











1.5 Million Natural Gas Connections Project in 11 Governorates

Site-Specific Environmental and Social Impact Assessment

El Obour/Qalyubeya Governorate

September 2016

EGAS
Egyptian Natural Gas Holding Company

Developed by

EcoConServ Environmental Solutions

Petrosafe
Petroleum Safety & Environmental Services Company

List of acronyms and abbreviations

AFD	Agence Française de Développement (French Agency for Development)
BUTAGASCO	The Egyptian Company for LPG distribution
CAPMAS	Central Agency for Public Mobilization and Statistics
CDA	Community Development Association
CO	Carbon monoxide
CRN	Customer Reference Number
CULTNAT	Center for Documentation Of Cultural and Natural Heritage
EEAA	Egyptian Environmental Affairs Agency
EGAS	Egyptian Natural Gas Holding Company
EGP	Egyptian Pound
EHDR	Egyptian Human Development Report 2010
EIA	Environmental Impact Assessment
ER	Executive Regulation
E&S	Environmental and Social
ESIA	Environmental and Social Impact Assessment
ESIA	Environmental and Social Impact Assessment Framework
ESM	Environmental and Social Management
ESMF	Environmental and Social Management framework
ESMP	Environmental and Social Management Plan
FGD	Focus Group Discussion
GAC	governance and anticorruption
GDP	Gross Domestic Product
GIS	Global Information Systems
GoE	Government of Egypt
GPS	Global Positioning System
GRM	grievance redress mechanisms
HDD	Horizontal Directional Drilling
HDPE	High-Density Polyethylene pipes
HH	Households
HHH	Head of the Household
hr	hour
HSE	Health Safety and Environment
IBA	Important Bird Areas
IDSC	Information and Decision Support Center
IFC	International Finance Corporation
IGE/SR	Institute of Gas Engineers/Safety Recommendations
LDCs	Local Distribution Companies
LGU	Local Governmental Unit
LPG	Liquefied Petroleum Gas
mBar	milliBar
MDG	Millennium Development Goal
MOP	Maximum operating pressure
MP	Management Plan
MTO	Material take-off
NG	Natural Gas

NGO	Non-Governmental Organizations
NO2	nitrogen dioxide
OSH	Occupational Safety and Health
P&A	Property and Appliance Survey
PAP	Project Affected Persons
PE	Poly Ethylene
PM10	Particulate matter
PPM	Parts Per Million
PRS	Pressure Reduction Station
RAP	Resettlement Action Plan
RPF	Resettlement Policy Framework
SDO	Social Development Officer
SIA	Social Impact Assessment
SO2	Sulphur dioxide
SSIAF	Supplementary Social Impact Assessment Framework
SYB	Statistical Year Book
T.S.P	Total Suspended Particulates
Town Gas	The Egyptian Company for Natural Gas Distribution for Cities
WB	The World Bank
WHO	World Health Organization
$	United States Dollars
€	Euros

Exchange Rate: US$ = 8.83 EGP. as of March 2016
Exchange Rate: € = 9.8949 EGP as of March 2016

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1 Introduction

1.1 Preamble

The Government of Egypt (GoE) has immediate priorities to increase household use of natural gas (NG) by connecting 1.2 million households/yr to the gas distribution network to replace the highly subsidized, largely imported Liquefied Petroleum Gas (LPG).

The total installed domestic connections until 2015 reached 7.2 million customers and 14.8 thousand commercial customers and 2.3 thousand industrial clients. That was achieved in full cooperation with the local distribution companies.

The GoE is implementing an expansion program for Domestic Natural Gas connections to an additional 1.5 Million households over the next 4 years. The project presented in this study is part of a program that involves extending the network and accompanying infrastructure to connect 1.5 million Households in 11 Governorates between 2016 and 2019 with the assistance of a World Bank Loan of up to US$500 Million and the Agence Française de Développement (French Agency for Development) financing of up to €70 Million. The program is estimated to cost US$850 Million.

1.2 Project Objectives

The proposed project represents an integral component of the National energy strategy which aims for greater use of natural gas for domestic users and reduction of government subsidies of the energy sector (LPG). The project is planned for completion within 3 years. The following results are envisaged:

- Wider NG coverage and stable household energy supply
- Reduced leakage and fire risk compared to LPG
- Reduced LPG cylinder prices due to lower demand
- Reduced hardships to the physically challenged, women, and the elderly
- Reduced costs compared to butane gas (LPG) and electricity in Egypt
- Reduced strategic dependence on imported fuel (LPG)
- Rationalization of subsidies for LPG cylinders.

1.3 Environmental and Social Impact Assessment (ESIA)

World Bank Environmental and Social Safeguard policies require an Environmental & Social Impact Assessment **(ESIA)** of the proposed project. In 2013 an Environmental and Social Impact Assessment framework **(ESIAF)** and a Supplementary Social Impact Assessment Framework **(SSIAF)** were prepared for the 11 governorates.

This ESIA has been prepared based on the Terms of Reference prepared by EGAS and cleared by the World Bank. A joint venture between Petrosafe (Petroleum Safety & Environmental Services Company and EcoConServ Environmental Solutions was contracted in November 2015 to develop the governorate-level and site-specific ESIAs.

ESIA is undertaken to assess and propose mitigations for environmental and social impacts of distribution networks serving the various project areas. Impacts of NG exploration, extraction,

refining, transmission, off-takes from the national network to the project areas, pressure and reduction stations are outside the scope of the ESIA.

The objectives of the ESIA include:

- Describing project components and activities of relevance to the environmental and social impacts assessments
- Identifying and addressing relevant national and international legal requirements and guidelines
- Describing baseline environmental and social conditions
- Presenting project alternatives and no project alternative
- Assessing potential site-specific environmental and social impacts of the project
- Developing environmental & social management and monitoring plans in compliance with the relevant environmental laws
- Documenting and addressing environmental and social concerns raised by stakeholders and the Public in consultation events and activities

As the project involves components in various areas within the 11 governorates, the parties to the project agreed that site-specific Environmental and Social Impact Assessments (SSESIAs) for each of the project sub-areas within the governorate will be prepared. Guided by the 2013 Environmental and Social Impact Assessment Framework (ESIAF) and Supplementary Social Impact Assessment Framework (SSIAF), this is the site specific ESIA for the connections network planned for El Obour in Qalyubeya Governorate. The project in El Obour encompasses around 4,000 household connections. Around 4,000 households are to be connected in year 1 of the 3-year project.

The local distribution company responsible for project implementation in El Obour is Egypt Gas or (شركة غاز مصر).

No major environmental or social risks could be foreseen to prevent reaching the targeted customer over the proposed 3-year timeframe. The extensive experience gained, by EGAS and affiliates, through implementation of the previous WB- and GoE-funded Natural Gas Connection project in Greater Cairo (and all over Egypt) plays a critical role in minimizing environmental and social risks and maximizing public ownership and acceptance.

1.4 Contributors

The ESIA has been prepared by a Joint Venture between Petrosafe (Petroleum Safety & Environmental Services Company and EcoConServ Environmental Solutions (Cairo, Egypt) with collaboration, and facilitation from EGAS, Egypt Gas, Regas and Town Gas HSE and Engineering Departments. The names of the Petrosafe and EcoConServ experts who have participated in the preparation of the ESIA study are listed in Annex 1 of this report.

2 Project Description

2.1 Background

Natural Gas is processed and injected into the high pressure lines of the national Grid (70 Bar) for transmission. Upon branching from the main lines to regional distribution networks, the pressure of the NG is lowered to 7 Bar at the Pressure Reduction Stations (PRS). An odorant is added to the NG at PRSs feeding distribution networks to residential areas[1] in order to facilitate detection. Regulators are then used to further lower the pressure to 100 mbar in the local networks, before finally lowering the pressure to 20 mbar for domestic use within the households. In addition to excavation and pipe laying, key activities of the construction phase also include installation of pipes on buildings, internal connections in households, and conversion of appliance nozzles to accommodate the switch from LPG to NG.

Project components planned for **El Obour are enclosed in a box** in the figure below:

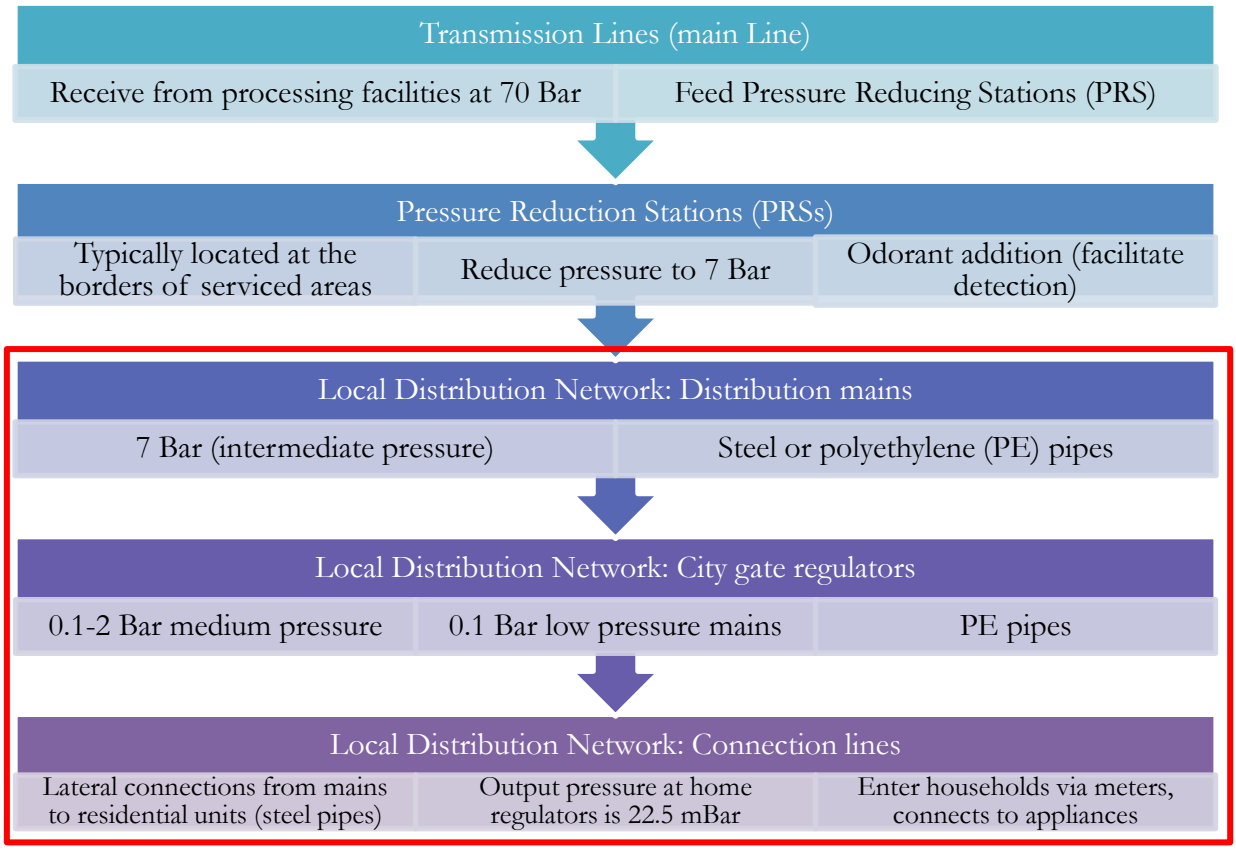


Figure 2-1: General components of the city's distribution network

[1] Because natural gas is odorless, odorants facilitate leak detection for inhabitants of residential areas.

2.2 Project Work Packages during Construction

2.2.1 Main feeding line/network "7 bar system – PE 100"

A gas distribution piping system that operates at a pressure higher than the standard service pressure delivered to the customer. In such a system, a service regulator is required to control the pressure delivered to the customer.

Main feeding lines are mainly constructed from polyethylene pipes with maximum operating pressure (MOP) below 7 bar.

2.2.2 Distributions network "Regulators, PE80 Networks"

A gas distribution piping system in which the gas pressure in the mains and service lines is substantially the same as that delivered to the customer's Meters. In such a system, a service regulator is not required on the individual service lines.

Distribution networks are mainly constructed from polyethylene pipes with MOP below 100 millibar.

2.2.3 Installations (Steel Pipes)

A gas distribution piping system consist of steel pipes which is connected from individual service line to vertical service pipe in a multistory dwelling which may have laterals connected at appropriate floor levels; in addition to service pipe connected to a riser and supplying gas to a meter and gas appliances on one floor of a building.

Internal Installation consists of a pipe connecting the pressure reducing regulator/district Governor and meter Outlet (MOP 25 millibar) to appliances inside the customer's premises.

2.2.4 Conversions

Conversions involve increasing the diameter of the nozzle of the burner of an appliance to work with natural gas as a fuel gas rather LPG or others.

2.3 Project Execution Methodology

2.3.1 Project area selection criteria

Preliminary project planning has applied social, economic, safety, and technical criteria to identify sub-areas (districts and villages that might be increased subject to availability of resources and compliance with technical, economic, and social criteria) as targets for connecting the customers (households). The project shall introduce the service in new areas, which have not been connected before, and shall further extend the network in areas which are partially covered.

A preliminary estimate was generated through a general survey (outlined below), followed by a Property & Appliance (P&A) survey. The outcome of the P&A survey is a detailed listing of individual households to be connected after passing safety and technical evaluations. The detailed listing is then used to finalize pipeline sizing and routing.

2.3.2 General survey

- Data collection on potential households to be connected from all relevant authorities
- Field visits to record road and building conditions.

- Approximation of the number of customers not meeting safety and technical criteria.
- Identifying availability of utilities in the area and their conditions (Electricity, Water, telephone lines, and sanitation network) through data and maps from the relevant authorities.
- Identifying the location of the nearest PRS or gas networks, if available.

2.3.3 Property & Appliance (P &A) survey

- Obtain the latest aerial maps of the project areas from the Egyptian Survey Authority
- Identifying Global Positioning System (GPS) coordinates of the sites
- Locating each road and building and inserting them on the corresponding map
- GPS team develops a survey map to be used by the P&A survey team to generate a unique customer reference number (C.R.N) based on building, block, and sector
- The final (C.R.N) will be associated to customer name, address, appliances, and data.
- An isometric drawing for each building, location of service, and riser routes is created, reviewed by the surveyors, and delivered to the Installations department
- Data is entered into a central database and G.I.S system for review by a design team
- Design team finalizes pipe sizing, type, regulator capacity & locations, routing, and number of appliances to be converted

2.3.4 Criteria for selection of structures eligible for connections

- Areas with pre-existing utilities especially underground (electricity, water, sewerage, telecommunication)
- Structures in residential areas cannot be made from clay or wood
- Structures must comply with British Standards and Egyptian Building Codes
- Residential areas must be in proximity to the gas network

Based on the above, potential connections in El Obour are presented below:

Table 2-1: Planned connections

Governorate	First year ٢٠١٦/٢٠١٧	Second year ٢٠١٧/٢٠١٨	Third year ٢٠١٨/٢٠١٩	Total (Thousand units)
El Obour	4	-	-	4

Figure 2-2: El Obour location relative to Khosous within Qalyubeya

Figure 2-3: Project sectors in El Obour

2.3.5 Design and material take-off (MTO) including procurement

Once the final number and location of project components and households is finalized, a final design of the distribution pipelines is utilized to estimate the materials needed to implement the project. Procurement of the materials includes local and international components. Local purchases typically include PE piping for the distribution networks. The main international purchases may include critical components, regulators, and metering stations

2.3.6 Construction works of Main feeding line/network "7bar system – PE100"

The distribution system shall consist of 7-Bar mains extending from the PRSs through city gate regulators, which in turn feeds low pressure networks via district regulators.

Distribution mains are typically Polyethylene (PE) pipes connected to regulators. Regulators are fed by 7-Bar piping which is orange in color (referred to as PE100) with diameters between 16mm to 3°5mm according to GIS PL2-8.

2.3.6.1 Excavation and pipe laying:

In general, the least expensive and most commonly used excavation technique is the Open cut technique. Alternatively, borings may be excavated using hydraulic drive, and finally Horizontal Directional Drilling (HDD) technique. HDD is only utilized in the case of railway crossings, waterways, and major streets where traffic cannot be interrupted. In the case of HDD under railway crossings steel or reinforced concrete sleeves will be installed to further protect the piping from fatigue. It should be noted that intersections with waterways of the Nile or its major branches are not anticipated in this project.

2.3.6.2 Site preparation and excavation:

Prior to excavation works, pipeline routes shall be identified and marked in the field. Excavation works start by removing the asphalt layer using either a mechanical trencher or a jack hammer. The mechanical trencher also removes broken asphalt and the base stone layer. In case the jack hammer is used, road layers are then removed by excavator.

The road base soil, underneath asphalt and stones, is then excavated either by a backhoe excavator or by manual excavation. The advantage of manual excavation is that it reduces the risks of breaking water, sewerage, electric or telecommunication lines which are unmapped. Typically, the trench for PE pipes is 0.4-0.6-meter-wide, and about 1.5-meter-deep, depending on pipe diameter. For steel pipes the trench width is 0.6-0.8 meters with the same depth, also depending on diameter.

Excavated soils, broken asphalt and other waste materials during excavation are loaded onto trucks, for transfer to disposal sites. Because of limited space on most streets, loading waste trucks shall be done upon excavation in order to avoid stockpiling waste.

In some cases, where groundwater table is shallow, the trench should be dewatered before pipe laying. Dewatering pumps typically discharge into a drain or sewer manhole, according to arrangements with local authorities. To conserve water, if dewatered groundwater is free of perceivable pollution, it will be- to the extent possible- used on- or around the work site or discharged into the nearest canal to be used for irrigation.

2.3.6.3 Pipe laying:

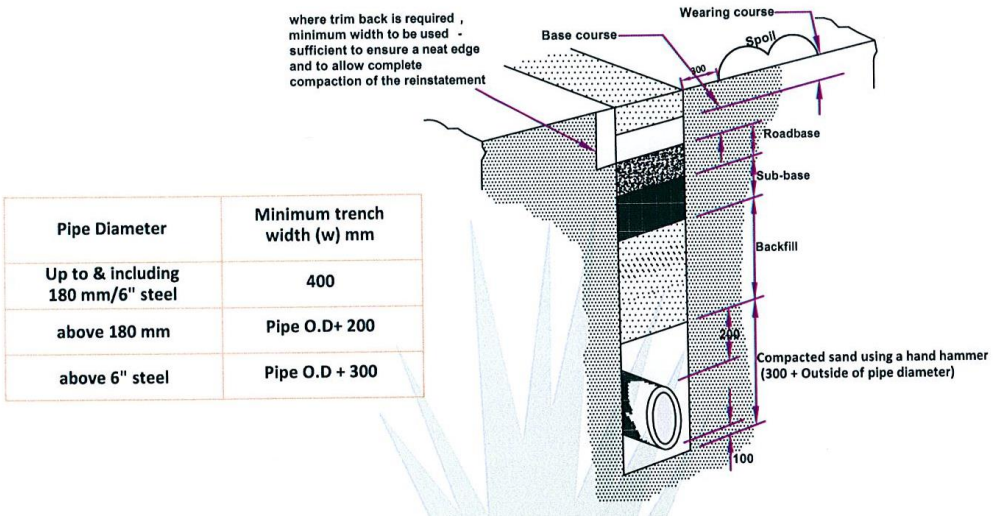
During the excavation works, welding works may take place above-ground. Once the trench is excavated, the pipe stretch shall be laid down.

Welding may involve a built-in coil electrical fusion weld (fittings with heating coils installed inside) or butt welds (hot plate softening the tips of the PE pipes before joining). In both cases, adequate electrical units are needed onsite (diesel generators, cables).

2.3.6.4 Backfill and road repair:

Natural gas PE pipes should be surrounded by sand in order to absorb loads from the road. After laying and welding works, the trench is then filled with sand either by a front loader or manually.

