Trichocerca inermis Linder
Copepoda
Acanthocyclops americanus March
Acanthocyclops exilis Coker
Acanthocyclops vernalis Fischer
Apocyclops panamensis March

B. Aquatic Benthos

Table 5-21 gives the Checklist of benthos species recorded along River Nile bank.

Table 5-21

Checklist of Benthos Species Recorded along River Nile Bank

Species
Arthropoda
Corophium orientale (Schellenberg)
Gammarus lacustris (Fabricius)
Gammarus aequicauda
Gammarus orinicornis
Mesanthura sp.
Palaemon elegans
Tandipos tentans (Meigen)
Nymph of *Neurocordula* sp.
Nymph of *Ischneura* sp. (Pinhey)
Nymph of *Enallaga vansomerni*
Micronecta plicata (Costa)
Lethocerus niloticus (Stal)
Sternolophus solieri (Lapouge)
Aquatic spiders
Annelida
Branchiura sowerbyi (Beddard)
Limnodrilus hoffmeisteri (Claparede)
Limnodrilus udekemianus (Claparede)
Limnodrilus claparedeianus (Ratzel)
Potamothrix hammoniensis (Mich)
Chaetogaster limnaei (K. Von Beak)
Helobdella conifera (Moore)
Salifa perspicax (Blanchard)
Glossiphonia sp.
Mollusca
Melanoides tuberculata (Müller)
Theodoxus niloticus (Reeve)
Buliuns truncatus (Audouin)
Gyraulus ehrenbergi (Beck)
Physa acuta (Draparanud)
Cleopatra bulimoides (Olivier)
Bellamya unicolor (Olivier)
Lanistes carinatus (Olivier)
Biomphalaria alexandrina (Ehr.)
Hydrobia ventrosa (Montagu)
Succinea cleopatra (Pallary)
Corbicula consobrina (Cailliaud)
Corbicula fluminalis (Müller)

C. Fishes

Table 5-22 gives Fish species at the study site in the River Nile (*see Figure 5-87 and Figure 5-88*).

Table 5-22

Fish Species at the Study Site in the River Nile

Family	Species	Arabic name
Cyprinodontidae	*Aphanius fasciatus* (Valenciennes, 1821)	بطريق
Poecilidae	*Gambusia affinis* (Baird & Girard , 1853)	جامبوزيا
Atherirudae	*Atherina mochon* Cuvier, 1829	بساريا
Mugilidae	*Mugil cephalus* Linnaeus, 1758	بورى
	Liza ramada (Risso, 1826)	طوبارة
Cichlidae	*Hemichromis bimaculatus* Gill , 1862	هيمكروس مخطط
	Haplochromis bloyeti (Sauvage,1883)	هابلوكروس قزم
	Tilapia zillii (Gervais, 1848)	بلطى اخضر
	Oreochromis niloticus (L.,1757)	بلطى نيلى
	Oreochromis aureus (Steindachner,1864)	بلطى ازرق
Gobiidae	*Pomatoschistus minutus* (Pallas ,1767)	ابو كرش

Figure 5-69

Common Herpetofauna

Hemidactylus turcicus turcicus **برص منزلي**

Ptyodactylus hasselquistii **برص أبو كف**

Figure 5-70

Common Herpetofauna (Contd.)

Stenodactylus petrii **برص واسع العين**

Stenodactylus sthenodactylus **برص واسع العين**

Figure 5-71

Common Herpetofauna (Contd.)

Acanthodactylus boskianus سقنقر خشن

Acanthodactylus scutellatus سقنقر الرمل الكبير

Figure 5-72

Common Herpetofauna (Contd.)

Chalcides ocellatus سحلية دفانة

Scincus scincus سقنقور

Figure 5-73

Common Herpetofauna (Contd.)

Sphenops sepsoides سحلية نعامة

Chamaeleo chamaeleon حرباء

Figure 5-74

Common Herpetofauna (Contd.)

Varanus griseus ورل صحراوي

Lytorhynchus diadema بسباس

Figure 5-75

Common Birds

Motacilla flava

Prina gracilis

Hirundo rustica

Gallinula chloropus

Figure 5-76

Common Birds (Contd.)

Falco tinnunculus

Elanus caeruleus

Alcedo atthis

Figure 5-77

Common Mammals

Hemiechinus auritus **القنفذ طويل الأذن**

Gerbillus pyramidum **الدمسي**

Figure 5-78

Common Mammals (Contd.)

Gerbillus andersoni **جربيل اندرسون**

Gerbillus gerbillus **البيوضي**

Figure 5-79

Common Mammals (Contd.)

Meriones **carssus** **مريونز كراسوس**

sammomys obesus **جرذ**

Figure 5-80

Common Mammals (Contd.)

Rattus rattus **جرذ أسود**

Mus musculus فأر المنزل

Figure 5-81

Common Mammals (Contd.)

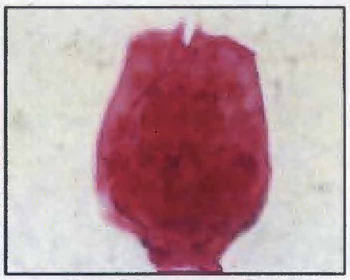
Jaculus orientalis القرفتي

Jaculus jaculus **يربوع حر**

Figure 5-82

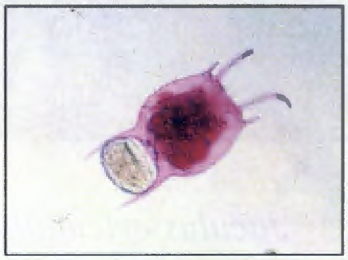
Common Zooplankton

Brachionus angularis

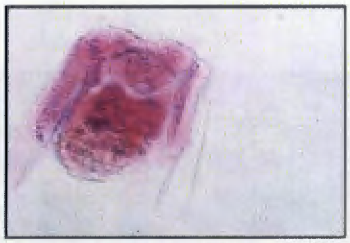


Brachionus caudatus

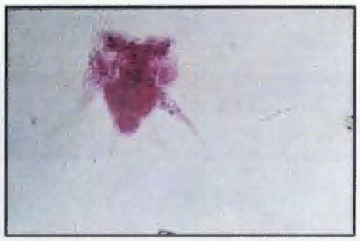
Brachionus calyciflorus



Brachionus falcatus



Polyarthra vulgaris



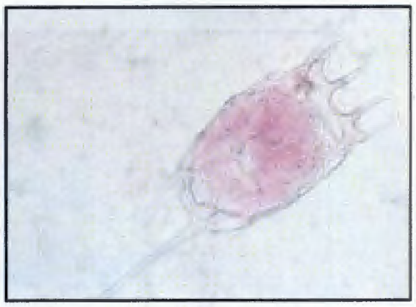
Hexarthra oxuris

Asplachnia sieboldi

Anuraeopsis fissa

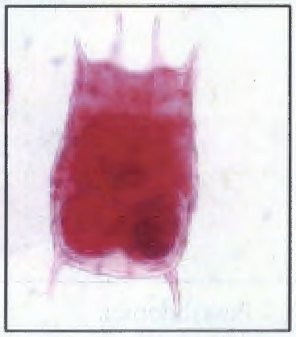
Figure 5-83

Common Zooplankton (Contd.)



Keratella tropica

Keratella cochlearis



Keratella quadrata dispersa

Keratella quadrata quadrata

***Proalides* sp.**

Lecane luna

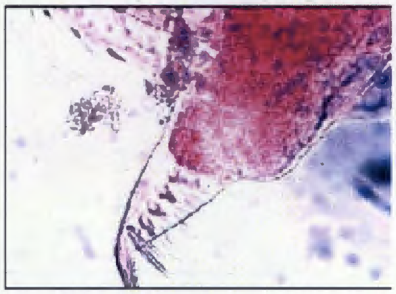
Filinia longiseta

Brachionus urceolaris

Figure 5-84

Common Zooplankton (Contd.)

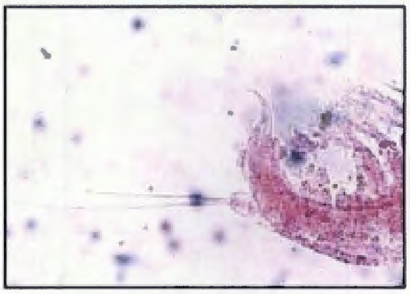
Adult female



Postabdomen

Moina micrura

Adult female



Postabdomen

Diaphanosoma exesium

Bosmina longirostris

Chydorus sphearicus

Figure 5-85

Common Zooplankton (Contd.)

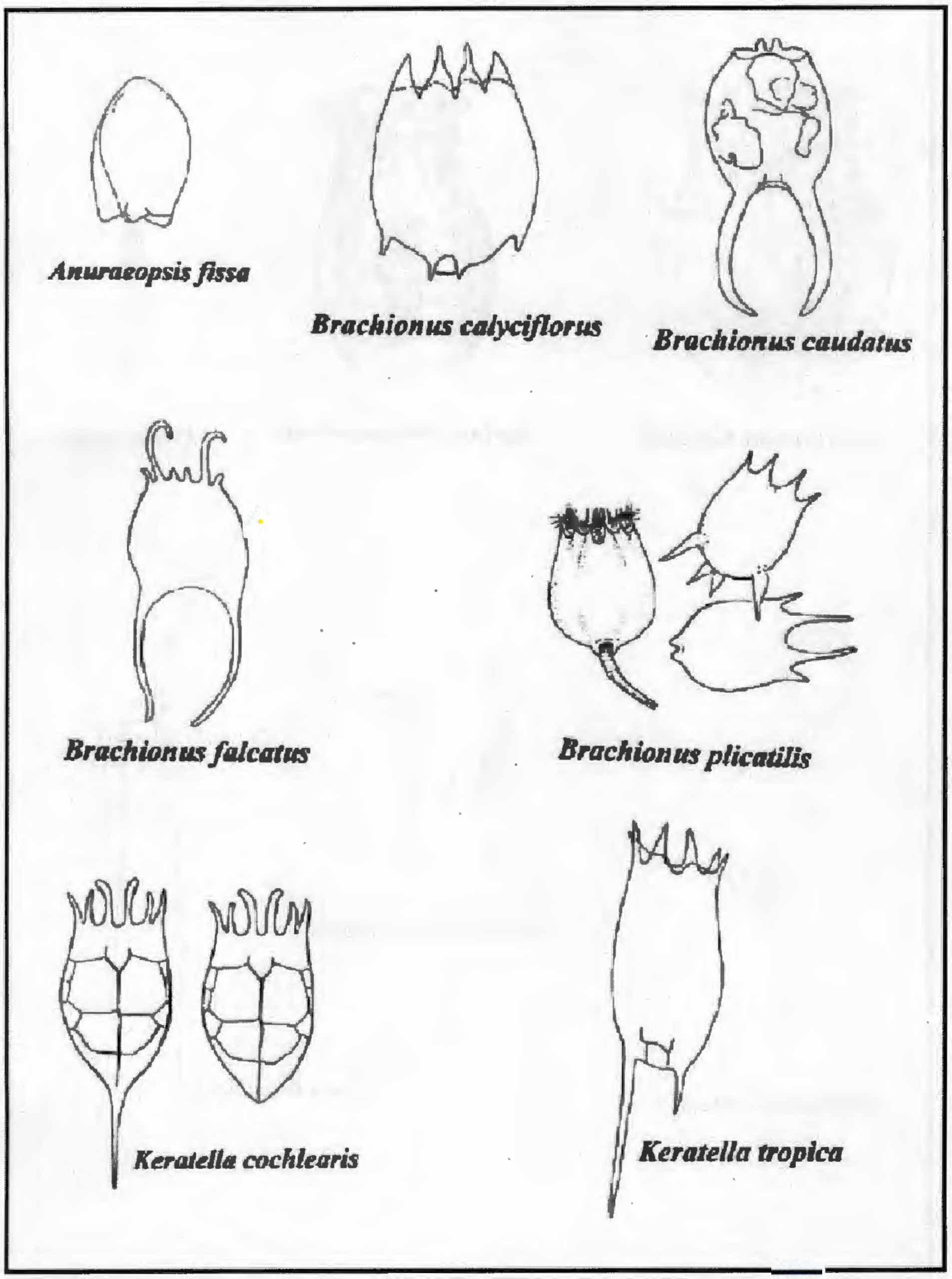


Figure 5-86

Common Zooplankton (Contd.)

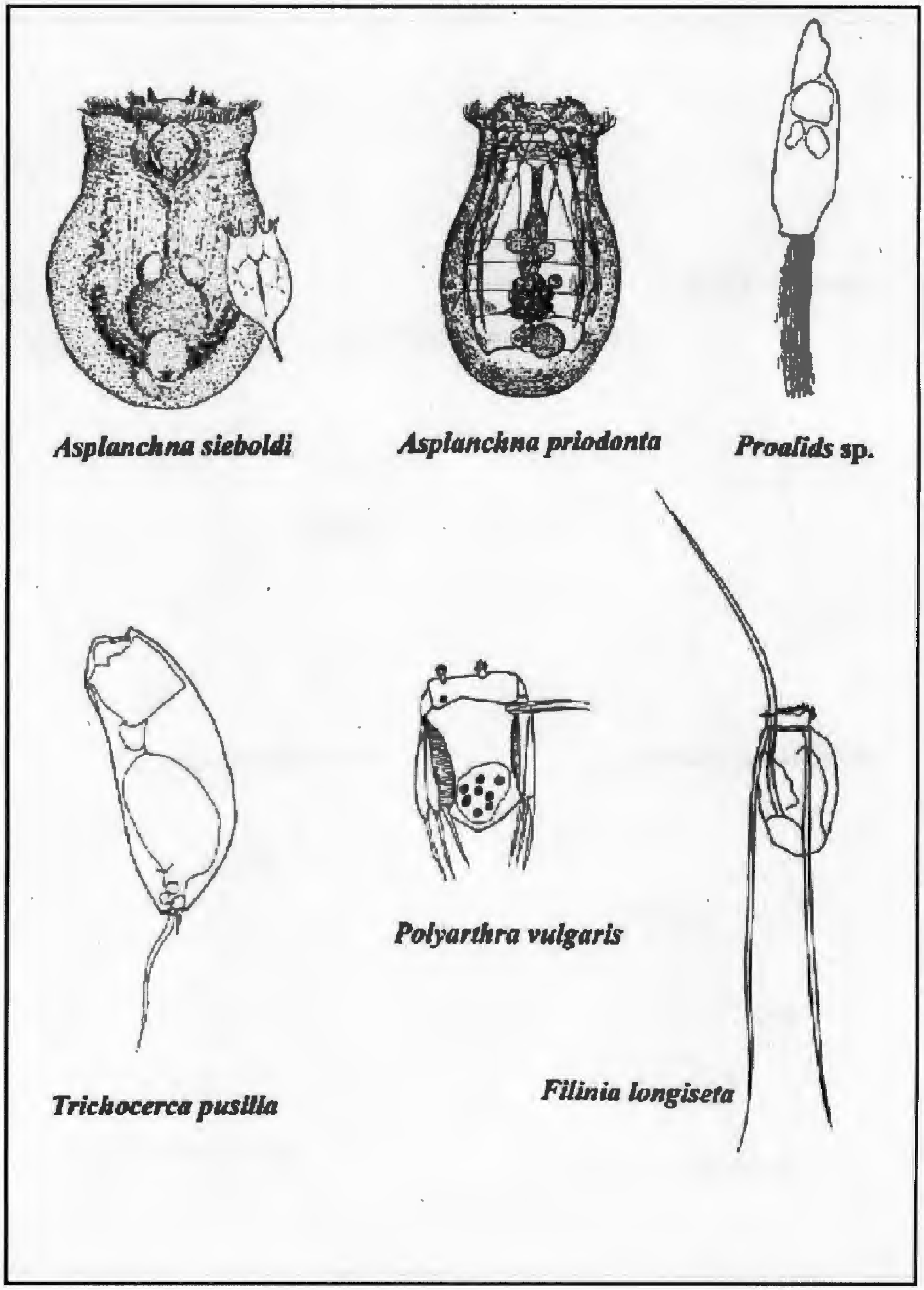


Figure 5-87

Common Fish Species

Tilapia zillii بلطي أخضر

Oreochromis niloticus بلطي نيلي

Figure 5-88

Common Fish Species (Contd.)

Liza ramada طوبار

5.6 SOCIO-ECONOMIC ENVIRONMENT

5.6.1 Basic Information about the Project Sites

Cairo Governorate

The foundation of Cairo city dates back to 358 H / 969 AD by the Fatimid leader Gawhar El Sekly who laid the foundation of the city in the north of "Fustat" where it took him three years. He named it for

Al- Mansureya then later came the Caliph - El Muez Ledeen El Lah El-Fatmy – to rename it El Qahirah "Cairo", the vanquisher, and made it the capital of his State. The city's total area at that time covered 340 feddans.

Cairo is privileged with a unique strategic location that qualified it to be the political capital of Egypt (*Figure 5-89*), besides its idiosyncrasy as a cultural, artistic, scientific, and historical capital of the Arab and the Islamic world. The governorate is one of Greater Cairo Region that includes Cairo, Giza, and Qalyubiya governorates.

Cairo's total area covers 3085,12 km². It is considered one of the governorates which comprises a sole city, and by large the biggest Arab city and the most populated in Africa and the Middle East.

According to the preliminary results of the 2006 census, Cairo is inhabited by 7.8 million people and visited by 2 million Arabs, Foreigners, and Egyptians daily either for health treatment, tourism, or for business.

In dealing with the population growth problem in Cairo, the New Urban Communities Authority - an affiliate to the Ministry of Housing - embarked on extension in desert and built new cities as New Cairo City, the closest city to Cairo, and one of the third generation cities that was established by virtue of presidential decree No 1991/2000.

The governorate hosts several industrial zones that make it a haven attracting capital, which could be invested to develop the national industry and enhance its competitiveness on the local and international levels. Some of these industrial zones are located in El Basateen, El Waily, Heliopolis, Helwan, and the duty free zone in Naser City, as well as in the new industrial zones in the newly established cities namely; Obour, Qatameyah, Badr, and El Amal. The governorate has a solid base of strategic and consumer industries such as iron and steel, cement, military equipment, electric appliances and cars, as well as textiles and ready-made clothes.

Giza Governorate

Giza governorate is one of the Greater Cairo Region that includes Cairo, Giza, and Qalyubiya governorates. It was established in year 20 Hegiri with the early Islamic conquest of Egypt.

The total area of the governorate covers 13184 km^2, representing 1.3% of the Republic's area (*Figure 5-90*). The governorate encompasses 10 Marakz, 12 cities, 7 districts, 51 rural local units annexed by 171 villages, and 636 hamlets.

According to the preliminary results of the 2006 census, population is 6.3 million people; 58.6% of them live in urban areas, and 41.4% in rural areas and population natural growth rate has reached 19.3 per thousand.

Beside being an agricultural governorate, Giza is also considered an industrial one as it hosts many industries such as: food, spinning and weaving, basic metals, engineering and electronics, as well as mining. Moreover, the governorate hosts two industrial zones; one of them is located along Cairo-Alexandria Desert Road and has big industrial companies. In addition to that, the governorate hosts many new projects such as the under construction new Egyptian Museum, the Smart Village, and the third underground line.

In addition, the governorate has the sound and light project and several museums and gardens that attract internal and bound tourism such as: Naggy Museum, the Zoo, the Agricultural Museum, and the Modern Arts Museum, in addition to entertainment places in El Haram street, besides the Media Production City in 6th of October City.

Beni Sueif Governorate

Beni Sueif governorate is located in the North Upper Egypt Region that encompasses Giza, Beni Sueif, and Minya Governorates (*Figure 5-91*). It is known for its rural style. The governorate covers an area of 10954 km2 epresenting1.08% of the Republic's total area. It comprises 7 Marakz, 7 cities, and 39 rural local units annexed by 222 villages and 690 hamlets. According to the preliminary results of 2006 census, the population is about 2.3 million; 23.3% of them live in urban areas, and 76.8% in rural areas. The population natural growth rate has reached 21.9 per thousand. Beni Sueif is an agricultural governorate. The cultivated areas cover 279.8 thousand feddans. Major crops are: wheat, cotton, sugar cane, in addition to medical and aromatic plants. Arable agricultural lands amount to 63 thousand feddans.

The governorate contributes to the industrial activity through big industries such as cement, clay bricks, and textiles, besides small industries such as: carpets, and handmade carpets. Furthermore, it hosts a zones for light industries, and another for medium industries as well as small industries complex.

El-Minya Governorate

El-Minya governorate is located in the North Upper Egypt Region that encompasses El-Minya and Beni Sueif governorates (*Figure 5-92*). It is characterized with its rural style. El-Minya is known as the beautiful bride of Upper Egypt. The governorate covers an area of 32279 km^2, representing 3.2% of the Republic's total area. It comprises 9 Marakz, 9 cities, 61 rural local units, 360 villages and 1429 hamlets. According to the preliminary results of the 2006 census, the population is estimated at 4.2 million; 18.8% of them live in urban areas and

81.2% in rural areas. The population natural growth rate has reached 22.8 per thousand. The governorate moved towards the expansion into the desert and established new urban communities such as New Minya City and is expected to achieve human and economic development (urban, agricultural, and tourist). Minya is an agricultural governorate with estimated cultivated areas of 472.7 thousand feddans. Cotton, wheat, onion, and sugar cane are the major crops. Besides being an agricultural governorate, it has made major strides in industry, particularly in food processing, spinning and weaving and chemicals, in addition to the establishment of an industrial area in the East of the Nile, 12 km south of Minya bridge. The area was mapped out and divided into nine industrial zones, along with establishing the small enterprises complex as well as the main and secondary services centers taking into consideration environment friendly standards.

1. Local Distribution

Based on the information provided in Egypt Description by Information 2007. It is notable that Minya Governorate is distributed into 9 Markaz and 9 cities. In addition to that 61 rural local units and 299 affiliated villages are reported. Regarding Beni Suef Governorate, it is distributed into 7 markaz, 7 cities, 29 districts, 180 affiliated village and 3 local units. In addition to that a big number of hamlets were reported in both governorate, 1741 in Minya and 844 in Beni Suef.

Cairo Governorate compiles of 31 districts as it is categorized as fully urban governorate. Giza Governorate consists of 10 main Markaz, 12 cities and 7 districts. In addition to 51 rural local units, 171 affiliated villages and 636 Hamlets (*see Table 5-23*).

Table 5-23

Administrative Division for Cairo, Giza, Minya and Beni Sueif Governorates

Administrative Division	Cairo	Giza	Minya	Beni Suef
No. of Marakz	0	10	9	7
No. of cities	0	12	9	7
No. of districts	31	7	0	0
No. of rural local units	0	51	61	29
Affiliated villages	0	171	299	180
Villages outside local units	0	0	0	3
Hamlets	0	636	1741	844

Source: Egypt Description by Information 2010.

The total area of the Cairo Governorate is up to 3085.12 Km^2. The total populated area represents about 5.2% of the total area. While housing and scattering areas represent 2.25%. The agriculture land is about 47.34 km^2. Giza Governorate is one the biggest governorate in Egypt, the total are is estimated with 13184 km^2 among which 1191 km^2 are populated. It represents about 9.0% of the total populated area.

The total area of the Minya Governorate is up to 32279 Km^2. The total populated area represents about 7.47% of the total area. While housing and scattering areas represent 0.25%. The agriculture land is about 6.12% of the total area. Regarding Beni Suef, the total area of the Governorate is up to 10954 Km^2. The total populated area represents about 12.50% of the total area. While housing and scattering areas represent 0.44%. The agriculture land is about 10.9% of the total area. The distribution of the land use reflects that the majority of lands in both governorates is empty desert lands. This is a common feature of the Egyptian society, that people gather around the Nile River and the majority of Egyptian lands are desert lands. Yet, there is a reclaiming for lands in the whole areas. However, it is still slow process (*Table 5-24*).

Figure 5-89

Administrative Map of the Cairo Governorate

محافظة القاهرة

Cairo Governorate

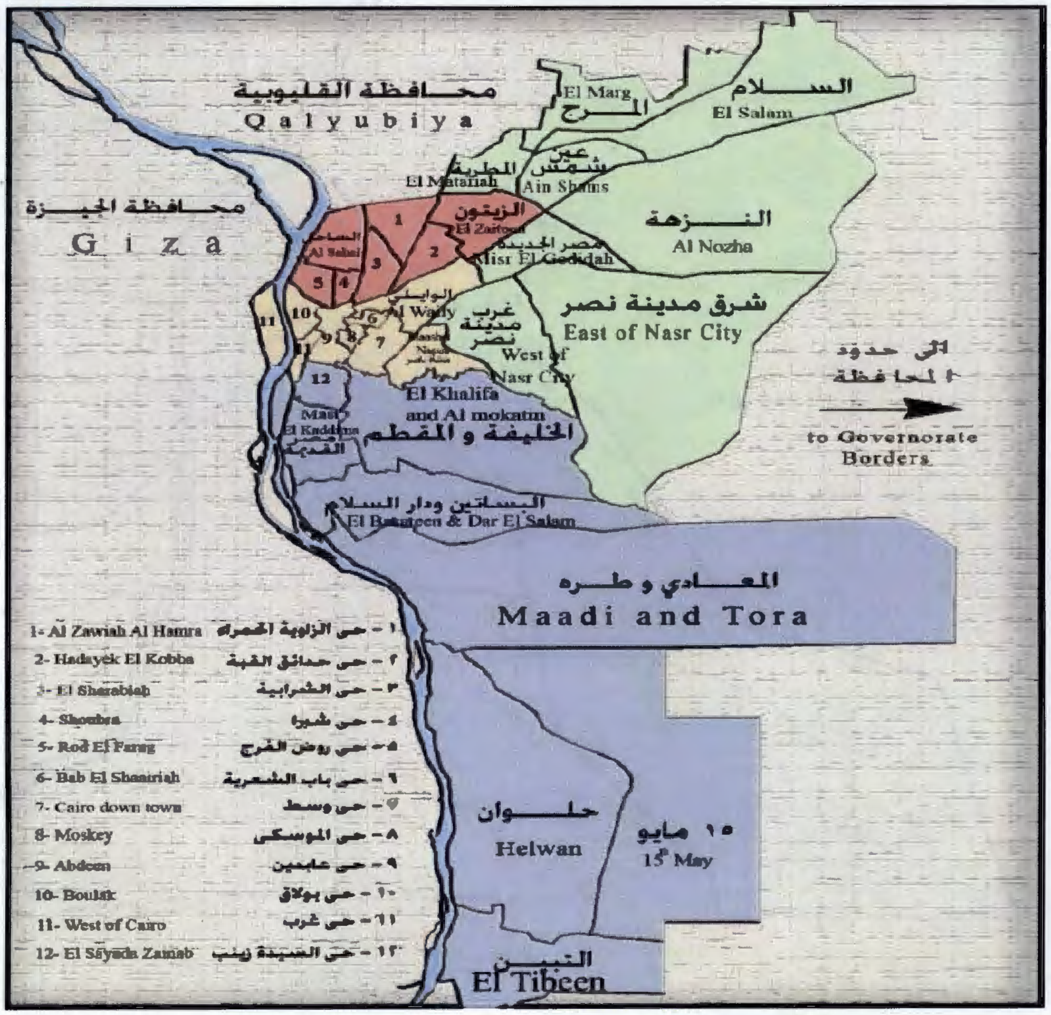


Figure 5-90

Administrative Map of the Giza Governorate

محافظة الجيزة

Giza Governorate

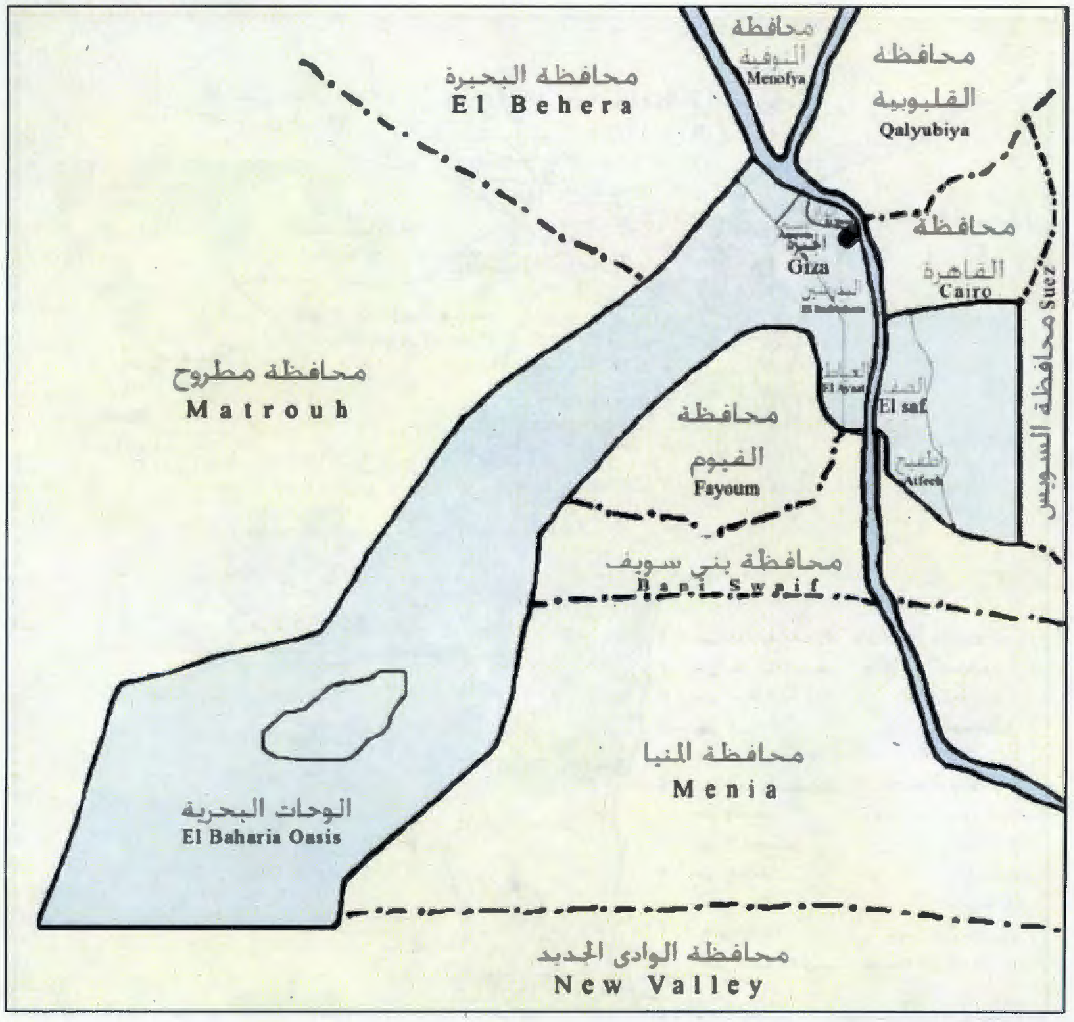


Figure 5-91

Administrative Map of the Beni-Sueif Governorate

Source: Egypt Description by Information 2009

Figure 5-92

Administrative Map of the El-Minya Governorate

Table 5-24

Distribution of Area and Land-use in Cairo, Giza, El-Minya and Beni Sueif Governorates

Area	Cairo	Giza	Minya	Beni Suef
Total area	3085.12 km^2	13184 km^2	32279 km^2	10954 km^2
Total populated area	190.42 km^2	1191 km^2	2411.65 km^2	1369.41 km^2
Housing and scattering areas	96.52 km^2	84 km^2	81.79 km^2	48.07 km^2
Facilities and cemeteries	17.66 km^2	120 km^2	168.28 km^2	121.93 km^2
Ponds and fallow	28.90 km^2	9 km^2	29.70 km^2	33.92 km^2
Agricultural land within agricultural borders	15.45 km^2	776 km^2	1975.59 km^2	1105.77 km^2
Agricultural land outside agricultural borders	31.89 km^2	202 km^2	156.29 km^2	59.72 km^2
Population density in the populated area	40.89 Thousand person/ km^2	5.27 Thousand person/ km^2	1.94 Thousand person/ km^2	1.86 Thousand person/ km^2
Population density in the total area	2.52Thousand person/ km^2	0.48Thousand person/ km^2	0.14 Thousand person/ km^2	0.23 Thousand person/ km^2
Total populated area (% to total area)	6.2%	9.0 %	7.47%	12.50%

Source: Egypt Description by Information 2010.

