



EGAS

Egyptian Natural Gas Holding Company
Developed by



EcoConServ Environmental Solutions

**1.5 Million Natural Gas Connections
Project in 11 Governorates
Low Pressure Natural Gas Network
Environmental and Social
Management Plan
Qalyubeya, Governorate
(El Qalag and El Gabal El Asfar, Met
Asem, Izbet Afandena)
Final Report
March 2018**



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 |
| NO ₂ | Nitrogen dioxide |
| OSH | Occupational Safety and Health |
| P&A | Property and Appliance Survey |
| PAP | Project Affected Persons |
| PE | Poly Ethylene |
| PM ₁₀ | 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 |
| SO ₂ | 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\$ = 17.5 EGP. as of January 2018

Exchange Rate: € = 19.26 EGP as of January 2018



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1 Introduction

1.1 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) in El Qalag and El Gabal El Asfar, Met Asem and Izbet Afandena in Qalyubeya governorate

Objectives of the Environmental and Social Management Plan (ESMP)

This ESMP has been prepared based on the Terms of Reference prepared by EGAS and cleared by the World Bank; additionally the ESMP follows national and IFC requirements regarding scope and detail of assessment and procedure, and gives particular emphasis to public information and stakeholder participation. **Objectives of the ESMP 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
- Assessing project alternatives if different from those presented in ESMP framework
- 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

This ESMP follows national and IFC requirements regarding scope and detail of assessment and procedure, and gives particular emphasis to public information and stakeholder participation. It will identify and assess significant impacts the proposed project is likely to have on the local population and on human health; on land, soil, water, air and climate; on landscape; on biodiversity; and on cultural heritage. It will identify risks and will suggest mitigation measures where appropriate.

The areas and the total number of household which will be covered in this ESMP are illustrated in the following table:

**Table1-1: Number of Areas and household**

| Governorate | Local Distribution Companies | Areas | Households connection | | |
|----------------------|------------------------------|--------------------------------|-----------------------|-------------|--------|
| | | | First year | Second year | Total |
| Qalyubeya | Egypt Gas | Izbet Afandena | 750 | --- | 750 |
| | | Met Asem | 1750 | 400 | 2150 |
| | | Al-Qalag and El Gabal El Asfar | 14,000 | 6000 | 20,000 |
| | Cairo Gas | | | | |
| Total of Governorate | | 3 areas | | | 22,900 |

The studied areas contain existing pressure reduction stations (PRS) and no Environmental and social impact assessment (ESIA) is required for these stations.

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.

1.2 Contributors

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



2 Project Description

2.1 Background

Excavation and pipe laying of the distribution network, installation of pipes on buildings, internal connections in households, and conversion of appliance nozzles to accommodate the switch from LPG to NG are the key activities of the construction phase.

The red box below denotes project activities covered by this ESMP:

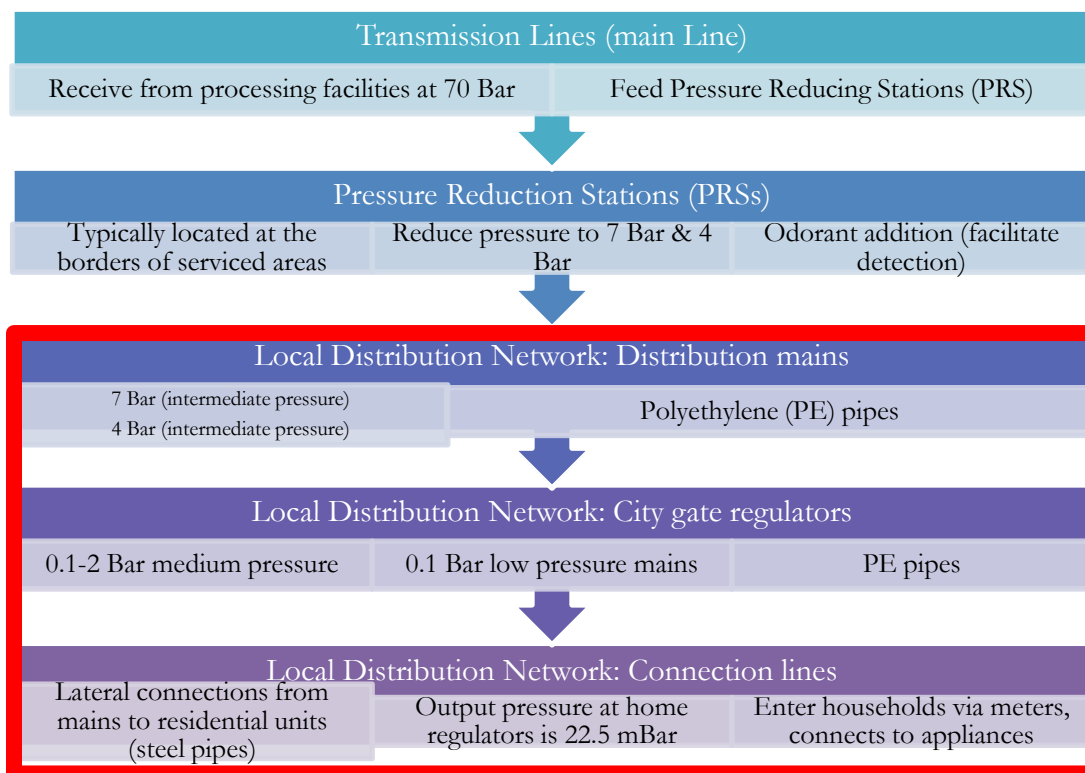


Figure 2-1 General components of the City's distribution network

2.2 Project Work Packages

2.2.1 Intermediate Pressure Network-Main feeding line (7 bar system)

2.2.1.1 El Qalag and El Gabal El Asfar (distributed by Cairo Gas Company)

El Qalag and El Gabal El Asfar are considering as one area and it is belong to Qalubeya Governorate which is located adjacent to Khanka at the south of the Nile delta.

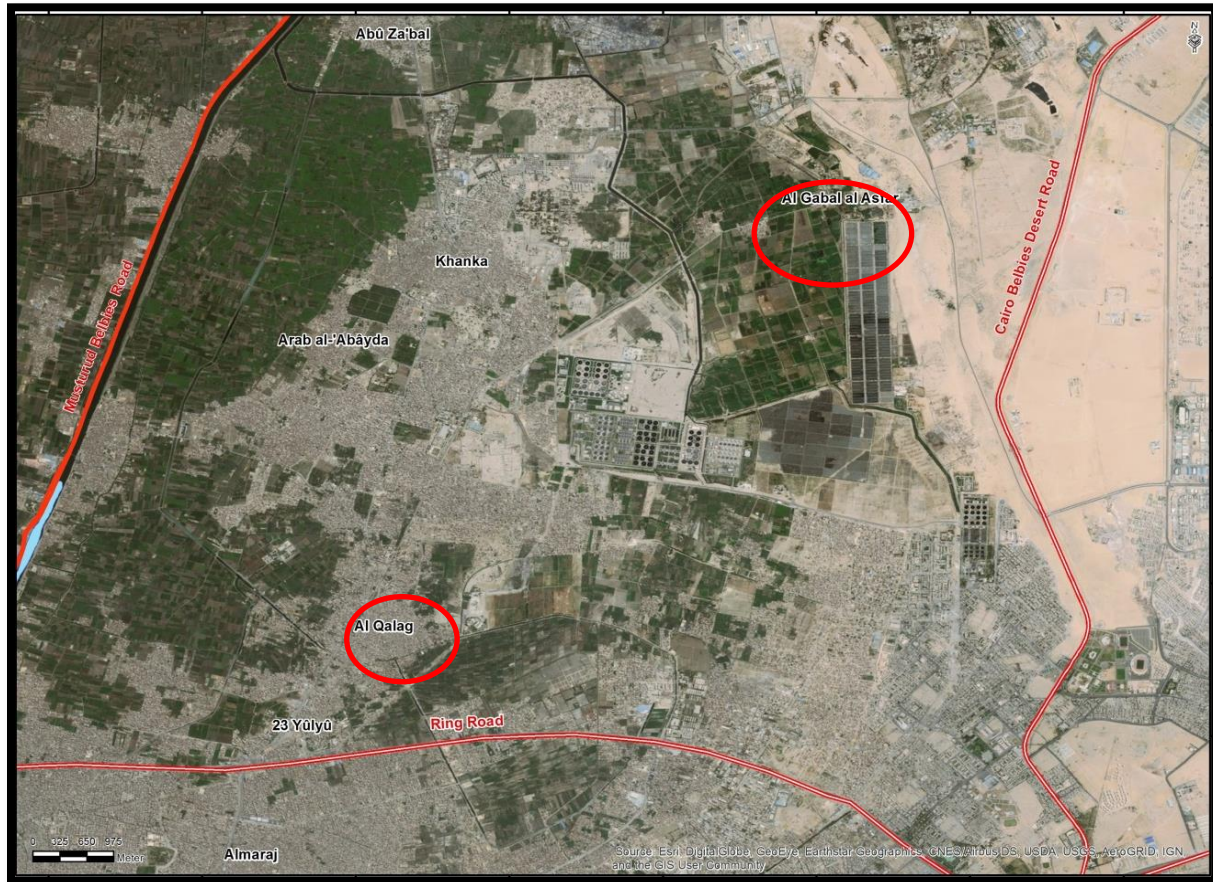


Figure2-2 El Qalag and El Gabal El Asfar location

2.2.1.2 Route

El Qalag and El Gabal El Asfar is supplied from the outlet of the existing Abo Zaabal pressure reduction station (PRS) affiliate to GASCO with capacity of 2000 m³/hr and 7 bar operating pressure. There is an existing pressure regulator with metering station and odorant unit affiliate to Cairo Gas is installed within Abo Zaabal station to reduce the operating pressure from 7bar to 4bar. El Qalag and El Gabal El Asfar is supplied with another feeding line branched from the existing gas network of 4bar affiliate to Nat Gas supplying El Qalag and El Gabal El Asfar with capacity of 2000 m³/hr. The branched line is 6.4 kilometers long to reach the required area.

New feeding line

Nat Gas has two existing gas network which are 7 bar gas network and 4 bar gas network. As per the agreement with Nat Gas, a new feeding line will be branched from the existing 7 bar gas network affiliate to Nat Gas with capacity of 5000 m³/hr.

The starting point for the new feeding line will be at the intersection between Trolley Street and ring road close to central security forces camp where the gas network (7bar) of Nat Gas is existing. A branched pipeline will be taken from this existing network. A new pressure regulator with filter and metering unit will be installed in the same area to reduce the pressure from 7bar to 4bar to link with the existing pipeline from the outlet of Abo Zabaal PRS of 4bar and 2000 m³/hr to supply El Qalag and El Gabal El Asfar.



Accordingly, El Qalag and El Gabal El Asfar are supplied with total capacity of 9000 m³/hr (4000 m³/hr existing, 5000 m³/hr future). The length and size of the pipeline of the connection from Nat Gas to El Qalag and El Gabal El Asfar

Table 2-1 Length and size of pipes in the intermediate Pressure Network for El Qalag and El Gabal El Asfar (7-4 bar)

| Pipe diameter | 90 mm | 180 mm | 250 mm (4bar) | 250 mm (7bar) |
|---------------|------------|------------|---------------|---------------|
| Pipe length | 100m | 2880 m | 4100 m | 1000 m |
| Laying depth | 1.2 m :2 m | 1.2 m :2 m | 1.2 m :2 m | 1.2 m :2 m |

The figures below show the intake point from Nat Gas network (intersection between Trolly Street and ring road).

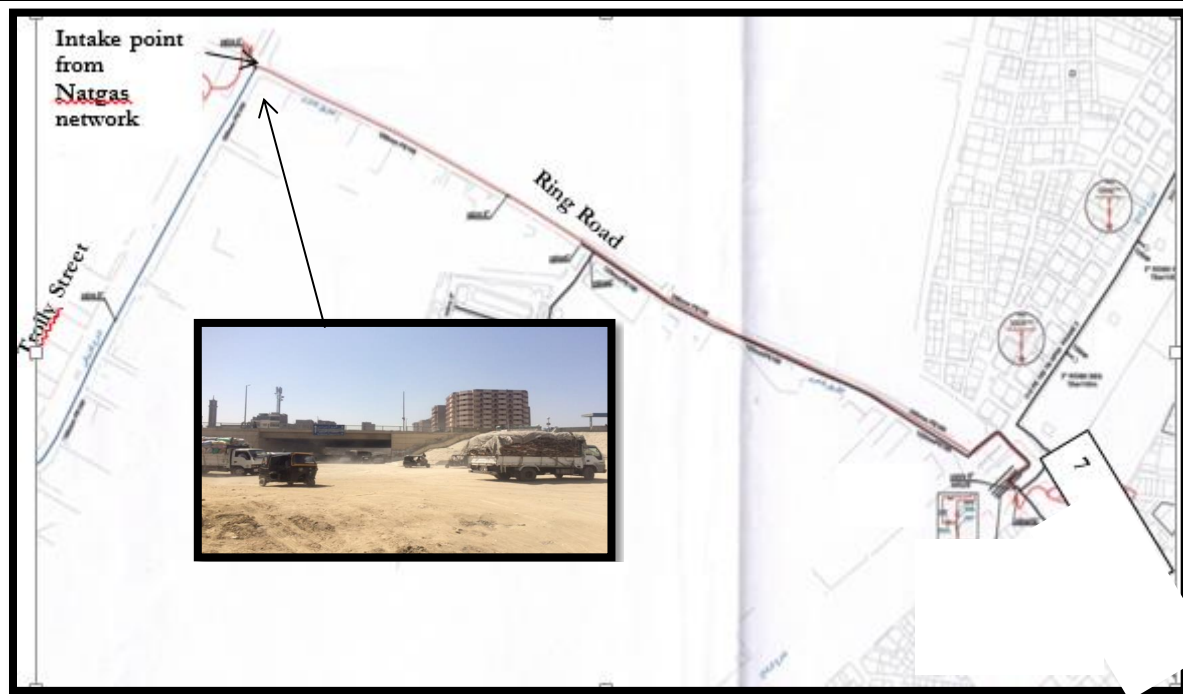


Figure2-3 Intake point from Nat Gas network with capacity of 5000m³/hr



Figure2-4 Location of starting point of the route and pressure regulator in El Qalag, El gabal El Asfar



Figure2-5 Example of Cairo Gas pressure regulators

The route of the branched line from Nat Gas network is 3 km long till it reaches Abo Zaabal PRS affiliate to GASCO (2.10 km in unpaved road and 900 meters paved road at el Zaka Street) and 2.7 km from GASCO PRS to the required supplied areas. No land acquisition or resettlement activities are anticipated as the network will pass through the main urban



roads/streets and side roads and far from any agriculture lands without causing any damage to private assets or lands.



Figure2-6 Route of feeding line in El Qalag and El gabal El asfar



Figure2-7 View of the existing pressure reduction station affiliate to GASCO

The route is passing by some public establishments which are the following:

- Abo Baker el sedek Mosque,
- Medical Unit,
- The Intellectual Education Foundation in Al-Marj, and
- El Qalag complex new School

Sensitive receptors along the route have been identified which are the medical Unit, The Intellectual Education Foundation in Al-Marj, and El Qalag complex new School and will be presented in details in Chapter 4 (Baseline conditions) and Chapter 5 (Impact Assessment).



Medical Unit



The Intellectual Education Foundation in
Al-Marj



El Qalag complex new School

Figure2-8 Sensitive Receptors in El Qalag and El gabal El asfar

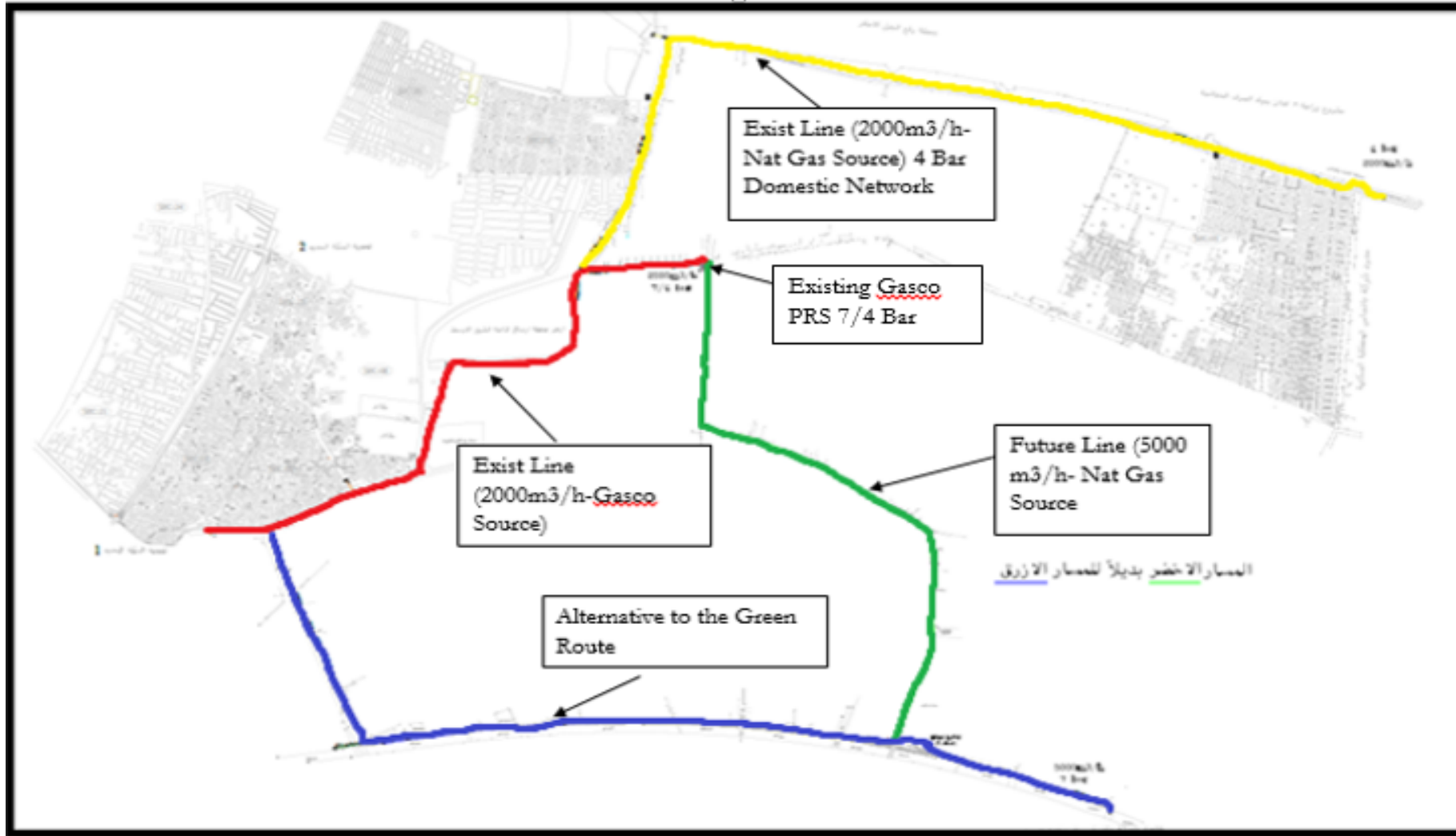


Figure2-9 Future and Existing feeding line

The blue route is alternative to the green route. Cairo Gas will implement the green route.



2.2.1.3 Met Asem (distributed by Egypt Gas Company)

Met Asem belongs to Al Qalyubeya Governorate which is located adjacent to Banha at the south of the Nile delta in Egypt.

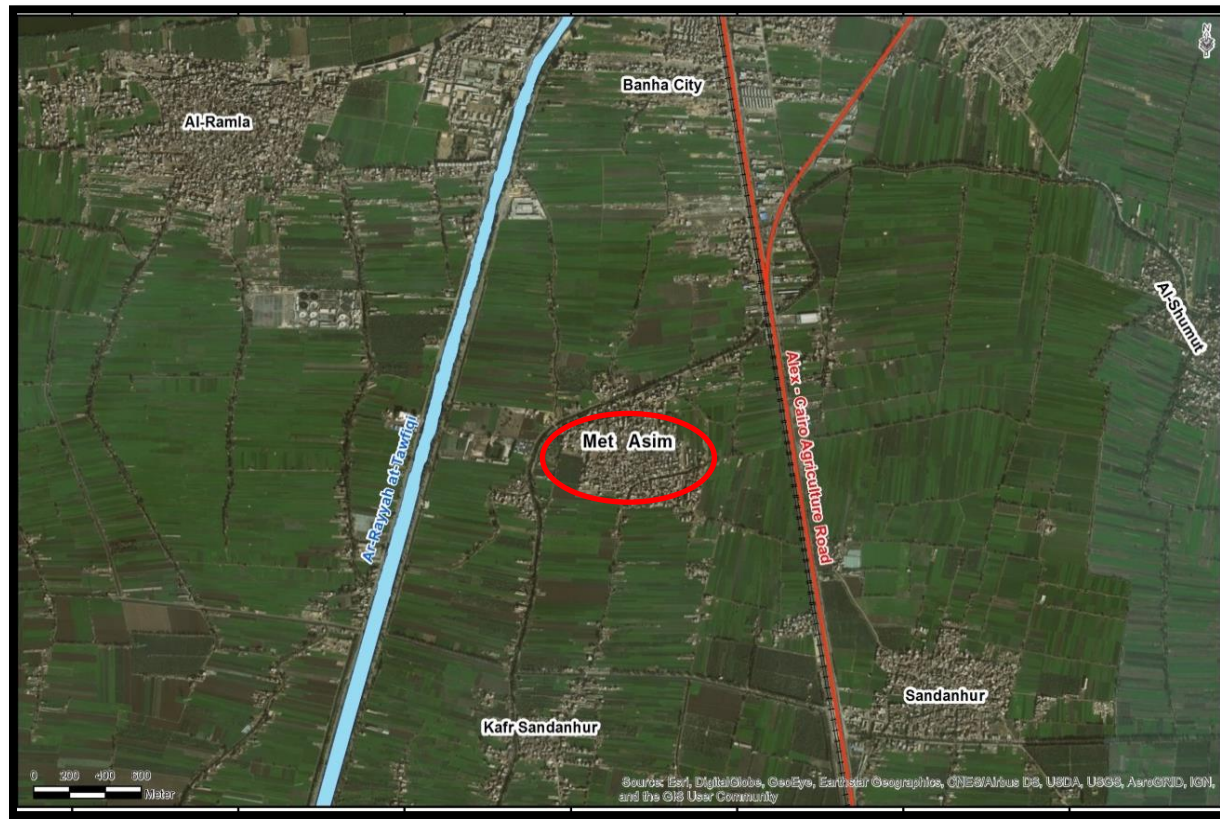


Figure2-10 Met Asem location

2.2.1.4 Route

The main feeding line supplies Met Asem is coming from the outlet of the existing PRS located in Banha affiliate to Egypt Gas with capacity of 2500 m³/h and 7 bar operating pressure. This PRS is around 5 kilometers far from Met Asem. The feeding line is extended to El Zaazeea Street till matahn 23 July where the pressure regulator with odorant unit (7-4 bar) is existed. However, the construction of this extended line had been done in the previous phase.

