



## 1.5 Million Natural Gas Connections Project in 11 Governorates

### Site-Specific Environmental and Social Impact Assessment

Qena City/Qena 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
ESIAF	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
SSIAP	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 ESIA's.

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) will be prepared for each of the project sub-areas within the governorate. Guided by the 2013 Environmental and Social Impact Assessment Framework (ESIAP) and Supplementary Social Impact Assessment Framework (SSIAP), this is the site specific ESIA for project components in Qena city as well as the connections network and Pressure Reduction Station (PRS). The project in Qena city encompasses 18,816 household connections in year 3 of the project and capacity increase of the existing PRS from of 10000 m<sup>3</sup> /hr to 20000m<sup>3</sup>/hr to connect new households during the 3 years.

**The local distribution company responsible for project implementation in Qena is Regions Gas Company (ReGas) or (شركة غاز الاقاليم- ريجاس).**

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.

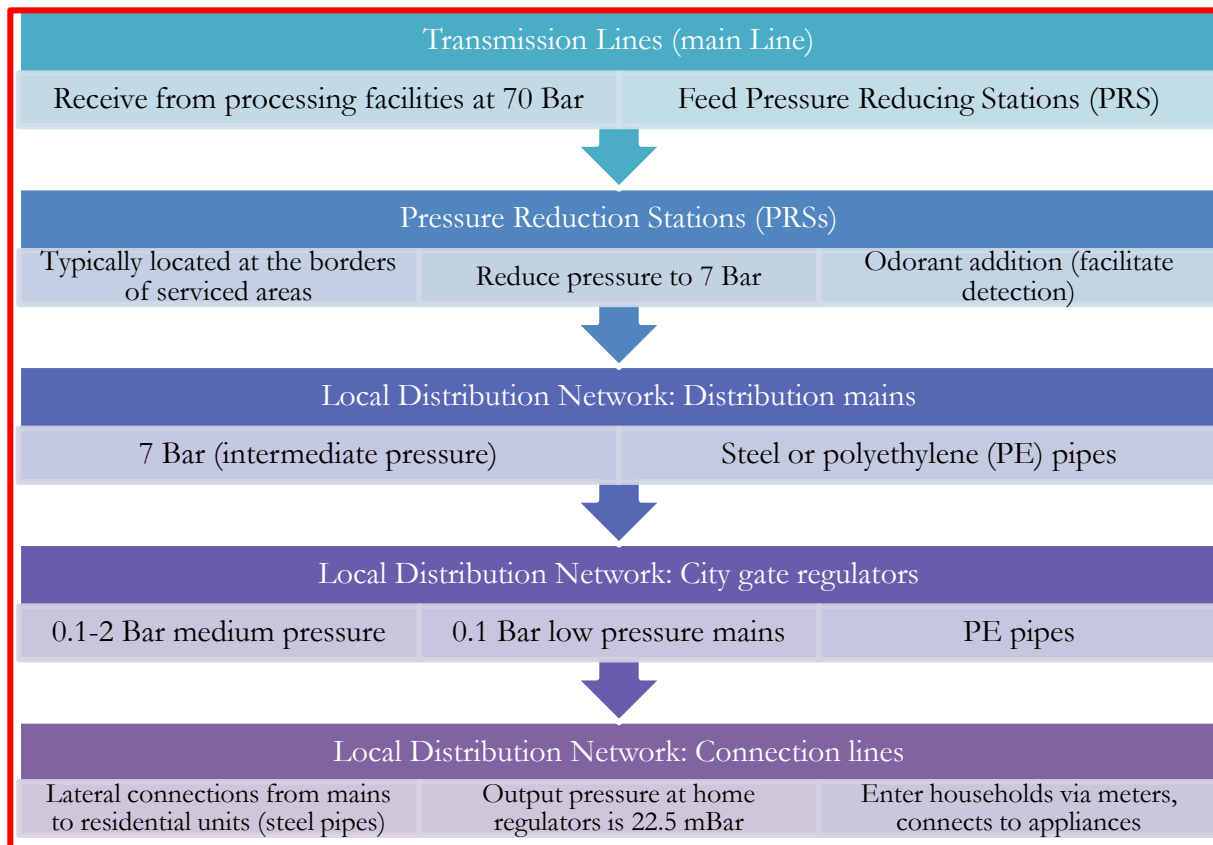


## 2 Project Description

### 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<sup>1</sup> 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 in **Qena** are enclosed in a box in the figure below:



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

<sup>1</sup> Because natural gas is odorless, odorants facilitate leak detection for inhabitants of residential areas.



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## 2.2 Project Work Packages

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### 2.2.1 Off-take & Inlet connection/Pipeline “70 bar system”

In Qena city there will be 50-m pipeline connection between off-take from the national high-pressure grid (70 bar) and PRS (Pressure Reduction Station).

### 2.2.2 Pressure Reduction Station (PRS)

PRS consists of equipment installed for automatically reducing and regulating the pressure in the downstream pipeline or main to which it is connected. Included are piping and auxiliary devices such as valves, control instruments, control lines, the enclosure, and ventilation equipment.

PRS for Qena city will be designed such that it has an inlet pressure range (70-18 bar) and outlet pressure 7 bar and maximum flow rate 20,000 SCM/H.

### 2.2.3 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 (HDPE) with maximum operating pressure (MOP) below 7 bar.

### 2.2.4 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 (MDPE) with MOP below 100 millibar.

### 2.2.5 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 pipe connecting the pressure reducing regulator/district Governor and meter Outlet (MOP 25 millibar) to appliances inside the customer’s premises.

### 2.2.6 Conversions

Conversions involve increasing the diameter of the nozzle of the burner of appliances (stove and bathroom water heater) to work with natural gas as a fuel gas rather LPG and others.

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## 2.3 Project Execution Methodology

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### 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 sanitary pipelines) 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

Table 2-1: Planned Connections

Governorate	First year 2016/2017	Second year 2017/2018	Third year 2018/2019	Total (Thousand units)
Qena city			18.816	18.816

### 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 transmission and 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 and PRSs, regulators, and metering stations



### 2.3.6 Construction works of Off-take & Inlet connection/Pipeline “70 bar system”

Qena City will be connected to the national Natural Gas Grid (High-Pressure Steel lines). A 50m off-take will connect the 70-bar HP line to a new 5,000 m<sup>3</sup>/h Pressure Reduction Station (PRS). Diameters of the steel-HP pipelines are 8 inch, and are usually 1.2m deep inside the ground.

General features of the construction activities are also applicable to excavation and installation of the 70-bar high-pressure piping. However, HP piping in the case of Qena is quite limited (50m). HP piping will take place in an area which is by and large uninhabited and exhibits minimal flora/fauna aside from agricultural crops in reclaimed desert land.

### 2.3.7 Construction works of PRS

#### 2.3.7.1 Pressure Reduction Station Civil Works

PRS siting was selected according to international best-practice and guided by minimizing the possible negative impacts on surroundings: the safety of neighboring areas from possible gas release accidents and noise associated with reducers operations. The PRS will be surrounded by a wall for safety and security purposes (including reducing noise impacts of the PRS reducers on the surrounding receptors). Currently, there are scattered buildings in the agricultural land surrounding the PRS. The closest buildings are around over 100m from the PRS location. In case buildings arise in the area around the PRS, Institute of Gas Engineers Safety Recommendations require the following buffer zones:

- Minimum distance between high pressure line (70 bar) and buildings outside the PRS will be 90 meters from the center line.
- PRS should have free areas from each side to allow for emergency vehicle access.
- At least 20 meters between reducers and any building which may arise in the future to minimize noise impacts.



Figure 2-2: Aerial view of the existing PRS to be expanded in Qena City





**Figure 2-3: Qena current Pressure Reduction Station**



**Figure 2-4: The location of the planned PRS**



**Figure 2-5: Digging the main roads close to the PRS in Qena**

### **2.3.7.2 Pressure Reduction Station Mechanical Works**

Constructing Pressure Reduction Stations and City gate Regulators are regular construction works in addition to connections between transmission mains and distribution mains. The PRS comprises two types of pressures, the first is the upstream pressure, which a high pressure is ranging from 30 to 70 Bar, while the second pressure is the downstream pressure, which is a low pressure (7 Bar). PRS design is in accordance with Institute of Gas Engineers/ Safety Recommendations IGE/SR/9, 10, 16, 18, 22, 23, 24, 25; Institute of Gas Engineers/ Transmission Distribution IGE/TD/13; and National Fire Protection Association NFPA 15.

#### **2.3.7.2.1 Inlet stage**

Inlet components of the PRS should be completely isolated from the cathodic system applied to the feeding steel pipes by installing isolating joint with protection.





#### 2.3.7.2.2 Filtration stage

The aim of the filtration stage is to remove dust, rust, solid contaminants and liquid traces. Two filters and two separators are installed in parallel; each filter-separator operates with the full capacity of the PRS. Filter-separator lines are equipped with safety devices such as differential pressure gauges, relief valves, liquid indicators, etc.

#### 2.3.7.2.3 Heating stage

Because the difference between the inlet and outlet pressure is relatively high, icing normally occurs around outlet pipes. This may cause blockings and accordingly reduce or stop the gas flow. To avoid such circumstances, a heater is installed to keep the temperature of outlet pipes over 7°C. Each PRS is equipped with two heaters in parallel in order to allow for a standby heater in emergencies.

#### 2.3.7.2.4 Reduction stage

Each PRS includes two reduction lines in parallel, also to allow for a standby line. The lines are equipped with safety gauges, indicators and transmitters to maintain safe operation conditions. According to the IGEM standards, the reduction unit should be installed in a well-ventilated-closed area or, alternatively, in an open protected area.

#### 2.3.7.2.5 Measuring stage

After adjusting the outlet pressure, gas flow and cumulative consumption are then measured to monitor NG consumption from the PRS and to adjust the dosing of the odorant as indicated below. Measuring devices are sensitive to low gas flow, which normally occurs during first stages after connecting a small portion of targeted clients.

#### 2.3.7.2.6 Odorizing stage

The objective of the odorant is to enable the detection of gas leaks in residential units at low concentration, before gas concentration becomes hazardous. The normally used odorant is composed of Tertiobutylmercaptin (80%) and Methylsulphide (20%). The normal dosing rate of the odorant is 12-24 mg/cm<sup>3</sup>. The system consists of a stainless steel storage tank, which receives the odorant from 200-liter drums, injection pumps and associated safety devices.

#### 2.3.7.2.7 Outlet stage

The outlet stage includes an outlet valve gauge, temperature indicators, pressure and temperature transmitters and non-return valves. The outlet pipes are also, like inlet pipes, isolated from the cathodic protection by an isolating joint.

### 2.3.8 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 355mm according to GIS PL2-8.

#### **2.3.8.1 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.

#### ***2.3.8.2 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, which transfer it to disposal areas. Because of the limited available space on most Egyptian streets, loading waste trucks shall be done upon excavation, whenever possible, in order to avoid stockpiling waste on site.

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.

#### ***2.3.8.3 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).

#### ***2.3.8.4 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.

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

#### ***2.3.8.5 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).

### **2.3.9 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.

### **2.3.10 Construction works of household installation**

- 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

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.

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.

### **2.3.11 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.

### **2.3.12 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**

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### **2.4.1 Operation of the PRS**

Operation of the PRS involves operation of the various components outlined in the construction phase. Risks associated with those activities are further addressed separately in a Quantitative Risk Assessment (QRA).

#### ***2.4.1.1 Filtration stage***

During the operation, one filter-separator line is operated, while the other is on standby.

#### ***2.4.1.2 Heating stage***

During operation, one of the two heaters in parallel is used, while the second is kept on standby and operated in case of emergencies.

#### ***2.4.1.3 Reduction stage***

One of the two reduction lines in parallel is used, while the second is on standby. y line.

#### ***2.4.1.4 Measuring stage***

Gas flow and cumulative consumption are measured to monitor NG consumption from the PRS and to adjust the dosing of the odorant as indicated below.

#### ***2.4.1.5 Odorizing stage***

Operation of the odorant unit is controlled automatically, and could be switched to manual operation if needed.

### **2.4.2 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;



- Checking cathodic protection on "Flange Adaptors" by taking voltage readings and changing anodes whenever needed.

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 and welding, backfilling and road repair

#### **2.4.3 Repairs in households**

Repairs in include appliance adjustments or piping/metering replacement.

#### **2.4.4 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 Qena city as no land acquisition or resettlement is anticipated. The PRS land was a state owned land allocated by Qena. Governorate to EGAS.

The PRS land was obtained from state owned lands with no encroachment or customary land use. Additionally, the network will pass through the main urban streets and local roads without affecting any private assets causing and economic displacement.

### 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<sup>2</sup>, 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<sup>3</sup>. 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 envisaged that the project will result in any physical or economic dislocation of people in **Qena city** as the PRS will be implemented in State owned lands with no encroachment or illegal use. Additionally the gas network will penetrate the main urban streets. It will not go inside any agriculture 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<sup>4</sup> will be followed by the Project.

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<sup>2</sup> 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*.

<sup>3</sup> 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.

<sup>4</sup> <https://policies.worldbank.org/sites/ppf3/PPFDocuments/Forms/DispPage.aspx?docid=3694>



### **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 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.



## 4 Environmental and Social Baseline

### 4.1 Description of the Environment

Qena Markaz is located in the middle of Qena Governorate, between Deshna center from the north, Naqada and Qift from the South. The Nile River is dividing Qena Markaz and city, the city is located in the eastern part of the Nile. Qena City is the capital of the governorate. It is located in the north of Qena approximately 500 km south of Cairo.

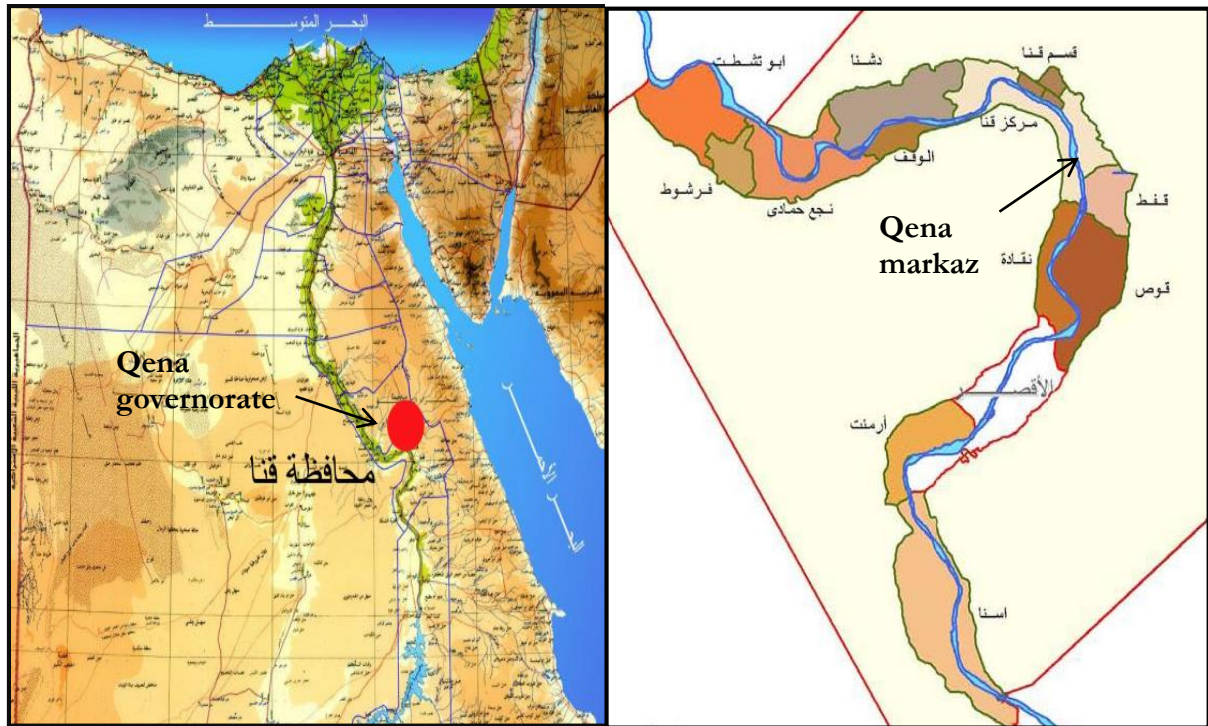


Figure 4-1: Qena governorate (red circle) and distribution of Marakez (right).