2. Urbanization Trends

Cairo is an urban governorate which suffers severely due to the squatter areas which are 75 areas surrounding all Cairo among which 5 slum areas are under removal and 2 areas will be removed. 68 of the squatters are under development. The severity of problem in Giza is less than it is in Cairo as only 36 areas are categorized as squatters among which 22 are under development and 14 have been developed[1]. Due to the Egyptian society conditions urbanization is not a systematic organized process but sometimes it happens haphazardly. Due to that the problem of squatters and slums come to the scene. The total number of slums in Minya is 30 areas that are being developed now. But for Beni Suef the slums represents 52 areas among which 18 have been developed and 34 are still in the process.[2]

The total number of unsafe areas in Minya is up to 9 areas among which 3 of them are located in Magaga and 3 in Malawy. In Beni Sueif , the number of unsafe areas is up to 17 areas the majority of them are located in Ehnasia and Nasser Markaz *(Table 5-25)*.

1. Egypt description by Information, IDSC, 2007
2. Egypt description by Information, IDSC, 2010

Table 5-25

Distribution of Squatter and Unsafe Areas in Minya and Beni-Sueif Governorates

Minya		Beni Suef	
Markaz Minya	1 area	Markaz Beni Sueif	2 areas
Markaz Samalot	1 area	Markaz Beba	1 area
Markaz Magaga	3 areas	Markaz Ehnasia	6 areas
Markaz Abu Qorqas	1 area	Markaz El Fashn	2 areas
Markaz Malawy	3 areas	Markaz Nasser	6 areas
Total	9 areas	Total	17 areas

Source: Egypt Description by Information 2010.

5.6.2 Historical and Cultural Heritage

- ***Monumental and Touristic Sites in Cairo Governorate***

Cairo embraced several civilizations across history including the pharaonic, the Roman, the Greek, the Coptic, and the Islamic. Moreover, these civilizations have left behind landmarks such as: Mary Tree, the Hanging Church, El Azhar Mosque, Salah El Din Citadel, Khan El Khalili area. Cairo also includes some modern highlights such as: the Egyptian Museum, the Islamic Museum, the Coptic Museum, Mohamad Ali Mosque, the Japanese Garden, El Gezira Tower, the International Garden, the Military Museum October War Panorama, Cairo International Conferences Center and the Opera House.

- ***Monumental and Touristic Sites in Giza Governorate***

Giza is also rich in ancient pharaonic monuments that made it rank second after Luxor for its wealth of pharaonic monuments and as a tourist attraction city. It hosts Giza Pyramids, the Sphinx, the Sakara Pyramid, Cheops Funeral Canoe, monuments of Meet Rahina City, and Dahshour monuments. The governorate includes as well Bahareya Oases that have 400 mineral and sulfur fresh, cold, and hot springs. Thus, it is a spa for curative tourism. Further, the governorate hosts Kerddasa and Haranyea villages which are famous for the hand-made environmental industries favored by tourists and Egyptians as well.

- ***Monumental and Touristic Sites in Minya Governorate***

Minya governorate enjoys special monumental sites holding and featuring the Egyptian Pharonic history (old state - middle state - modern state) then the Greek age, Roman age, Christian and Islamic age. Minya Environmental Profile report 2007 provided detailed information about the history and culture of Minya Governorate. The monumental sites spread along the whole governorate, yet we will focus only on Samalot District where the project will be implemented.

Minya governorate is held an eternal record of all dynasties and monuments in Egypt that represent the Pharaonic, the Coptic, and the Islamic eras. Mosques of El-Laty, El-Amrawy "Elwadaa", El-Masry, El-Fouly, Zawyet Sultan, Tahna El-Gabal, Antar Stable, that includes Hatshepsut Temple, Tal El-Amarna, and the Tilting Minaret Mosque are[1] the most important monuments in the governorate.

* **Samallout Markaz :**

Lies 25 km north of Minya city. It holds Pharonic, Christian and Islamic monuments.

The Pharonic monumental region of El-Babein : Lies east of the Nile in Beni Khaled village. It goes back to about 4 thousand years B.C. It is told that some of the stony used in building the pyramids was brought from this area. Of the most important monuments there is the temple of God Hathore, the God of mines and cutting stones.

1. ***Virgin Mary Convent in Global El-Teir***

Lies about 25 km north east Minya city, and 2 km from the eastern desert road. It is one of the important sites through which the scared family passed by and stayed in during their trip to Egypt. It has a church sculptured in the rocks built by Helana, and empress in the fourth century.

It contains many icons that go back to the beginnings of the Christian age.

2. ***The Old Mosque***

One of the oldest mosques in Minya, it goes back to year 368 hjri. It lies south of Samallout city, and it has many names, some of which, Sheikh Genidi mosque, and the mosque of the lilte minaret.

* **Beni Sueif Historical Sites**

1. It includes the second oldest step pyramid "Meidum",
2. "Ehnasia" city that was Egypt's most important city and its capital in ancient times.
3. It also includes Monasteries of Saint Antonius, Anba Pula, Mar Gergis,

The tomb of Marwan Ibn Mohamad, the last ruler of the Umayyad Caliphate. Snoor huge Cave is one of Egypt's treasures that lies in the heart of the mountain, and is 19 meters deep.

5.6.3 Basic Demographic Characteristics

[1] Egypt description by Information, IDSC, 2007

- ***Population Characteristics***

Getting a clear description for the population is essential for any socioeconomic study, especially after the revolution. As the characteristics of population might affect the willingness of community to host any developmental projects. As well as, such description might give a clear idea about how to bring the project to the communities and how to gain acceptance for the project in the areas.

a. Total Population

The total population of Cairo Governorate is 7.786.6 million person among which 49.3% are females. The average of family members is 3.8 person. While Giza propulsion is 6.490.8 million. Females represent 48.5%. the average family size is 4 persons. The total population of Minya is estimated with 4.179.3 million among which 49.0 are females. The average family size is relatively high 4.6 persons. The total population in Beni Suef is 2.371 in Beni Suef. Density rate and female percentage is almost exactly like Minya (*see Table 5-26*).

The natural growth rate is higher in Minya as it represents 22.8 followed by Beni Suef 21.9 and Giza 19.3. The lowest natural increase reported was in Cairo 16.1.

Table 5-26

Population of Cairo, Giza, Minya and Beni Suef Governorates

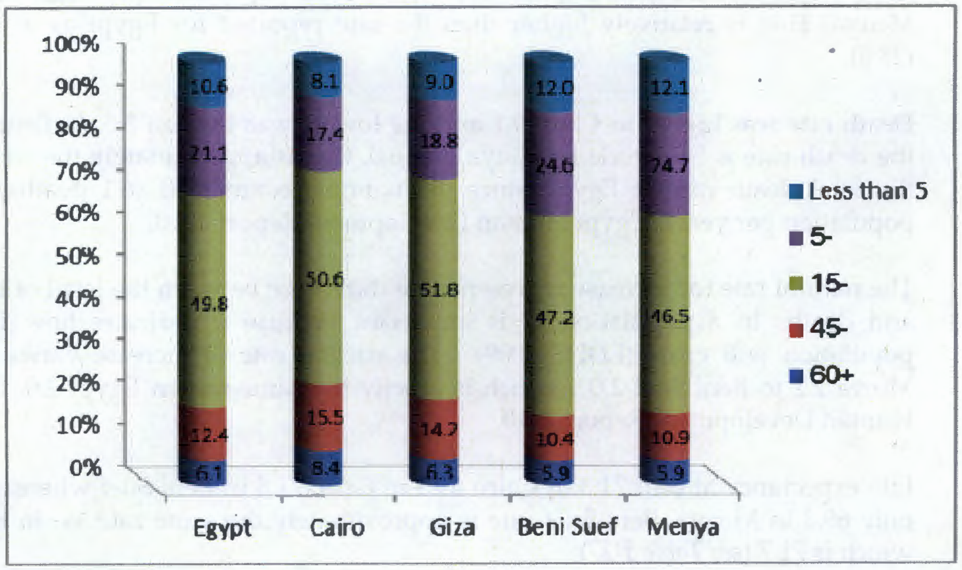
Population	Unit	Cairo	Giza	Menya	Beni Suef
Total population	*Thousand persons	7786.6	6490.8	4179.3	2371.0
Females (% of total population)	%	49.3	48.5	49.0	49.1
The average of family members	Person	3.8	4	4.6	4.6

b. Age Structure

The age-distribution of the population in the four governorate is slightly different as in Cairo and Giza about 18.0 % of the total population are less between 5- <15 years old. While the same category in Minya and Beni Suef represents about a quarter of the total population. 46.5% of Minya population lies in the category between 15- < 45. The same category in Giza and Cairo is up to 50.0% of the population. The older category is relatively higher in Giza and Cairo as it represents 23.9% in Cairo and 20.5% in Giza while it is less than 16.0% in the other two governorates (*Figure 5-93*).

Figure 5-93

Percentage Distribution of the Total Population by Age Governorate



Source: CAPMAS Census 2006.

c. **Rate of Natural Increase**

The crude birth rate in Cairo is (28.7 Live birth/ Thousand persons) and 27.8 in Giza, while in Beni Suef is (30.3 live births/1000 population per year) 30.4 in Menya. That is relatively higher than the rate reported for Egypt as a whole (27.8).

Death rate was higher in Cairo 9.1 and the lowest was in Giza 5.3. In Beni Suef the death rate is 5.9, while in Minya it is 6.0. that is approximately the same as the total death rate of Egypt; since the national estimate is (6.1 deaths/1000 population per year). Egypt Human Development Report 2010.

The natural rate for increase represents the difference between the level of births and deaths in a population. It is important because it indicates how fast a population will grow (EDHS 2009). The natural rate of increase varies from Minya 2.2 to Beni Suef 2.0% which is exactly the same rate in Egypt 2.0. Egypt Human Development Report 2010.

Life expectancy at birth71.3 in Cairo 69.5 in Giza, 71.6 in Beni Suef whereas it is only 69.3 in Menya. Beni Suef rate is approximately the same rate as in Egypt which is 71.7 (*see Table 5-27*).

Table 5-27

Natural Growth of Cairo, Giza, Minya and Beni Suef Governorates

Population	Unit	Cairo	Giza	Menya	Beni Suef
Birth rate	Live birth/ Thousand persons	28.7	27.8	30.4	30.3
Mortality rate	Dead person/Thousand persons	9.1	5.3	6.0	5.9
Population natural growth	Per thousand persons	1.5	2.5	2.2	2.0

Source: Egypt Human Development Report 2010.

- *Living Conditions*

a. **Household Size and Density**

Household is defined as "Family (and non-family) members who share residence and livelihood, and operates as one social and economic unit". The customary levels of demographic parameters and the norms governing living arrangement patterns, together determine the size and composition of households in any population.

The 2006 census reported a national average household size of (4.18). In Minya the size of family is estimated with (4.56). While the density is not as high as may be anticipated. In fact, household density in Minya varies between 1.14 in urban areas to 1.24 in rural areas. On average it is up to 1.14. In Beni Suef family size estimated with 4.61 which is relatively higher than Cairo 3.75 and Giza 3.88. that affected the density in house as Cairo was of the least density rate 1.13 while Beni Suef was of the highest density rate 1.2 (*see Table 5-28*).

Table 5-28

Average Family Size and Density Rate of Cairo, Giza, El-Minya and Beni Suef Governorates

Governorates	Total households	Average Family size	Density Rate
Cairo	89186	3.75	1.13
Giza	15219	3.88	1.13
Beni Suef	7586	4.61	1.2
Menya	11650	4.56	1.14
Egypt	308289	4.18	1.15

Source: Egypt Human Development Report 2010.

The 2006 census reported a national average household size of (4.7). In Minya the size of family is estimated with (4.56). While the density is not as high as may be anticipated. In fact, household density in Minya varies between 1.14 in urban areas to 1.24 in rural areas. On average it is up to 1.14 *(Table 5-29)*.

Table 5-29

Size of Family and Density Rate in Minya Governorate

Markaz/Qism	Size of Family	Density rate
Minya Qism	3.94	1.14
Minya Markaz	4.54	1.08
New Minya City	4.18	1.22
Abu Qorqas Markaz	4.51	1.17
El edwa Markaz	4.81	1.08
Beni Mazar Markaz	4.98	1.15
Der Mawas Markaz	4.6	1.24
Samalot Markaz	4.47	1.04
Matay Markaz	4.72	1.19
Magaga Markaz	4.56	1.14
Malawy Qism	4.28	1.2
Malawy Markaz	4.59	1.24
Total population in the Governorate	4.56	1.14

Source: Egypt Human Development Report 2010.

In Beni Sueif family size varies between 3.88 in Qism Beni Sueif to 5.19 in Markaz Ehnasia, thus the density rate varies between 1.07 in Beni Sueif Qism to 1.25 in Ehnasia district (*Table 5-30*).

Table 5-30

Size of Family and Density Rate in Beni Sueif Governorate

Markaz/Qism	Size of Family	Density rate
Qism Beni Suef	3.88	1.07
Beni Sueif Markaz	4.63	1.19
New Beni Sueif City	3.89	1.16
El Fashn Markaz	4.65	1.2
El Wasta Markaz	4.55	1.18
Ehnasia Markaz	5.19	1.25
Beba Markaz	4.62	1.23
Somosta Markaz	4.68	1.18
Naser Markaz	4.72	1.23
Total population in the Governorate	4.61	1.2

Source: Egypt Human Development Report 2010.

5.6.4 Access to Basic Services

a. Access to Electricity

Access to electricity in Upper Egypt is high at (99.0%) (EHDR 2010). That is primarily due to the care given to improve living conditions for people in Egypt in particular access to electricity. Even squatter areas have access to electricity regardless of their formality and legality. That indicates to the stability of infrastructure in most of areas.

The census showed that the majority of households use electricity as the main source of light represent 98.8% of the population in Beni Sueif and 98.5% in Minya. Regarding Cairo and Giza almost 99.0% of the population use electricity (*see Figure 5-94*).

b. Source of Potable Water

The four governorates depend almost entirely on Nile water for all its water needs whilst ground water, which is extremely saline and brakish in nature, is not used for drinking water purposes and is only partially used for irrigation in some areas.

Accessibility to potable water is high in Cairo and Giza while it is lower in Beni Suef and Menya, indicating the well being of community there. The high rate of access to potable water is mainly due to the Government's clear prioritization of water quantity and quality issues. Most households have easy access to water (tap water in dwellings) (68.8% in Beni Suef and 60.14% in Menya). Not only that, the type of source of water available reflects the well being of the house conditions as it is mainly tab water inside the unit. Few percentages reported using other types i.e. wells or pumps. However, it is worth mentioning that the quality of water supply is poor as water in some area has bad smelling and colored.

Access to a proper Sewage System is not high in both governorates, with a connectivity rate of (15.2%) in Minya and (12.7%) in Beni Suef (Egypt description by Information 2007). That is consistent with the low connectivity reported in upper Egypt which is less than 37.2% (EHDR 2010).

The main sanitary system reported was the septic tank which represents (84.0%) in Beni Suef and (80.1%) in Minya Governorate. The septic tanks cause so many environmental problems to the community people and affects their standard of health conditions. The high connectivity rate reported was in Cairo 98.2% and Giza 69.3% (*see Figure 5-95*).

Figure 5-94

Percentage Distribution of Population by Source of Light and Governorates

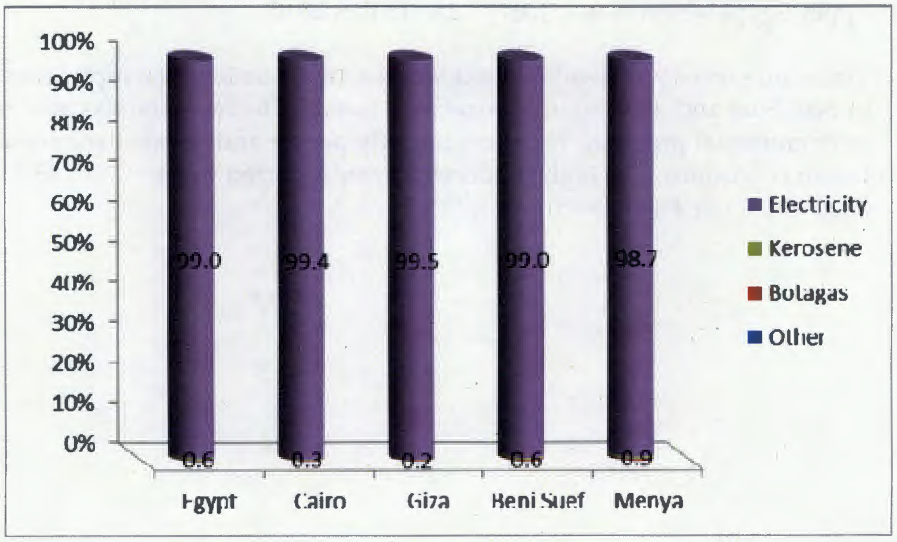
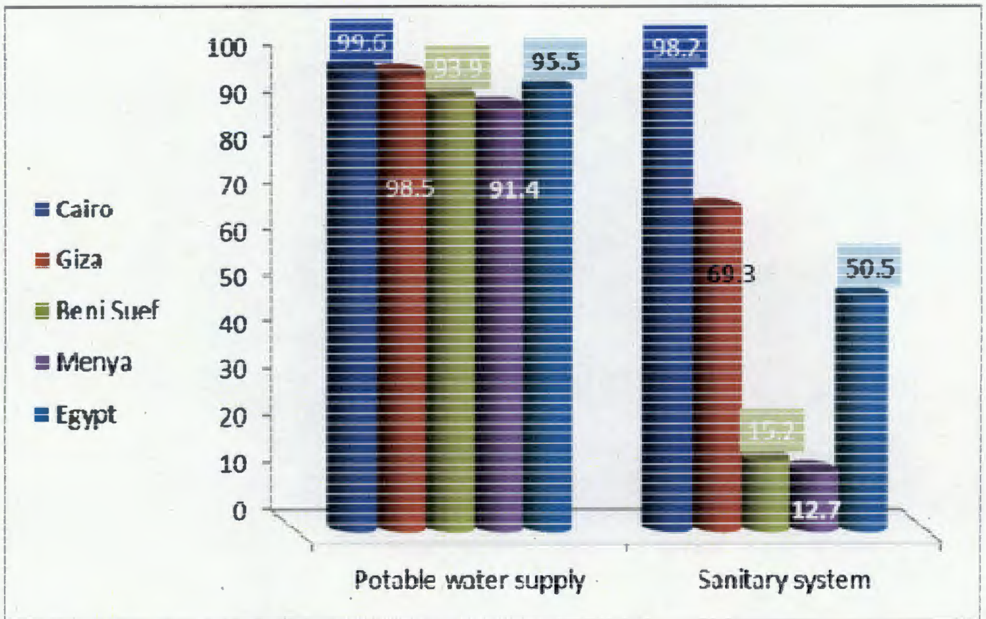


Figure 5-95

Percentage Distribution of Population by the Access to Potable Water and Sewage System by Governorates



Source: Egypt description by Information, IDSC, 2007.

5.6.5 Human Development Profile

Egypt's Human Development Report (2010) ranked the governorates according to their human development index scores1, Tracking the level of Human Development achieved in different governorates since 2005, five governorates occupied the first five rankings in Human Development level, namely Port Said, Suez, Cairo, Alexandria and Damietta. While the governorates that occupied the bottom five ranks are, Assuit, Minya, Beni Sueif and Suhag. This is relatively reflects the poor conditions of the governorates. Some determinants constitute such index including, education, work status ...etc. This section will discuss in details such determinants.

a. Education

The Egyptian Human Development Report (2010) stated that adult literacy rate (+15) is (59.5%) in 2007/2008 in Beni Suef, and (58.7%) while in Cairo it was 80.7 and Giza 80.3 whereas the overall rate is (70.4%) in Egypt. The combined Primary, Preparatory and Secondary level gross enrolment ratio is up to (73.7%) in Beni Suef and (74.2%) in Menya. As it was anticipated, the level in Cairo is (63.1%) and in Giza (77.5) while it is only 66.0 in Egypt[2]. That is mainly due to paying attention to education in the governorates. Education Index consequently 0.642 in Beni Suef and 0.639 in Minya versus 0.689 in Egypt.0.748 in Cairo and 0.794 in Giza

For more information about the educational status of the Governorate population, CAPMAS information census 2006 was more informative as indicted on the following table. The highest level of education was mainly in Cairo followed by Giza, Beni Suef and Menya. While the illiteracy rate was extremely high in Minya (41.29%) followed by Beni Suef (40.54%) and Giza (19.71%) and Cairo (19.31%) (*see Table 5-31*).

(1) The UNDP Human Development Index first appeared in 1990 as a single number that captured elements of income, health and education indicators and was hailed as introducing a more complete measure of human welfare than the income indicator of GDP per capita could alone. Today, many countries and organizations including UNDP are still striving to formulate new, more integrated and comprehensive measures of well-being. Over time, the process has moved from having the HDI, which integrates three variables, to having indices for multidimensional poverty, gender welfare, child welfare and many others. The process has reached stage where more and more of the components used in measurement try to capture the non-material aspects of well-being. Source EHDR 2010.

(2) Primary education in Egypt starts at age 6 and continue for a period of 6 years schooling. This is then followed by preparatory school for 3 years. The two stages represent basic compulsory education. Secondary education is for 3 years, which is finally followed by higher / university education.

Figure 5-31

Educational Distribution by Gender and Governorates

Governorate	Gender	Illiterate		Read and write		literacy		less than intermediate		Intermediate		Above intermediate		University		Above University	
		No	%	**No**	%	**No**	%	No	%	No	%	No	%	No	%	No	%
Cairo		1085745	19.31	501437	8.92	26238	0.47	1101805	19.59	1523473	27.09	214680	3.82	1126187	20.03	41091	**0.73**
	M	443274	15.54	263041	9.22	13651	0.48	579142	20.31	783346	27.47	117358	4.12	623663	21.87	25981	**0.91**
	F	642471	23.18	238396	8.6	12587	0.45	522663	18.86	740127	26.7	97322	3.51	502524	18.13	15110	**0.55**
Giza		505273	19.71	226454	8.83	11640	0.45	529237	20.64	719200	28.05	93445	3.64	460522	17.96	17145	**0.67**
	M	205353	15.72	120722	9.24	6166	0.47	276549	21.16	373727	28.6	51412	3.93	261118	19.98	11021	**0.84**
	F	299920	23.86	105732	8.41	5474	0.44	252688	20.1	345473	27.48	42033	3.34	199404	15.86	6124	**0.49**
Beni Suef		707050	40.54	254236	14.58	20010	1.15	294434	16.88	357049	20.47	26152	1.5	83525	4.79	1771	**0.1**
	M	258598	29.24	149773	16.93	13672	1.55	171747	19.42	220283	24.91	15966	1.81	53138	6.01	1288	**0.15**
	F	448452	52.16	104463	12.15	6338	0.74	122687	14.27	136766	15.91	10186	1.18	30387	3.53	483	**0.06**
Menya		1304675	41.29	418713	13.25	51184	1.62	530247	16.78	663771	21.01	41441	1.31	145983	4.62	3533	**0.11**
	M	483202	30.07	245265	15.26	28740	1.79	305392	19.01	418998	26.08	27991	1.74	94759	5.9	2532	**0.16**
	F	821473	52.91	173448	11.17	22444	1.45	224855	14.48	244773	15.76	13450	0.87	51224	3.3	1001	**0.06**
Egypt		17023517	29.64	6871080	11.96	557056	0.97	11154823	19.42	14816566	25.8	1454165	2.53	5371464	9.35	140268	**0.24**
	M	6549518	22.34	3932148	13.41	354665	1.21	6109773	20.84	8263098	28.18	828095	2.82	3165673	10.8	93765	**0.32**
	F	10473999	37.26	2938932	10.45	202391	0.72	5045050	17.95	6553468	23.31	626070	2.23	2205791	7.85	46503	**0.17**

b. Work Status

Labor force is an important indicator for any socio-economic study. In Cairo (29.9%) of the population were in the labor force and (29.3%) in Giza. In Minya (35.4%) of the population are in the labor force among which (31.4%) are females. Minya is famous for agriculture, such types of work might need more man power. Therefore, (58.1%) of the labor force work in agriculture. While, (12.8%) of the labor force works in industrial sectors, whilst, (29.1%) work in services sector. Professional and technical staff represents (9.1%) of the laborers.

The data reported in Beni Suef is identical to some extent with Minya data as (36.0%) of the total population are in the labor force among which (33.7%) are females. (55.1%) work in the agriculture sector followed by services (29.3%) and 15.6% in industrial fields. The professional and technical staff is a little bit higher as they represent about (12.0%) in Beni Suef.

Industrial laborer in Cairo represented (41.7%) while they represented (32.6%) in Giza (15.6% in Beni Suef and the least percentage reported was in Minya (12.8%) (*see Table 5-32*).

Table 5-32

Employment Status in Cairo, Giza, El-Minya and Beni Suef Governorates

Information about employment	Cairo	Giza	Menya	Beni Suef	Egypt
% of labor force 15+ of total population	29.9	29.3	35.4	36.0	32.4
% of female labor force 15+ of total population	11.9	14.4	31.4	33.7	23.9
Distribution of labor force by sector					
% of agricultural laborer 15+2007	0.4	11.1	58.1	55.1	31.7
% of Industrial laborer 15+2007	41.7	32.6	12.8	15.6	22.1
% of services laborer 15+2007	57.9	56.3	29.1	29.3	46.2
Professional& Technical staff					
Professional& Technical staff (% of labor force15+) 2007	27.8	15.6	9.1	12.0	18.7
Wage earners (% of labor force 15+)					
Total 2008	77.4	67.3	38.9	45.5	56.6
Female 2008	89.2	65.9	12.3	15.1	39.8
Employees in Gov., public sector & public enterprise sector (% of total labor force (15+)					
Total 2008	31.2	23.4	15.0	17.2	25.6
Female 2008	58.9	40.0	10.6	11.2	30.5

Source: Egyptian Human Development Report 2010.

Beni Suef and Minya governorates are privileged with low unemployment rate. The high unemployment rate reported was in Cairo 11.9%. However, the definition of work for majority of people is "*the job that produces money*". Due to that definition, some of unpaid workers i.e. with family in workshops do not consider themselves as employed. The same concept might be applied on the housewives who raise poultry at home and sell them. They also perceive themselves as unemployed. Thus the results of employment quantitative surveys might be misleading. However, the data available is as follow: (9.0%) of Minya females are unemployed versus only (5.5%) of the total population in the governorate are unemployed. But in Beni Suef, it is only (4.8%) of the females are unemployed versus only (3.5%) on the level of governorate. While the total unemployment rate in Egypt is (8.9%). That is mainly due to the main economical activity which is agricultural work which needs more laborer . Urban areas suffer from the unemployment more than rural areas as 10.4% of the residents in urban areas are unemployed versus only 4.4% in the rural areas in Menya. In Beni Suef, the urban unemployment rate is (11.4%) versus (1.4%) in rural areas. The highest unemployment rate was among secondary graduates (66.8%) in Minya and (68.7%) in Beni Suef and (31.3 %) among university graduates in Minya and (30.6%) in Beni Suef, while it is only (1.9%) among below secondary people in Minya and (0.7%) in Beni Suef (*see Table 5-33*).