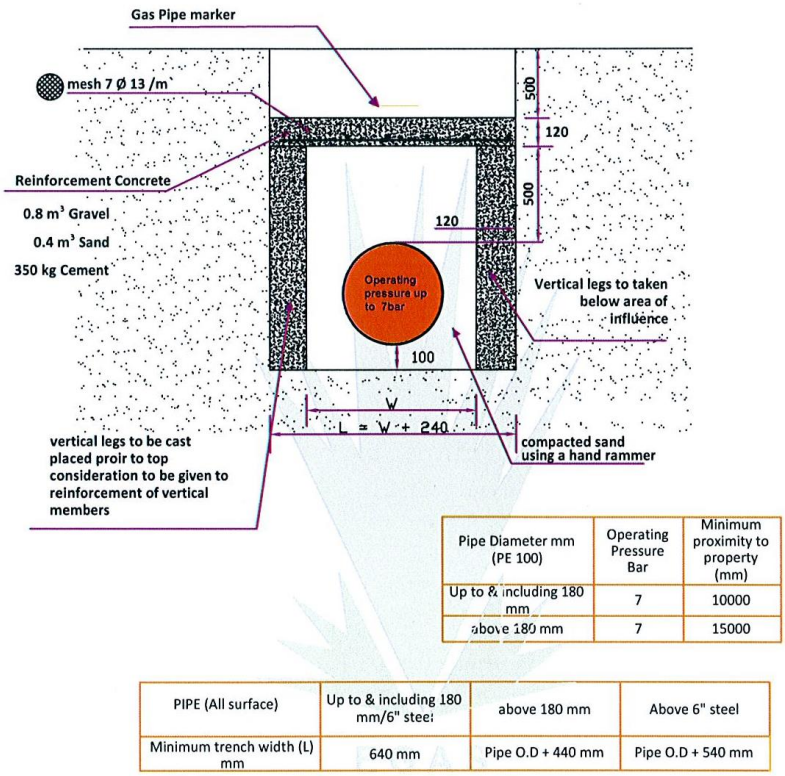
The sand should be effectively compacted in the trench in order to avoid road settlements, and subsequent cracks. A yellow warning tape marked "Natural Gas" is placed on top of the sand layer.



Pipe Diameter	Minimum trench width (w) mm
Up to & including 180 mm/6" steel	400
above 180 mm	Pipe O.D+ 200
above 6" steel	Pipe O.D + 300

Figure 2-4: Typical backfill arrangement (Source: EGAS technical drawings)

In some cases, an inverted U-shaped reinforced concrete slab is constructed around the pipeline after laying in order to improve shock resistance.



Pipe Diameter mm (PE 100)	Operating Pressure Bar	Minimum proximity to property (mm)
Up to & including 180 mm	7	10000
above 180 mm	7	15000

PIPE (All surface)	Up to & including 180 mm/6" steel	above 180 mm	Above 6" steel
Minimum trench width (L) mm	640 mm	Pipe O.D + 440 mm	Pipe O.D + 540 mm

Figure 2-5: Typical layout of U-shaped concrete slab (Source: EGAS technical drawings)

2.3.6.5 Leakage testing:

Following construction activities, the piping should be tested to locate possible leaks using either hydrostatic testing or pneumatic air-gas testing. In the former, the pipe is filled with water and then pressurized to the desired level, along with pressure testing at different locations to detect leaks, then water is drained. In the second process, air, or an inert gas, is used instead of water. In both cases, pressure is increased to 1.5x the operating pressure. Pressure drop indicates leakage.

Hydrostatic testing is more complicated than the pneumatic, as it requires highly efficient water drainage. This drainage takes place by the "pigging process", which includes forcing an object, the "pig", through the pipe by liquid or air pressure to totally drain the line before NG is fed. In the case of pneumatic testing, Nitrogen gas purge to remove air after the test.

In order to prevent deformation, dislocation, and rupture of the pipes, leakage testing through pressurization must be performed AFTER backfilling the excavation under (10 cm), around (10 cm), and above the pipes (20 cm, at least).

2.3.7 Construction works of distribution network "regulators, PE80 networks":

The distribution system shall consist of 100 mbar mains extending from the city gate regulators through, Distribution networks are typically Polyethylene (MDPE) pipes connected to regulators. Regulators are feed by 100 mbar piping which is yellow in color (referred to as PE80) with diameters between 16mm to 250mm according to GIS PL2-2.

2.3.8 Construction works of household installation

After testing the piping for leakage, connections to the buildings commence. The connection starts from the main line (PE) and crosses the road to the buildings on both sides. At the edge of the building, a riser (steel) feeds different laterals which ends at the customer gas meter then to different appliances. Traffic may be affected by the connection works due to obstructions by scaffolding structures. The underground portion of the riser is sleeve-protected, while above-ground pipes are painted. Risers and laterals are fixed on walls by steel clips. This will involve drilling the walls to attach the necessary bolts and rivets. The laterals enter the household through the wall. Connections are tested for leakage by increasing pressure to 2Bar and monitoring pressure drop.

- Connections work will connect the distribution network to the households.
- Gas will be feed into the property at 100 mbar maximum, through risers and laterals for flats and an external meter box service termination for singly occupied premises.
- Sizes of risers depend on the number of dwellings in the block of flats but laterals will be normally 1 inch or 3/4 inch.
- Gas meters will be installed with a suitable regulator (governor) at internal pressures of 20 mbar.
- Internal piping inside the household will be steel pipes of 1 inch, 3/4 inch and 1/2-inch diameter and will generally supply a cooker and a water heater. Connections from steel pipes to appliances are typically flexible rubber tubing in the case of stoves and copper tubing for water heaters.

2.3.9 Conversion of home appliances

Conversion of home appliances shall be carried out on 2 appliances (stove and water heater). The majority of appliances will be converted by drilling out existing injector nozzles to accommodate the targeted gas flow. Burner drilling is necessary to increase the flow of low-pressure NG in order to maintain the calorific value that was previously available from high-pressure LPG. Typically, injector nozzles are drilled to become 1.25 to 1.5 times larger in diameter.

The installation contract between the household owner and the implementing company includes the cost of converting 2 appliances. Conversion involves increasing the diameter of the gas injectors of the stove and water heater to accommodate the difference in operating pressures and calorific value of natural gas in comparison with LPG. Conversion works are practiced at the client's flat, by changing the injectors' properties of the appliance. Typical drill bit sizes used for conversions are either 35 or 70mm.

Conversion also involves flue gas outlet/stack installation for bathroom heaters. The stack must lead to external/ambient atmosphere outside the HH. In order to allow the installation of the conversion of the heater and installation of the stack, the bathroom volume must exceed 5.6 cubic meters. Installation of the stack may require scaffolding and breaking of the wall or ceiling.

2.3.10 Hotline

During construction activities, a 24-7 Hotline (**129**) is available for customers and the public to report leaks, damage, emergencies, and/or incidents related to gas connections, components,

infrastructure, and activities (inside or outside households) and to request repairs/emergency response/assistance.

This includes possible damage to other underground utility lines (water, wastewater, electricity, phone, Internet) and to buildings and physical structures or cultural sites during excavation/construction activities.

It also includes reporting issues resulting from construction activities such as excessive/prolonged noise, vibration, waste, traffic, accessibility, visual, and other community health and safety impacts.

2.4 Activities of the operation phase

2.4.1 Operation of the network

The operation of the system is undertaken by LDCs. Normal operation will include routine audits on pressures and condition of the network. Normal maintenance and monitoring works for the network include:

- Monitoring valves at selected points on the pipeline. Gas leaks are routinely monitored using gas detection sensors;

In case of a leak detection, or damage to part of the network, the damaged pipe is replaced. The following procedures are usually followed:

- Stopping leaking line by valves when available or by squeezing the lines before and after the damaged part.
- Excavating above the effected part (in case of distribution main or underground line)
- Venting the line
- Removing affected pipe, replacing effecting part and welding it with the two ends, filling and road repair

2.4.2 Repairs in households

Repairs in residential units include appliance adjustments or piping/metering replacement.

2.4.3 Hotline

A 24-7 Hotline (**129**) is available for customers and the public to report leaks, damage, emergencies, and/or incidents related to gas connections, components, infrastructure, and activities (inside or outside households) and to request repairs/emergency response/assistance.

3 Legislative and Regulatory Framework

3.1 Applicable Environmental and Social Legislation in Egypt

- Law 217/1980 for Natural Gas
- Law 4 for Year 1994 for the environmental protection, amended by Law 9/2009 and law 105 for the year 2015

  Executive Regulation(ER) No 338 for Year 1995 and the amended regulation No 1741 for Year 2005, amended with ministerial decree No 1095/2011, ministerial decree No 710/2012, ministerial decree No 964/2015, and ministerial decree No 26/2016
- Law 38/1967 for General Cleanliness
- Law 93/1962 for Wastewater
- Law 117/1983 for Protection of Antiquities
- Traffic planning and diversions
  - Traffic Law 66/1973, amended by Law 121/2008 traffic planning during
  - Law 140/1956 on the utilization and blockage of public roads
  - Law 84/1968 concerning public roads
- Work environment and operational health and safety
  - Articles 43 – 45 of Law 4/1994, air quality, noise, heat stress, and worker protection
  - Law 12/2003 on Labor and Workforce Safety
  - Book V on Occupational Safety and Health (OSH)
  - Minister of Labor Decree 48/1967.
  - Minister of Labor Decree 55/1983.
  - Minister of Industry Decree 91/1985
  - Minister of Labor Decree 116/1991.
- International Plant Protection Convention (Rome 1951)
- African convention on the conservation of nature and natural resources (Algeria 1968)
- UNESCO Convention for the protection of world cultural and natural heritage (Paris, 16 November 1972)
- Basel Convention on the control of trans-boundary movements of hazardous wastes and their disposal (1989)
- United Nations convention on climate change (New York 1992).
- United Nations Convention on climate change and Kyoto Protocol (Kyoto 1997)
-

3.2 World Bank Safeguard Policies

Three policies are triggered for the project as a whole: Environmental Assessment (OP/BP 4.01), Physical Cultural Resources (OP/BP 4.11), and Involuntary Resettlement (OP/BP 4.12). However, OP/BP 4.12 will not be applicable to **El Obour** as no land acquisition or resettlement is anticipated. Particularly, as the network will pass through the main roads/streets and side roads without causing any damage to private assets or lands.

3.2.1 OP 4.01 – Environmental Assessment

According to the World Bank Operational Policy OP 4.01, the Natural Gas Connection Project is classified among Category A projects. Projects under this Category are likely to have significant adverse environmental impacts that are sensitive[2], diverse, or unprecedented.

Likely environmental impacts shall be analyzed and mitigation measures proposed for expected negative impacts in an Environmental Management/Monitoring Plan.

3.2.2 OP 4.11 – Physical Cultural Resources

Project areas may include sites, buildings and monuments that fall under the definition of Physical Cultural Resources[3]. As the project involves excavations in many locations, which may be near sites of cultural value, there has been specific attention in this study to identify the locations of such sites, and to develop mitigation measures for controlling the effects on such sites. These mitigation measures are also reflected in the Environmental Management and Monitoring Plan.

3.2.3 OP/BP 4.12 – Involuntary Resettlement

According to the WB's safeguard policy on Involuntary Resettlement, physical and economic dislocation resulting from WB funded developmental projects or sub-projects should be avoided or minimized as much as possible. Unavoidable displacement should involve the preparation and implementation of a Resettlement Action Plan (RAP) or a Resettlement Policy Framework (RPF), to address the direct economic and social impacts resulting from the project or sub-project's activities causing involuntary resettlement.

It is not foreseen that the project will result in any physical or economic dislocation of people in **El Obour as** there will be no new PRSs or expansion of current PRSs. Additionally, the gas network will go through the main urban streets. NG pipes will not pass through agricultural lands or damage any assets. Therefore, no safeguards instruments for OP 4.12 will be triggered for this specific area.

In addition to the above mentioned safeguards policies, the Directive and Procedure on Access to Information[4] will be followed by the Project.

3.2.4 World Bank Group General Environmental, Health, and Safety Guidelines & WBG Environmental, Health and Safety Guidelines for Gas Distribution Systems

Gaps between requirements outlined by WBG guidelines and actions detailed by the ESIA and the Egypt Gas Health& Safety Guideline (Annex 6) have been analyzed. There are no significant differences between the requirements outlined by the WBG EHS GUIDELINE on GAS DISTRIBUTION SYSTEMS and the management and monitoring actions outlined by the ESIA. Egypt Gas H&S guidelines are currently being updated to further align them with WBG guidelines on Gas Distribution Systems.

[2] A potential impact is considered "sensitive" if it may be irreversible (e.g., lead to loss of a major natural habitat) or raise issues covered by OP 4.10, *Indigenous Peoples*; OP 4.04, *Natural Habitats*; OP 4.11, *Physical Cultural Resources*; or OP 4.12, *Involuntary Resettlement*.

[3] Physical Cultural Resources are defined as movable or immovable objects, sites, structures, groups of structures, and natural features, and landscapes that have archeological, paleontological, historical, architectural, religious, aesthetic, or other cultural significance.

[4] https://policies.worldbank.org/sites/ppf3/PPFDocuments/Forms/DispPage.aspx?docid=3694

4 Environmental and Social Baseline

4.1 Description of the Environment

El Obour City is a new residential city in the Eastern Desert of El-Qalyubeya Governorate, about 35 km northeast of Cairo Governorate and on the eastern side of Nile Delta.

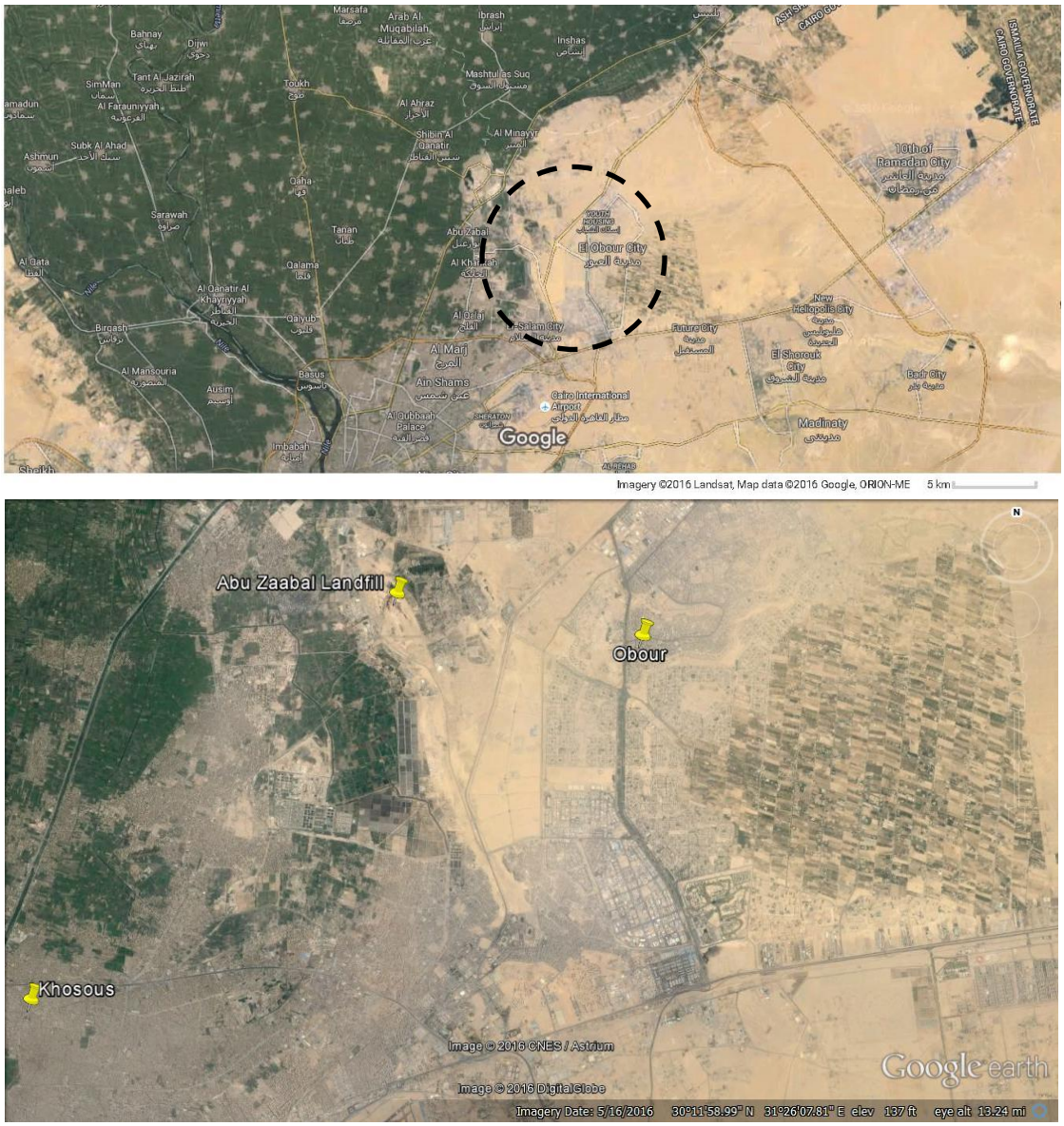


Figure 4-1: Location of El Obour City

4.1.1 Climatology and Air Quality

4.1.1.1 Site Specific Ambient Air Quality

8-hour average measurements were conducted for pollutants of primary concerns, namely, carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), Total Suspended Particulates (T.S.P) and particulate matter (PM_{10}).

Table 4-1: Location of Air and Noise measurements

Location	
Cairo Continental School	30-11-5.2 N 31-28-18.7 E

The methodology for site selection and instrumentation are detailed in Annex 3.

Results

The following tables present the results for ambient air quality measurements conducted at the monitoring location. Daily average results are shown in the following table for all the measured parameters.

Table 4-2: 8 hours average results at the school (µg/m³)

Time	***NO***	***NO_2***	***NOx***	***SO_2***	***CO***	***PM_{10}***	***T.S.P***
10:AM	40.9	45.2	86.1	10.7	2.4	122.49	143.36
11:00	36.8	47.3	78.3	12.3	2.4		
12:00	35.7	46.1	76.8	12.3	2.5		
13:00	36.2	48.2	84.4	12.2	2.4		
14:00	27.8	42.1	69.9	13.6	2.4		
15:00	27.5	44.2	71.7	14.5	2.3		
16:00	40.9	45.2	86.1	10.7	2.4		
17:00	36.8	47.3	78.3	12.3	2.4		
Limits							
National (24 hrs.)	150	150	150	150	10 (mg/m³, 8 hrs.)	150	230
WB (24 hrs.)	-	-	200 (1 hr)	125	N/A	150	230

The concentrations of measured air pollutants are below national and WB guidelines. All the measurements for the gaseous pollutants were complying with the maximum allowable limits according to law 4/1994 for Environment protection and its amendments by law No.9/2009 and the executive regulation issued in 1995 and its amendments no. 710 in 2012 and 964 in April 2015".

Construction equipment and machinery are certified, i.e., exhaust is below permissible levels. Ambient concentrations of gaseous pollutants, NOx, SOx and CO are unlikely to surpass permissible levels due to operation of construction equipment. Management and mitigation plans for ambient air pollution are further addressed in chapters 5 and 7.

During the construction phase, excavation, backfill, and street rehabilitation activities will likely cause dust levels to surpass permissible levels. That said, excavation and rehabilitation are done on the same work day. Therefore, the duration of permissible levels being surpassed will be intermittent for the duration of the work day i.e., 8-10 hours. Management and mitigation plans for dust concentration beyond permissible levels are further addressed in chapters 5 and 7.

4.1.1.2 Site specific noise measurements

Noise level measurements were conducted in the same location of the ambient air quality measurements. The duration of the measurements is 8 hours with one-hour averaging intervals.

Methodology

Instrumentation for noise levels measurements

Ambient noise levels were measured using two B & K 2238 Mediator, Integrating Sound Level Meters, Type I (precision grade), compliant with IEC 1672 Class 1 standard and a B & K 4198 Outdoor Weatherproof Microphone Kit.

Results

The table below presents the results of ambient noise measurements and their corresponding national and international permissible limits.