#### 4.1.1 Climatology and Air Quality

##### *Site Specific Ambient Air Quality*

8-hour average measurements were conducted for pollutants of primary concerns, namely, carbon monoxide (CO), nitrogen dioxide (NO<sub>2</sub>), sulfur dioxide (SO<sub>2</sub>), Total Suspended Particulates (T.S.P) and particulate matter (PM<sub>10</sub>).

Table 4-1: Location of Air and Noise measurements

Location	N coordinates	E coordinates
Qena city (General hospital)	26° 9'35.40"N	32°42'22.83"E
Qena pressure reduction station	26°10'20.26"N	32°41'18.83"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: Eight-hour average results at the general hospital ( $\mu\text{g}/\text{m}^3$ )**

<i>Time</i>	<i>NO</i>	<i>NO<sub>2</sub></i>	<i>NO<sub>x</sub></i>	<i>SO<sub>2</sub></i>	<i>CO</i>	<i>PM<sub>10</sub></i>	<i>T.S.P</i>
10:AM	17.8	15.3	34.1	16.4	2.7	125.82	161.47
11:00	15.4	14.9	30.3	8.4	2.8		
12:00	15.2	14.5	29.7	10.3	2.9		
13:00	15	14	29	12.9	3.1		
14:00	14.8	13.9	28.7	12.9	3.1		
15:00	14.8	13.5	28.3	16.8	2.9		
16:00	13.7	20.3	34	16.8	2.9		
17:00	13	23.7	36.7	15	2.8		
<b>Limits</b>							
National (24 hrs)	150	150	150	150	10 ( $\text{mg}/\text{m}^3$ , 8hrs)	150	230
WB (24 hrs)	-	-	200 (1 hr)	125	N/A	150	230

**Table 4-3: 8 hours average results at pressure reduction station location ( $\mu\text{g}/\text{m}^3$ )**

<i>Time</i>	<i>NO</i>	<i>NO<sub>2</sub></i>	<i>NO<sub>x</sub></i>	<i>SO<sub>2</sub></i>	<i>CO</i>	<i>PM<sub>10</sub></i>	<i>T.S.P</i>
17:00	13.7	20.3	37	11.9	3.1	110.12	150.33
18:00	13	23.7	36.7	15	3.3		
19:00	13.1	23	36.1	10.4	2.9		
20:00	13.6	23.7	37.3	8.2	2.9		
21:00	13.1	19.9	33	6.7	2.9		
22:00	11.1	13.7	24.8	6.3	2.1		
23:00	15.7	30.5	34	10.8	1.9		
00:00	15.9	33.6	36.7	15	2.2		
<b>Limits</b>							
National (24 hrs)	150	150	150	150	10 ( $\text{mg}/\text{m}^3$ , 8hrs)	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 engines are certified, i.e., exhaust is below permissible levels. Ambient concentrations of gaseous pollutants, NO<sub>x</sub>, SO<sub>x</sub> 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 and rehabilitation activities will likely cause dust levels to surpass permissible levels in construction areas. 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.

#### ***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 4-4 Ambient Noise Levels measured at the general hospital**

Time	Sound Level Equivalent & Percentile Recordings in dBA for 24 Hours					
	LAeq	LA10	LA50	LA90	LA95	LCpeak
10:00	<b>42.79</b>	41.58	31.58	25.04	23.63	108.85
11:00	<b>55.2</b>	45.41	51.53	50.03	52.47	100.74
12:00	<b>46.12</b>	44.43	37.99	33.89	32.81	118.63
13:00	<b>41.83</b>	45.48	38.11	32.58	31.71	88.82
14:00	<b>57.9</b>	52.54	41.9	36.13	34.77	93.7
15:00	<b>52.98</b>	56.19	47.64	38.16	36.34	95.32
16:00	<b>53.12</b>	56.87	47.47	39.7	37.8	104.96
17:00	<b>54.5</b>	58.67	49.75	38.61	36.17	99.24



**Table 4-5: Ambient Noise Levels measured at the pressure reduction station location**

Time	Sound Level Equivalent & Percentile Recordings in dBA for 24 Hours					
	LAeq	LA10	LA50	LA90	LA95	LCpeak
17:00	55.12	51.58	41.58	40.04	33.53	90.85
18:00	53.32	45.41	52.53	50.03	53.47	88.74
19:00	56.41	44.43	53.99	33.89	44.81	110.63
20:00	59.11	45.48	43.11	48.58	40.71	88.82
21:00	61.7	52.54	49.9	49.13	44.77	99.7
22:00	60.98	56.19	48.64	46.6	46.34	97.11
23:00	66.88	56.87	47.47	38.1	41.8	100.1
00:00	55.41	58.67	49.75	41.1	40.17	97.12

**Table 4-6: National and World Bank limits for ambient noise levels**

Noise	Egyptian Law 4 Requirements			WB Requirements		
	TYPE OF AREA	Permissible noise intensity decibel		Receptor	One hour L <sub>Aeq</sub> (dBA)	
		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 street/road near the measurement location, baseline ambient noise levels are marginally higher than the national (Sensitive Area: Hospital for connections /Rural Area for PRS)and 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

The climate in Qena city is continental climate, hot in summer and cold in winter.

#### Temperature

The average annual temperature is 24.1°C in Qena. The warmest month of the year is August, with an average temperature of 32.0°C. January has the lowest average temperature of the year at 13.4°C.

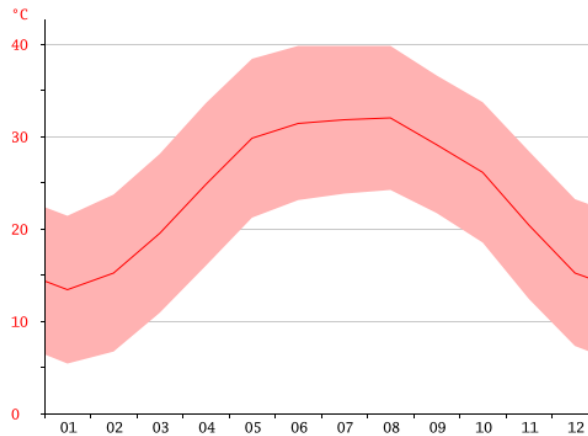


Figure 4-2: Average annual temperatures (red line) and maximum and minimum temperatures.

#### Rainfall

The average annual rainfall are shown in the table below.

Table 4-7: Mean rainfall in Qena (CAPMAS statistical Year book 2015)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mean Rainfall (mm)	0	0.2	1.2	0.2	0	0	0	0.4	0.2	0.2	0.1	0.1

### 4.1.3 Geology

The stratigraphy of Qena consists of the following units:

- Holocene Unit: Silty Clay (Neonile deposits)
- Late Pleistocene Unit (Prenile deposits)
- Plio-Pleistocene Unit (Protonile-Prenile deposits)
- Pliocene Unit (Paleonile deposits)
- Eocene Unit
- Palaeocene-Late Cretaceous Unit
- Upper Cretaceous-Paleozoic
- Pre-Cambrian



#### 4.1.4 Water resources

##### *Surface water*

Wadi Qena drains from the Red sea to Nile, which flows through Qena.

**The projected work will be in residential areas in the city of Qena; no works are planned to cross any wadis or the Nile.**

##### *Water canals*

Qena Governorate is supplied with Nile water through the two main canals: Asfoun and Kalabaya canals, which are located on the western and eastern side of the Nile, respectively.

**The projected work will be in residential areas in the city of Qena; no works are planned across canals.**

##### *Groundwater*

The main groundwater aquifer in Qena city is the Nile valley aquifer system composed of Quaternary and Late Tertiary sand and gravel beds intercalated with clay lenses.

**Groundwater of the Nile aquifer is unlikely to be encountered as excavation depth for does not exceed 1 m.**

#### 4.1.5 Terrestrial Environment

##### *Terrestrial habitats*

The terrestrial habitat in Qena is characterized by:

- Wetlands:
- Agricultural/arable lands
- Desert

The projected work is planned along existing roads in residential areas; no pipelines will be passing through any of the aforementioned habitats. **No pipelines will be passing through any of the aforementioned habitats as the connections will be installed in the city.**

##### *Flora*

With respect to flora of significance, none were encountered in residential areas, where household connections are planned. Typical residential areas are free of significant vegetation.

**The projected works are to take place in urbanized areas, where flora of significance is absent.**

##### *Fauna*

The presence of domesticated animals such as camels, buffaloes, cows, donkeys, sheep goats, horses and dogs, was dependent on human activity and found in agricultural areas. All of these animals were sheltered and fed by their owners either in open or covered pens, and no free grazing animals were observed.

**The projected works are to take place in urbanized areas. Hence, migrant and resident birds occurring in wetlands, arable lands and desert habitats, and reptiles and amphibians are unlikely to be encountered.**



### ***Statutorily Protected Areas***

Qena city is not located within any Statutorily Protected Areas<sup>5</sup>.

### ***Important Bird Areas***

Qena lies within an Important Bird Areas (IBA)<sup>6</sup>. Project activities namely excavation and rehabilitation are ground level activities lasting over the duration of a work day (8 hours), therefore, unlikely to impact birds. Concerning household connections, pipelines will be installed on existing buildings; therefore, no impact is expected to affect birds.

#### **4.1.6 Physical cultural resources**

The main physical cultural resources in and around Qena city are:

- Dendara temple: Located on the west bank of Qena city 8 km across from Qena city center.
- Sidi Abdelrahim El Qenawy mosque: one of the most popular mosques located in the city.
- Qose temple
- Shanhour temple in Quos (40 km away from Qena city center)
- The Church of the Great Martyr Saint Mar Girgis located in the city
- Qift temple

Other sites of religious significance include: El Daqity mosque, Al Zawya mosque, Al Bar Al Taqwa mosque, El Mahatta mosque, Sidi Omar mosque, Sidi Abu el Hassan mosque, Al Maghreby mosque, Al Salam mosque, the Church of the Martyr Al Aqiqa Domiata, the Monastery of the Great Al Mar Morcos Al Rassoul, Church of the Great Prophets Botros and Bolis.

**Concerning the household connections, the project work is planned in residential areas where physical cultural resources are unlikely to be encountered.** However, should any chance finds occur, the procedure outlined in the Annex 2 titled ‘Chance Find Procedure’ will be followed.

Cemeteries

Cemeteries are located within in residential area next to Sidi Abdel Rehim mosque.

#### **4.1.7 Road distribution network**

##### **Main roads**

- Cairo -Qena Desert Road
- Cairo- Qena Agriculture Road
- Al Koossir -Qena Road
- Qena -Safaga Road

**No works are planned along main roads.**

<sup>5</sup> [http://www.ecaa.gov.eg/Portals/0/eaaReports/N-protect/Protectorates2013\\_A3En\\_Ar\\_Existing\\_Future.pdf](http://www.ecaa.gov.eg/Portals/0/eaaReports/N-protect/Protectorates2013_A3En_Ar_Existing_Future.pdf)

<sup>6</sup> <http://www.birdlife.org/datazone/userfiles/file/IBAs/AfricaCntryPDFs/Egypt.pdf>



### Urban primary and secondary arterial streets

Urban arterial streets are 3-4 lanes wide, partially paved with asphalt and partially dusty and rocky. Urban roads carry major portions of traffic in and out of urban areas. Street parking is usually prohibited on primary streets and allowed on secondary streets. Urban arterial streets include: Corniche el Nile and the Dandara Bridge shown in the figure below.



Figure 4-3: Dandara bridge (left) and Corniche el Nile (right) in Qena city.

Urban Secondary Arterial Street are of a lower grade than the primary arterial network (e.g. lower number of lanes). Examples include: Al Rayah Street, Naga al Mansour Street, Qena, Manfaloot and Algumhoria Street.

Other popular streets include: Mahatta street, Al Gomhoreya street, El Sahareeg street, Mostafa Kamel street, July 26th street, July 23rd street, Luxor street, Port Said street, El Helal hospital; street Macaroni factory street, Al Shatourea street and El Ghazal factory street.



Figure 4-4: Secondary road network in Qena city





**Urban roads consist of residences as well as businesses. As households are present on urban roads, construction works are likely to pass through urban roads.**

**Local streets**

Local streets are 2 lanes wide and serve residential areas. Local and distributor streets within the city of Qena are dusty and rocky. Street parking is allowed. Those streets are not congested with vehicles, where the principal modes of transport are Tuk Tuks, carriages pulled by donkeys, walking, and bicycles. Examples of local streets are shown below.



**Figure 4-5: Local street in Qena city**

As households are mainly present on local streets, construction works are likely to pass through local streets.

**4.1.8 Waste management**

Construction waste is disposed of based on an agreement between the contractor and the local council. The waste is transported to the dump site Al Taramsa. Pipe left overs are collected and transported regularly to Cairo.

Domestic waste is transported to a recycling plant in El Saleheya in south of Qena. The waste is separated in to recyclables and non-recyclables. Non recyclables are transported to large landfills in Al Tersana located on the West bank of Qena.

The Nasreya & UNICO facilities in Alexandria are the only designated entities in Egypt for disposal of non-medical hazardous waste.

Project activities in Qena will take place in the city, where project workers will have access to public sanitary facilities. Therefore, no extra sanitary waste is anticipated.

**4.1.9 Physical structures**

The implementing body in Qena city, EGAS/REGAS, has carried out an assessment to determine the eligibility of structures for proposed pipeline connections. The type of dwelling should be highlighted in order to identify the probability to install the NG to those houses. With regards to the sample surveyed 65.2% all of the sample surveyed live in an apartment and 33.6% live in separate house.



The data collected revealed that the majority of the sample surveyed live in newly constructed buildings. The type of buildings in the selected areas is suitable to install the NG.

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. It was obvious that some of the buildings are still under construction. The concrete columns were seen among various areas. Total number of floors within the house is at least 3 floors. The majority of buildings are more than 5 floors.



Figure 4-6: Physical structures in Qena city

## 4.2 Socioeconomic Baseline

Qena is one of South Upper Egypt Region's governorates that encompasses Aswan, Sohag, Qena, the Red Sea, and Luxor. Qena is an agricultural as well as an industrial governorate. It ranks first in production of sugar cane, tomatoes, bananas, sesame, and hibiscus. Total cultivated area comes to nearly 291.7 thousand feddans of which sugar cane makes up 64%. 60% of sugar production nationwide comes from Qena.

### 4.2.1 Administrative division

Based on the information available from the Statistical Year Book 2015, Qena Governorate consists of 9 Markaz and cities<sup>7</sup> and 41 *Shiakha*. Additionally, there are 111 rural local units and no affiliated villages plus 1466 hamlets. Qena Markaz comprises one city, 7 shiakha, 17 rural local units and 226 hamlets

Qena Markaz's total area is 403.2 km<sup>2</sup> including the desert border. The total populated area is 201.51 km<sup>2</sup>. It represents 50.0% of the total area. The majority of population reside the banks of Nile valley.

### 4.2.2 Urbanization trends

The governorate geared towards expansion into the desert, thus it established new urban communities on the desert hinterland. i.e. New Qena City.

<sup>7</sup> Markaz represents the main administrative division in the governorate. It is equivalent to a region





### **4.2.3 Demographic characteristics**

#### ***Total Population***

The total population of Qena Markaz is 654,107 people who reside 138,704 households. The residents of Qena Markaz represent about 21.78% of the total population in Qena Governorate.