Table 5-33

Unemployment Status in Cairo, Giza, Minya and Beni Suef Governorates

Information about employment	Cairo	Giza	Menya	Beni Suef	Egypt
Unemployment rate (%)					
Total 2007	11.9	6.7	5.5	3.5	8.9
Female 2007	22.6	13.9	9.0	4.8	18.6
Unemployment rate (%)					
Urban 2007	11.8	8.3	10.4	11.4	11.7
Rural 2007	0.0	4.1	4.4	1.4	7.0
Unemployment rate by education (15+ %)					
Below secondary 2007	9.7	9.7	1.9	0.7	4.8
Secondary 2007	44.2	55.9	66.8	68.7	62.4
University 2007	46.1	34.5	31.3	30.6	32.8
Future force replace ratio					
Below secondary 2007	200.2	139.5	308.10	297.2	289.0

Source Egypt Human Development Report 2010.

c. *Economic Wellbeing*

In 2010, EHDR reported that the real gross domestic product (GDP) per capita is7726.4 in Cairo, 8242.8 in Giza, 8857.4 in Beni Suef, 8655.9 in Minya and 7787.0 in Egypt[1]. This means that gap between the two governorates and Egypt is relatively high.

(1) GDP per capita for Egypt is estimated from the National Income Accounts of 2006/2007. The estimated GDP per capita in local currency (LE) is transformed to its value in US$ using an appropriate exchange rate (taking into consideration the estimations of the Ministry of State for Economic Development .Then the real GDP per capita (ppp US$) is calculated by applying a suitable factor to the estimated GDP per capita in US$ (the factor used in the International Human Development Report for 2008). This resulted in a national GDP per capita index for Egypt of 0.727 in 2008.

5.6.6 Economic Activities

In 2007, Egypt Description by Information reported that 164 industrial establishments registered in Minya versus only 164 establishments in Beni Suef. The number of industrial zones in Beni Sueif is higher than in Minya as 7 zones are located in Beni Sueif versus 2 zones in Minya. Number of productive cooperation association in Minya is 20 versus 7 only in Beni Sueif. The industrial zones are 10 in Cairo and 2 in Giza (*Table 5-34*).

Table 5-34

Industrial Zones - Productive Cooperation Associations 2006/2007

		Cairo	**Giza**	**Beni Suef**	**Menya**
	Unit	N	N	N	N
No. of industrial zones	Zone	10	2	7	2
No. of productive factories in industrial zones	Factory	1971	830	74	81
Area allocated for industrial activity :	Feddan	9730.7	6745	8698	1071.4
Area allocated for factories	Feddan	7501.7	6290	3158	373.4
Area available for allocation	Feddan	2229.0	455	5540	698.0
No. of productive cooperation association	Association	26	35	6	20
Members in association	Members	2411	1423	479	3042

5.6.7 Characteristics of the Project Sites and Pollution

1. Area description

The study team downloaded all areas coordinates on Google earth first to define the sites accurately. Later on a site visit was paid to the areas The majority of the areas where the project will be implemented in is an empty desert land which is surrounded by cultivated lands. The following are the main criteria of the areas in photos (*Figure 5-96 through 5-101*).

Figure 5-96

The Areas that will be Covered by the Interconnection Project

Figure 5-97

Desert Areas

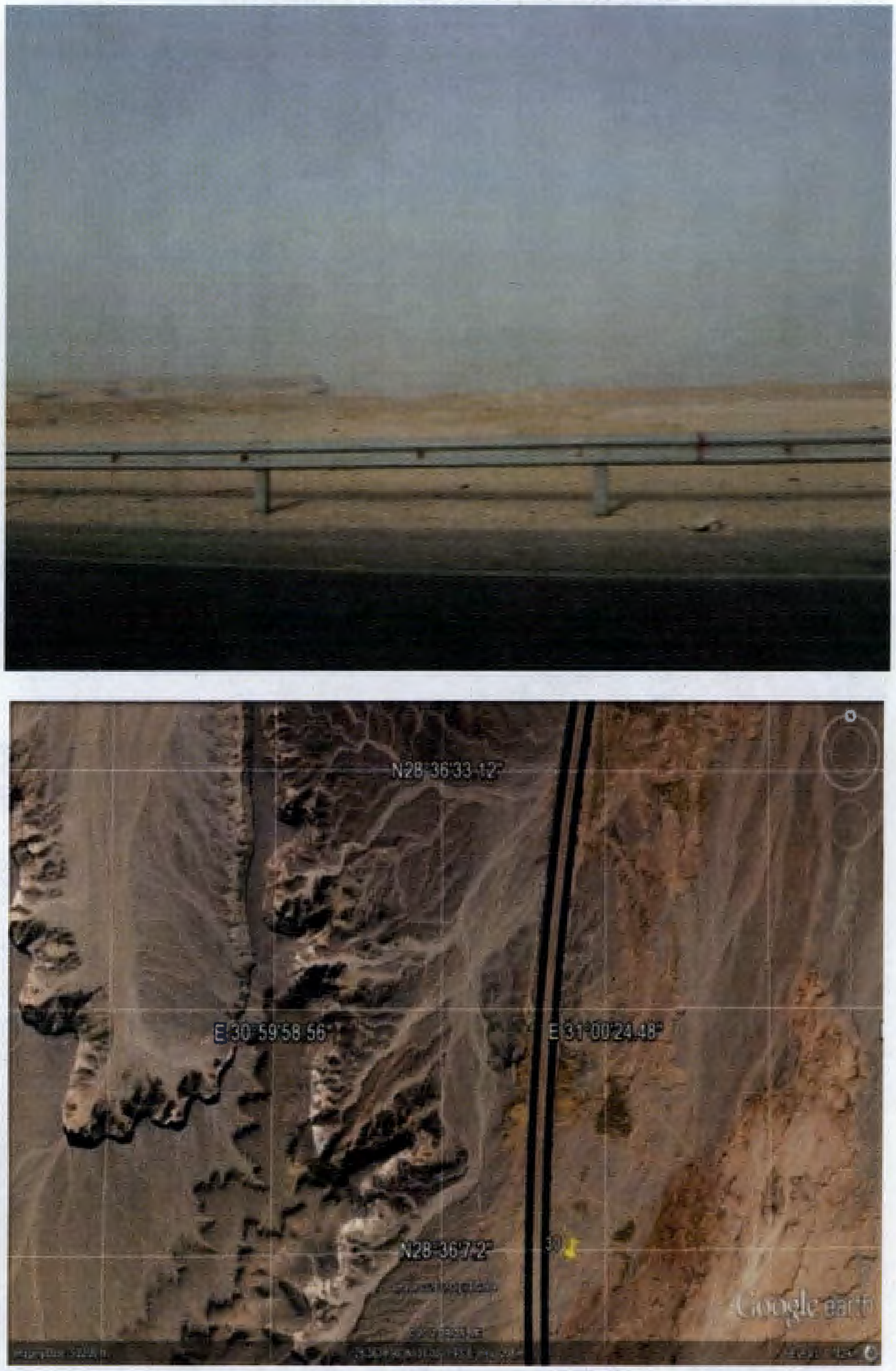


Figure 5-98

Agricultural Lands Near to Project Site

Figure 5-99

Residential Areas Near to the Project Site

Figure 5-100

Project Coordinates in Satellite Maps

Figure 5-101

Very Limited Areas Close to the Residential Sites Occupied by Towers' Footing

According to the site visits the project areas characteristics are as follows:

- Almost all areas are desert lands. Especially the sites located in the Western Road. They are totally empty desert lands.
- A small area that is located in Minya governorate is a cultivated land.
- The majority of surrounding areas population are originally farmers, upper Egyptians, employees, merchants and vendors
- The people pay more attention to the norms and traditions. Moreover, they care for the community leaders, respect them and obedient to them,
- All populated areas are served by electricity. However, the electricity connection is completely unorganized and risky,
- The majority of lands are estate property (*Amlak Dawla*). However, some cases were reported as illegitimate ownership,
- People interviewed trust the compensation policy that will be applied by the Holding Company due to their good experiences with other projects related to electricity. The compensation received was quite fair.

2. Type of Lands in the Area

The majority of lands in the populated areas (spots) are cultivated lands. However, few percentage was a lands suitable for construction. It was crucial to cover this issue on the level of governmental institutes. It was notable that the desert lands are divided into two types:

1. the desert areas that is located close to the cultivated lands
2. the desert areas located along the Western Road.

The near desert areas are:

- Facilitated with different services (electricity, water supply ...etc)
- Potential jobs

The far desert areas are:

1. Completely empty desert lands
2. Along paved road passes in parallel to it

The army constructed a good condition road that facilitate moving to and fro the governorates in upper Egypt (Beni Suef, Minya and Assuit.

3. Land Price

Many determinants work for estimating the land prices in the cultivated areas. In case of any expropriation the average prices of lands are as follow:

1- Owned cultivated lands 100,000 L.E: 250,000 L.E per Feddan.
2- Owned legitimate lands 200,000 L.E:250,000 L.E per Feddan.
3- Owned illegitimate land 50,000 L.E : 100,000 L.E per Feddan.

According to the qualitative interviews the determinants of land prices are as follow:

1- legality of the ownership
2- type of lands (cultivated – desert)
3- Availability for source of water
4- Access to different facilities

4. Availability of Social and Political Institutes

Reviewing one of the recent quantitative study about the socioeconomic conditions in these areas, about 95.9% of the areas have some NGOs around, not necessarily in the areas, but at least they provide services to the residents. 87.80% of the areas have community development associations. About 50.0% of the sample reported having an NGO related to Muslims, while 31.6% of the sample reported having Christian NGOs in areas

5. Sources of Pollution in the Areas

Environmental issues became very important to describe the socioeconomic conditions of the community, as they might affect the health of people and their ability to work and gain money.

Sources of Pollution in Minya

There are several registered craft workshops in Minya governorate, represent about 6.41% of the total productive workshops in the country. They vary in the type of their activities.

Metal products, machines, wooden products represent a good feature of small industries in Minya. The workshops that work in the field of machines and supplies can actually serve several other related industries.[1]

Workshops in the field of wooden industries represent the biggest percentage of the total workshops in the governorate, in addition to the workshops in the field of non metal mining materials (stone quarries) as previously illustrated in the mining sector.

The total number of workshops in Minya is 3224 in which 4265 workers are involved.

- ***Air and Industrial Pollution***

Gaseous emissions, dust and smoke are restricted to sugar factories in Abo korkas, cement factory in Beni Khaled, Samalot, some flour grinders and the industries of molasses, where Bagas and Mazot are still used as fuel in the industrial operations. This is the main source of pollution. As for grinders, dust percentage increases when using a high percentage of local heat due to the

(1) Environmental profile of Minya 2008.

presence of impurities in the local wheat due to the presence of impurities in the local wheat. In case of using a small of local wheat, pollutants can then be controlled.

It is worthmentioning that workshops scattering inside housing blocks and habitant communities are considered the main source of noise, most of which are workshops of smithery and car fixing as well as cutting and welding metals. As for big factories, it is only restricted on the workers there.

Industrial pollution in the governorate is limited to certain spots involving the major industries including sugar factories, cement, Nile Company for cotton ginning and some grinders. As for the industrial emissions resulting from medium and small industries, it is not as dangerous as those of the big industries although its impact is somehow tangible.

- *Water Pollution*

The sugar factory in Abo korqas is considered the biggest source of water pollution, as it dumps heavy weights of pollutants in Moheet drain which, in turn, drains in the Nile. The amount of drain coming from this factory only is estimated to be 1.43 m/sec. during the operation season that lasts about 8 months/year. It is true that the administration of the factory has exerted efforts to cut down liquid or gaseous pollutants, however, such efforts are still not enough. Worth mentioning is that there is an approach to relocate the sugar factory to the desert areas after the crawling of the housing block to it.

- *Solid and hazardous wastes*

Solid wastes produced from industrial plants, whether big or small, are being disposed by the plant itself, either through recycling, such as the sugar factory where some of its wastes join the production of fodders inside the factory. Other plants sell their wastes as junk, such as carpentry workshops, or dump it in regular dumps. However, some plants dispose their waters randomly the thing that negatively affects the surrounding environment.

As for the hazardous wastes produced from big plants such as the sugar factory or the cement factory of the oil factory, such plants are contracted with special companies that receive these wastes to recycle it or dump it safely. Such actions are recorded in the environmental records of these plants, and it is being followed through an inspection team either in the department or the EEAA (in Cairo or the ROB in Assuit).

Policies for cutting pollution down

Action plan

The action plan includes inspection and follow up plans in association with EEAA and its ROB in Assuit, and the environmental affairs department in the governorate to inspect the existing projects in addition to forcing all the plants to readjust its status. In case of disobedience, legal procedures are taken along with directing these projects to the different institutions to get loan or grants for establishing treatment stations for its wastes.

As for the under construction plants, they are not allowed the licenses or the operation unless they get the environmental approval and show commitment towards environmental conditions along with the continuous follow up after operation. Moreover, there is an approach towards transferring all the polluting industries outside the habitant area to industrial zones, especially in case of the high population cities.

A crafts zone (for craft industries) was allocated insider the industrial zone. Crafts industries, especially the polluting ones, are currently being transferred from inside the cities to this zone.

Sources of pollution in Beni Suef

Beni Sueif Governorate suffers from different environmental pollution due to the following behaviors and attitudes of community people:

1- Unorganized waste management and haphazardly throwing of wastes
2- Contamination of water and canals due to disposing sewage and grey water into the canals
3- Air pollution due to cement factories, bricks ovens, bakeries and burning the wastes
4- Bad maintenance of potable water taps leads to losing of water

- ***Air and Industrial pollution***

Air pollution results from the industrial pollution in the governorate is limited to certain spots involving the major industries including cement factories, bricks,… etc. the industrial emissions resulting cement factories result huge amount of emissions and CO_2. In addition to 37 factories that produce the bricks using *Mazot* in burning. As well as having 321 bakeries run with *Mazot* which causes a destructive tangible impact on the environment. It is also notable that the badly management of house wastes and agricultural wastes made people obliged to burn them.

The last pollutant for air is that the exhausts result from the badly maintained old cars which is widely used in the governorate.

Industrial pollution in the governorate is limited to certain spots involving the major industries including cement factories, bricks, …etc. the industrial emissions resulting cement factories result huge amount of emissions and CO2. In addition to 37 factories that produce the bricks using *Mazot* in burning. As well as having 321 bakeries run with *Mazot* which causes a destructive tangible impact on the environment. Another source of pollution result from factories was the unorganized disposing of water result from the industrial process in the areas. Until now the factories try to modify their environmental procedures.

- ***Water pollution***

Surface Water in the governorate has so many pollutants they are as follow:

a. Organic substances result from disposing sewage water
b. Disposing industrial water into the canals.
c. The underground water is polluted with mineral hazards due to the excessive usage of fertilizers.
d. The underground water is polluted due to the septic tanks which are not emptied but dispose water into the underground surface.

- ***Solid and hazardous wastes***

Wastes are collected by NCOs and local units which are not processing their work appropriately. In addition the transfer stations in Beni Sueif use open burning method which don't cover the wastes with sand. Regarding landfills, they are located in Beba only. There was a plan to construct another 2 landfills or dumping station. Moreover, there is one unit for composting was constructed by a fund from Finland Aid. Two recycling factories were constructed

Policies for cutting down pollution

Action plan

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Annex 5-1

More Baseline Information on the El-Minya Governortae

- **Population and Demography**

The total population of El-Minya Governorate, including all Marakez (Al-Odwa, Maghagha, Beni Mazar, Mattay, Samallout, El-Minya, Abu Korkas, Mallawi and Deir Mowas) was estimated at 3,310,000 in 1996.

Population studies indicate a rapid increase in Minya's population. In 1976, Minya's population was 2,045,000 raised to 2,645,000 in the next census in 1986, then 3,310,000 in 1996. According to the estimated census of the governorate in 2006, Minya's population reached 4,049,000 with a growth rate of 2.19%. Population concentration for the total area of Minya is 0.12 thousand/km^2. As for the inhabited area, population concentration reaches 1.64 thousand person/km^2 as this area is estimated to be 2411.65 km^2. Such increase in growth rate in Minya compared to other governorates is related to the cultural inheritance that encourages early marriage & abundant off springs as do the other governorates in Upper Egypt. Low economic standards of the family also encourage the family to have more kids as a source of income especially that poverty level in El-Minya rises up to 51%, in addition to other factors related to the general awareness of the citizens.

Growth rate in Minya reached 2.56% from 2008 till 2010. Growth rate in the rural part of the governorate exceeds the urban ones, as it recorded 2.64% in the country side and 2.37% in the urban areas. However, growth rate in general tends from what it was prior to 1996 where it reached 2.71%.

Under the proposals set out in the Governorate's Development Plan, the population of the El-Minya is likely to increase with the development of new industrial, commercial and residential businesses, and is expected to reach 4,332,950 by 2015. *Tables 5-1-1 and 5-1-2* show population data for the El-Minya Governorate, obtained from both the Central Agency for Public Mobilization & Statistics (CAPMAS) and the Information and Decision Support Center of the El-Minya Governorate.

Table 5-1-1

Population of the El-Minya Governorate, with Details on Samallout Zone, Year 2010 Estimates
(based on 1996 Census)

No.	Sex / Area	Males (Capita)	Females (Capita)	Total (Capita)	% age of Total
El-Minya Governorate		2,126,916	2,039,383	4,166,299	100%
El-Minya Marakez / Kisms:					
1	Minya	390,292	373,834	764,126	18.34%
2	Maghagha	221,398	213,841	435,239	10.45%
3	Al-Odwa	105,751	101,211	206,962	4.96%
4	Beni Mazar	233,424	230,085	463,509	11.13%
5	Mattay	119,224	119,600	238,824	5.73%
6	Samallout	302,592	284,182	586,774	14.08%
7	Abu Korkas	241,557	226,159	476,716	11.23%
8	Mallawi	361,026	341,744	702,770	16.87%
9	Deir Mowas	151,652	148,727	300,379	7.21%

Source: El-Minya Governorate: Information and Decision Support Center, 2010.

Table 5-1-2

Number and Percent of Population (10 Years & above) in the El-Minya Governorate by Educational Status according to Preliminary Results of Population Census 2006

No.	Educational Status	Number	Ratio %
1	Illiterate	1,304,675	41.3%
2	Read & Write	418,713	13.3%
3	Illiterate Erase	51,184	1.6%
4	Below Intermediate	530,247	16.8%
5	Intermediate	663,771	21.0%
6	Above Intermediate	41,441	1.3%
7	University Degree	145,983	4.6%
8	Above University Degree	145,983	0.1%
9	Not Stated	3,533	0.00
	Total	**2,593,836**	

Source: Central Agency for Public Mobilization and Statistics (CAPMAS): Statistical Year Book, Dec. 2010.

- **Employment and Labor Market**

The labor force of the El-Minya Governorate is around 1,221,400, i.e. 29.32% of total population, with unemployment, including job loosers, at around 5.7% in 2010. *Table 5-1-3* gives labor force market for the El-Minya Governorate.

The labor pool is comprised of employees of industrial activities (chemicals, building and construction, basic metals products, wood, wooden products & upholstery, spinning, weaving, garments & leather, paper products and food products), employees of small industry and small business operators. Around 43% of the total labor pool can be categorized as skilled, having been trained as industrial technicians.

Table 5-1-3

Labor Market in the El-Minya Governorate according to Preliminary Results of Population Census 2006

Item	Unit	Urban	Rural	Total
Total Labor Force	(1000) persons	243.3	978.1	1,221.4
No. of Employed Persons	(1000) employed	217.0	934.3	1,151.2
No. of Un-employed Persons	(1000) un-employed	26.4	43.8	70.2
Labor Force (% age of population)	%	30.9	28.8	29.2
Rate of Un-employment	%	10.8	4.5	5.7
Growth Rate of Work Force	%	-10.5	-9.7	-9.90
Females (% age of Work Force)	%	28.9	28.1	28.3
Un-employment Rate of High Education Graduates	%	24.1	17.7	20.9
Un-employment Rate of Intermediate & above Intermediate Education Graduates	%	29.0	18.9	21.9

Source: CAPMAS: "Labor Force Sample Survey 2006", Preliminary Data, 2010.

- **Government and Public Services**

Potable Water Supply

Table 5-1-4 presents supply and consumption of potable water in the El-Minya Governorate in 2010.

The Nile river is the principal source for potable water for the entire El-Minya Governorate. Nile river freshwater canals are the principal source of fresh water in the El-Minya Governorate. The El-Minya water stations provide the entire Governorate with actual capacity of about 330,000 m^3/day. The total potable water consumption for the whole area, is 210,500 m^3/day in 2010.

The percentage of households with access to potable water reaches 89.7%.

The per capita potable water consumption in the El-Minya Governorate reaches an average of about 50.37 liters/day.

Sewage System

Table 5-1-5 gives some data on sanitation system in the El-Minya in the year 2007. The total sanitation capacity of Minya, Abu Korkas, Odwa, Deir Mowas cities and Bahnasa village was 64,000 m^3/day in 2010, while the total Governorate's actual drainage of sewage stations owned by city councils totaled 30,107,000 m^3 in 2010.

Table 5-1-6 presents the under construction wastewater treatment stations.

Table 5-1-4

Supply and Consumption of Potable Water in the El-Minya Governorate, 2010

Item	Unit	Urban	Rural	Total
Production of Potable Water	1000m³/day	156	174	330
Consumption of Potable Water	1000m³/day	108.2	102.3	210.5
% age of Household with access to Potable Water	%	98.7	87.5	89.7
Pep Capita Potable Water Consumption	Liter. day/person	137.56	30.15	50.37
Per Capita Potable Water Production	Liter. day/person	198.33	51.29	78.96

Source: CAPMAS Statistical Year Book 2010 - Ministry of Housing Utilities & Urban Development, 2010 – the El-Minya Governorate Information & Decision Support Center, 2010.

Table 5-1-5

Waste Water (Sewage) Stations, Served Locations, Designed Capacity and Drainage Locations in the El-Minya Governorate, 2010

S	Markaz or city	No. of Elevating Station	No. of Treatment Stations	Designed Capacity	Year of Operation	Drainage Location
1	Minya city	15	1	4000m³/day	1965	Moheet
2	Abo korkas city	5	1	40000 m³/day	1997	Moheet
3	Odwa city	2	1	2000 m³/day	2005	Moheet
4	Deir Mowas city	2	1	1000 m³/day	2005	Kapkap
5	Bahnasa village	2	1	2000 m³/day	1999	Balh
Total		**26**	**5**	**64000 m³/day**	-	-

Source: Potable and Waste Water Company in the El-Minya Governorate, 2010.

Table 5-1-6

Under Construction Waste Water Treatment Stations in the El-Minya Governorate, 2010

S	Location	Designed	Notes
1	Mallawi	40000 m^3/day	2.5 km south west Mallawi city to serve it
2	Samallout	20000 m^3/day	15km west of Samallout city to serve it
3	Beni Mazar	20000 m^3/day	3km west of Beni Mazar city to serve it
4	Mattay	10000 m^3/day	6km west of Mattay city to serve it
5	Maghagha	20000 m^3/day	6 km west of Maghagha city to serve it
6	Minya at the desert hinterland t	90000 m^3/day 120000 m^3/day	a. first stage b. the end of the second stage.

Source: Potable and Waste Water Company in the El-Minya Governorate, 2010.

Electricity and Natural Gas

Table 5-1-7 gives basic energy data for the El-Minya Governorate in terms of number of subscribers in both the electricity network and natural gas services as well as the electricity consumption.

Table 5-1-7

Energy Data for the El-Minya Governorate, 2010

Item	Unit	Urban	Rural	Total
No. of Subscribers in the Electricity Network	1000 Subscribers	-	-	810
No. of Subscribers in Natural gas Services	1000 Subscribers	-	-	0.0
Total Electricity Consumption	M kWh/year	950	970	1,920
Electricity Consumed for Lighting	M kW/year	846	947	1,793
Electricity Consumed for Industrial Utilization	M kWh/year	104	23	127
Per Capita Consumption of Electricity for Lighting	kWh/year/person	1,075.5	279.1	429.0

Source: The Cabinet Information and Decision Support Center: The Egypt's Description by Information 2010.

Health and Education

Main medical facilities in the El-Minya Governorate consist of 9 public and central hospitals, 31 health integrated hospitals, 21 health groups, 21 private sector hospitals and 18 specialized hospitals. The hospitals collectively support approximately 6,574 beds, they are well equipped for most types of surgery and convalescence and are staffed by more than 2,052 physicians, 212 dentists and

3,778 nurses covering all medical specializations. Many other private hospitals, clinics, kidney washing facilities and physical therapy units are distributed over the El-Minya Governorate area. Additional health care services in the El-Minya Governorate include, also, 3 university hospitals, 93 ambulances, 343 family planning units/centers and 33 mobile clinics shown in *Tables 5-1-8*.

Table 5-1-8

Health Care Indicators for the El-Minya Governorate, 2010

Indicator	Unit	Value
No. of Inhabitants per bed	Inhabitant/Bed	635.7
No. of Working Physicians	Physician	2,052
No. of Inhabitants per physician	Inhabitant/physician	2,036.7
No. of Working Dentists	Dentist	212
No. of Working Pharmacists	Pharmacist	419
No. of Working Nursing Staff	Nurse	3,778
No. of Inhabitants per Nurse	Inhabitant/Nurse	1,106.2
No. of Inhabitants per pharmacy	Inhabitant/pharmacy	3,995.5
No. of Beneficiaries from Health Insurance System	1000 Beneficiaries	2,020
No. of Patients Treated at the State Expense (in Egypt)	1000 Persons	22.13
Total Medical Treatment Expenditure at the State Expense (in Egypt)	L.E. Million	33.48
No. of Mobile Clinics	Clinic	33
No. of Ambulances	Ambulance	93
No. of inhabitants per Ambulance	1000 Inhabitant/ Ambulance	44.94
Prevalence of Contraceptives	%	50.0
No. of Family Planning Units	Unit	343

Source: Ministry of Heath and Population--Governorate Information & Decision Support Center, 2010.

Communications and Transportation

Table 5-1-9 lists the available communication services in the El-Minya Governorate. The El-Minya region, includes 75 Telephone Centrals and about 365,100 telephone lines. The Governorate is currently in the process of providing additional telephone lines for thousands of list-waited customers.

The transportation network available within the El-Minya Governorate includes 66 km main paved roads, and 1,828 km un-paved ones.

About 644 buses run within all over the El-Minya Governorate. A total of 76,390 licensed vehicles provide transportation services in the El-Minya Governorate, out of them about 17,142 private cars and 4,367 taxis.

Table 5-1-10 gives some more details on transport services in the El-Minya Governorate.

Table 5-1-9

Communications Services in The El-Minya Governorate, 2010

Item	Unit	Urban	Rural	Total
No. of Telephone Centrals	Central	11	64	75
No. of Telephone Lines	1000 Lines	195.4	169.7	365.1
Telephone Density	Line/100 persons	24.8	5.0	8.7
No. of Working Post Offices	Post Office	38	173	211
No. of Inhabitants per Post Office	1000 inhabitant/ Post Office	20.7	19.6	19.8
No. of Information Technology Clubs	Club	-	-	55

Source: Ministry of Communications & Information Technology, 2010.

Table 5-1-10

Length of Roads in the El-Minya Governorate, 2010

Unit: km

No.	Attribution	Road Spec.	Length of Roads
1	General Authority for Roads & Bridges	Les than 7.5m	0.0
		7.5-12m	612
		More than 12m	28
		Total	640
2	Local Administration	Local Paved Roads	1,805
3	Un-paved Roads	Total	63
	Total Paved (Asphalted) Roads	Total	2,445
		% age of total Gov.	92.4

Source: CAPMAS: Statistical Year Book , Dec. 2010.

Social Services and Social Care

Community associations registered in the Ministry of Social Solidarity in the El-Minya Governorate totaled 3,195 associations in 2010, while non-profit subsidized care ones reached 84 societies in 2010.

Tables 5-1-11 gives useful information about social services, including guidance and family consultation offices and lodges in expatriate houses. *Table 5-1-12* gives a list of some environment-related NGOs and their activities in the El-Minya Governorate.

Table 5-1-11

Social Affairs in the El-Minya Governorate, 2010

Item	Unit	Urban	Rural	Total
No. of social units	Unit	19	104	123
No. of inhabitants per social unit	Thousand inhabitants/ Unit	41.4	32.6	34.0
No. of community associations	Association	518	675	1,193
No. of inhabitants per community association	Thousand inhabitants/ Association	1.5	5.0	3.5
No. of children at the nursery age	Thousand children	105	590.5	695.5
No. of nurseries(*)	Nursery	181	167	348
No. of children enrolled in nurseries(*)	Thousand children	7.24	6.68	13.92
No. of children per nursery(*)	Child/ Nursery	40	40.0	40.0
No. of nurseries for disabled children	Nursery	-	-	5
No. of centers for persons with special needs	Center	-	-	2
No. of vocational formation centers	Center	-	-	3
No. of rehabilitation offices	Office	-	-	8
No. of physiotherapy centers	Center	-	-	2
No. of beneficiaries of social security	Thousand cases	-	-	71.36
Disbursed amount of social security funds	L.E Million	-	-	57.25
Amount of disbursed funds per beneficiary	L.E/ Case	-	-	802.34
No. of productive family projects(*)	Thousand projects	-	-	52.2
No. of social insurance beneficiaries in the government sector(*)	Thousand beneficiaries	-	-	177.9
No. of social insurance beneficiaries in public & private sectors(*)	Thousand beneficiaries	-	-	208.6

Notes:

(*) The number of productive family projects reflects the number of families benefiting from productive family projects

Source: CAPMAS "According to Census Preliminary Results 2006, Dec. 2010 and Ministry of Social Solidarity 2010.