Table 4-3 Ambient Noise Levels Readings at the school

Time	Sound Level Equivalent & Percentile Recordings in dBA for 24 Hours					
	LAeq	LA10	LA50	LA90	LA95	LCpeak
10:00	**59.15**	58.26	56.82	53.14	50.03	94.42
11:00	**56.5**	56.54	55.21	50.52	46.68	95.49
12:00	**69.61**	65.26	62.34	57.95	56.29	117.67
13:00	**67.77**	64.3	60.96	55.9	53.84	102.71
14:00	**60.71**	56.41	54.52	50.22	47.42	107.36
15:00	**74.35**	65.91	63.15	57.53	55.03	121.12
16:00	**64.43**	62.62	60.08	55.38	54.03	96.92
17:00	**60.76**	56.48	55.68	53.78	52.78	108.15

Table 4-4: National and World Bank limits for ambient noise levels

	Egyptian Law 4 Requirements				WB Requirements		
Noise		Permissible noise intensity decibel			Receptor	One hour L_{Aeq} (dBA)	
	TYPE OF AREA	DAY 7 a.m. to 10 p.m.	NIGHT 10 p.m. to 7 a.m.			Day 07:00–22:00	Night 22:00 - 07:00
	Sensitive Areas (Schools-hospitals- rural areas)	50	40		Residential; Institutional; educational	55	45
	Residential with limited traffic	55	45		Industrial; commercial	70	70
	Urban residential areas with commercial activities	60	50				
	Residential adjacent to roads less than 12m wide	65	55				
	Residential adjacent to roads 12m wide or more, or light industrial areas.	70	60				
	Industrial areas (heavy industries)	70	70				

Typically due to noise from passing traffic on the road near the measurement locations, baseline ambient noise levels are marginally higher than the national (Sensitive Area: School for low-pressure network connections) World Bank permissible limits for residential, educational, and institutional receptors and higher than national permissible limits for sensitive receptors.

Furthermore, excavation and construction activities may cause noise levels to further surpass permissible levels at the site.

Overall, the duration of permissible levels being further surpassed during excavation and construction activities will be intermittent for the duration of the work day i.e., 8-10 hours. Management and mitigation plans for noise levels beyond permissible levels are further addressed in chapters 5 and 7.

4.1.2 Climate

4.1.2.1 Temperature

The average annual temperature is 21.5 °C in El Obour. The highest and lowest average temperatures are 28.0 °C and 13.4 °C and recorded in July, and January, respectively.

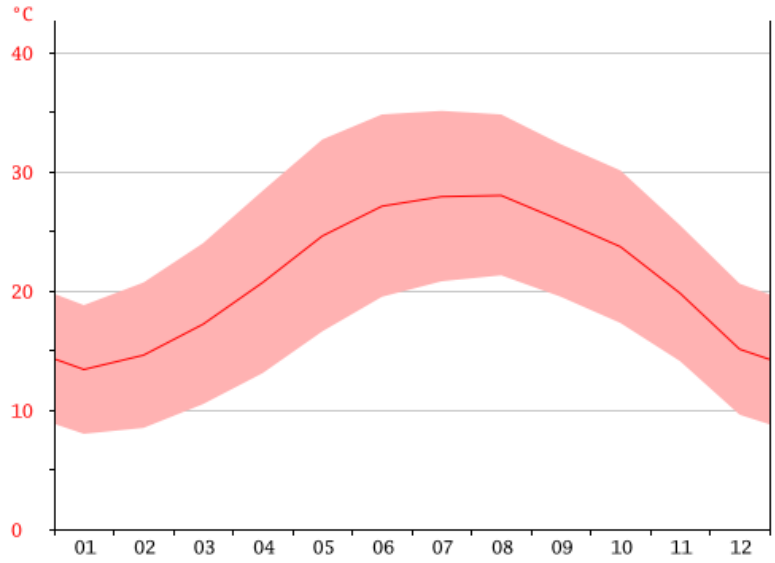


Figure 4-2: Average annual temperatures (red line) and maximum and minimum temperatures[5].

4.1.2.2 Rainfall

The average annual rainfall is 24 mm. The bar chart in the figure below shows the average annual precipitation. January is represented by 01 etc. and shows the highest average precipitation of 6 mm.

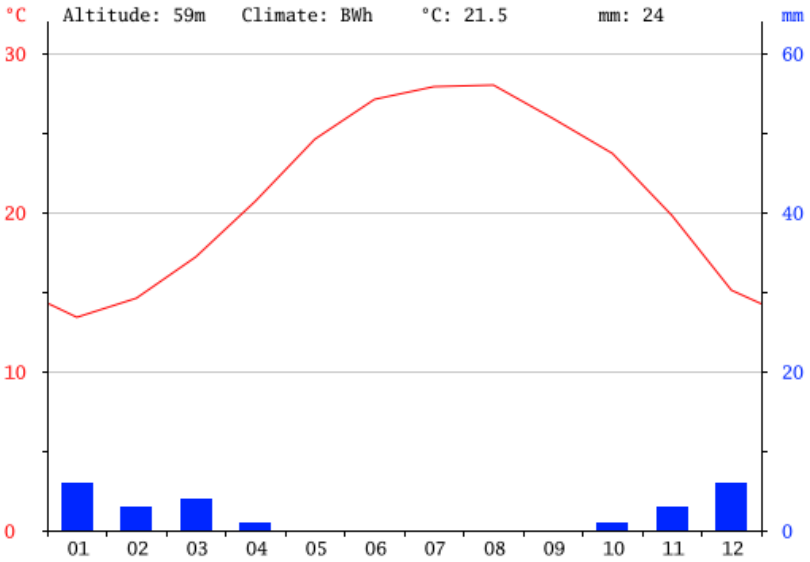


Figure 4-3: Average rainfall in El Obour[5]

4.1.3 Geology

The geological formations of El Obour consist of quaternary and tertiary deposits. The area is composed of sand dunes and alternating clay and gravel layers[6].

[5] http://en.climate-data.org/location/3828/

4.1.4 Water resources

4.1.4.1 Surface water

There are no surface waters crossing El Obour city.

4.1.4.2 Groundwater

El Obour area consists of the following formations[6]:

1) Deep confined aquifer underneath the whole area (Aquifer B),

2) A top most unconfined aquifer covering most of the surface

3) A confined aquifer in the middle in the south area of the district only (Aquifer A).

The figure below depicts the soil type and the aquifer characteristic of El Obour.

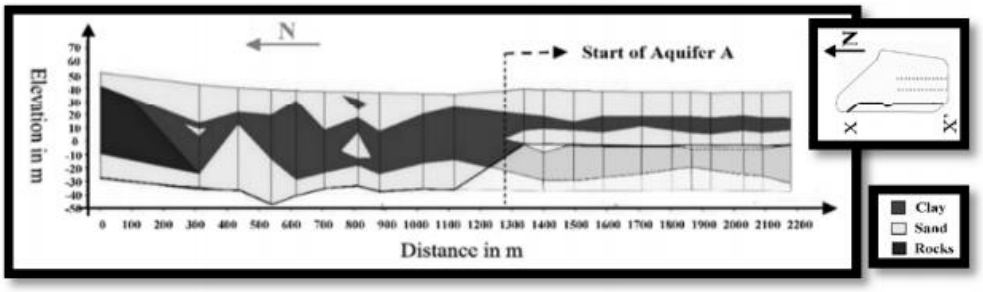


Figure 4-4: Geological formation in El Obour area[6].

During the project construction activities, the excavation depth does not exceed 1 meter, therefore groundwater is unlikely to be encountered.

4.1.5 Terrestrial Environment

The connections of pipelines to households are planned in urbanized desert areas, where flora and fauna of significance do not occur.

4.1.5.1 Flora

Vegetation in and around the designated area is representative of arid sub-Sahara and Sahara areas, e.g., grass and shrubs. **The projected works are to take place in urbanized areas; vegetation is unlikely to be encountered.**

4.1.5.2 Fauna

Stray dogs were observed. **The projected works are to take place in urbanized areas; fauna of significance is unlikely to be encountered.**

4.1.5.3 Statutorily protected areas

El Obour is not located within any statutorily Protected Area[7].

[6] Elleithy, D., et al. "Best applicable geostatistical model for interpolating groundwater-levels in El-Obour city, Egypt." *Sustainable Development* 1: 435.

[7] http://www.nationalparks-worldwide.info/egypt.htm

4.1.5.4 Birds

El Obour does not lie within the Important Bird Area (IBA)[8]

4.1.6 Road distribution network

Main roads

El Obour city is a new city with a modern network of roads. The main roads surrounding the city are ring road, which borders the city from the west, El Qahira Belbees road and El Qahira Ismailia road. Other main roads are: Cairo-Faied road, Mehwar El Obour, and Street 90.

No works are planned on main roads.

Urban primary and secondary arterial streets

Primary urban arterial streets are 3-4 lanes wide paved with asphalt. Primary roads carry major portions of traffic in and out of urban areas. Street parking is usually prohibited on primary roads.

Secondary urban streets are partially paved with asphalt and partially dusty and rocky. Secondary have less lanes and street parking is usually allowed.

Local streets

Local streets are 2 lanes wide and serve residential areas. Street parking is permitted.

Smaller streets connecting the city include: EL Shabab street, EL Sahafa street, El Gamaa street, El Sakafa street, Belbees street, El Shabab street, El Sadat street

El Obour city is a newly built city and is generally not congested. Following are images of urban streets in El Obour.

[8] http://www.birdlife.org/datazone/userfiles/file/IBAs/AfricaCntryPDFs/Egypt.pdf

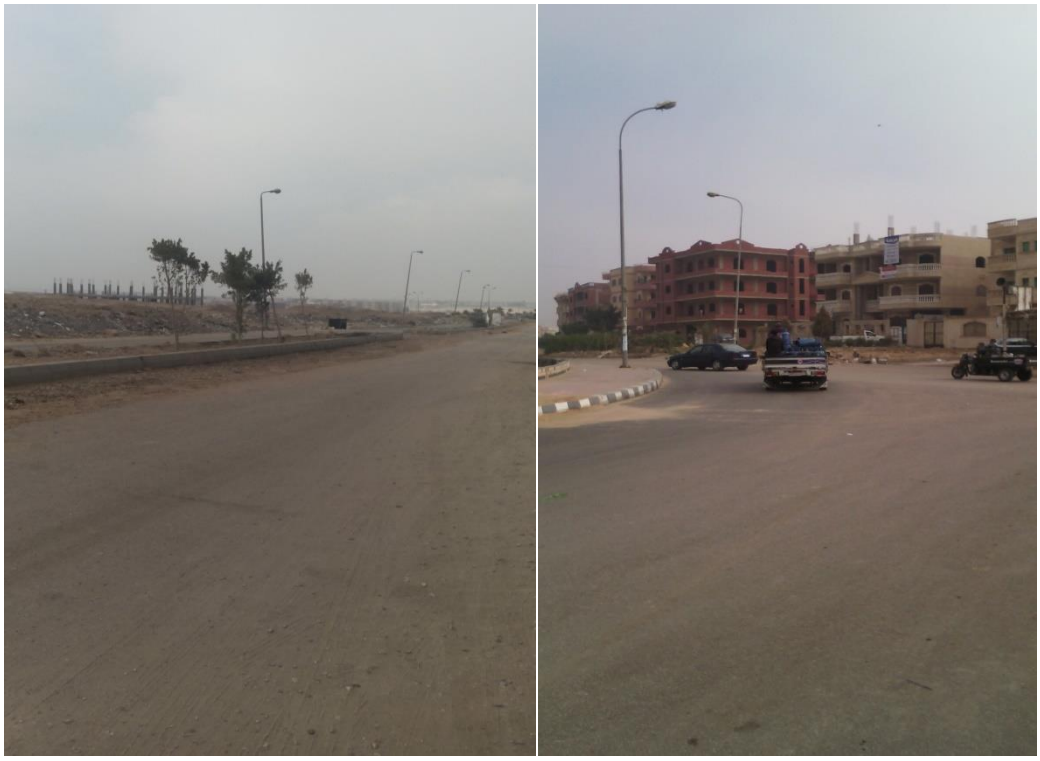


Figure 4-5: Example of primary urban streets in El Obour city

Figure 4-6: Example of secondary urban streets in El Obour city

4.1.7 Waste management

For the gas connection project: Excavation wastes are used to rehabilitate the roads. Steel pipe cuttings and other scrap items are collected and auctioned off once a year.

The Nasreya & UNICO facilities in Alexandria are the only designated entities in Egypt for disposal of non-medical hazardous waste. This includes empty paint cans which are collected stored at the company depot in Abu Rawash and collected by licensed hazardous waste handlers for disposal in the Alexandria facilities.

Domestic waste is collected by the local governmental unit and disposed in the dump site the main sanitary landfill in Abu Zaabal.

Figure 4-7: Location of Abu Zaabal landfill about 6 km West of El Obour

4.1.8 Physical cultural resources

As the natural gas connections project will only take place in urbanized and semi-urbanized areas, no physical cultural resources are expected to be disturbed by project activities. In addition, one of the conditions for connecting natural gas to a given area is the presence of all other underground utilities in that area. This means that excavation will take place in streets that have already been excavated and include underground utilities.

Nevertheless, an environmental management and monitoring actions and chance finds procedure are included as an annex to this report (in the unlikely case of encountering such sites or building in project areas.)

4.1.9 Physical structures

El Obour is a newly built city, where buildings comply with building codes and are suitable for NG connections. The images below should typical structures in El Obour city.

Figure 4-8: Example of physical structures in El Obour city

4.2 Socioeconomic Baseline

El Obour is located in Qalyubeya Governorate. El Obour is a relatively new city and is mostly made up of urbanized areas and contains zero agricultural land masses. The total land mass is 16 thousand feddans, with 12.5 thousand dedicated to urban masses, while the remaining 3.5 thousand feddans are still under construction.

Figure 4-9:Obour types of buildings

4.2.1 Demographic characteristics

4.2.1.1 Total Population

The total population of Obour city is estimated to be 47,299 in 2013.

4.2.1.2 Rate of Natural Increase

The birth rate in Qalyubeya is 27.30 births per 1000 persons. The adult mortality rate is 5 per 1000 people. That gives a natural growth rate of 22.30 per thousand persons in Qalyubeya . The IDSC 2012 Description of the Egyptian Governorate reported that the neonatal mortality rate is 4.80 per 1000, while the infant mortality is 14.4 per thousand live births. With regards to the children below five years of age, the mortality rate is 12.10 per thousand live births.

4.2.2 Living Conditions

4.2.2.1 Household Size and Density

A household is defined as "Family (and non-family) members who share residence and livelihood, and operate as one social and economic unit". The average family size in El Obour is 4.03 persons per household at a total of 10,212 households, as per the 2006 results of Qalyubeya 's Statistical Yearbook.

4.2.2.2 Dwelling characteristics

The type of dwelling should be highlighted in order to identify the probability to install the NG to those houses. 88.12% of the sample surveyed in Obour lives in an apartment. Seeing as El Obour city is a newly developed, the distribution of buildings and streets is better planned than informally developing cities. The buildings are relatively new and made up of around 4-5 floors.

Figure 4-10: prevalent building type

The construction materials of the walls and ceilings are one of the main bases and conditions required to install the NG. It was reported that all of the sample surveyed live in buildings that are constructed of concrete and red bricks. Taking into account the nature of El Obour, it was fairly difficult to meet with residents as many buildings were still under construction. The consultant assumes however that most buildings have the necessary permits and legal documents and should face no problem in installing NG and paying in installments.

Regarding street conditions, the majority of them vary between 3-25 meters' width. That was an indication of the high probability to get the NG installed. Streets in El Obour are mostly paved with asphalt. This is an important factor for determining street restoration plans and cost.

4.2.3 Access to Basic Services

4.2.3.1 Access to Electricity

The number of subscribers to the electricity utility in Obour is around 99.5%. The census showed that the majority of households use electricity as the main source of lighting.

The sample surveyed provided electricity bills (one bill per respondent) which have been used by the consultant to understand monthly consumption rates. Drawing a relation between electricity consumption and the expenditure ability of the households reveals that households with high expenditure ability tend to consume more electricity.

4.2.3.2 *Access to potable water & Sanitary network*

The governorate depends almost entirely on Nile water for all its water needs. Accessibility to potable water is high in El Obour. According to the poverty study of 2014, 99.95% of El Obour residents have access to potable water. Also, about 94.94% have access to tab water.

The coverage of sanitary connections for households in El Obour is rather high at 92.68%. This high coverage will reflect on the ability to connect NG in areas without sanitary network coverage.

4.2.4 Human Development Profile

4.2.4.1 *Education*

Education is perceived as the first line of defense which can help populations to withstand poverty. On the scale of El Obour, 12.25 % of the populations are illiterate, with a slight increase in the female illiteracy rate to 14.56%. These rates fall well below the national average which has been reported to be just under 25% in 2013.

Table 4-5: %Distribution of El Obour population by educational status

Level	Illiterate	Illiteracy rate	Illiteracy among females	Primary education	University degree
El Obour City	61,250	12.25%	14.56%	13.66%	37.49%

Source: Poverty Mapping 2013

4.2.4.2 *Unemployment and Work Status*

The unemployment ratio in El Obour is 6.20% which is considerably low in comparison with the national average of 24%. This gap in unemployment between national average and El Obour shows as follows:

Table 4-6: % Distribution of El Obour population by work status

Area	Workers									Unemployed	
	15+ in labor force	Females 15+ in labor force	24+ in total labor force	Self-employed	Female self-employed	Unpaid employee	Unpaid female employees	Adult wage workers	Adult female wage workers	Unemployment Rate	Female Unemployment Rate

El Obour	56.34 %	28.616 %	64.04 %	5.165 %	0.37 %	0.25 %	0.212 %	82.01 %	87.95%	6.20%	10.23 %

Source: Poverty Mapping 2013

4.2.5 Poverty index

The extreme poverty measure is very close to US$1.25 per day (Millenium Development Goal # 1), whereas the upper poverty measure is very close to US$2.5 per day. The equivalence is calculated at a purchasing power parity (PPP) exchange rate of US$1=LE3.1 for 2008/2009. (Handousa, 2010). According to poverty mapping developed by CAPMAS in 2013, the poor in El Obour is estimated to be 9.23% of the total population as compared to a national average of 26.3%.

Table 4-7: Poverty incidence in Obour

Area	% of Population Classified as Poor	Poverty Gap	Gini Coefficient[9]	# of Poor in 2013
El Obour	**9.23%**	**2.07**	**0.24**	**4,359**

4.2.6 Fuel currently used in households

The surveyed sample in EL Obour reported that the main type of fuel used for cooking are LPG cylinders which are mainly obtained from the informal LPG vendor. Regarding the fuel used for water heating, the sample surveyed in El Obour relies upon electricity.

4.2.7 Problems faced with the current household fuel

The study aimed at highlighting problems associated with the LPG cylinders in order to verify the willingness of community people to convert to the natural gas. El Obour sample reported the unavailability of LPG as the main problem particularly during the shortage period which peaked in 2013-2014 and seems to recur to an extent during periods of high demand while some of them reported no problems, and some were concerned about from the difficulties of transporting the LPG cylinder.

Water heating fuel was less problematic. the sample reported having no problems.

4.2.8 Perception towards the project

Throughout the various consultation and engagement activities, the team experienced and recorded remarkable and overwhelming public acceptance, even eagerness, by the community and the governmental stakeholders towards the proposed project. The indignity and financial hardships experienced by scores of Egyptian families (especially women) in obtaining LPG cylinders (the current household fuel) was revealed through testimonies over all targeted governorates during the preparation of the framework and the site specific studies.

Community perceptions were investigated in order to gain better understanding of the hosting communities' attitudes towards the project. Overall perception of the project and of NG by the

[9] The Gini Coefficient is a statistical dispersion tool used most commonly as a measure of inequality whereby 1 (100%) expresses maximum inequality in income distribution and 0 (0%) represents absolute equality. Both extremes are unlikely to be reached.

community was positive. There was remarkable acceptance for the project. Reluctance to install the NG was not reported by all community members. This is mainly attributed to their high socioeconomic conditions.

5 Environmental and Social Impacts

The environmental and social advantages of switching household fuel from LPG cylinders to natural gas pipelines are diverse. On the residential level, the proposed project will lead to improved safety, reduced physical/social/financial hardships, and secure home fuel supply. On the national level, it promotes the utilization of Egyptian natural resources and reduces the subsidy and import burden. Even on the global level, the project involves cleaner fuel with reduced carbon footprint.

A thorough analysis of environmental and social impacts is important to detail an effective management and monitoring plan which will minimize negative impacts and maximize positives.

The assessment of impacts distinguishes between the construction phase and the operation phase.

5.1 Positive Impacts

5.1.1 During the construction phase

5.1.1.1 Provide direct job opportunities to skilled and semi-skilled laborers

The project is expected to result in the creation of job opportunities, both directly and indirectly. Based on similar projects implemented recently by EGAS and the local distribution company, the daily average number of workers during the peak time will be about 40 workers. The total number of new short term job opportunities within the project areas is estimated at 50-60 temporary jobs. They are segregated as follows:

- Up to 20% semi-skilled workers on a temporary basis
- Up to 30% local construction workers for water heater vent installations
- Up to 50% daily wage workers for street drilling

In order to maximize employment opportunities in the local communities it is anticipated that training will be required for currently unskilled workers. On-the-job training will also supplement opportunities for the local workforce for both temporary construction roles and also for long-term operation phase positions, where these are available.