New feeding line

The starting point of the new feeding line will be after crossing Zaazeea Street (in front of matahen 23 July). The pipeline will cross by Alexandria - Cairo railway and drainage path (brackish water from agriculture wastes) to reach Met Asem.

Design specifications for crossing railway will be presented in section 2.4.2 Excavation and pipe laying.

All necessary permits will be obtained from railways prior to starting work.



Table 2-2 Length and size of pipes in the intermediate Pressure Network for Met Asem (7-4 bar)

| Pipe diameter | 90 mm | 180 mm(01) | 180 mm(02) |
|---------------|------------|------------|------------|
| Pipe length | 270 m | 1600 m | 1380 m |
| Laying depth | 1.2 m :2 m | 1.2 m :2 m | 1.2 m :2 m |



Figure2-11 Main feeding line to Met Asem



Figure2-12 View of the existing pressure reduction station (Banha) affiliate to Egypt Gas



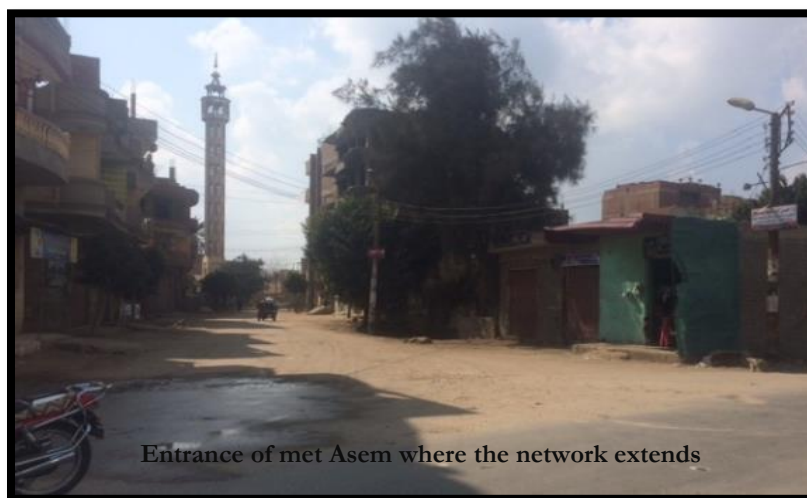


Figure 2-13 Route of feeding line in Met Asem

2.2.1.5 Izbet Afandena (distributed by Egypt Gas Company)

Izbet Afandena belongs to Al Qalyubeya Governorate which is located adjacent to Musturud, east shobra el khayma district at the south of the Nile delta in Egypt.



Figure 2-14: Location of Azbet Afandena

2.2.1.6 Route

The main feeding line supplies Izbet Afandena is coming from the outlet of the Sornaga existing PRS affiliate to Egypt gas with capacity of 1000 m³/h and 7 bar operating pressure. This PRS is around 5 kilometers far from Izbet Afandena.

New Main feeding line

The gas network pipeline will extended from the feeding line coming from the PRS and a new pressure regulator with a filter meter and odorant unit will be installed on that line with inlet pressure of 7 and 4 bar outlet pressure to supply Izbet Afandena with the required gas.

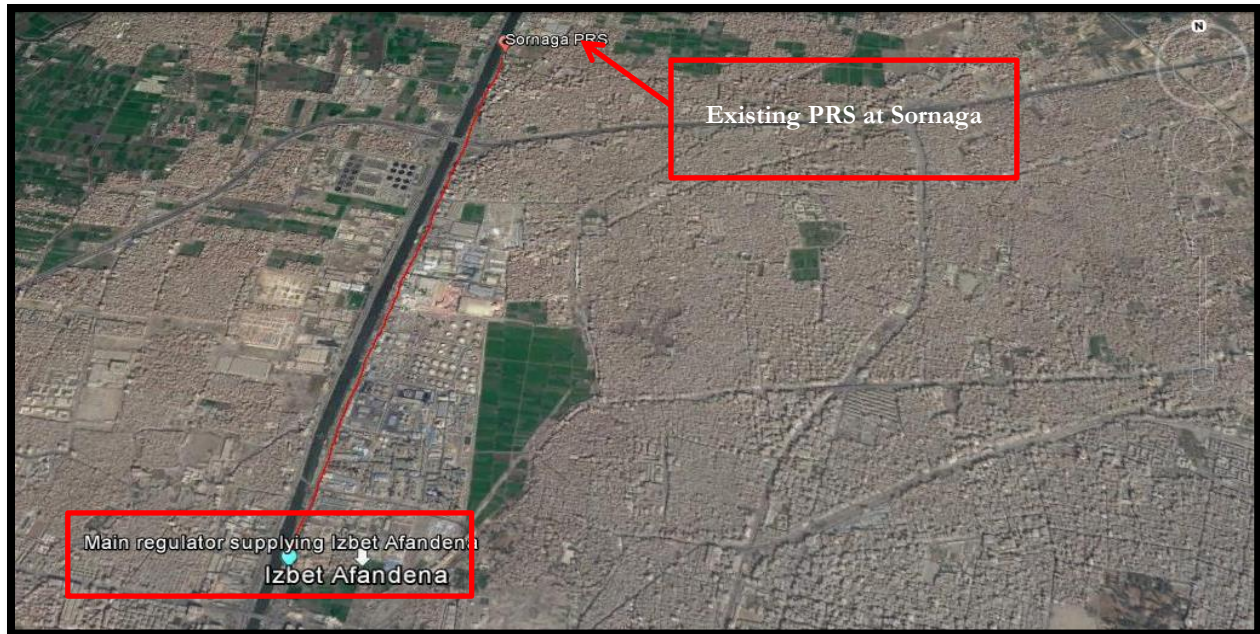


Figure 2-15 Main feeding line to Izbet Afandena



Figure 2-16 View of the existing pressure reduction station (Sornaga) affiliate to Egypt Gas



Figure 2-17 Starting point of the project area

2.2.2 Low pressure Network-Distribution Network (Regulators, PE 80 Networks)

Low pressure gas distribution network in the studied areas is distributed via a gas distribution piping system consisting of low pressure service lines. The pressure of gas in service lines is 100 mbar. In such a system, a service regulator is not required on the individual service lines. Low pressure service lines are mainly constructed from medium density polyethylene pipes (MDPE) having a maximum operating pressure (MOP) below 100 mbar. PE80 network will be installed horizontally underground. Piping characteristics are tabulated below.

Table 2-3: Length and size of pipes for the Low Pressure Network for El Qalag and El gabal El Asfar (100 mbar)

| Pipe diameter | 32 mm | 63 mm | 90 mm | 125 mm | 180 mm | 250 mm |
|---------------|------------|------------|------------|------------|------------|------------|
| Pipe length | 32,000 | 50,000 m | 8000 m | 7000 m | 6000 m | 1000 m |
| Laying depth | 1.2 m :2 m | 1.2 m :2 m | 1.2 m :2 m | 1.2 m :2 m | 1.2 m :2 m | 1.2 m :2 m |

Table 2-4: Length and size of pipes for the Low Pressure Network for Izbet Afandena (100 mbar)

| Pipe diameter | 32 mm | 63 mm | 90 mm | 125 mm | 180 mm |
|----------------|------------|------------|-----------|------------|------------|
| Pipe length(m) | 400 | 1400 | 140 | 400 | 100 |
| Laying depth | 1.2 m :2 m | 1.2 m :2 m | 1.2 m:2 m | 1.2 m :2 m | 1.2 m :2 m |

Length and size of pipes for the low pressure network in Met Asem is not available as Egypt Gas is still working on it.

2.3 Project Execution Methodology



2.3.1 Project area selection criteria

Preliminary project planning has applied social, economic, safety, and technical criteria to identify sub-areas eligible for connecting customers (households). The project shall introduce the service in new areas and shall further extend the network in areas which are partially covered.

A preliminary estimate was generated through a general survey, followed by a Property & Appliance (P&A) survey.

The general survey covered the following:

- 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 gas networks.

While the Property & Appliance (P&A) survey covered the following:

- Obtain the latest aerial maps of the project areas from the Egyptian Survey Authority
- Identifying Global Positioning System (GPS) coordinates of the sites
- Data is entered into a central database and G.I.S system for review by a design team
- Design team finalizes pipe sizing, capacity & locations and routing.

Based on the surveys described above, potential connections in El Qalag and El Gabal El Asfar, Met Asem and Izbet Afandena are presented below:

Table 2-5 Planned Connection

| Governorate | Local Distribution Companies | Areas | Households connection | | |
|----------------------|------------------------------|--------------------------------|-----------------------|-------------|--------|
| | | | First year | Second year | Total |
| Qalyubeya | Egypt Gas | Izbet Afandena | 750 | | 750 |
| | | Met Asem | 1750 | 400 | 2150 |
| | | Al-Qalag and El Gabal El Asfar | 14,000 | 6000 | 20,000 |
| | Cairo Gas | | | | |
| Total of Governorate | | 3 areas | | | 22,900 |

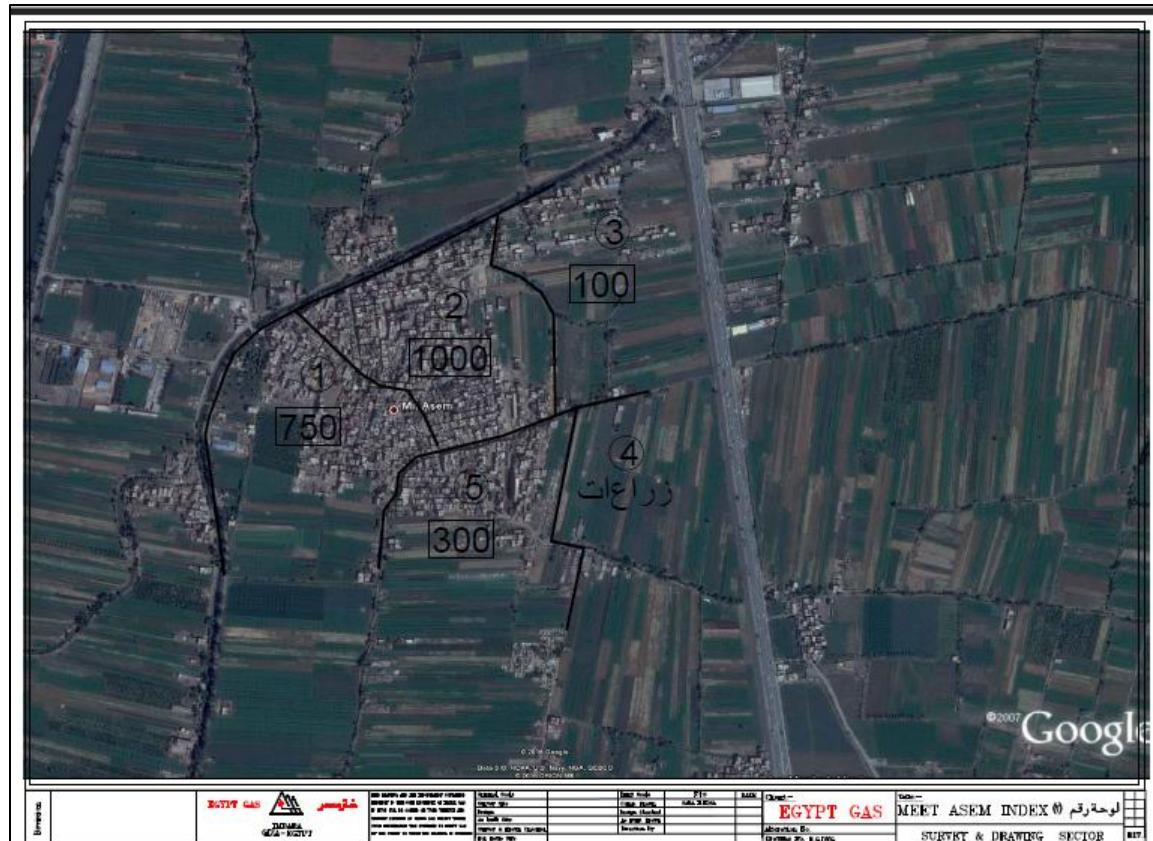


Figure 2-18 Distribution Number of households in each index for Met Asem

Figure 2-18 shows the index of Met Asem (index 1,2,3,4,5) where the low pressure gas network will be distributed and the number of households in each index.

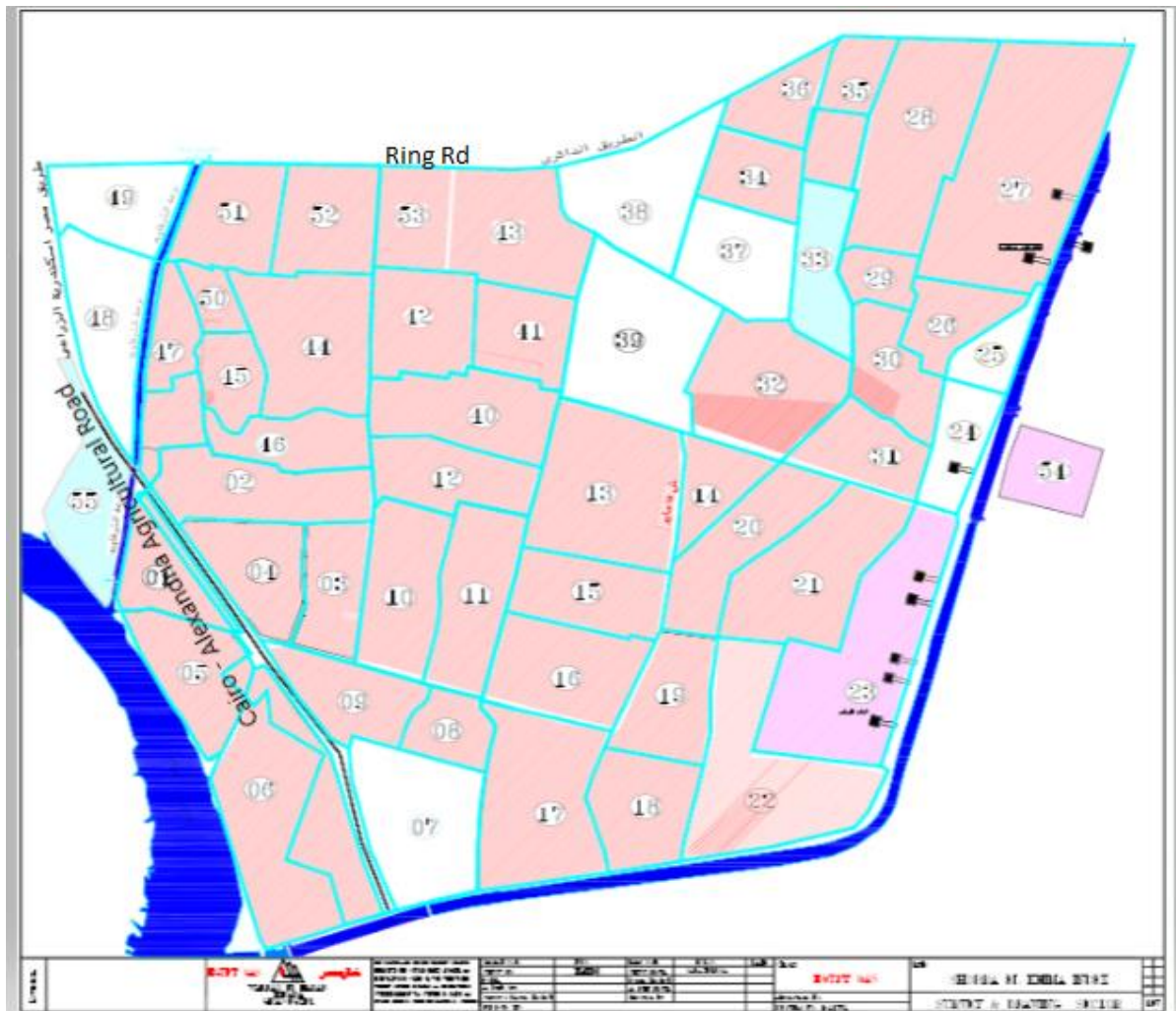


Figure 2-19 internal low pressure distribution networks in Izbet Afandena

Figure 2-19 shows the index in Izbet Afandena in which the low-pressure gas network will be distributed.

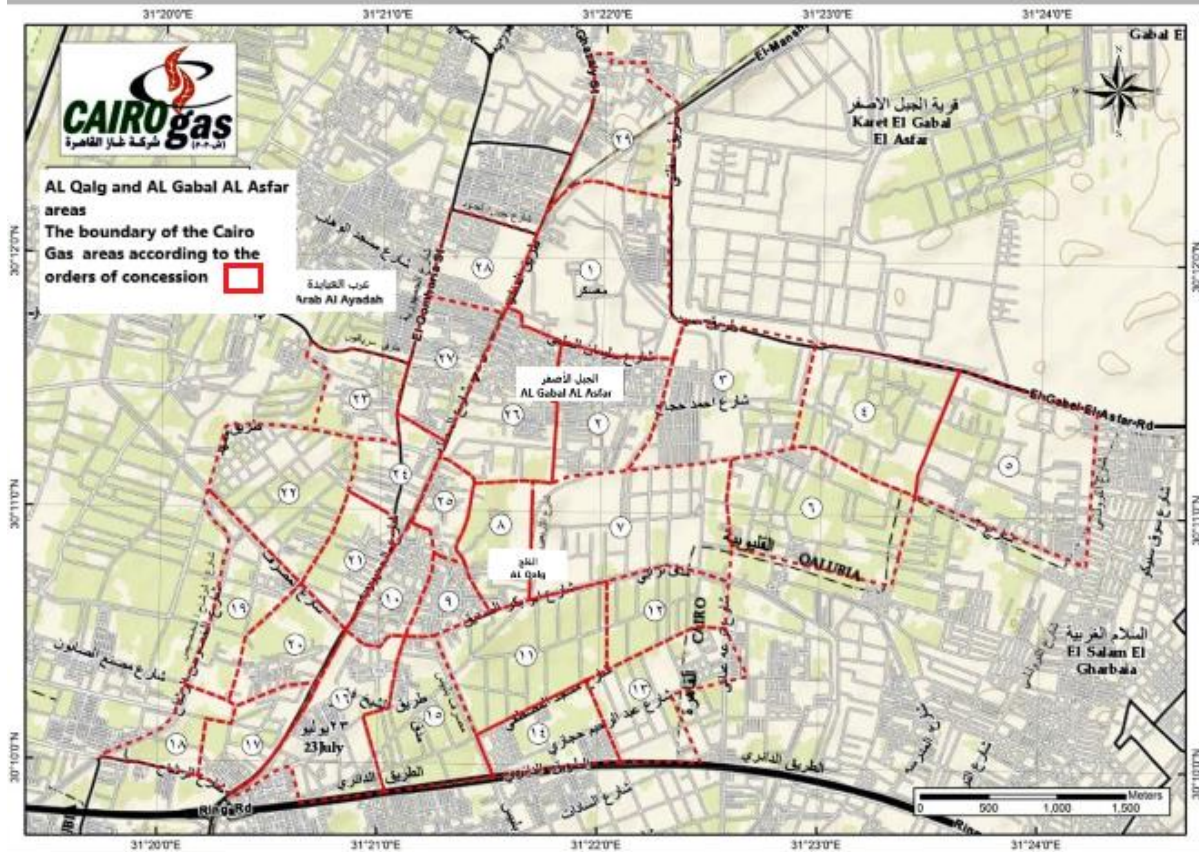


Figure 2-20 internal low pressure distribution networks in El Qalag , El gabal El Asfar

Figure 2-19 shows the index in El Qalag, El Gabal EL Asfar which the low-pressure gas network will be distributed.