Table 5-1-12

NGO's Working in the Field of Environment and Type of their Projects in the El-Minya Governorate, 2010

No	NGO name	Type of Project	Location
1	Improving the environment	Solid and liquid wastes	Aker , Minya
2	Ragaa for development	Solid and liquid wastes	Beni Ahmed, Minya
3	Egyptian for development	Solid and liquid wastes	Beni Mazar
4	Egyptian for Local development	Solid and liquid wastes	Samaloot
5	The hope	Plantation and cleaning	Badraman, Die Mawas
6	Kamadeir development	Cleaning and garbage	Kamadeir, Samaloot
7	Alkais development	Health awareness and cleaning	Samaloot
8	El E'tezaz development	Health awareness and cleaning....	Samaloot
9	Abo Gerg development	Liquid wastes	Beni Mazar
10	Social development	Health awareness and toilets	Zahra, Minya
11	Future Eve organization	Cleaning and health awareness	Minya
12	Country side woman development	Cleaning and awareness and garbage	Dir Mawas
13	Youth of the Future	Health awareness	Minya
14	Integrated and sustainable development	Health awareness	Minya

Source: Social Solidarity Directorate in the El-Minya Governorate, 2010.

6. ENVIRONMENTAL IMPACT ASSESSMENT

6.1 METHODOLOGY

The objective of the impact assessment is to identify and manage the risks to the environment and society that are expected to arise from the proposed activities. The process involves:

1. Identifying all the hazardous and beneficial activities.
2. Introducing mitigation measures to reduce those hazardous activities to an acceptable level.

The hazardous and beneficial activities were identified using a Checklist based on EU Guidelines[1] to provide a systematic approach and help to make sure that nothing is missed. The construction contractor has yet to be appointed and the construction methods described in the project description are used as the basis for the impact assessment, although worst case scenarios have been considered such as the use of mobile construction camps. If there is any material change in these procedures once the contractor is selected, the contractor will be required to re-assess the social and environmental impacts under a change control process.

The project activities are summarized in *Table 6-1* below:

Table 6-1

List of Activities

- Carry out pre-installation investigations
- Construct access roads
- Prepare line corridor
- Prepare and construct tower foundations
- Mobilisation / Demobilisation of temporary construction sites
- Install towers and cables
- All construction activities
- Operate the line
- Maintain the line
- De-commission and reinstatement

The outcomes of the activities described were divided into environmental aspects and environmental impacts to make it easy use the impact assessment in the installation contractor's environmental management system.

Environmental aspects have a special meaning within the ISO 14001, the international standard for Environmental Management Systems and are defined

[1] *Guidance on EIA: Scoping*, issued by the European Commission in June 2001

as any "element of an organization's activities, products or services that can interact with the environment".

An environmental impact is defined within ISO 14001-2004 as "any change to the environment, whether adverse or beneficial, wholly or partially resulting from an organization's activities, products or services."

Put more simply we start with an activity, like preparing the line corridor that leads to an environmental aspect, like clear-cutting crops in some cultivated areas for the towers foot spots or cutting down trees (usually physical effect), that in turn has an impact like the destruction or degradation of a habitat (biological effect). The environmental aspects that have been identified are listed in *Table 6-2.*

Table 6-2

List of Aspects

- Clear-cutting Crops or cutting down trees, land clearance
- Physical disturbance (noise, movement, dust)
- Compaction of soil
- Noise
- Solid waste generation and disposal
- Discharge of effluent / sewage
- Fuel or oil leaks
- Change of land use
- Creation of EMF
- Physical presence of towers and cables
- Failure of towers / loss of structural integrity
- Construction traffic
- Influx of labour
- Accidental damage to crops / land/ property
- Land acquisition / use
- Failure of wires
- Accidents from electrocution
- Accidents from working at height
- Working in sensitive lands, soil disturbance
- Subterranean cultural heritage finds
- Above ground cultural heritage sites
- Air emissions
- Creation of ozone, NOx
- Accidents and injuries
- Improved transmission efficiency
- Light pollution
- Fire
- Theft

From these aspects a number of impacts are generated. Clearly, each aspect may lead to more than one impact while many aspects may share the same impact. The list of potential impacts associated with the above aspects is presented in *Table 6-3.*

Table 6-3

List of Potential Impacts

• Contamination of soil • Contamination of surface waters • Destruction / degradation of habitats • Safety / health impact for the neighbouring population • Safety / health impact for workers • Impact on hydrological patterns • Impact to geomorphology (from soil and debris) • Changes in biodiversity • Loss of income • Increased income • Disturbance of mammals / nesting birds • Mortality of birds • Nuisance to neighbouring population, visitors • Reduction of property value	• Reduction of amenity value • Reduction of soil productivity • Resettlement of population • Visual impact -> Reduction of property value • Visual impact -> Reduction of amenity value • Climate change, acidification • Changes in soil dynamics and composition • Changes in flora species • Increased access & secondary impacts • Improve conditions for certain species (e.g. reptiles, raptors) • Loss of cultural heritage • Death or illness from infectious disease

6.2 SOCIO-ECONOMIC IMPACTS AND MITIGATION MEASURES

6.2.1 Involuntary Resettlement

It appears that no one family will have to be moved because of the project. EETC is in the process of finalizing the exact route of the transmission line. All sections of the proposed route are far enough (450 meter or more) of any family houses.

6.2.2 Temporary Economic Impacts during Construction

Temporary economic impacts are expected to include damage or loss of crops and possibly some damage to agricultural infrastructure such as fences and drainage ditches. The impacts may also include loss of access to areas used for grazing livestock and will definitely include the clearance of areas of crops. The impacts will occur at the sites used for assembling the towers and along the all access routes that will be used to reach the sites where the towers will be erected. It is expected that other sites will also be required for construction camps, for stockpiling materials and for parking and the maintenance of the vehicles and equipment (cranes, generators and so on) that will be used at the assembly and tower sites.

It is important to emphasise that the details of the construction program– including the selection of the access roads to the ROW, the number of work fronts, the selection of the sites for the construction camps, stockpiles and vehicle maintenance sites will only be determined once the construction contract has been put into force. The amount of damage can be reduced through the careful selection of access roads, which will have to be carried out in close consultation with the local authorities, landowners and land users. The timing of the construction program is another factor that will have to be taken into account. There will be an opportunity to negotiate the specific conditions with land users before construction starts.

Past experience shows that compensation for temporary damage does not represent a significant problem. Compensation will be assessed in accordance with the Law No. 63 of the year 1974 and will be determined by commissions created by the Governorate's Administrations that will include representatives of the affected Village Councils, the Governorate's Land Use Authority, the Governorate's Architecture and Planning Authority, the Governorate's Department of Finance and the Governorate's affected landowners.

6.2.3 Other Temporary Impacts during Construction

This may include positive and negative impacts. The possible positive impacts include the generation of some direct employment for people living in the project area, an increase in opportunities for indirect income generation and possibly the reconstruction of roads in the project area.

- **Direct employment.** This is important since there are high levels of under and unemployment in the areas situated along the route of the transmission line. The employment of local labour would help to maximise the potential benefits to people living in the nearby settlements. It is likely that the construction workers will be organised as four or five separate teams at each work front. The teams would be responsible for:

1) Laying the foundations for the towers,
2) Construction or assembly of the towers,
3) Erection of the towers and installation of the electric cables.

The first team as a rule will not require highly skilled labour and the work could potentially be carried out by local excavator and bulldozer drivers and builders under the supervision of qualified taskmaster. In fact, the main contractor may conceivably sub-contract these tasks to local companies. The other tasks, particularly the erection of the towers and hanging the cables requires labour with specialist skills that will have to be drawn from all over Egypt.

In addition to employment on the construction sites there may be opportunities for direct employment - perhaps through local sub-contractors - in areas such as catering (at construction camps), transport (bringing workers and/or materials to the construction sites) and security. The potential benefits of the project can be maximised either by including a requirement in the tender documents for the contractor/s to hire a certain proportion of non-specialist workers from the districts or perhaps regions affected by the project and/or by requirements in the tender for the contractor/s to publicise job opportunities in the affected districts, using local media (radio and local newspapers) and by providing information to local authorities and village councils. Some additional jobs could be reserved for the local population, for instance, crop clearance along the RoW and access roads.

- **Opportunities for income generation.** As well as the sub-contracts noted above, the influx of construction workers and/or the increased disposable income available to the local workers employed on the project will have a minor multiplier effect on the economy of the towns and villages situated along the route of the transmission line. There may be an increased demand for rented accommodation, meals and so on. There may also be some opportunities for linkages, such as the provision of food to the caterers at the construction camps, sale of clothing for workers, maintenance of vehicles and so on.

- **Improvements to the road network.** In some cases there will be a need to improve or construct access roads leading to the RoW of the transmission line. These roads can be used by other traffic and will improve the transport network in the project area. However, negative secondary impacts may also arise from improved access, disturbance of birds at nesting times or illegal logging.

Other potential negative impacts during construction include an increase in road traffic and an increased risk of road accidents, noise, dust and perhaps traffic fumes, which could create conflict between local people and outside workers. Most of these impacts can be avoided or at least significantly mitigated if the consultation process is maintained and the concerns of local people are properly addressed during the detailed planning of the construction program. These mitigation measures will be explicitly addressed in the tender documents, monitoring procedures and environmental management plan. The grievance procedures will also allow EETC to identify any unforeseen problems as they arise.

- **Road traffic and risk of accidents.** The project will increase the movement of heavy traffic on roads near the route of the transmission lines. This will include movements of excavators and bulldozers, cranes and other lifting gear, trucks carrying building materials for the towers and the cables, and buses or minibuses carrying workers to and from the construction sites. The negative impacts of this traffic flow can be reduced by selecting specific access roads to the route of the transmission line and avoiding or by-passing the built-up areas of villages and towns and especially avoiding routes that pass in front of schools, old people's homes or hospitals. The access routes - especially for oversized or hazardous loads - will be determined in coordination with the local authorities and will be binding on the contractor/s and sub-contractor/s. This can be enforced by putting up signs to show the selected route and/or the roads where access is prohibited. The impacts can also be reduced by restricting traffic to certain hours, for instance from 8.00am to 10.00pm and/or by prohibiting heavy traffic on minor roads outside daylight hours. The risk of road accidents can be reduced through strict enforcement of the health and safety policy (particularly in regard to vehicle maintenance), speed limits and the code of conduct, especially in regard to the consumption of drugs (see below).

- **Noise, dust and traffic fumes.** The main problems during construction relate to the traffic movements and possibly pile driving in some areas for construction of the foundations of towers. As noted above, the worst impacts on the local population can be avoided by ensuring traffic is restricted to specific, clearly-defined access roads and by limiting traffic movements outside normal working hours. Dust may be a problem in some areas during almost all months, especially where heavy traffic is moving along dirt roads. It can be controlled by using water spraying from bowsers - although this may make the roads slippery and perhaps more dangerous for light vehicles. Controls on noise, dust and traffic fumes have to be addressed in the tender documents.

- **Presence of an outside workforce.** There is a potential for conflict if much of the workforce is brought from outside and is housed in a temporary construction camp or camps near the work sites. Typical problems include disputes with local people and possibly the presence of bars and prostitutes, leading to a risk of fights, accidents, increase in sexually transmitted diseases and so on.

The construction of the transmission line is not concentrated in a single place but is continually moving from one site to another. Since the work requires four or five separate teams on each front and a number of fronts may be working simultaneously, it is expected that the contractor/s will bring the workers to the construction sites on a daily basis, bussing them in from the nearest towns or villages. In this case the workforce is less likely to have a negative impact on villages along the route of the transmission line; indeed many of the less specialized workers could be hired locally and would live at home.

It is essential that the presence of an outside workforce does not adversely affect local people and strict "code of conduct" will be applied that will cover public health and safety issues along with respect for the environment and respect for local people. The application of a "code of conduct" will be contractually binding and will be described in the tender documents and included in the contract drawn up between EETC and the main contractor.

6.2.4 Permanent Land Take and Restriction of Use

The areas of that land required for the transmission towers are relatively small: between 10x10 m^2 (for suspension towers) and 14x14 m^2 (for terminal and special towers) and reach 30x30 m^2 for only two Nile Crossing towers. One estimate gives a total of 625 towers: comprising 493 G2, 55 G30, 30 G60, 2 (GT 60 + E0), 6 GTR, 35 A0, 2 Nile Crossing and 2 special. Around 80 of them will cross cultivated areas west of the Nile River at Samallout / El-Minya area. This would give a total land take in Samallout, El-Minya area of just **around 3.0** Feddans for all the towers crossing green field land. The rest of the number of towers (around 552) will be extended along uncultivated uninhabited, state-owned desert lands. As the areas required are relatively small and since the line will not pass through the built-up areas of any villages, the impact of the permanent land-take will be minor and is unlikely to have any significant effect on the productive capacity or earning potential of people living in the project area.

It is recommended that people do not work for more than 3-8 hours at a time under the transmission lines - which normally would hang at a minimum of 15-20m above the ground. In fact, the lowest tower height doesn't go under 50 m. This would reduce the likelihood of any effects from EMF and would allow people to work under the transmission lines for 3-8 hours at a time. The main concerns relating to the easement are:

- Much of the line crosses areas of desert. Most desert and desert land belongs to the State ownership. The desert will have to be crossed to the height determined in the maintenance regulations for power lines. In terms of the purely social impacts (i.e. as opposed to environmental or aesthetic impacts) this will not be very significant.

- The main concerns in relation to land acquisition and the easements have been raised in the El-Minya Governorate's meetings, where land is being developed as agricultural areas. Compensations that shall be paid by EETC to affected farmers have been emphasized and well detailed several times.

At the public consultations it was clear that there is no expectation that land values will rise and landowners are demanding volatile compensation for the easements and the payment would be on the basis of "market value" for the land needed for the towers.

It should be noted that there are fair rules for estimating or ascertaining the "market value" of the land needed for the towers. People in the El-Minya have been demanding that EETC should negotiate the acquisition of all plots on a willing buyer-willing seller basis. There is also an expectation that the "market value" should take into account the potential increase in the value of the land due to loss of crops.

6.2.5 Public Safety

It is useful to distinguish public health and safety issues during construction from the long-term public health and safety issues related to the transmission line. The main issues during construction relate to the potential for road accidents and security at the construction sites.

- The increased risk of road accidents due to an increase in heavy traffic is discussed above in section 6.2.3. It should be noted that normally there is very little traffic in rural villages in Upper Egypt. This accentuates the risk, firstly because children and others are not used to traffic and secondly because people in rural areas often use animal traction - especially donkey-drawn carts. The contractor/s can reduce the risk of accidents first by instilling a health and safety focused working culture among all the drivers and other employees - i.e. they will be obliged to drive slowly in village areas, respect donkey-drawn transport and not frighten the donkeys by using their horns or revving their engines to hurry them along. Second, there may be opportunities to organize road safety classes in local schools in order to instill greater awareness of the potential hazards of road traffic among pupils.

- The other issue that needs to be considered is security at the construction sites. The security requirements differ from most construction projects as the project involves a number of separate construction sites that will be worked in phases: laying the foundation, assembling the tower, hanging the transmission lines. Adequate security will be provided during construction at all the sites: where appropriate temporary fencing will be provided to prevent livestock straying onto the sites and to prevent children playing there. During construction of the foundations and assembly of the towers it will probably be necessary to have a watchman at the site to prevent people and animals from entering the site and to discourage the pilfering of materials. The watchmen or security guards will have adequate training in dealing with the situations that are likely to arise. In particular they must be trained not to overreact to minor incidents.

The long-term issues include the risk of people trying to steal materials or climb the towers, the risk of the towers collapsing and possible impacts of the electrical and magnetic fields (EMF) on the health of people living near to the transmission lines.

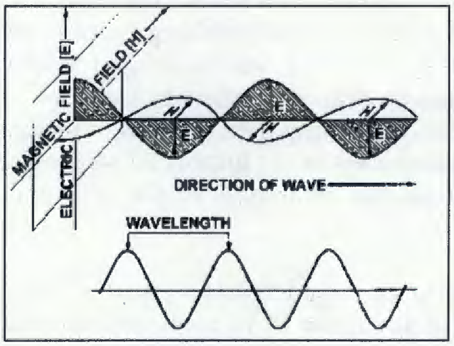
- Apparently in other parts of Egypt there have been cases where people have been killed trying to hange something on the transmission lines or steal conductors from transmission lines to sell as scrap. This can be discouraged by presenting regular information programs in the villages situated along the route of the transmission line. The information could be provided through posters and leaflets - distributed in schools and other public buildings - and could be backed up with short radio or TV "spots".

- The nuts and bolts used in the construction of transmission towers are also prone to theft, and this can in turn lead to the toppling or collapse of the towers. To prevent this all the nuts are welded to the bolts in the towers.

The transmission companies have contingency plans to deal with the collapse of towers, for instance due to exceptionally high winds and/or strong floods.

6.2.6 Public health & Electromagnetic fields (EMF)

During the past 20 years the public has become increasingly concerned about potential adverse health effects of exposure to electric and magnetic fields. With transmission lines, these effects occur at extremely low frequencies.



Electromagnetic fields consist of electric (E) and magnetic (H) waves travelling together, as shown in the diagram[1]. They travel at the speed of light and are characterized by a frequency and a wavelength. The frequency is simply the number of oscillations in the wave per unit time, measured in units of Hertz or cycles per second. The wavelength is the distance travelled by the wave in one oscillation (or cycle).

With transmission lines, the wavelengths in air are very long (6000 km at 50 Hz) and, for practical purposes, the electric and magnetic fields act independently of one another and can be measured separately.
Electric fields effectively arise from voltage and are measured in kilovolt per meter (kV/m). Anything that is connected to an electrical outlet, even if the device is not switched on, will have an associated electric field that is proportional to the voltage of the source to which it is connected. Electric fields are strongest close to the device. The strength of the field diminishes with distance and is shielded by

[1] Courtesy of World Health Organisation (1998) Factsheet 205 http://www.who.int/mediacentre/factsheets/fs205/en/

materials such as wood and metal. WHO report that the available evidence suggests that, the effects of exposures of up to 20 kV/m are generally few and innocuous. Low frequency electric fields have not been shown to have any effect on reproduction or development in animals at strengths over 100 kV/m.

Magnetic fields arise from current and their strength is usually expressed as corresponding magnetic induction in units of tesla, (T), millitesla (mT). There is little confirmed experimental evidence that low frequency EMF can affect human physiology and behaviour at field strengths found in the home or environment. WHO report that exposure of volunteers for several hours to low frequency EMF fields up to 5 mT had little effect on a number of clinical and physiological tests, including blood changes, heart rate, blood pressure, and body temperature.

Some epidemiological studies have determined a tentative link with a doubling of childhood leukemia, a rare disease affecting 4 out of 100,000 children[1]. These studies are still ongoing. There is no evidence to link EMF with other cancers.

Egyptian requirements in relation to EMF are generally similar to those of WHO and impacts of EMF are regulated by the Rules for Protection from Impacts of Electromagnetic Fields issued by the Law 63 of 1974.

These regulations apply to people who work or reside in the area near to the transmission lines or other facilities, which generate electric fields. Compliance monitoring is the responsibility of managers of organizations who organize such work and the EEAA, which agrees ESIA documents, signs environmental permits and monitors operation of transmission lines and facilities.

Transmission Lines - Protection Zones (TLPZ) are established by Law 63/1974 to protect population from impacts of electric fields. For 500 kV transmission lines the width of TLPZ is 25 m from the trajectory of projection of transmission lines on the ground, on both sides (a total of 50m).

Personnel employed for maintenance of transmission lines should raise awareness of population regarding safe behavior near transmission lines. If any works are planned in transmission lines protection zone or near transmission lines, personnel responsible for labor safety should provide necessary briefing for involved workers.

It is recommended that for new power lines which are designed or being constructed, the distance from the axis of 500 kV transmission line to the boundary of settlement should not be less than 25 m. In most cases this distance could be increased as an additional measure to reduce the intensity of electric field.

For the sake of comparison, electric and magnetic fields underneath overhead transmission lines may be as high as 12 kV/m and 30 µT respectively. Within industry, workers around generating stations and substations, are subjected to electric fields up to 16 kV/m and magnetic fields up to 270 µT. Workers within

[1] WHO (2001) Factsheet 263 http://www.who.int/mediacentre/factsheets/fs263/en/

generating stations and substations experience electric fields in excess of 25 kV/m and magnetic fields in excess of 2 mT. Welders can be subjected to magnetic field exposures as high as 130 mT, whilst magnetic fields near induction furnaces and industrial electrolytic cells can be as high as 50 mT.

6.3 ENVIRONMENTAL IMPACTS AND MITIGATION

6.3.1 Impacts on Natural Reserves

Farmlands: The line will cross part of the farmlands. According to past experience, this will not cause significant impacts as, apparently, the farmland is already managed, cropped and harvested. The farmland service has already planned to be cultivated and harvested alternatively with periodical crops. Nevertheless the current design of the line is not anticipated to cause problems with the species since the farmlands population has been greatly minimal.

Desertlands - In general the transmission line is not expected to cause negative impacts on either the desertlands or the wider area around it. However based on the fact that very few parts of the desert land may be used as a migration stop-over for different birds and in order to minimise any possible disturbance, it is proposed that construction is not carried out during migration and nesting season. Additional to the avian-safe construction in those parts of desertlands of the towers, the power lines in these parts of the desertland are to be properly insulated. Alternatively, a monitoring program will be implemented for two migration periods to verify possible problems.

6.3.2 Impacts on Biodiversity

While the majority of route only passes through desertlands and avoids crop cultivations, considerable areas will be affected as 30-32km of the 250km route (12%) passes through cultivable land. The impact will be reduced where possible by using small areas for towers footings. This helps to **preserve** overall **croplands**.

6.3.3 Loss of Habitats

The transmission line will not cause significant habitat loss. As regards to habitat homogeneity and continuance, the small clearings that will be created for the needs of the transmission line (including access roads) while wider and stretching to a long and continuous line, they will still be similar to the ones resulting from the current clear-felling cultivar practises. As a result, and provided that the mentioned small occupations are made to the proposed route, the created clearances will not cause significant loss of habitats or significant additional disturbance to local flora and fauna.

The improper disposal of excavation material is another factor that may have significant impact on habitat both in terms of area and ofquality. This is especially important in the case of very humid sites and parts of the cultivated lands. Improper practises and dumping alters the composition of the soils, their ability to withhold and drain water, and finally causes changes in vegetation cover and flora. As a result they are not expected to have any impact on species composition and population numbers. In general the measures proposed for the geological impacts are suitable to maintain habitat qualities as well.

6.3.4 Impacts from Construction, Clearance, Disturbance

Works during the construction phase (use of access roads, excavations and improper deposition of excavation material, human presence) are expected to cause some increased annoyance and disturbance. This applies especially to construction carried out during the reproduction period of important bird species. Birds may abandon their nests if disturbed or disturbance may result in very low reproductive success.

Apart from birds, the majority of the other fauna species encountered in the area are relatively common and tolerant to human presence. Rare species are not considered to be threatened by the project, especially if the activities are not carried out during nesting season (to also accommodate the needs of birds).

Once constructed, the transmission line is not expected to cause any impacts greater than the ones already caused by the current general commercial harvesting, provided that some vegetation (including crops) will continue to exist in at least parts of the line route

6.3.5 Impacts from Operation / Birds

Depending on the type of construction used, transmission towers, power lines and power poles may cause impacts to birds residing in the area. This is particularly true for large birds.

Such impacts are related to collisions with the wires of the line, due to the fact that large birds are not easy in changing flight direction while wires may not be readily visible to them. In addition, some towers may be preferred by birds as they may provide considerable elevation above the surrounding terrain, thereby offering a wide field of view.

Migratory birds, if any, may also be at risk under certain conditions, although they usually fly in much higher elevations than the height of the transmission lines.

The area of the River Nile Valley between Samallout and Zahraa Al-Maadi, although does not host any significant bird population itself, part of it may be situated on a major trajectory of the Eurasian-African migration route (*Figure 5-68*), and substantial numbers of migratory birds traverse the area during both autumn and spring.

Along the El-Minya segment of the T.L., very high towers are only limited to two towers crossing the Nile River, with a height of approximately 150 m, each. However, this area is outside the Eurasian-African migration route (*see Figure 5-68*), and therefore impacts to migrating birds are considered low. EETC has already experience of transmission line construction near the Nile (i.e. the Aswan

Dam / Cairo 500 kV transmission line constructed in Egypt since 1967) where there has been no accidental bird collision recorded for more than 40 years.

Mitigation Measures:

In order to further reduce potential impacts to migratory birds during project operation, parts of the transmission line that are potential to cross potential corridors of migrating birds shall be constructed and protected according to the Guidelines: "Protecting Birds from Power Lines; Nature and Environment, No. 140, Council of European Publishing" (use of red poles, for instance is a successful mitigating measure that is utilized in many locations). Such measures will also be employed for the elevated line segment crossing the River Nile.

In addition, an ornithological study is already conducted by JICA over 2-years period on both sides of the River Nile in El-Minya area, in the course of investigating possible conditions for constructing wind farms. The outcomes of this study have proved that almost no migratory birds would be found in the area, thus no mitigation measures are required (the study is presented by NREA, but the Report is not disclosed yet).

In order to reduce the impact on resident and migratory birds during the construction phase, construction work and other human activities should be avoided or greatly reduced in the wadis. Additionally, depositing of garbage and construction of areas with open water should be avoided.

6.3.6 Geomorphology, Geological Structures, Soil

Significant changes in the relief during the transmission line construction are not expected. Some local changes may take place close to the sites of towers locations as a result of earth-moving works.

Impacts to the upper geologic layers and soil will take place at the locations of transmission towers installation, as the structure of layers may be disturbed during the excavation for the foundations and the backfilling. In addition, the construction of temporary access roads to the places of towers installation and sites for their assembly and erection will require earth works that may also impact on geological structures.

During the construction process the contamination of ground surface is possible at places of construction and installation works, at construction bases (storage places for building materials, machinery, mechanisms and at places where building workers will temporary live), along the temporary roads. Soil contamination may take place during preparatory works and carrying out of geological survey, clearing of the route, etc.

In order to address these potential impacts, the top layer of fertile soil is to be removed during construction works and stored. Lands recultivation and restoration will be carried out after works implementation. In addition, after completion of construction all the temporary roads and embankments will be decommissioned, lands will be recultivated and restored and the micro relief reproduced.

6.3.7 Impacts on Groundwater / Soil Composition

The major part of the transmission line route is characterized by rather low groundwater level. As a consequence, the construction of the transmission line at all places will not have any impact to the underground aquifer.

In specific, no changes in infiltration of the ground layer will take place at the locations where the towers will be installed as a result of the earth works related to tower foundations. In addition, direct ingress of contaminants into the aquifer is not possible during the construction process, during foundations assembly and piling in particular. The significance of such impacts is expected to be very limited due to the relatively deep locality of the underground aquifer.

Temporary contamination of soils with runoffs from construction sites may take place during the construction of the transmission line. Contaminants may comprise:

- fuel leaks;
- paints and solvents;
- construction waste and domestic garbage.

Similar impacts but at a lower scale may also occur during transmission line inspection and maintenance.

The contamination of soils and groundwaters will be avoided through the application of best practice during construction and operation of the line, including the management of subcontractors.

6.3.8 Archaeological Finds

Despite the fact that reasonable precaution measures have been taken during the transmission line route planning not to interfere with sites of archaeological or cultural importance, there is a chance that archaeological finds come up during construction activities.

The construction contractor will be required to have management plans in place to ensure that such finds are appropriately handled. This will include appropriate training of the workforce, and suitable procedures to assess the importance of finds and notify the relevant authorities.

6.3.9 Aesthetics

The transmission line route crosses a rather flat terrain in desert lands. In those segments of the route where the line crosses cultivated areas, the visibility of towers and conductors is reduced and so is the visual impact to local inhabitants and visitors. This is not the case, however, in non- cultivated areas, where the line may be visible from long distances.

Effort has been put during the route design to mitigate visual impacts as far as possible, through:

- Routing the line away from inhabited areas .
- Avoiding angle towers that are far more noticeable.
- Running alongside other infrastructure (i.e. highways, transmission lines).

Consultation was also carried out with the regional administrations of the cultural heritage preservation as well as the local councils in order to identify and avoid potential impacts to buildings, monuments or sites of local cultural significance.

6.3.10 Noise

The audible noise associated with overhead transmission lines is due to the corona effect. Corona is the partial electrical breakdown of the insulating properties of air around the conductors of a transmission line. In a small volume near the surface of the conductors, energy and heat are dissipated. Part of this energy is in the form of small local pressure changes that result in audible noise.

Corona generated audible noise can be characterized as a hissing, crackling sound that, under certain conditions, is accompanied by a 120-Hz hum. Corona-generated audible noise is of concern primarily for transmission lines operating at voltages of 500 kV and higher during bad weather.