5.1.1.2 Create indirect opportunities

As part of the construction stage, a lot of indirect benefits are expected to be sensed in the targeted areas due to the need for more supporting services to the workers and contractors who will be working in the various locations. This could include, but will not be limited to accommodation, food supply, transport, trade, security, manufacturing… etc.

5.1.2 During the operation phase

- As indicated in the Baseline Chapter, women are key players in the current domestic activities related to handling LPG and managing its shortage. Being the party affected most from the shortfalls of the use of LPG, the NG project is expected to be of special and major benefits to women. This includes, but is not limited to, clean and continuous source of fuel that is safe and does not require any physical effort and is very reasonable in terms of consumption cost. Time saving is among the benefits to women. The use of

a reliable source of energy will allow women to accomplish the domestic activities in less time and this will potentially open a space for better utilization of the saved time.

- Constantly available and reliable fuel for home use.
- The producers of gas water heater will benefit from supplying water heaters to the community. Additionally, the retailers who trade in these heaters will benefit.
- Reduced expenditure on LPG importation and subsidies, as, 96.4 thousand connections will be installed in the areas. Each household consumes 1.3 LPG cylinder monthly. Accordingly, the total number of LPG cylinders consumed are about 144.6 thousand cylinders per month. The subsidy value is about 70 EGP per each cylinder. Consequently, the total saved monthly subsidy will be about 10.122 million EGP monthly. This will result in total annual savings of 121.464 million EGP.
- Significantly lower leakage and fire risk compared to LPG.
- Improved safety due to low pressure (20 mBar) compared to LPG cylinders.
- Beneficiaries to benefit from good customer service and emergency response by qualified personnel/technicians.
- Eliminate the hardships that special groups like the physically challenged, women, and the elderly had to face in handling LPG.
- Limiting possible child labor in LPG cylinder distribution.

5.2 Anticipated Negative Impacts

5.2.1 Impact Assessment Methodology

To assess the impacts of the project activities on environmental and social receptors, a semi-quantitative approach based on the Leopold Impact Assessment Methodology with Buroz Relevant Integrated Criteria was adopted.

Detailed assessment matrices shown in Annex 4. The table below presents the classification of impact ratings and respective importance of impact values.

Importance of Impact	**Impact rating**	
0-25	**None** or irrelevant (no impact);	
26-50	**Minor** severity (minimal impact; restricted to the work site and immediate surroundings)	
51-75	**Medium** severity (larger scale impacts: local or regional; appropriate mitigation measures readily available);	
76-300	**Major** severity (Severe/long-term local/regional/global impacts; for negative impacts mitigation significant).	

5.3 Potential Negative Impacts during Construction

5.3.1 Reduction of Traffic Flow (disruption of local and regional traffic)

Environmental impacts

During the mobilization, preparation phases and construction phases: Mobilization of heavy machinery, asphalt breaking, excavation, placement of piping, and backfill activities are bound to limit traffic and accessibility. The impact of works on traffic flow and local access will be dependent on the type of road accessed during project activity.

Main roads (highways)

No works are planned on main roads; therefore, the project will not directly impact circulation on main roads. An indirect impact can be increased flow of vehicles as urban roads are avoided.

Urban roads

On urban roads, mobilization, preparation and construction phases will entail narrowing roads by longitudinal and/or lateral excavation or totally blocking narrow or side roads as well as limiting or prohibiting parking along the length of the works. Access to buildings and shop entrances may be limited or constricted in cases where excavations form obstacles for pedestrians and cargo.

Coordinating with and obtaining approvals from local government and traffic police is vital to avoid delays, objections, and public inconvenience to the work program.

On urban roads, the impact on traffic flow and local accessibility are of **medium severity.**

Local roads

There are no local roads (alleys) in El Obour Project areas.

Socioeconomic impacts

The project will result in inconvenience and disturbance to local communities and business and delay in the various daily activities due to the following:
Traffic congestion will result in various unfavorable socioeconomic impacts. i.e.:

1- Microbuses may find difficulty in maneuvering the streets that will be dug during the project construction. This will increase their oil consumption and reduce their ability to move quickly and transport less clients as each errand will take more time.
2- There might be a disturbance to community people due to the traffic congestion

5.3.2 Air Emissions

Environmental impacts

WB requirements and Law 4/1994 (modified by laws 9/2009 & 105/2015) stipulates strict air quality standards. Air emissions (gases and particulates) during construction shall arise from:

- Particulate matter and suspended solids from excavation/backfilling operations
- Possible dispersion from stockpiles of waste or sand used for filling trenches.
- Exhaust from excavation equipment and heavy machinery (excavators, trenchers, loaders, trucks) containing SO_x, NO_x, CO, VOCs, etc.
- Traffic congestions resulting from road closure or slowing down of traffic due to excavation works.

Dust

The impact of dust generation (particulate matter) will be limited to the working hours as excavation and backfilling are carried out within the same day.

Excavation on dusty or rocky roads such as local roads and some urban roads are likely to generate more dust compared to asphalted streets due to the dusty status of those roads.

Gaseous pollutants emissions

Provided machinery used during construction is certified and maintained as per guidelines, the increase in emissions stemming from the exhaust of machinery is unlikely to increase ambient levels beyond national and WB permissible levels.

On urban roads, traffic congestion may lead to increased exhaust emissions. Traffic management with local authority will reduce the impact of works on road congestion and associated emissions.

Socioeconomic impacts

Air emission might result in health problems to allergic community members.

Air emissions impacts are expected to be temporary, local, and of minor severity.

5.3.3 Noise

Environmental impacts

Construction activities of the gas distribution network will likely increase noise levels due to excavation and heavy machinery. Typical construction noise includes noise intensity due to engine operation, and intermittent impacts which may take place during demolition of asphalt, either by a trencher or by a jack hammer. As discussed previously, the WB/IFC guidelines and Law 4/1994-9/2009-105/2015 have defined standards for noise intensity and exposure periods in the work place, in addition to certain limits for ambient noise levels for different types of urban and rural areas.

Noise impacts on construction workers, technicians and engineers in direct vicinity of the excavation works and heavy machinery are considered more significant than those on residents. Traffic congestions, which could be caused by excavation works, may increase ambient average noise intensity levels.

Socioeconomic impacts

Noise might result in health problems to the workers, engineers and technicians.

Noise impacts are expected to be temporary, local, and of minor severity.

5.3.4 Risk on Infrastructure and underground utilities

Environmental impacts

Gas network connection

Underground utilities and infrastructure pipelines (such as water, sewerage and telecommunication) have been installed years ago without accurate documentation and maps for its routes and depths. Therefore, the risk of damage to such utilities during excavations for natural gas pipeline installation is possible.

The most significant potential environmental impact will arise in case a sewerage pipe is broken and wastewater potentially accumulating in the trench. There is also the possibility of overflowing to the streets causing nuisance to the surrounding environment.

Socioeconomic impacts

Breaking a water supply pipe may result in cutting the supply to a number of residential units, which may lead residents to use other sources of water which may be either expensive or unsafe.

Damaging sanitation network, electricity and water supply result in severe disturbance to community people. The time needed to resolve problems with damaged utilities is relatively short (no more than 4-8 days). Additionally, the contractor will be responsible of compensating for damaged pipes.

Impacts on underground utilities are expected to be temporary, local, and of minor severity

5.3.5 Impacts related to land

Socioeconomic impact

The project will not entail any land acquisition in El Obour as there will be no need for any land during construction or operation. There will be no new PRS. Additionally, the connection network will pass through the main roads and streets. This will not result in any land acquisition either temporary or permanent.

Land acquisition impacts are of irrelevant severity

5.3.6 Possible effects on vulnerable structures[10]

Environmental impacts

Gas network connection

Dewatering activities: Excavation for natural gas pipelines is usually shallow and does not exceed 1.0-meter depth. **Groundwater is typically not encountered at shallow depths.** However, if groundwater is encountered, dewatering will be applied. If dewatering activities are sustained for a long duration, differential settlement of the fine soil can jeopardize the integrity of weak structures in the surrounding area.

Drilling vibrations: Workers are accustomed to manually drill to prevent vibrations near sensitive structures.

[10] If encountered within project areas.

Another possible impact on structurally-vulnerable buildings is weakening the structural system during drilling holes in the walls for riser connections on the side of the building or for internal connections to the household. The hole for the pipe usually is small compared to the wall section. Moreover, beams can easily be avoided by carefully selecting the distance of the drilling from the ceiling. For skeleton type buildings, drilling in columns or beams could have a significant effect on the structure, but this risk is well understood among connection workers and could be avoided.

Overall no structurally-vulnerable buildings are expected to be encountered in El Obour project areas.

Structural impacts on vulnerable buildings are of irrelevant severity

5.3.7 Effect on Culturally Valuable Sites[11]

Effects on culturally valuable sites (monuments, archaeological, paleontological, historical, architectural, religious, aesthetic or other cultural significance) may involve:

1. Structural damage to a monument due to dewatering during excavation.
2. Damages to monuments' foundations due to excavation works.
3. Damage to the monument body by vibration of machinery.
4. Reducing the aesthetic appeal of the site or building.
5. Improper management of discovered antiquities during excavation (chance finds).

If dewatering is needed, may lead to differential settlement of the soil surrounding the monument foundations could result. Shallow foundations may be affected by excavation works. This may cause differential settlement and may cause cracks and stability risks to the monument body.

Vibrations caused by machinery such as a trencher and jack hammer may cause cracks and surface damage to the stones of the monument, and risks to its stability.

According to the CULTNAT classification, a site may be classified as architecturally-valuable for its artistic design, its elevation view, artistic balcony, windows, domes or other components. Fixing gas risers and connections next to such components may reduce their artistic value.

Chance finds during excavation are highly unlikely within the project area as the streets have been previously excavated for installing underground utilities. However, Antiquities Law provides clear guidelines for action in the case of chance finds. It also states that a representative of the antiquities department must be present during excavations in areas adjacent to antiquities sites. Please see Annex 2 that outlines procedures in case of chance finds.

The works for the gas distribution network are not planned nearby physical cultural resources as described in the baseline of the project area in chapter 4.

Impacts on culturally valuable sites and buildings are of irrelevant severity

[11] If encountered within project areas.

5.3.8 Effect on ecological systems (green areas/farmland)

Environmental impacts

During construction of the gas distribution network, excavations and pipe laying will mostly be aligned along routes previously excavated or paved.

No protected areas will be encountered in the alignment of the lines.

Impacts on ecological systems are expected to be irrelevant.

5.3.9 Solid and Liquid Waste Management

Environmental impacts

Wastes that are generated during the construction phase include:

- Excavated soil and excess sand; concrete and bricks waste;
- Broken asphalt in the case of paved roads;
- Cans containing paint used on steel pipes in household connections
- Containers of chemicals and lubricant oils used for construction machinery;
- Possibly damaged asbestos water pipes during excavation; and
- Dewatered product from trenches.
- Construction waste estimates are in the range of 100-120 m^3/km.

Excavated soil and concrete/bricks waste are inert materials. Improper disposal of such wastes will only have aesthetic effects on the disposal site. The legal standards of Law 4/1994-9/2009-105/2015 for the Environment and Law 38/1967 stipulate that these wastes should be disposed of in licensed sites by the local authority, which minimizes any aesthetic effects of such waste.

Asphalt waste may contain hazardous components, such as tar, lubricating oils, some heavy metals, etc. However, its solid nature minimizes the transport risk of such components to the environment. Disposal of asphalt waste to a construction waste disposal site is common practice in Egypt, and is not normally associated with environmental risks because of dry weather.

Empty containers of chemicals, lubricating oils, and paint are considered hazardous waste. They should be disposed of in an approved hazardous waste handling facility. This is not a direct result of construction activities, but rather relates to maintenance of equipment. By preventing fueling/lubricating activities on construction sites no empty containers will need disposal.

Asbestos waste could result if an underground water pipe is broken during excavation. If encountered, wasted parts of the pipe must be sprayed with water, to prevent emissions of asbestos-containing dust, and transported to an approved hazardous waste landfill. Asbestos waste may pose significant health risks to workers, pedestrians and residents of neighboring areas. Therefore, efficient management of such waste, if generated, will be very important. The probability of generating asbestos waste is relatively low as the damage is usually repaired locally without the need for pipe replacement. Management and disposal of the generated waste is the responsibility of the Water Authority performing the repairs.

Improper drainage of dewatering water may result in forming stagnant water ponds around the construction site, which can develop, if not drained, infiltrated or evaporated, to form nuisance and an environment for breeding of insects. Normally dewatered product is relatively clean water, which should be drained to the sewer system. To conserve water, if dewatered groundwater is free of perceivable pollution, it will be- to the extent possible- used on- or around the work site or discharged into the nearest canal to be used for irrigation When dewatering is performed from a contaminated trench or near a source of pollution seepage to groundwater, contaminated water is collected for certified treatment/disposal according to WB/IFC guidelines and National Laws 93/1962 and 48/1982, respectively.

Socioeconomic impacts

Waste contractors and recycling/disposal sites will benefit from waste disposal contracts.

If waste is not managed properly, it will result in health problems to the surrounding communities.

Overall, waste generation impacts are of minor severity

5.3.10 Street condition deterioration

Environmental impacts

Streets rehabilitation or restoration following pipeline network installation: is referred to by an Egyptian legal/institutional expression (رد الشئ لإصله) that signifies the responsibility to "restore to original condition". In the context of the project, it applies to the responsibility of the implementing company to provide the necessary resources to re-pave roads and streets to the original state after natural gas excavation and installation works. The current arrangement is that the implementing entity performs the backfilling of the excavated trenches and agrees a restoration fee with the local government unit (district) to cover the balance of the restoration and pavement cost. The local unit uses the fee to include the restoration and re-pavement of the streets in its "pavements plan".

Socioeconomic impacts

Delays in street restoration may lead to varying degrees of damage to vehicles, loss of access and business, traffic congestions with associated delays and emissions, and a potentially significant public discontentment.

Although the restoration impact may be temporary, localized, and of minor severity, it is perceived by the public as major inconvenience.

5.3.11 Overconsumption of community resources

Environmental impacts

No probability of environmental impacts pertaining to overconsumption of community resources.

Socioeconomic impacts

Generally speaking, having workers in small cities might result in unfavorable impact on the available resources, e.g. pressure on accommodation, food, health care and medication and potable source of water. Given the size of population in project sites and the availability of most of services; the limited number of workers (100 worker) will not result in any significant impact on the community resources.

The impact of overconsumption of community resources is of irrelevant severity given that the limited number of workers is small in comparison to the number of residents in the area.

5.3.12 Community health and safety

Environmental impacts

No probability of environmental impacts on community health and safety

Socioeconomic impacts

Negligent workers may cause accidents harmful to the community members, particularly children and old people, especially close to the digging sites. The workers should support children and old people in case of crossing digging areas. There should also be caution tapes to stop community people from accessing construction sites. In case of the workers and contractor adhere to such procedures the community health and safety impact will be limited.

With compliance to the health and safety measures, impact related to the community health and safety during the construction phase will be **minor**

5.3.13 Visual intrusion

Project activities will entail piling of sands and moving of vehicles in various construction sites. Moreover, the temporary storage areas will be used to store pipes, painting materials and safety equipment. That will result in significant visual intrusion impact.

Impact related to the visual intrusion during the construction phase is **irrelevant**

5.3.14 Labor conditions and occupational health and safety

Throughout this phase there will be many occupational health and safety risks to workers on the sites. These are generic risks associated with construction sites and include slips and falls; moving lorries and machinery; exposure to chemicals and other hazardous materials; exposure to electric shock and burns; weather related impacts (dehydration; heat stroke). This is short term (6-12 months) but because of the large number of unskilled workers who are reluctant to use Personal Protective Equipment, there might be some level of risk.

Impact related to Occupational health and safety during the construction phase is **of medium severity**

5.4 Potential Negative Impacts during Operation

5.4.1 Community health and safety

In addition to a full array of safety and emergency precautions taken by EGAS and the implementing entities (**local Distribution companies: Egypt Gas for El Obour**), user safety is prioritized by stating emergency precautions on the household gas meter and by setting up emergency response centers. Impacts on user health and safety may occur through improper handling of piping and valves by the user. This may be due to a lack of awareness, illiteracy, or failures in piping or sealants.

Considering the low probability of occurrence and the lower density of natural gas (compared with current practice of LPG), impacts on community health and safety due to gas leaks is of minor severity.

5.4.2 Integrity of natural gas piping

Environmental impacts

Low-probability events may impact the integrity and safety of the NG network and components during the years of the operation phase.

- Geological and geotechnical events: earthquakes may result in geotechnical instabilities that lead to network breakage or leakage in multiple locations simultaneously. The geological and geotechnical history of the area may also lead to possible events.
- Sabotage: pipelines and other components may be targeted for sabotage.

Socioeconomic impacts

Adverse impact is expected due to the possibility of disrupting the Gas supply reaching households.

Leak impacts may be permanent and highly severe, however, considering the extremely low probability of occurrence, the impact is of minor severity.

5.4.3 Visual intrusion impacts

The installation of house connection and the chimney will affect the building There is a probability to affect the building, particularly, unique old buildings. Under certain technical and safety conditions it is not possible to avoid visually impacting the entrance of the apartment and dwellings with installed pipes.

Visual intrusion Impacts will be of irrelevant severity

5.4.4 Economic disturbance to the LPG distributors

There could be a Minor negative economic impact on LPG cylinders distributors. (Governmental sector- private sector who have license to distribute LPG cylinders- non official distributors). The LPG distributors will lose their income. However, their ability to move to other areas or change their business is high. Various previous NG projects have not influenced the informal LPG vendors.

The probability of such impact is **minor** as LPG distributors manage to perform alternative job.

5.5 Women and Vulnerable Groups

Vulnerable groups[12] are more exposed to the implications of various impacts and are more likely threatened to fall deeper into impoverishment. The level of vulnerability of a certain group and the severity of the impact on these groups has been assessed during the course of this study. It is believed that certain groups are more vulnerable than others due to higher level of exposure to these impacts or lack of alternatives or survival methods that allow for coping with these impacts.

It is expected that poor women and female headed households will be able to access the project benefits through the installment schemes that EGAS is making available to encourage citizens to get connected to the project. The same benefits that women will gain from this project apply also to other relevant vulnerable groups including the elderly and people living with disabilities.
It is foreseen that the project will not have any unfavorable impacts on women and vulnerable groups.

[12] According to World Bank definition, *a vulnerable group is a population that has some specific characteristics that make it at higher risk of falling into poverty than others living in areas targeted by a project. Vulnerable groups include the elderly, the mentally and physically disabled, at-risk children and youth, ex-combatants, internally displaced people and returning refugees, HIV/AIDS- affected individuals and households, religious and ethnic minorities and, in some societies, women.*

6 Analysis of Alternatives

6.1 No Project Alternative

This Natural Gas Connections to Households Project is expected to yield many economic and social benefits in terms of providing a more stable energy source, achieving savings in LPG consumption and enhancing safety in utilizing energy.

The No-Project alternative is not favored as it simply deprives the Egyptian Public and Government of the social, economic, and environmental advantages.

6.2 Energy Alternatives

- **Maintain LPG use:** Introduction of piped natural gas to replace LPG will help to remove subsidies and reduce imports. The proposed project would also improve the safety of gas utilization as appliance standards are strictly controlled and only qualified personnel carry out installations and respond to emergencies. In the case of LPG, installations are not carried out by trained personnel resulting in possible unsafe installations and unsafe use of LPG.

- **Convert to Electricity**: The second alternative is to convert all homes to use electricity for all energy supply applications. Additional power stations would be needed to cope with the additional demand created by utilization of electricity in homes, which most probably would operate also by natural gas. Power losses in transmission and distribution are also significantly higher than their natural gas equivalents which would add to the overall inefficiency.

- **Use Renewables**: the renewables market does not present feasible, practical, and affordable alternatives to connecting 1.5 million households at this point in time in Egypt. Biogas requires large amounts of agricultural and domestic waste, while solar panels and heaters remain in pilot phase.