The technical criteria can be summarized as follow:

EGAS prepared a list of technical specification required to have the NG installed in the area:

1. Areas that have access to all necessary public utilities especially land networks (electricity, water, sewage, telephone lines)
2. Adobe and wooden houses are not eligible for NG connections
3. Areas that comply with the British standards and/or the applied standards for NG connections that can be used for determining areas eligibility for NG connections.
4. Areas adjacent to NG National Grid

Criteria for connecting to buildings, and selection of the path of external pipeline:

1. Buildings are to be located close to the local distribution network
2. Buildings are to be built with concrete and red bricks not adobe or wood
3. Buildings are to be legally permitted and has access to electricity
4. The possibility of installing the riser pipes along the length of the building depending on the following priority (service stairwell, stairwell, façade)
5. Availability of enough space for the erection of the scaffold and the existence of access door to the stairwells
6. Easy access to the entrance point of vertical line in case of emergency
7. Approval of the building administration to grant access to workers

2.4 Construction works of Main feeding line/network “7bar system- low pressure Network 100 mmbar”



The construction activities of the network lines will involve drilling, pipeline placement, pipeline connection welding, and then surfacing. The construction activities will be located within the allocated site. The following activities will take place during the construction of network:

- Clearing and grading activities and Pipe transportation and storage
- Site preparation
- Excavation
- Pipe laying
- Welding
- Backfill and road repair
- Leakage testing
- Construction works of household installation
- Commissioning

The construction will be mainly in urban roads and local roads. No construction activities will take place in main roads.

2.4.1 Clearing and grading activities and Pipe transportation and storage

The first step of construction includes flagging the locations of approved access route of pipeline, temporary workshop for the crew, install fences surrounding the area of working, clean the land from any rubbish and /or remove weeds. Grading is conducted where necessary to provide a reasonably level work surface. Additionally, equipment and piping will be transported to the site (temporary storage area). Quality control procedures during the transportation and handling of pipes should take place to ensure protection from any effects that may damage the pipes, and prevent any traffic accidents.



Figure 2-21 Potential temporary storage area in the studied areas

2.4.2 Site preparation

Before any excavation activities, the Egypt gas and Cairo Gas shall coordinate with the different authorities to determine the existing infrastructure in the project's area (e.g. water lines, sewage lines, electrical cables and telecommunication lines) so as to avoid any undue damage. In case of



lacking sufficient information on the available infrastructure, they will carefully excavate a trial pit.

2.4.3 Excavation

The most commonly used excavation technique is the Open cut technique. Horizontal Directional Drilling (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, a reinforced concrete sleeves will be installed to further protect the piping from fatigue. **It should be noted that there are no crossing with waterways of the Nile or its major branches in the studied areas.**

HDD is anticipated in Met Asem as it is required to cross a railway to reach it.

HDD is a trenchless methodology that use high excavation depths (about 30-40 meters) and can be used for high pipeline length. HDD provides a number of benefits compared to the other traditional technologies.

These benefits include having very little disruption to traffic as road narrowing or diverting are not required, in addition to the smaller work area requirements and it takes 2 working days.

Auger boring drilling is used in one of the urban road crossing. The horizontal auger boring trenchless technique involves equipment like auger boring machine, auger, and cutting head. This technique also requires the excavation of a drilling pit and a receiving pit. The process starts by lowering the auger boring machine into the drilling pit, and then the augers installed inside the casing pipe are lowered into the pit and connected to the auger boring machine. The boring operation then starts by rotating the augers and the cutting head, and pushing the casing pipe gradually forward. This process continues till the casing pipe emerges from the receiving pit side. The boring process results in cuttings (spoil) which is carried through the augers and extracted from the entry side of the boring machine.

Excavation works start by removing the asphalt layer and the base stone layer using either a mechanical excavator (used in urban roads) or an air compressor jack hammer for dusty roads (used in local roads). In case the jack hammer is used, road layers are removed by excavator. The trench is excavated to a depth that provides sufficient cover over the pipeline after backfilling.

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.

At locations with irregular ground elevations, additional excavation may be applied to avoid undue bending of the pipe. In addition, and in case of having crossing with other underground infrastructure lines/cables, the trench shall be deepened so that the pipeline be installed below or above the existing lines/cables.

Typically the trench (for PE100 7 bar network are orange pipes with diameter of 0.09m to 0.25 m and for PE80 10 mmbar are yellow with diameter 0.25 m-0.03 m) is 0.4-0.6 meter wide, and about 1.2-1.5 meter deep, depending on pipe diameter.



Figure 2-22 Typical trench for PE pipes

The excavation products are placed on the sides of the trench by distance of 60 cm so it doesn't fall down inside the trench. The followed safety procedures are presented in annex 2

2.4.4 Pipe laying

Before pipe lying, the bottom of the trench is cleaned of any rocks or solid objects which may damage the pipes.

2.4.5 Welding

Two types of welding are used, butt fusion welding technique will be used for pipe welding (hot plate softening the tips of the PE pipes before joining) and electro fusion welding (fittings with heating coils installed inside) will be used to weld fittings. In both cases, diesel generators and relevant cabling would be needed.

2.4.6 Backfill and road repair

The trench will be backfilled immediately after the pipeline has been laid considering that the finished backfilling level will be the same as the road level. The initial backfill will be to a minimum height 20 cm of fine sieved sand either by a front loader or manually to protect the pipeline. The backfill will be then compacted by wet sand layers of 15 cm thickness in order to avoid road settlements and subsequent cracks. In some cases, an inverted U-shaped reinforced concrete slab is constructed around the pipeline after laying in order to improve shock resistance.

Cathodic protection is mandatory for underground gas distribution lines. Packed magnesium anode cathodic protection system will be applied to the pipeline in all cases

After that, the contractor will work on restoring the road surface to its original status. A yellow warning tape marked "Natural Gas" is placed on top of the sand layer. Appropriate signage and community safety measures will be in place in addition to covering or safeguarding any open trenches that are not promptly filled.

2.4.7 Leakage testing:

Following construction activities, the piping should be tested to locate possible leaks. As long as the operating pressure in the studied areas is low therefore pneumatic leakage testing will be required.



- **Pneumatic testing**

A pressure test is always required for a new pressure system before the flow of natural gas starts to ensure the following:

- Safety
- Reliability of operation
- and leak tightness of pressure systems

The testing pressure is 1.5% higher than the design pressure. It is recommended only for low pressure applications. The testing media used is compressed air. Pressure relief devices are must during the test to ensure no over pressurization

Before testing, checking of weld joints is needed to be very careful thoroughly. It is needed the involvement of senior experienced staff to monitor the test. Testing media is air. Test pressure is normally 1.5 higher than the design pressure. Pressure drop indicates leakage.

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).

2.4.8 Regulators

A gas distribution piping system that operates at a pressure higher than the standard service pressure delivered to the customer is required a service regulator to control the pressure delivered to the customer. A new pressure regulator (7-4 bar) will be installed in El Qalag and El gabal El asfar and Izbet Afandena.

A subunit for gas reduction from 4 bars to 100 mbar regulators (inlet pressure 4-2 bar and outlet pressure 100mbar) is placed to serve one or two adjacent sectors in a kiosk provided with a safety device according to international standards surrounded by guard rail fence

The pressure of this network is 100 mbar and it is made from low density polyethylene PE 80 SDR 17.6

The path of the low pressure network (100mbar) starts from the outlet of the pressure regulating kiosk of each sector till the service line of each property.

There are 7 Pressure Reduction Regulators in El Qalag and El gabal El asfar with the following specifications:

Input pressure: 2:4 bar

Output pressure: 100 mbar

Flow rate: 1000 m³/hr

2.4.9 Construction works of household installation

After testing the piping for leakage, connections work will connect the distribution network to the households. The connection starts from the main line (PE) and crosses the road to the buildings on both sides. Connection work will include the following activities:

- 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

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 2 bar and monitoring pressure drop.

2.4.10 Commissioning

Before starting the flow of Natural gas, the pipeline will be purged by flushing with dry nitrogen at ambient temperature to ensure that no operational problems arise from air or water left in the pipeline. The pressure of Nitrogen is gradually increased till it reaches the operating pressure, and then the operation starts by replacing the Nitrogen with Natural gas.

2.5 Machines used

- Air compressor with jack hammer
- Portable generators
- Directional boring machine
- Trench drilling machine
- Control box welding machine
- Butt fusion welding machine
- Manual excavation tools

2.6 Conversion of home appliances

The installation contract between the household owner and the local distribution company includes the cost of converting 2 appliances (stove and water heater). Conversion involves drilling injector nozzles to become 1.25 to 1.5 times larger in diameter. Conversion works are practiced at the client's household. Typical drill bit sizes used for conversions are either 35 or 70mm.

Conversion works also involve 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.

2.7 Activities of the operation phase

2.7.1 Operation of the network

The operation of the system is undertaken by local distribution companies (Egypt Gas, Cairo Gas). 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.

The natural gas composition of the national network is mainly Methane (80%) and traces of ethane, propane, Iso-butane, Nitrogen...etc. . The main activities are the monitoring of the pipeline and the routine checking for the occurrence of gas leaks.

2.7.2 Repairs in households

Repairs include appliance adjustments or piping/metering replacement.

2.7.3 Hotline

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

2.8 Resources Consumption

2.8.1 During Construction

Water

There is a permanent source of water from Egyptian Holding Company for Drinking Water and Sanitation. But, no water is needed during the construction activities.

Fuel

Diesel fuel will be mainly used for diesel generators that supplies electricity to the different construction activities including welding. In addition, diesel will be the fuel used by the trucks and excavators. The fuel will be delivered to the construction site via trucks when needed.

- Expected number of Workers

An estimated number of 51 workers from Egypt gas and 210 from Cairo gas will be needed during the construction period for the project. A section of the site may be used as a laydown area where shelters, equipment, washing and toilet facilities (portable) and containers will be located.

Workers accommodation will not be required on site because all the workers will be local.

2.9 Waste Generation

2.9.1 During Construction

2.9.1.1 Solid Waste

All solid wastes generating during the construction phase (excavated soils, broken asphalt and other waste materials during excavation, domestic waste) will be managed and disposed in accordance with applicable regulations and established best management practices. But common practice, the wastes 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.

2.9.1.2 Liquid Waste

Project activities in the studied areas will take place in the city, where project workers will have access to public sanitary facilities. Therefore, **no extra sanitary waste**



3 Legislation 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

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 the land obtained in Izbet Afandena, Met Asem, Al-Qalag and El-Gabal El-Asfar as the gas network will be established in the main urban streets and local roads without affecting any private assets. No pipelines will cross agriculture land in Izbet Afandena, Met Asem, Al-Qalag and El-Gabal El-Asfar, accordingly no land acquisition or resettlement activities are anticipated. Particularly, as the network will pass through the main urban streets/roads and side roads without causing any damage to private assets or lands. In addition, it is not envisaged that the project will result in any physical or economic dislocation of people for the construction of low-pressure pipelines in the project areas. The pipelines network will not cross agricultural land in the project areas and accordingly no compensation will be applied.

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

The General EHS Guidelines are designed to be implemented together with the relevant industry Sector EHS Guidelines. Gas distribution system – HSE Guideline (provided in Annex 2 from the report) are applicable to the project.

3.3 International Finance Corporation (IFC) EHS Guidelines



The IFC Environmental Health and Safety (EHS) Guidelines describes pollution prevention and abatement measures and emission levels that are normally acceptable to the Bank. However, it is taking into account borrower country legislation and local conditions.

In 2007, IFC Environmental, Health, and Safety (EHS) Guidelines were released which replace World Bank Guidelines previously published in Part III of the Pollution Prevention and Abatement Handbook.

The IFC EHS Guidelines are technical reference documents with general and industry-specific examples of Good International Industry Practice (GIIP). When one or more members of the World Bank Group are involved in a project, these EHS Guidelines are applied as required by their respective policies and standards (please see Annex 5)

3.4 Permits Required

- Railway Authority permit for crossing railways
- Constructions permit to be obtained from the Local Governmental Unit.
- Road and Bridges Directorate permission for digging of main roads in accordance to 84 of year 1968 pertaining to the public roads
- Environmental permit: according to Egyptian Law for the Environment, Law 4/1994 amended by Law 9/2009. EEAA approval on ESIA is considered the environmental permit.
- Permission from the High Council of Antiquities in accordance to Law No 117 of year 1983 and its amendment No 12 of year 1991.

The obtainable permits will be presented in the progress report.



4 Environmental and Social Baseline

4.1 Introduction

El Qalag, El gabal El Asfar, Met asem and Izbet Afandena belongs to Al Qalyubeya Governorate.

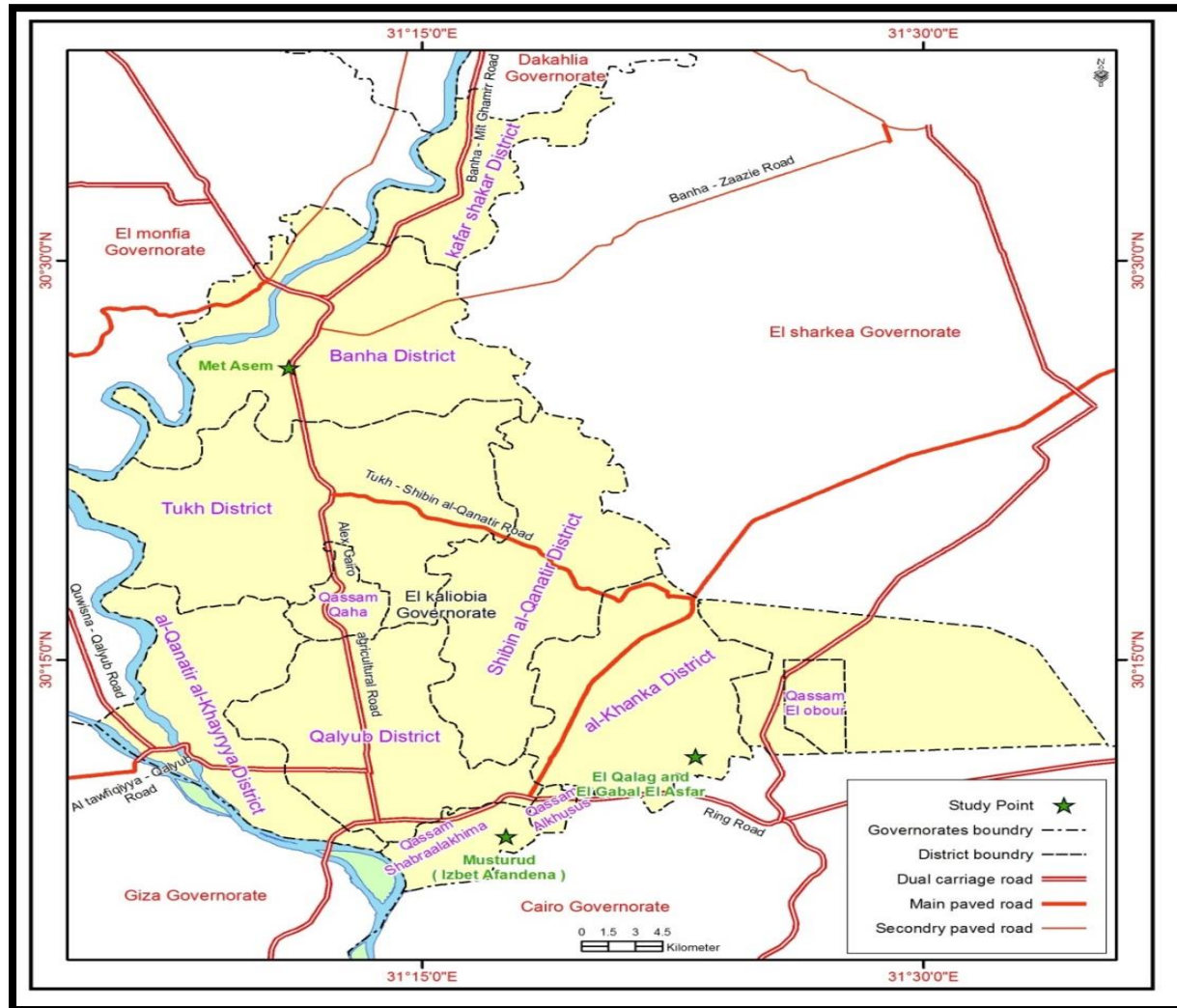


Figure4-1 Distribution of cities in Qalyubeya governorate

4.2 Environmental Baseline

4.2.1 Climate

The mean monthly values for temperature are more or less in the same range all over the studied areas as they all are located within the same governorate which reflects regional identity. The maximum values of temperature are generally recorded from April to August (27-28 °C) and the minimum from December to February (12-13°C). (Source: www.weatherbase.com)

4.2.2 Site Specific Ambient Air Quality

The selection of the active air measurement location is based on the nature of the surrounding activities, the location of the nearest sensitive receptors with respect to the project plots, prevailing wind direction, site topography and the future layout of the proposed project



components. Moreover, the selection is based on the guidelines stated in the American Society for Testing Materials (ASTM) reference method.

The measurement location was chosen on the basis that it's beside a school and near a residential area beside a main road and close to the pipeline route. The GPS coordinates of the selected Ambient Air monitoring locations.

One hour average results for 8 hours continuous measurements were conducted for pollutants of primary concerns, namely, carbon monoxide (CO), nitrogen oxides (NO₂), sulfur dioxide (SO₂), Total Suspended Particulates (T.S.P) and particulate matter (PM₁₀).

Table 4-1: Location of Air and Noise measurements

| Area | Latitude | Longitude |
|------------------------------|---------------|---------------|
| El Qalag , El gabal el Asfar | 30°10'59"N | 31°21'11"E |
| Met Asem | 30°25'31.00"N | 31°10'29.00"E |
| Izbet Afandena | 30° 7'57.00"N | 31°17'36.00"E |

Methodology, instrumentation, and results of Air Quality measurements are detailed in Annex 3.



4.2.2.1 Results of ambient air quality measurements

The concentrations of measured air pollutants in the studied areas are below national and WB guidelines. All the measurements for the gaseous pollutants are 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". Accordingly, the ambient air quality in the project areas is one of the tolerable areas in Egypt in terms of ambient air quality which can be attributed to the absence of any major industrial sources

During the construction phase, excavation and construction activities will likely cause dust levels to surpass permissible levels at the construction areas. As the excavation and construction 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 chapter 7.

Table 4-2 Average Air measurement's results for 8 hours at the 3 studied areas

| Area | NO ₂ (µg/m ³) | SO ₂ (µg/m ³) | CO (mg/m ³) | PM ₁₀ (µg/m ³) | T.S.P (µg/m ³) |
|-----------------------------------|---|---|----------------------------|--|-------------------------------|
| El Qalag/El Gabal El asfar | 24.4875 | 10.075 | 2.2375 | 124.2 | 183.6 |
| Met Asem | 17.0425 | 18.4725 | 5.97875 | 101 | 166 |
| Izbet Afandena | 19.1725 | 26.0825 | 6.69 | 113 | 174 |
| National Limits | 350 | 350 | 30 (mg/m ³) | 150 | 230 |
| International Limits | 200 | 125 | - | 150 | - |

4.2.3 Site specific noise measurements

One hour average results for 8 hours continuous measurements were conducted for noise level measurements in the same location of the ambient air quality measurements.

Methodology, instrumentation, and results of Noise measurements are detailed in Annex 3.

4.2.3.1 Results of noise measurements

The noise measurements in the studied areas are below national and WB guidelines. They are 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



The excavation and construction activities may cause noise levels to further surpass permissible levels at the site. As the excavation and construction 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 noise levels beyond permissible levels are further addressed in chapter 7.

Table 4-3 Average Ambient Noise Levels Readings for 8 hours at the 3 studied areas

| District | LAeq (dBA) |
|----------------------------|------------|
| El Qalag/El Gabal El Asfar | 56.4875 |
| Met Asem | 50.425 |
| Izbet Afandena | 56.3125 |
| National Limits | 70 |
| International Limits | 70 |

4.2.4 Water resources

4.2.4.1 Groundwater

Groundwater is unavailable in the 3 studied areas.

4.2.4.2 Surface water

There are no canals or drainages in the surroundings of Al-Qalag, El-Gabal El-Asfar and Izbet Afandena. The areas are mainly urban with scarce trees and palms. However, at the entrance of Met Asem, There is a drainage path (brackish water from agriculture wastes). It will be crossed by the main feeding gas pipelines.

4.2.5 Terrestrial Biological Environment

The projected work is planned along existing roads; no pipelines will be passing through any of the natural habitats. The gas route will be located in mixed agricultural urban area.

The proposed gas route and the connections of pipelines to households are planned in areas where flora and fauna of significance do not occur. The project area is eventually free from any endangered or vulnerable species.

4.2.6 Waste Management

The responsibility of service planning, delivery and monitoring in Al Qalyubeya Governorate is delegated to Cleansing Agencies. In most cases, the proportion of waste collected in the capital cities of the selected Governorates exceed 70 - 80%, however, in other cities at the Marakez, the figure is likely to be lower; - Few collection bins existed in the districts of AL-Qalyubeya Governorate.

Municipal Solid Waste (MSW) collection points, used as open transfer systems, existed in residential areas in the capital cities of Al Qalyubeya Governorate.

The responsibility of waste collection in the project areas in El Qalag falls under private company. They provide door to door waste collection. They also provide a kind of special waste collection contracts with entities and organization in El Qalag and el Gabal El Asfar.

With regards to Izbet Afandena and Meit Asem, the local Governmental Units are responsible for collecting wastes. They transfer wastes to open landfills.



4.2.7 Potential Sensitive areas

El Qalag, El gabal El asfar is the only area which sensitive receptors have been identified along the route of the main feed line and network extension which are the medical Unit, The Intellectual Education Foundation in Al-Marj, and El Qalag complex new School. Met asem and Izbet Afandena gas network extension will be in the residential areas where the safety procedures of construction can be followed in these areas.

The followed instructions during construction:

- Construction is during night, not at peak time in populated areas with following the proper implementation of the night lighting mode,
- Precaution signs, and
- Security personnel.