The conductors of high-voltage transmission lines are designed to be corona-free under ideal conditions. However, protrusions on the conductor surface—particularly water droplets on or dripping off the conductors—cause electric fields near the conductor surface to exceed corona onset levels, and corona occurs. Therefore, audible noise from transmission lines is generally a bad-weather (wet-conductor) phenomenon. Wet conductors can occur during periods of rain, fog, snow, or icing.

During bad weather, noise levels as high as 70 dB(A) have been observed at distances as much as 100 m from the conductors. Sound levels associated with common noise sources are given in *Section 2.6.4 and Section 2.6.6*.

Noise levels reduce rapidly with distance from the source. Noise emissions associated with the Corona effect, even in bad weather conditions, will comply with national standards (acceptable level of night time noise less than 45 dB(A), day time less than 55 db(A) at the closest house) with the closest house being at least beyond 25 m away.

6.4 RISK OF NATURAL HAZARDS

As far the Transmission Line is passing through Wadi Hof, Wadi Garawi, Wadi Tarfa and others, the project will be subjected to the impact of the flash flood hazard. The project area can be divided into 2 sectors (*Figure 6-1*). In each sector, the risk zone area is marked and determined in the intersection of the

Transmission Line with the main drainage system, wadi tributaries and the main faults (*Figure 6-2 and Tables 6-4 & 6-5 and Figure 6-3 and Tables 6-6 & 6-7*).

According to the morphometric parameters proposed by different authors, the flash flood risk assessment in the study area will be in a medium grade.

It is highly recommended to trace the Transmission Line on the top of the Wadi Terraces above the level of the wadi course (floor) and in the downstream side of the wadi. In this case, the road will be acting as a dyke to reduce the velocity of the surface runoff and to minimize the risk of the flash flood hazards.

The eastern part of the study area is vulnerable to earthquakes. This should be taken into consideration during the design of the foundation and the installation of the towers of the Transmission Lines.

The location of West Samallout Station will partially subjected to the threat of the sand dunes encroachments. Sand fixation and stabilization process should be taken on the consideration.

The transmission line on the strip east of the River Nile from Sammalout to El-Minya will pass close to many Archaeological and Historic Sites , such as: Tihna El-Jabal and Tell El-Amarna.

Protection Against Flash Flood, Earthquake and Sand Dunes

The analysis of flash flood and earthquake risks has resulted in the determination of type of hazard associated with the transmission line route. The geographic co-ordinates and the type of hazards for each point along the proposed route are given in *Figure 6-2 and Tables 6-4 & 6-5* for the first sector and in *Figure 6-3 and Tables 6-6 & 6-7* for the second sector. This should be taken carefully into consideration by the Desinger Consulting Firm (EPS) when implementing the final routing of the transmission line. Minimum requirements to withstand flash flood, earthquake and sand dunes will be included in the design and construction of the transmission lines.

Figure 6-1

Location Map of the Transmission Lines (Sectors A & B)

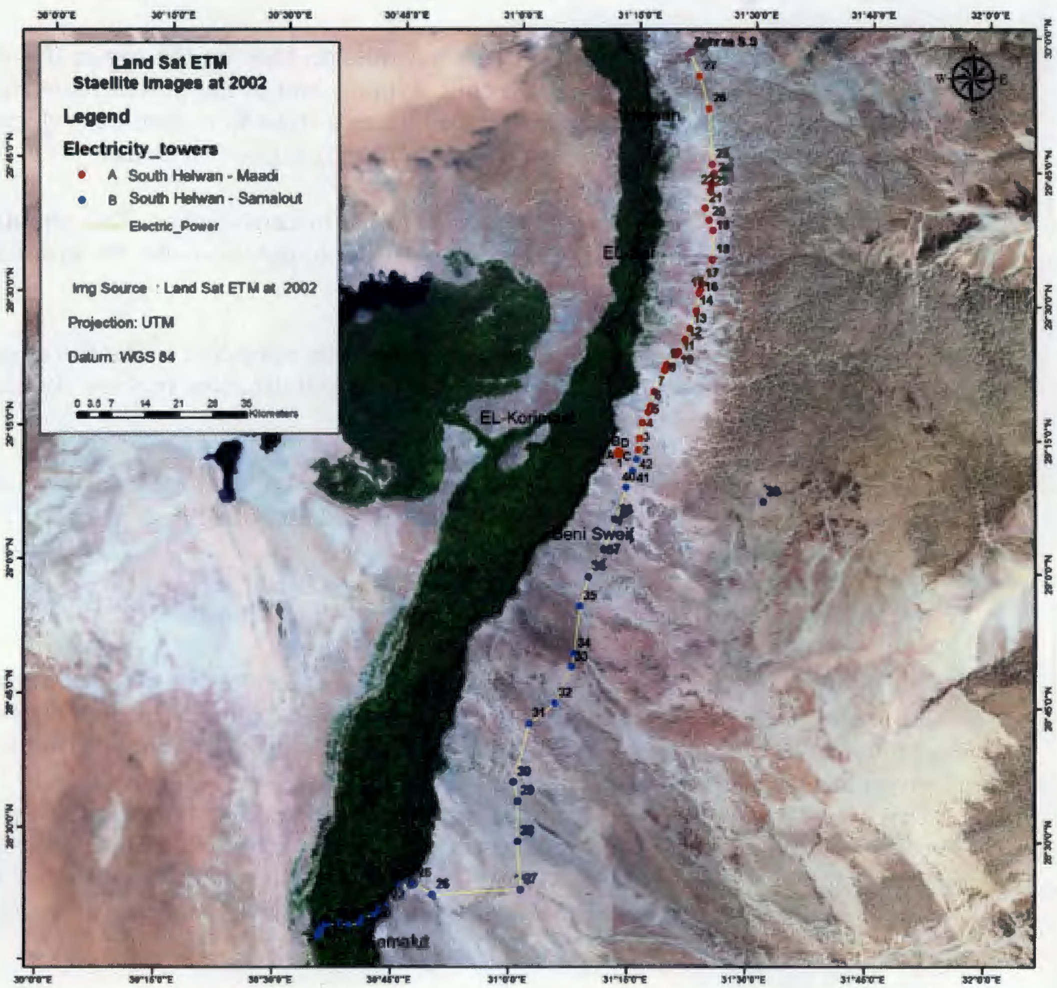


Figure 6-2

South Helwan – Zahraa Al-Maadi Transmission Line Route Segment (A-Sector)

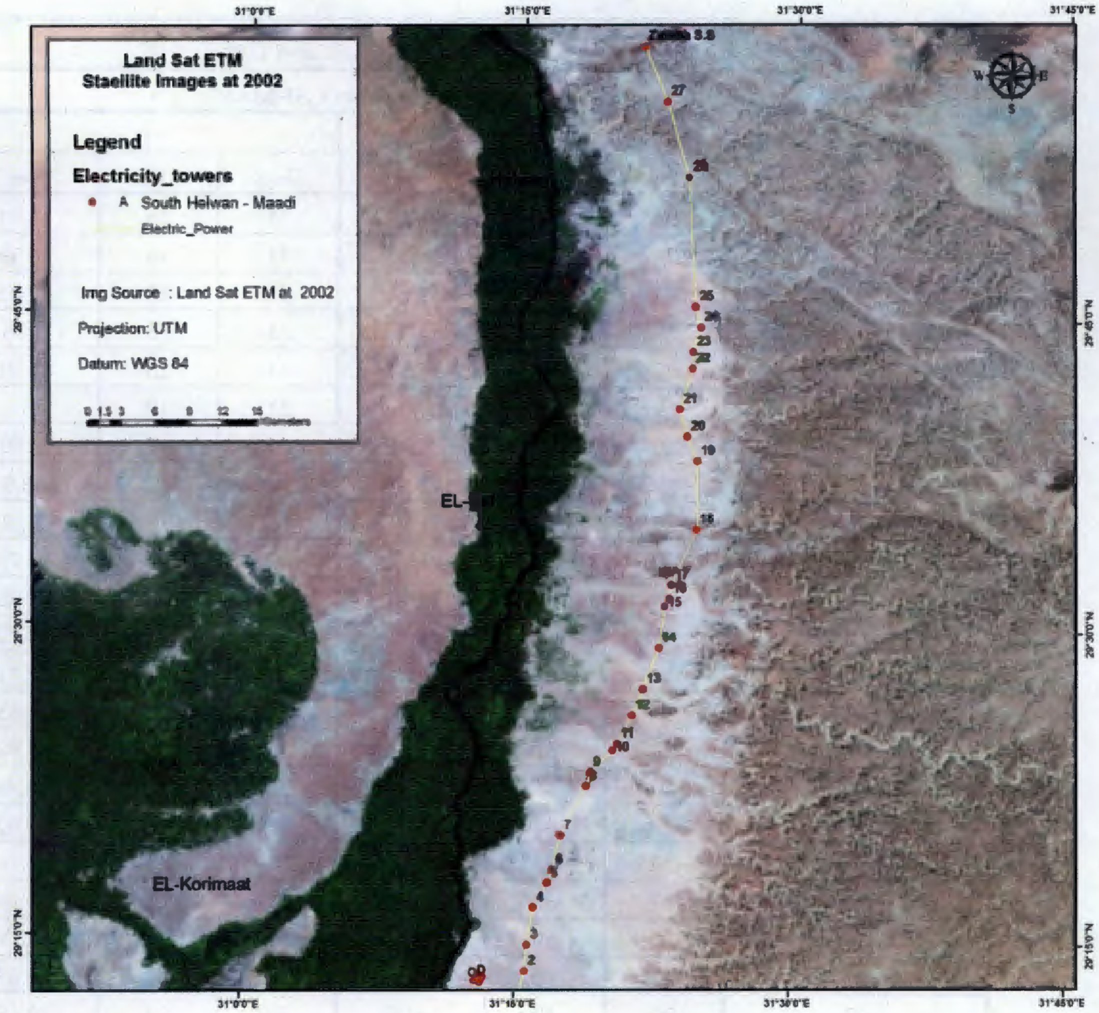


Table 6-4

Sector A - Co-ordinates of South Helwan / Zahraa Al-Maadi Transmission Line Route Segment

Coordinates of the 500 kV Transmission Line						
Helwan South Power Project / Zahraa Al-Maadi						
	N			E		
Pt. No	Deg.	Min	Sec	Deg.	Min	Sec
1	29	13	5.4	31	13	15.94
2	29	13	30.53	31	15	36.39
3	29	14	45.61	31	15	42.02
4	29	16	34.17	31	16	1.06
5	29	17	47.34	31	16	44.91
6	29	18	24.34	31	17	1
7	29	20	2.92	31	17	26.91
8	29	22	26.96	31	18	48.9
9	29	23	5.39	31	19	2.28
10	29	24	9.69	31	20	13.78
11	29	24	29.71	31	20	29.45
12	29	25	53.49	31	21	17.72
13	29	27	8.59	31	21	52.41
14	29	29	8.33	31	22	41.85
15	29	31	9.38	31	22	57.82
16	29	31	31.33	31	23	13.76
17	29	32	12.29	31	23	20.52
18	29	34	52.09	31	24	41.16
19	29	38	10.43	31	24	39.87
20	29	39	19.93	31	24	6.43
21	29	40	39.25	31	23	40.55
22	29	42	38.37	31	24	20.68
23	29	43	25.04	31	24	21.75
24	29	44	35.83	31	24	46
25	29	45	35.43	31	24	28.54
26	29	51	46.6	31	24	2.14
27	29	55	25.04	31	22	46.62
A	29	13	18.78	31	13	2.85
B	29	13	11.83	31	13	19.68
C	29	12	53.95	31	13	10.02
D	29	12	59.9	31	12	51.12
Zahraa S.S	29	58	1.43	31	21	31.19

Table 6-5

Type of Hazards and the Number of Towers' Locations along the Transmission Line Route Segment (A)
[South Helwan - Zahraa Al-Maadi Transmission Line Route]

Co-ordinate of the Transmission Line Tower							*Type of Hazards*
South Helwan - Zahraa El Maadi							
Pt. No	*N*			*E*			
	Deg	*Min*	*Sec*	*Deg*	*Min*	*Sec*	
10	29	24	9.69	31	20	13.78	Flash flood
13	29	27	8.59	31	21	52.41	Flash flood
14	29	29	8.33	31	22	41.85	Flash flood
16	29	31	31.33	31	23	13.76	Flash flood
17	29	32	12.29	31	23	20.52	Flash flood
20	29	39	19.93	31	24	6.43	Flash flood
22	29	42	38.37	31	24	20.68	Flash flood
24	29	44	35.83	31	24	46	Flash flood
25	29	45	35.43	31	24	28.54	Flash flood
26	29	51	46.6	31	24	2.14	Earthquake
27	29	55	25.04	31	22	46.62	Earthquake

Figure 6-3

South Helwan – Samallout Transmission Line Route Segment (B-Sector)

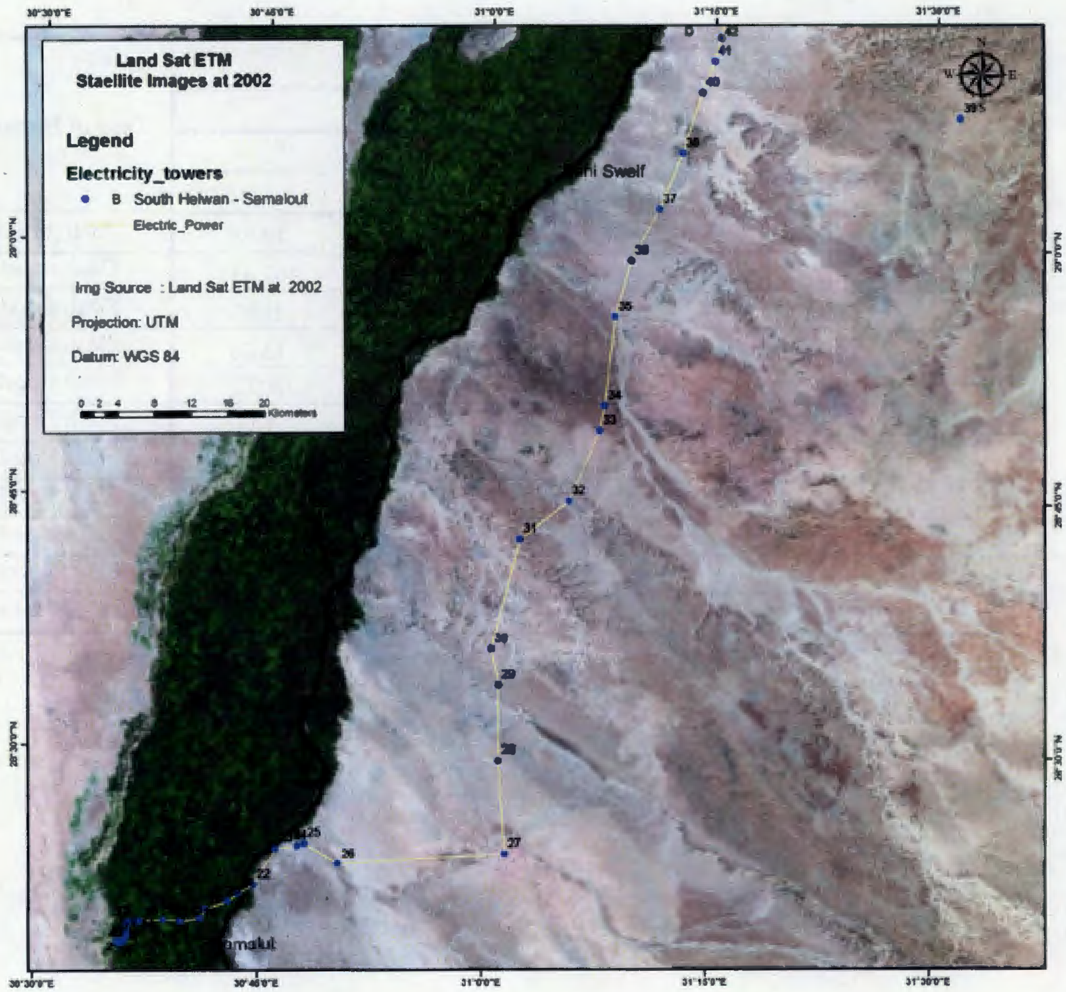


Table 6-6

Sector B - Co-ordinates of South Helwan / Samallout Transmission Line Route Segment

Coordinates of the 500 kV Transmission Line						
Helwan South Power Project / Samallout / Assiut 500						
Pt. No.	N			E		
	DEG	MIN	SEC	DEG	MIN	SEC
1	28	18	29.1	30	35	42.2
2	28	18	23.3	30	35	38.3
3	28	18	16.6	30	35	39.2
4	28	18	12.7	30	35	46.6
5	28	18	14.5	30	35	58.1
6	28	18	26.4	30	36	4.1
7	28	18	31.6	30	36	12.4
8	28	18	43.5	30	36	17.4
9	28	18	53.9	30	36	16.1
10	28	19	19.5	30	36	17.3
11	28	19	26.2	30	36	21.8
12	28	19	31.7	30	36	32.8
13	28	19	35	30	36	45.7
14	28	19	32.7	30	36	58.8
15	28	19	34.5	30	37	13.4
16	28	19	39.8	30	38	43.1
17	28	19	35.8	30	39	50.6
18	28	19	48	30	41	9.7
19	28	20	21.5	30	41	30.2
20	28	20	50.6	30	42	59.7
21	28	21	20	30	43	39.3
22	28	21	51.4	30	44	40.5
23	28	24	7.3	30	46	7.7
24	28	24	16.1	30	47	34.1
25	28	24	25.1	30	48	1
26	28	23	10.6	30	50	18.8
27	28	23	58.26	31	1	28.58
28	28	29	28.35	31	0	56.95
29	28	33	58.7	31	0	52.7
30	28	36	6.41	31	0	21.48
31	28	42	37.89	31	2	14.26
32	28	44	56.26	31	5	27.48
33	28	49	6.24	31	7	28.55
34	28	50	35.5	31	7	47.35
35	28	55	51.09	31	8	24.61
36	28	59	11.26	31	9	26.09
37	29	2	15.58	31	11	19.46
38	29	5	36.62	31	12	48.47
39	29	7	49.83	31	31	29.61
40	29	9	12.15	31	14	4.82
41	29	11	4.12	31	14	53.26
42	29	12	26.01	31	15	18.64

Table 6-7

Type of Hazards and the Number of Towers' Locations along the Transmission Line Route Segment (B)
[South Helwan – Samallout Transmission Line Route]

Pt. No.	N			E			Type of Hazards
	DEG	MIN	SEC	DEG	MIN	SEC	
1	28	18	29.1	30	35	42.2	Sand dune
2	28	18	23.3	30	35	38.3	Sand dune
3	28	18	16.6	30	35	39.2	Sand dune
4	28	18	12.7	30	35	46.6	Sand dune
27	28	23	58.26	31	1	28.58	Flash flood
28	28	29	28.35	31	0	56.95	Flash flood- Earthquake
29	28	33	58.7	31	0	52.7	Flash flood- Earthquake
30	28	36	6.41	31	0	21.48	Flash Flood – Earthquake
33	28	49	6.24	31	7	28.55	Flash flood
34	28	50	35.5	31	7	47.35	Flash flood
35	28	55	51.09	31	8	24.61	Flash flood
36	28	59	11.26	31	9	26.09	Flash flood
40	29	9	12.15	31	14	4.82	Flash flood
41	29	11	4.12	31	14	53.26	Flash flood

6.5 SUMMARY OF MAIN POTENTIAL IMPACTS ASSOCIATED WITH THE PROPOSED PROJECT

The major environmental impacts associated with proposed project as identified through the ESIA include:

A) Overall benefits associated with the establishment of the Helwan South / Zahraa Al-Maadi - Helwan South / Samallout 500 kV transmission lines and Substations, in terms of assisting in meeting the increasing electricity demand in Egypt and evacuate new installed power infrastructure at Helwan South to the national power grid.

B) Potential impacts on vegetation and ecology associated with the establishment of the Helwan South / Zahraa Al-Maadi - Helwan South / Samallout 500 kV transmission line and Substations.

C) Potential impacts on avifauna associated with the establishment of the Helwan South / Zahraa Al-Maadi - Helwan South / Samallout 500 kV transmission line and Substations.

D) Potential impacts on visual/aesthetic aspects associated with the establishment of the Helwan South / Zahraa Al-Maadi - Helwan South / Samallout 500 kV transmission line and Substations.

E) Potential impacts on the social environment associated with the establishment of the Helwan South / Zahraa Al-Maadi - Helwan South / Samallout 500 kV transmission line and Substations.

An assessment of the social and environmental impacts associated with the Project based on field inspections and literature sources indicates that most impacts associated with the Project are of a temporary nature resulting during construction and can be minimized by good engineering practice and implementation of appropriate safeguards as outlined in the ESMP.

The biophysical impacts of the Project utilizing the preferred route from Samallout substation to Helwan South and from Helwan South to Zahraa Al-Maadi substation are expected to be minimal and short term. The preferred route does not pass through any conservation reserves or protected areas, where the lines cross an area of lesser importance. All of the vegetation along the route at Samallout area will be avoided except for very little pieces of land for the towers' footings, so that there is unlikely to be a loss in biodiversity of plants or vegetation communities.

Because of the linear nature of a transmission line development, it is concluded that the Helwan South / Zahraa Al-Maadi - Helwan South / Samallout transmission lines and substations Project will have minimal impact on communities or persons, and on private or common property assets. However, compensation will be due where towers or Project right-of-way (ROW) affects residential dwellings or social services (which may pose health and safety impacts). Most of likely disturbing or problematic impacts (fragment cultivated fields and compromise productivity and income; removal of fruit-bearing trees and other economically valuable natural resources, disturb cultural properties such as mosques, churches, or archaeological sites) are to be avoided with a precautions and conservative ROW. Although the Project will have minimal impact upon PAPs, site-specific relocation may have to occur where access routes, line corridors or transmission towers are to be located.

Project impact is anticipated to occur predominantly during the construction phase with the importation of skilled workers into the area, and the construction of work camps and temporary access roads and establishment of the transmission line ROW. While major attention will be focused on loss of income due to temporary disturbance to crops or grazing areas, and on health conditions related to the influx of workers from outside the region, positive opportunities to PAPs may be presented in the form of temporary employment, as well as through income generated by the sale of food to immigrant workers. For the most part, however, compensation is expected to be characterized by a number of payments for the temporary loss of assets.

6.5.1 Overall Benefits associated with the Establishment of the Helwan South / Zahraa Al-Maadi - Helwan South / Samallout 500 kV Transmission Line and Substations

With the implementation of the/proposed project, the additional power output will assist in meeting the increasing electricity demand in Egypt. Indirect benefits could accrue due to increased capacity by new Helwan South power plant to provide reliable electricity supply to existing facilities, as well as electricity for new developments (including residential, commercial and industrial developments). This impact will be positive and is anticipated to be of high significance at the national level.

6.5.2 Potential impacts on vegetation and general ecology associated with the establishment of the Helwan South / Zahraa Al-Maadi - Helwan South / Samallout 500 kV Transmission Line and Substations

Concerns regarding the potential long-term impact on vegetation as a result of the proposed project (particularly along the Transmission line route at its Samallout segment) have been expressed by some of the landowners, largely as a result of historical experiences associated with land and/or crop compensations along the existing power lines in the area. However, from the specialised studies undertaken it has been determined that, with the implementation of appropriate mitigation measures, and the use of existing access service roads within the area, the proposed Transmission line is not anticipated to impact on any sensitive area in terms of natural vegetation. Potential impacts which are anticipated include:

- the destruction of the vegetation at the tower footprint,
- disturbance of natural vegetation along access/service routes through trampling, compaction by motor vehicles etc.,

Although the majority of these impacts are not likely to occur, they will be localized and of low significance due to the low sensitivity of the vegetation in the area of the proposed site. Through the implementation of appropriate mitigation measures, these impacts can be effectively minimized. Strict adherence to specific mitigation measures and general practice during construction and maintenance is, therefore, in order to demonstrate commitment to the environmental management principles laid down within the Environmental and Social Management Plan.

6.5.3 Potential impacts on avifauna associated with the establishment of the Helwan South / Zahraa Al-Maadi - Helwan South / Samallout 500 kV/transmission line and Substations

Potential impacts on bird species associated with the construction and maintenance of the Helwan South / Zahraa Al-Maadi - Helwan South / Samallout 500 kV transmission line and Substations are anticipated to be related to crossing the bird migration route, if any, in the area. Such impacts were shown to be of low significance as the specific area crossed is not considered critical for bird migration, even for wind farm development. In order to further minimize the impacts, construction, operation and maintenance activities will be carried out in accordance with best environmental practice principles.

6.5.4 Potential impacts on visual/aesthetic aspects associated with establishment of the Helwan South / Zahraa Al-Maadi - Helwan South / Samallout 500 kV transmission line and Substations

The study area can be regarded as having a low level of aesthetic value, as it consists predominantly of desert lands. In addition the study area at Samallout is impacted by existing Transmission line infrastructure (i.e. High Dam/ Cairo 500 kV arterial transmission lines) and the Samallout substation. Therefore, the visual quality of the Samallout area/is already impacted by developments of a similar nature. For El-Minya in the South up to Zahraa Al-Maadi in the North, the impact is minimal as the land is mainly uninhabited, desert land.

The proposed substations at the Helwan South and Zahraa Al-Maadi are considered to impose a considerable visual impact as a result of its larger size and low aesthetic appeal. In addition, the visibility of these structures is significantly higher if viewed against the skyline. Therefore, the/construction of new substations is anticipated to add significantly to this visual impact, as this infrastructure is steel-intensive and considered to be visually intrusive. However, this impact will be minimised to a great extent as a result of the area is uninhabited desert land.

The visual intrusiveness of the proposed Transmission line is anticipated to be significantly mitigated as a result of the existing powerlines in the area of Samallout as this new powerline is not anticipated to add significantly to the existing impact.

6.5.5 Potential impacts on the social environment associated with the establishment of the Helwan South / Zahraa Al-Maadi - Helwan South / Samallout 500 kV transmission line and Substations.

In terms of the identified and evaluated social impacts, the following conclusions can be drawn:

- There are not expected to be any significant adverse social effects arising from the project that can not be mitigated.
- The main impacts associated with the Substations relate to the construction of this facility (intrusions, noise and dust pollution, conduct of construction workforce).
- The main impacts relating to the Transmission line construction activities refer to the influx of workers and job seekers to the area. The intensity of the impact mainly depends on the conduct of the construction workforce and whether the guidelines in the Environmental Management Plan are adhered to.
- The influx of workers to the area could have a positive short-term economic impact, and will not place additional demands on the existing infrastructure and provision of services, considering the availability of services at place for workers.
- Direct positive impacts include local Job creation (although limited), the improvement of the country's power supply and the indirect contribution to the country's development In addition, the need to supply goods and services to the workforce will provide a temporary stimulus for local development and would thus generate indirect employment opportunities.
- The construction of the Transmission line is thus only expected to result in positive economic effects (e.g. limited, short-term contracts for local labour and services).
- The impacts on infrastructure and services are expected to be of low significance (long term) and could be properly mitigated.
- There is no formal and focused attitude formation (action groups) for or against the proposed project, although the individual attitudes regarding the construction of the proposed Transmission line are based on the individual's perception of the perceived impacts on his/her property. Should EETC take these into account it could lead to eliminating any formal opposition to the proposed project.

6.5.6 Local Livelihoods

Some individual Fellahs (Farmers) own the cultivated lands, where the transmission line will go through along its pathway routing in the Samallout area. Based upon experience from many similar transmission lines, particularly the main 500 kV arterial transmission line: Aswan Dam S/ST-Cairo 500 S/ST, which passes the Samallout 500 kV S/ST and crosses the same cultivated lands, Fellahs at the Samallout area are quite familiar with such transmission line projects.

They are fully aware of the type of land acquisition as well as land and crop compensations associated with the construction of transmission line towers, with footings occupying around 10x10 m^2 to 14x14 m^2 pieces of cultivable land.

Dialogues with many of the Fellahs in the Samallout area pointed out they fully recognize that the transmission line projects are "national projects", and they should support them for the welfare of the country, thus they accept that the lines may cross their lands.

Speaking to them about compensation rates and fees, they assured they are convinced that as long as there will be a fair application to the set rules, their rights for fair compensation are guaranteed.

Many of them expressed their hopes that compensation should take into consideration the loss of land and the loss of crops for the many years to come.

Most importantly, it was stated that no civil work will start unless land expropriation is completed and compensation is paid (land expropriation is a per-construction phase activity).

According to the World Bank OP 4.12, a Resettlement Policy Framework is prepared to cover all cases when homesteads are to resettled or land and/or crop loss is to be compensated. A detailed RAP will be conducted when exact route of the TL is identified.

6.5.7 Impact Assessment Matrix

Table 6-8 below presents a summary of the environmental and social impact assessment for the route considered for the project based on information gathered during the ESIA process and baseline studies. For the most part, the impact is expected to be temporary and acceptable through implementation of appropriate mitigation measures. Since EETC is constructing its double circuit line along identified route, then it is expected that the Helwan South / Zahraa Al-Maadi - Helwan South / Samallout 500 kV Interconnection Project will exact minimal additional impact on affected communities and the environment beyond the construction phase.