The percentage distribution reflects that 19.8% of the total population live in urban areas in Qena Governorate, while 80.2% of reside in rural areas. With regard to percentage distribution by area 37.0% of the total population live in urban areas in Qena Markaz.

#### ***Age Structure***

The age distribution of the population in Qena Governorate shows that almost 38.0% are less than 15 years old; while those between 15 to 45 years old represent about 29.19%. The population pyramids shows that the majority of Qena Governorate is growing young as the majority are less than 25 years old. In Qena City, 35.59% are less than 15 years old, while adults aged 15 to 45 represent 31.24%.

#### ***Rate of Natural Increase***

The total birth rate in Qena governorate is 29.8 births per 1000 persons. The adult mortality rate is relatively low; it is 5.4 per 1000 people. This gives a natural growth rate of 24.4 per thousand persons in Qena Governorate. There is no information on the district level.

### **4.2.4 Living conditions**

#### ***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 Qena Governorate is about 4.73 persons. All the sample surveyed live in apartment building.

### **4.2.5 Access to basic services**

#### ***Access to Electricity***

Access to electricity in Upper Egypt governorates is 99.0% (Egyptian Human Development Report 2010). Even squatter areas have access to electricity regardless of their legality. The number of customers of the Electricity Utility Company in Qena Governorate is 660,494 units. In Qena Markaz, the number of subscribers is 220, 8867. It is relatively crucial to mention that minor percentage of residents within the project areas in Qena Markaz have no legal access to electricity.

The census showed that the majority of households use electricity as the main source of lighting. However, the electricity supply is not stable and is frequently interrupted, particularly in rural areas. (Source: Qena Statistical Year Book, 2015)

A quarter of the sample surveyed consumes less than 50 EGP per month, while 58.3% of the sample consume 50 to135 EGP. The average electricity consumption in Qena Governorate is about 61.3 EGP.

#### ***Access to potable water***

The governorate depends almost entirely on Nile water for all its water needs. Occasionally, ground water is utilized in remote areas. Accessibility to potable water is high in Qena Governorate, and 85.6% the households in Qena City have access to running potable water.



The Human Development Report 2010 presented limited information about access to sanitation networks which is one of the requirements to install the NG. The coverage of sanitation networks in Qena Governorate urban areas is high. 32.09% in the Governorate have access to a proper sanitation networks. This figure increased to be 94.23% in Qena City.

#### 4.2.6 Human development profile

Egypt’s Human Development Report (2010) ranked the governorates according to their human development index scores. Tracking the level of Human Development achieved in different governorates since 2005, five governorates occupied the first five rankings in HD level, namely Port Said, Suez, Cairo, Alexandria and Damietta, while the governorates that occupied the bottom five ranks are Fayoum, Assiut, Menia, Beni Suef and Qena.

##### *Education*

Education is perceived as the first shell that can help population to withstand poverty. The review of the secondary data showed that intermediate education prevailed among all governorates. There was a remarkable gap between males and females’ education. 33.48% of females are illiterate, compared to 25.7% of males. University graduates represent 14.88% of males and 10.87% of females. In Qena City illiteracy rate is 17.84% among males and 25.06% among females.

##### Unemployment and Work Status

The total labor force (above 15 years) in Qena Governorate is estimated by 856,300 person. The population within labor force are estimated by 756,600 person. The total working people of the labor force is 99,900. 12.7% of the females are within the labor force, whereas 87.3% of the females are housewives.

The unemployment rate is estimated by 16.34%. It reaches to 29.3% among females (Poverty Mapping 2013). Employment rate in Qena City is relatively high. 18.43% of the total labor force are unemployed. This ratio increases to be 25.41% of females. The study team investigated the work of households’ head. He will be responsible for paying the installation cost.

26.9% of the total sample in Qena City work as administrative laborers. 16.9% work as services and sales persons. Skilled laborers represent about 8.0% of the sample. 21.1% of the sample are unemployed.

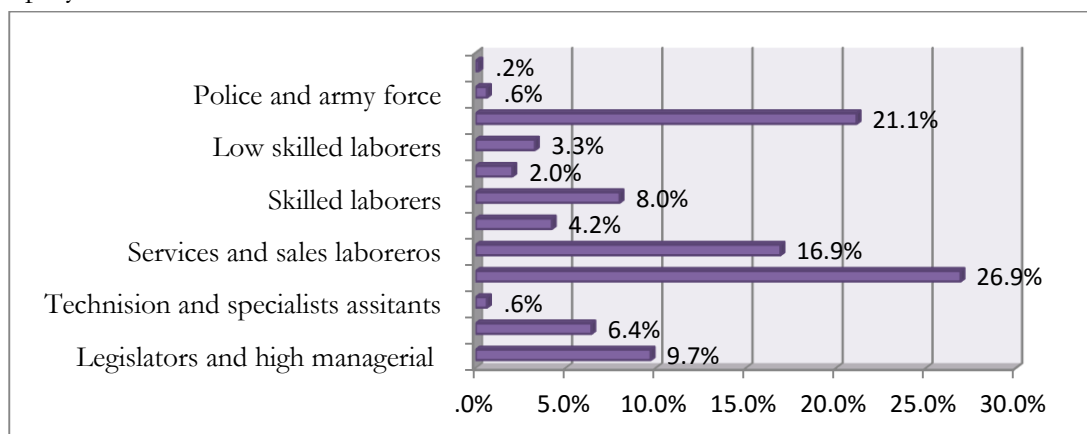


Figure 4-7: % Distribution of sample by head of household type of work  
Source: Data collection results

#### 4.2.7 Poverty index

The extreme poverty measure is very close to US\$ 1.25 per day (Millennium 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 (purchasing power parity) exchange rate of US\$1=LE3.1 for 2008/2009. (Handousa, 2010)

According to poverty mapping developed by CAPMAS in 2013, poor people in Qena Governorate are estimated by 44.67%. The total percentage of poor people in Qena city is 31.58%. The annual expenditure per capita is 4571.2 EGP in Qena Governorate. The value escalates to be 5155.55 EGP in Qena City

#### 4.2.8 Income and expenditure

NG installation project necessitates a clear determination of poverty through analyzing the income and expenditure of the household. Reliability of expenditure data is higher than that of income.

People are more willing to talk about expenditure rather than income. Thus, the study focused on the breadwinner who supports the family financially. The expenditure and income of households reflected that 42.9% of the sample surveyed spend less than 1500 EGP. The average expenditure value is estimated by 1720.00EGP per household. This is relatively above poverty ratio. Income average was relatively high in Qena City 1928.47 EGP per month.

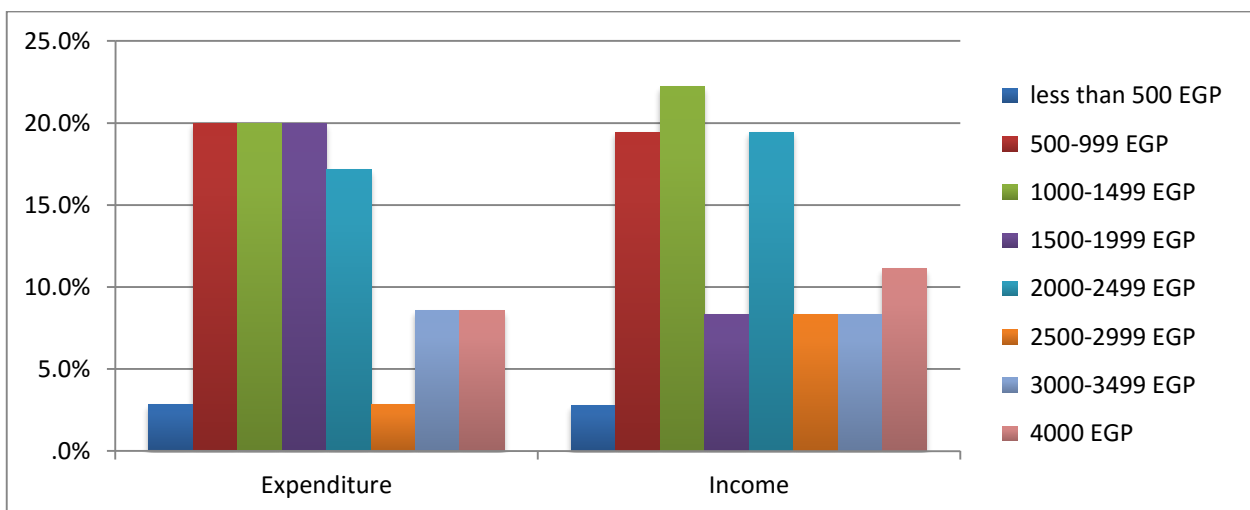


Figure 4-8: % Distribution of population by income & expenditure in Qena City  
Source: Data collection results

Stability of income is one of the factors that might play for the benefit of the project as paying by installment is one of the payment option. About 10.0% of the total sample surveyed reported a decrease in their income during the previous year. However, about 42.5% of the sample surveyed reported an increase in their income. This is a good indication that works for the benefit of encouraging paying in installment.

#### 4.2.9 Fuel currently used in households

The sample surveyed in Qena City reported that the main type of fuel used for cooking is the LPG cylinders. The source of aforementioned type is mainly the LPG outlet (60.0%). The second source is the LPG cylinder distribution vehicle.



The distribution system suffers due to the chaotic distribution mechanism. Many groups try participating in the distribution activities. It is completely an informal system. The informal group includes vendors, grocers, house guards and community based organizations. The Local Governmental Unit participates only during the shortage of LPG. It is worth noting that the LPG fuel is used also for baking in house backing ovens that can't be operated by the NG. That was one of the main concerns raised by the community during the consultation activities.

The data collected revealed that informal LPG distributors in Qena City earn about 50-100 EGP per day (working for 10-20 days a month). Nevertheless, they earn around 100 + EGP per day during the LPG shortage period in winter. The governmental LPG distributors (formal groups) who work in the LPG outlet get about 5-15 EGP per each LPG cylinder as so called *tips*. They have a lucrative business out of that. During LPG cylinders shortage they gain 20-25 EGP per each cylinder.

With regards to the fuel used for water heating, 97.4% of the sample use electric heaters.

#### 4.2.10 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 natural gas. The majority of the sample surveyed in Qena City reported that the LPG cylinder is not available all the time (67.5%). The respondent reported the high cost of LPG cylinder and price fluctuations, particularly, during shortage periods in winter. Also, they reported the leakage of the LPG cylinder. Another problem reported is that the LPG cylinder is not full as the vendors use it, thereafter they trade in. Transportation of cylinders was one of the problems raised and assembling in queues to obtain the cylinder.

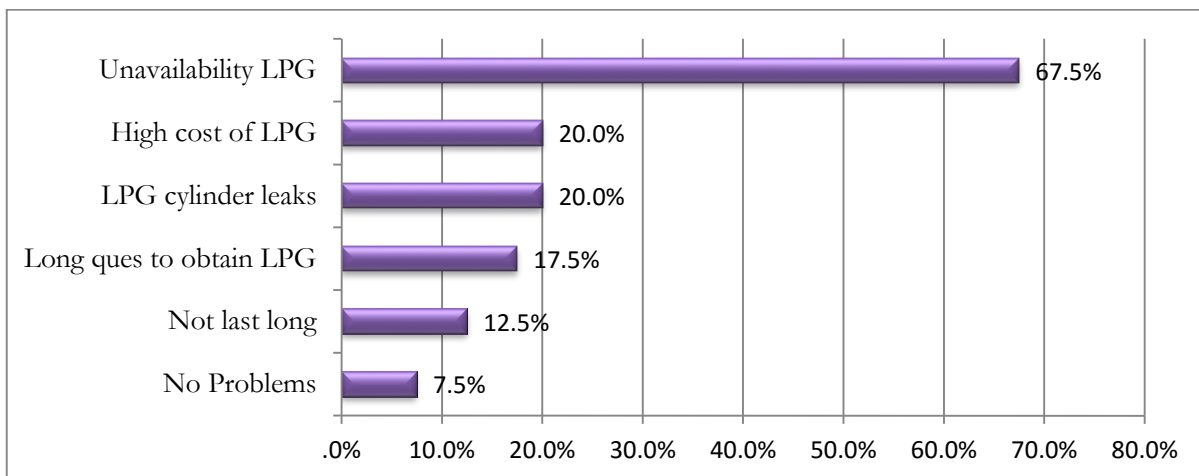


Figure 4-9: Distribution of the problems related to LPG cylinders  
Multiple responses

Strategies to overcome such problems will enable the team to define the willingness to convert to the NG. 45.0% of the sample surveyed reported that they obtain the LPG cylinder through paying a higher price. 20.0% of the sample reported that they have a spare cylinder. The majority of them have to obtain the cylinder either by going to other areas or borrow from their neighbors.

Electricity used in water heating fuel was of less problems. High electricity bill was the first major problem. The second problem was the power cut. Additionally the efficiency of the electric heater is not as the gas one. The sample surveyed reported that they overcome such problems by heating water on the stove.



#### 4.2.11 Perception towards the project

Throughout the various consultation and engagement activities, the work teams 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 many Egyptian families (especially women) in obtaining LPG cylinders (the current household fuel) was revealed through testimonies all over the country during the preparation of the framework and the site specific studies.

95.0% of the sample reported positive perception of the NG. Community perceptions were investigated in order to gain better understanding for the hosting communities' attitudes towards the project. It is very obvious that almost all of the sample have positive perception about NG. The NG has many remarkable benefits as 56.0% reported that NG save time and effort. The availability and reliability was reported by 46.2% of the sample surveyed. Safety of the NG was reported by the respondents. It will also put limitation to the crisis of the LPG cylinders shortage. It will also work for solving electricity shortage problem. The humiliating treatment of the vendors and LPG handlers will not continue.

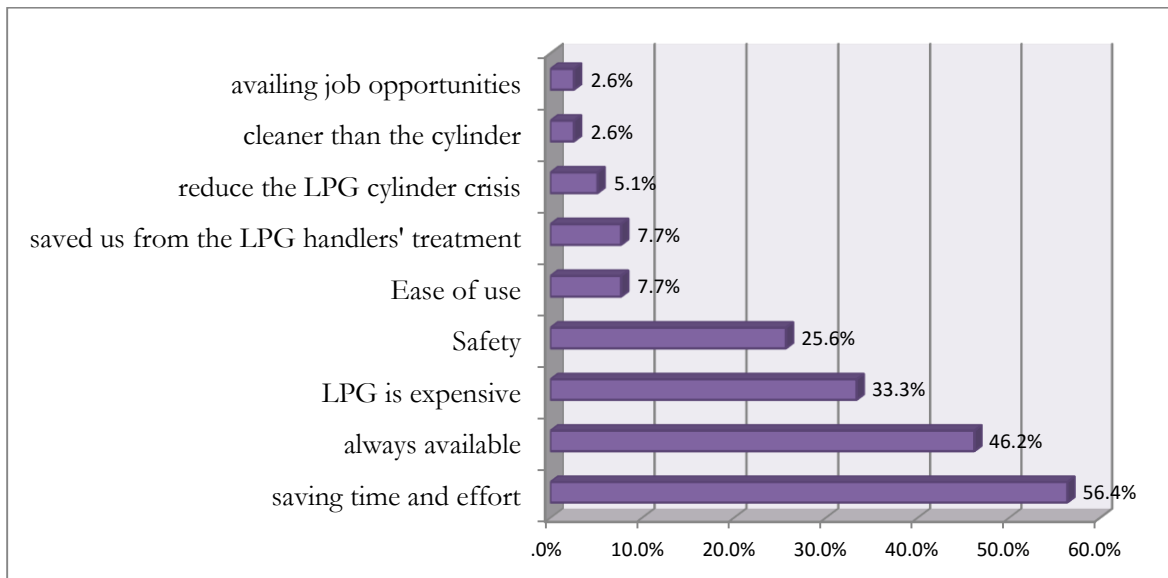


Figure 4-10: Perception of the NG in Qena Governorate  
Source: Data collection results

Additional level of investigation was applied on the sample through asking directly about the drawbacks of the NG. 42.0% of the sample reported no disadvantages of the NG. 22.5% reported problems related to damaging the streets and disturbing traffic. 7.5% respondents of the surveyed sample reported high cost of the NG installation. 7.5% of the sample surveyed reported having limited financial resources. 12.5% of the sample reported lack of safety.