4.2.8 Road distribution network and traffic

According to the frequent site visits and the field observations, there are main and sub streets within the project areas. The width of the main streets within the three villages varies between 6-10 meters, while the width of the sub streets varies between 3-5 meters.

Most of streets in the three villages are dusty and compacted especially the substreets. Some of the main streets are paved with asphalt.

Following are examples of some main and sub streets within the three villages:

- El Qalag, El Gabal El Asfar villages include: El-Gomhoreya Street, El-Mahata Street, El-Madena El-Menwara Street, Khaled Ebn El-Waled Street, Omar Ebn El-Khatat Street, and Abu Bakr El-Sedik Street.
- Met Asem village includes: Teraat El-Felfela Street, Muhammad Gomaa Street, SediYehia Mosque, and El-Shaheed Muhammad Zakriya Salim.
- Izbet Afandena village includes: El-Masged street, El-Forn street, El-Shekh Ahmed street, and Sabry Hussien street

The figures below show some of the main and sub streets within the project areas.



Figure 4-2: dusty main Street in El Qalag El Gabal El Figure 4-3: dusty sub Street in El Qalag El Gabal



Asfar

El Asfar



Figure 4-4: paved main street in El Qalag El Gabal El Asfar



Figure 4-5: paved main street in Met Asem village



Figure 4-6: dusty sub street in Met Asem village



Figure 4-7: dusty main street in Izbet Afandena village



Figure 4-8: dusty sub street in Izbet Afandena village



Figure 4-9: paved main road in Izbet Afandena village

- There are excavation works in some main and sub streets within El Qalag El Gabal El Asfar villages in order to change the sanitation networks. The NG excavation will be close to the sanitation excavation sites, which will be paved after the excavation process. This means that NG excavation will take place in streets that have already been excavated.



Figure 4-10: The impacts of sanitation networks in El Qalag, El Gabal El Asfar villages

The traffic within the project areas:

- The streets in El Qalag, El Gabal El Asfar and Met Asem villages are congested with pickup trucks, cars, TukTuks, carriages pulled by donkeys, bicycles, motorcycles, tricycles and pedestrians. While in Izbet Afandena village, TukTuks are the only means of transportation.
- In El Qalag, El Gabal El-Asfar villages, the traffic density is limited in the sub streets and some of the main streets. However, some of the main streets have high traffic density such as El-Gomhoreya Street, which is the main road for the residents. As well as, the main commercial areas, the schools and the services are found within it. Therefore, there is a high traffic density at peak times. While In Met Asem and Izbet Afandena villages, the traffic density is limited all days.



The figures below show the traffic within the project areas:



Figure 4-11: traffic in El Qalag, El Gabal El Asfar villages



Figure 4-12: traffic in El Qalag, El Gabal El Asfar villages



Figure 4-13: microbus stop in Met Asem village



Figure 4-14: carriage pulled by donkey in Izbet Afandena village



Figure 4-15: traffic in IzbetAfandena village

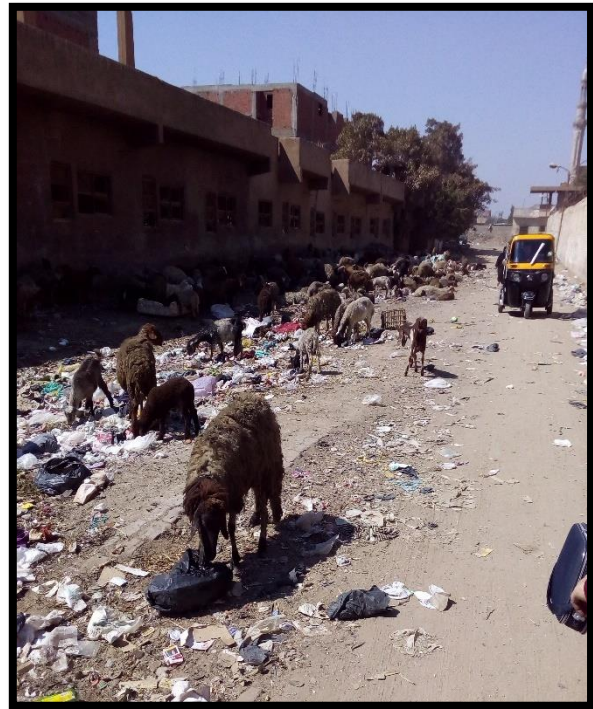


Figure 4-16: the main entrance of IzbetAfandena village

4.3 Socio-Economic Baseline

Depending on a combination of both primary data collected from the field and secondary resources reviewed including statistical data, this section will highlight the following: administrative division, urbanization trends, demographic characteristics, human development profile, access to basic services, roads and transport, poverty index, Income and expenditure, Fuel currently used in households, Problems faced with the current household fuel, Perception towards the project, gender dimension of the current type of fuel, and physical cultural resources.

The project will be implemented in three villages of Qalyubeya governorate. The following table illustrates the project areas.


Table 4-4: Project Areas

| Governorate | district (<i>Markaz</i>) | Village |
|-------------|------------------------------|-----------------------------|
| Qalyubeya | El-Khanka | El Qalag, El Gabal El Asfar |
| | Banha | Met Asem |
| | Haii Sharaa Shoubra El-Khema | Izbet Afandena ¹ |

4.3.1 Administrative affiliation

According to Egyptian general survey authority, the areas of the three villages will be as the following:

| Project area | Total area |
|-----------------------------|-----------------------|
| El Qalag, El Gabal El Asfar | 22513 km ² |
| Met Asem | 2922 km ² |
| Musturud ² | 7122 km ² |

Source: Egyptian general survey authority <http://esa.gov.eg/>

The administrative affiliation of the three villages is as the following:

El Qalag, El Gabal El Asfar villages are administratively affiliated to El-Khanka district (*Markaz*).

Met Asem village is administratively affiliated to Banha district (*Markaz*).

While Izbet Afanden avillage is affiliated to Haii Sharaa Shoubra El-Khema district (*Markaz*).

The following figures illustrate the administrative affiliation of the three villages:

¹The information on the level of Izbet Afandena village is very limited (Actually the limited information is justified by the small area of the village. In addition, it is located within Mostorod village in which the information is available), therefore the study team will employ data on the level of MostorAod village.

²Izbet Afandena village represents one third of Mostorod village

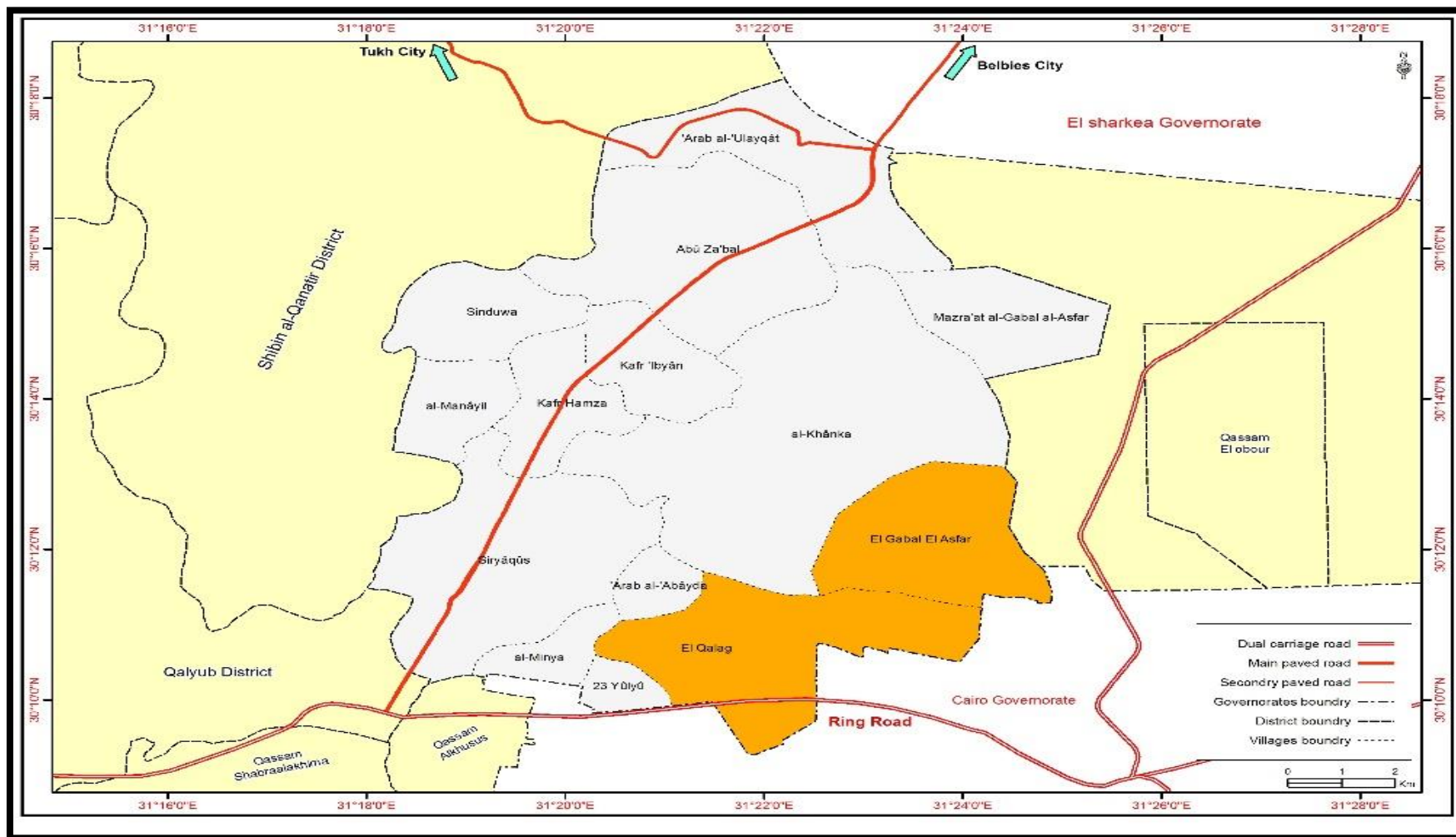


Figure 4-17 El Qalag, El Gabal El Asfar villages

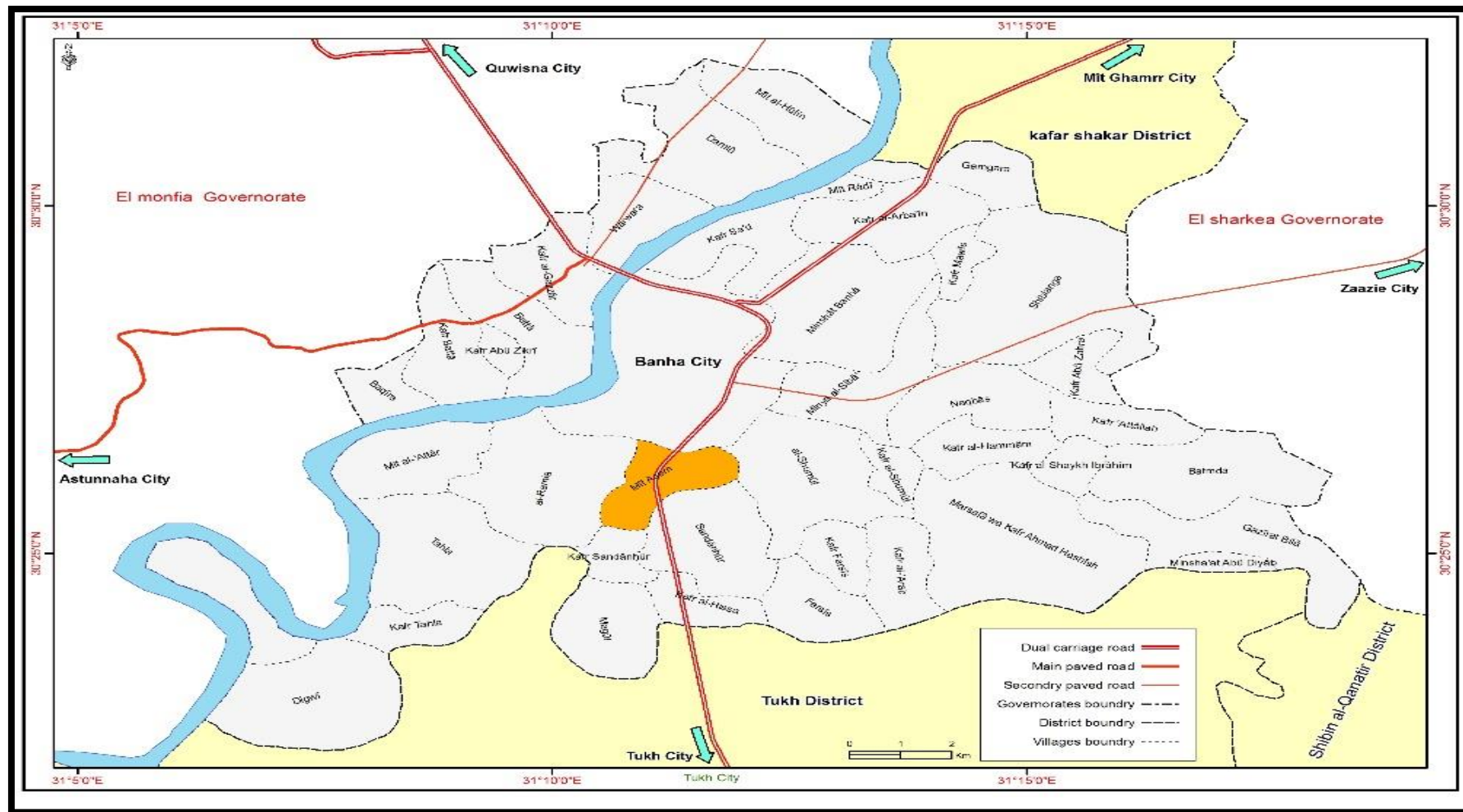


Figure 4-18: map of Met Asem village

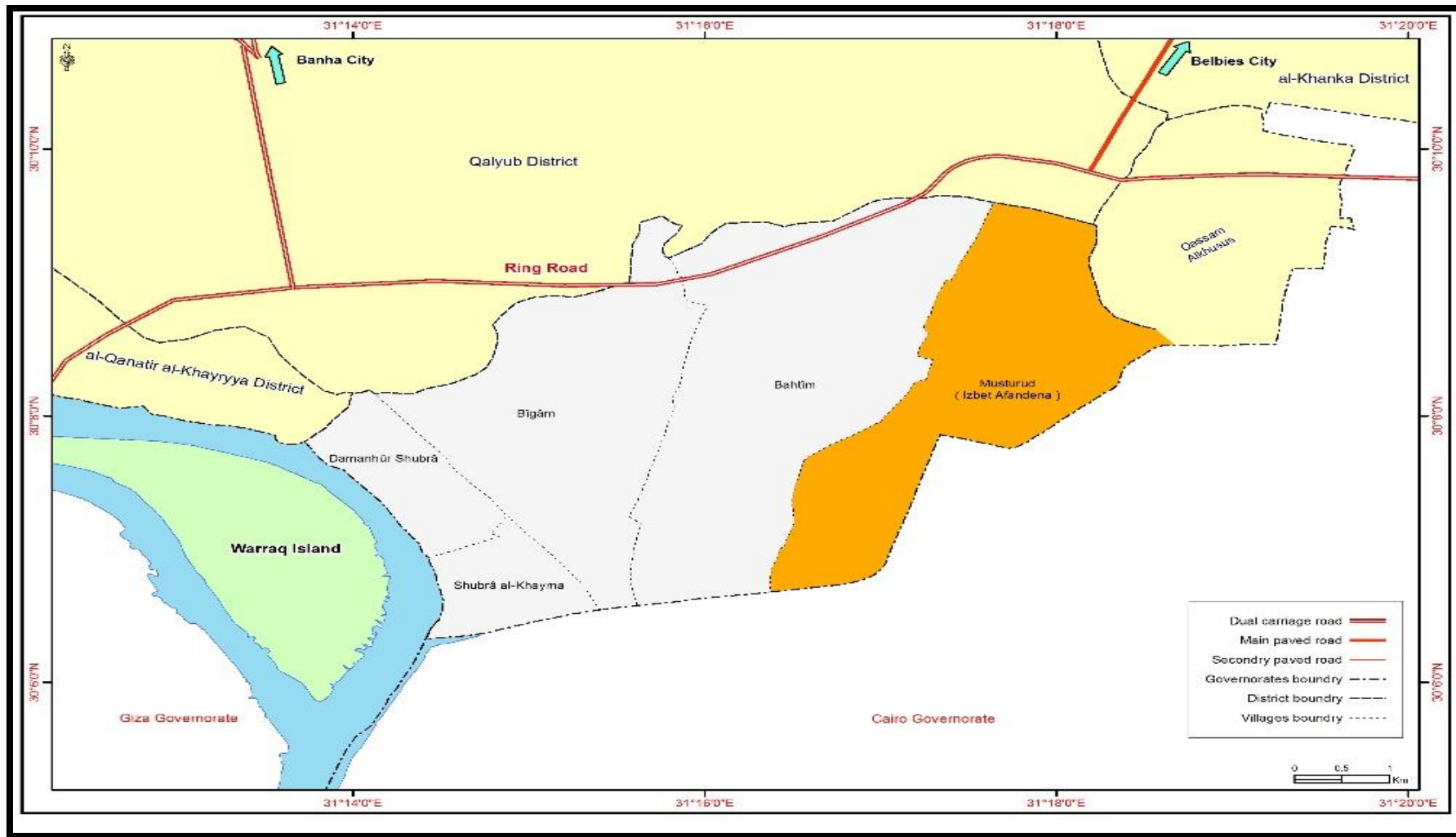


Figure 4-19: map of Izbet Afandena village



4.3.2 Urbanization trends

According to the frequent site visits and the field observations, the three villages are classified as semi-urbanized areas. Most of the buildings within the villages are constructed of concrete and red bricks. **On the level of each village:**

- El Qalag, El Gabal El Asfar villages are of a mixed nature. Between small industries, small workshops, residential and commercial zones.
- The same for Met Asem village, it is classified as a residential and commercial area. Regarding the industrial activities; there are no factories within the area. However, some workshops were reported in the village.
- On the scale of Izbet Afandena village, it is also classified as a residential zone, as some agricultural zones are being replaced by residential areas. The agriculture lands are far from the residential zones. Regarding the commercial activities within the village there are no commercial shops, or administrative services. While, there is an industrial area Close to the village.

4.3.3 Demographic characteristics

Total population

Total population, number of households, and the potential clients within the three villages are presented in the table below:

Table 4-5: Distribution of population in project areas

| Village | Population | | | Households | Potential clients |
|------------------------------------|------------|--------|--------|------------|-------------------|
| | Male | Female | Total | | |
| El Qalag, El Gabal El Asfar | 89898 | 84949 | 174847 | 42855 | 20000 |
| Met Asem | 6009 | 5773 | 11782 | 2931 | 2150 |
| Musturud | 69040 | 64311 | 133351 | 33008 | 750 |

Source: Qalyubeya CAPMAS 2014

The current phase in the scope of this study will cover almost 47% of the households in El Qalag, El Gabal El Asfar villages, 73.35% of the households in Met Asem village, and nearly 75% of the households in Izbet Afandena village which represented one third of Musturud village. That is an indication that the NG project will cover most of the households within the three villages.

- Rate of natural increase

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



regards to the children below five years of age, the mortality rate is 12.10 per thousand live biLiving Conditions

4.3.4 Household size

The average household size in Qalyubeya governorate is about 3.97 persons. The following table illustrates the average household size in the project areas.

Table 4-6: Average family size

| Village | Total population | No. of households | Household size |
|-----------------------------|------------------|-------------------|----------------|
| El Qalag, El Gabal El Asfar | 174847 | 42855 | 4.08 |
| Met Asem | 11782 | 2931 | 4.02 |
| Musturud | 133351 | 33008 | 4.04 |

Source: Qalyubeya CAPMAS 2014

- Dwelling characteristics

The type of dwelling should be highlighted in order to identify the probability to install the NG to those houses. According to the site visits to the project areas, almost all of the samples surveyed live in apartments. The majority of buildings are red brick houses in relatively tight streets.

The following table contains the percentage of individuals living in apartments and in rural houses in the project areas.

Table 4-7: percentage of individuals living in apartments and in rural houses

| Village | Apartments | Rural houses | Others ³ |
|-----------------------------|------------|--------------|---------------------|
| El Qalag, El Gabal El Asfar | 90% | 2% | 8% |
| Met Asem | 82% | 10% | 8% |
| Musturud | 3% | 7% | 0% |

Source: CAPMAS Poverty Mapping data 2013

The construction materials of the walls and ceilings are one of the main bases and conditions required to install the NG. All of the samples surveyed live in buildings that are constructed of concrete and red bricks.