Table 6-8

Summary Impact Assessment Matrix

Impacts and Mitigation Measures during Construction Phase

Impact	Likelihood and severity	Significance	Mitigation Measures Effects
Handling of construction waste	Uncertain likelihood for medium impact	Medium	Reduce impact significance to minor
Limitations on land use and risks of involuntary resettlement	Generally low likelihood for resettlement for substation and higher likelihood for power lines	Medium	Reduce impact significance to minor following recommendations of RPF
Losing environmental benefits of trees along power lines	Low likelihood of major or medium impacts	Minor	Minimizing impact significance
Construction air emissions	Low likelihood of major or medium impacts –high likelihood of minor impact	Minor	Minimizing impact significance – only needed in loose sandy soil
Construction noise	Low likelihood of major or medium impacts – high likelihood of minor impact	Minor	Minimizing impact significance
Impacts on traffic	Low likelihood of major or medium impacts	Minor	Reduce impact significance to minor following recommendations of RPF
Impacts on Fauna and Flora	Low likelihood of major or medium impacts – high likelihood of minor impact	Minor	Minimizing impact significance
Impacts of excavation and trenching	Low likelihood of major or medium impacts	Minor	Minimizing impact significance
Safety of mechanical equipment	Low likelihood of major or medium impacts	Minor	Minimizing impact significance
Affecting the culture and privacy of local communities	Low likelihood of major or medium impacts	Minor	Minimizing impact significance

Impacts and Mitigation Measures during Operation Phase

Impact	Likelihood and severity	Significance	Mitigation Measures Effects
Risks of scrap and hazardous waste	Low likelihood of major impacts	Medium	Reduces impact significance to minor
Safety Along the Power Lines, risks of Electrolux and fire accident	Low likelihood of major impacts	Medium	Reduces impact significance to minor

Impacts and Mitigation Measures during Operation Phase

Impact	Likelihood and severity	Significance	Mitigation Measures Effects
Exposure to EMFs	Low likelihood of major or medium impacts	Minor	Minimizing impact significance
Risk of soil Contamination	Low likelihood of major or medium impacts	Minor	Minimizing impact significance
Impacts on land use, landscape and visual amenities	Low likelihood of major or medium impacts	Minor	Minimizing impact significance
Impact on Bird Migration(*)	Low likelihood of extremely minor impacts	Extremely Minor	**No mitigation measures required**

Notes:
(*) First outcomes of the Draft Report of a JICA funded study for NREA Authority done by a German Consultant (DECON) on Bird Migration West of El-Minya Governorate have proved that almost no migrating birds would be found in the area.

Annex 6-I

Impact Register and Mitigation Measures(*)

No.	Activity	Aspect	Impact	Context	Risk	Mitigation Measures	Residual Risk
1.	All construction activities	Construction traffic	Reduction of property value	Potential damage to property	L	Traffic management. Use appropriate vehicles. Consultation	VL
2.	All construction activities	Construction traffic	Safety / health impact for the neighbouring population	Risk of accidents from increased traffic	H	Traffic management schemes in place.	L
3.	All construction activities	Fuel or oil leaks	Contamination of soil / groundwater	Especially with the Maximized construction machinery, generators etc	M	Temporary fuel stores should be lined and bunded. Use drip trays when Maximized .	L
4.	All construction activities	Air emissions	Climate change, acidification	Air emissions from construction traffic, generators etc - may be little above baseline	L	Require contractor to use only equipment with compliant for air emissions	VL
5.	All construction activities	Solid waste generation and disposal	Contamination of soil / groundwater	Contamination from inappropriate waste disposal.	M	Require contractor to use dispose of waste in designated facilities	L
6.	All construction activities	Solid waste generation and disposal	Contamination of surface waters	Contamination from inappropriate waste disposal	M	Require contractor to use dispose of waste in designated facilities	L
7.	All construction activities	Influx of labour	Increased income	Opportunity for increased goods and services. Potential resentment of lost opportunity	M	Require contractor to aximize local labour wherever possible	L
8.	All construction activities	Accidents and injuries	Safety / health impact for workers	Accidents arising from alcohol abuse, dangerous driving, firearms etc	M	Require contractor to follow Rules of Conduct	L
9.	All construction activities	Theft	Loss of income	Theft of materials during construction	M	Provide security in vulnerable areas	L
10.	All construction activities	Accidental damage to crops / land / property	Loss of income	Some damage may be unavoidable	M	Provide compensation	L

(*) L= Low, VL = Very Low, M= Medium and H= High.

No.	Activity	Aspect	Impact	Context	Risk	Mitigation Measures	Residual Risk
11.	All construction activities	Accidents and injuries	Safety / health impact for the neighbouring population	Danger from children playing on construction sites	M	Hazardous areas should be protected / secured	L
12.	All construction activities	Physical disturbance (noise, movement, dust)	Nuisance to neighbouring population, visitors	General activity associated with construction	M	Good communication with locals, implement Rules of Conduct	L
13.	All construction activities	Noise	Nuisance to neighbouring population, visitors	General construction activities, piling, generators, welding, traffic, earthworks	L	Avoid unsociable hours	VL
14.	Create access roads	Cutting down vegetation, land clearance	Destruction / degradation of habitats	Unlikely to be required. No high value cultivated lands on the route.	M	Use existing cleared areas. Handover to local authority or re-instate on completion	L
15.	Create access roads	Cutting down vegetation, land clearance	Loss of income	Unlikely to be required. No high value croplands on the route.	M	Use existing cleared areas/roads. Handover to local authority or re-instate on completion	L
16.	Create access roads	Change of land use	Increased access & secondary impacts	Unlikely to be required. Increased access routes may lead to new settlements, illegal logging, though cultivable areas is well controlled	M	Handover to local authority or re-instate on completion	L
17.	Create access roads	Working in cultivation areas, soil disturbance	Changes in flora species	Unlikely to be required. Churning up topsoil, creation of ruts, changes in topography	M	Use temporary plank-road (logs, branches etc.)	L
18.	Create access roads	Solid waste generation and disposal	Climate change, acidification	Unlikely to be required. Disposal of vegetation- burn or mulch?	M	Leave some small vegetation to rot	L
19.	Create access roads	Above ground cultural heritage sites	Loss or damage to cultural heritage	Unlikely to be required. Vibration damage to cultural heritage sites or dwellings from oversized vehicles	M	Avoid using vehicles that will create more vibration than baseline conditions. If unavoidable, carry out baseline surveys on potential sites and risk assessment on all potential routes	L
20.	Create access roads	Physical disturbance (noise, movement, dust)	Disturbance of mammals / nesting birds	Unlikely to be required. Temporary disturbance - could adversely affect nesting birds.	M	Avoid disturbing nesting areas during the season in highly sensitive sites. Environmental awareness training	L

No.	Activity	Aspect	Impact	Context	Risk	Mitigation Measures	Residual Risk
21.	Create access roads	Cutting down vegetation, land clearance	Changes in biodiversity	Unlikely to be required. No high value croplands on the route. Risk of habitat islandisation.	M	Handover to local authority or re-instate on completion	L
22.	Prepare line corridor	Solid waste generation and disposal	Climate change, acidification	Disposal of vegetation - burn or mulch?	L	Use as a mulch. Leave some small vegetation to rot	VL
23.	Prepare line corridor	Working in cultivation areas, soil disturbance	Changes in flora species	Churning up topsoil, creation of ruts, changes in topography	H	Use temporary plank-road (logs, branches etc.)	L
24.	Prepare line corridor	Cutting down vegetation, land clearance	Changes in biodiversity	No high value vegetation on the route, but areas affected are desert in majority and considerable - long term change in land use	M	Use cleared spaces for nursery areas, may improve conditions for certain species (reptiles, raptors)	L
25.	Prepare line corridor	Cutting down vegetation, land clearance	Destruction / degradation of habitats	No high value croplands on the route, but areas affected are desert in majority - long term change in land use	H	Use cleared spaces , for nursery areas	L
26.	Prepare line corridor	Cutting down vegetation, land clearance	Loss of income	No high value vegetation on the route.	H	Compensation. Encourage use of cleared spaces, for nursery areas	L
27.	Prepare line corridor	Compaction of soil	Reduction of soil productivity	Impact of heavy machinery leading to long term damage	M	Sensitive management by contractors, use of appropriate vehicles with low axle loads	L
28.	Prepare line corridor	Compaction of soil	Impact on hydrological patterns	Impact of heavy machinery leading to long term damage, especially sensitive lands	M	Sensitive management by contractors, use of appropriate vehicles with low axle loads	L
29.	Prepare line corridor	Cutting down vegetation, land clearance	Reduction of amenity value	Loss of croplands, access to public often restricted	M	Reduce visual impact, use cleared spaces , for nursery areas	L
30.	Prepare line corridor	Land acquisition / use	Resettlement of population	No one household affected, but negligible impact	M	Provide compensation, if required.	L

No.	Activity	Aspect	Impact	Context	Risk	Mitigation Measures	Residual Risk
31.	Prepare line corridor	Physical disturbance (noise, movement, dust)	Disturbance of mammals / nesting birds	Temporary disturbance - could adversely affect nesting birds.	M	Avoid disturbing nesting areas during the season in highly sensitive sites. Environmental awareness training in highly sensitive sites. Environmental awareness training	L
32.	Prepare and construct tower foundations	Discharge of effluent / sewage	Impact on hydrological patterns	Pumping operations in sensitive lands	L	Use best practice to avoid impact	VL
33.	Prepare and construct tower foundations	Compaction of soil	Reduction of soil productivity	Impact of heavy machinery leading to long term damage	M	Sensitive management by contractors, use of appropriate vehicles with low axle loads	L
34.	Prepare and construct tower foundations	Compaction of soil	Impact on hydrological patterns	Impact of heavy machinery leading to long term damage, especially sensitive lands	M	Sensitive management by contractors, use of appropriate vehicles with low axle loads	L
35.	Prepare and construct tower foundations	Physical disturbance (noise, movement, dust)	Changes in biodiversity	No high value croplands on the route, small footprint compared with RoW long term change in land use	M	Keep footprint to a minimum	L
36.	Prepare and construct tower foundations	Change of land use	Destruction / degradation of habitats	Permanent loss of approx 2 feddans of land of cultivated type	M	Keep footprint to a minimum	L
37.	Prepare and construct tower foundations	Solid waste generation and disposal	Impact to geomorphology (from soil and debris)	Careless disposal of soil from excavation of tower foundations	M	Ensure that there is an appropriate plan for disposal of soil	L
38.	Prepare and construct tower foundations	Noise	Nuisance to neighbouring population, visitors	Piling operations for preparing foundations	M	Avoid unsociable hours	L
39.	Prepare and construct tower foundations	Physical disturbance (noise, movement, dust)	Disturbance of mammals / nesting birds	Temporary disturbance - could adversely affect nesting birds.	M	Avoid disturbing nesting areas during the season in highly sensitive sites. Environmental awareness training in highly sensitive sites. Environmental awareness training	L

No.	Activity	Aspect	Impact	Context	Risk	Mitigation Measures	Residual Risk
40.	Prepare and construct tower foundations	Subterranean cultural heritage finds	Loss or damage to cultural heritage	Route avoids known sites, but excavations may reveal new finds	M	Archaeological finds procedure	L
41.	Mobilization / Demobilization of temporary construction sites	Influx of labour	Safety / health impact for the neighbouring population	Potential increase in communicable or sexually transmitted diseases from migrant workers	M	Require contractors to follow Rules of Conduct. Education programs.	L
42.	Mobilization / Demobilization of temporary construction sites	Influx of labour	Nuisance to neighbouring population, visitors	Short term social disruption from workers camps. See also construction activities	L	Require contractors to follow Rules of Conduct	VL
43.	Mobilization/ Demobilization of temporary construction sites	Discharge of effluent / sewage	Contamination surface waters	From mobile construction camps, if used	M	Make provision for appropriate disposal	L
44.	Mobilization / Demobilization of temporary construction sites	Change of land use	Loss of income	Temporary loss of land use	M	Make appropriate compensation	L
45.	Install towers and conductors	Accidents from working at height	Safety / health impact for workers	High potential for serious/fatal accidents, relatively short exposure time	M	Training programs, supervision	L
46.	Install towers and conductors	Compaction of soil	Reduction of soil productivity	Impact of heavy machinery leading to long term damage	M	Sensitive management by contractors, use of appropriate vehicles with low axle loads	L
47.	Install towers and conductors	Compaction of soil	Impact on hydrological patterns	Impact of heavy machinery leading to long term damage, especially sensitive lands	M	Sensitive management by contractors, use of appropriate vehicles with low axle loads	L
48.	Install towers and conductors	Change of land use	Loss of income	Temporary loss of land use	M	Make appropriate compensation	L

No.	Activity	Aspect	Impact	Context	Risk	Mitigation Measures	Residual Risk
49.	Install towers and conductors	Working in sensitive lands, soil disturbance	Changes in flora species (esp. in sensitive land areas)	Churning up topsoil, creation of ruts, changes in topography	H	Install when dry, use temporary plank-road (logs, branches etc.)	L
50.	Install towers and conductors	Physical disturbance (noise, movement, dust)	Disturbance of mammals / nesting birds	Temporary disturbance - could adversely affect nesting birds.	M	Avoid disturbing nesting areas late March to late June in highly sensitive sites. Environmental awareness training	L
51.	Operate the line	Accidents from electrocution	Safety / health impact for the neighbouring population	People have been electrocuted trying to steal the transmission wires for scrap value	M	Use barbed wire etc to make it difficult for people to climb towers	L
52.	Operate the line	Change of land use	Loss of income	Loss of land use from restrictions from working under the wires	M	Raise heights of towers in valuable agricultural areas and when crossing the Nile River to lengthen working times	L
53.	Operate the line	Creation of EMF	Safety / health impact for the neighbouring population	Prevent potential damage to health from restricting time from working under the wires	H	Provide guidance on exposure times - 3-4 hr/day. Risk that advice may not be taken.	L
54.	Operate the line	Improved transmission efficiency	Climate change, acidification	Improved transmission efficiency and reduction of power losses	M	Positive impact wrt Transmission power line emissions	L
55.	Operate the line	Physical presence of towers and conductors	Mortality of birds	Collision risk & mortalities especially with endangered species	M	Monitor bird mortality and install visual signs if required	L
56.	Operate the line	Noise	Nuisance to neighbouring population, visitors	Corona effect	L	Mitigated by the design	VL
57.	Operate the line	Light pollution	Nuisance to neighbouring population, visitors	Corona effect producing flashes and sparks in certain conditions	M	Mitigated by the design	M
58.	Operate the line	Creation of ozone, NOx	Safety / health impact for the neighbouring population	Corona effect can lead to the production of small amounts of ozone and NOx	L	Mitigated by the design	VL
59.	Operate the line	Failure of towers / loss of structural integrity	Safety / health impact for the neighbouring population	Toppling of transmission towers from storms or theft of bolts	M	Good design. Welding bolts to prevent theft.	L

No.	Activity	Aspect	Impact	Context	Risk	Mitigation Measures	Residual Risk
60.	Operate the line	Failure of wires	Safety / health impact for the neighbouring population	Risk from falling object, electrocution	M	Establish SPZ, education	L
61.	Operate the line	Fire	Destruction / degradation of habitats	Fire arising from short circuits, bird nesting, wire failure etc	M	Effective emergency response procedures	L
62.	Operate the line	Physical presence of towers and conductors	Visual impact -> Reduction of property value	In most cases, lands are not a subject for sale at agricultural areas in Upper Egypt.	M	Consultation and careful routing of line. Resolve compensation issues	L
63.	Operate the line	Above ground cultural heritage sites	Visual impact -> Reduction of amenity value	No impact expected on national monuments but possible concerns about sites of local interest	M	Consultation and careful routing of line	L
64.	Operate the line	Physical presence of towers and conductors	Visual impact -> Reduction of amenity value	Visual impact is highly emotive and subjective	H	Careful routing, consultation	L
65.	Operate the line	Accidents from electrocution	Mortality of birds	Electrocution risk, nesting	M	Build nesting platforms as required	L
66.	Maintain the line	Accidents from working at height	Safety / health impact for workers	High potential for serious/fatal accidents	M	Training programs, supervision	L
67.	Maintain the line	Solid waste generation and disposal	Contamination of soil / groundwater	Paints, packaging etc from maintenance activities	M	Training programs, appropriate waste disposal	L
68.	Maintain the line	Accidents from electrocution	Safety / health impact for workers	Electrocution risk	M	Training programs	L
69.	Maintain the line	Compaction of soil	Reduction of soil productivity	Impact of heavy machinery leading to long term damage	M	Sensitive management by contractors, use of appropriate vehicles with low axle loads	L
70.	Maintain the line	Compaction of soil	Impact on hydrological patterns	Impact of heavy machinery leading to long term damage, especially sensitive lands	M	Sensitive management by contractors, use of appropriate vehicles with low axle loads	L
71.	Maintain the line	Creation of EMF	Safety / health impact for workers	Prevent potential damage to health from restricting time from working under the wires	H	Provide guidance on exposure times. Risk that advice may not be taken.	L
72.	Maintain the line	Accidental damage to crops / land / property	Loss of income	Some damage may be unavoidable in order to effect emergency repairs	M	Provide compensation	L

No.	Activity	Aspect	Impact	Context	Risk	Mitigation Measures	Residual Risk
73.	Maintain the line	Cutting down crops, land clearance	Increased income	Additional work maintaining the RoW in vegetated areas	M	Positive impact	M
74.	Maintain the line	Change of land use	Loss of income	Temporary loss of land use	M	Make appropriate compensation	L
75.	Maintain the line	Working in sensitive lands, soil disturbance	Changes in flora species (esp. in sensitive land areas)	Churning up topsoil, creation of ruts, changes in topography	H	Install when dry, use temporary plank-road (logs, branches etc.)	M
76.	Maintain the line	Physical disturbance (noise, movement, dust)	Disturbance of mammals / nesting birds	Temporary disturbance - could adversely affect nesting birds.	M	Avoid disturbing nesting areas during the season in highly sensitive sites. Environmental awareness training	L
77.	Maintain the line	Solid waste generation and disposal	Climate change, acidification	Disposal of vegetation, branches - burn or mulch?	L	Use as a mulch. Leave some small vegetation to rot	VL
78.	De-commission and reinstatement	Accidents from working at height	Safety / health impact for workers	High potential for serious/ fatal accidents, relatively short exposure time	M	Training programs, supervision	L
79.	De-commission and reinstatement	Compaction of soil	Reduction of soil productivity	Impact of heavy machinery leading to long term damage	M	Sensitive management by contractors, use of appropriate vehicles with low axle loads	L
80.	De-commission and reinstatement	Compaction of soil	Impact on hydrological patterns	Impact of heavy machinery leading to long term damage, especially sensitive lands	M	Sensitive management by contractors, use of appropriate vehicles with low axle loads	L
81.	De-commission and reinstatement	Change of land use	Loss of income	Temporary loss of land use	M	Make appropriate compensation	L
82.	De-commission and reinstatement	Working in sensitive lands, soil disturbance	Changes in flora species (esp. in sensitive land areas)	Churning up topsoil, creation of ruts, changes in topography	H	Install when dry , use temporary plank-road (logs, branches etc.)	L
83.	De-commission and reinstatement	Solid waste generation and disposal	Visual impact -> Reduction of amenity value	Disposal of towers, wire etc at end of life	M	Implement responsible decommissioning program. Re-use or recycle material where possible	L
84.	De-commission and reinstatement	Physical disturbance (noise, movement, dust)	Disturbance of mammals / nesting birds	Temporary disturbance - could adversely affect nesting birds.	M	Avoid disturbing nesting areas during the season in highly sensitive sites. Environmental awareness training	L

No.	Activity	Aspect	Impact	Context	Risk	Mitigation Measures	Residual Risk
85.	Mobilization / Demobilization of temporary construction sites	Light pollution	Nuisance to neighbouring population, visitors	Light from temporary workers camps & construction sites	L	Consultation, sympathetic management	VL

8. ENVIRONMENTAL MITIGATION AND MONITORING: ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN (ESMP)

8.1 OBJECTIVES OF THE PLAN

The project company is committed to implementing an environmental and social management and monitoring plan which will ensure that the construction and the operation of the Helwan South / Zahraa Al-Maadi - Helwan South / Samallout 500 kV Transmission Line and Substations Project involves full implementation of all proposed mitigation measures and complies with high environmental standards, the requirements of the environmental legislation and guidance notes as applicable in Egypt, and the procedures and guidelines of the World Bank.

Previous sections of this report have outlined the baseline environmental and socio-economic conditions in the area of the proposed development, have identified the potential impacts on these baseline conditions which could result from construction and operational activities and have proposed measures to minimize and mitigate against any negative impact identified with necessary monitoring. To complete the environmental evaluation, this section presents necessary Institutional Arrangements for the Helwan South / Zahraa Al-Maadi - Helwan South / Samallout 500 kV Transmission Line and Substations project (*Table 8-2*) as well as the Environmental and Social Management Plan (ESMP) which summarizes the mitigation measures suggested and discusses initial and ongoing monitoring and management of significant impacts of the proposed project.

The ESMP covering design, construction and operation of the project is summarized in *Tables 8-3 and 8-4,* respectively. The Egyptian Electricity Holding Company (EEHC) and its affiliated Egyptian Electricity Transmission Company (EETC) have a very good understanding of the contents of the ESIA reports, including these management tables and are committed to implementing the Environmental and Social Management Plane (ESMP) requirements included therein. *Table 8-5* gives a summary of implementation cost of the ESMP. For further detail on the mitigation measures to be undertaken, reference should be made to Section 7 of this report. Details of construction and operations monitoring and management activities, summarized in the tables, are discussed in more detail below.

The ESMP includes the definition of the following measures to minimize environmental effects:

- **construction management**, including control of construction traffic, site drainage, construction waste and spoil etc.;

- **engineering design measures** directly incorporated into the project as good design practice, through the selection of appropriate equipment and choice of construction materials;
- **specific mitigation measures designed to prevent or minimize impacts;**
- **operational control systems,** such as the use of chemicals and transformer oils; and
- **operational management**, which includes staffing levels and staff training.

The effectiveness of these environmental management and mitigation measures will be monitored throughout the construction and operation of the project.

Monitoring will be carried out **by the Project Implementation Unit (PIU), which includes the Environmental Management Staff (EMS) (2-3 staff members recruited by EETC)** using standard techniques and equipment agreed with the Egyptian Environmental Affairs Agency (EEAA), which will be calibrated, operated and maintained in accordance with the manufacturers specifications. The EMS will be directly supervised by an Environmental Specialist, within the PIU, at the same level as FM / Procurement.

Monitoring data will be analyzed and reviewed at regular intervals by **PIU/EMS** and compared with the relevant standards so that any necessary corrective actions can be taken in a timely manner. Records of monitoring results will be kept in an acceptable format and reported to the responsible government authorities and relevant parties (including the WB).

(PIU / EMS roles during construction are shown in Figure 8-1 and specified in Table 8-1 as training requirements)

8.2 ENVIRONMENTAL MANAGEMENT

8.2.1 Environmental Management Organisation

During Design and Construction

Suitably qualified and experienced contractors will be responsible for the detailed design and construction of the project. Construction workers will be required to demonstrate appropriate skills, qualifications and/or experience prior to employment.

During construction, **PIU/EMS** will ensure that all contracts with Contractors and sub-contractors stipulate construction management measures (as given in this ESMP), operational design criteria and environment, health and safety standards which must be implemented at the project site.

Implementation of these measures will be enforced and supervised by the Assistant Project Manager who will have direct responsibility for the Environment, Safety and Quality Assurance program on site during construction and operation. The Assistant Project Manager is responsible for ensuring that construction works comply with the requirements of the ESMP and all environmental permits. His key roles will be to:

- assume the interface with authorities for environmental authorizations and permits;
- act as the Assistant Project Manager for local authorities, industrial and commercial interests and any other interested parties;
- ensure that mitigation measures to reduce impacts during the construction phase are implemented;
- ensure that monitoring to be undertaken during construction is implemented;
- ensure compliance with the environmental and social management plan; and
- ensure that health and safety requirements are respected.

During Project Operation

During operation, direct responsibility for environmental compliance and the implementation of the mitigation, management and monitoring measures described in this section and in Section 7 of this report, will continue to be with the PIU/EMS under direct supervision of the Assistant Project Manager. This position, will report directly to the Chairman/General Manager of EETC.

The Assistant Project Manager will be based at the site and will be responsible for recruiting, training and managing his staff. He will be responsible for implementing the mitigation and management measures described above and for monitoring and record keeping of the following:

- emissions to the air;
- air quality;
- noise emissions;
- quality of effluent discharge; and
- waste management.

In his role, the Assistant Project Manager will also be responsible for maintaining any pollution control equipment and for developing and implementing procedures for safe handling and storage of any hazardous materials used on site.

The Assistant Project Manager will also have lead responsibility for maintaining a written Environmental Register with respect to environmental impacts as required under Egyptian and World Bank guidelines. The written records will identify the characteristics of discharges and emissions, details of periodic testing including results, procedures for follow-up environmental safety actions and the person in charge of this follow-up. Should any prescribed standards be breached, **PIU/EMS**, through the Assistant Project Manager, will immediately inform the EEAA and disclose the procedures being taken to rectify non-conformity.

Results of environmental monitoring as described above, shall be recorded and submitted to the EEAA, EEHC and to any other party (i.e. WB etc.) as required. The EEAA and WB are entitled to audit the project company in order to ensure conformity with environmental standards and requirements.

In addition, the project company must keep a record of any significant environmental incidents occurring at the project including accidents and occupational illnesses, spills, fires and other emergencies. The Assistant Project Manager will be responsible for ensuing that these records are maintained up to date and are available on site.

The Assistant Project Manager will supervise and lead the Environmental Unit (EU) and cooperate with the Environmental Management Staff (EMS) of the EETC directed by the PIU. *Figure 8-1* illustrates the organization of the EMS.

(PIU / EMS roles during operation are shown in Figure 8-1 and specified in Table 8-1 as training requirements)

Social / Community Development Specialist

Within the PIU/EMS, a Social / Community Development Specialist will be recruited by EETC for managing all expected socio-economic impacts that are associated with the implementation of the project.

His / Her responsibility should basically include, but is not limited to, the following tasks:

- **Solve problems related to valuation and compensation.**
- **Solve problems related to community interests.**
- **Community information and outreach.**

8.2.2 Environmental Training

The Project Company will ensure that the transmission interconnection project is manned all working hours. All staff employed at the project will be trained in the following:

- general operation of the transmission line and substations;
- specific job roles and procedures;
- occupational health and safety; and
- contingency plans and emergency procedures.

Training will include:

- induction training on appointment;
- specialist training (as required for their prescribed job role); and
- refresher training as required.

The training program will be designed to ensure that appropriate skilled staff are used to operate the project at all times. Aspects of occupational health and safety and emergency procedures are described below.

In addition to this environmental training for all staff employed at the project, special environmental training will be given to the staff employed for the EMU. They will receive training in the following:

- day-to-day monitoring activities;
- collection and analysis of environmental quality data;
- monitoring the waste effluents;
- monitoring the waste disposal;
- use of monitoring equipment, operation and maintenance;
- industrial hygiene;
- occupational health and safety; and
- emergency and contingency procedures.

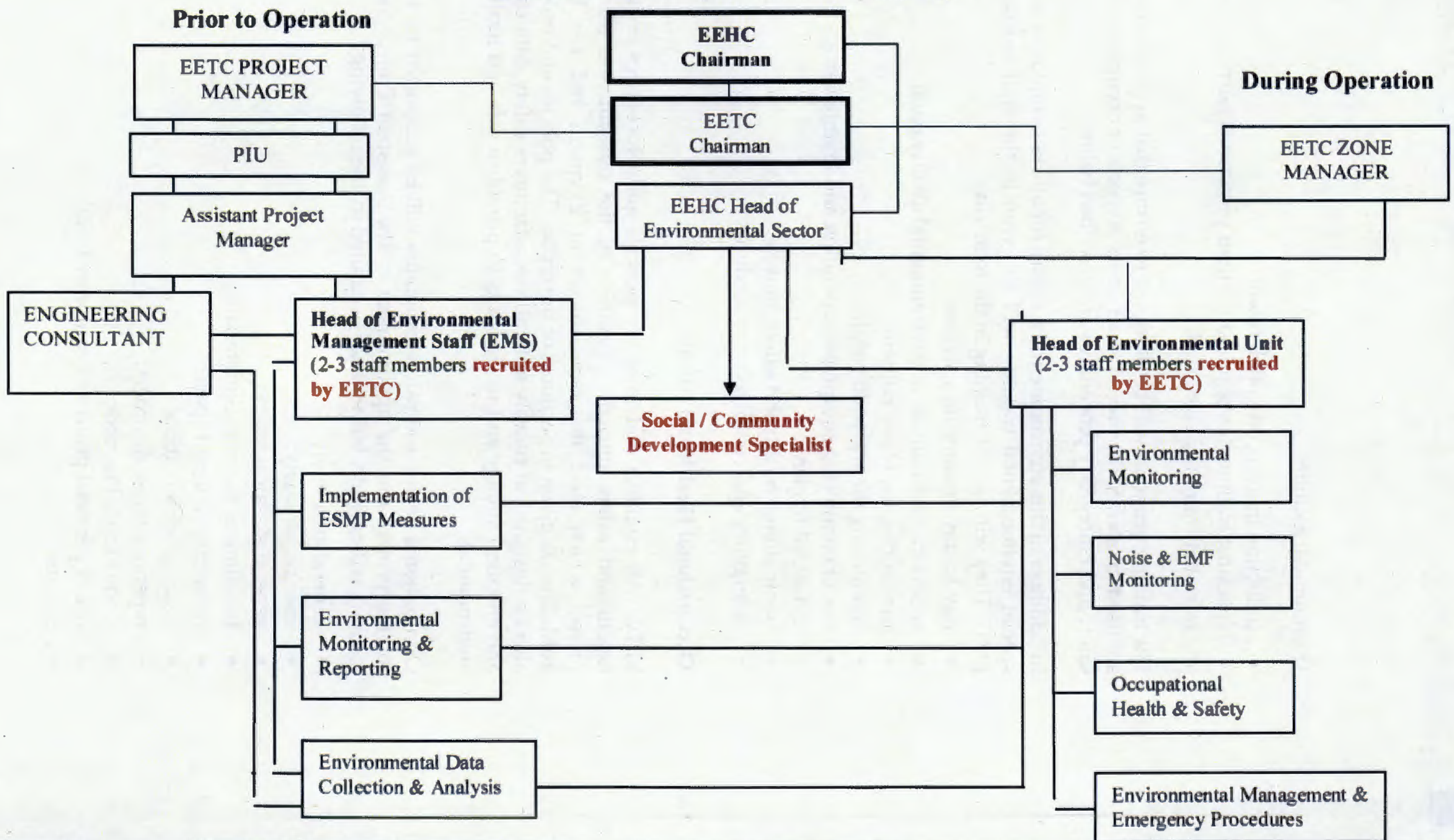
8.2.3 Occupational Health and Safety

EETC will establish and integrate policies and procedures on occupational health and safety into the operation of the transmission interconnection project which meet the requirements of Egyptian and the World Bank guidelines as given in Section 2 of the report. The policies and procedures will also be designed to comply with all manufacturers safety data sheets for oils and chemical storage and usage, so as to provide a safe and healthy working environment.