Energy alternatives do not provide favorable options to the proposed NG networking

6.3 Installation costs

The average natural gas connection installation cost is about 5600 EGP and consumers contribute a part of 1700 LE because the connection is heavily subsidized by the Government. This payment can be made either upfront or in installments over a period of time. Installment schemes are available to all community people.

The government of Egypt is negotiating with the project's financing organizations in order to secure additional subsidy to poor and marginalized groups. They also provide facilitation payments strategies through offering various installment schemes. The following are the main types of installments: 138 EGP/Month for 12 months, 74 EGP/Month for 24 months, 52 EGP/Month for 36 months, 42 EGP/Month for 48 months, 35 EGP/Month for 60 months, 31 EGP/Month for 72 months and 28 EGP/Month for 84 months[13].

[13] In case of any change of the value of NG installation cost, the installment value might be changed

7 Environmental and Social Management & Monitoring Plan

7.1 Objectives of the ESM&MP

The objective of the Environmental and Social Management and Monitoring Plan (ESMMP), is to outline actions for minimizing or eliminating potential negative impacts and for monitoring the application and performance of mitigation measures. The ESMMP identifies roles and responsibilities for different stakeholders for implementation and monitoring of mitigations. This section also presents an assessment of the institutional capacity and institutional responsibilities for implementing the ESMMP.

Wherever applicable, the ESMMP is designed to accommodate alternative context-specific mitigations and monitoring measures.

Overall, the following Environmental and Social measures are complementary to and do not substitute compliance to the detailed HSE guidelines, procedures, and actions adopted by EGAS and its subsidiary LDCs.

In the following Management and Monitoring measures the term Local Distribution Company (**LDC**) refers to the gas company in charge of project implementation: **Egypt Gas.**

7.2 Management of Mitigation and Monitoring Activities During Construction Phase

7.2.1 Hotline

During construction activities, a 24-7 Hotline (**129**) is available for customers and the public to report leaks, damage, emergencies, and/or incidents related to gas connections, components, infrastructure, and activities (inside or outside households) and to request repairs/emergency response/assistance.

This includes possible damage to other underground utility lines (water, wastewater, electricity, phone, Internet) and to buildings and physical structures or cultural sites during excavation/construction activities. It also includes reporting issues resulting from construction activities such as excessive/prolonged noise, vibration, waste, traffic, accessibility, visual, and other community health and safety impacts.

7.2.2 Management of Traffic Impacts

The following mitigation measures are proposed to minimize traffic disruptions:

1. Construction During Off-peak Periods: Times of construction are identified by the local Traffic Department in a conditional excavation permit issued to the implementing company, based on the Traffic Department operational experience in the area,
2. Signage and Markings: Construction works require proper information disseminated to motorists. This can be done by provision of informational and directional signs posted prior to the construction. Pedestrian crossings can be also provided at proper locations.
3. Traffic Detour: To maintain traffic in critical streets at a reasonable level of service, the Traffic Department may implement traffic detouring

4. Re-structuring the Road Right-of-Way: The arterial road network generally exhibits a wide right-of-way. Normally, it would be possible to re-structure the road's cross section to accommodate the construction works and maintain traffic movements along the road.

Coordination between **Egypt Gas/EGAS** and the local traffic authority is imperative as the above mentioned mitigation measures will be implemented by, or in coordination with, the local Traffic Department. Monitoring will be carried out by the local Traffic Department to make sure that flow reduction is within acceptable levels. Coordination should be established between the Traffic Department and the HSE Departments of the implementing gas companies (Local Distribution Companies- LDCs) to ensure compliance and adequate implementation of the identified mitigation measures. LDC HSE should record any comments by the Traffic Department regarding violation of excavation permits by the contractor.

7.2.3 Management of Air Emissions

The following mitigation measures are considered minimum standards:

1. Excavated soil stockpiles and stored sand should be located in sheltered areas. Stored fine sand should be covered with appropriate covering material[14], such as polyethylene or textile sheets to avoid soil dispersion.
2. Transportation of excavation/construction waste should be through licensed and sufficiently equipped vehicles with a suitable special box or provided with a cover to prevent loose particles of waste and debris from escaping into the air or dropping on the road.
3. Disposal of excavation/construction waste should be in locations licensed by the local authority.

Air emissions of excavation machinery and diesel-powered electrical units should be within allowable legal limits. Because dust emissions from construction works include non-point sources such as excavation, direct emission levels cannot be measured. On the other hand, monitoring ambient total suspended particles or PM_{10} could be misleading because of the interference of other sources. Therefore, monitoring activities should ensure point sources, i.e., exhaust of excavation machinery, are within the standards stipulated by the Law. Mitigation measures must be documented. Documentation should consist of standard operating procedures and monitoring reports for emission tests and complaints.

Leaks of natural gas

A natural gas leak can result if integrity of pipes is jeopardized. The Local Distribution Company must coordinate with the local municipality to safely evacuate the area and deploy trained personnel to repair broken pipe based on an Emergency Response Plan.

7.2.4 Management of Noise

Mitigation measures for avoiding unacceptable, and illegal, noise levels include:

1. Prevent exposure of construction workers to different noise levels and noise impacts according to the Egyptian legal standards. This could be achieved through adjusting working hours, breaks, and exposure duration to be within permissible limits.
2. Provide construction workers with ear muffs.

[14] Sufficient sheets should accompany work groups during the construction phase. Cost of sheets should be included in ESMP budget

3. Minimize construction through nighttime whenever possible. Implementing this measure should be balanced with avoiding peak hours of heavy traffic. If construction works are to take place on important traffic roads, avoiding traffic disturbance in day time may outweigh reducing noise levels in afternoon or night times and vice versa.

Monitoring of noise levels during construction shall include:

1. Measurements of noise intensity at the locations of construction, where workers are exposed to the noise.
2. At locations where mechanical hammers are used, measurements of noise intensity of impacts, and the corresponding number of impacts at the construction location.
3. Recording complaints of the neighboring areas regarding the noise levels.

Documentation should consist of standard operating procedures and monitoring reports for noise measurement tests and complaints.

7.2.5 Management of Excavation Activities Posing Risk on Utilities

LDCs follow established procedures to deal with emergency situations related to breaking underground utility and infrastructure lines. The company supervisor calls the Police Department and emergency department in the relevant utilities company for immediate repair of the damage, which the contractor is invoiced for. The mitigation measures below focus on preventive measures and documentation.

Mitigation measures for avoiding breaking underground utilities and infrastructure pipes:

1. Collecting most accurate maps for underground utilities and infrastructure routes from Information Centers in the various Governorates and asking them for site markings, whenever available, and making such data available to the contractor prior to commencing the works.
2. Boreholes to locate underground utilities before using mechanical excavation.
3. Once underground utilities are mapped or uncovered, horizontal and vertical clearances between natural gas lines and electricity lines must be respected for safety considerations.
4. In case an underground utility and infrastructure pipe has been damaged, standard procedures should be followed, as described before, in addition to preparing a documentation report for the accident. The documentation report should include:
    a. Time and place of accident;
    b. Name of contractor;
    c. Type of underground utilities and infrastructure line;
    d. Description of accident circumstances and causes;
    e. Actions taken and responses of different parties, such as infrastructure company;
    f. Duration of fixing the damage; and
    g. Damage caused (description shall be according to observation, expertise judgment, reports of infrastructure company).

Monitoring activities for such risks, are basically documenting, analyzing reasons that led to the accident and updating procedures to avoid future accidents. Monitoring environmental consequences of such accidents, such as depth of effected soils, volumes of effected groundwater, and other social effects are believed to be unnecessary actions by the implementing company, though it might be recommended for the authority owning the infrastructure line (Water and Wastewater Authority or Telecommunication Authority) for their research activities.

7.2.6 Management of Activities Posing Risk on Structures Stability[15]

1. Screening by a technical committee from the Design, Projects and Operations Departments of LDCs to identify areas/sectors including buildings with potential structural problems. Areas with potential problems should be excluded from the project.
2. In areas of high groundwater level, dewatering activities would be needed. Dewatering activities should follow a tight excavation/dewatering schedule through preplanning and supervision of implementation to avoid lengthy dewatering activities. If water resulting from dewatering is contaminated, it should be transferred to an adequate facility.
3. Minimize excavation intensity and vibrations from heavy equipment in the vicinity of vulnerable structures, if any. In case vulnerable structures are identified, excavation should be done manually.

   Monitoring activities will be mainly performed through supervision of the work of LDCs, and reviewing site reports by the HSE supervisor.

7.2.7 Management of Culturally Valuable Sites[16]

Law 117/1983 for the Protection of antiquities has set certain standards that should be followed during excavation works near a registered antiquity site. Proposed mitigation measures include:

1. Identifying a comprehensive list of all registered antiquities falling within the domain of the project and possibly at risk from construction activities.
2. Provide supervision by the Supreme Council of Antiquities on implementation of construction works at identified locations.
3. If dewatering activities are to take place, the process should be undertaken under the supervision of foundation engineers who shall perform necessary soil investigations.
4. Reduce vibration, in identified locations of antiquities:
   a. using manual tools whenever possible;
   b. phasing work to eliminate vibrations from several machineries; and
   c. Establish cutoff barrier through a vertical trench to absorb vibrations.
5. Fixing gas risers on the back of architecturally valuable structures.
6. Chance find process, in case an antiquity is found during excavation, includes stopping excavation works, and contacting the Supreme Council of Antiquities to handle the site.

Monitoring activities will be site specific according to the requirements and conditional permits granted by the Supreme Council for Antiquities.

1. Monitor vibration levels at the monument location during excavation.
2. Undertake geophysical survey for some locations prior to construction, according to the instructions of the Supreme Council of Antiquities.

The LDC site supervisor will be responsible for documenting the monitoring activities in monthly reports delivered to EGAS.

These mitigation measures, **if required**, shall be implemented by the Council, while the costs will be covered by LDCs.

[15] If encountered within project areas.

[16] If encountered within project areas.

7.2.8 Management of Waste Disposal

The local unit is responsible for the pick-up and disposal of solid waste. Construction waste such as soil waste is disposed of. . Domestic waste is collected from domiciles and collection sites and disposed.

7.2.8.1 Solid Waste

1. Allocating certain areas, in each Sector, for stockpiling waste soil and construction waste, in coordination with the local authority.

2. No soil stockpiling is allowed on banks of waterways.

3. Maximize re-use of excavation waste as backfill for natural gas pipeline trenches.

4. Normally asphalt waste could be disposed of with other excavation waste/aggregates in the local non-hazardous waste site.

5. Solid waste from unlikely scenarios such as worker camps should be addressed in specific waste management plans, as appropriate

7.2.8.2 Liquid and hazardous waste

1. Empty cans of oil-based paint resulting from painting the steel connection pipes to households are to be collected and sent back to nearest LDC depots for temporary storage until disposal at a hazardous waste facility (Nasreya or UNICO in Alexandria).

2. As an important pollution prevention measure, fueling, lubricating or adding chemicals for excavation should not take place at the construction site. Accordingly, no empty chemicals/oils containers will be generated by direct project activities.

3. Further to the above measure, in case waste containers of hazardous materials are generated in the construction site due to unusual circumstances, the LDC is responsible for ensuring that contractor should collect these containers and transfer it to the hazardous waste landfill in Nasreya or UNICO in Alexandria[17]. This measure should be specified in the construction contract and supervised by LDCs site supervisor.

4. If hazardous waste quantities generated are too small for isolated transport to the Nasreya landfill, a temporary storage site can be created. Coordination with waste authority will be imperative to secure a location and implement adequate procedures for storage depending on quantities and type of wastes until collection and shipping to Nasreya landfill. .

5. In case of damaging of asbestos pipes during excavation, the Water Authority, which will carry out the repairs, will be responsible for handling the waste asbestos according to their procedures.

[17] The Nasreya hazardous waste facility is currently being operated under supervision of Alexandria Governorate while UNICO (also in Alexandria) is approved by EEAA to treat and dispose of petroleum wastes.

6. Preplanning drainage of dewatering water and taking necessary permits from the water and wastewater authority, or irrigation authority. No land disposal should be accepted for the water

7. If dewatering is taking place from a contaminated trench, or contains hydrocarbons that could be observed or smelled, contaminated water should be collected in barrels and transported to a wastewater treatment facility.

8. Asphalt waste may contain hazardous components, such as tar, lubricating oils, heavy metals, etc. However, its solid nature minimizes the transport risk of such components to the environment. Disposal of asphalt waste to the municipal waste disposal site is common practice in Egypt as this is normally not associated with significant environmental risks because of the dry weather nature of the country.

In order to minimize risk of spillage of hazardous liquid wastes, the following general precautions should be taken:

- Pre-Plan the anticipated amounts of hazardous liquid materials (such as paint, oils, lubricants, fuel) to be used in the various activities in order to minimize leftovers and residuals.
- To the extent practical, seek to combine leftovers or residuals of the same liquid material/waste in order to minimize the number of containers containing hazardous residuals
- Ensure hazardous liquid material/waste containers are always sealed properly and secured from tipping/falling/damage/direct sunlight during transportation and storage (temporary and long-term)
- In case of spillage:
    - avoid inhalation and sources of ignition
    - cover and mix with sufficient amounts of sand using PPE and tools
    - collect contaminated sand in clearly marked secure containers/bags
    - Add sand to inventory of hazardous waste

Solid wastes generated during the construction phase are classified as non-hazardous (which includes inert wastes) and hazardous wastes. They are summarized in the tables below where the waste type, description, classification and method of treatment or disposal is explained.

Medical or healthcare wastes containing pathologic, contagious, or radioactive constituents as per the definitions of Ministry of Health decree 192 for the year 2001 should be collected, stored and transported separately from any other wastes. Several certified incinerators are available across Egyptian governorates in designated healthcare facilities. In the unlikely case of medical waste, arrangements should be made immediately with the local office of the ministry of health for safe handling and disposal.

The tables below present other solid wastes that are generated during the construction phase during the proposed gas connection project. It worth mentioning Construction wastes will be generated only during a relatively short period.

Table 7-1 Handling of Solid Wastes during Construction Phase

Waste Type	Description	Classification	Treatment and Disposal
Excavated soil and excess sand	Excess sand not used in construction, and excavated soil other than broken asphalt.	Non-Hazardous	Dispose to an approved non-hazardous waste disposal facility: Abu Zaabal Landfill site West of El Obour (to be agreed with local unit)
Metal - Scrap	Includes sheet metal, piping, tubing, wire, cable, , welding residue, valves, fittings, and vehicle and equipment parts.	Non-Hazardous	Disposal: - Preferred: Sell to scrap yard for recycling. - Alternative: Dispose to an approved non-hazardous waste disposal facility: Abu Zaabal Landfill site West of El Obour (to be agreed with local unit)
Paint Containers – Water Based	Pails used for latex paint and paint related solvent containers.	Non-Hazardous	Dispose to an approved non-hazardous waste disposal facility. Which in is the Abu Zaabal Landfill site West of El Obour (to be agreed with local unit)
Paint Containers – Oil Based	Pails used for oil based paints, solvents and paints that contain lead, silver, chromium or other toxic heavy metals.	Hazardous	Dispose to an approved hazardous waste disposal facility, Nasreya Hazardous Waste disposal Centre.
Welding Rods	Generated from piping welding. Remaining portions of used rods or unused but opened packaged.	Non-Hazardous	Dispose to an approved non-hazardous waste disposal facility. Which in this case Abu Zaabal Landfill site West of El Obour (to be agreed with local unit)
Concrete and bricks waste	Excess liquid cement that not used in cementing operations, loose fragments of solidified cement , concrete debris from construction, and bricks waste	Non-Hazardous	Dispose to an approved non-hazardous waste disposal facility: Abu Zaabal Landfill site West of El Obour (to be agreed with local unit)
Broken asphalt	Streets excavation will produce broken asphalt	Non-Hazardous	Dispose to an approved non-hazardous waste disposal facility: Abu Zaabal Landfill site West of El Obour (to be agreed with local unit)

Table 7-2 Wastes Common for Construction of gas pipelines

Waste Type	Description	Classification	Treatment and Disposal
Possibly damaged asbestos water pipes during excavation	Any waste material containing more than 1 wt% asbestos including piping/equipment/vehicle gaskets, pump packing brake pads, etc.	Hazardous	Dispose to an approved hazardous waste disposal facility: Nasreya Hazardous Waste Treatment Centre
Batteries	Scrap wet and dry cell batteries from vehicles and equipment.	Hazardous	- Preferred: Recycle - Alternative: Dispose to an approved hazardous waste disposal facility, Nasreya Hazardous Waste Treatment Centre.
Contaminated Soil – Refined Fuel and Oil	Contaminated soil from routine activities and minor accidental releases spills or leaks.	Hazardous	Dispose to an approved hazardous waste disposal facility Nasreya Hazardous Waste Treatment Centre.
Domestic Waste	Food waste, paper and packaging discarded from kitchens, living quarters, bathrooms, laundries, warehouses and offices.	Non-Hazardous	Dispose to an approved non-hazardous waste disposal facility. Which in this case Abu Zaabal Landfill site West of El Obour (to be agreed with local unit)
Filters – Lube Oil (Drained)	Lube oil filters used to remove solids and impurities originating from vehicles, machinery and equipment maintenance and repair.	Hazardous	Disposal: - Filters - Dispose to an approved hazardous waste disposal facility Nasreya Hazardous Waste Treatment Centre. - Drained liquids - Manage same as Lubricating Oil
Oil Containers – (Including Drums and Barrels)	Drums and barrels used for bulk oils and lubricants.	Hazardous	Dispose to an approved hazardous waste disposal facility, Nasreya Hazardous Waste Treatment Centre.
Shop Towels (Not Laundered - Contaminated)	Shop towels, rags, Nomex, and other cloth wipers that are contaminated with a hazardous waste or that exhibit a hazardous characteristic and are not commercially dry cleaned or laundered	Hazardous	Dispose to an approved hazardous waste disposal facility, Nasreya Hazardous Waste Treatment Centre.

Monitoring activities shall depend mainly upon observation of waste stockpiles of soil and construction waste to ensure the frequency of removal from site, and whether they contain hazardous components.

7.2.9 Management of Street Restoration after asphalt breaking

Standard protocols adhering to national/local administrative requirements are to be followed:

- Close and early coordination between the LDC (and the excavation contractor, if applicable), the local unit, and any other relevant authorities (in the case of public roads, the Roads and Bridges Directorate may become the counterpart to the LDC)
- Agreement on the restoration arrangements, schedules, fees, and payment schedules
- Coordination with the General Utilities before starting work especially the Traffic Department, sewerage, water, telephones and electricity departments.
- Payment of restoration fees by the LDC before works commencement
- Documentation of the agreement and adoption by all involved parties
- Communication with the Public and relevant authorities (such as the security and the traffic departments) regarding excavation and restoration plans

As mentioned in the impacts section of the study, restoration and re-pavement of streets post-construction and excavation is one of the impacts which are highly perceived by the public. The implementing entity agrees a restoration fee with the local administration unit in charge of the area. The fee is used by the local unit to include the restoration in their re-pavement plans. In some cases, the restoration and re-pavement job is carried out by the Roads and bridges directorate who, in turn, schedule the re-pavements in their own plans. A key to minimize public discontentment and socioeconomic impacts of excavated streets is quick restoration and effective communication with regarding work and restoration schedules.

7.2.10 Management of Community health and safety

In addition to all the environmental and social management and monitoring measures in this section which aim for health and safety, awareness-raising actions and signs should be provided to workers and community members to promote safety and health, safety supervisors should be hired by the LDCs to oversee work sites and they will be largely responsible for children and their safety around the construction site.

Following are some mitigation procedures to be adopted

- Using caution tapes that help to keep people away of the site,
- Informing residents and shopkeepers about the timeline of the project (street by street) in order for the residents to know when to avoid certain streets
- A worker should support old people to cross the digging areas, especially, on the wooden bars

7.2.11 Management of occupational health and safety (OH&S)

A comprehensive and practical occupational health and safety management system must be enforced. The OH&S measures are to comply with all relevant national legal requirements well as international Best Practice such as the IFC EHS General Guidelines. Practical and administrative measures should be taken by EGAS and the LDC to ensure adherence of site crews to OH&S procedures and measures; especially:

- Use of relevant Personal Protective Equipment at all times

- Special procedures for working at heights and working in confined spaces
- Earthing to prevent electric shock and fire hazards
- Defensive driving and operation of machinery, equipment, and vehicles
- Diligent reporting of incidents and "near-incidents" in order to take corrective steps
- Other OH&S measures, as detailed by the latest editions of the Egypt Gas HSE Manuals

7.2.12 Management of grievances (E&S Grievance Redress Mechanism)

EGAS and the LDCs aim to be recognized as a responsible operator exemplary in the management of the impacts of its activities. As such, EGAS and the LDCs are committed to preventing, limiting and, if necessary, remedying any adverse impacts caused by its activities on local populations and their social and physical environment.