³ Others refer to people who are residing in huts that not constructed out of bricks and not formally access to sanitation or electricity



Figure 4-20: Dwellings constructed of concrete and red bricks in El Qalag, El Gabal EL Asfar villages



Figure 4-21: Dwellings constructed of concrete and red bricks in Met Asem village

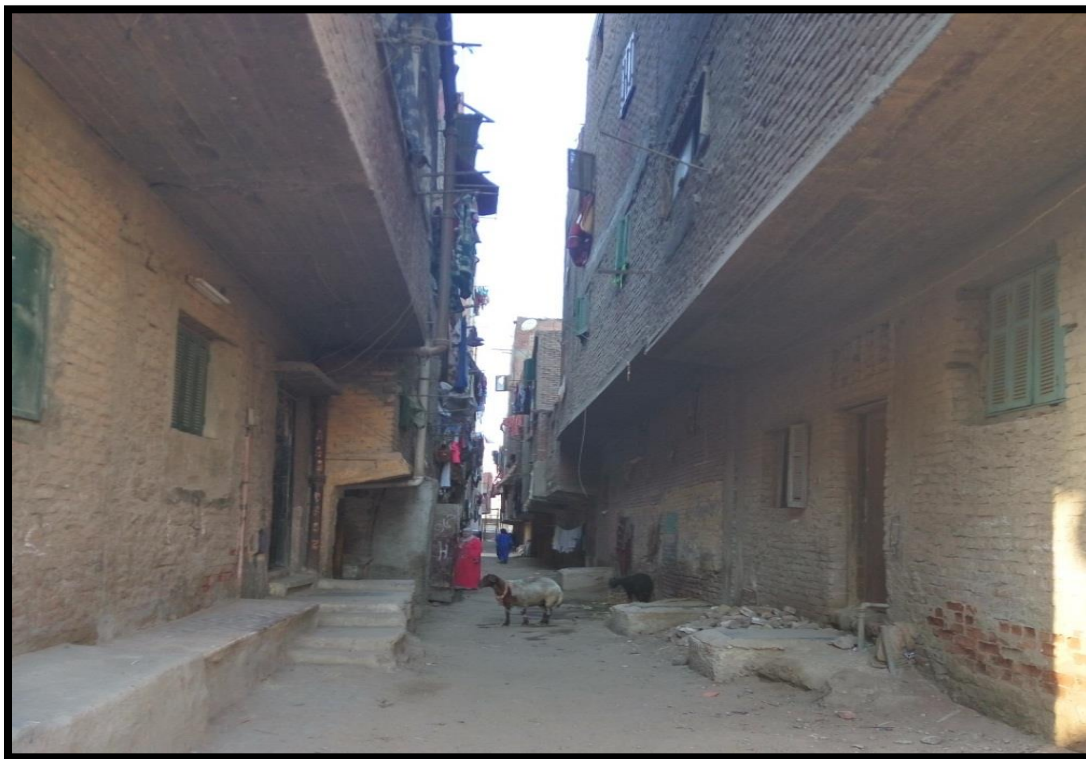


Figure 4-22: Dwellings constructed of concrete and red bricks in Izbet Afandena village

4.3.5 Access to basic services

Access to basic services, water supply, sanitation and electricity is one of the main pillars that determine the economic well-being of the community.

According to the frequent site visits to the project areas and the focus group discussions, the three villages are access to basic services, such as; electricity, sanitation, and potable water. Thus, it will be possible to install the NG to the three villages.

The following table contains the percentage of individuals who have access to basic services in the project areas.

Table 4-8: percentage of individuals' access to basic services in the project areas

| Village | % of individuals having public water network | % of individuals using electricity for lighting | % of individuals having public sanitation network |
|-----------------------------|--|---|---|
| El Qalag, El Gabal El Asfar | 99% | 99% | 91% (governmental and civil sanitation) |
| Met Asem | 100% | 100% | 85. % |
| Musturud | 99% | 99% | 95% |

Source: CAPMAS Poverty Mapping data 2013



4.3.6 Human development profile

Educational and work status, poverty index, income and expenditure should be highlighted in order to determine the current socioeconomic conditions of the target areas (El Qalag, El Gabal El Asfar – Met Asem – Musturud)

4.3.6.1 Education

Education is perceived as the first shell that can help population to withstand poverty. The review of secondary data, and the focus group discussions showed that the intermediate education is prevalent among the three villages. They also revealed that, the schools are available among the three villages, excluding Izbet Afandena, the schools are located in Musturud village and Haii sharia shoubra El-Khema district (*Markez*).

Table 4-9: Distribution of the project areas' population by educational status and sex

| Village | The percentage of those having basic education (10 years+) | The percentage of those having basic education among females (10 years+) | The percentage of those having university education | The percentage of those having university education among females | Illiteracy rate | Illiteracy rate among females |
|-----------------------------|--|--|---|---|-----------------|-------------------------------|
| El Qalag, El Gabal El Asfar | 21.5% | 19% | 10% | 8% | 29% | 35% |
| Met Asem | 15% | 11% | 13% | 11% | 25% | 33% |
| Musturud | 16% | 14% | 11% | 9 % | 28% | 34% |

Source: CAPMAS Poverty Mapping data 2013

4.3.6.2 Unemployment and work status

With regards to the frequent site visits and the focus group discussions, the majority of population resides in El Qalag, El Gabal El Asfar villages are blacksmith, carpenters, drivers, and workers.

In Met Asem village the majority of the residents are farmers, workers, teachers, craftsmen, and employees. While in Izbet Afandena village the majority of the residents are workers, and employees. This indicates that the households can afford to pay NG installation costs.


Table 4-10: Distribution of the project areas' population by work status and sex

| Village | % of individuals 15 years + who joined labor force | % of adult self-employed from total labor force | % of adult unpaid employee from total employed | % of adult wage workers from total employed | Unemployment rate | Unemployment rate among females |
|-----------------------------|--|---|--|---|-------------------|---------------------------------|
| El Qalag, El Gabal El Asfar | 41.6% | 6.5% | 0.25% | 81% | 9% | 20% |
| Met Asem | 46% | 4% | 0.36% | 82% | 11% | 18.5% |
| Musturud | 43% | 5% | 0.21% | 78% | 13% | 24% |

Source: CAPMAS Poverty Mapping data 2013

The formal Statistics obtained from the Poverty Mapping Data 2013 regarding manpower reflected that the age of starting work is 15 years old.⁴ Both the Child Law and the Labor Law state that children shall not be employed before they complete 14 years old, nor shall they be provided with training before they reach 12 years old; however, children between 12 and 14 years old are permitted to work as trainees. Furthermore, the governor concerned in each governorate, in agreement with the Minister of Education may permit the employment of minors aged 12-14 years in seasonal work which is not harmful to their health and growth, and which does not conflict with regular school attendance. Consequently, there is always a high probability to detect child labor in most of the projects implemented in Egypt. In the project areas where agriculture work and sales activities are in place, there is a big number of underage laborers were noticed. As a conclusion, there is a high risk that the contractors might employ young people below 18 years old. Therefore, a rigid restrictions to employ this category must be added to the contractor obligations.

4.3.7 Poverty index

According to Poverty Mapping developed by CAPMAS in 2013, the percentage of poor people in the project areas (El Qalag, El Gabal El Asfar – Met Asem – Musturud) is limited, and the majority of households in the project areas are not below the poverty line.

Based on the frequent site visits and the focus group discussions, the majority of households in the project areas expressed their willingness to be connected to the NG and that they can afford to pay NG installation costs either in cash or in installments.


Table 4-11: Poverty indicators

| | El Qalag, El Gabal El Asfar | Met Asem | Musturud |
|-----------------------------|-----------------------------|----------|----------|
| Percentage of poor people | 18% | 1% | 25% |
| Poverty gap | 2.5 | 1.07 | 6.99 |
| Gini coefficient | 0.15 | 0.14 | 0.25 |
| Per capita consumption | 5321.675 | 5933.86 | 5796.68 |
| Number of poor in 2013 | 14357 | 935 | 31354 |
| Population estimations 2013 | 80357 | 108306 | 122573 |

Source: CAPMAS Poverty Mapping data 2013

4.3.8 Income and expenditure

According to the frequent field visits, the monthly average individual income is estimated between 2500 and 3000 EGP. As well as, the samples surveyed provide information that informs about their monthly expenditure which is almost equivalent to their income. They also reported that they prefer to pay NG installation costs in installments.

4.3.9 Fuel currently used in households

The majority of the samples surveyed in the project areas reported that, the main type of fuel used for cooking are the LPG cylinders. The source of aforementioned type is mainly the LPG vendors (sareha). The second source is the LPG outlets. The price of LPG cylinder ranges between 25 to 50 EGP. The average consumption of LPG cylinders for cooking per household is ranges between 1 to 2 cylinders monthly. While during winter each household consumes between 2 to 4 cylinders monthly.

With regards to the fuel used for water heating, the majorities of the samples surveyed in the project areas rely upon LPG cylinders, while few percentages of the samples surveyed rely upon electricity.



Figure 4-23: LPG vendor in El Qalag, El Gabal El Asfar villages



Figure 4-24: One of the LPG collection places till the arrival of the LPG outlet truck in Met Asem village



Figure 4-25: LPG outlet truck in Izbet Afandena village

4.3.10 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 the natural gas. The majority of the samples surveyed in the three villages reported the problems related to LPG cylinders

- High cost of LPG and price fluctuations especially during winter
- The tedious process to obtain LPG cylinders



- LPG cylinders are not available all the time
- LPG cylinder is a bomb in the house; it might explode in any minute.
- The LPG is not completely full. It is half filled
- Sometimes it might leak
- It is difficult to bring the LPG upstairs

With regards to the electricity heater, high electricity bill was the first major problems. The second problem is having weak water flow that does not enable heater working properly. The third major problem is the power cut. Therefore, the majority of samples surveyed in the project areas expressed their willingness to be connected to the NG.

4.3.11 Perception towards the project

Throughout the various consultation and focus group discussions, the team experienced and recorded remarkable and overwhelming public acceptance, even eagerness, by the community towards the proposed project. The burdens and financial hardships experienced by the community people (especially women) in obtaining LPG cylinders (the current household fuel) created an actual need to install NG.

It is obvious that the majority of the samples surveyed in the project areas (El Qalag El Gabal El Asfar – Met Asem – Musturud) have positive perceptions about NG connections project. They reported that NG has many benefits:

- NG will save community people effort and money
- It is reliable, safe, and available
- It will put limitation to the quarrels and fights occur to obtain an LPG
- It also will put limitation to the crisis of the LPG shortage
- It will save electricity that is used in electricity heater and reduce the cost of electricity bill

4.3.12 Gender dimension of the current type of fuel

Females are the main player when it comes to play a major role in the domestic labor relating handling LPG. According to the interviews and the focus group discussions,

- Women in Izbet Afandena village are responsible for carrying the LPG cylinders from Musturud, or El-Arab, or El-Ameriya outlets and installing them to their stoves or water heaters, as the LPG outlets are located outside the village which adds more pressure on women in terms of time, effort and money.
- In met Asem village, the women are the main person who is responsible for carrying the LPG cylinders from the LPG collecting points.
- In El Qalag, El Gabal El Asfar, LPG vendors are spread in the villages; however, women also are in charge of waiting the vendors in order to change the cylinders.

4.3.13 Willingness and affordability to pay

Almost all the samples surveyed in the project areas (consultation activities 2017) expressed their willingness to be connected to the NG; such attitude is attributed to the fluctuation of the LPG cylinders' prices reaching in some cases over 50 EGP. As well as, the above mentioned problems associated with LPG cylinders.



According to the consultation activities, few percentages of the samples in the three villages is willing to pay in cash. The majority of the samples cannot pay NG installation costs in one installment, they strongly recommended to have payment plan and All NGOs interviewed expressed their willingness to act as communication channels with poor but no one of them will provide financial aid to the poor. However, the AFD in cooperation with the European Union will provide the poor with a kind of grant to be able to install the NG. Eligible households are those households with average monthly electricity consumption, calculated over a period of 12 months, is in the range of 50kWh and 130 kWh/month. This initiative has been approved and is currently being applied to all project areas. The grant covers 50% of the installation costs.

Monthly installment value was investigated among the whole sample. The most preferred installment will be as the following:

Table 4-12: the preferred monthly installment value according to the sample surveyed

| Villages | Monthly installment value |
|-----------------------------|---------------------------|
| El Qalag, El Gabal El Asfar | 50 – 100 EGP |
| Met Asem | 50 – 200 EGP |
| Izbet Afandena | 20 – 150 EGP |

Source: consultation activities 2017

4.3.14 Physical cultural resources

As the natural gas connections project will only take place in semi-urbanized areas, no physical cultural resources are expected to be disturbed by project activities.

In addition, one of the conditions for connecting natural gas to a given area is the presence of all other underground utilities in that area. This means that excavation will take place in streets that have already been excavated and include underground utilities.

Mosques and Cemeteries are located within the three villages, but they are of no direct relevance to the project areas where the NG connections installed in.



5 Environmental and Social Impact Assessment

The environmental and social impact assessment (ESIA) is a process used to identify and evaluate the significance of potential impacts on various environmental and social receptors as a result of planned activities during (construction and operation) phases of the Project. Furthermore, the 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 evaluation of the potential impacts on various receptors is based on a significance ranking process described in the following subsection.

5.1 Impact Assessment Methodology

To determine and assess the impacts of the project phases on environmental and social receptors, a semi-quantitative approach based on Leopold was first adopted. 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.

The second approach is based on Buroz's 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.

Detailed assessment matrices for both approaches are in Annex 4. Following are the impact assessment scoring classification and results.

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



5.2 Potential Positive Impacts

5.2.1 Positive impacts during construction

5.2.1.1. Provide direct job opportunities to skilled and semi-skilled laborers

Many variables affect the number and type of workers needed in specific time during construction. This includes but not limited to ; the number of connections, nature of work required, and time plan.

- According to information gained from Cairo Gas & Egypt Gas, the daily average number of workers during the peak time will be about 50-55 excavation worker, two engineers and eighteen technicians.
- In order to maximize employment opportunities in the local communities it is anticipated that on the job capacity building activities 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 positions, where these are available.

5.2.1.2. Create indirect opportunities

Increased economic activity in project through the following supply chain:

- Drivers will benefit from the transportation of the workers
- Provision of food supplies, catering, and cleaning services; cafes, restaurants and grocery stores
- Implementation of works and provision of supplies related to construction from the local community.

5.2.2 Positive impacts during operation phase

- On a national level, reduced expenditure on imported LPG cylinders and subsidies
- As indicated in 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 sources 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 for the saved time.
- The NG connection will help the household achieve a higher level of privacy by eliminating the need for informal LPG distributors from entering private homes.
- Constantly available and reliable fuel for home use.
- Significantly lower gas 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 the physically challenged, women, and the elderly had to face in handling LPG.



- Limiting possible child labor in LPG cylinder distribution

5.3 Potential Negative Impacts

5.3.1 Negative impacts during construction

5.3.1.1 Air Emission

Environmental impacts

Construction of the network pipeline will include several activities such as excavation, land clearing, concrete foundations, transportation of construction material and equipment, burial of cables and pipes, etc. Those activities in consequence are expected to emit air pollutants to the ambient air, however it will be conducted for a short periods. The following air pollutants are foreseeable for most of the construction activities:

- Particulate matter and suspended solids from excavation/backfilling operations
- Possible dispersion from stockpiles of waste or sand used for filling trenches.
- Exhaust from excavation equipment and heavy machinery (excavators, trenchers, loaders, trucks) containing SO_x, NO_x, CO, VOCs, etc.
- Fugitive dust emissions (PM₁₀, PM_{2.5})
- 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

Machineries used during construction such as excavator, generators, boring machine, etc are 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. The emissions will be mostly limited to the construction phase and therefore are temporary.

Socioeconomic Impacts

Air impacts related to excavation works will differ from one village to another according to the population, time of excavation work, the nearby of excavation place to the places crowded with people such as: schools, markets, and microbus and Tuk Tuks stations.

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

5.3.1.2 Noise

Environmental impacts

Construction activities of the gas distribution network will likely increase noise levels due to excavation and heavy machinery but not exceeding the WB/IFC guidelines and Law 4/1994-



9/2009-105/2015 standards for noise intensity. However, the activities will be temporary and for short time.

Traffic interruption due to excavation can cause congestions, which can result in increased ambient average noise intensity levels.

Socioeconomic Impacts

Noise impacts related to excavation works will differ from one village to another according to the population, time of excavation work, the nearby of excavation place to the places crowded with people such as: schools, markets, and microbus and Tuk Tuks stations.

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

5.3.1.3 Soil

The excavation activities will result in disturbance of the soil and geological characteristics. This will be more pronounced in the trench's area (around 1.2 to 2 meter depth) where excavation, pipeline laying, and soil compaction as a result of heavy equipment take place. Soil disturbance at higher depths will also take place in case of applying HDD technologies in crossing the railway. In addition, potential soil contamination may take place as a result of spillage or leaks

The impact on soil considered medium severity.

5.3.1.4 Water

Groundwater

Information on groundwater in the 3 studied areas where distribution networks are planned is unavailable. Considering that the project areas are residential and that excavation will be carried out in lands that have previously been excavated for other underground utilities installation, groundwater is not anticipated.

Impact assessment on groundwater is irrelevant

5.3.1.5 Ecological impact (fauna or flora)

As mention in baseline section, project site is not characterized by the presence of endangered species (fauna or flora) as practically. Only some non-significant exotic species such as grasses recorded at project area. For fauna Very confined species had been recorded in the project site area.

The impact on fauna and flora is irrelevant

5.3.1.6 Waste generation

Environmental Impact

Normal construction non-hazardous solid wastes including scrap concrete, steel, bricks, packaging waste, used drums, wood, scrap metal, and building rubble will be generated. Human or domestic wastes generated by construction labor.. Disposal of sewage and garbage generated from construction labor, if not transported to adequate sites, will be a continuation of the existing sanitation situation and contribute, although to a relatively low extent, to environmental deterioration. This kind of wastes has to be transported outside the site.

Solid hazardous wastes generated include empty containers, spent welding materials, solvents, paints or adhesives, and other hazardous wastes resulting from operation and maintenance of the equipment and vehicles, i.e. spent oils, spent lube, waste oil filters, batteries, etc. Among the hazardous wastes also are the wasted or faulted materials.

Adverse impacts on the environment from the possible improper disposal of the solid wastes and hazardous waste.



Surface water

There are no canals or drainages in the surroundings of Al-Qalag, El-Gabal El-Asfar and Izbet Afandena. The areas are mainly urban with scarce trees and palms.

However, at the entrance of Met Asem, There is a drainage path (brackish water from agriculture wastes). It will be crossed by the main feeding gas pipelines which may be susceptible to pollution resulting from uncontrolled dumping of wastes generated during construction.

The impact on surface water pollution is of minor severity

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.

Therefore impact considered medium severity

5.3.1.7 Traffic Flow (disruption of local and regional traffic)

Traffic Flow is not expected to be disturbed by the workers due to the limited expected number of workers. However, it will be affected by the excavation works of the project which does not exceed one day or two days at most. It may result in some adverse impacts:

- Traffic congestion and loss of access due to the excavation and installation works will be vary from village to another according to the population and the services within each village.
 - In El Qalag, El Gabal El-Asfar villages, the traffic density is limited in the sub streets and some of the main streets. However, some of the main streets have high traffic density such as El-Gomhoreya Street, which is the main road for the residents. As well as, the sensitive receptors in El Qalag and El Gabal Asfar (the medical Unit, The Intellectual Education Foundation in Al-Marj, and El Qalag complex new School), the main commercial areas and the services are found within it. Therefore, there is a high traffic density at peak times.
 - In Met Asem, and Izbet Afandena villages, the traffic density is limited; however, the non-rehabilitation (رد الشئ لأصله) of the streets will affect the accessibility of the residents.
- Affect the drivers and vehicles in case of non-rehabilitation of streets after the project implementation
- Congestion and traffic disturbance for both pedestrians, cars as well as the livelihoods of taxi, Tuk Tuk and microbus drivers; such as the microbus station in Met Asem village. Thus, clear traffic diversion plan should be settled.
- Reduction of Traffic Flow Mobilization of heavy machinery, asphalt breaking, excavation, placement of piping, and backfill activities are bound to limit traffic and accessibility during construction. This may entail narrowing major roads by longitudinal and/or lateral excavation or totally blocking narrow or side roads.
- In addition to reducing the lanes/space available for traffic, impacts May also entail limiting or prohibition of 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 persons and cargo.



- Negative effects on the business of neighboring shopkeepers due to excavation close to such shops. The excavation activities affect having access to the shops.

Traffic and access limitation effects are temporary, local, Medium severity

5.3.1.8 Occupational health and safety

General risks associated with construction sites and anticipated include slips and falls; moving Lorries and machinery; exposure to chemicals and other hazardous materials; exposure to electric shock and burns; exposure to high noise intensity levels.

Noise

The noise intensity level resulting from jackhammers surpasses permissible level of 90 dB (A) for work place with up to 8 hour shifts. Therefore, the use of construction equipment constitutes an occupational and safety health risk on workers operating and in the vicinity of the equipment.

Vibrations

The use of jackhammers will results in the generation of hand-arm vibrations; the typical vibration value is of 9 m/s^2 , which exceeds the ACGIH Threshold limit value of 5 m/s^2 (8 hour equivalent total value), but is below the exposure limit of 12 m/s^2 for a total daily duration of less than an hour. Typical drilling activities for excavation works are intermittent.

Electrical

Faulty equipment or exposed cables can cause risks of electrocution.

Working at heights

Household installations will require working at heights, which can result in falls and pose a safety hazard.

Occupational health and safety considered medium severity

5.3.1.9 Risk pertaining to child labor

As mentioned in the baseline, child labor is a common practice in Egypt at large. Children below 18 are favorable labor as they receive low salaries and they are less demanding. There is a risk that this common practice is used in the project. This risk should be carefully handled in the ESMP and restrict obligations and monitoring should be applied in the contractor obligations.

The impact of construction activities pertaining to child labor is of **low-medium** severity.