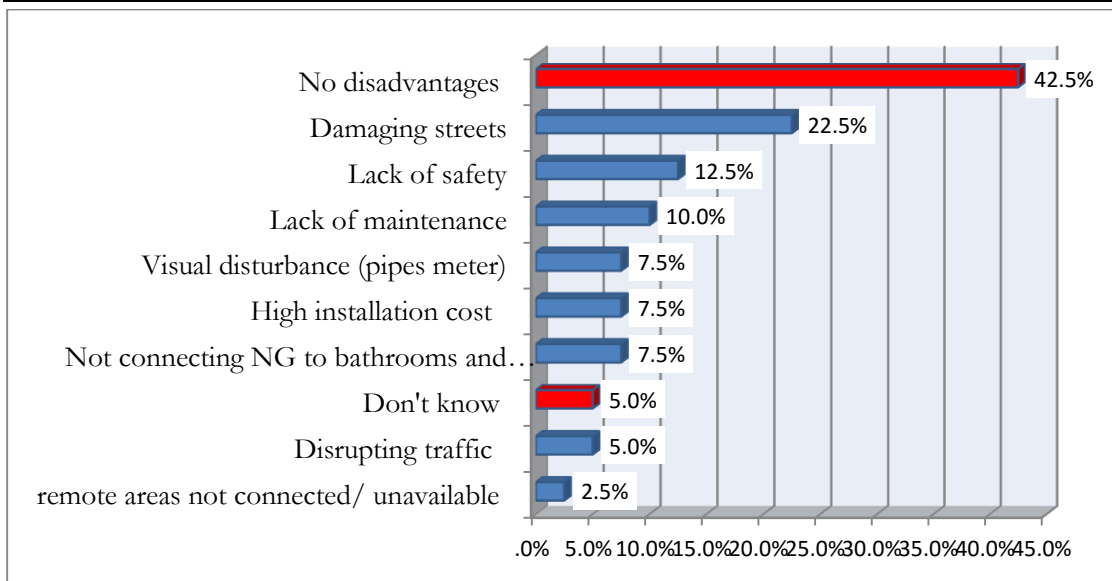


Figure 4-11: Concerns related to NG in Qena Governorate  
Source: Data collection results

#### 4.2.12 Gender dimension of the current type of fuel

Females play a major role in the domestic labor related to bringing and handling LPG cylinders. 12.5% of the households nominate women to bring the LPG cylinder from the LPG outlet. 20.5% of the sample nominate woman to install the LPG cylinder to the cooker.

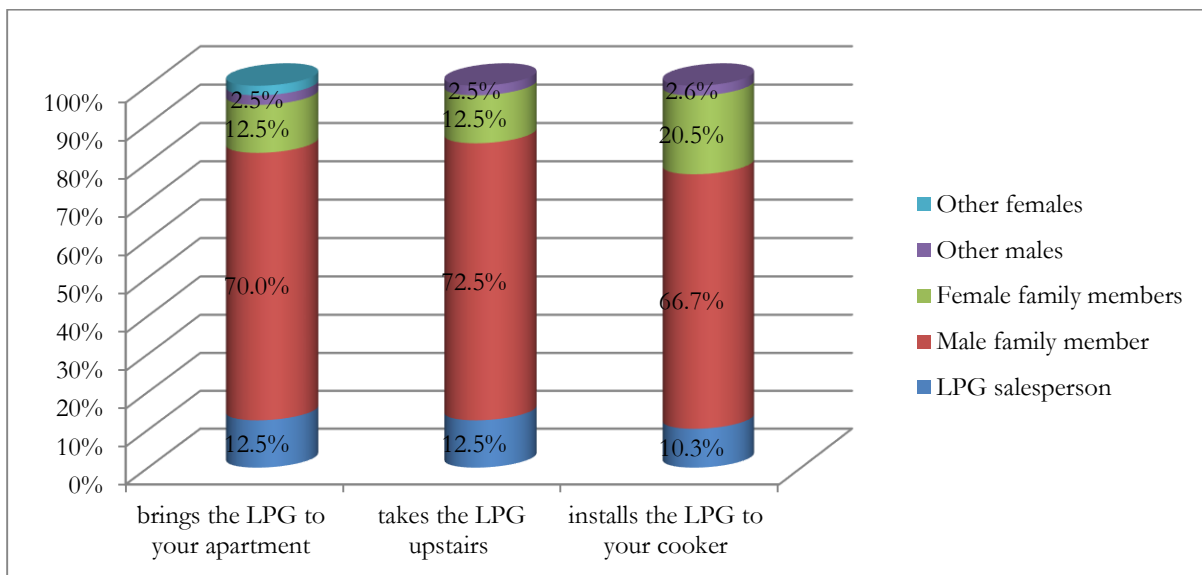


Figure 4-12: % Distribution of handling the LPG cylinder by person in charge of installing it  
Source: Data collection results

#### 4.2.13 Willingness and affordability to pay

The majority of sample surveyed expressed their willingness to be connected to the NG regardless to the amount of money they can afford to pay. Such attitude is attributed to the fluctuation of the LPG cylinder prices. On average each household consumes 1.5 LPG cylinder



for cooking. The cost of one LPG is about 11.08 EGP on average. This indicates that each house will pay about 20.65 EGP per month for cooking fuel. The average cost of water heating was about 18.6 EGP.

The majority of the sample surveyed in Qena pay 11-20 EGP per cylinder. The sample expressed high willingness to have the NG installed as it is more useful and convenient to them.

The discussion of willingness to pay for the NG installation cost, 47.5% of the sample in Qena Governorate were willing to pay in cash. 47.1% of them reported their willingness to pay in installment.

The group discussion reflected that the community decision to pay in installment is higher..

Monthly installment value was investigated among the whole sample. The methods of payments discussed revealed that 23.1% of the sample surveyed are willing to pay 138 EGP for 12 months. However, 23.19% of the sample reflected their willingness to pay 74 EGP for 24 months

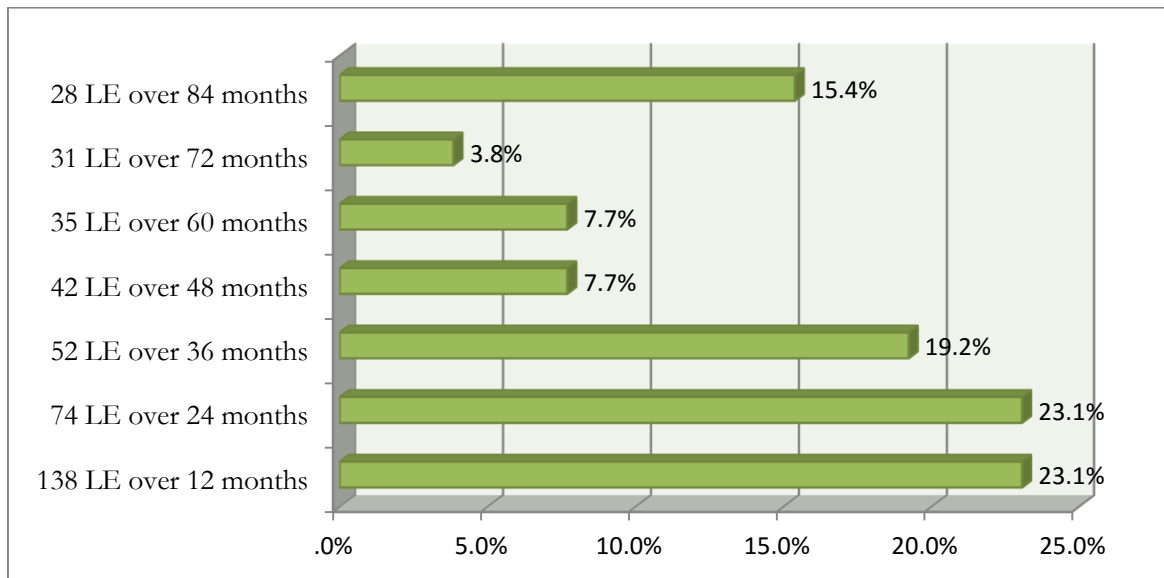


Figure 4-13: % Distribution of the sample surveyed by monthly installment and district  
Source: Data collection results

The households surveyed reported that the least they can pay in cash on average is about 1084.25, such amount increased to 1850 EGP. The average of full installation cost reported by the sample surveyed reflected that almost all surveyed sample are fully aware of the cost. Concerning the lowest advance payment value they are willing to pay, it was about 154.32 EGP. Whereas, the highest amount of advance payment was 318.41 EGP. This is much higher than the advance payment proposed by Regas which is 245.5 EGP. With regard to the monthly installment cost they afford to pay, the majority reported was 55.36 EGP as minimum. However, the highest monthly installment reported was 92.27 EGP. The two values are in consistency with the installment patterns

Regardless to various types of installments reported, it is anticipated that the ultra-poor might not afford paying for the installments. Subsequently, investigating the potential mechanisms the poor



might adopt to overcome such problem should be highlighted according to the poor sample surveyed. The majority of the respondent reported that poor people can pay in installment. Otherwise, the poor might form a money pool “*Gameia*”.

The figure below reflects that poor households (those who spend less than 1500 EGP per month) were willing to pay 28 EGP for 84 month. About 45.0% of those who spend less than 1000 EGP were willing to pay less than 42 EGP per month. The poorest category were willing to pay a high installment in order to reduce bank profits and save their money.

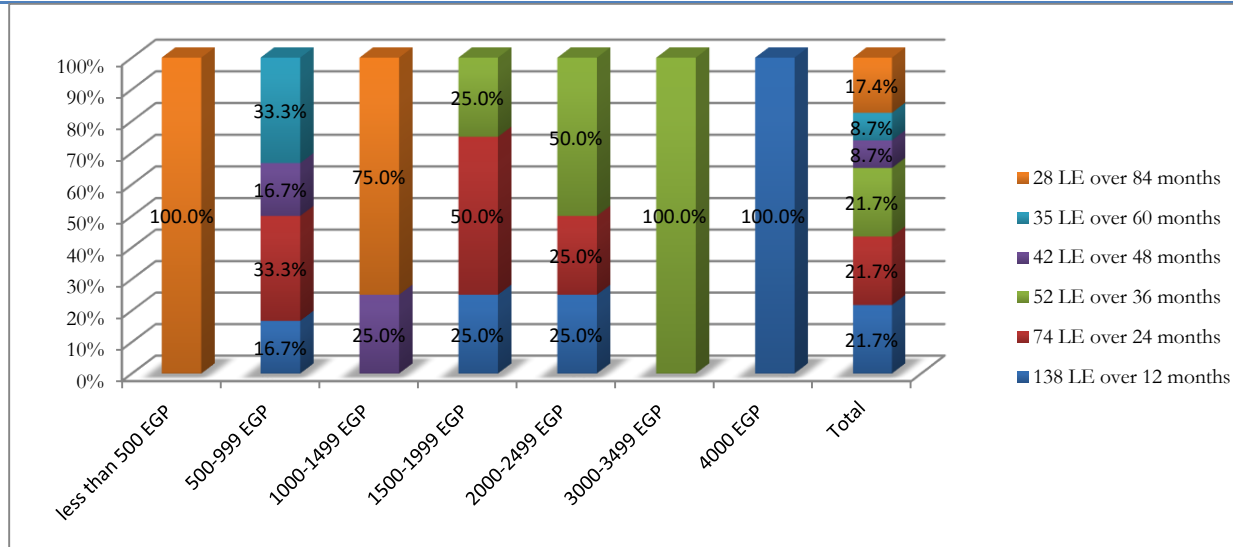


Figure 4-14: % Distribution of the sample surveyed by monthly installment and house expenditure.

Source: Data collection results

Community socioeconomic characteristics and willingness of people to convert to NG is remarkable. Community people are much in favor to host the project. However, there is an actual need to provide clear information about the project in order to warrantee their support to the project.



## 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

##### *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 150 workers. The local community of Qena Governorate could provide a proportion of this temporary labour force dependent on skills needed and the strategies of the individual contractors in sourcing their workforce.

The total number of new short term job opportunities within the project areas is estimated at 150-200 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

Additionally, job opportunities will be provided to construction workers in the PRS site. They will be as follow:

- 7 drilling workers
- 2 security staff
- 1 engineer
- 6 plumbers
- 5 carpenters

They will work for 5-6 months until the completion of construction work.

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 for long-term operation phase position, where these are available.

##### *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.
- Reduced expenditure on LPG importation and subsidies as 18,816 connections will be installed in Qena City. Each household consumes 1.5 LPG cylinders monthly. Accordingly, the total number of LPG cylinders to be reduced from the current consumption will be about 28, 224LPG cylinders per month for cooking purposes. The subsidy value is about 70 EGP per cylinder. Consequently, the total subsidy to be saved monthly will be about 1,975,680 EGP. This will result in total annual savings of 23,708,160 EGP. Additionally, significant savings will result due to replacing the electric water heaters by NG heaters.
- Significantly lower leakage and fire risk compared to LPG.
- Improved safety due to low pressure (20 mBar) compared to cylinders.
- Beneficiaries to benefit from good customer service and emergency response by qualified personnel/technicians.
- Eliminate the hardships that special groups like 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 the Buroz Relevant Integrated Criteria was adopted.

Detailed assessment matrices are 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*

#### **PRS**

No major traffic impacts are expected during construction of the PRS as the construction activities are contained on the existing PRS premises and the construction period is limited.

#### **Low Pressure distribution Network**

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 for the low pressure pipelines; 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**

As pipeline installation will be taking place on roads, local access on select parts of the road will be ceased and will likely restrict local access to residents into and out of their households.

Inconvenience to the residents will last for the duration of the construction phase activities, namely, excavation and rehabilitation of the road, which will be done on the same day with no pits being left open overnight. Therefore, the duration of inconvenience and slowed traffic in affected areas will last for the duration of the work day i.e., 8-10 hours.

On local roads traffic congestion of regular sized vehicles will be insignificant. The main impact will be inconvenience to residents in accessing residential buildings and will likely be of minor severity.

On local roads, traffic and access limitation impacts are temporary, local, and of minor severity

#### *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 and tuk tuks 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*

PRS, and Low Pressure distribution network

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<sub>x</sub>, NO<sub>x</sub>, 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.

PRS construction is unlikely to cause major air emissions impacts as the nearest receptors are over 100m from the PRS construction site

#### *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.



No major noise impacts are expected during construction of the PRS as the nearest receptors are around 100m away and the construction period is limited.

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 networks, electricity and water supply result in severe disturbance to community people. Yet such problem takes short time (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 Possible effects pertaining to land acquisition**

The existing PRS capacity will be extended in Qena city. However, the extension will not require any new plots of lands. The total area of the state owned land (which has been allocated by Qena Governorate to EGAS) is 50\*50 m<sup>2</sup> (14.286 Qirate).

The procedures followed by EGAS and the LDC to obtain the land reflected no involuntary land acquisition took place. Following is a summary of the procedures:

1. Egypt Gas (the LDC) sent a letter to Qena Governorate requesting the allocation of State-Owned-Land for the purpose of construction of the PRS for the Gas Connections project.
2. The Governorate allocated a State Owned Land.
3. EGAS and Egypt gas (land inspection committee) visited the site to make sure that the land is technically and socially acceptable.
4. A decree issued by Qena Governorate to allocate the land for the project.