Identifying, preventing and managing unanticipated impacts are facilitated by a grievance redress mechanism (GRM). As the World Bank's governance and anticorruption (GAC) agenda moves forward, grievance redress mechanisms (GRMs) are likely to play an increasingly prominent role in Bank-supported projects .Well-designed and -implemented GRMs can help project management significantly enhance operational efficiency in a variety of ways, including generating public awareness about the project and its objectives; deterring fraud and corruption; mitigating risk; providing project staff with practical suggestions/feedback that allows them to be more accountable, transparent, and responsive to beneficiaries; assessing the effectiveness of internal organizational processes; and increasing stakeholder involvement in the project. For task teams more specifically, an effective GRM can help catch problems before they become more serious or widespread, thereby preserving the project's funds and its reputation[18].

Effective grievance management helps to:

- Build trust through having a dialogue with stakeholders.
- Detect weak signal and propose solution.
- Reduce risk of conflict between the affiliate and local communities.
- Reduce risk of litigation by seeking fair solutions through mediation in the event of an established impact.
- Identify and manage unanticipated impacts of operation.
- Avoid delays to operations and additional costs.
- Avoid future impacts through analysis of weak signals.

The detailed grievance mechanism (GRM) below is to be shared with the community beneficiaries. Posters will be prepared and made available to the beneficiaries in the contracting office[19]. Additionally, they will be availed in the customer services office. Thus, sufficient and appropriate information about the GRM will be disseminated to the communities prior to the

[18] http://siteresources.worldbank.org/

[19] Falls under the budget of the LDCs

construction phase. Information dissemination about the GRM should be shared with the beneficiaries during the process of contracting and disclosed in the contracting office and other publically accessible venues. Following are the various stages of grievances.

The proposed mechanism is built on three tiers of grievances:

1- The level of site engineer and regional branch of **Egypt Gas** in **El Obour**
2- On the level of LDC headquarter
3- On the level of EGAS

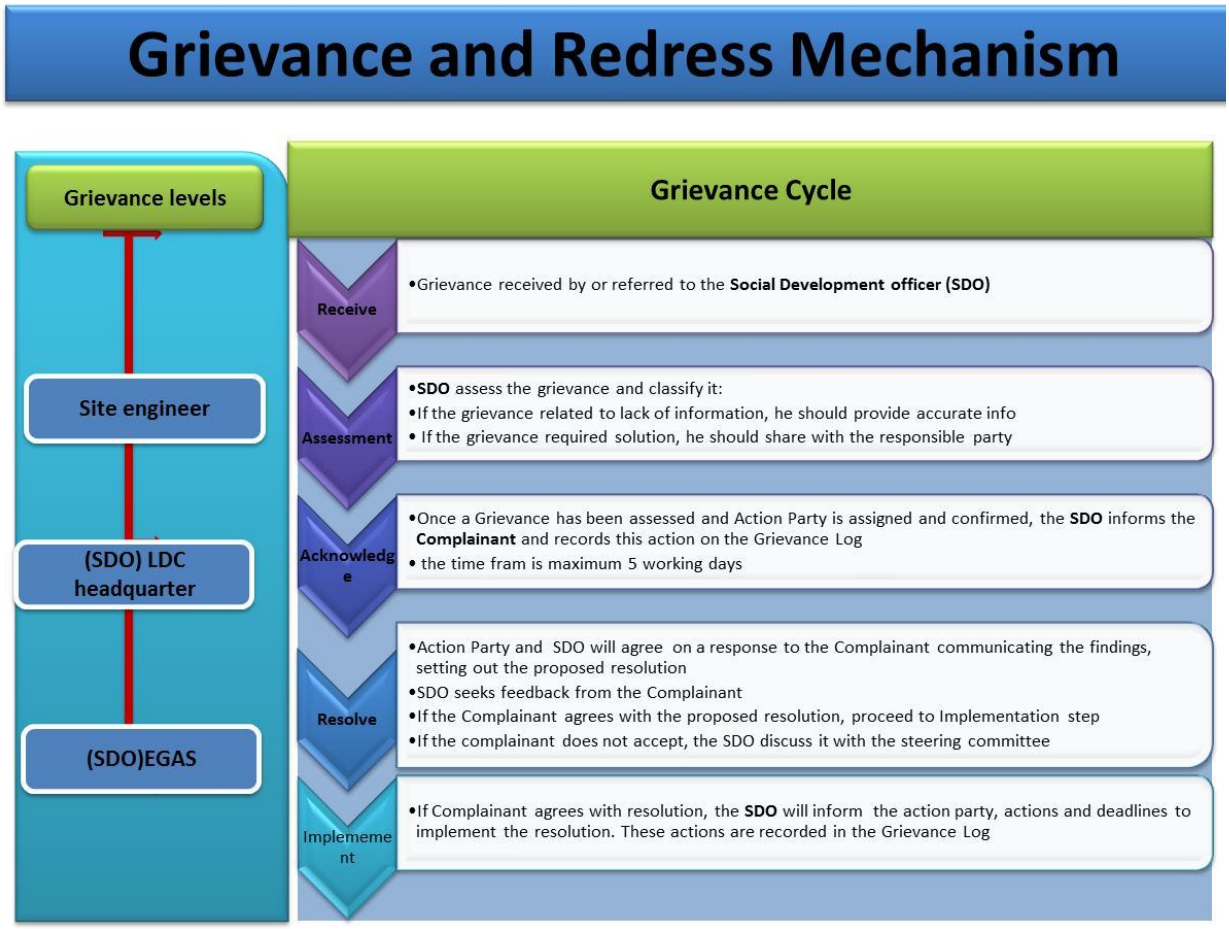


Figure 7-1 Proposed Grievance and Redress Mechanism

7.2.12.1 First tier of grievances

In order to ensure high level of responsiveness to the local communities, it is essential to ensure that a local grievance mechanism is functioning and that the communities are aware of it. **Egypt Gas** will assign a Social Development Officer (SDO) (can be more than one) who will be working closely with the assigned SDO of EGAS. It is the responsibility of **Egypt Gas** SDO to ensure that the GRM system is widely known and well explained on the local level. Moreover, s/he will follow up on the complaint until a solution is reached. The turnaround time for the response/resolution should be 10 days and the complainant should know that he/she should receive response by then.

The grievances should be presented to the following:

- The foreman working on the ground in **El Obour**,
- The project manager in **El Obour**,
- The regional department of **Egypt Gas** in Qalyubeya Governorate

It is worth noting that most of the previous experience of EGAS is suggesting that complaints are usually handled efficiently and resolved on the local level. However, the management of the complaints including level of responsiveness, providing feedback and the documentation of the complaints needs to be significantly strengthened. In case the problem is not solved, the complainant may reach out to the second level of grievance.

7.2.12.2 Second tier of grievances:

If the aggrieved person is not satisfied with the decision of the first tier, they can present the case to **Egypt Gas** headquarter. Complaint form is attached in Annex 5. The SDO there should provide resolution within 15 days. The process for the second level of grievances is as follows:

1. The Social Development Officer in **Egypt Gas** headquarter will handle technical, environmental and land acquisition complaints. **Egypt Gas** headquarter SDO should receive the unsolved problems. Thereafter, the SDO gets in contact with the petitioner for more information and forwards the complaint to the implementing entities for a solution.
2. The SDO should follow the complaints and document how they were solved within **15** days.
3. The SDO should update the complainant on the outcome of his/her complaint.

7.2.12.3 Third tier of grievances:

If the aggrieved person is not satisfied with the decision of the SDOs of **Egypt Gas** at Stage 2, they can present the case to EGAS SDO where they should provide resolution within 15 days. The following section presents the third level of grievances:

1. The Social Development Officer in EGAS will handle technical, environmental and land acquisition complaints. He should receive the unsolved problems. Thereafter, they get in contact with the petitioner for more information and forwards the complaint to the implementing entities for a solution.
2. The SDO should follow the complaints and document how they were solved within **15** days.
3. The SDO should update the complainant on the outcome of his/her complaint.

7.2.12.4 Grievance channels

Due to the diversity of the context in different Governorates and the socioeconomic characteristics of the beneficiaries, the communication channels to receive grievances were locally tailored to address all petitioners concerns and complaints. The following are the main channels through which grievances will be received:

1. Foremen act as the main channel for complaints. They are always available on the construction sites. However, complaints raised to him/her are mostly verbal. Thus, s/he

should document all received grievances in a written form using a fixed serial number which should be shared with the complainant to be able to follow up on the complaint

2. Hotline: 129 is the hotline in **Egypt Gas**.
3. The SDO of Egypt Gas and EGAS

7.2.12.5 Trustworthy people, community leaders and NGOs/CDAs will be an appropriate channel to guide petitioner about the various tiers of grievances, particularly, in rural areas. Response to grievances

Response to grievance will be through the following channels

1. The response to grievances should be through an official recognized form to ensure proper delivery to the complainant. It is the responsibility of the SDOs to ensure that complainants were informed about the results of handling their complaints.
2. Response to grievances should be handled in timely manner as mentioned above, thereby conveying a genuine interest in and understanding of the worries put forward by the community.
3. EGAS and **Egypt Gas** should maintain record of complaints and results.

7.2.12.6 Monitoring of grievances

All grievances activities should be monitored in order to verify the process. The monitoring process should be implemented on the level of EGAS and the LDC. The following indicators will be monitored:

Monitoring dimensions	Means of verification and indicators
GRM is fully operational	○ Number of received grievances monthly (Channel, gender, age, basic economic status of the complainants should be mentioned) ○ Type of grievance received (according to the topic of the complaint ○ Documentation efficiency
Efficiency of responses and corrective procedures	○ Number of grievances solved and closed ○ Feedback offered to the grievances ○ Number of unsolved grievances and the reasons behind not solving them ○ Time consumed to solve the problem
Efficiency of information sharing about GRM	○ Dissemination activities undertaken ○ Total number of brochures distributed (if any) ○ Total number of awareness meetings conducted (if any)

7.2.12.7 Institutional Responsibility for the Grievances

The entity responsible for handling grievances will mainly be the Environmental Affair Department within the implementing agency (EGAS). The Social Development Officer (SDO) working within EGAS in cooperation with the **Egypt Gas** will address all grievances raised by community members. The main tasks for the SDO related to grievances on the various levels are:

1. Raise awareness about channels and procedures of grievance redress mechanisms
2. Collect the grievances received through different communication channels
3. Document all received grievances
4. Transfer the grievance to the responsible entity
5. Follow up on how the problem was addressed and solved
6. Document, report and disseminate the outcome of received grievances
7. Ensure that each legitimate complaint and grievance is satisfactorily resolved by the responsible entity
8. Identify specific community leaders, organizations and citizen groups required to enhance the dialogue and communication through a public liaison office to avoid or limit friction and respond effectively to general concerns of the community
9. Monitoring grievance redress activities

7.3 Environmental and Social Management Matrix during CONSTRUCTION

Table 7-3: Environmental and Social Management Matrix during CONSTRUCTION

Receptor	Impact	Mitigation measures	Responsibility		Means of supervision	Estimated Cost
			Mitigation	Supervision		
Local traffic and accessibility	**Traffic congestion** (and associated noise/air emissions)	Excavation during off-peak periods Time limited excavation permits granted by local unit & traffic department	Excavation contractors	– LDC + – Traffic department	Contractor has valid conditional permit + Field supervision	Contractor costs LDC management costs
		Announcements + Signage indicating location/duration of works prior to commencement of work	– LDC – Excavation contractors	– LDC HSE – Local Unit – Traffic department	Ensure inclusion in contract + Field supervision	
		Apply Horizontal Directional Drilling under critical intersections whenever possible to avoid heavy traffic delays	Contractor	LDC HSE	Field supervision	
		Traffic detours and diversion	Traffic Department	Traffic Department	Field supervision for detouring efficiency Complaints received from traffic department	Additional budget not required
		Road restructuring and closing of lanes			Fluidity of traffic flow	
Ambient air quality	**Increased emissions of dust and gaseous pollutants**	Controlled wetting and compaction of excavation/backfilling surrounding area	Excavation Contractor	LDC HSE	Contractual clauses + Field supervision	– Contractor costs – LDC

Receptor	Impact	Mitigation measures	Responsibility		Means of supervision	Estimated Cost
			Mitigation	Supervision		
		Isolation, covering, transportation in equipped vehicles and disposal of stockpiles			Contractual clauses + Field supervision	management costs
		Compliance to legal limits of air emissions from all relevant equipment			Measure and document emissions of machinery by regular audits request emission measurements	
		– Availability of 24-7 hotline service (129) to all beneficiaries and the public for reporting possible leaks, damages or emergencies – Quick response to gas leaks by evacuation of the affected area – Repair or replacement of failed component	LDC	LDC HSE	Field Supervision	
– **Ambient noise levels** – **Local community** – **Workers**	**Increased noise levels beyond WB/National permissible levels**	Ear muffs, ear plugs, certified noise PPE for workers	– LDC – Excavation Contractor	LDC HSE	Contractual clauses + Field supervision (audits)	– Contractor costs – LDC management costs
		Avoid noisy works at night whenever possible			Field supervision Complaints receipt from local administration	

Receptor	Impact	Mitigation measures	Responsibility		Means of supervision	Estimated Cost
			Mitigation	Supervision		
– **Ground utilities' integrity** – **Local community**	**Damage to underground utilities resulting in water/wastewater leaks, telecommunication and electricity interruptions**	Coordination with departments of potable water, wastewater, electricity, and telecom authorities to obtain maps/ data on underground utilities, whenever available	Excavation Contractor	LDC HSE	Official coordination proceedings signed by representatives of utility authorities – Examination of site-specific reports and records – Field supervision	– Contractor management costs – LDC management costs
		If maps/data are unavailable: Perform limited trial pits or boreholes to explore and identify underground utility lines using non-intrusive equipment		LDC HSE Supervisor	– Contractual clauses + Field supervision	
		Preparation and analysis of accidental damage reports		LDC HSE	– Review periodic HSE reports	
		Repair and rehabilitation of damaged components		LDC HSE Local Government Unit Local Police	– Contractual clauses + Field supervision	

Receptor	Impact	Mitigation measures	Responsibility		Means of supervision	Estimated Cost
			Mitigation	Supervision		
– **Streets (physical status)** – **local community and workers (health and safety)**	**Hazardous waste accumulation**	– Temporary storage in areas with impervious floor – Safe handling using PPE and safety precautions – Transfer to LDC depots for temporary storage – Disposal at licensed Alexandria hazardous waste facilities (Nasreya or UNICO) – Hand-over selected oils and lubricants and their containers to Petrotrade for recycling	– LDC – Excavation Contractor	LDC HSE	Field supervision and review of certified waste handling, transportation, and disposal chain of custody	Indicative cost items included in contractor bid: Chemical analysis of hazardous waste Trucks from licensed handler Pre-treatment (if needed) Disposal cost at Nasreya Approximate cost of the above (to be revised upon project execution): 8,000-10,000 LE per ton
		– Adequate management of asbestos and any possible hazardous waste	Water Authority + contractor		Field supervision + review of Water Authority manifests	– Contractor costs – LDC management costs
		– Minimize fueling, lubricating and any activity onsite that would entail production of hazardous materials empty	– LDC – Excavation Contractor		Field supervision	

Receptor	Impact	Mitigation measures	Responsibility		Means of supervision	Estimated Cost
			Mitigation	Supervision		
		containers _ Pre-Plan the anticipated amounts of hazardous liquid materials (such as paint, oils, lubricants, fuel) to be used in the various activities in order to minimize leftovers and residuals. _ To the extent practical, seek to combine leftovers or residuals of the same liquid material/waste in order to minimize the number of containers containing hazardous residuals _ Ensure hazardous liquid material/waste containers are always sealed properly and secured from tipping/falling/damage/direct sunlight during				

Receptor	Impact	Mitigation measures	Responsibility		Means of supervision	Estimated Cost
			Mitigation	Supervision		
		transportation and storage _ In case of spillage: o avoid inhalation and sources of ignition o cover and mix with sufficient amounts of sand using PPE o collect contaminated sand in clearly marked secure containers/bags _ Add sand to inventory of hazardous waste				

Receptor	Impact	Mitigation measures	Responsibility		Means of supervision	Estimated Cost
			Mitigation	Supervision		
– **Local community**	**Non-hazardous waste accumulation**	1. Designate adequate areas on-site for temporary storage of backfill and non-hazardous waste 2. Segregate waste streams to the extent possible to facilitate re-use/recycling, if applicable 3. Reuse non-hazardous waste to the extent possible 4. Estimate size of fleet required to transport wastes. **5. <u>Transfer waste to disposal facility East of the project area</u>**	– LDC – Excavation Contractor	LDC HSE	– Contractual clauses – Monitoring of waste management plan – Field supervision	– Contractor costs – LDC management costs
Local community	**Destruction of streets and pavement**	– Arrange Restoration and re-pavement (رد الشئ لأصله) with local unit – Communication with local community on excavation and restoration schedules.	– LDC in cooperation with the LGU	EGAS	- Field supervision - Coordination with LGU as needed	Included in re-pavement budget agreed by LDC with local units or Roads and Bridges Directorate

Receptor	Impact	Mitigation measures	Responsibility		Means of supervision	Estimated Cost
			Mitigation	Supervision		
Occupational health and safety	**Health and safety**	1. Full compliance to EGAS and LDC HSE requirements, manuals, and actions as per detailed manuals developed by Egypt Gas 2. Ensure the provision of the appropriate personal protective Equipment and other equipment needed to ensure compliance to HSE manuals	Excavation Contractor	LDC HSE SDO	Field supervision	– Contractor costs – LDC management costs
Local communities and businesses	**Lack of accessibility to businesses due to delay in street rehabilitation**	Compliance with the Environmental management plan concerning timely implementation of the construction schedule to minimize impact on local business • Follow up the procedure of Grievance Redress Mechanism • Ensure transparent information sharing	During digging process LDC The sub-contractors	LDC and the SDO	– Ensure the implementation of GRM – Supervision on Contractors performance	No cost

Receptor	Impact	Mitigation measures	Responsibility		Means of supervision	Estimated Cost
			Mitigation	Supervision		
Local community Health and safety	**Threat to Safety of users and houses (due to limited level of awareness and misconceptions)**	Prepare Citizen engagement and stakeholder plan Awareness raising campaigns should be tailored in cooperation with the community-based organizations	During the construction LDC	LDC and the SDO	– List of awareness activities applied – Lists of participants – Documentation with photos – Awareness reports	– 2250 $ per awareness raising campaign – 2250 $ for brochure and leaflets to be distributed (material available by EGAS-$ spent)

7.4 Environmental and Social Monitoring Matrix during CONSTRUCTION

Table 7-4: Environmental and Social Monitoring Matrix during CONSTRUCTION

Receptor	Impact	Monitoring indicators	Responsibility of monitoring	Frequency of monitoring	Location of monitoring	Methods of monitoring	Estimated Cost of monitoring
Local traffic and accessibility	Reduction of traffic flow and accessibility to local community	Comments and notifications from Traffic Department	LDC HSE	Monthly during construction.	Construction site	Documentation in HSE monthly reports Complaints log	LDC management costs
Ambient air quality	Increased air emissions	HC, CO% and opacity	LDC HSE	Once before construction + once every six months for each vehicle	Vehicles licensing Department	Measurements and reporting of exhaust emissions of construction activities machinery Complaints log	LDC management costs
Ambient noise levels	Increased noise levels	Noise intensity, exposure durations and noise impacts	LDC HSE	Regularly during site inspections and once during the night in every residential area or near sensitive receptors such as hospitals	Construction site	Measurements of noise levels Complaints log	LDC management costs
		Complaints from residents	LDC HSE	Monthly during construction.	Construction site	Documentation in HSE monthly reports	LDC management costs
Underground utilities	Damages to underground utilities and	Official coordination reports with relevant authorities	LDC HSE	Monthly during construction.	Construction site	Documentation in HSE monthly reports	LDC management costs

Receptor	Impact	Monitoring indicators	Responsibility of monitoring	Frequency of monitoring	Location of monitoring	Methods of monitoring	Estimated Cost of monitoring
	infrastructure	Accidents documentation					
Physical state of street	Waste generation	Observation of accumulated waste piles	LDC HSE	During construction. Monthly reports	Construction site	Observation and documentation	LDC management costs
		Observation of water accumulations resulting from dewatering (if encountered)	LDC HSE	During construction. Monthly reports	Around construction site	Observation and documentation	LDC management costs
		Chain-of-custody and implementation of waste management plans	LDC HSE	Zonal reports	Construction site and document examination	Site inspection and document inspection	LDC management costs
Local community	Damaging to the streets	– Streets quality after finishing digging – Number of complaints due to street damage	LDC, EGAS	Four times per year, each three months	Site and Desk work	Checklists and complaints log	No cost
Local community	Threat to Safety of users and houses (due to limited level of awareness and misconceptions)	– Number of awareness raising implemented – Number of participants in information dissemination	LDC, EGAS	Quarterly monitoring	Office	Reports Photos Lists of participants	No cost

7.5 Management of Mitigation and Monitoring Activities During Operation Phase

7.5.1 Hotline

As mentioned previously, odorant is added to odorless natural gas to facilitate leakage detection by smell/odor.