5.3.1.10 Risk on Infrastructure and underground utilities

Environmental Impacts

Prior to excavation the LDC (Egypt gas and Cairo gas) performs exploratory drills to investigate the presence of underground utilities that may have been installed without accurate documentation and maps for its routes and depths .The risk of damage to such utilities during excavations for natural gas pipeline installation is possible, but minimal. In the event that an underground utility is fractured, 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 sanitary pipes, electricity underground cables and water pipelines result in severe disturbance to community people. The time needed to resolve problems with damaged utilities is relatively short (no more than 4-8 days). Additionally, the contractor will be responsible of compensating for damaged pipes

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

5.3.1.11 Possible effects on vulnerable structures⁵

Works involving drilling will generate vibrations, which could threaten weak structures. Construction 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.

Structural impacts on vulnerable buildings are of irrelevant severity

5.3.1.12 Effect on Culturally Valuable Sites

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

Impacts on culturally valuable sites and buildings are of irrelevant severity

5.3.1.13 Community health and safety

The excavation works within the project areas will affect the community health and safety:

- **Waste accumulation** illegal dumping and potential burning of construction waste, which will consist mainly of excavated soil and leftover PE and carbon steel pipes can pose health and safety threats to local community. Accumulation of waste in the construction areas might become a hub for insects and unfavorable smells which will negatively affect the surrounding communities. This is one of the potential unfavorable impacts.
- **Project infrastructure** excavation works will result in the presence of open trenches in areas accessible to local community (e.g., in front of building and shops.) The presence of open trenches can pose risks of accidental falls and injuries. Trenches are expected to be open during the work day, with no trenches being left open after working hours.

There was a fear that negligent workers may cause accidents harmful to themselves or to the community members, particularly children, especially close to the excavation sites. Therefore awareness-raising sessions should be provided to workers and community members to promote safety and health while safety supervisors are hired to oversee

⁵ If encountered within project areas.



excavation sites. These supervisors can be chosen from among community members by NGOs and will be largely responsible for children and their safety around the construction site. Concerning workers, they should be trained on the occupational health and safety measures and they should be strictly monitored. The measures in the environmental management framework should be followed by the contractors.

Community health and safety is temporary, local, medium severity for community health and safety

5.3.1.14 Temporary Labor Influx

Generally speaking having workers in small cities might result in unfavorable impacts on the available resources (e.g. pressure on accommodation, food, health care and medication and potable source of water). It may also result in inconvenience to the local communities, particularly in the areas where communities are conservative or not accustomed to having outsiders. Given the fact that only limited number of workers exist in each of the locations during working hours, portion of those workers are local workers and that the LDCs are imposing roles and code of conduct on the contractors to ensure good behaviors and limit any potential conflict with the communities, it is very unlikely that impacts related to labor influx will be relevant in the project areas.

Temporary Labor Influx limitation effects are considered as irrelevant

5.3.1.15 Street condition deterioration

Environmental Impact

Streets rehabilitation or restoration following pipeline network installation: is referred to by an Egyptian legal/institutional expression (رد الشيء لأصله) 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.

5.3.1.16 Impacts related to land

Socioeconomic impact

The project will not entail any land acquisition in both project areas rather than storage areas and workshops in the vicinity of the project sites. The implementation companies will rent site



storage areas in order to store the equipment and excavation tools, in addition, temporary equipment for workers' services. With regards to the workshops' site, they are allocated by the local governmental units in the side roads

Land acquisition impacts are of irrelevant severity

5.3.1.17 Visual resources and landscaping

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

5.3.2 Negative impacts during operation

5.3.2.1 Impact on worker health and safety

Possible impacts to health and safety during operations include exposures to odorant, noise, accidental injury to workers. In addition; health and safety issues include working around energized equipment, and possible contact with natural hazards. However, during the operation and maintenance phase, the impacts on workers tend to be low.

Therefore the impact related to health and safety of workers is assessed as low.

5.3.2.2 Risk pertaining to child labor

The LDC have never employed any children during the operation of the networks as they adhere to labor law. Additionally, maintenance and operation activities need highly professional technicians who graduated from secondary schools. They all are above 18 years old.

Child labor risk is assessed as irrelevant

5.3.2.3 Waste management

No wastes are expected during the operation phase

Therefore impact considered to be irrelevant

5.3.2.4 Noise

No noise impact is expected during the operation phase of the gas network

Therefore impact considered to be irrelevant

5.3.2.5 Air emission

No gaseous emissions are expected to occur during the operation phase except for the potential natural gas leak or in case of accidents (odorant handling or storage) and during maintenance activities.

Therefore impact considered to be irrelevant

5.3.2.6 Soil

The normal operation of gas network doesn't have any impact on soil; however risk of soil contamination is only associated with the possible spillage or leakage.



Therefore, impact is considered to be irrelevant

5.3.2.7 Ecological (Fauna and flora)

The normal operation will not have any impact on flora and fauna.

Therefore, the impact is considered to be irrelevant

5.3.2.8 Community health and safety

In addition to a full array of safety and emergency precautions taken by EGAS and the implementing entities (**local Distribution companies: Egypt Gas, Cairo Gas**), 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. Low probability to affect the aesthetic appeal of the buildings, this is due to the installing of the pipelines on the walls of the building.

Concerns of the community people regarding the pipelines safety. The project should increase the community awareness about the emergency place and number.

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.

5.3.2.9 Integrity of natural gas piping

Environmental impacts

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

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

Socioeconomic impacts

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

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

5.3.2.10 Economic disturbance

- For those who will pay in installments, this may be an added financial burden on the poor families. However, the AFD in cooperation with the European Union will provide the poor with a kind of grant to be able to install the NG based on an eligibility criteria (section 4.3.13). This initiative has been approved and is currently being applied to all project areas.
- 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.
- Based on the meetings conducted with the LPG cylinder distributors, they reported that the NG will not cover all areas. Inside the same areas covered by the NG not all of the



units are technically eligible to be connected to the NG. Therefore, they will continue working in the same areas and in the uncovered areas.

- The surveyed LPG distributors have their vehicle in transporting the LPG cylinders. They reported that this vehicle might be used in transporting other goods. Such activity is also lucrative for them in case of not being able to distribute the LPG cylinders and such approach was adopted during the shortage of LPG cylinders occurred two years ago.

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



5.4 Summary of impacts

Table 5-1: Summary of Impacts

| Construction | | | |
|----------------------|---|-----------------|--------------|
| Receptor | Description of impact | Type of impact | Significance |
| Air Emissions | <p><i>Environmental impacts</i></p> <p>Construction of the network pipeline will include several activities which are expected to emit air pollutants to the ambient air with exceeding the permissible limits, however it will be conducted for a short periods. The following air pollutants are foreseeable for most of the construction activities:</p> <ul style="list-style-type: none">- Particulate matter and suspended solids from excavation/backfilling operations- Possible dispersion from stockpiles of waste or sand used for filling trenches.- Exhaust from excavation equipment and heavy machinery (excavators, trenchers, loaders, trucks) containing SO_x, NO_x, CO, VOCs, etc.- Traffic congestions resulting from road closure or slowing down of traffic due to excavation works.- Fugitive dust emissions (PM10, PM2.5) <p>Dust</p> <p>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.</p> <p>Gaseous pollutants emissions</p> <p>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.</p> <p>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.</p> <p><i>Socioeconomic Impacts</i></p> <p>Air impacts related to excavation works will differ from one village to another according to the population, time of excavation work, the nearby of excavation place to the places crowded with people such as: schools, markets, and microbus and Tuk Tuks stations.</p> | | Medium |
| Noise | <p><i>Environmental impacts</i></p> <p>Construction activities of the gas distribution network will likely increase noise levels due to excavation and heavy machinery but not exceeding the WB/IFC guidelines and Law 4/1994-9/2009-105/2015 standards for noise intensity. However, the activities will be temporary and for short time.</p> <p>Traffic interruption due to excavation can cause congestions, which can result in increased ambient average noise intensity levels.</p> <p><i>Socioeconomic Impacts</i></p> <p>Noise impacts related to excavation works will differ from one village to another according to the population, time of excavation work, the nearby of excavation place to the places crowded with people such as: schools, markets, and microbus and Tuk Tuks stations.</p> | Negative impact | Minor |
| Soil | <p>Degradation of soil quality, Excavation and movement of heavy machinery on unpaved surface soils during site preparation and foundation-laying could cause a physical breakdown of soil particles potentially causing destabilization of the soil structure.</p> <p>Soil disturbance at higher depths will also take place in case of applying HDD technologies in crossing the railway in Met Asem. In addition, potential soil contamination may take place as a result of spillage or leaks</p> | Negative impact | Medium |
| Surface Water | Surface waters consisting of canal branches may be susceptible to pollution resulting from uncontrolled dumping of wastes generated during construction. | Negative impact | Minor |



| Construction | | | |
|---------------------------------------|--|-----------------|--------------|
| Receptor | Description of impact | Type of impact | Significance |
| Waste generation | <p><i>Environmental impacts</i></p> <p>Inappropriate waste disposal and improper management of construction waste materials which could lead to spillages that will cause soil contamination.</p> <p>Excavated soil and concrete/bricks waste are inert materials. Improper disposal of such wastes will only have aesthetic effects on the disposal site. These wastes should be disposed in licensed sites by the local authority, which minimizes any aesthetic effects of such waste.</p> <p>Poor handling of Hazardous and non-hazardous materials may result in poor containment of induced leaks.</p> <p><i>Socioeconomic impacts</i></p> <p>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.</p> | Negative impact | Medium |
| Traffic & Accessibility | <p>Traffic Flow is not expected to be disturbed by the workers due to the limited expected number of workers. However, it will be affected by the excavation works of the project which does not exceed one day or two days at most. It may result in some adverse impacts:</p> <ul style="list-style-type: none">• Traffic congestion and loss of access due to the excavation and installation works will be vary from village to another according to the population, time of excavation work and the services within each village.<ul style="list-style-type: none">○ In El Qalag, El Gabal El-Asfar villages, the traffic density is limited in the sub streets and some of the main streets. However, some of the main streets have high traffic density such as El-Gomhoreya Street, which is the main road for the residents. As well as, the sensitive receptors in El Qalag and El Gabal Asfar (the medical Unit, The Intellectual Education Foundation in Al-Marj, and El Qalag complex new School) ,the main commercial areas and the services are found within it. Therefore, there is a high traffic density at peak times.○ Congestion and traffic disturbance for both pedestrians, cars as well as the livelihoods of taxi, Tuk Tuk and microbus drivers; such as the microbus station in Met Asem village.• Affect the drivers and vehicles in case of non-rehabilitation of streets after the project implementation• Reduction of Traffic Flow Mobilization of heavy machinery, asphalt breaking, excavation, placement of piping, and backfill activities are bound to limit traffic and accessibility during construction. This may entail narrowing major roads by longitudinal and/or lateral excavation or totally blocking narrow or side roads.• In addition to reducing the lanes/space available for traffic, impacts May also entail limiting or prohibition of 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 persons and cargo.• Negative effects on the business of neighboring shopkeepers due to excavation close to such shops. The excavation activities affect having access to the shops. | Negative impact | Medium |
| Occupational health and safety | <p>General risks associated with construction sites and anticipated include slips and falls; moving lorries and machinery; exposure to chemicals and other hazardous materials; exposure to electric shock and burns, exposure to high noise intensity levels.</p> <p>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.</p> <p>Vibrations</p> <p>The use of jackhammers will results in the generation of hand-arm vibrations; the typical vibration value is of 9 m/s², which exceeds the ACGIH Threshold limit value of 5 m/s² (8 hour equivalent total value), but is below the exposure limit of 12 m/s² for a total daily duration of less than an hour. Typical drilling activities for excavation works are intermittent.</p> <p>Electrical</p> <p>Faulty equipment or exposed cables can cause risks of electrocution.</p> <p>Working at heights</p> <p>Household installations will require working at heights, which can result in falls and pose a safety hazard.</p> | Negative impact | Medium |



| Construction | | | |
|---|--|-----------------|--------------|
| Receptor | Description of impact | Type of impact | Significance |
| Risk on Infrastructure and underground utilities | <p><i>Environmental Impacts</i></p> <p>Prior to excavation the LDC (Egypt gas and Cairo gas) performs exploratory drills to investigate the presence of underground utilities that may have been installed 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 but minimal.</p> <p>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.</p> <p><i>Socioeconomic impacts</i></p> <p>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.</p> <p>Damaging sanitary pipelines, 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.</p> | Negative impact | Minor |
| Community health and safety | <p>The excavation works within the project areas will affect the community health and safety by the following means:</p> <ul style="list-style-type: none">• Waste accumulation illegal dumping and potential burning of construction waste, which will consist mainly of excavated soil and leftover PE and carbon steel pipes can pose health and safety threats to local community as it might become a hub for insects and unfavorable smells, which will negatively affect the surrounding communities. This is one of the potential unfavorable impacts.• Project infrastructure excavation works will result in the presence of open trenches in areas accessible to local community (e.g., in front of building and shops.) The presence of open trenches can pose risks of accidental falls and injuries. Trenches are expected to be open during the workday, with no trenches being left open after working hours. <p>There was a fear that negligent workers may cause accidents harmful to themselves or to the community members, particularly children, especially close to the excavation sites.</p> | Negative impact | Medium |
| | <p>In addition to a full array of safety and emergency precautions taken by EGAS, Egypt Gas and Cairo Gas, 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, which can result from lack of awareness, illiteracy, or failures in piping or sealants. Low probability to affect the aesthetic appeal of the buildings, this is due to the installing of the pipelines on the walls of the building.</p> <p>Concerns of the community people regarding the pipelines safety. The project should increase the community awareness about the emergency place and number.</p> | Negative impact | Minor |
| Risk pertaining to child labor | <p>As mentioned in the baseline, child labor is a common practice in Egypt at large. Children below 18 are favorable labor as they receive low salaries and they are less demanding. There is a risk that this common practice is used in the project. This risk should be carefully handled in the ESMP and restrict obligations and monitoring should be applied in the contractor obligations.</p> | Negative | Low-Medium |
| Temporary Labor Influx | <p>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.</p> | Negative impact | Irrelevant |
| Street condition deterioration | <p><i>Environmental Impact</i></p> | Negative impact | Minor |



| Construction | | | |
|--|---|-----------------|--------------|
| Receptor | Description of impact | Type of impact | Significance |
| | <p>Streets rehabilitation or restoration following pipeline network installation: is referred to by an Egyptian legal/institutional expression (ردالشي لأصله) 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”.</p> <p><i>Socioeconomic impacts</i></p> <p>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.</p> | Negative impact | Minor |
| Land Needed | <p>Regard to the land needed, there will no land needed for the project, as there is PRS already existed in each project area.</p> <p>The implementation companies will rent site storage areas in order to store the equipment and excavation tools, in addition, As well as, the companies will coordinate with the district in order to provide portable toilets</p> | Negative impact | Minor |
| Operation | | | |
| Integrity of natural gas piping | <p><i>Environmental impacts</i></p> <p>Low-probability events may impact the integrity and safety of the NG network and components during the years of the operation phase</p> <p>Geological and geotechnical events: earthquakes may result in geotechnical instabilities that lead to network breakage or leakage in multiple locations simultaneously.</p> <p>Sabotage: pipelines and other components may be targeted for sabotage.</p> <p><i>Socioeconomic impacts</i></p> <p>Adverse impact is expected in raising the fear of disruption of Gas supply</p> | Negative impact | Minor |
| Economic disturbance | <ul style="list-style-type: none">• For those who will pay in installments, this may be an added financial burden on the poor families (a grant is available through AFD to help the poor people based on an eligibility criteria (section 4.3.13))• There could be a minor negative economic impact on LPG cylinders distributors | Negative impact | Minor |



6 Analysis of Alternatives

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, achieve savings in LPG consumption and enhance safety in utilizing energy.

6.1 Pipeline Installation Technology Alternatives

To install a natural gas pipeline beneath the ground level, this can either be done by digging a trench or using trenchless technologies. Trenchless technologies can be further classified as guided methods and non-guided methods. In this analysis, the most famous technology in each category will be considered; namely, horizontal directional drilling representing the guided trenchless technology, auger boring representing the non-guided trenchless technology, and the open-cut representing the trench technology. This technology will be applied only in Met Asem since the pipeline route will cross by railway.

6.1.1 Trenchless Technologies

HDD has some advantages compared to auger boring and open-cut technique as follows:

- Compared to the open-cut technology, it doesn't cause interruption to traffic flow.
- Compared to the open-cut technology, it causes fewer disturbances to the surface and sub-surface soil layers.
- Compared to the auger boring technology, it can be used for larger distances and wider range of pipeline diameters.
- Compared to the auger boring technology, it is a surface-launched process which doesn't require drive pits.
- Compared to the auger boring technology, it is a guided method, and accordingly can achieve high accuracy for the pipeline path.
- Can be employed for high depths, and accordingly can avoid any breakage accidents to the existing infrastructure lines/cables.

On the other hand, HDD suffers from some disadvantages including:

- Like any other trenchless technology, and according to the geologic condition, soil collapse may take place during the installation.
- In case of having existing infrastructure lines/cables, there will be less flexibility in choosing the pipeline depth, the fact which may necessitate drilling through soil layers which may be of insufficient strength to withstand the slurry's pressure.
- Not favorable with soils containing gravels and cobbles.

6.1.2 Open-Cut Method

This is the traditional method for pipeline installation. It is very simple technology which just depends on excavating the soil, laying the pipeline, and backfilling. However, it is technically not possible to be used in crossings with major waterways. It can be used in crossings with major roads and



railways; however, this will cause huge interruption to traffic as this will necessitate either re-routing or reducing the number of lanes. This will lead to reduction in the average speed of the vehicles on the road, and may affect the areas devoted for parking. This may also increase the probability of having car accidents, in addition to negative socio-economic impacts as a result of interrupting the flow of people and goods. Open-cut method may be the only possible recommended solution in the 3 studied areas since the pipeline route passes through urban and local roads and does not cross any main road (Except in Met Asem as mentioned in section 3.1.1 as it will cross by railway), and this will not negatively affect the environment, and it will be a cheap and safe option

6.2 Routing

The preferred route was selected on parameters like:

- Study Area Identification: Identifying major features in the study area like main roadways, residential and commercial areas to help identify constraints during the selection of the routes
- Mapping the resources: Existing linear corridors include major streets, waterways, railroads, and utility lines. Existing linear corridors are considered opportunity areas for pipeline routing because they have already been developed and therefore are generally considered a compatible land use. In addition, these linear corridors generally provide existing access for construction and maintenance requirements.

Cairo Gas proposed an alternative route to the chosen route shows the alternative route.

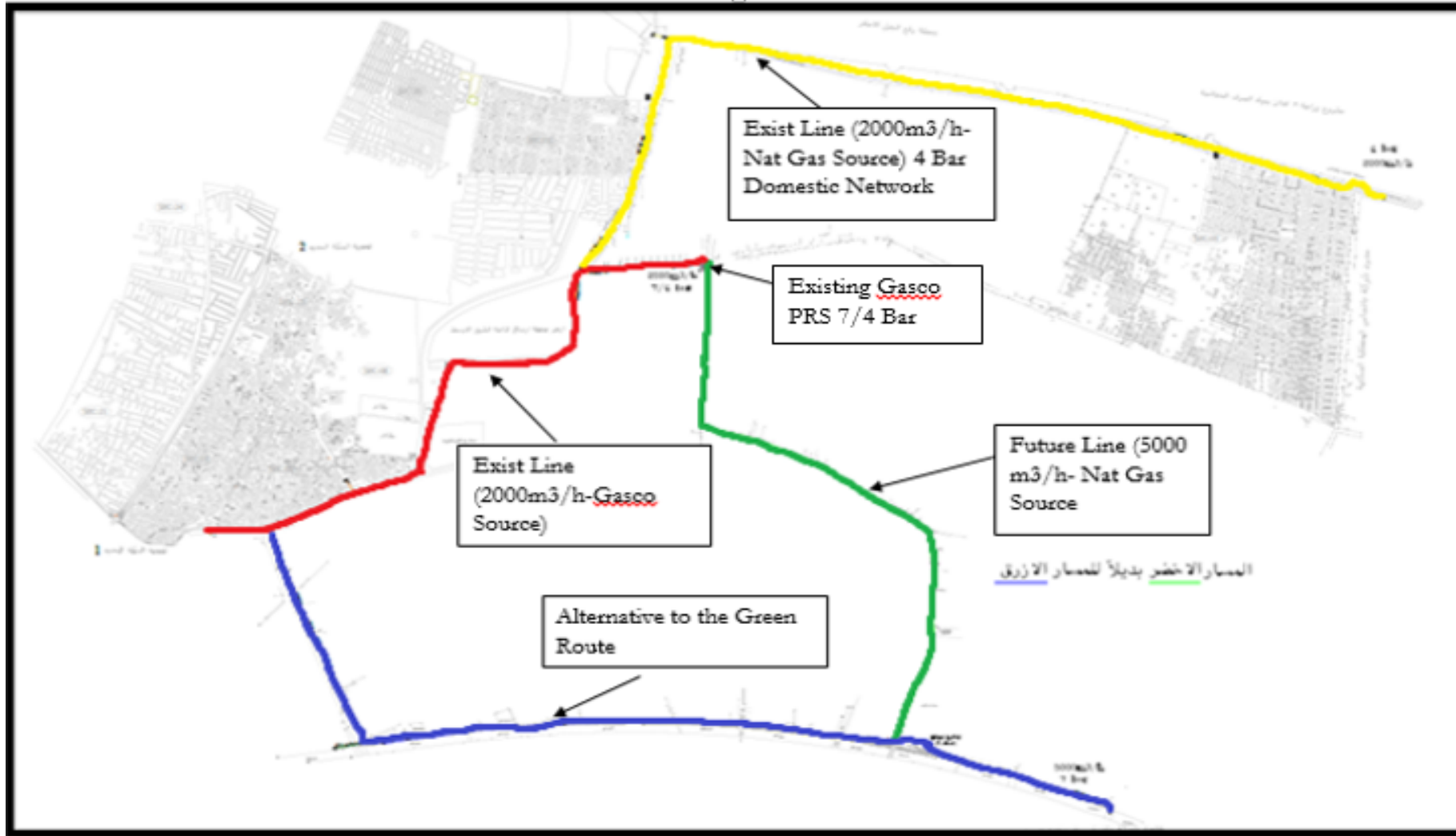


Figure2-9 Future and Existing feeding line



6.3 Regulators

Two type of 100 mbar regulators outlet pressure were considered

1- Kiosk regulators

2- Wall mounted regulators

Kiosk regulators were preferred because:

- Easier maintenance
- Less expensive
- More safe

6.4 Working time

As stated in the traffic baseline, some areas are overcrowded from 7 a.m. to 2 p.m. Therefore, it will be useful to apply flexible working time that can avoid working during rush hours. Additionally, in some residential areas, it will be extremely difficult to work during night. Working during morning can be applied in such areas. Moreover, in some areas, there is a weekly market e.g. the market located in Farshout city. Such market should be avoided. As a wrap up, the three alternatives related to working time are:



- Working during day time in most of project areas
- Working during night in overcrowded areas
- Avoid market working hours

6.5 Installation Costs

The average natural gas connection installation cost is about 7000 EGP and consumers contribute a part of it because the balance is subsidized by the Government. No financial assistance will be provided by the NGOs for the poor to install the NG. All NGOs interviewed expressed their willingness to act as communication channels with poor but no one of them will provide financial aid to the poor. However, the AFD in cooperation with the European Union will provide the poor with a kind of grant to be able to install the NG based on an eligibility criteria (section 4.3.13). This initiative has been approved and is currently being applied to all project areas.