Occupational health and safety programs will be supported by staff training for the project and the appointment of the Assistant Project Manager. The training will include, but will not be limited to, the following:

- general area safety;
- specific job safety;
- general electrical safety;
- handling of hazardous materials;
- entry into confined spaces;
- hearing conservation;
- repetitive stress disorders;
- Code of Safe Practices;
- use of personal protective equipment; and
- first-aid.

Figure 8-1
Environmental Management Staff (EMS) within the Project Implementation Unit (PIU)



The training will include induction courses when staff are first employed at the project, with specialist and refresher training as required by the job role. Training will be updated annually and occupational health and safety procedures will be included within the Operations Manual for the project.

The safety record at the project administration will be reviewed each month at a formal meeting, led by the Assistant Project Manager, where the agenda items, comments and attendance will be recorded and kept on file.

In addition, periodic safety audits will be conducted to verify compliance with safe working practices, which will comprise physical inspections, review of project records and interviews with staff. The audits will assign responsibility for any corrective action necessary to mitigate a potential hazard and allow the tracking of the completion of the corrective measure.

Table 8-1 summarizes the recommended training required for the PIU/EMS.

8.2.4 Emergency Procedures and Accident Response

Instructions on emergency measures necessary to safeguard employees and the wider environment will be prepared as part of the Operations Manual for the project.

Accident Response

As part of the preparation of emergency procedures and the plans for accident response arrangements, the project company will carry out the following:

- review industry-specific and Egyptian, EIA and World Bank standards and regulations;
- establish general guidelines on potential safety and accident risks;
- prepare job-specific operating instructions where appropriate;
- establish safety and security notices for hazardous materials;
- prepare specific emergency operating instructions;
- provide protective equipment (including clothing, air and ear protection etc.) as required;
- evaluate information and feedback from employees; and
- record and investigate all accidents, injuries and incidents.

Table 8-1

Recommended Training Required for the PIU/EMS

Training Course	Contents	Type of Training	Participants	Proposed Scheduling	Cost Estimate (L.E.)
General EHS Training: • Induction Training on Appointment • Specialist Training • Refresher Training (as required)	• General operation of the project. • Specific job roles and procedures. • Occupational Health & Safety: - general area safety; - specific job safety; - general electrical safety; - handling of hazardous materials; - entry into confined spaces; - hearing conservation; - repetitive stress disorders; - Code of Safe Practices; - use of personal protective equipment; and - first-aid. • Contingency Plans & Emergency Procedures.	Classroom and On-job training.	All project staff, including EMS.	Once before project implementation and during operation for refresher training.	Included in construction & operation cost. (around US$ 60k)
Special Environmental Training on Environmental Aspects of transmission and substation systems and Monitoring.	• Allover Environmental Performance of the transmission and substation systems • Day-to-day monitoring activities. • Collection & analysis of environmental quality data. • Monitoring the waste effluents. • Monitoring the waste disposal • Use of monitoring equipment, operation and maintenance. • Industrial Hygiene.	Classroom and On-job training.	EMS. (2-3 staff members)	Once before project implementation and monitoring program.	Included in construction & operation cost. (around US$ 10 k)
Environmental Auditing and Inspection, including periodic safety audits	• Environmental Auditing Techniques. • Auditing Checklists. • Environmental Auditing Reports. • Safety Audits: - Physical inspections; - Review of project records; - Interviews with staff.	Classroom and Field Exercises.	EMS.	Once after project implementation	Included in operation cost. (around US$ 10 k)
Social Communications	• Communications Skills. • Mass Communications.	Classroom and Field Exercises.	EMS.	Once before project implementation and monitoring program.	Included in construction & operation cost. (around US$ 10 k)

Contingency plans and emergency procedures are being developed to cover events due to operational failures, natural causes and acts of third parties. The plans and procedures will cover, as a minimum, the following:

- fire;
- explosion;
- bomb alerts;
- leaks and spills of hazardous materials;
- structure or equipment failures;
- injuries and illnesses;
- risk from natural disasters (wind, sandstorm, earthquake); and
- third-party risks (potential impacts of an accident occurring at another industrial facility which may impact upon the transmission line or the substations).

Oil Spill Contingency Plan

As Good practice and part of the ESMP, EETC will prepare an Oil Spill Contingency Plan for substations transformers and other equipment and oil uses.

The plan will cover the following activities.

- delivery;
- handling;
- spills; and
- cleanup.

The plan will detail procedures, responsibilities, chains of command, information flows, monitoring and documentation.

8.3 SCHEDULE AND COSTS FOR PREPARATION AND IMPLEMENTATION OF EHS PLANS

Table 8-2 below provides a time schedule and approximate costs for the preparation and implementation of the Environment, Health and Safety Plans.

Table 8-2

Schedule and Cost Estimates for EHS Plans

Plan	Responsibility	Schedule for Submission	Schedule for Implementation	Approx. Cost (US$)
Occupational Health and Safety Plan (Construction)	EETC Assistant Project Manager and PIU/EMS	4th Quarter 2012	2nd Quarter 2013	Within Construction Contracts
Occupational Health and Safety Plan (Operation)	EETC Assistant Project Manager and PIU/EMS	2nd Quarter 2013	3rd Quarter 2013	(a)
Emergency Procedures and Accident Response Plan	EETC Assistant Project Manager and PIU/EMS	4th Quarter 2012	4th Quarter 2012	(a)
Oil Spill Contingency Plan	EETC Assistant Project Manager and PIU/EMS	2nd Quarter 2013	2nd Quarter 2013	(a)
Chance Finds Procedure	EETC Assistant Project Manager and PIU/EMS	4thQuarter 2012	4th Quarter 2012	(a)
Monitoring Plan	EETC Assistant Project Manager and PIU/EMS	Already prepared, see Table 8-3 and Table 8-4 of ESMP	Start of Construction	(a)

Notes:
(a) The cost of the preparation of these plans will amount to around US$ 50,000. The costs of maintaining and implementing the requirements of these plans on-site cannot be determined at this stage until the contents and requirements of the plans are known.

8.4 SOCIAL MANAGEMENT PLAN (SMP)

8.4.1 Objectives of the SMP

The objective of the Social Management Plan is to put forward mitigation measures for potential negative impacts and to monitor the efficiency of these mitigation measures on relevant environmental and social indicators. Similarly, the goal of the Social Management Plan, as represented by the Resettlement Policy Framework, is to construct guidelines for the avoidance of expected negative social impacts, and initiate a mechanism for implementing these guidelines when issue arise. The respective plans identify certain roles and responsibilities for different stakeholders for implementation, supervision and monitoring.

The following list provides explanations of the social aspects of some of the impacts detailed above:

- Affected farmers should be compensated for their crops in appropriate prices and paid prior to implementation. As well as, The affected areas needed should be compensated for on a market price or change the tower into underground cable in order to avoid high compensation rate.
- Regarding the affect on the workers, safety measures should be applied.
- Regarding the mitigation of reduction of traffic flow due to the construction materials and dust that will result from digging. It is recommended that dust be removed and construction materials be stored in big storage areas close to the construction sites.
- There must be precautions to ensure that drivers approaching such a construction site change their lane prior to the site and adjust their speed to that of the traffic in the adjacent lanes. These precautions will be easier to carry out when traffic volumes are low during night time, i.e. from midnight to 6:00 am.
- For the mitigation of affecting the community people who might be affected due to accumulation of wastes, it is recommended to follow the environmental safety measures needed to reduce the wastes or moving them to remote landfill.
- Risks to existing infrastructure, especially water pipes that are not mapped and must be identified through excavation holes. It is crucial to have updated maps of these lines and pipes in order to avoid damaging them. If such maps are not available, excavation holes must be dug before any construction.
- The potentially effect on the project by stealing its properties, security guards should be hires to watch the equipments and other materials.

8.4.2 Social Monitoring Guidelines

It was notable that the main activities that should be monitored are those related to expropriation of lands and valuation of crops. Moreover, the grievances should be also highlighted and reported.

This monitoring process necessitates some forms in order to be able to process the management and monitoring system appropriately (*Tables 8-3 and 8-4*).

The results of the monitoring and management system should be reported quarterly to the Headquarter of holding company and the World Bank. The monitoring and management will be implemented by the branches of electricity company in each governorate and monitored by the headquarter staff.

In order to achieve this monitoring system, personnel identified in *Figure 8-2* are needed. Regarding the compensation committee that is responsible for the valuation of the compensations are a manager, an accountant and a lawyer.

Table 8-3

Affected Land and Crops Form

a. **Serial Number**
b. **Governorate**
c. **District**
d. **Village**
e. **Area of land**
f. **Direct and indirect crop owner**
g. **His ID number**
h. **The value of the crops**
i. **The total area of the land to be expropriated**
j. **Duration of expropriation**
k. **Signature and stamp of the owner of crops**
l. **Witness from community**
m. **Prepared by (Name of the employee)**

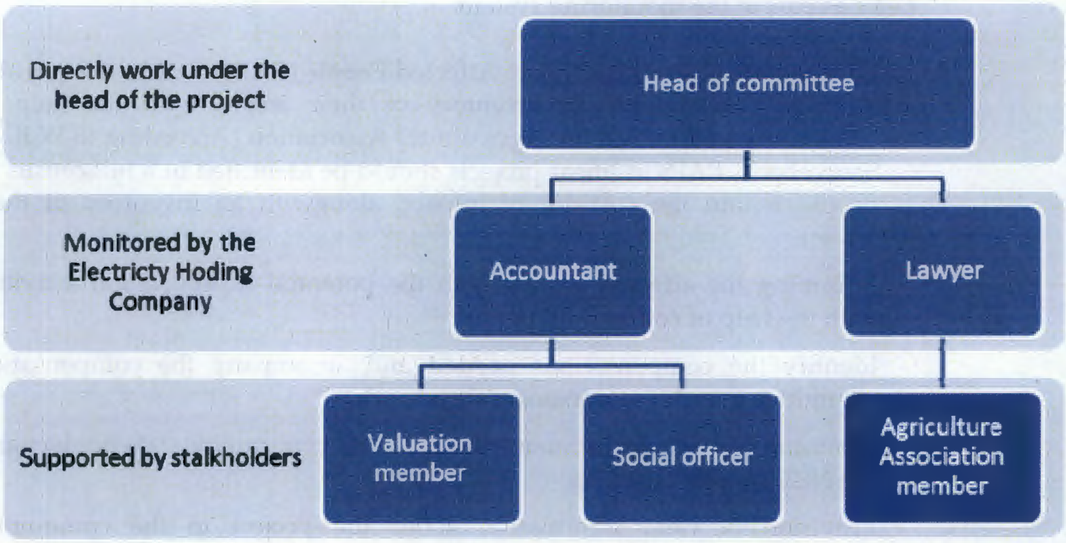
Table 8-4

Grievance Form

a. **Serial Number**
b. **Governorate**
c. **Gender of the person reporting a grievance**
d. **Age of the person reporting a grievance**
e. **Education of the person reporting a grievance**
f. **Topic of grievance**
g. **Actions to be taken**
h. **Monitoring for grievance**

Figure 8-2

Organizational Chart for Compensation Committee



The Compensation Committee should be assessed by the Agricultural Association during the process of compensation.

In addition, the social Officer that will be hired will undertake the following tasks as part of the monitoring system:

- Having a full census of Project Affected People (PAPs) within the corridor of impact, alongwith an inventory of their assets, with the help of community people and the Agricultural Association (According to W.B. IR Sourcebook, PAPs in linear projects should be identified in a full census of people within the corridor of impact, alongwith an inventory of their assets).
- Informing the affected groups with the potential expropriation activities with the help of community people.
- Identify the compensations needed and accompany the compensation committee in order to document their work.
- Provision of detailed list about the potential community stakeholders and the NGOs representatives.
- Provision of clear information about the project to the community members.
- Conducting regular meetings with stakeholders in order to discuss the information needed and any potential complains and grievances.
- Document the grievances, classify them, raise them to the head of the project management unit to response on them, inform the people about the responses and document all the process.

8.4.3 Management of Culturally Valuable Sites

The project is not expected to encounter any sites of cultural or historical significance. Nonetheless, management and mitigation guidelines have been established in case of such a situation.

Law 117/1983 for Protection of antiquities has set certain standards that should be followed during excavation works near a registered antiquity site. The Supreme Council for Antiquities emphasizes that collaboration should be established between an archeologist and an infrastructure developer during construction near an antiquity. These standards and requirements are followed among the following proposed mitigation measures:

- Identifying comprehensive list of all registered antiquities, falling within the domain of the project, and collect their maps and identified buffer zones from the Supreme Council of Antiquities.
- Identifying locations of the interconnection areas where line will be next to or near, antiquities buffer zones. In such location permission from the Supreme Council of Antiquities on excavation works should be obtained. These locations are expected to be concentrated in Old Cairo district.

- Provide supervision on implementation of construction works at these identified locations.
- No tunneling activities should be allowed under or next to monuments.
- If dewatering activities are to take place, the process should be undertaken under the supervision of foundation engineers who shall perform necessary soil investigations. The process should be tight in time schedule to avoid elongated dewatering, and possibly use under-trench culvert or tunnel to preserve groundwater table under the monument.
- Reduce vibration, in identified locations of antiquities:
  - using manual tools whenever possible.
  - phasing work to eliminate generation of resultant vibrations from several machinery.
  - Establish cutoff barrier through a vertical trench, whenever needed, to absorb vibrations.
- Identify architecturally valuable sites and implement aesthetic designs of rising connections, choosing back sides to avoid artistic sides and components.
- In case an antiquity is found, excavation works should hold and the Supreme Council of Antiquities should be contacted to handle the site.

Possibly required monitoring activities for some antiquities, which will be based on survey report of archeological constant undertaking mitigation measures 1 and 2, include:

- Perform Elevation Reference Points (ERP) test for identified monuments if dewatering is to take place in identified locations of the line, near antiquity sites, according to the methodology mentioned in the previous section.
- Monitor vibration levels at the monument location during excavation.
- Undertake geophysical survey for some locations prior to construction, according to the instructions of the Supreme Council for Antiquities.

8.4.4 Mitigation Measures for Social Impacts during Operation

The main major unfavorable impacts during the operation phase will be mitigated as follows:

- Raising the level of awareness of the people in the project areas through different media channels and with the help of local NGOs.
- Local Community Councils should ensure that the roads are paved immediately after finishing the installation to avoid any further congestion and disturbances.
- The impact on fisheries that might affect their livelihood chances should be mitigated.

During the operation phase, it is recommended to monitor the line, especially to make sure that no one tries to build on the routes of the line. Moreover, in case of changing the farm land into construction land, the appropriate compensation should be applied by the Committee for Compensation in order to limit the unfavorable impacts of the project.

Environmental Management Plan (EMP) is illustrated in *Table 8-5, and Table 8-6* [(A), (B)].

Socio-economic Management Activities during design, construction and operation, proposed responsibilities of different stakeholders and approximate cost are given in *Table 8-7 [(A), (B)]*.

8.5 MONITORING PROGRAM

The purpose of the environmental monitoring program is to ensure that the envisaged outcome of the Project is achieved and results in the desired benefits to Egypt. To ensure the effective implementation of the ESMP it is essential that an effective monitoring program be designed and carried out. The environmental monitoring program provides such information on which management decisions may be taken during construction and operational phases. It provides the basis for evaluating the efficiency of mitigation and enhancement measures and suggests further actions that need to be taken to achieve the desired Project outcomes.

Monitoring activities during design, construction and operation are given in *Table 8-8 [(A), (B)] and Table 8-9 [(A), (B)]*.

Table 8-10 gives summary of implementation cost of the ESMP.

Table 8-5

Institutional Arrangements for Helwan South / Zahraa Al-Maadi - Helwan South / Samallout 500 kV Transmission Interconnection Project

Issue/Impact	Mitigation Measures	Implementation Schedule	Type and Frequency of Reporting / Monitoring	Responsibility		Monitoring Indicators	Budget in US$
				Implementation	Supervision		
Construction Phase							
Institutional capacity to address environmental and social issues	Establishment of the Project Implementation Unit (PIU), including the Environmental Management Staff (EMS) (will include 2-3 staff members, B.Sc. and/or 5 years high technical education **recruited by EETC, in addition to a Social/ Community Specialist)**, construction phase. Basic training of persons employed to operate the monitoring activities. Basic induction training for all employees on good construction and site management practice.	Prior to project construction. Ongoing training	Quarterly to EETC Chairman Quarterly to EEHC Environmental Management (EEM) and EEHC Chairman Quarterly to WB	PIU / EMS	EETC Project Manager in collaboration with the Consultant Site Manager	Training programs Compliance with ESMP	Environmental Quality quarterly monitoring will start with the commencement of construction phase. Basic Training Basic Induction Training Training time and cost (included in construction cost) (around US$ 60 k) EETC responsibility
Operation Phase							
Institutional capacity to address environmental and social issues	Establishment of the Project Implementation Unit (PIU), including the Environmental Management Staff (EMS) (will include 2-3 staff members, B.Sc. and/or 5 years high technical education **recruited by EETC, in addition to a Social/ Community Specialist)**, operation phase. Basic training of persons employed to operate the monitoring activities. Induction, specific and refresher training for all employees on good operation management practice. Training methods, facilities & manuals	Prior to starting operation. Ongoing training	Quarterly to EETC Chairman Quarterly to EEHC & EEHC Environmental Management (EEM) Quarterly to WB	PIU / EMS Assistant Project Manager	EETC Project Manager in collaboration with the Consultant Site Manager	Training programs Compliance with ESMP	Training time and cost (included in operation cost) (around US$ 30 k) EETC responsibility

Notes:
(*) EETC responsibility: means that training and capacity building activities are included in the company organizational structure and budget.

Table 8-6 (A)

Environmental Management Plan during Design and Construction Phase(*)

Potential Impact	Proposed Mitigation Measures	Project Phase	Institutional Responsibility For Implementation	Responsibility of direct supervision	Means of supervision
Effects of construction waste	Identify disposal sites for construction waste approved by the local authority	Pre-construction	EETC	EETC	Review local authority approvals
	Identify location within construction site for temporary storage of construction waste	Construction	Construction contractor	Construction supervisor consultant	Site supervision
	Adequate transportation and disposal of construction waste	Construction	Construction contractor	Construction supervisor consultant	Site supervision and occasional inspection of disposal site
	Allocate and prepare areas for temporary storage of scrap	Pre-construction	EETC	EETC	Auditing of allocated stores
	Keeping tidiness and cleanliness of the utility store	Construction	Storekeepers selected from EETC	EETC	Auditing of stores
Land use restrictions and possible resettlement	Choose routes of power lines not passing through highly produced fruits and could be rejected by public concern	Design and planning	Design consultant	EETC	Design review
	ROW and transmission route should avoid the damage of animals, birds and sensitive archeological site	Design and planning	Design consultant	EETC	Design review
	If the resettlement occur, information and RPF should be implemented in accordance with WB standards	Construction	EETC and local authorities	EETC and local authorities	Site supervisors
Trees removal for power lines right-of-way	Plantation of trees near removed trees	Construction	EETC	EETC	Review reports and occasional audits

Notes:
(*) The cost of Environmental Management Measures during design and construction is estimated for around US$ 70 K.

Table 8-6 (A) *(Contd.)*

Environmental Management Plan during Design and Construction Phase

Potential Impact	Proposed Mitigation Measures	Project Phase	Institutional Responsibility For Implementation	Responsibility of direct supervision	Means of supervision
Construction air emissions	Spraying soil before excavation in loose sandy soil	Construction	Construction contractor	Construction supervisor consultant	Site supervision
Construction noise	Provide ear muffs to construction workers usually located near noisy machines	Construction	Construction contractor	Construction supervisor consultant	Site supervision
	Organize working hours so that noise exposure to workers will be minimized	Construction	Construction contractor	Construction supervisor consultant	Site supervision
Impacts on traffic on roads	Prevent storage of construction materials, equipment or machinery on traffic lanes	Pre-construction and construction	Construction contractor	Construction supervisor consultant	Site supervision
	Facilitate alternative access roads to villages during temporary occupation of narrow roads.	Pre-construction and construction	Construction contractor	Construction supervisor consultant	Site supervision
	Drivers of heavy trucks or loaders should be carefully turn as the high speed vehicles on the highway	Pre-construction and construction	Construction contractor	Construction supervisor consultant	Site supervision
	Drivers of construction machinery should receive sensitization/training on safety issues	Construction	Construction contractor	Construction supervisor consultant	Site supervision
Impacts on Fauna and Flora	ROW and transmission rout should avoid any damage to fauna and flora	Design and planning	Design consultant	EETC	Design review

Table 8-6 (A) *(Contd.)*

Environmental Management Plan during Design and Construction Phase

Potential Impact	Proposed Mitigation Measures	Project Phase	Institutional Responsibility For Implementation	Responsibility of direct supervision	Means of supervision
Excavation and Trenching	Identify the excavation according to the drawing design	Pre-construction Construction	Construction Contractor	Construction supervisor	Site supervision and occasional inspection
	Clear safety signs and boundary for the excavation sites				
	Safety and clear area around the excavation site including the safety helmets and boots compulsory for workers				
Safety of Mechanical Equipment	Drivers should have a certified and valid license	Construction	Construction contractor	Construction supervisor consultant	Site supervision
	All mechanical equipment should be checked prior to use				
	Appropriately tagged all mechanical equipment that are locked or out of service				
Impacts of culture and privacy of local communities	Maximize the use of local workers as much as possible	Construction	Construction Contractor	Construction supervisor consultant	Review of contractor's reports
Protection against flash flood, earthquake and sand dunes	Minimum requirements to withstand flash flood, earthquake and sand dunes will be included in the design and construction of the transmission lines.	Design and Construction	Engineering Designer Construction Contractor	EETC Management Construction supervisor consultant	Review of Design and contractor's reports
Raising awareness(*)	Inform the community about the different stages of the project, safety measures and transportation route	Construction Contractors	Construction Contractors	Construction Contractors	Construction Contractors

Notes:
(*) The cost of Awareness Raising during design and construction is estimated for around US$ 20 K.

Table 8-6 (B)

Environmental Management Plan during Operation Phase(*)

Potential Impact	Proposed Mitigation Measures	Project Phase	Institutional Responsibility For Implementation	Responsibility of direct supervision	Means of supervision
Generation of scrap and hazardous waste	Allocate and prepare areas in substation site for temporary storage of scrap	Pre-construction	EETC	EETC	Auditing of allocated stores
	Keeping tidiness and cleanliness of the utility store	Operation	storekeepers	EETC operator / Environmental section	Auditing of stores
	Controlling the hazardous and special waste either to sell or to recycle	Operation	EETC operator	EETC operator / Environmental section	Documentation of the waste management
	Controlled disposal of non sold hazardous and special waste	Operation	EETC operator	EETC operator / Environmental section	Documents review and occasional inspection of disposal site
	Implement waste minimization measures in design and construction	Design and Construction	Design consultants for design, and contractors during construction	Construction supervising consultant	Site supervision
	Carry out awareness campaign about safety precautions with specific emphasis on women and children	Operation	NGOs local promoters and training consultant	EETC	Review NGOs training of trainers and visits of local promoters
Health & Safety	Strict adherence with standard H&S principles and measures	Operation	EETC operator	EETC / Environmental section	Occasional inspection of substations and transmission line route
Exposure to EMFs	Select routes of power lines as far as possible from developed areas	Design	Design consultant	EETC operator/ Environmental section	Review design reports

Notes:

(*) The cost of Environmental Management Measures during operation is estimated for around US$ 50 K.

Table 8-6 (B) *(Contd.)*

Environmental Management Plan during Operation Phase

Potential Impact	Proposed Mitigation Measures	Project Phase	Institutional Responsibility For Implementation	Responsibility of direct supervision	Means of supervision
	Fix a ROW distance on both sides of power lines where no permanent structures should be established	Pre-construction	EETC and Local Authorities	EETC operator	Review correspondence with local authorities
	In case EMF monitoring results gave high EMF readings in populated areas, EMF reduction measures should be taken according to recommendations of the engineering consultant	Operation	Specialized Engineering Consultant	EETC / environmental section	Review consultant reports and implementation of measures
Risk of soil contamination	Care should be taken during transformer oil changing, which should be over an impermeable layer of soil	Operation	EETC operator	EETC / environmental section	Occasional visits to substations especially at the transformer location
	Adequate collection and disposal of contaminated soil	Operation	EETC operator	EETC / environmental section	Occasional visits to substations especially at the transformer location
Impacts on land use, landscape and visual amenities	Improve land scape using means of harmonization and beautification	Pre-construction and Operation	EETC in collaboration with Specialized Engineering Consultant	EETC / environmental section	Review consultant reports and implementation of measures

Table 8-7 (A)

Socio-economic Management Matrix during Design and <u>Construction</u>

Impact	Mitigation measures	Responsibility of mitigation	Responsibility of direct supervision	Means of supervision	Estimated Cost of mitigation / supervision
Expropriation of Land	Providing compensation to the land owners	EETC (Compensation Committee)	EETC Headquarter and Regional branches	List of affected parties Documentation Report Receipts for the provided compensation	EETC management staff Estimated compensations US$ 128K
Damage of crops	Compensation for the crops	EETC (Compensation Committee)	EETC Headquarter and Regional branches	List of affected parties Documentation Report Receipts for the provided compensation	EETC management staff Estimated compensations US$ 235K
Risk of damaging infrastructure	- Collect infrastructure maps - prepare accidents log	EETC (HSE supervisor)	EETC HSE Manager	Review HSE site reports	- EETC management cost
	- Use excavation pits	Contractor	EETC HSE Supervisor	Field supervision	- Contractor costs in normal bid price - EETC management cost
	- Analyze accidents log	EETC HSE Research	EETC HSE Manager	Review periodic HSE reports	- EETC management cost
Waste disposal	- Control over construction waste - Arrange effective disposal sites	Contractor	EETC HSE supervisor	Field supervision	- Contractor responsibility: Included in normal contractor bid

Table 8-7 (B)

Socio-economic Management Matrix during Operation

Impact	Mitigation measures	Responsibility of mitigation	Responsibility of direct supervision	Means of supervision	Estimated Cost of mitigation / supervision
Residual Expropriation of Land (if any)	Providing compensation to the land owners Change the power tower to underground cable	EETC (Compensation Committee)	EETC Headquarter and Regional branches	List of affected parties, Documentation Report, Receipts for the provided compensation	EETC management staff (permanent EETC Staff) Estimated compensations included in the previous cost
Residual Lack of information	Awareness raising activities should be provided to community people	EETC+ NGOs	EETC Headquarter and Regional branches	List of awareness participants	included in awareness raising cost

Table 8-8 (A)

Environmental Monitoring Plan during Design and Construction Phase(*)

Potential Impact	Monitoring Indicator	Monitoring Location	Monitoring Methods	Monitoring Frequency	Monitoring Responsibility
Disposal of construction scrap	Quantities of scrap item by type	Utility store	Inspection and recording of admitted items	Quarterly reporting	EETC storekeeper
Excavation and trenching	Areas of excavations and trenching Safety areas around the excavation	Construction site	Inspection and marked the safety areas for excavation especially the deep whole	Upon excavation and trenching	Site supervisor consultant Construction contractor
Land use restrictions and possible resettlement	Areas of restricted use penetrated by ROWs	Construction site	Area measurements on maps and on ground using surveying tools	Once during design phase	Design consultant
Trees removal during construction of power lines	Number of removed trees	Construction site	Visual counting of removed trees	Upon removal of trees, reporting will be once monthly	Site supervisor consultant
Safety on roads	U turn from the main highway to the site Marked sign on the entrance to the site	Highway road and the U-turn on both side	Clear sign on both U-turn side on the highway and at the entrance to the site	Upon turning or entering the location	Site supervisor and contractor
Safety of mechanical equipment	Performance of the equipment and the visible damage	Construction site	Inspection and recording of the performance	Upon the use of the mechanical and heavy Machineries	Construction contractor
Culture and privacy of local communities	% of local labor to total labor	Construction site	Reporting labor origin governorates and calculating the natives ratio	Quarterly	Construction contractor
Protection against Flash Flood and Earthquake	Design considerations and construction method.	Construction site	Investigation will be done to ensure that protection against flash flood and earthquake is already incorporated in the design and construction of the transmission lines.	Quarterly	Construction contractor
Raising awareness	Clear sign on the project site and along the transmission lines route	Construction site	Marked the project site and warning sign as well along the interconnection lines	Monthly	Construction Contractor

Notes:

(*) The cost of Environmental Monitoring during construction is estimated for around US$ 30 K.