A 24-7 Hotline (**129**) is available for customers and the public to report leaks, damage, emergencies, and/or incidents related to gas connections, components, infrastructure, and activities (inside or outside households) and to request repairs/emergency response/assistance.

7.5.2 Community health and safety

Several measures are suggested to overcome obstacles to full understanding and adoption of safety measures by the clients in the social management plan. Examples include using drawings instead of written instructions to improve communication with illiterate customers, coordinating with women of local NGOs who are interested in cooperating with the project to explain safety precautions to women in the households to be connected, and constantly monitoring the performance of emergency response units.

During all consultation activities conducted, participating NGOs offered to host awareness activities related to the NG project. In **Qalyubeya**, various NGOs were interviewed. They expressed their willingness to act actively as awareness centers for the project. Consequently, such activities will not necessitate additional cost

The LDC must communicate clear instructions to clients in order to ensure that NG piping and components (both inside the household and outside) are not be altered, violated, or intruded upon in any way without written approval from, or implementation of the alteration by, the LDC.

7.5.3 Management of Repairs and Maintenance

The same mitigation and monitoring measures discussed for the construction phase shall also apply to the repair and maintenance works that will require excavation.

7.5.4 Management of network integrity

Rare events may threaten the integrity of the network and cause multiple failures/leaks/fires/explosions simultaneously should be addressed, despite their low occurrence probability. Such events may include the unlikely impacts from earthquakes, unexpected geotechnical settlements, and pipeline sabotage. Mitigation should involve review of geological/geotechnical history and vulnerabilities. Other measures include an emergency action plan and training drills to deal with such events with minimal damage and risk to the public.

Basic emergency response actions in case of leakage or network damage:

- Mobilization of emergency response team to cut gas supply to affected area or divert the gas supply whenever required
- Quick coordination with civil defense, police, and other relevant local authorities whenever necessary
- Creation of an exclusion zone around the affected area where vehicles and people are moved out of the danger zone

- Using local announcement systems and local community leaders to inform residents, businesses, and people in and around the affected area that a leakage has occurred
- Removing all possible sources of ignition in the affected area
- Damage Repair under strict H&S precautions
- Re- operation

7.5.5 Management of financial disturbance

Residential gas connection installation costs are around 5,600 EGP20. Customers pay 1700 EGP of that cost in cash. The balance is subsidized by the government of Egypt. The 1700 EGP can be paid either upfront or in installments over a period of time. If they pay in installments, the interest rate will be added in accordance to the selected installment scheme. Typically, households opt for flexible monthly payment plans facilitated by the LDCs and local banks. A limited number of NGOs also provided financial assistance for installing gas connections for households in very low income neighborhoods.

The government of Egypt does not provide additional subsidy to the poorer groups, However, they provide number of payments strategies through offering the various installments schemes[21]: It is worth mentioning that the Government of Egypt try to negotiate with funding agencies to provide extra support to poor.

[20] *Converting Households from LPG to Natural Gas- Social Impact Assessment Study- 2013*

[21] In case of any change of the value of NG installation those installments might be changed

7.6 Environmental and Social Management Matrix during OPERATION

Table 7-5: Environmental and Social Management Matrix during OPERATION

Receptor	Impact	Mitigation measures	Responsibility		Means of supervision	Estimated Cost
			Mitigation	Supervision		
- **Ambient air quality** - **Community health and safety**	**Network integrity**	_ Detailed review of the geotechnical and geological history of the project area _ Development of a full emergency response plan with at least the following actions o Mobilization of emergency response team to cut gas supply to affected area or divert the gas supply whenever required o Quick coordination with civil defense, police, and other relevant local authorities whenever necessary o Creation of an exclusion zone around the affected area where vehicles and people are moved out of the danger zone o Using local announcement systems and local community leaders to inform residents, businesses, and people in and around the affected area that a leakage has occurred o Removing all possible	LDC	LDC HSE.	- Map and local geotechnical report review - Site inspections - Awareness actions - Periodical trainings and drills	LDC management costs

Receptor	Impact	Mitigation measures	Responsibility		Means of supervision	Estimated Cost
			Mitigation	Supervision		
		sources of ignition in the affected area o Damage Repair under strict H&S precautions o Re- operation _ Random inspections and awareness campaigns to ensure that NG piping and components (both inside the household and outside) are not be altered, violated, or intruded upon in any way without written approval from, or implementation of the alteration by, the LDC. _ Availability of 24-7 hotline service (129) to all beneficiaries and the public for reporting possible leaks, damages or emergencies _ Quick response to gas leaks by evacuation of the affected area _ Repair or replacement of failed component				
- **Ambient air quality** - **Community health and safety**	**Repairs and maintenance (network and households)**	As with construction phase activities	_ LDC _ Excavation Contractor	LDC HSE	As relevant from construction phase	LDC management costs
Economically disadvantaged Community members	**Financial burden on economically disadvantaged due to the**	- Petro Trade should collect the installment immediately after the installation of NG - The installments should be collected on monthly basis in order	Petro trade (Company responsible for collecting the consumption fees	EGAS	Banks loans log Complaints raised by poor people due to the frequency of	No cost

Receptor	Impact	Mitigation measures	Responsibility		Means of supervision	Estimated Cost
			Mitigation	Supervision		
	installments	not to add burden to the poor, as it will be easier for them to pay on monthly basis - The installment should not be high	and the installments		collecting the installments	
Informal LPG distributors	**Loss of revenue for LPG distributors**	- LPG distributors should be informed about the NG potential areas in order to enable them to find alternative areas - They should be informed about the GRM in order to enable them to voice any hardship	Butagasco	EGAS	Information sharing activities with the LPG vendors Grievances received from them	No cost
Community health and safety	**Possibility of Gas leakage**	- Information should be provided to people in order to be fully aware about safety procedures - The hotline should be operating appropriately - People should be informed of the Emergency Numbers	LDC	LDC	Complaints raised due to Gas leakage	No cost

7.7 Environmental and Social Monitoring Matrix during OPERATION

Table 7-6: Environmental and Social Monitoring Matrix during OPERATION

Impact	Monitoring indicators	Responsibility of monitoring	Monitoring Frequency	Location of monitoring	Methods of monitoring	Monitoring Estimated Cost
Network integrity	- Earthquakes or geotechnical settlements - Emergency response time and corrective actions during emergency drills - Reports of alteration or tampering with ANY gas components	LDC HSE	Bi-annual inspections and annual emergency response drills	Along the network and inside and outside households	- Inspection, leakage detection, running the drills	LDC management costs
Financial burden on economically disadvantaged due to the installments	- Number of economically disadvantaged people who complained - Number of those who can't pay the installment	LDC and Petro Trade, EGAS	Quarterly	Desk work	- Complaints log - Bank reports - Petro trade reports	No cost
Impact on the informal LPG distributors	- Grievance received from the informal LPG distributors - Information shared with them	EGAS, LDC	Quarterly	Desk work	- Complaints log	No cost
Possibility of Gas leakage	- Complaints raised by the community people - Number of leakage accidents reported/raised	LDC, EGAS	Four times per year, each three months	Site and Desk work	Complaints log LDC	No cost

7.8 Reporting of Mitigation and Monitoring Activities

LDC HSE Departments are to prepare monthly and quarterly reports to be submitted to EGAS Environment Department during the construction phase.

During construction phase monthly reports should include as a minimum:

- Conditional permits and any comments or recommendations by Traffic Department and Supreme Council for Antiquities
- Number and date of paint cans shipped to company depot or returned to supplier
- Evaluation of LDC and contractor's performance on applying his relevant mitigation measures
- Any accidents or breaking of utility pipes
- Monitoring results of excavation machinery exhaust emission, noise and vibrations
- The number of complaints received and how they were dealt with
- Communication and information sharing activities done by the LDC on the field

During Operation phase monthly reports should include as a minimum:

- Evaluation of the adherence of staff to safety measures
- Pipeline leakage or damage incidents
- The number of complaints received and how they were dealt with

7.9 Institutional Framework for ESM&MP Implementation

7.9.1 Environmental Management Structures

EGAS is the supervisory body. **Egypt Gas** is the implementing body. Below is the management structure of **Egypt Gas**.

Being the implementing body of the natural gas network in project areas, **Egypt Gas** has a direct involvement with the environmental management and monitoring of the natural gas network. **Egypt Gas** has limited environmental and social background. Therefore, an upgrade in their environmental and social capacity will be necessary. EGAS will be responsible for providing **Egypt Gas** staff with the needed information.

One of the standard tasks of the HSE Departments of **Egypt Gas**, supervised by EGAS, is to ensure that the Environmental and Social Management Plan of the project is implemented in all the phases of the Project.

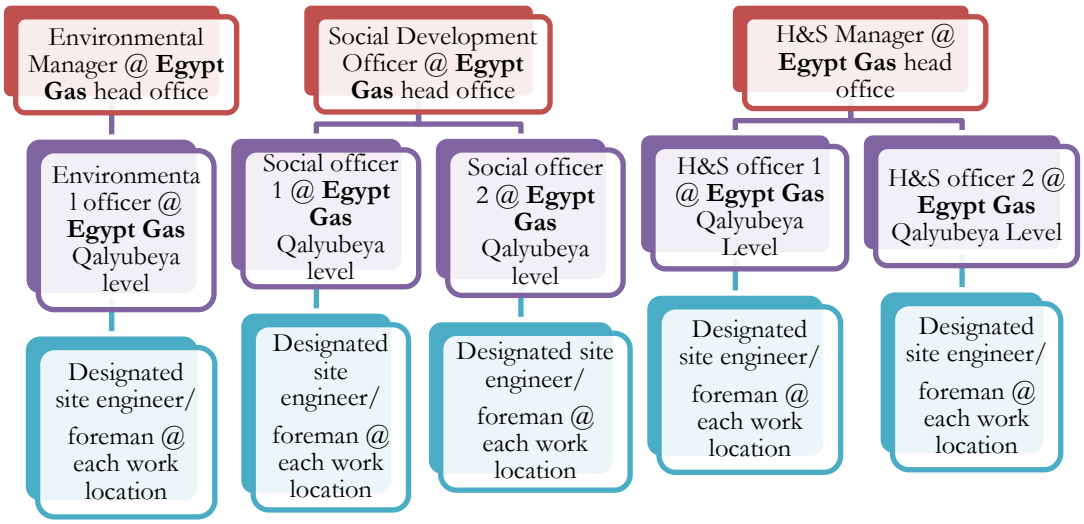


Figure 7-2: Egypt Gas ESMP organogram

7.9.2 Roles and responsibilities of EGAS and LDCs Environmental and H&S Officers

In the structure above, designated site engineers/foremen perform daily implementation, monitoring and reporting of activities as per the ESMP with special attention to:

1. Worker and contractor compliance to EGAS HSE manuals and procedures
2. Occurrence of HSE incidents and suggestions for incident avoidance
3. Management of broken asphalt (if any), unused backfill, solid waste, metal scrap
4. Management of paint cans, refueling & lubrication, soil contamination
5. Management of liquid waste such as leaked condensate hydrocarbons (if any) or chemicals used in heaters; and
6. Checking that handling of hazardous waste is done according to the requirements of the Environmental Law, where a permit for handling hazardous material and Hazardous wastes is issued from EGAS Environment Department
7. Using analyzers to measure noise, SO_2, CO, CH_4 and NO_2 in ambient air, and detect possible natural gas leaks
8. Other tasks as outlined in ESM&MP

Daily reports are to be compiled and sent to the governorate H&S and Environmental officers for preparation of monthly summary reports.

Monthly reports are sent to H&S and Environmental officer at **Egypt Gas** head office for compilation into quarterly reports to EGAS.

7.9.3 Roles and responsibilities of EGAS and LDCs Social Development Officers

EGAS, its subsidiary Local Distribution Companies (LDCs), and the contractors will be responsible for adopting the following procedures:

7.9.3.1 Compliance with Bank safeguards

- Preparing internal guidelines for the preparation, implementation, monitoring and reporting of social documents required by various safeguard instruments;
- Reviewing, as applicable, ESMP and other social safeguard documents prepared by consultants to ensure compliance with relevant safeguard policies of the government and the World Bank;
- Providing recommendations to EGAS/LDC management and other subsidiary companies accordingly and make necessary changes prior to submission of relevant social documents to the World Bank – ensure consistency in the level of proficiency and presentation of the documentation;
- Carrying out documentation review pertaining to social compliance (including bidding documents, reviews on-site, reports from contractors etc.) throughout project implementation;
- Coordinating and facilitating the work of consultants engaged to carry out environmental and social impact assessments and resettlement planning and external monitoring of safeguard instruments implementation;

- Organizing the technical aspects of workshops and meetings as required, as outlined in the ESMF/RPF training and capacity building section;
- Preparing training materials, and conducting technical training workshops to EGAS/LDC staff and project implementation agencies on social safeguards requirements.

7.9.3.2 Monitoring and reporting

- Conducting internal monitoring of the implementation of the social component of the ESMP in matters pertaining to timely payments and the provision of temporary measures to affected persons;
- Contributing to project progress reports pertaining to overall implementation of social requirements of the project;

7.9.3.3 Communication with and responsiveness to targeted communities

- Design community friendly grievance redress mechanism with clear and timely bound tiers and responsibilities and ensure dissemination on the local level.
- Conducting field visits to ensure that the established grievance redress mechanisms are functioning properly and that the individual projects are implemented in a socially sustainable manner;
- Participate in the process of disbursing compensations and keep track record of the compensation process documentation
- Reach out to local communities, including PAPs, to raise awareness about the project and the implementation schedule.
- Build the capacity and provide support to the field staff as needed.

7.9.4 Required Actions

Existing Environmental and social guidelines & practices of EGAS and its LDCs are following sound environmental procedures in the operation phase. EGAS is also working to institutionalize the social management in their practices and day to day business. A ministerial decree was issued in November 2015 with the effect of establishing a social unit to affiliate to the Environmental Management Unit. The social unit currently has 3 staff mapped officially to the unit (although support is also provided by other team members). EGAS assigned team is benefiting from number of capacity building activities to enable them to carry out their social management mandates in an efficient manner.

1- Deeper involvement of environmental and social officers during the design, costing, tendering, and construction phases would be advantageous.
2- Specifically, **Egypt Gas** should take steps to develop capacity of site engineers/foremen and HSE officers with specific courses focused on implementation of the ESMP detailed in this ESIA as well as Egypt Gas detailed HSE guidelines (Latest version: 2015).

8 Stakeholder Engagement and Public Consultation

The public consultation chapter aims to highlight the key consultation and community engagement activities that took place as part of the preparation of the ESIAs and their outcomes.

The consultation activities used multiple tools and mechanisms (including scoping meetings, interviews, surveys, focus group discussions, public hearings/consultations) with various stakeholders and community people in the host communities. The consultations were held for the proposed 1.5 million household NG connections project in compliance with:

- WB policies and directives related to disclosure and public consultation, namely,
  - Directive and Procedure on Access to Information
  - World Bank Operational Policy (OP 4.01)

- Egyptian regulations related to public consultation

  - Environmental law No 4/1994 modified by Law 9/2009 modified with ministerial decrees no. 1095/2011 and no. 710/2012

Objectives of various consultation activities are summarized as follows:

1- Define potential project stakeholders and identify their potential project roles
2- Disseminate comprehensive information about the project to enable stakeholders to identify their concerns, needs, and recommendations.
3- Document stakeholder feedback on the defined impacts as well as the social and environmental management plan and enhance the ESIA accordingly
4- Identify the most effective outreach channels that support continuous dialogue with the community
5- Discuss potential resettlement plans and impacts of involuntary resettlement (in the places where this is applicable).

8.1 Defining the stakeholder

In order to ensure an inclusive and meaningful consultation process, a stakeholders' analysis was conducted to get a better understanding of the various groups and their roles, interests and influence on the project. For the purpose of this site specific ESIA, a focused stakeholders' identification was conducted to identify the key groups of relevance to the project in this specific location. The main identified groups are very similar to those identified on the governorate level but should be considered on the scale of El Obour and include local communities of both men and women of projects beneficiaries as well as the PAPs, local NGOs/CDAs.

The abovementioned stakeholders were consulted using various tools (i.e. individual interviews, surveys, group meetings and public consultation). Most of them have attended the public consultation hearings conducted during December 2013 in the 11 governorates. However, some of them were also interviewed in their premises in order to enable them to voice their concerns and worries freely.

8.2 Consultation Methodology and Activities

The consultation process was a dynamic and evolving process which adapted multiple qualitative and quantitative tools and was tailored to the local culture and context of the communities. The consultation was also a good chance for the team of EGAS and the LDCs to have direct interaction with the local communities and helped in establishing channel of communication and trust.

The team applied various consultation activities. This included, but was not limited to, public consultation on the governorate level as well as scoping meetings, in-depth and household interviews and focus groups discussions on El Obour city level. It is worth noting that intense consultation was conducted at an earlier stage during the process of preparing the ESIAF and the RPF in December 2013 (please see the ESIAF report and the Governorate ESIA report)). All those activities contributed in maintaining an ongoing process of communication and consultation aiming aimed to set a foundation for future community engagement activities as part of the project.

Table 8-1: Summary of Consultation Activities in El Obour City

Participants	Number		Methods	Date
During the site specific study	**Male**	**Female**		
Government officials	3		In-depth	September and October 2015
NGOs	2			
Educational institute	1			
Public hearing for the ESIA of the governorate level. Potential beneficiaries, government officials, NGO representatives.	89	33	Public consultation	10th of February 2016
Total	95	33		

The residents of El Obour and the doormen were consulted and informed about the project. The team tried to consult with governmental entities and the residents. It was relatively a challenge to consult with the residents as the high middle class groups tend not to be interviewed.

8.2.1 Main results of consultation during the data collection phase

The majority of sample surveyed expressed very high demand for the project. They also indicated their willingness to be connected to the NG regardless of the amount of money they can afford to pay. This high level of enthusiasm from the local communities towards the project is attributed to the high level of awareness of natural gas benefits.

Following is a list of main issues raised during data collection and scoping phase

Table 8-2: Sample of the main issues raised during the data collection and scoping phase in El Obour

Subject	Questions and comments	Responses
Time plan	The duration of project implementation and the final date to operate the NG	The time plan will be shared with the community prior to construction
Street rehabilitation	The streets that were previously dug by the NG in the area are of bad condition. This affected the cars and vehicles	Streets restoration will be coordinated with the Local unit
Safety measures	NG is safer than the LPG. However, it needs to be monitored.	The LDCs apply international standards that concern about safety
Installation of NG to the ground floors	Doormen were concerned that they might not be eligible to be connected to the NG as they have one room and no kitchens	Their concern is valid as they will not be technically accepted to have the NG installed in their rooms
Working during night	It is recommended not to work during night as it might disturb the residents	This will be considered during the construction phase
Damage to infrastructure	It is a concern to all residents that the infrastructure might be affected during construction	There are mitigation measures that will be adopted in order to rehabilitate any damaged infrastructure
Having more than two appliances	Does the number of appliances affect the installation cost?	The NG LDCs will visit the client in order to estimate the costs of other appliances

On the 10th of February 2016, a public consultation was conducted in Banha City (the capital city of Qalyubeya Governorate) in which all project relevant areas in Qalyubeya Governorate were invited. The head of municipality, governmental entities and some community people attended the consultation event. Comprehensive documentation and presentation for the results of the public consultation conducted in Banha City on the 10th of February is presented in the SSESIA allocated for El Khosous City.