### 5.3.6 Possible effects on vulnerable structures<sup>8</sup>

#### *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.

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.

##### PRS construction

The PRS is not located near any physical structures.

**Overall no structurally-vulnerable buildings are expected to be encountered in Qena project areas.**

Structural impacts on vulnerable buildings are of irrelevant severity
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### 5.3.7 Effect on Culturally Valuable Sites<sup>9</sup>

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.

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<sup>8</sup> If encountered within project areas.

<sup>9</sup> If encountered within project areas.



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 projected works for the PRS and 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

### 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, Hazardous Wastes 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<sup>3</sup>/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.

It is highly unlikely that groundwater may be encountered at the PRS location and routes of the low pressure distribution networks as these have been previously excavated with no record of groundwater. In the unlikely case that groundwater is encountered during excavation, 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.

As mentioned previously, site offices will be located in residential areas during excavation of the low pressure distribution network. Workers and employees typically utilize the bathrooms of surrounding facilities; especially mosques.

In the case of construction of HP pipeline offtakes or PRSs, work locations may take place in area without sanitary facilities. In such cases, portable toilets are provided for workers and employees. In such a case, septic tanks will be utilized. The septic tanks are purged and emptied as needed by means of a local contractor, in coordination with the local unit. In such cases, the Local Distribution Company (ReGas) will ensure that the agreement for disposal of the wastewater will be stipulate the disposal at certified wastewater treatment facilities and shall require sanitation contractors to produce documentation to that effect. Management of sanitation waste water shall be carried out according to applicable National laws and WB/IFC guidelines.

#### *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 الشيء 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 other than the impacts discussed elsewhere in this section.

All excavation, network installation, household installation, and appliance conversion activities should comply with Egypt Gas H&S Guidelines (Please see Annex 6 for details).

#### *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: Regions Gas (ReGas) for Qena**), 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 in raising the fear of disruption of Gas supply

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 Improper handling of the Odorant

#### *Environmental impacts*

Odorant handling is part of the operation of the PRS and is addressed in a Quantitative Risk Assessment attached as a separate study.

An odorant is added to the NG in order to enable detection upon leakage. The odorant containing Tertiobutylmercaptin (80%) and Methylehylsulphide (20%) is classified as a hazardous substance. The MSDS of the odorant identifies the following hazardous properties: Highly



flammable, flammable and toxic products upon thermal decomposition, irritant, and toxic to aquatic flora and fauna.

It will also be required to keep a register for management practices followed in PRSs.

Odorant leak can result from improper handling of the odorant includes:

- Storage in unsafe conditions, in terms of occupational health and safety.
- Discharge of remaining odorants in containers, after use, in land or sewers;
- Disposal of used containers with domestic waste, or by open disposal; and
- Recycling of used containers for other materials.

#### 5.4.4 Noise of PRS

##### *Environmental impacts*

The pressure reducers normally cause noise generated from the reducers' pipes. Maximum noise level expected from the reducers is 80db. The generated noise is constant (not intermittent). Assuming ambient noise levels are complying with WB/IFC requirements and Law 4/1994-9/2009- 105/2015 standards for low noise residential areas, a 20-meter buffer distance kept between the reducers and the PRS fences should lead to minimal impact outside the PRS borders.

Impacts of PRS noise may be permanent and of minor severity.

#### 5.4.5 Safety Aspects of PRS Operation

The safety risks associated with PRS' operation (leakage, fire hazard, explosion, suffocation) are assessed for the workers and the public at large, in a separate Quantitative Risk Assessment (QRA) modeling and comparing the results with international risk management guidelines as a reference.

#### 5.4.6 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

#### 5.4.7 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.



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## 5.5 Women and Vulnerable Groups

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Vulnerable groups<sup>10</sup> are more exposed to the implications of various impacts and are more likely threatened to get in more impoverishment. The level of vulnerability of a certain group and the severity of the impact on these groups has been assessed. 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 vulnerable groups of elderlies and people with disabilities.

It is foreseen that the project will not have any unfavorable impacts on women and vulnerable group

The construction of the PRS is not anticipated to result in any adverse impacts on women or vulnerable groups, as the PRS will be constructed on the plot of state owned land. There is no buildings in the vicinity of the PRS site.

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<sup>10</sup> 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 detailed in section 5.1.

### 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:<sup>11</sup>: 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<sup>12</sup>.

<sup>11</sup>

<sup>12</sup> In case of any change of the value of NG installation cost, the installment value might be changed





#### **6.4 PRS siting**

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As mentioned in section (5.3.5 Impacts related to land), the main criteria for PRS siting are:

- Proximity to High-pressure gas main lines to minimize offtake length
- Availability of space with adequate dimensions and affordability of the land for PRS construction and possible expansion
- Presence of standard buffer zones between PRS and nearest buildings or receptors

As per national and WBG guidelines, PRS siting avoids habitat alteration and seeks to minimize environmental, occupational health and safety, and community health and safety impacts.

*These are general criteria for PRS siting. They are, however, not applicable to this specific ESIA as no new land was acquired for the PRS. The PRS component in this ESIA is a state-owned land.*



## 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: **ReGas**.

### 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 LDC, 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 **ReGas/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<sup>13</sup>, 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<sub>10</sub> 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.
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:

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<sup>13</sup> Sufficient sheets should accompany work groups during the construction phase. Cost of sheets should be included in ESMP budget



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, stops work in the affected area, 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<sup>14</sup>

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<sup>15</sup>

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 machinery; 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.

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<sup>14</sup> If encountered within project areas.

<sup>15</sup> 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.

#### ***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 domestic site activities (such as temporary offices or rest areas) should be addressed in specific waste management plans, as appropriate

#### ***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<sup>16</sup>. 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 Nassreya 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 Nassreya 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.

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<sup>16</sup> The Nasserya 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:
  - o avoid inhalation and sources of ignition
  - o cover and mix with sufficient amounts of sand using PPE and tools
  - o collect contaminated sand in clearly marked secure containers/bags
  - o Add contaminated 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
<b>Excavated soil and excess sand</b>	Excess sand not used in construction, and excavated soil other than broken asphalt.	Non-Hazardous	Dispose to an approved non-hazardous waste disposal facility: <u>Municipal disposal site south east of Qena</u> (to be agreed with local unit)
<b>Metal - Scrap</b>	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: <u>Municipal disposal site south east of Qena</u> (to be agreed with local unit)
<b>Paint Containers – Water Based</b>	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 <u>Municipal disposal site south east of Qena</u> (to be agreed with local unit)
<b>Paint Containers – Oil Based</b>	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.
<b>Welding Rods</b>	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 <u>Municipal disposal site south east of Qena</u> (to be agreed with local unit)
<b>Concrete and bricks waste</b>	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: <u>Municipal disposal site south east of Qena</u> (to be agreed with local unit)
<b>Broken asphalt</b>	Streets excavation will produce broken asphalt	Non-Hazardous	Dispose to an approved non-hazardous waste disposal facility: <u>Municipal disposal site south east of Qena</u> (to be agreed with local unit)



**Table 7-2 Wastes Common for Construction of gas pipelines**

Waste Type	Description	Classification	Treatment and Disposal
<b>Possibly damaged asbestos water pipes during excavation</b>	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
<b>Batteries</b>	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.
<b>Contaminated Soil – Refined Fuel and Oil</b>	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.
<b>Domestic Waste</b>	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 <u>Municipal disposal site south east of Qena</u> (to be agreed with local unit)
<b>Filters – Lube Oil (Drained)</b>	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
<b>Oil Containers – (Including Drums and Barrels)</b>	Drums and barrels used for bulk oils and lubricants.	Hazardous	Dispose to an approved hazardous waste disposal facility, Nasreya Hazardous Waste Treatment Centre.
<b>Shop Towels (Not Laundered - Contaminated)</b>	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 sit,
- 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 applicable

### 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<sup>17</sup>.

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<sup>18</sup>. 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 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 **Regions Gas (Regas) in Qena**
- 2- On the level of LDC headquarter
- 3- On the level of EGAS

<sup>17</sup> <http://siteresources.worldbank.org/>

<sup>18</sup> Falls under the budget of the LDCs

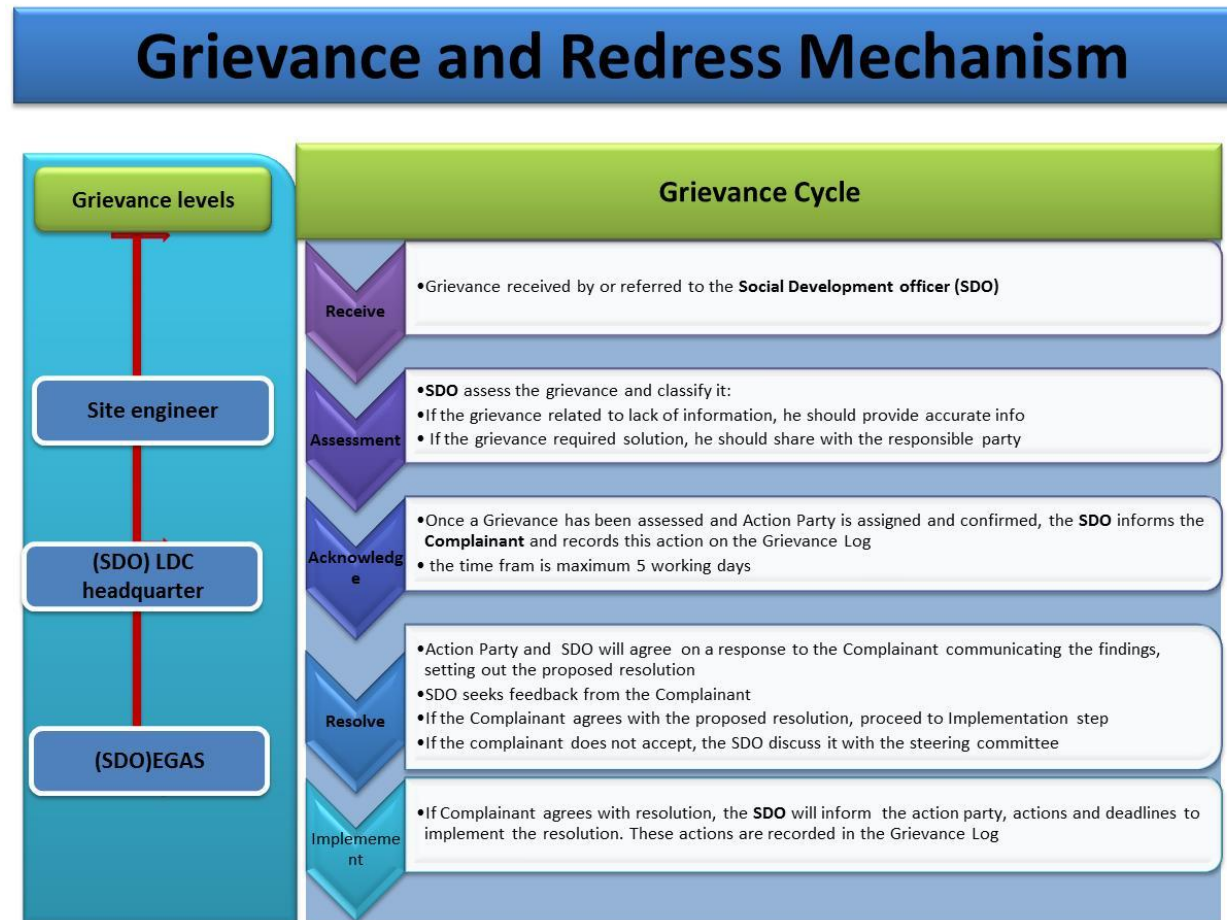


Figure 7-1 Proposed Grievance and Redress Mechanism





### ***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. **Regions Gas (Regas)** will assign a Social Development Officer (SDO) (possible more than one) who will be working closely with the assigned SDO of EGAS. It is the responsibility of **Regions Gas (Regas)** 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 **Qena** ,
- The project manager in **Qena** ,
- The regional department of **Regions Gas (Regas)** in Qena 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.

### ***Second tier of grievances:***

If the aggrieved person is not satisfied with the decision of the first tier, they can present the case to **Regions Gas (Regas)** headquarter. Complaint form is attached in Annex 5. SDO where they should provide resolution within 15 days, following is the second level of grievances:

1. The Social Development Officer in **Regions Gas (Regas)** headquarter will handle technical, and environmental. **Regions Gas (Regas)** 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.

### ***Third tier of grievances:***

If the aggrieved person is not satisfied with the decision of the SDOs of **Regions Gas (Regas)** 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 and environmental 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.

**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 writing form using a fixed serial number that the complainant should be informed about to be able to follow up on the complaint
2. Hotline: 129 is the hotline in **Regions Gas (Regas)**.
3. The SDO within the LDC and EGAS
4. 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 **Regions Gas (Regas)** should maintain record of complaints and results.

**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
<b>GRM is fully operational</b>	<ul style="list-style-type: none"> <li>○ Number of received grievances monthly (Channel, gender, age, basic economic status of the complainants should be mentioned)</li> <li>○ Type of grievance received (according to the topic of the complaint)</li> <li>○ Documentation efficiency</li> </ul>
<b>Efficiency of responses and corrective procedures</b>	<ul style="list-style-type: none"> <li>○ Number of grievances solved and closed</li> <li>○ Feedback offered to the grievances</li> <li>○ Number of unsolved grievances and the reasons behind not solving them</li> <li>○ Time consumed to solve the problem</li> </ul>
<b>Efficiency of information sharing about GRM</b>	<ul style="list-style-type: none"> <li>○ Dissemination activities undertaken</li> <li>○ Total number of brochures distributed (if any)</li> <li>○ Total number of awareness meetings conducted (if any)</li> </ul>



### ***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 **Regions Gas (Regas)** will address all grievances raised by community members. The main tasks related to grievances of the SDOs 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	Excavation contractors	- LDC + - Traffic department	Contractor has valid conditional permit + Field supervision	Contractor costs  LDC management costs	
		Time limited excavation permits granted by local unit & traffic department					
		Announcements + Signage indicating location/duration of works prior to commencement of work	- LDC - Excavation contractors	- LDC - 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 management costs	
		Isolation, covering, transportation in equipped vehicles and disposal of			Contractual clauses + Field supervision		



Receptor	Impact	Mitigation measures	Responsibility		Means of supervision	Estimated Cost
			Mitigation	Supervision		
		stockpiles 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	
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			– Contractual clauses + Field supervision	



Receptor	Impact	Mitigation measures	Responsibility		Means of supervision	Estimated Cost
			Mitigation	Supervision		
		<ul style="list-style-type: none"> <li>identify underground utility lines using non-intrusive equipment</li> <li>Preparation and analysis of accidental damage reports</li> <li>Repair and rehabilitation of damaged components</li> </ul>		<ul style="list-style-type: none"> <li>LDC HSE Supervisor</li> <li>LDC HSE</li> <li>LDC HSE Local Government Unit Local Police</li> </ul>	<ul style="list-style-type: none"> <li>Review periodic HSE reports</li> <li>Contractual clauses + Field supervision</li> </ul>	
<b>Streets (physical status) local community and workers (health and safety)</b>	<b>Hazardous waste accumulation</b>	<ul style="list-style-type: none"> <li>Temporary storage in areas with impervious floor</li> <li>Safe handling using PPE and safety precautions</li> <li>Transfer to LDC depots for temporary storage</li> <li>Disposal at licensed Alexandria hazardous waste facilities (Nasreya or UNICO)</li> <li>Hand-over selected oils and lubricants and their containers to Petrotrade for recycling</li> </ul>	<ul style="list-style-type: none"> <li>LDC</li> <li>Excavation Contractor</li> </ul>	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
		<ul style="list-style-type: none"> <li>Adequate management of asbestos and any possible hazardous waste</li> </ul>	Water Authority + contractor		Field supervision + review of Water Authority manifests	<ul style="list-style-type: none"> <li>Contractor costs</li> </ul>
		<ul style="list-style-type: none"> <li>Minimize fueling, lubricating and any activity onsite that would entail production of</li> </ul>	<ul style="list-style-type: none"> <li>LDC</li> <li>Excavation Contractor</li> </ul>		Field supervision	<ul style="list-style-type: none"> <li>LDC management costs</li> </ul>