Table 8-8 (B)

Environmental Monitoring Plan during Operation Phase(*)

Potential Impact	Monitoring Indicator	Monitoring Location	Monitoring Methods	Monitoring Frequency	Monitoring Responsibility
Disposal of hazardous waste and scrap	Quantities of waste items by type	substation utility store	Inspection and recording of admitted items	Quarterly reporting	Substation's storekeepers
Safety of power lines and substation	Number of electrocution or fire accidents by type	Substation operator	Counting accidents and reporting its causes	Once an accident happens	Substation's operator
Exposure to EMF	EMF (mG)	Selected locations where developed areas are closest to power lines	Measurements through EMF meter	Quarterly, or as required	EMF Expert (substation's operator)
Risk of soil contamination	Volume of contaminated soil	Locations of release	Approximate estimation of the volume by measuring surface area and approximate depth	Once an accident happens	Substation's operator

Notes:
(*) The cost of Environmental Monitoring during operation is estimated for around US$ 30 K.

Table 8-9 (A)

Socio-economic Monitoring Matrix during Design and Construction

Impact	Monitoring indicators	Responsibility of monitoring	Duration of monitoring	Methods of monitoring	Estimated Cost of monitoring
Expropriation of Land	• lands expropriated • Affected people list	EETC headquarter	During construction	Reviewing documents and site visit Meeting Affected people and discussing their attitudes, options and satisfaction	Around US$ 40K
Damage of crops	• lands expropriated • types of crops • Affected people list	EETC headquarter	During construction	Reviewing documents and site visit Meeting Affected people and discussing their attitudes, options and satisfaction	
Risk of damaging infrastructure	• Maps for infrastructure and excavation pits results	EETC headquarter	During construction	Reviewing documents and site visit	
Waste disposal	Wastes accumulated	EETC headquarter	During construction	Reviewing licensing to specialized contractor. Reviewing consignments for disposal. Reviewing lists of waste taken off-site. Audit disposal procedure	

Table 8-9 (B)

Socio-economic Monitoring Matrix during Operation

Impact	Monitoring indicators	Responsibility of monitoring	Duration of monitoring	Methods of monitoring	Estimated Cost of monitoring
Residual Expropriation of Land (if any)	- lands expropriated - Affected people list	EETC headquarter	During operation	Reviewing documents and site visit Meeting Affected people and discussing their attitudes, options and satisfaction	Around US$ 20K
Residual Lack of information	- List of participants in awareness activities	EETC headquarter	After installation of line	Reviewing list of participants and attending awareness activities Meeting Affected people and discussing their attitudes, options and satisfaction	

Table 8-10

Summary of Implementation Cost of the ESMP

No.	Phase of Implementation	Cost in US$		Source of Funding
		Measures	Monitoring	
1	Design and Construction Phase			EETC
	• Monitoring equipment **[Corona Discharge and S/Ss Noise measuring- EMF levels measuring,..etc. (if required)]**	70 K	30 K	EETC
	• Environmental Health& Safety	50 K		
	• Awareness Raising	20 K		
	• Training/Inst. Building	60 K		EETC
2	Operation Phase	50 K	30 K	EETC
	• Awareness Raising	10 K		EETC
	• Training/ Inst. Building	30 K		EETC
3	Mitigating Social Safeguard Issues (during Design, Construction & Operation) (cultivated land & crop compensation)	128 K 235 K	60 K	EETC
	Sub. Total	**653 K**	**120 K**	
	Grand Total	**773 K**		

Table 8-10 **shows that the total implementation cost of the environmental and Social Management Plan is about US$ 0.773 million, which amounts to about 0.4% of the total project cost.**

All the mitigation, monitoring and management measures proposed above (the Environmental and Social Management Plan (ESMP)), will be adopted by the Project Company and imposed as conditions of contract on the contractor and any sub-contractors employed to build or operate any part of the project.

8.6 RAISING AWARENESS

During different stages of the project, different awareness raising activities should be carried out with the public in order to minimize the impact, environmentally and socio-economically and to introduce and inform the community about the different stages of the project as well as expected duration of its completion. Awareness raising activities for socio-economic issues are presented in *Table 8-11*.

Table 8-11

Awareness Raising Activities(*)

Topic	Contents	Type of Activity	Expected Participants	Proposed Time	Expected Outcome
Awareness Raising	- Introducing the new project. - The benefits of the new project. - Explain the different alternatives of the project. - The importance of mobilizing the local resources to replace the removed trees with new ones.	- Organizing community conferences/symposia. - Printing pamphlets. - Using local media. - Making banners	The local residents	Before the start-up of the project and during the construction phase.	- people are convinced of the importance of the new project. - people are participating in replacing the removed trees.
Health and Safety Measures	- The importance of applying safety measures during construction. - The needed precautions that ensures the health and safety of people. - The tools that can be used for the protection of laborers as well as the local people. - How to apply safety audits.	Classroom, on-job training, and field inspections	The local residents, the laborers and crew	Throughout the construction phase and Operation phase	Both the local people as well as the project crew are applying the safety measures during construction and operation phases.
Communication Skills	- How to communicate with the public. - Different methods of communication - The negotiation skills.	Classroom, practical training.	The project staff	Throughout the construction phase and Operation phase	The communication and negotiation between the local people and the project staff is moving smoothly.

Notes:
The cost of Awareness Raising Activities is estimated for around US$ 30K.

9. CONSULTATION AND DISCLOSURE

9.1 INTRODUCTION AND GENERAL APPROACH

In order to ensure that the views and interests of all project stakeholders are taken into accounts, public consultation has been carried out according to the World Bank guidelines and EEAA requirements for Category (B) projects, which require coordination with other government agencies involved in the ESIA, obtaining views of local people and affected groups during the social research conducted for the project. This consultation has been undertaken as part of the Environmental and Social Impact Assessment process. The process of this consultation is also implemented in accordance with the World Bank requirements.

This section summarizes the activities which have been undertaken and the results of consultation. It, also, summarizes the activities which may be undertaken, under this condition, during the construction and operation of the project.

9.1.1 Public Consultation Regulations and Requirements

In accordance with the World Bank requirements, namely the Bank's Operational Policy (OP) 4.01 Environmental Assessment and other key documents, affected groups and NGOs must be consulted as part of the environmental assessment of projects. The primary purpose of this provision is to protect the interests of affected communities. Therefore, the ESIA and RPF process should include consultation and disclosure of information to key stakeholders involved in and/or affected by the Helwan South / Zahraa Al-Maadi - Helwan South / Samallout 500 kV transmission line and substations.

The objectives of consultation and disclosure are to ensure that all stakeholders and interested parties, are fully informed of the proposed project, have the opportunity to voice their concerns and that any issues resulting from this process are addressed in the ESIA and incorporated into the design and implementation of the project.

Egyptian Law number 4 of 1994 and its updated Law No. 9/2009, which addresses the environment, does stipulate and refer directly to public consultation within the ESIA process. In addition, its importance may be inferred from the inclusion of representatives of environmental non-governmental organizations on the Board of Directors of the EEAA. Furthermore, the EEAA "Guidelines for the Basis and Procedures of Environmental Impact Assessment (EIA) - Sector Guidelines" suggest discussions with local stakeholders and interested parties during scoping and preparation of the ESIA.

9.1.2 Stakeholders

During the ESIA process, stakeholders for the project have been identified and included the following:

- Local Councils and Districts Authorities;
- Government Regulatory Agencies;
- Local business and commercial interests;
- Local people including population representatives;
- Environmental research organizations; and
- NGOs and other environmental interests.

A full list of primary stakeholders is presented in *Table 9-1*.

Table 9-1

Primary Stakeholder Organizations

Organization
• Cairo Governorate
• Giza Governorate
• Beni-Suef Governorate
• El-Minya Governorate
• Marakez Samallout in the El-Minya Governorate and Zahraa Al-Maadi in the Cairo Governorate
• Egyptian Electricity Holding Company (EEHC)
• Egyptian Electricity Transmission Company (EETC)
• Local Electricity Authority (North & South Cairo and Upper Egypt Electricity Distribution Companies)
• Egyptian Environmental Affairs Agency (EEAA)
• Ministry of Water Resources and Irrigation
• The El-Minya, Beni-Sueif, Giza and Cairo population representatives
• Ministry of Transport
• The El-Minya and Zahraa Al-Maadi Transport Departments
• Egyptian Natural Gas Holding Company (EGAS) (Upper Egypt Gas Pipeline)
• Supreme Council of Antiquities
• Egyptian General Authority for Shore Protection
• National Research Center, State Ministry of Scientific Research and Technology
• Organization for Physical Planning, Ministry of Housing
• Egyptian General Authority for Meteorology
• National Authority for Remote Sensing and Space Sciences
• General Authority for Geological Survey

9.1.3 Management and Participation

Public consultation and disclosure was managed and undertaken by Environmental Consultant ECG and EETC with participation from EEHC. Concerned stakeholders, including local community, economic representatives and local economic activities, have been, and will continue to be, requested to actively participate in this process.

9.2 CONSULTATION OBJECTIVES, METHODOLOGY AND SAMPLING

9.2.1 Objectives

The overall objective of this consultation is to measure the social impact of the project. This necessitates to measure and highlight the following objectives:

- Identify positive and negative impacts on the local market in change in demand for local services, as well as access to social infrastructure.
- Identify the impacts on employment, housing of workers, and general public safety issues.
- Highlight the legislations under which the project will be implemented, in case of expropriation of lands(*).
- Address the land use in the areas and investigate the ability of expropriation.
- Identify potential obstacles that might face the project and how to overcome them.
- Outline the vulnerable groups that might be affected by the project and identify the appropriate mitigation measures.
- Investigate the possibility of having community participation during the implementation phase of the project. The role of NGOs and different institutions was investigated to support the project and discern what types of assistance should be provided during each phase.
- Identify the monitoring system needed during the construction and operation phases.
- Provide various options to minimize the need for involuntary resettlement.
- Finally, try to propose a Social Management Plan that might be responsible for any potential social problems.

(*) Regardless of having a decree to allocate lands by the governor in some cases the project might find illegitimate possession of land.

9.2.2 Methodology

Participatory Rapid Appraisal Methodology is applied. Therefore, a cross-sectional analysis that uses a multi-data sources is developed.

*a. **Primary Data***

- Focus group discussion with the community people and scoping sessions.
- In-depth interview guides with the governmental organizations and the NGOs.

*b. **Secondary Data***

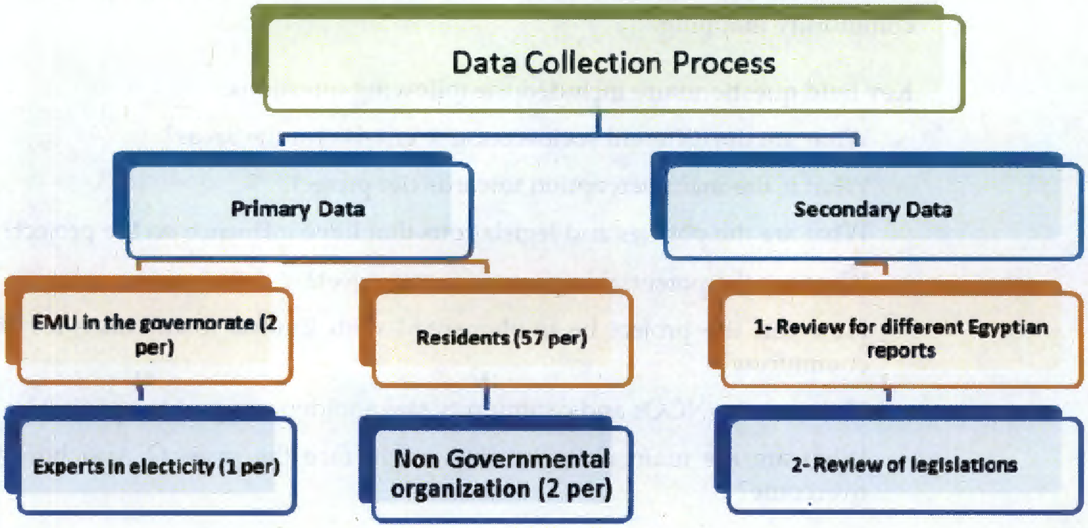
The secondary data analysis was used to review governmental documents and to provide a clear socioeconomic profile for the communities that will host the project. Thus, the following reports have been reviewed:

- Egyptian Human Development Report 2010.
- Environmental profile for El-Minya, 2007.
- Environmental profile for Beni Suef 2008.
- Egyptian Census results 2006.
- Egypt Description by Information, IDSC, 2010.
- Egyptian Demographic and Health Survey 2009.
- Egypt Description by Information, IDSC, 2009.
- Resettlement Policy Framework, World Bank.
- Different laws that govern the expropriation process.

Figure 9-1 depicts the "Data Collection Process".

Figure 9-1

Data Collection Scheme



c. Maps and Photos and Observation

Documentation with maps and photos was presented. In addition, observation for different areas was used to facilitate the process of community mapping.

Key field questionnaire included the following questions:

- What are the different socioeconomic criteria for the areas?
- What is the main perception towards the project?
- What are the policies and legislations that have influence on the project?
- What are the potential impacts of such project?
- How can the project be implemented with limited disturbance for the community?
- How can the NGOs and community stakeholders support the project?
- What are the main obstacles that might face the project? And how to overcome?

9.2.3 Sampling

The sample was selected randomly from the areas that might be affected by the project in El-Minya. The sample is considered representative, as it investigated the conditions of most targeted groups.

Three tools were applied as follows:

- Six Focus group discussion with males and females in the areas.
- Two in-depth interviews with NGOs and social institutes.
- Two in-depth interviews with the governmental organizations (EMU manager in Minya Governorates and Urban planning in Minya governorate).

In addition one in-depth interview with an electric consultant in Cairo was conducted.

a. Gender of Community Sample

Six focus group discussions were applied in the potential affected areas in Minya Governorate. 52.6% of them were females. It was obvious that the females are more aware about the electricity status in the areas due to staying at home.

Figure 9-2 shows some Females and Males participants in the FGDs.

b. Age Distribution of Community Sample

In order to investigate a community sample that might reflect all points of view, diversity according to age was put into consideration. The age varied between 18-65 years old. The average was about 33.3. while the mode was about 29. About 40.4% of the sample were between 20- less than 30 years old. While about 19.0% of the sample were between 50- less than 60. Those between 30-50 were about 28.0% of the total sample. Few of the sample were of older age category.

c. *Educational Status of Community Sample*

It was foreseen that education is not so common in these communities as about 28.0% of the sample were illiterate . While those who dropped out from basic information were about 33.0% of the sample. Only 28.0% of the sample graduated from vocational and agriculture secondary education. Few percentage completed their university education 3.5%. That should be put into consideration during the preparation of awareness activities.

d. *Work Status of Community Sample*

Regarding work status, the majority of the sample, who were mainly females, were housewives. Regardless of their educational level or their age. 21.1% were farmers which reflects the nature of the areas where the study was implemented. 8.8% of the sample were among drivers as they are one of the potential affected groups during the construction of the majority of developmental projects. 10.5% of the sample were among common workers.

Figure 9-2

Females and Males Participants in the FGDs

e. ***Marital Status of Community Sample***

About 3/4 of the sample surveyed were married, the majority of them were females, while only 21.1% were single, they were mainly among males. Almost all females interviewed were married with at least one child.

f. ***Land Ownership, Expenditure and Income***

About 33.3% of the sample surveyed possess lands, either through legal ownership or illegal. They consider having a land might be through renting it. Therefore, those who rent a land reported that they have lands.

Regarding the expenditure and income of the FGDs participants. They were completely unable to tell about their monthly income and expenditure due to:

- The type of work which is relatively unstable.
- Live in an extended family which has only one budget.
- Being so young to know about such issues.

It was notable that the range was between 500-3000 EGP for income and expenditure per month. With an average of 1089 and mode value of 900 EGP. That might reflect the poor socioeconomic of the sample.

9.2.4 Limitations of the Sample

Limitations of the sample were as follows:

- The sample surveyed was not big, but informative.
- Community people were furious due to the inefficiency of electricity provision in the areas.
- During scoping sessions people were so keen to get information about the project in order to tell about their worries. But, they were affected by the quality of electricity supplied to their areas.

9.3 POTENTIAL AFFECTED PARTIES

The farmers were ranked as the first affected groups due to passing through their lands in Minya Governorate. Those farmers might be owners of their lands or just tenants. Definitely the project will affect their crops temporarily but it will not affect the productivity of their lands. The main problem that might face the project with the affected people is the possibility for urbanization. The rapid expansion of town's area made it possible that the current agricultural lands might be a land suitable for construction in the near future (*Figure 9-3*).

The second ranked affected group was the microbus and small trucks (Tuc Tuc) drivers who will be delayed during the construction phase. The accumulation of construction materials and wastes might affect their routes. The fishermen were a little bit worried that the project might affect the fisheries life in the area. But, it was not clear if this viable or not.

Fishermen are ranked as not affected at all. Transmission Lines will cross the Nile at El-Minya segment on two high towers, one located on the eastern bank of the Nile and another is located on the western one. The project will not touch the Nile at all or its waters.

9.4 VULNERABLE GROUPS

Vulnerable groups are those people who might be susceptible to loss of income, assets and job due to the implementation of the project. The sample surveyed reported different categories of vulnerable groups. The following were reported as vulnerable groups (*Table 9-2*):

Table 9-2

Vulnerable Groups and Mitigation Measures

Vulnerable groups	Type of impact	Mitigation measures
Farmers	Affect their crops temporarily Affect their lands in case of having an electric tower	Crops should be valuated in appropriate prices and paid prior to implementation The affected areas needed should be compensated for on a market price or change the tower into underground cable in order to avoid high compensation rate
Workers in the sites	Might be injured	The maximum safety procedures should be followed
Microbus and small truck drivers	Loss of income due to the delay (Because of construction materials and waste accumulation)	The routes should be addressed with the traffic police and informed to the drivers through signs and policemen
Community people	Might be injured during the construction, especially, children and older people due to digging and accumulation of construction materials	There should be some signs and guards who will keep people away from the areas
The project itself	The project construction materials might be subject to theft or robbery	Security guards should observe the construction materials and all equipments related to the project
Affect the infrastructure in the areas	The infrastructure might be damaged due to digging works	Clear maps should be provided, otherwise, excavation wholes might inform about the hidden infrastructure

Figure 9-3

Rapid Construction on the Agricultural Lands

9.5 COMPENSATIONS

Compensation is a delicate and crucial issue. There exists a capacity for great suffering if individuals are not appropriately compensated in the cases of expropriation. However, it is difficult to discern accurate estimates of property and asset value. Individuals tend to request inappropriate compensation. The issue of compensation should be tackled in a comprehensive way in order to satisfy community members and remain within the budget of the project. The following procedures should be applied regarding compensation:

- Compensation should be provided to the owner of the crop regardless of his legal status, (the owner of crops might be the land tenant not necessary the owner of land).
- A clear screening of different areas should be done prior to the implementation (maximum three months before the implementation) of the project in order to identify any possibility of arousing disputes regarding compensations.
- It is the Agricultural Association and the community people in addition to the administrative documents (if available) who provide the information about the Project Affected People.
- A clear documents for the person who received the compensation should be documented in order to argue based on this documents.
- The person who receives the compensation stipulates that he will be responsible legally for any disputes result from receiving the compensation.

9.6 COMMUNITY PARTICIPATION

Community participation is a main element of sustainability for any project. To ensure the success of the project, community's role is discussed to summarize essential tasks for community members to undertake.

9.6.1 Role of Community Members

NGOs and different organizations reported a willingness to provide support for the project, primarily by raising awareness. They proposed to create a comprehensive awareness-raising campaign to help the community address the following issues:

- The areas covered by the project.
- Information about the prices of crops and lands.
- Clarification among community leaders as to which groups are in need of receiving the compensation.

- Project participation and support from religious leaders and leading members of the community (doctors, teachers, CDA chairmen) to acquaint resident's with the idea of expropriation.
- Addressing regulatory and environmental management aspect of the project during the awareness-raising campaign.

Throughout this process, the most influential community members are: Religious leaders, Esteemed people (Mayors, People Assembly Member)…etc.

During the Construction Phase:

Continue the comprehensive awareness-raising campaign and address the issues of accidents that might affect residents and the benefits of the new project.

1. The NGOs should be responsible for:
   - Provide posters concerning safety and potential accidents.
   - Cooperate with expropriation authorities to negotiate appropriate compensation with residents.
2. A local committee should be established and charged with responsibility for implementing awareness-raising programs, establishing methods of payment for expropriated dwellings, and facilitating land acquisition. This committee should include the Local Unit Chairman, the local politician or Member of Parliament, the CDA chairman. The governorate must provide the necessary administrative documents to facilitate expropriation.

During the Operational Phase:

Community members should be supportive to the project through the provision of the needed help to monitor the interconnection line and report any potential theft for it. Moreover, they should inform the Social Officer all complains result due to the project.

9.7 TRADITIONAL STRUCTURES AND LAND ACQUISITION FOR PUBLIC BENEFIT

A traditional organization structure focuses on a process called departmentalization. It is where a structure places people into groups with specific tasks or jobs in which they are qualified to do or have experience in or specialize in that particular area. They are then linked, both within the group and within the organization, in three main ways structured formats: functional structures, divisional structures and matrix structures.

The discussion of traditional entities that govern Egypt in case of land acquisition became relatively of high importance due to the current attitudes of different communities regarding the expropriation. However, the traditional actions are applicable only in rural and Bedouin inhabited areas. The power of traditions and norms declined severely outside the rural and non Bedouin areas. Yet, the power and influence of the religious institutes (Mosques and churches) might be of high influence in the semi structured and squatters. Indicating that traditional attitudes, behaviors and laws might be abided to in the absence of the state power and police force.

In accordance with the fundamental procedures applied in different areas, it is crucial for any developmental study to apply a stakeholder analysis in order to achieve the full inclusion of the community. That might work for the benefit of amicable implementation for the project.

In order to comprehend the problematic status of the traditional procedures versus the formal laws and regulations it is important to describe briefly the following cases:

1. **Agrium Company in Damietta Governorate** is one of the disputes resulted before and after the 25th of January Revolution, which is being solved using the influence of NGOs in cooperation with business men and the government.

2. **British Petroleum Natural Gas Excavations in Lake Edko** in El Behira Governorate is one of the most recent problems that will be solved based on negotiations with community people directly without involving any representative.

3. **Metro Line Third Phase**, in El Moneeb and Zamalek that faced relatively severe problems due to the willingness to expropriate lands.

4. The EETC has faced problems with the community in Ashmoun due to Ashmoun transmission line.

Reviewing the above mentioned cases, the following analysis was done.

The type of communities faced expropriation problems were:

1- Squattered communities.
2- Semi-urban communities.
3- Poor communities.
4- Unstable communities with internal disputes.
5- Urban communities.

The strategies used per each community vary according to the characteristics of them.

Unstable & Squatted Communities:

- The power and influence of religious people is relatively high in case of providing appropriate compensation. But, if compensation is not fair enough the influence of religious people will declined.
- Having alternative appropriate dwellings will work for the acceptance of the project more than any community integration.
- Inside the squatter, the only acceptable law is Win Win. The affected people should be fully compensated to accept the project.

Urban & Semi- Urban Communities:

- People need to be consulted and the main stakeholder should be included for support. Negotiations regarding the value of compensation should be transparently and adequately implemented in order to make them feel at ease.
- Integration of religious people might be useful in the presence of other stakeholders.
- In some areas, "Urfi" sessions might be applied, especially in the El-Minya Governorate.
- Having trustful people from the community is supportive.

Poor Communities:

- They pay more attention to the value of compensation.
- Trustful people might work for the benefit of the project.

In addition, community engagement is the action that actively seeks informed and inclusive dialogue and exchange of views between responsible authorities and those citizens and communities most affected - directly and indirectly - by the design, alignment, construction and operation of projects. This dialogue should include the promise that all stakeholders' views and proposed alternative solutions will be respectfully considered and will influence final decisions and the choice of solutions on priority issues of concern. Stakeholders should be fully informed of and invited to participate actively in key decisions regarding the design, alignment, construction and operation of public services that will markedly impact their lives, their well-being and their communities.

Therefore, Resettlement Action Plan (RAP) or Appreciated Action Plan (AAP) should be prepared as a stand alone document based on a thorough stakeholder analysis. That plan should cover, in addition to other basic items, the following:

- Analysis for the stakeholders,
- Identification of the potential support groups,
- Type of traditional and Urfi actions applied,
- Other recommendations.

9.8 PUBLIC CONSULTATION

Stakeholder participation and consultation is a core to the ESIA process in order to ensure that the proposed mitigation plan clearly reflect the views and interests of various groups of stakeholders, particularly potentially affected groups.

The ESIA, conducted in March 2012, was originally prepared to include scoping sessions (*Figure 9-4*) during social data collection process, via carrying out consultative interviews with relevant stakeholders alongwith the transmission line according to the sample mentioned before. The main objective of having such scoping sessions was to:

- Bring the project forward to the community people to investigate their perception towards it.
- Give information on the nature of farming, crops, and land shares within the project area.
- Introduce the project to a number of stakeholders, including farmers, drivers, women and young people who will be the key affected groups of the project.
- Familiarize the community with the fairness compensation strategies seeking to modify it to be acceptable to the community
- Assure the potentially affected groups that compensation schemes are in place and that actual inventory/survey of the affected lands and crops will be prepared as part of the project in order to provide fair compensation to the affected farmers
- Inform the community people a clear idea about the project and the areas that might be expropriated.

Results of scoping sessions were as follows:

59 community people attended the sessions among which:

- About 52% were females who are housewives.
- About 65.0% were less than 40 years old among which about 50.0% were less than 30 years old in order to involve more young people
- About 28.0% were among illiterate people who are targeted to raising awareness activities
- 21.0% of the participants were farmers and 8.8 % were drivers. While 50.0% almost were housewives

Table 9-3 gives key comments and responses raised during scoping session.

Figure 9-4

Scoping Sessions' Participants

Table 9-3

Key Comments and Responses Raised during Scoping Sessions, 20th March 2012

Questions/ Recommendations	Responses
Dalia Abd El Rasoul: a housewife, Will the project result reduction on the electricity bill?	***Social Consultant**: I don't think the project will have any impact on the bills but it will affect the quality of electricity in the villages like yours*
Nasem Ibraheim: housewife, They mentioned that the electricity company will use cards for electricity supply. will your project be implemented for this cards	***Social Consultant**: No the high pressure line aims at enhancing the quality of electricity not how to pay for it*
Rabeea Abu El Eioun, driver. Our area suffer due to bad electricity supply and unemployment among young people. Will the electricity company hire us	***Social Consultant**: We have over 100.000 young man in El-Minya Governorate. So the company will not hire them all. But some will be hired from your area at least during the construction phase. But you as a driver you will benefit from the workers who will use your microbus to go the sites.*
Moamen Rabeaa, Farmer. You will corrupt our crops and lands. And sometimes you take a big part of land I can show you your excessive expropriation. (We went to the site he mentioned and there was about 16 meters of land that should be compensated for	***Social Consultant**: I don't think the corruption is permanent. It is temporarily during construction phase . All expropriated parts will be compensated. No effect on the productivity of lands The type of towers to be used has small base like the one in this photo*
Mohamed Salah Omar, lab technician The instability of electricity affect our appliances and made them damaged, will you compensate for it also	***Social Consultant**: Definitely not because it was not our project impact. I think also the Electricity company will not afford such things. You should use a voltage adapter to save your appliances*
Taha Abu El Eioun, Farmer, Can we irrigate our lands or we might be strike by electricity	***Social Consultant**: You can do whatever you want. No such thing might happen. You can see close to your areas lands are cultivated under electricity power with no problem*
Hisham Mahmoud Mohamed, principle You have heard about the theft in the areas so you should protect your equipments	***Social Consultant**: Thank you for this advice, we will put it into our consideration*
The majority of them, We don't trust grievance system in electricity company. They never listened to our complains	***Social Consultant**: Now after revolution you are listened to and the World bank has restrict rules and regulations that emphasize on responding to your complains*

9.9 ONGOING FACILITY FOR PUBLIC CONSULTATION AND DISCLOSURE

The World Bank also require that the consultation process is ongoing during the construction and operation phases of the project. To this effect, EETC/EEHC has stated its commitment to maintaining long term and mutually beneficial open dialogue with local authorities, agricultural, industrial and commercial interests and local people, through its Safety and Environment Officer during construction and Assistant Project Manager during operation. A key role of this post consultation will be to ensure that local stakeholders have an opportunity to raise questions, comments or concerns and that all issues raised are answered promptly and accurately.

Disclosure of information will also continue throughout project construction and operation. The primary emphasis here will be to assure stakeholders that the environmental mitigation, monitoring and management practices established in the ESIA and its ESMP are being implemented and the environmental standards and guidelines dictated by the Egyptian government and the World Bank are being met through a comprehensive monitoring and reporting process. EETC/EEHC is required under the Egyptian law, to maintain an Environment Register of written records with respect to environmental impacts from the project. In addition, an annual report containing technical data relating to the monitoring program will be prepared by the EETC/EEHC and submitted to the EEHC, EEAA and the WB.

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