8.3 Summary of Consultation Outcomes

The key message carried over from the consultation events is that both public and governmental groups accept and strongly support the project. Concerned governmental entities and NGOs proposed to support the project in terms of encouraging people to install the NG to their houses. Aside from limited concerns regarding damage of utilities and streets, the main public and governmental requirement was the speedy implementation of the project and expansion to additional areas.

In El Obour, the doormen were concerned that they will not be able to install the NG as they reside in rooms without kitchens which do not meet the technical specifications of EGAS. Safety measures adopted by the NG companies were not clear for some participants. Therefore, they strongly recommend develop a communication and information sharing strategy. With regards to working during night, it was relatively a problem for some of the residents.

Site specific consultation activities, as detailed above, engaged with a wide range of concerned stakeholders. This included but was not limited to, persons/households affected by the project activities, civil society organizations representing the interest of the community, or regulatory and governmental bodies who will play a role in facilitating or regulating the implementation of site-specific project activities.

While WB safeguards and regulations state that a minimum of two large-scale, well-publicized public consultation sessions are a must for projects classified as category 'A' projects like the one at hand[22], additional consultation activities (for example through focus group discussions, in-depth meetings, and interviews) were implemented to reach the most vulnerable and difficult to reach community members. Additionally, in order to obtain larger scale and more quantifiable information, the consultant has conducted surveys in the different sites.

8.4 SSESIA disclosure

The Site Specific ESIA after being approved by the World Bank and EEAA will be disclosed on the WB website, EGAS and Egypt Gas websites. An executive summary in Arabic will be disclosed in EGAS and Egypt Gas websites. A copy of Qalyubeya Site specific reports will be disclosed in EEAA and in the Governorate level.

[22] Clause 14 of OP 4.01 states that: "For Category A projects, the borrower consults these groups at least twice: (a) shortly after environmental screening and before the terms of reference for the EA are finalized; and (b) once a draft EA report is prepared. In addition, the borrower consults with such groups throughout project implementation as necessary to address EA-related issues that affect them."

Annex 1: Contributors to the ESIA

	Team Member	Role
1.	Dr. Tarek Genena	Senior ESIA expert and team leader (EcoConServ)
2.	Dr. Khaled Gamal	Senior ESIA expert and team leader (Petrosafe)
3.	Ms. Zainab Hafez	Senior SIA expert and project coordinator (EcoConServ)
4.	Dr Amr Sobhy	Senior EIA specialist (EcoConServ)
5.	Eng. Khaled El Sahy	Senior ESIA expert (Petrosafe)
6.	Eng. Fakhry Abd el Khalek	Senior EIA specialist (EcoConServ)
7.	Eng. Maysara Shams	EIA specialist (EcoConServ)
8.	Ms. Dalia Ashour	Senior SIA specialist (EcoConServ)
9.	Dr Nermin Eltouny	Senior EIA specialist (EcoConServ)
10.	Mr. Mohamed Hassan	Data analyst Expert (EcoConServ)
11.	Ms. Shaimaa Mostafa	SIA specialist (EcoConServ)
12.	Ms. Zeinab Aly	Data management manager
13.	Mr. Sohy El Grouf	Field manager
14.	Mr. Sameh Mahrous	Senior administrative coordinator (EcoConServ)
15.	Mr. Mohamed Abd El Hady	Community engagement manager
16.	Ms. Hana Mostafa	Field supervisor
17.	Team of surveyors	

Acknowledgement

The EcoConServ and Petrosafe consultant teams would like to express their deep gratitude to the scores of support staff, drivers, NGOs, collaborators and organizations who logistically supported the completion of this project under tight time limitations.

EcoConServ and Petrosafe also acknowledge the invaluable knowledge and support provided by the technical, environmental, and social teams of EGAS and LDCs who accompanied the consultant teams.

Annex 2: Procedures for chance finds and ESM&MP for physical cultural resources[23]

Cultural property includes monuments, structures, works of art, or sites of significance points of view, and are defined as sites and structures having archaeological, paleontological, historical, architectural, religious, aesthetic, or other cultural significance. This includes cemeteries, graveyards and graves.

Antiquities Law 117/1983: Article 24 states that everyone who finds by chance the part or parts of a fixed monument in its place must promptly inform the nearest administrative authority within forty-eight hours.

Prior to the construction phase, the approval shall be obtained from the antiquities department and surveying department

Chance Find Procedures

1. Stop the construction activities in the area of the chance find;
2. Delineate the discovered site or area;
3. Secure the site to prevent any damage or loss of removable objects. In cases of removable antiquities or sensitive remains, a night guard shall be present until the responsible local authorities and Ministry take over;
4. Notify the site manager and HSE supervisor who in turn will notify the responsible local authorities and the Antiquities Authority immediately (within 24 hours or less);
5. Responsible local authorities and the Antiquities Authority would be in charge of protecting and preserving the site before deciding on subsequent appropriate procedures;
6. Decisions on how to handle the finding shall be taken by the responsible authorities from the Antiquities Authority;
7. Construction work could resume only after permission is given from the responsible local authorities and the Antiquities Authority concerning safeguard of the heritage.

These procedures must be referred to as standard provisions in construction contracts, where applicable. During project supervision, the site manager and HSE supervisor shall monitor the above regulations relating to the treatment of any chance find encountered are observed.

Relevant findings will be recorded in Monitoring Reports and Implementation Completion Reports (ICRs) submitted to the World Bank.

[23] In the highly unlikely event that such finds are encountered in the project areas which are have been previously excavated for all underground utilities.

Table 0-1: Management matrix for cultural sites (if encountered)

Impact	Mitigation measures	Responsibility of mitigation	Responsibility of direct supervision	Means of supervision	Estimated Cost of mitigation / supervision
Effects on cultural sites	Identify areas of antiquities, monument repair zones	Contactor & Supreme Council for Antiquities and Local Council	LDC HSE	Review permitting procedures and ensure review of Council	LDC costs
	Supervise intensity and locations of construction activities	Expert from Supreme Council of Antiquities	LDC HSE	Review field reports + field supervision	Indicative cost to be revised and included in contractor bid $715 / site for supervision and measurement of vibration for locations identified as "monument-critical" LDC costs
	Control dewatering process	Contractor	Supreme Council Expert + LDC HSE	Field supervision	Indicative cost to be revised and included in contractor bid $2,850 /site LDC costs
	Reduce vibrations	Contractor	Supreme council Expert + LDC HSE	Contractual clauses + Field supervision	Indicative cost to be revised and included in contractor bid $2,150/site LDC costs
	Preserve architecturally valuable sites	Contractor	LDC HSE	Field supervision	Contractor costs (included in bid price) + LDC costs
	Preserve any found antiquity	Contractor + LDC HSE supervisor	LDC HSE	Field inspection throughout works and review field reports	Contractor costs (included in bid price) + LDC costs

Table 0-2: Monitoring matrix for cultural sites (if encountered)

Impact	Monitoring indicators	Responsibility of monitoring	Frequency of monitoring	Location of monitoring	Methods of monitoring	Estimated Cost of monitoring
Effects on monuments and vulnerable buildings	**Vibration test results**	LDC HSE	During construction near sites identified by the Council	Construction site	Calibrated vibration test meter	($750/meter + $160 maintenance and calibration) x 11 vibration meters = $10,000
	Investigate possible buried antiquities	LDC HSE + Supreme Council for Antiquities	Once before construction if required by the council	Streets and areas identified by the Council	Geophysical survey	Contractor costs (included in bid price) in areas designated as antiquities or monument repair zones (to be covered by LDC)

Annex 3: Site air measurements Methodology

Site selection

The selection of the site for the active air measurements is based on the prevailing wind direction, the future layout of the proposed project components.

Collection of air measurement

Instrumentation for measurements of ambient air pollutants

Ambient air concentrations of sulfur dioxide were measured using an SO_2 analyzer (Thermo Scientific SO_2 Analyzer model 43i-USA) with a detection limit of ≤ 1 ppb and a precision of ≤ 0.5%. Nitrogen oxides were measured using a NO_x analyzer (Thermo Scientific NO_x Analyzer - Model 42i- USA) with a detection limit of ≤ 0.4 ppb and a precision of ≤ 0.5%. Carbon monoxide concentrations were measured using a CO Analyzer (Thermo Scientific Carbon Monoxide CO Analyzer model 48i-USA) with a detection limit of ≤ 0.04 ppm and a precision of ≤ 0.5%. Particulate matter, PM_{10}, and total suspended particles, T.S.P, were measured using a Sequential Particulate sampler equipped with a Beta Ray Source. The detection limit is ≤ 1.5 μg/ m^3 and the precision is ≤ 0.4 μg/ m^3 for 24-hour cycle time at a 2.3 m^3/h operating flow rate.

Protocols for measurements of ambient air pollutants

Concentrations of ambient pollutants were measured according to the standard reference methods presented in the table below.

Table 0-3: Standard reference methods followed for the collection of ambient air pollutants

Pollutant	Standard reference procedure
NO_x	ISO 7996 equivalent to(U.S.A EPA Reference method – RFNA-1289-74)
SO_2	ISO 10498 equivalent to(U.S.A EPA Reference method – EQSA-0486-60)
CO	ISO 4224 equivalent to U.S.A EPA Reference method – RFCA-0981-54)
PM_{10} T.S.P	EPA method, Appendix J-Reference method FR

Annex 4: Impact Assessment

The impact of each activity on each receptor was assessed according to magnitude on a scale of -10 to 10, where negative values indicate a negative influence on the receptor, and importance on a scale of 0 to 10, which encompasses the probability of occurrence, frequency of the impact etc. The numbering system is used as a relative measure, where more negative numbers correspond to impacts having a higher negative magnitude. Susceptible receptors and corresponding activity are deduced and addressed if both magnitude and importance are of minor severity.

Further, the Buroz Relevant Integrated Criteria and is used to determine the total importance, I, of the impact for each activity on all receptors and of the project overall.

On the basis of the value of the importance of impact, I, obtained, the severity of the impact of an activity is assessed.

Criterium	Definition	Scoring Scale
Intensity (IN)	Degree of destruction of activity on receptor	1 (lowest)-12 (highest)
Extension (EX)	Theoretical area of influence of the impact	1 (localized) – 8 (widespread)
Momentum (MO)	Period of time for manifestation of the impact	4 (immediate: <1 year) – 2 (medium: 1-5 years)- 1 (long term: > 5 years)
Persistence (PE)	Duration of the effect of the impact	1 (fleeting, < 1 year), 2 (temporary, 1-5 years), 4 (permanent, >5 years)
Reversibility (RV)	Possibility of returning to pre-activity initial conditions by rebuilding or natural means	1 (short term, < 1 year)- 2 (medium term, 1-5 years) – 4 (long term, > 5 years or irreversible)
Recoverability (MC)	Possibility of reconstruction with corrective measures	1 -2 (full and immediate recovery)- 4 (partial recovery and medium term)- 8 (unrecoverable)
Synergy (SI)	Reinforcement ability of manifested effects	1(No synergy of actions on a receptor) -2 (moderate synergism)-4 (high synergy)
Accumulation (Ac)	Progressive increase of the effect	1 (no cumulative effect)-4(cumulative effect)
Effect (EF)	Directionality of impact-the cause (action)-effect (impact)	4 (direct)- 1 (indirect)
Frequency (PR)	Regularity of manifestation of the effect	4 (continuous) – 2 (irregular)-1 (periodic)
Importance of Impact (I)	$I = \pm (3\times IN + 2\times EX + MO + PE + RV + SI + AC + EF + PR + MC)$	

Receptor CATEGORY	COMPONENT	RECEPTOR / ACTIVITIES	MOBILIZATION: Transport of equipment	Transport of machinery	Temporary storage	Traffic due to transport of equipmen	PREPARATION: Site preparation: Area delination & Fencing	Reception equipment & materials (unloading)	Storage of equipment & materials	Temporary infrastructure-workers' site	Water consumption	Waste generation	CONSTRUCTION: Excavation: low pressure (7 bar) depth 1 m	Pipe laying main PE (7 bar)	Excavation low pressure residential connections	pipe laying: low pressure residential connections	infrastructure & permanent buildings	Backfilling and road repair-	Reception & storage of equipment and materials	Waste Generation	Leakage testing: hydrostatic	Leakage testing: pneumatic	OPERATION: Gas netwrok processing	Leakage (residential)-Appliance conversion	magnitude	importance
PHYSICAL	Soil	Soil degradation										-3 1	-1 1	-1 1	-1 1	-1 1		5 5	-1 1	-5 5	-3 1	-1 1			-12	18
		Potential Soil pollution							-1 1			-1 1	-1 5	-1 1	-1 1	-1 1				-1 1	-5 1				-12	12
		Landscape & visual impact	-1 1	-1 1	-1 1		-3 10			-1 1			-2 5		-2 5	-2 5	-5 5	2 5							-16	39
	Air	Air quality	-1 1	-1 1		-1 1		-1 1					-3 1	-1 1	-3 1	-1 1		-1 1		-3 3		-1 1			-17	13
		Air emissions (gases and dust)	-1 1	-1 1		-1 1		-1 1					-6 6	-2 2	-6 6	-2 2		-5 5				-4 5	-4 1	-4 3	-37	34
	Water	Potential pollution of ground water sources																							0	0
		Superficial water sources consumption																							0	0
	Noise	Background noise levels	-1 1	-1 1		-5 5	-1 1	-2 1		-1 1			-8 5	-5 2	-8 3	-5 3	-1 1	-2 3	-5 2		-3 3				-48	32
	UG utilities	Integrity of UG facilities											-5 5		-5 5										-10	10
SOCIO-ECONOMIC	Social	Visual intrusion	-1 1	-1 1	-2 1	-2 1	-1 1		-1 1	-1 1		-1 1	-1 1	-1 1	-1 1	-1 1	-1 1	-1 1	-1 1	-1 1			-5 2		-23	18
		Occupational Health & Safety for workers	-1 1	-1 1	-2 1	-2 1	-1 1	-3 3	-3 3	-2 1			-3 3	-3 3	-3 3	-3 3		-1 1	-1 1		-1 1	-2 1		-1 1	-33	29
		Community Health, Safety & Security	-1 1	-1 1	-1 1	-1 1							-4 4	-4 4	-5 3	-2 2		4 4			-1 1		-3 1	-8 2	-27	25
		Workforce & job opportunities	1 2	1 2	1 1		1 2	1 2	1 2	1 2	1 2		1 2	1 2	1 2	1 2	1 2	1 2	1 2	1 2			1 2	1 2	18	35
		Land acquisition & involuntary resettlement																							0	0
		Local traffic & Accessibility on a **main road**																							0	0
		Local traffic & Accessibility on **urban road**	-7 7	-7 7		-7 7	-7 7	-7 7					-7 7	-7 7	-7 7	10 10		-7 7	-5 5	-5 5		-5 5	-9 1		-77	89
		Local traffic & Accessibilityon **local road**	-3 1	-3 1		-3 1	-3 3	-3 3					-3 3	-3 3	-3 3	3 3		-3 3	-3 3	-3 3		-3 3	-9 1		-42	34
		Physical cultural resources												-1 1	-1 1	-1 1	-1 1	-1 1							-5	5
		Overconsumption of community resources																							0	0
		Women & vulnerable groups																							0	0
	Economic	Infrastructure development																					3 3		3	3
		Community Development	2 2	2 2	2 2	2 2	2 2	2 2	2 2	2 2	2 2	2 2	2 2	2 2	2 2	2 2	2 2	2 2	2 2	2 2	2 2	2 2	2 2		42	42
		Local economy (local supply chain)	2 2	2 2	2 2	2 2	2 2	2 2	2 2	2 2	2 2	2 2	2 2	2 2	2 2	2 2	2 2	2 2	2 2	2 2	2 2	2 2	2 2		42	42
		Regional economy (supply chain)																					3 3		3	3
Magnitude			-12	-12	-1	-18	-11	-12	0	0	5	-1	-39	-24	-41	-1	-3	-5	-11	-13	-9	-12	-19	-12		
Importance			21	21	9	22	29	22	11	10	6	7	52	32	46	39	14	42	19	24	11	20	18	8		
					-43 / 73			-19 / 85										-158 / 299					-31 / 26			

The table below is based on the Buroz's Relevant Integrated Criteria

PROJECT PHASES																			
MOBILIZATION			PREPARATION					CONSTRUCTION							OPERATION				
Transport of equipment	Transport of machinery	Temporary storage	Area delination & fencing	Receiving equipment & materials (unloading)	Storage of equipment & materials	Temporary infrastructure	Waste generation	Excavation: low pressure residential connections	Pipe laying: low pressure- residential	Backfilling and road repair- street restoration	Reception & storage of equipment and materials	Waste Generation	Leakage testing: hydrostatic	Leakage testing: pneumatic	Gas network	Appliance conversion	Leakage (residential)	Waste generation	
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-	-		
5	5	1	1	1	2	2	1	5	6	2	2	6	2	2	8	1	8	3	
4	4	2	1	1	1	1	1	1	1	1	1	1	2	2	4	1	4	1	
4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	1	4	4	
1	1	1	1	1	1	1	1	4	4	4	4	4	1	1	1	1	1	1	
1	1	1	1	1	1	1	1	4	4	4	4	4	1	1	1	1	1	1	
4	4	1	1	4	4	1	4	1	1	1	1	4	1	1	2	1	1	1	
1	1	1	1	1	1	1	4	1	1	1	1	4	1	1	1	1	1	1	
4	4	1	4	4	4	4	4	4	4	4	4	4	4	4	4	1	4	4	
1	1	1	1	1	4	4	4	4	4	4	1	4	1	1	1	1	1	1	
1	1	1	1	1	1	1	1	4	5	1	1	1	1	1	1	1	1	1	
40	**40**	**18**	**19**	**22**	**28**	**25**	**28**	**43**	**47**	**31**	**28**	**49**	**24**	**24**	**47**	**13**	**46**	**25**	
32.7			**24.4**					**35.1**							**32.8**				
31.2																			

None/ Irrelevant	0	25
Minor severity	26	50
Medium severity	51	75
Major severity	76	300

Annex 5: Complaint Form

Local Distribution Company:----------

English Complaint Form

Date:---/----/------ Time: ---:----

Aggrieved person information

Name of the customer:---------- ID Number:----------

Address:----------

CRN:----------

Name of aggrieved person:----------

Relation to the customer:----------

Cell phone:----------

Summary of the complaint:

Name of aggrieved person ---------- Signature ----------

Complaint recipient

Name of the person received the complaint---------- Signature:----------

The entity caused the complaint---------- Zone:----------

Analysis of complaint reason:

Proposed corrective procedures:

Person responsible of the corrective procedures:---------- Signature:----------

شركة.....

شكوى عميل

التاريخ :- ...../...../..... **الوقت :-** :.....

بيـــــانـــــــات الشاكى

اسم العميل : ..... **رقم قومي** .....

العنوان:- ..... **CRN** :.....

اسم مقدم الشكوي:..... **صفتة:**..... **تليفون:**.....

ملخص الشكوى :

.....

.....

.....

.....

مقدم الشكوي

الاسم:..... **التوقيع :**

.....

بيـــانـــــات متلقي الشكوي

اسم متلقى الشكوى : ..... **التوقيع:**.....

الجهة المشكوي منها : ..... **المنطقة :**.....

تحليل أسباب الشكوى:

.....

.....

.....

.....

الإجراءات التصحيحية:

.....

.....

.....

.....

اسم متخذ الاجراء التصحيحي : ..... **التوقيع :** .....

Annex 6: Egypt Gas Health and Safety guidelines

The H&S practices of the Gas Distribution industry in Egypt follows International standards and the National labor law and its relevant decrees.

Egypt Gas, as one of the LDCs working in the project has taken the initiative to prepare H&S guidelines (kindly see below) that are generally followed by other LDCs. This is a comprehensive document in Arabic which covers environmental, health, and safety aspects of most project activities with clear instructions, administrative requirements, and illustrations.

Attached below is the 3rd version of the Egypt Gas H&S guideline. This version, currently under revision by Egypt Gas, in addition to actions proposed in the ESIA generally meet relevant WBG EHS guidelines. However, Egypt Gas and EGAS will seek to further align the guideline with WBG EHS guidelines during this revision.