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 we 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 companies in charge of project implementation: **Egypt Gas and Cairo Gas.**

7.2 Management of Mitigation and Monitoring activities During Construction Phase

7.2.1 Hotline

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

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

7.2.2 Air Emissions

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

7.2.3 Noise

Mitigation measures proposed to minimize Noise impact are detailed in the ESMP matrix below. Documentation should consist of standard operating procedures and monitoring reports for noise measurement tests and complaints.



7.2.4 Soil

Mitigation measures proposed to minimize Soil impact are detailed in the ESMP matrix below.

7.2.5 Surface water

Mitigation measures proposed to minimize Surface water impact are detailed in the ESMP matrix below.

7.2.6 Waste

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 wastes generated during the construction phase are classified as either non-hazardous (which includes inert wastes) and hazardous wastes. It is worth mentioning Construction wastes will be generated only during a relatively short period.

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.

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.

Preplanning drainage of dewatering water (subsurface water) and taking necessary permits from the Water and Wastewater Company, or irrigation authority. No land disposal should be accepted for the water. 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. Testing the subsurface water sample before selecting the appropriate disposal option

7.2.7 Traffic Impacts

Mitigation measures proposed to minimize traffic disruptions are detailed in the ESMP matrix below.

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

7.2.8 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. Annex 2 presents EGAS Health and Safety guidelines.

Mitigation measures proposed for minimizing occupational H&S impacts detailed in the ESMP matrix below.

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

The grievance mechanism (GRM) is to be shared with the community beneficiaries. Posters will be prepared and made available to the beneficiaries in the contracting office⁶ and the construction sites. Additionally, they will be available in the customer services office. Thus, sufficient and appropriate information about the GRM will be disseminated to the communities prior and during 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.

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 Egypt Gas.
3. Cairo Gas contact : 02 23494192/23494714/ Fax: 02 ٢٣٤٩٤٣٩٤,
Email:info@cairogas.com
4. The SDO within the LDC and EGAS
5. Email. info@*Egypt Gas*.com.eg

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

Response to grievance will be through the following channels

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

Details on the GRM and the institutional arrangements required to implement it are presented in Annex 6.

⁶ Falls under the budget of the LDCs



7.2.10 Excavation Activities Posing Risk on Utilities

Mitigation measures proposed to impact on underground utility lines and infrastructure are detailed in the ESMP matrix below.

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 Company or Telecommunication Authority) for their research activities.

7.2.11 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.

Mitigation measures proposed for minimizing community H&S impacts detailed in the ESMP matrix below.

7.2.12 Temporary Labor influx

Mitigation measures proposed for minimizing temporary labor influx impacts detailed in the ESMP matrix below.

7.2.13 Street Restoration after asphalt breaking

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.

Mitigation measures proposed for restoration of excavated streets are detailed in the ESMP matrix below.



7.3 Management of Mitigation and Monitoring activities During CONSTRUCTION Phase

Table 7-1 Environmental and Social Management Matrix during CONSTRUCTION

| Receptor | Impact | Mitigation measures | Residual Impact | Responsibility | | Means of supervision | Estimated Cost of mitigation / supervision | |
|---------------------|---|---|-----------------|----------------|--------------------|---|--|--|
| | | | | Mitigation | Supervision | | | |
| Ambient air quality | Increased emissions of dust and gaseous pollutants | • Controlled wetting and compaction of excavation/backfilling surrounding area | Minor | - LDC | LDC HSE department | Contractual clauses + Field supervision | - | Contractor costs |
| | | • Excavated soil stockpiles and stored sand should be located in sheltered areas. Stored fine sand should be covered with appropriate covering material ⁷ , such as polyethylene or textile sheets to avoid soil dispersion. | | - contractor | | | - | LDC management costs |
| | | • 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. | | | | | | |
| | | • Appropriate maintenance, engine tuning and servicing of construction equipment to minimize exhaust emissions | | | | | | |
| | | • Minimize unnecessary journeys and switching off machinery and equipment when not in use (idle mode). | | | | | | |
| Noise | Increased noise levels | • Ear muffs, ear plugs, certified noise PPE for workers | Minor | - LDC | LDC HSE department | Contractual clauses + Field supervision (audits) | - | Contractor costs |
| | | • Avoid noisy works at night whenever possible | | - Contractor | | | - | LDC management costs |
| | | • Complaints receipt from local administration | | | | | | |
| Soil | Degradation of soil quality | • Decrease erosion by minimizing disturbances and scarification of the surface | Minor | - LDC | LDC HSE department | Field supervision (audits) | - | Contractor costs |
| | | • Best practices for soil management should be followed | | - Contractor | | | - | LDC management costs |
| | | • Good housekeeping to minimize spills/leaks | | | | | | |
| | | • Proper handling and management of wastes | | | | | | |
| Surface water | Uncontrolled dumping of waste in canals can result in water pollution | • Control all onsite wastewater streams and ensure appropriate collection, treatment and discharge. Prevent discharge of contaminants and wastewater streams to ground. | Irrelevant | - LDC | LDC HSE department | Field supervision (audits) | - | Contractor costs |
| | | • Adequate management and proper handling and storage of construction materials, oils and fuel to avoid spillages | | - Contractor | | | - | LDC management costs |
| Waste generation | Hazardous waste accumulation | - Temporary storage in areas with impervious floor | Irrelevant | - LDC | LDC HSE department | Field supervision and review of certified waste handling, transportation, | | Indicative cost items included in contractor |
| | | - Safe handling using PPE and safety precautions | | - Contractor | | | | |

⁷ Sufficient sheets should accompany work groups during the construction phase.



| Receptor | Impact | Mitigation measures | Residual Impact | Responsibility | | Means of supervision | Estimated Cost of mitigation / supervision |
|----------|--------|--|-----------------|---|-------------|-------------------------------|---|
| | | | | Mitigation | Supervision | | |
| | | <ul style="list-style-type: none">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).Transfer to LDC depots for temporary storageDisposal at licensed Alexandria hazardous waste facilities (Nasreya or UNICO). Table 7-2 shows the solid wastes generated during construction and means of disposal.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.Preplanning drainage of dewatering water (subsurface water) and taking necessary permits from the Water and Wastewater Company, or irrigation authority. No land disposal should be accepted for the waterIf 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.Testing the subsurface water sample before selecting the appropriate disposal option.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 residualsEnsure hazardous liquid material/waste containers are always sealed properly and secured from tipping/falling/damage/direct sunlight during transportation and storageIn case of spillage:<ul style="list-style-type: none">avoid inhalation and sources of ignitioncover and mix with sufficient amounts of sand using PPEcollect contaminated sand in clearly marked secure containers/bagsAdd sand to inventory of hazardous waste | | <ul style="list-style-type: none">Water Authority | | and disposal chain of custody | 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 |



| Receptor | Impact | Mitigation measures | Residual Impact | Responsibility Mitigation | Supervision | Means of supervision | Estimated Cost of mitigation / supervision |
|---------------------------------------|---|--|-----------------|------------------------------|---------------------------------|---|---|
| | Non Hazardous waste accumulation | <ol style="list-style-type: none"> Allocating certain areas, in each Sector, for stockpiling waste soil and construction waste, in coordination with the local authority. No soil stockpiling is allowed on banks of waterways. Segregate waste streams to the extent possible to facilitate re-use/recycling, if applicable Maximize re-use of excavation waste as backfill for natural gas pipeline trenches. Normally asphalt waste could be disposed of with other excavation waste/aggregates in the local non-hazardous waste site. 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 <p><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></p> | Irrelevant | Excavation Contractor | LDC HSE department | Official coordination proceedings signed by representatives of utility authorities – Examination of site-specific reports and records – Field supervision | – Contractor management costs – LDC management costs |
| Local and accessibility | traffic | Traffic congestion (and associated noise/air emissions) | Minor | – Excavation contractors | – LDC + Traffic department | Contractor has valid conditional permit + Field supervision | Contractor costs |
| | | | | | – LDC HSE | | LDC management costs |
| | | | | – LDC Excavation contractors | – Local Unit Traffic department | Ensure inclusion in contract + Field supervision | – |
| | | | | Contractor | LDC HSE | Field supervision | |
| | | <ul style="list-style-type: none"> Excavation during off-peak periods Time limited excavation permits granted by local unit & traffic department Announcements + Signage indicating location/duration of works prior to commencement of work Traffic detours and diversion, there will be signs, which indicate the construction areas and deviations. Road restructuring and closing of lanes | | Traffic Department | Traffic Department | Field supervision for detouring efficiency – Complaints received from traffic department Fluidity of traffic flow | Additional budget not required |
| Occupational health and safety | Health and Safety | 1. The project will hire a qualified sub-contractor with the high health and safety standards. In addition, the ToR for the contractor and the ESMP will provide the provision of the health, safety and precaution of the environmental impacts and | Minor | - LDC Excavation Contractor | LDC-HSE department | Field supervision and review of HSE report+ Field supervision (audits) | - Contractor costs LDC management |



| Receptor | Impact | Mitigation measures | Residual Impact | Responsibility Mitigation | Responsibility Supervision | Means of supervision | Estimated Cost of mitigation / supervision |
|----------|---------------------------------------|--|-----------------|---|----------------------------|--|---|
| | | its mitigation measures to be followed during construction. 2. Standard protection by placing clear project signs. 3. Time management for vehicles movement; especially avoiding the peak hours 4. Standard protection for the workers especially working at elevated heights or trench. 5. Regular inspection to compelling worker to used their PPE 6. Training and licensing industrial vehicle operators of specialized vehicles. 7. The contractor also should keep attendance worksheet and laborers ID in order to verify the age of workers 8. Health insurance should be applicable to the contractor workers and workers contracted by a sub-contractor 9. Full compliance to EGAS and LDC HSE requirements, manuals, and actions as per detailed manuals developed by Egypt Gas 10. Ensure the provision of the appropriate personal protective Equipment and other equipment needed to ensure compliance to HSE manuals | | | | | costs |
| | Risk pertaining to child labor | <ul style="list-style-type: none">• The ToR to be prepared for both contractor and subcontractors will prohibit any kind of child labor in the project• Rigid obligations and penalties will be added to the contractor/subcontractors' ToR in order to warrantee no child labor is occurred in the project• The ToR also will oblige the contractor/subcontractor to keep a copy of IDs of laborers in order to monitor the hired staff below 18 years old <p>The contractor/subcontractor also will be obliged to maintain daily attendance sheets in order to verify the attendance of workers not include staff below 18 years old</p> | Minor | <ul style="list-style-type: none">• LDC - Excavation Contractor/subcontractor | LDC-HSE department | Field supervision and review of HSE report+ Field supervision (audits) | <ul style="list-style-type: none">• Contractor costs - LDC management costs |



| Receptor | Impact | Mitigation measures | Residual Impact | Responsibility | | Means of supervision | Estimated Cost of mitigation / supervision |
|---|---|--|-----------------|--|------------------|---|--|
| | | | | Mitigation | Supervision | | |
| Risk on Infrastructure and underground utilities | Damage to underground utilities resulting in water/wastewater leaks, telecommunication and electricity interruptions | <p>If maps/data are unavailable:</p> <ul style="list-style-type: none"> ○ Perform limited trial pits or boreholes to explore and identify underground utility lines using non-intrusive equipment ○ In case of breaking underground utility and infrastructure line, 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. <p>The mitigation measures on preventive measures and documentation:</p> <ul style="list-style-type: none"> ○ Preparation and analysis of accidental damage reports ○ Arrange Restoration and re-pavement (ردالشى لأصله) with local unit ○ Communication with local community on excavation and restoration schedules. <p>Standard protocols adhering to national/local administrative requirements are to be followed:</p> <ul style="list-style-type: none"> - 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, , 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 | Minor | <ul style="list-style-type: none"> ● LDC ● Local Governmental unit | LDC | <p>Field supervision and review of complaints</p> <p>Coordination minutes of meeting with the local governmental unit</p> | LDC management costs |
| Local communities and businesses | Lack of accessibility to businesses due to delay in street rehabilitation | <ul style="list-style-type: none"> ● Access to business due to excavation out the streets will be mitigated through enabling alternative entrances to the business. Also special wooden bars will be used to enable the shoppers to get into the markets. Additionally, the duration of work will not exceed one working day. In case of excavation main streets in the commercial areas, this can be only done during night after | Minor | <ul style="list-style-type: none"> - LDC - contractors | LDC and EGAS SDO | <p>_ Ensure the implementation of GRM (see Annex 6)</p> <p>Supervision on Contractors performance</p> | No cost |



| Receptor | Impact | Mitigation measures | Residual Impact | Responsibility Mitigation | Responsibility Supervision | Means of supervision | Estimated Cost of mitigation / supervision |
|-----------------------------------|---|--|-----------------|---------------------------|----------------------------|--|--|
| | | business closing <ul style="list-style-type: none">• Compliance with the Environmental management plan concerning timely implementation of the construction schedule to minimize impact on local business• Follow up the procedure of Grievance Redress Mechanism as showed in annex 6.• Ensure transparent information sharing• The telephone numbers of the social development officer responsible for grievances should be shared with the community people | | | | | |
| Local community Health and safety | Threat to Safety of users and houses (due to limited level of awareness and misconceptions) | <ul style="list-style-type: none">• Prepare Citizen engagement and stakeholder plan• Awareness raising campaigns should be tailored in cooperation with the community-based organization Following are some mitigation procedures to be adopted <ul style="list-style-type: none">• Using caution tapes that help to keep people away of the site,• Informing residents and shopkeepers about the timeline of the project (street by street) in order for the residents to know when to avoid certain streets• Install wooden bars or decks over trenches to allow safe crossing• A worker should support old people to cross the digging areas, especially, on the wooden bars. | Minor | LDC | LDC and EGAS SDO | <ul style="list-style-type: none">_ List of awareness activities applied_ Lists of participants_ Documentation with photos Awareness reports | LDC management costs |
| Labor conditions | Occupational Health and Safety | 1. Total number of complaints raised by workers 2. Periodic Health report Periodic safety inspection report | LDC HSE | - Biannual | Construction site | Documentation in H&S monthly reports Complaints log | No cost |
| Labor conditions | Child labor | Attendees lists with workers IDs Complaints and accidents reports | LDC HSE | - Biannual | Construction site | Documentation in H&S monthly reports Complaints log | No cost |

Table 7-2: Solid wastes during Construction

| Waste Type | Description | Treatment and Disposal |
|--------------------------------|--|---|
| Non-Hazardous | | |
| Excavated soil and excess sand | Excess sand not used in construction, and excavated soil other than broken asphalt. | Dispose to an approved non-hazardous waste disposal facility: <u>Municipal solid waste Qalyubeya</u> (to be agreed with local unit) |
| Metal – Scrap | Includes sheet metal, piping, tubing, wire, cable, , welding residue, valves, fittings, and vehicle and equipment parts. | |
| Paint Containers – Water Based | Pails used for latex paint and paint related solvent containers. | |
| Welding Rods | Generated from piping welding. Remaining portions of used rods or unused but opened packaged. | |



| Waste Type | Description | Treatment and Disposal |
|---|--|--|
| Non-Hazardous | | |
| Concrete and bricks waste | Excess liquid cement that not used in cementing operations, loose fragments of solidified cement , concrete debris from construction, and bricks waste | |
| Broken asphalt | Streets excavation will produce broken asphalt | |
| Domestic Waste | Food waste, paper and packaging discarded from kitchens, living quarters, bathrooms, laundries, warehouses and offices. | |
| Hazardous | | |
| Paint Containers – Oil Based | Pails used for oil based paints, solvents and paints that contain lead, silver, chromium or other toxic heavy metals. | Dispose to an approved hazardous waste disposal facility Nasreya Hazardous Waste Treatment Centre. |
| Possibly damaged asbestos water pipes during excavation | Any waste material containing more than 1 wt% asbestos including piping/equipment/vehicle gaskets, pump packing brake pads, etc. | |
| Contaminated Soil – Refined Fuel and Oil | Contaminated soil from routine activities and minor accidental releases spills or leaks. | |
| Oil Containers – (Including Drums and Barrels) | Drums and barrels used for bulk oils and lubricants. | |
| Shop Towels (Not Laundered - Contaminated) | Shop towels, rags, Nomex, and other cloth wipers that are contaminated with a hazardous or that exhibit a hazardous characteristic and are not commercially dry cleaned or laundered | |
| | | |

7.4 Environmental and Social Monitoring Matrix during CONSTRUCTION

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

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



| Receptor | Impact | Monitoring indicators | Responsibility of monitoring | Frequency of monitoring | Location of monitoring | Methods of monitoring | Estimated Cost of monitoring |
|-----------------|---|---|------------------------------|--|--|--|------------------------------|
| | | dewatering (if encountered) | | | | | |
| | | 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 |
| Local community | Damage to the streets | <div><div>–</div>Streets quality after finishing digging</div> <div><div>–</div>Number of complaints due to street damage</div> | LDC, EGAS | Four times per year, each three months | Site and Desk work | Checklists and complaints log | No cost |
| Local community | Threat to Safety of users and houses (due to limited level of awareness and misconceptions) | <div><div>–</div>Number of awareness raising implemented</div> <div><div>–</div>Number of participants in information dissemination</div> | LDC, EGAS | Quarterly monitoring | Office | Reports Photos Lists of participants | No cost |



7.5 Management of Mitigation and Monitoring activities During OPERATION Phase

Table 7-4: Environmental and Social Management Matrix during OPERATION

| Receptor | Impact | Mitigation measures | Residual Impact | Responsibility | | Means of supervision | Estimated Cost |
|--|--------------------------|--|-----------------|----------------|-------------|---|----------------------|
| | | | | Mitigation | Supervision | | |
| Integrity of natural gas piping | Network integrity | <ul style="list-style-type: none"> Detailed review of the geotechnical and geological history of the project area Random inspections and awareness campaigns to ensure that NG piping and components (both inside the household and outside) are not be altered, violated, or intruded upon in any way without written approval from, or implementation of the alteration by, the LDC. Availability of 24-7 hotline service (129) to all beneficiaries and the public for reporting possible leaks, damages or emergencies evacuation of the | Minor | LDC | LDC HSE. | <ul style="list-style-type: none"> - Map and local geotechnical report review - Site inspections - Awareness actions Periodical trainings and drills | LDC management costs |



| Receptor | Impact | Mitigation measures | Residual Impact | Responsibility | | Means of supervision | Estimated Cost |
|-------------------------------|--|---|-----------------|--|-------------|---|----------------|
| | | | | Mitigation | Supervision | | |
| | | affected area - Repair or replacement of failed component | | | | | |
| Economical disturbance | <ul style="list-style-type: none"> Financial burden on economically disadvantaged due to the installments Loss of revenue for LPG distributors | - Petro Trade should collect the installment immediately after the installation of NG - 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 - The installment should not be high - LPG distributors should be informed about the NG potential areas in order to enable them to find alternative areas - They should be informed about the GRM in order to enable them to voice any hardship | Minor | 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 |
| | | | | Butagasco | EGAS | Information sharing activities with the LPG vendors Grievances received from them | No cost |
| Community health and | Possibility of Gas leakage | - Information should be provided to people in | Minor | LDC | LDC | Complaints raised due to Gas leakage | No cost |



| Receptor | Impact | Mitigation measures | Residual Impact | Responsibility | | Means of supervision | Estimated Cost |
|-------------------------|---------------------------------------|--|-----------------|----------------|-------------|---|----------------------|
| | | | | Mitigation | Supervision | | |
| safety | | <p>order to be fully aware about safety procedures</p> <ul style="list-style-type: none"> - The hotline should be operating appropriately - People should be informed of the Emergency Numbers - The complete integrated, comprehensive and robust Emergency Response Plan of the LDC (in Arabic) is in annex 7 A of the study and only a small part concerning the followed procedures during some emergency scenarios is translated in annex 7 B - | | | | | |
| Labor conditions | Occupational Health and Safety | <ul style="list-style-type: none"> – Total number of complaints raised by workers – Periodic Health report - Periodic safety | Irrelevant | LDC HSE | LDC | <ul style="list-style-type: none"> - Safety supervisor should follow the commitment of workers to use the protective | LDC management costs |



| Receptor | Impact | Mitigation measures | Residual Impact | Responsibility | | Means of supervision | Estimated Cost |
|----------|--------|---------------------|-----------------|----------------|-------------|---|----------------|
| | | | | Mitigation | Supervision | | |
| | | inspection report | | | | equipment - Inspection and recording of the performance -Reports about the workers and complaints | |

7.6 Environmental and Social Monitoring Matrix during OPERATION

Table 7-5 Environmental and Social Monitoring Matrix during OPERATION

| Impact | Monitoring indicators | Responsibility of monitoring | Monitoring Frequency | Location of monitoring | Methods of monitoring | Monitoring Estimated Cost |
|---|---|------------------------------|--|---|---|---------------------------|
| Network integrity | <ul style="list-style-type: none"> - Earthquakes or geotechnical settlements - Emergency response time and corrective actions during emergency drills - Reports of alteration or tampering with ANY gas components | LDC HSE | Bi-annual inspections and annual emergency response drills | Along the network and inside and outside households | <ul style="list-style-type: none"> - Inspection, leakage detection, running the drills | LDC management costs |
| Financial burden on economically disadvantaged due to the installments | <ul style="list-style-type: none"> - Number of economically disadvantaged people who complained - Number of those who can't pay the installment | LDC and Petro Trade, EGAS | Quarterly | Desk work | <ul style="list-style-type: none"> - Complaints log - Bank reports - Petro trade reports | No cost |
| Impact on the | <ul style="list-style-type: none"> - Grievance received from the informal | EGAS, LDC | Quarterly | Desk work | <ul style="list-style-type: none"> - Complaints log | No cost |



| Impact | Monitoring indicators | Responsibility of monitoring | Monitoring Frequency | Location of monitoring | Methods of monitoring | Monitoring Estimated Cost |
|-----------------------------------|--|------------------------------|--|------------------------|-----------------------|---------------------------|
| informal LPG distributors | LPG distributors - Information shared with them | | | | | |
| Possibility of Gas leakage | - Complaints raised by the community people - Number of leakage accidents reported/raised | LDC, EGAS | Four times per year, each three months | Site and Desk work | Complaints log LDC | No cost |



7.7 Reporting of Mitigation and Monitoring Activities

Egypt Gas and Cairo Gas HSE Departments are to prepare monthly and/ or 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:

- Undertaken treatment and temporary storage and/or disposal activities of empty odorant containers
- 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



7.8 Institutional Framework for ESM&MP Implementation

7.8.1 Environmental Management Structures

EGAS is the supervisory body. **Egypt Gas and Cairo Gas** are the implementing bodies. Below is the management structure of **Egypt Gas and Cairo Gas**.