Receptor	Impact	Mitigation measures	Responsibility		Means of supervision	Estimated Cost
			Mitigation	Supervision		
		<p>hazardous materials empty containers</p> <ul style="list-style-type: none"> <li>- 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 residuals.</li> <li>- 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</li> <li>- Ensure hazardous liquid material/waste containers are always sealed properly and secured from tipping/falling/damage/direct sunlight during transportation and storage</li> <li>- In case of spillage:               <ul style="list-style-type: none"> <li>o avoid inhalation and sources of ignition</li> <li>o cover and mix with sufficient amounts of sand using PPE</li> <li>o collect contaminated sand in clearly marked secure containers/bags</li> </ul> </li> <li>- Add sand to inventory of hazardous waste</li> </ul>				



Receptor	Impact	Mitigation measures	Responsibility		Means of supervision	Estimated Cost
			Mitigation	Supervision		
Local community	Non-hazardous waste accumulation	<ol style="list-style-type: none"> <li>1. Designate adequate areas on-site for temporary storage of backfill and non-hazardous waste</li> <li>2. Segregate waste streams to the extent possible to facilitate re-use/recycling, if applicable</li> <li>3. Reuse non-hazardous waste to the extent possible</li> <li>4. Estimate size of fleet required to transport wastes.</li> <li>5. <b><u>Transfer waste to Qena disposal facility South East of the city</u></b></li> </ol> <p><b><u>If septic tanks are used in case of temporary toilet facilities, make contractual arrangements with a wastewater removal contractor (in coordination with the local unit) to purge and dispose of possible septic tanks in the case they are utilized in work sites</u></b></p>	<ul style="list-style-type: none"> <li>- LDC</li> <li>- Excavation Contractor</li> </ul>	LDC HSE	<ul style="list-style-type: none"> <li>- Contractual clauses</li> <li>- Monitoring of waste management plan</li> <li>- Field supervision</li> </ul>	<ul style="list-style-type: none"> <li>- Contractor costs</li> <li>- LDC management costs</li> </ul>
Local community	Destruction of streets and pavement	<ul style="list-style-type: none"> <li>- Arrange Restoration and re-pavement (رد الشئ لأصله) with local unit</li> <li>- Communication with local community on excavation and restoration schedules.</li> </ul>	<ul style="list-style-type: none"> <li>- LDC in cooperation with the LGU</li> </ul>	EGAS	<ul style="list-style-type: none"> <li>- Field supervision</li> <li>- Coordination with LGU as needed</li> </ul>	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		
<b>Occupational health and safety</b>	<b>Health and safety</b>	<ol style="list-style-type: none"> <li>1. Full compliance to EGAS and LDC HSE requirements, manuals, and actions as per detailed manuals developed by Egypt Gas</li> <li>2. Ensure the provision of the appropriate personal protective Equipment and other equipment needed to ensure compliance to HSE manuals</li> </ol>	Excavation Contractor	LDC HSE and EGAS SDO	Field supervision	<ul style="list-style-type: none"> <li>– Contractor costs</li> <li>– LDC management costs</li> </ul>
<b>Local communities and businesses</b>	<b>Lack of accessibility to businesses due to delay in street rehabilitation</b>	<p>Compliance with the Environmental management plan concerning timely implementation of the construction schedule to minimize impact on local business</p> <ul style="list-style-type: none"> <li>• Follow up the procedure of Grievance Redress Mechanism</li> <li>• Ensure transparent information sharing</li> </ul>	<p>During digging process LDC</p> <p>The sub-contractors</p>	LDC and EGAS SDO	<ul style="list-style-type: none"> <li>– Ensure the implementation of GRM</li> <li>– Supervision on Contractors performance</li> </ul>	No cost
<b>Local community Health and safety</b>	<b>Threat to Safety of users and houses (due to limited level of awareness and misconceptions)</b>	<p>Prepare Citizen engagement and stakeholder plan</p> <p>Awareness raising campaigns should be tailored in cooperation with the community-based organizations</p>	During the construction LDC	LDC and EGAS SDO	<ul style="list-style-type: none"> <li>– List of awareness activities applied</li> <li>– Lists of participants</li> <li>– Documentation with photos</li> <li>– Awareness reports</li> </ul>	<ul style="list-style-type: none"> <li>– 2250 \$ per awareness raising campaign</li> <li>– 2250 \$ for brochure and leaflets to be distributed (material available by EGAS-\$ spent)</li> </ul>





## 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
<b>Local traffic and accessibility</b>	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
<b>Ambient air quality</b>	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
<b>Ambient noise levels</b>	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
<b>Underground utilities</b>	Damages to underground utilities and infrastructure	Official coordination reports with relevant authorities Accidents documentation	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
<b>Physical state of street</b>	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
		Chain-of-custody and implementation of domestic wastewater (sewage) management	LDC HSE	During construction. Monthly reports	Construction site	Site inspection and document inspection	LDC management costs
<b>Local community</b>	Damaging to the streets	<ul style="list-style-type: none"> <li>- Streets quality after finishing digging</li> <li>- Number of complaints due to street damage</li> </ul>	LDC, EGAS	Four times per year, each three months	Site and Desk work	Checklists and complaints log	No cost
<b>Local community</b>	Threat to Safety of users and houses (due to limited level of awareness and misconceptions)	<ul style="list-style-type: none"> <li>- Number of awareness raising implemented</li> <li>- Number of participants in information dissemination</li> </ul>	LDC, EGAS	Quarterly monitoring	Office	Reports Photos Lists of participants	No cost





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## 7.5 Management of Mitigation and Monitoring activities During Operation Phase

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### 7.5.1 Hotline

A 24-7 Hotline (129) is available for customers and the public to report leaks<sup>19</sup>, 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 fully understand and adopt 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 **Qena**, various NGOs interviewed expressed willingness to act as awareness centers.

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.

### 7.5.5 Management of Odorant Handling

The MSDS of the odorant provides information on the required storage conditions and procedures to be followed in emergencies. For the disposal of empty containers, the MSDS indicates that the remaining product could be either destroyed by oxidation using dilute solutions of hydrogen peroxide or sodium hypochlorite, or alternatively through incineration.

LDCs are currently practicing the oxidation of the containers. After evacuation of odorant containers (metal barrels) in the PRS holding stainless steel tank, the PRS staff adds hydrogen peroxide or sodium hypochlorite and sodium hydroxide and detergents to the remaining odorant in the container, with continuous rolling to ensure that all sides of the container have been exposed to the oxidation solution. These treatment procedures are documented in the instructions of the HSE

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<sup>19</sup> Odorant is added to odorless natural gas to facilitate leakage detection by smell/odor.



department and followed by PRSs' staff. This process destroys the hazardous properties of the remaining odorant product; however, arrangements must be made for disposal of the treatment solution remaining in the containers. Although the oxidation process is environmentally acceptable, the accumulation of treated containers in PRSs will cause area limitations inside PRSs and could affect their efficient operation. Alternatively, some PRSs may have standby odorant tanks which are taken to the company depot to be filled and replace tanks in operation upon return to PRS.

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

- Pre-Plan the anticipated amounts of odorants to be used in order to minimize leftovers and residuals.
- Handle with extreme care and always perform visual checks on the integrity of the odorant container
- Avoid rough handling rolling or dropping of odorant containers
- Avoid exposure to direct sunlight during storage or transportation
- Ensure odorant containers are always sealed properly and secured from tipping/falling/damage during transportation and storage (temporary and long-term)
- Always have sufficient amounts of sand, sodium hypochlorite and detergent on standby during usage of odorant
- ALWAYS handle containers or spills with care and full PPE compliance
- Never release or empty residual odorant from its container to any receptor or for any reason other than filling the odorant tank at the PRS
- NEVER use empty odorant containers for any other purpose
- In case of odorant spillage:
  - o avoid inhalation and sources of ignition
  - o immediately cover and mix with sufficient amounts of sand and sodium hypochlorite using necessary PPE and tools
  - o collect contaminated sand in clearly marked secure containers/bags
  - o Add sand to inventory of hazardous waste

LDCs should arrange for regular transfer of empty containers to its nearest storage depot (مخزن الرائد) for temporary storage until collected by licensed hazardous waste handlers for disposal to the hazardous waste facility in Alexandria. Licensed waste handlers should produce official chain-of-custody documents to the LDC proving that the empty containers have been delivered to the certified facility. LDCs should verify and keep these records with their Environmental Register.

Trained HSE technicians should accompany drivers transporting the odorant barrels/tanks whether full or empty and treated.

#### **7.5.6 Management of PRS noise**

It is not expected that noise levels caused by the reducers will affect areas outside the PRS fences if the reducers are located in the middle of the location (at least 20 meters away from all fences). Therefore the following mitigation measures are recommended:

1. Location of reducers should be at least 20 meters away from the PRS fences.
2. The reducers should be either in a well-ventilated closed area, or in a protected open area according to IGEM standards. If the reducers are in an open area there should be wall barriers to dissipate the noise from the PRS staff offices and the neighboring areas.



LDCs are currently undertaking periodical monitoring of noise levels at each existing PRS bi-annually. It is expected that the noise monitoring of the new PRSs will take the same pattern. For PRSs in residential areas, it is recommended to increase noise monitoring at different locations especially at the southern border on a monthly basis, along with recording complaints from neighboring sites.

#### 7.5.7 Management of PRS Safety Aspects

1. Remote actuation of isolation and slam-shut valves by LDCs
2. Hazardous Area Classification drawings for all Pressure Reduction Stations.
3. Planned preventive maintenance policy should be in place for the new PRS. Also there is a need to produce a 'Station Manual' for the PRS, this manual should include formalized procedures, including precautions and a site scenario specific emergency plan, which should take wind direction, stability and interfaces with others, e.g. GASCO as well as the public living nearby, into account.
4. Control room inlet door should be located in the upwind direction away from the station (Inlet door should not face the PRS station). Alternatively, the control room should be provided by a secondary means of escape at the back side of the room, which shall be used in case of blockage of the main escape route by jet.
5. Self-contained breathing apparatus (2 units at least) to be provided at each PRS for handling odorant releases.
6. Jet fire rated passive fire protection system to be applied to all safety critical shutdown valves ESDVs or Solenoid valves in order to maintain small isolatable inventories. (As applicable)
7. Pipeline marking signs should be added indicating in Arabic and in English "Do Not Dig" and "High Pressure Pipeline Underneath" in order to prevent such extreme hazards.
8. Install an elevated wind sock in the PRS site, which can be seen - from distance and from outside the fence - to determine the direction of gas migration in case of major gas leak, in addition to provision of portable gas detectors.
9. The design should fully comply with IGE TD/3 code requirements.

**A Quantitative Risk Assessment QRA detailing such risks and mitigation measures has been submitted in February 2016.**

#### 7.5.8 Management of financial disturbance

Residential gas connection installation costs are around 5,600 EGP<sup>20</sup>. Customers pay 1700 EGP of that cost in cash. The balance is subsidized by the government of Egypt. The 1700 EGP can be made either upfront or in installments over a period of time. If they pay in installment, the interest rate will added in accordance to the selected installment scheme. Typically, households opt for flexible monthly payment plans facilitated by the LDCs and local banks. 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 various installments schemes<sup>21</sup>: It is worth mentioning that the Government of Egypt try to negotiate with funding agencies to provide extra support to the poor.

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<sup>20</sup> *Converting Households from LPG to Natural Gas- Social Impact Assessment Study- 2013*

<sup>21</sup> In case of any change of the value of NG installation those installment 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		
<ul style="list-style-type: none"> <li>- Ambient air quality</li> <li>- Community health and safety</li> </ul>	<p><b>Network integrity</b></p>	<ul style="list-style-type: none"> <li>- Detailed review of the geotechnical and geological history of the project area</li> <li>- Development of a full emergency response plan</li> <li>- 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.</li> <li>- Availability of 24-7 hotline service (129) to all beneficiaries and the public for reporting possible leaks, damages or emergencies</li> <li>- Quick response to gas leaks by evacuation of the affected area</li> <li>- Repair or replacement of failed component</li> </ul>	LDC	LDC HSE.	<ul style="list-style-type: none"> <li>- Map and local geotechnical report review</li> <li>- Site inspections</li> <li>- Awareness actions</li> <li>- Periodical trainings and drills</li> </ul>	LDC management costs
<ul style="list-style-type: none"> <li>- Ambient air quality</li> <li>- Community health and</li> </ul>	<p><b>Repairs and maintenance (network and households)</b></p>	<p>As with construction phase activities</p>	<ul style="list-style-type: none"> <li>- LDC</li> <li>- Excavation Contractor</li> </ul>	LDC HSE	<p>As relevant from construction phase</p>	LDC management costs



Receptor	Impact	Mitigation measures	Responsibility		Means of supervision	Estimated Cost
			Mitigation	Supervision		
<p>safety</p> <p>- Ambient air quality</p> <p>- Occupational health and safety</p> <p>- Community health and safety</p>	<p><b>Management of odorant and its containers</b></p>	<ul style="list-style-type: none"> <li>- Strict use of chemical-resistant suits and PPE when handling odorant barrels, tanks, or spills</li> <li>- Evacuation of odorant from barrels into holding tank with utmost care and full PPE</li> <li>- Covering possible odorant spills immediately with sand and treatment with sodium hypochlorite as per EGAS and LDC practices</li> <li>- On-site treatment of empty containers with sodium hypochlorite and detergent as Per EGAS and LDC practice</li> <li>- Ship empty containers to a certified hazardous waste facility via company depot using certified handling and transportation contractors</li> <li>- Ensure full and empty (treated) odorant containers are accompanied by a trained HSE specialist during transportation to and from the depot and to/from the hazardous waste disposal facility (UNICO and/or Nasreya)</li> <li>- Others measures as per QRA</li> </ul>	<p>PRS staff</p>	<p>LDC HSE</p>	<p>Quarterly auditing for each PRS</p>	<p>Cost to be included in PRS running budget:</p>
<p>- Ambient noise</p>	<p><b>Noise of PRS operation</b></p>	<ul style="list-style-type: none"> <li>- Locate noisy pressure reducers away from PRS borders in residential areas</li> </ul>	<p>LDC Design Department</p>	<p>LDC HSE</p>	<p>Review of PRS layout</p>	<p>LDC management costs</p>



Receptor	Impact	Mitigation measures	Responsibility		Means of supervision	Estimated Cost
			Mitigation	Supervision		
<ul style="list-style-type: none"> <li>- Occupational health and safety</li> <li>- Community health and safety</li> </ul>		<ul style="list-style-type: none"> <li>- Others measures as per QRA</li> </ul>				
		<ul style="list-style-type: none"> <li>- Build barrier walls between reducers and sensitive receptors when needed</li> </ul>	Contractor	LDC HSE	Field supervision of PRS construction	Contractor costs
<ul style="list-style-type: none"> <li>- Ambient air quality</li> <li>- Occupational health and safety</li> <li>- Community health and safety</li> </ul>	Leakage and fire	<ul style="list-style-type: none"> <li>- Mitigations based on Quantitative Risk Assessments (submitted to WB in February 2016)</li> </ul>	Independent consultant	LDC HSE	QRA Document review	LDC management costs & PRS cost
<ul style="list-style-type: none"> <li>- Ambient air quality</li> <li>- Occupational health and safety</li> <li>- Community health and safety</li> </ul>	Potential risks due to PRS Operation	<ul style="list-style-type: none"> <li>- Remote actuation of isolation and slam-shut valves by LDC for PRS and pipelines.</li> </ul>	Designer	LDC Project Dept.	PRS design Document Review	Additional budget not required
		<ul style="list-style-type: none"> <li>- Produce Hazardous Area Classification drawings</li> <li>- Control room exit design</li> </ul>	Designer	Eng. / Elect. Dept. Projects Dept.	Drawing and design Document Review	Additional budget not required
		<ul style="list-style-type: none"> <li>- Preventive maintenance policy and station manual</li> </ul>	contractor + LDC	Engineering Dept.	Policy and manual review	Included in PRS cost
		<ul style="list-style-type: none"> <li>- Provision of self-contained breathing apparatus (2 pieces for each station) for handling odorant leaks</li> </ul>	LDC	HSE Dept.	Inspection by operators	Included in PRS cost
		<ul style="list-style-type: none"> <li>- Apply jet fire rated passive fire protection system to all critical safety shutdown valves ESDVs or Solenoid valves (As applicable)</li> </ul>	Designer	LDC Projects Dept.	Component inspection and design document	Included in PRS cost