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

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

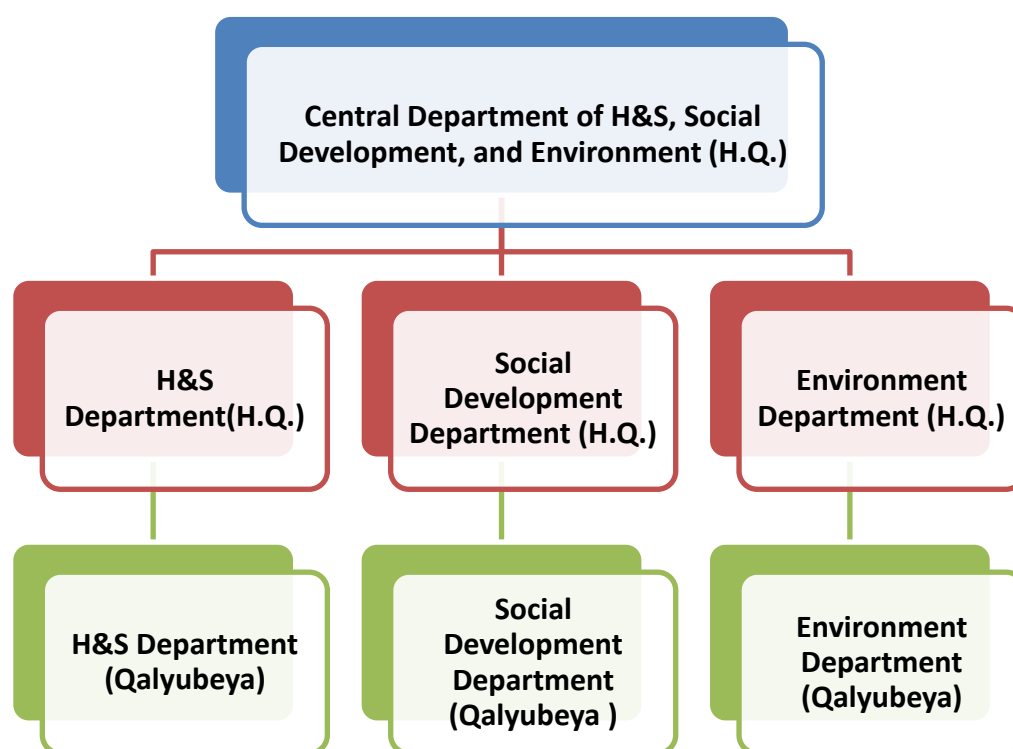


Figure 7-1: Egypt Gas and Cairo Gas ESMP organogram

7.8.2 Required Actions

- 1- Involvement of environmental and social officers during the design, costing, tendering, and construction phases would be advantageous.
- 2- Detailed HSE manuals covering each activity must be developed and institutionalized in Egypt Gas and Cairo Gas. Several versions of such manuals have been developed by Egypt Gas and should be mainstreamed to other LDCs, accompanied by the appropriate capacity-building.
- 3- An updated and detailed assessment of Egypt Gas and Cairo Gas EHS institutional capacity and available resources for implementation of the ESMP.
- 4- Specifically, Egypt Gas and Cairo Gas should take steps to develop capacity of site engineers and HSE officers with specific courses focused on implementation of the ESMP detailed in this ESIA.



8 Stakeholder Engagement and Public Consultation

The public consultation chapter aims at highlighting the key consultation and community engagement activities and their outcomes, in addition to outlining the validity and reliability of the collected data.

Public consultation activities have been implemented during the preparation of the framework and the site specific studies. Following are the public consultation activities that have been implemented:

- Public consultation session was conducted on 21 December 2013 in Qalyubeya city
- Public consultation session was conducted on 10 February 2016 in Qalyubeya city
- Consultation activities were conducted on February and March 2017

8.1 Legal framework for consultation

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 were held for the proposed 1.5 million household NG connections project in compliance with the following legislations:

- WB policies and directives related to disclosure and public consultation, namely:
 - o Directive and Procedure on Access to Information
 - o World Bank Operational Policy (OP 4.01)
- Egyptian regulations related to the public consultation
 - o Environmental law No 4/1994 modified by Law 9/2009 modified with ministerial decrees no. 1095/2011 and no. 710/2012
- 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 hand⁸, additional consultation efforts (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 should assess conducting surveys in the different sites.

⁸ 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."

**In order to achieve that:**

- Community engagement plan has been developed for the different communities through three phases:
 - Phase I: Preparation of the framework study in 2013
 - Phase II: The site specific studies in 2015-2016
 - Phase III: The consultation activities in 2017
- Based on the identification of stakeholders, various questionnaires and guidelines were prepared in order to engage:
 - The residents in the project areas
 - Governmental Organizations and Authorities
 - NGOs
 - Educational institutions and universities
 - Health departments
 - Environmental administrations
 - Formal and informal LPG distributors. In addition to, Cairo gas and Egypt Gas companies.

8.2 Consultation objectives

The objective of the Stakeholder Engagement is to ensure safe and successful Project delivery by:

- Informing stakeholders, including persons or groups who are directly or indirectly affected by a project, as well as those who may have interests in a project and/or the ability to influence its outcome, either positively or negatively;
- listening to their comments, ideas and concerns and recording the same for follow up;
- Avoiding conflict by addressing impacts and issues raised by stakeholders promptly; particularly with the communities that will not be served by the project
- Ensuring that fears and anxieties about the nature, scale and impact of the operation have been properly considered in the development and management of the Project;
- Accessing and making good use of existing local knowledge of the area;
- Avoiding any misconceptions about the project and properly manage expectations;
- Communicating and implementing a viable community feedback mechanism.



The consultation outcomes will be used in:

- 1- Define potential project stakeholders and suggest their possible project roles
- 2- Identify the most effective outreach channels that support continuous dialogue with the community

Thereafter the results will provide proper documentation of stakeholder feedback and enhance the ESIA accordingly.

8.3 Defining the stakeholder

In order to ensure an inclusive and meaningful consultation process, a stakeholder's analysis was conducted to get better understanding of the various groups and their roles, interests and influence on the project. Full list of the stakeholders on the governorate level is included in Annex 8 , 9 and 10.

For the purpose of this site specific ESMP, 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 (elaborated details on that are include in the Governorate level ESMP). In the meantime, local communities of both men and women of projects beneficiaries, 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 and the final Public consultation session was conducted in 10 February 2016.

8.4 Consultation Methodology and Activities

The research team for this study has adopted multi-dimensional consultation activities that enable the marginalized, voiceless, youth and women to gain information about the project. As well as, gaining information about their concerns and worries that regarding the project during various implementation phases. Following are the main consultation activities to date:

- 1- The study team visited the project area in order to define various stakeholders.
- 2- Community engagement plan has been developed for the different communities through three phases:
 - Phase I: Preparation of the framework study in 2013
 - Phase II: Preparation of the site specific studies in 2015-2016
 - Phase III: The consultation activities in 2017
- 3- The study team divided the various engagement activities of the project to:
 - Scoping phase,
 - Data collection phase and,
 - Final public consultation phase II.
 - Consultation activities in Phase III.
- 4- All activities conducted were documented with photos and lists of participants in order to warrantee appropriate level of transparency.

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

| Participants | Number | | Methods | Date |
|---|--------|--|---------|------|
| During the preparation of framework(2013) | | | | |



| | | Males | Females | | |
|---|-----------------------------|-------|---------|-----------------------------------|-----------------------------------|
| Potential beneficiaries and government officials | | 6 | 8 | FGD | October-November 2013 |
| Governmental and NGOs | | 3 | 2 | In-depth | Nov-2013 |
| Community people | | 69 | 206 | Structured questionnaire | October-November 2013 |
| Potential beneficiaries, government officials, NGO representatives | | 63 | 8 | Public consultation | 21 st of December 2013 |
| Total | | 141 | 224 | | |
| During the site specific study (2015 -2016) | | | | | |
| Potential beneficiaries and government officials | | 80 | 78 | FGD in depth | September and October 2015 |
| Governmental and NGOs | | 12 | 4 | In-depth | |
| Community people | | 477 | 727 | Focus Structured questionnaire | |
| Potential beneficiaries, government officials, NGO representatives, | | 64 | 19 | Public consultation | 10 ^h of February 2016 |
| During ESIA (2017) | | | | | |
| Potential beneficiaries | El Qalag, El Gabal El Asfar | 10 | 7 | - FGD -In depth | February and March 2017 |
| | Met Asem | 7 | 6 | | |
| | Izbet Afandena | 10 | 8 | | |
| LPG vendors | El Qalag, El Gabal El Asfar | 4 | 0 | Structured questionnaire | |
| | Met Asem | 0 | 0 | | |
| | Izbet Afandena | 0 | 0 | | |
| Governmental and NGOs | El Qalag, El Gabal El Asfar | 3 | 2 | In-depth | |
| | Met Asem | 4 | 0 | | |
| | Izbet Afandena | 1 | 2 | | |
| Community people | El Qalag, El Gabal El Asfar | 85 | 65 | -FGD -Structured questionnaire | |
| | Met Asem | 40 | 35 | | |
| | Izbet | 30 | 25 | | |



| | | | | | |
|--|-----------|---|--|----------|--|
| | Afandena | | | | |
| Representatives from Egypt Gas and Cairo Gas | Egypt Gas | 6 | | In-depth | |
| | Cairo Gas | 5 | | | |



Figure 8-1: official interview in El Qalag, El Gabal El Asfar



Figure 8-2: official interview in El Qalag, El Gabal El Asfar



Figure 8-3: Focus group discussion with males in El Qalag, El Gabal El Asfar



Figure 8-4: Focus group discussion with females in El Qalag, El Gabal El Asfar



Figure 8-5: interview with LPG vendor in El Qalag, El Gabal EL Asfar



Figure 8-6: official interview in Met Asem village



Figure 8-7: Focus group discussion with males in Met Asem village



Figure 8-8: Focus group discussion with females in Met Asem village



Figure 8-9: official interview in Izbet Afandena village



Figure 8-10: Focus group discussion with males in Izbet Afandena village



Figure 8-11: Focus group discussion with females in Izbet Afandena village

8.5 Consultation processes

Following are the community participation and the consultation processes that were conducted in Qalyubeya Governorate throughout the three phases in order to prepare the study:

- Phase I: Preparation of the framework study 2013
- Phase II: Final public consultation 2016
- Phase III: Consultation activities 2017

The results of the three phases will be presented as follows:

➤ **Summary of phase I: Preparation of the framework study 2013 (see Annex 8)**

A. The consultation session was conducted on December 2013

- Consultants (EcoConServ environmental and social) attended session
- Representatives of EGAS and Egypt Gas
- Representatives of EEAA accompanied the teams
- NGOs
- Media related expert was recruited to invite media people
- Community people

B. Key comments and concerns raised during the session are:

-The methods of dealing with gas leakages

In case of gas leakages in the house you should:

1. follow the instruction on the sticker on the top of the gas connection or
2. Call 129 for the emergency team and they will react within 15 minutes.

-Narrow streets, which have less than 3 meters width

According to the street situation the company put them underground starting from one meter downwards

-Construction of pressure station in Qalyubeya in between residential blocks, which is totally unsafe for the population.



It's not dangerous to have the stations in between residential houses as we are follow up all safety specifications.

-The gas contractors are not doing good rehabilitation for the roads after finishing their work.

The contractors are not in charge to do the rehabilitation of the roads, it's the Municipality's task. The GAS project has a budget for this and even when we coordinate the work with the municipality we are paying them in advance to rehabilitate the roads and bringing them to their old shape.

-Why don't you connect NG to the whole Governorate?

We have neither the money nor the power for installing NG to the whole Governorate. In addition we have to consider, that there are other clients than the households who are using NG and we should consider their consumption and compare it with the availability of gas.

-The criteria for choosing the nominated cities

There are three criteria for selecting connection areas:

1. Social criteria to cover a big number of poor and medium standard citizens.
2. Economic criteria to make sure that the connection can cover the largest number of citizens in one area. That's why EGAS is not connecting those areas, which have not yet reached 80% of the occupation rate.
3. Safety and security conditions.

-The side problems caused by excavation like the traffic deviations

We are coordinating our works with the traffic department. Additionally, there will be signs, which indicate the construction areas and deviations.



➤ **Summary of Phase II: Final public consultation 2016 (see Annex 9)**

A. The Consultation session was conducted in Qalyubeya governorate on 10th of February 2016

- Consultants (Petrosafe/EcoConServ environmental and social) attended meeting
- Representatives of EGAS and Egypt Gas
- Representatives of EEAA accompanied the teams
- Administrative managers
- Media related expert was recruited to invite media people
- Community people

B. Key comments and concerns raised during the Final Public Consultations are:

-Areas that have not been connected to the NG

There are certain specifications to install the NG to any area. In case the area is suitable, the Government of Egypt tries to allocate financial resources to install the NG. Given the limited resources Egypt face, the installation plan might take some time

-Many areas in Qalubeya districts have narrow streets.

According to the technical specification, certain street width is required in order to be able to mitigate any emergency cases

-Coordination with the local units in order to get information about the underground utilities

All LDCs coordinate with the Local Units, not only to obtain information but also to be able to get permissions for street cuts and crossings.

-The necessity to have sewage installed prior to NG

The sewage pipelines are located at lower depth than the NG. Therefore, the sewage should be installed first. This is one of technical specifications that can't be violated.

-The streets not rehabilitated after the completion of the NG construction

The LDCs disburse the cost of street restoration to the local unit and road authority prior to construction phase. It took them long time to rehabilitate streets so that the streets left without being rehabilitated

-Role of the NGOs

They will play an active role in the process of information sharing:

- 1- The cost of NG connection during the project and during operation
- 2- The importance to install the gas during the project as subsidy will be available only during the construction phase
- 3- The safety measures
- 4- Emergency procedures
- 5- Hot lines

➤ **Phase III: Consultation activities 2017**

Consultation activities were conducted in Qalyubeya governorate on February and March 2017

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

| Subject | Questions and comments | Responses | Addressed in the ESMP |
|---------|------------------------|-----------|-----------------------|
|---------|------------------------|-----------|-----------------------|



| | | | study |
|-------------------|---|---|--|
| LPG problems | <p>The community appreciate having the NG project as the LPG cause many problems:</p> <ul style="list-style-type: none"> - The LPG cost a lot of money - Sometimes residents can't find it - It is difficult to bring the LPG upstairs especially if the resident is in the upper floors and no elevator is available - Sometimes the LPG is not completely full. It is half filled - LPG cylinder is a bomb in the house; it might explode in any minute. | The government of Egypt has an ambition plan to connect the NG to 2.4 million households. This will solve LPG problems. | See section 4.3.10 Problems faced with the current household fuel |
| NG benefits | Members of the community acknowledged the importance of NG and the benefits of having NG connection to their households. | <ul style="list-style-type: none"> - NG is of lower cost than LPG - It is reliable, safe, and available - It will put limitation to the quarrels and fights occur to obtain an LPG - It also will put limitation to the crisis of the LPG shortage <p>It will save electricity that is used in electricity heater and reduce the cost of electricity bill</p> | See section 4.3.11 Perception towards the project and positive impacts during operation phase |
| Installation cost | The majority of the sample reported that, it is very expensive to pay the NG installation cost at once. They strongly recommended having installment mechanism. | The current NG installation cost is 2200 EGP. Therefore, there is a possibility to provide facilitation payments strategies through offering various installment schemes over a period of one year to seven years | See section 4.3.13 Willingness and affordability to pay |



| | | | |
|--------------------------|---|--|--|
| | | | |
| Role of NGOs | NGOs can pay for the installation of the NG to poor households. Or they can pay the advance payment. Thereafter, the poor people can pay few amount of money as installment | This will be from the recommendations, but the project will be not obligated to achieve that | See section 4.3.13 Willingness and affordability to pay |
| Women hardship with LPG | Women suffer from the LPG as they are responsible of bringing it from the LPG outlet and carry it upstairs. | NG connection will save women effort related to changing LPG cylinders | See section 4.3.12 Gender dimension of the current type of fuel |
| Impact on LPG vendors | The project might result in unfavorable impacts on the LPG vendors (Sareha). | The NG project will partially affected the vendors, but it will reduce the dangers of LPG cylinders which are considered bombs in houses | See The potential adverse impacts during the operation phase |
| Information desk | <p>It is recommended to have an information desk to</p> <ul style="list-style-type: none"> • share info with people about the project - people can send their grievances to the information desk - they also can submit a request for the installation of NG - They should have answers to the technical and contracting aspects <p>Information provided should be in a simple form</p> | The study recommended sharing information about the project not only in the location of contracts or at homes, but also in various public places. It also recommended holding regular meetings to inform the citizens about the natural gas project | See Final public consultation 2016, Annex 9 |
| Role of community people | Community people can mobilize each other to install the NG. Additionally, they can provide guidance to the illiterate groups | <p>the study recommended the participation of the community people in sharing information about NG project with the other people especially the illiterate groups</p> <p>Awareness raising campaigns should be tailored in cooperation with the community-</p> | See table 7.1 Environmental And Social Management Matrix During Construction |



| | | | |
|--|--|---------------------|--|
| | | based organizations | |
|--|--|---------------------|--|

8.6 Summary of consultation outcomes

The consultation outcomes revealed that:

- A. The key message from the consultation events carried out for this project is that Public and government acceptance for and support to the project are very strong.
- B. There are many problems related to LPG cylinders such as: (high cost, price fluctuations, unavailable, the exerted effort to hold and install the cylinder, and the risks related to the existence of LPG cylinder within the household)
- C. The interviews and the focus group discussions revealed some concerns raised by the community regarding the NG connection such as:
 - The majority of the community people cannot afford to pay NG installation costs in one installment, they strongly recommended to pay in installments.
 - Some concerns about LPG security and safety.
 - Actual need to provide clear information about the project
 - Actual need to response to grievances in timely manner
- D. The interviews with the implemented companies revealed that, they are fully aware about security and safety procedures. As well as, the excavation work dates in accordance with the nature of the region, the traffic density and the population.
- E. For poor people, the study recommended that NGOs can pay for the installation of the NG to poor households. (the recommendation is not obligated for the project)
- F. The study recommended the participation of the community people in sharing information about NG project with the other people especially the illiterate groups. (The recommendation is not obligated for the project)

8.7 ESMP disclosure

As soon as the site-specific ESMPs gets approval from the World Bank and EEAA, a final report will be published on the WB, EGAS and Egypt Gas and Cairo Gas websites. An executive summary in Arabic will be published on EGAS and Egypt Gas websites. A copy of the ESMP report in English and a Summary in Arabic will be made available in the customer service office. Additionally, an Arabic summary will be made available in the contracting offices. An A3 poster will be installed in the contracting office informing about the results of the ESIA and the website link for the full ESMP study.