Receptor	Impact	Mitigation measures	Responsibility		Means of supervision	Estimated Cost
			Mitigation	Supervision		
					review	
		- Place signs in Arabic and English "Do Not Dig" and "High Pressure Pipeline Underneath"	LDC	Engineering Dept.	Signage inspection and site visits	Additional budget not required
		- Install an elevated wind sock and provision of portable gas detectors	LDC	HSE Dept.	Design and implementation review	Included in PRS cost
		- The design should fully comply with IGE TD/3 code requirements	Designer	Project Dept.	Design document review	LDC management costs
		- Any other measures as per QRA	LDC	EGAS	As per QRA	As per QRA
<b>Economically disadvantaged Community members</b>	<b>Financial burden on economically disadvantaged due to the installments</b>	<ul style="list-style-type: none"> <li>- Petro Trade should collect the installment immediately after the installation of NG</li> <li>- The installments should be collected on monthly basis in order not to add burden to the poor, as it will be easier for them to pay on monthly basis</li> <li>- The installment should not be high</li> </ul>	Petro trade (Company responsible for collecting the consumption fees and the installments)	EGAS	Banks loans log Complaints raised by poor people due to the frequency of collecting the installments	No cost
<b>Informal LPG distributors</b>	<b>Loss of revenue for LPG distributors</b>	<ul style="list-style-type: none"> <li>- LPG distributors should be informed about the NG potential areas in order to enable them to find alternative areas</li> <li>- They should be informed about the GRM in order to enable them to voice any hardship</li> </ul>	Butagasco	EGAS	Information sharing activities with the LPG vendors Grievances received from them	No cost
<b>Community health and</b>	<b>Possibility of Gas leakage</b>	- Information should be provided to people in order to be fully	LDC	LDC	Complaints raised due to	No cost



Receptor	Impact	Mitigation measures	Responsibility		Means of supervision	Estimated Cost
			Mitigation	Supervision		
safety		<ul style="list-style-type: none"><li>aware about safety procedures</li><li>- The hotline should be operating appropriately</li><li>- People should be informed of the Emergency Numbers</li></ul>			Gas leakage	



## 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
<b>Network integrity</b>	<ul style="list-style-type: none"> <li>- Earthquakes or geotechnical settlements</li> <li>- Emergency response time and corrective actions during emergency drills</li> <li>- Reports of alteration or tampering with ANY gas components</li> </ul>	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
<b>Improper management of odorant during operation</b>	<ul style="list-style-type: none"> <li>- Log of spillage incidents</li> <li>- Number of treated containers</li> <li>- Odorant delivery forms</li> </ul>	LDC HSE	Quarterly for each PRS	PRSs	- Compare Environmental Register with odorant delivery forms, observation of site	LDC management costs
<b>Noise of PRS operation</b>	<ul style="list-style-type: none"> <li>- Noise intensity</li> </ul>	LDC HSE	Quarterly for each PRS	PRSs	- Noise meter	LDC management costs
<b>Financial burden on economically disadvantaged due to the installments</b>	<ul style="list-style-type: none"> <li>- Number of economically disadvantaged people who complained</li> <li>- Number of those who can't pay the installment</li> </ul>	LDC and Petro Trade, EGAS	Quarterly	Desk work	<ul style="list-style-type: none"> <li>- Complaints log</li> <li>- Bank reports</li> <li>- Petro trade reports</li> </ul>	No cost
<b>Impact on the informal LPG distributors</b>	<ul style="list-style-type: none"> <li>- Grievance received from the informal LPG distributors</li> <li>- Information shared with them</li> </ul>	EGAS, LDC	Quarterly	Desk work	- Complaints log	No cost
<b>Possibility of Gas leakage</b>	<ul style="list-style-type: none"> <li>- Complaints raised by the community people</li> <li>- Number of leakage accidents reported/raised</li> </ul>	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**

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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. **Regions Gas (Regas)** is the implementing body. Below is the management structure of **Regions Gas (Regas)**.

Being the implementing body of the natural gas network in project areas, **Regions Gas (Regas)** has a direct involvement with the environmental management and monitoring of the natural gas network. **Regions Gas (Regas)** has limited environmental and social background. They will be in need to upgrade their capacity regarding the environmental and social aspects. EGAS will provide **Regions Gas (Regas)** staff with the needed information.

One of the standard tasks of the HSE Departments of **Regions Gas (Regas)**, 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.

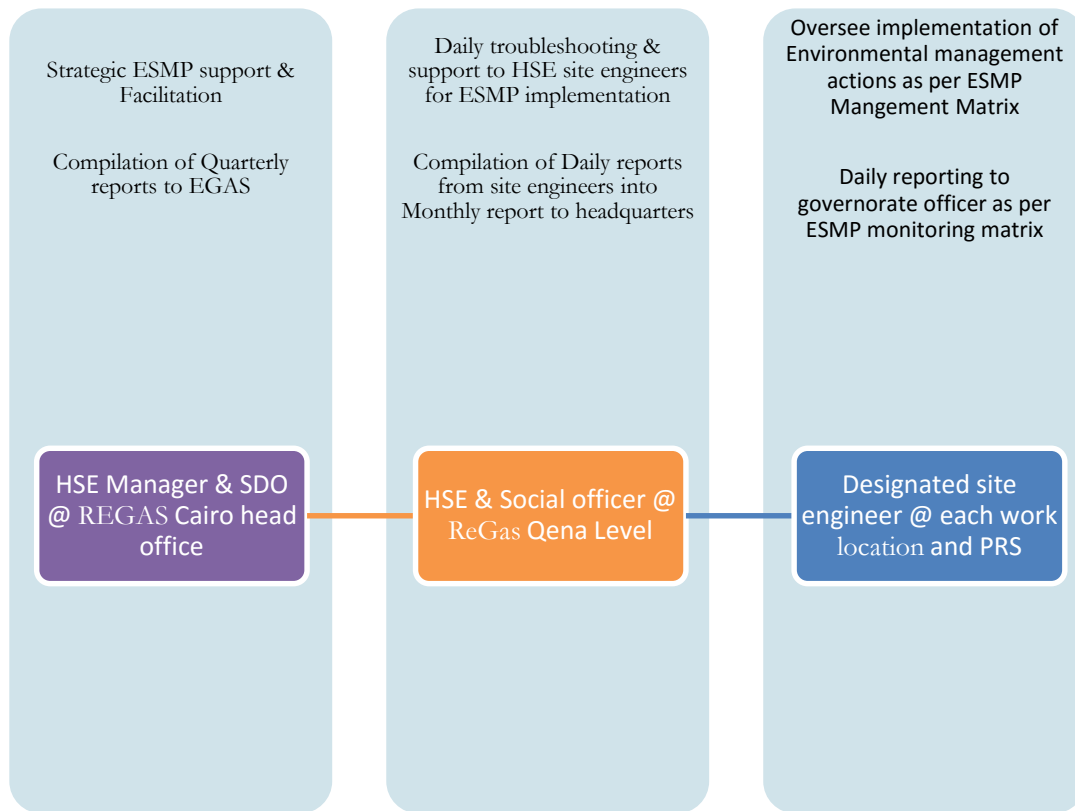


Figure 7-2: Regions Gas (Regas) ESMP organogram



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<sub>2</sub>, CO, CH<sub>4</sub> and NO<sub>2</sub> 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 **Regions Gas (Regas)** head office for compilation into quarterly reports to EGAS.

### **7.9.2 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:

#### ***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 national/WB safeguard policies;
- 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.





### ***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;

### ***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.

### **7.9.3 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, **Regions Gas (Regas)** 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 ESIA's and their outcomes.

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

- WB policies and directives related to disclosure and public consultation, namely,
  - o Directive and Procedure on Access to Information World Bank Operational Policy (OP 4.01)
- Egyptian regulations related to public consultation,
  - o 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 suggest their possible roles in the project
- 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 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 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 on a smaller scale. In the meantime, local communities of both men and women of projects beneficiaries as well as the PAPS, local NGOs/CDAs were among the key stakeholders on the local level.

The abovementioned stakeholders were consulted using various tools (i.e. individual interviews, 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 interviewed in their premises in order to enable them to spell out their concerns and worries freely.



## 8.2 Consultation Methodology and Activities

The consultation process was a dynamic and evolving process which adapted with the nature and expectations of the host community. Engaging with the local leadership represented by the mayor was a key to reaching out to various members of the community. Additionally, special attention was given to including all social groups in consultation and engagement activities in order to avoid sidelining fractions of the host communities.

During data collection process active engagement of the community and the NGOs took place. The main objectives of such activities were to determine whether the project is accepted by the community or not. Various NGOs participated actively in the preparation of the FGDs and providing data collectors to assist the team in collecting the data.



Figure 8-1: FGD in an NGO



Figure 8-2: Training data collectors in Horus NGO

The following table summarizes the main groups consulted during the ESIAF and SSESIA and the engagement tools used.

Table 8-1: Summary of Consultation Activities in Qena Governorate

Participants	Number		Methods	Date
	Male	Female		
<b>During the framework</b>				
Potential beneficiaries and governmental bodies	22	10	FGD	November and December 2013
Potential beneficiaries	75	67	Structured questionnaire	
Potential beneficiaries, government officials, NGO representatives,	96	57	Public consultation	
<b>Total</b>	193	134		
<b>During the site specific study</b>				
Government officials	5	1	In-depth	September and October
NGOs	2	1	In-depth	
Community people	52	27	FGD	



Participants	Number		Methods	Date
Community people	475	168	Structured questionnaire	2015
Potential beneficiaries, government officials, NGO representatives,	68	42	Public consultation	7 <sup>th</sup> of February 2016
Total	602	239		

### Main results of consultation during the data collection phase

The majority of sample surveyed expressed very high demand on the project. They also indicated their willingness to be connected to the NG regardless to the amount of money they can afford to pay. Almost all consulted groups were willing to have the NG installed to their houses. This high level of enthusiasm from the local communities towards the project is attributed to the high level of awareness of the benefits of natural gas and the current hardships that the households are facing to secure LPG. A summary of main issues raised during data collection and scoping phase is presented below:

### 8.3 Final consultation event

Consultation activities were conducted in Qena governorate in Basma Hotel on the 7<sup>th</sup> of February. Following are the main participants:

- Three consultants from Petrosafe and EcoConServ (environmental and social)
- Five representatives of EGAS and Regas
- One representatives of EEAA accompanied the teams
- 2 administrative managers and numerous drivers
- Media related expert was recruited to invite media people

The list of invitees was developed by active NGOs in Qena, EEAA regional branches, environmental offices in the governorates, governmental media centers, and various government employees, in cooperation with the Consultant. Invitees were informed of the date and location of the Public Consultation at least two weeks ahead. Participants were invited through:

- 1- Invitations sent by EGAS via mails, Faxes and e-mails.
- 2- Telephone communication by EGAS and the Consultant.
- 3- An advertisement published in El Gomhoria Newspaper.
- 4- Horus NGO was recruited to distribute the invitations. They previously participated in the data collection process. Therefore they managed to mobilize the target stakeholders all over the governorate.
- 5- Microbuses were leased to move community people from all project areas to Qena City.

Consultation was held in Basma Hotel. It is located in an accessible place. One day prior to the final public consultation five volunteers supported the team in the final preparation of the event.



من بيان حسن إلى سه سديعم مستمعين  
للتداول اعتباراً من يوم الثلاثاء الموافق ٢٦  
يناير.

بالتجديد للواء أبو بكر الجندى رئيساً  
للتعمية العامة والإحصاء لمدة عام  
القادم، يكرر أن أبو بكر الجندى في  
الجهاز المركزي للتعمية والإحصاء في

Egyptian Natural Gas  
Holding Company  
الشركة المصرية القابضة للغازات الطبيعية  
(إيجاس)

**جلسات الاستماع ومناقشة عامة**  
لدراسة تقييم التأثيرات البيئية والاجتماعية  
مشروع توصيل الغاز الطبيعي  
بمقاطعات قنا الإسكندرية أسوان القنوية سوهاج

في إطار خطة الشركة المصرية القابضة للغازات الطبيعية والتي تعد جزءاً متكاملاً من  
استراتيجية الدولة في التوسع في توصيل الغاز الطبيعي للوحدات السكنية لعدد  
٦,٥ مليون عميل في (١١) محافظة بالعام الجمهورية.

فإنه بعد الشركة المصرية القابضة للغازات الطبيعية (إيجاس) بالتعاون مع شركة  
الخدمات البروتوكولية للسلامة والبيئة (بتروسيف) وشركة الكونسرف للتحول  
البيئية دعوة ممثلي المجتمع المدني والجهات والأفراد المعنيين بموضوعات التعمية  
المستدامة والبيئة للمشاركة وإبداء الرأي بشأن المشروع وتأثيراته البيئية  
والاجتماعية المحتملة وذلك في تمام الساعة العاشرة صباحاً طبقاً للمواعيد التالية،

التاريخ	المكان	المحافظة
يوم الأحد ٢٠١٦/٢/٧	فندق بسمة	قنا
يوم الاثنين ٢٠١٦/٢/٨	فندق جراندي رويال	الإسكندرية
يوم الثلاثاء ٢٠١٦/٢/٩	قاعة مؤتمرات عروس النيل	أسوان
يوم الأربعاء ٢٠١٦/٢/١٠	مكتبة مصر العامة	القنوية
يوم الأحد ٢٠١٦/٢/١٤	قاعة المجلس الشعبي المحلي بالمحافظة	سوهاج

وفي حالة الرغبة في الحصول على نسخة من مسودة ملخص الدراسة التقييمية  
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وإننا ننتهز الفرصة لمشاركة سيادتكم في هذه الجلسة  
للمزيد من المعلومات يرجى الاتصال بالمكتب الاستشاري - الكونسرف  
فاكس: ٢٠٢ ٢٧٣٦٥٣٩٧ • تليفون: ٢٠٢ ٢٧٣٦٤٨١٨ / ٢٧٣٥٩٠٧٨ •  
بريد إلكتروني [gcnena@ecoconserv.com](mailto:gcnena@ecoconserv.com)

Figure 8-3: Advertisement published in El Gomhoria newspaper

### 8.3.1 Participants profile

The event was conducted on the 7<sup>th</sup> of February 2016. 110 persons attended the consultation event. 42 of them were females. More than 50 % of them were community people from various districts in Qena Governorate. 27.3% of them were affiliated to civil society and NGOs. Actually, Qena events were privileged with dense participation of NGOs. 11.5% of participants were affiliated to environmental entities within EEAA headquarter, the governorate authority and the local governmental units. The university and educational sector attended the sessions as the majority of key stakeholders in Qena were among teachers. Road authority and health directorate also participated in the event.

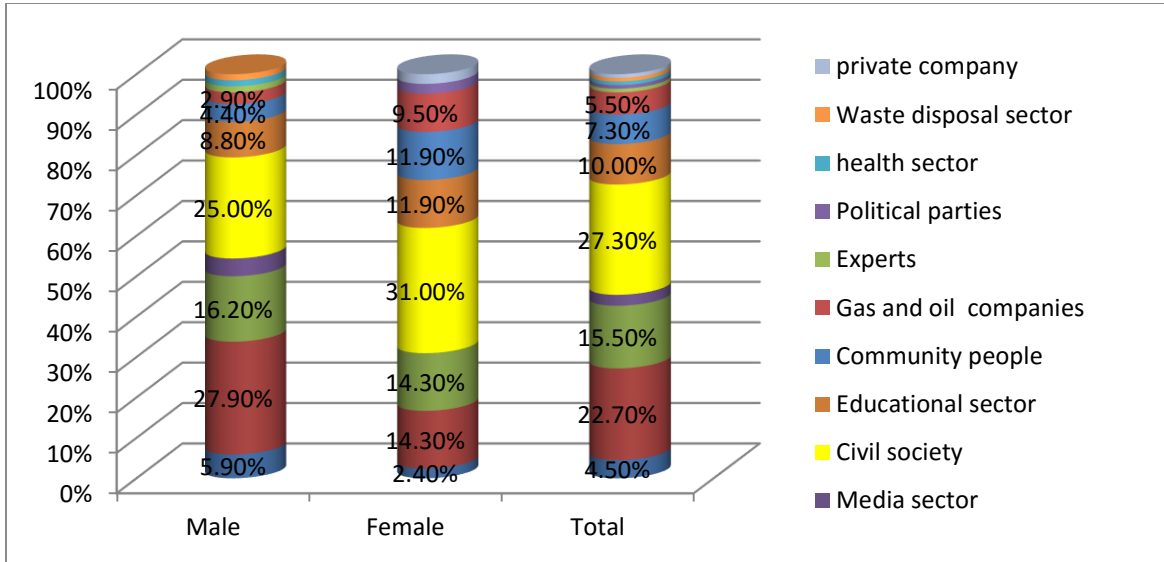


Figure 8-4: % Distribution of participants by sector and sex

With regards to the occupational status of the participants, 41.5 % of the participants were among specialists (engineers, doctors, accountants) 23.6% of them were of high managerial status. The head of Local Unit attended the consultation event. 31.1% of the participants were among administrative staff. 7.80% were students. Some of the participants were the farmers.

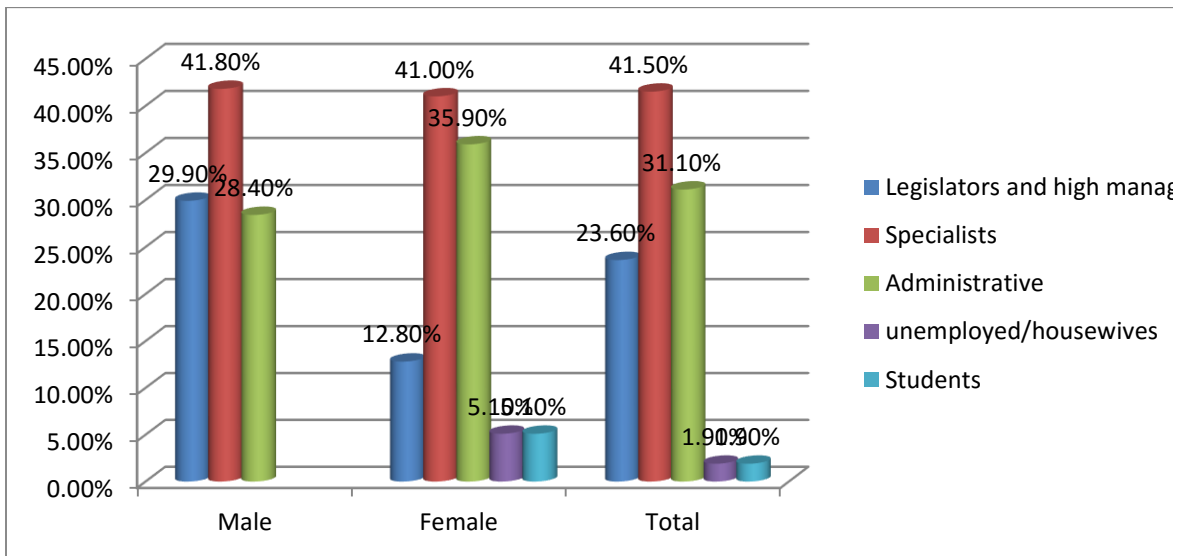


Figure 8-5: % Distribution of participants by occupation and sex





### 8.3.2 Summary of discussions

- His Excellency the Governor of Qena Governorate (General Abd El Hameed El Hagan) attended the consultation event. He inaugurated the consultation event by a brief discussion about the NG and its benefits.
- Eng. Mohamed Abd Allah, EAAA representative informed about the importance of consultation events. He provided a word about the problems aroused with some companies due to ignoring the environmental dimension. He also drew the participants attention to the importance of mitigating the unfavorable impacts.
- Mr. Osama Kamal the Deputy Head of EGAS said a word about the natural gas and importance to connect the NG. Eng. Mohamed Salah Head of Projects Department in EGAS presented the project to participants.
- Dr. Baha El Shal representative of Regas said a brief word about the project.
- Using PowerPoint and multimedia, EcoConServ experts presented the ESIA to the community people. Simple wording was used whenever possible by the environmental and social expert in order to be comprehended by the members of community. Thereafter, an open discussion took place for couples of hours. There was an active participation from the participants side and they were more than willing to play a role in informing people about the NG.





During breaks, Media interviewed EGAS representatives, government officials and community members. Main issues raised during these interviews were as follows:

- 1- General information about Natural Gas
- 2- How community people be responsive and install NG
- 3- Positive and negative impacts of NG
- 4- The rules and regulations of EEAA
- 5- The role of stakeholders and community participation



**Figure 8-6: The panel**



**Figure 8-7: Female participation**



**Figure 8-8: Participants**



**Figure 8-9: ESIA presentation**



**Figure 8-10: Female participations**



**Figure 8-11: Community people**

Afterwards the participants were keen to ask many questions related to the project, following are the main issues raised:



**Table 8-2: Key comments and concerns raised during the Final Public Consultations**

Subject	Questions and comments	Responses
Humanitarian treatment of NG workers	Reference to previous experience with NG, the participants reported an excellent treatment by the NG workers. They do their work efficiently without accepting any tips from the client	It is the regulation of NG companies not to accept any tips from the client
Areas that will not be connected	Almost all participants were asking about the areas that have not been connected to NG	The Government of Egypt adopt a strategic plan for the installation of NG
When will the LPG cylinders disappear?	All over the world the LPG is decreasing. When will it vanish from Egypt?	The state adopt a comprehensive plan to install NG. 1.2 million in this project. It will take up to 15 years until we install the NG to all buildings. However, access to sanitation networks should be attained first. This will take time
LPG & NG are not renewable energy.	What will happen after the consumption of NG and LPG? They are not renewable energy	The consumption of huge consumers is being reduced now. i.e electricity and factories. This will save gas to the houses. Additionally, there are many seismic activities that search for new NG wells
Eagerness to install the NG	Qena is keen to have NG installed to everyone. The NGOs actively participated in data collection process. People were met in their houses, offices and in youth centers and cafes. All interviewed people were eager to have NG installed.	NG will be gradually installed to the houses but it has to be in accordance to the budget and technical specifications
Safety procedures	What are the safety procedures adopted by the NG companies?	The NG companies adopt international procedures of NG safety. i.e. adding odor to NG, also, safety of construction and technical requirements
Shutting NG regulator daily	Should the NG house regulator be shut down every day?	No not necessarily. It can be shut down just during a long leave from the house



Subject	Questions and comments	Responses
Coordination with the NG for future maintenance of the other utilities	In case if any utilities get affected after the installation of NG, who will repair the damaged pipes?	In case if any utilities get broken or damaged, the LDC Regas should be reached out and informed about the damage. One employee from the LDC will accompany water company, electricity company The NG company should monitor any repairs. There will be a hot line to contact Regas. They should be informed about any activities.
NG pipeline get damaged	What will happen if any NG pipes get damaged?	LDCs have rigid emergency plans that should be adhered to. There is emergency vehicles that reaches the leakage area in just few minutes. Additionally, there is a hotline.
Fee collection problems	A huge problem is faced with the fee collectors. We had to pay a lot of money due to inefficient fee collectors	There was a problem in Petrotrade (the company responsible for collecting fees) the workers were on a strike asking to enhance their working conditions. This was ended a month ago and collection will continue with no further delays.
Street rehabilitation cost	The Local Distribution Company has not disbursed the street restoration cost until now	Prior to the construction the LDC conduct a meeting with the Local Governmental Unit. This meeting is called a coordination meeting. The cost of street rehabilitation will be paid after this meeting.
Safety measures in bakeries and industrial structures	What are the safety measures applied in industrial structures and bakeries?	Any industrial activity will apply a maintenance contract. We always adopt preventive procedures. Regas provides the clients with detailed instructions required for their safety.
NG is safe	NG installed to houses is safe. It is only 22 mm. It is lighter than air. Therefore it will rise and get out through windows	A leaflet was prepared and distributed to community prior to the construction. It is planned to provide awareness activities via schools as students can pass information easily to their parents.
Poor people ability to install NG	A high percentage of poor people will not be able to install NG	The NG connection costs 5500 EGP. The client pays only 1600 EGP. There is no further support to be given to the poor right now. However, there is an arrangement to pay in installment. There is a grant to support poor people



Subject	Questions and comments	Responses
Installation of NG that might cause visual impacts	Some people are reluctant to install NG due to the insistence of NG companies to install NG in the apartment's reception or entrance.	It is not a matter of visual intrusion, it is safety requirement. The NG companies do their best to install NG in the safest venue.
Requirement to install NG	Girls club needs to have NG installed. What are the requirements and the potential cost?	A study will be conducted to calculate the cost. Regas will contact the girls club
Economic analysis for the project	The presentation discussed the environmental and social impacts. What about the economic feasibility of the project?	This project is a service provided by the state. It is not generating money. However, the project will result in significant reduction in the subsidies allocated for the LPG cylinders.
Protective measures	The LDC use a yellow warning ribbon to keep children away. This should be replaced by metal barriers.	This will cost a lot. The yellow ribbon keeps children away. Additionally, workers keep an eye on construction sites
Contractors delay	The contractors in one of the areas have not been working for a week. What should people do?	They should get in contact with Regas. After the session we will check on this contractor.
Awareness activities	People should be informed about the project time plan and its activities	The LDC puts signs informing about project activities





## 8.4 Disclosure of the public consultation event

After the public consultation event, social media and newspapers disclosed information about the event and its results.

Following are some of the news items published:

- 1- El Youm El Sabea
- 2- El Watan
- 3- Vito website



Figure 8-12: News item in El Watan news

<http://www.elwatannews.com>





Figure 8-13: News item in El Youm El Sabea

<http://www.youm7.com>

## 8.5 Summary of consultation outcomes

Site specific consultation activities, as mentioned in details above, included wide range of concerned stakeholders. This included but 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.

His Excellency the governor of Qena expressed his welcome and support to the project. His enthusiasm about the project was reflected in attending the public consultation earlier before all other audience came. His interest in the project was an inspiring feeling to the other participants, especially, the heads of LGU. They expressed their support to the project. Other stakeholders expressed their overwhelming interest in the project. It was noticeable that NG staff members have a good reputation among community people. However, the performance of the fees collection company was not satisfactory. Safety of NG and street rehabilitation remained as the main concern among various stakeholders. The NG projects have a bad legacy regarding street restoration. The NG LDC representatives passed clear information about the role of the LGU in street restoration.



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<sup>22</sup>, 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.

## **8.6 SSESIA disclosure**

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The site specific SSESIA after being approved by the World Bank and EEAA, a final report will be disclosed on the WB, EGAS and Egypt Gas websites. An executive summary in Arabic will be disclosed on EGAS and Egypt Gas websites. A copy of Qena City Site specific reports will be disclosed on EEAA and Governorate level.

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<sup>22</sup> 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
12.	Ms. Zeinab Aly	Data management manager (EcoConServ)
13.	Mr. Sohy El Grouf	Field manager
14.	Mr. Sameh Mahrous	Senior administrative coordinator
15.	Mr. Mohamed Abd El Hady	Community engagement manager
16.	Ms. Hana Mostafa	Field supervisor

### Acknowledgement

The EcoConServ & 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 & Petrosafe also acknowledges 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<sup>23</sup>

Cultural property include 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.

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<sup>23</sup> 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
<b>Effects on cultural sites</b>	Identify areas of antiquities, monument repair zones	Contractor & 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<sub>2</sub> analyzer (Thermo Scientific SO<sub>2</sub> Analyzer model 43i-USA) with a detection limit of ≤ 1 ppb and a precision of ≤ 0.5%. Nitrogen oxides were measured using a NO<sub>x</sub> analyzer (Thermo Scientific NO<sub>x</sub> 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<sub>10</sub>, 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<sup>3</sup> and the precision is ≤ 0.4 µg/ m<sup>3</sup> for 24 hour cycle time at a 2.3 m<sup>3</sup>/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 <sub>x</sub>	ISO 7996 equivalent to(U.S.A EPA Reference method – RFNA-1289-74)
SO <sub>2</sub>	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 <sub>10</sub> 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.

Criterion	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)	$I = \pm (3 \times IN + 2 \times EX + MO + PE + RV + SI + AC + EF + PR + MC)$	





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

MOBILIZATION			PREPARATION					CONSTRUCTION							OPERATION				
Transport of equipment	Transport of machinery	Temporary storage	Area delimitation & 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	
<b>40</b>	<b>40</b>	<b>18</b>	<b>19</b>	<b>22</b>	<b>28</b>	<b>25</b>	<b>28</b>	<b>43</b>	<b>47</b>	<b>31</b>	<b>28</b>	<b>49</b>	<b>24</b>	<b>24</b>	<b>47</b>	<b>13</b>	<b>46</b>	<b>25</b>	
<b>32.7</b>			<b>24.4</b>					<b>35.1</b>							<b>32.8</b>				
<b>31.2</b>																			

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



## Annex 5: Complaint Form

<b>Local Distribution Company:-----</b>	
<b>English Complaint Form</b>	
Date:---/---/-----	Time: ---:---
<b>Aggrieved person information</b>	
Name of the customer:----- ID Number:----- -----	
CRN:-----	
Name of aggrieved person:-----	
Relation to the customer:-----	
Cell phone:-----	
Summary of the complaint: ----- ----- ----- -----	
Name of aggrieved person -----	Signature -----
<b>Complaint recipient</b>	
Name of the person received the complaint----- Signature:----- -----	
The entity caused the complaint----- Zone:----- -----	
Analysis of complaint reason: ----- ----- ----- -----	
<b>Person responsible of the corrective procedures:----- Signature:-----</b> -----	



شركة.....

شكوى عميل

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

بيانات الشاكي

اسم العميل : ..... رقم قومي .....

العنوان :- : CRN .....

اسم مقدم الشكوى : ..... صفته : ..... تليفون : .....

ملخص الشكوى :

.....

.....

.....

مقدم الشكوى

الاسم : ..... التوقيع :

بيانات متلقي الشكوى

اسم متلقي الشكوى : ..... التوقيع : .....

الجهة المشكو منها : ..... المنطقة : .....

تحليل أسباب الشكوى :

.....

.....

.....

الإجراءات التصحيحية :

.....

.....

.....

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





## **Annex 6: Egypt Gas Health and Safety guidelines**

This is a comprehensive document in Arabic which covers H&S aspects of nearly all possible project activities with clear instructions, administrative requirements, and illustrations.

Attached below is the 3<sup>rd</sup> version of the guideline. This is currently under review from Egypt Gas prior to official release.