











1.5 Million Natural Gas Connections Project in 11 Governorates

Environmental and Social Management Plan

Jazirat Mohamed, El-Kom El-Ahmar, Tanash, Suqayl, Ausim, Saft Al Laban, Hadayek El-Ahram, Al-Munib, Nazlet El-Semman and Kafr El-Gabal /

Final Report

Giza, Governorate

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EGAS

Egyptian Natural Gas Holding Company

Developed by

"Petrosafe"

Petroleum Safety & Environmental Services Company

EcoConServ Environmental Solutions

List of acronyms and abbreviations

AFD	Agence Française de Développement (French Agency for Development)
CAPMAS	Central Agency for Public Mobilization and Statistics
CDA	Community Development Association
EEAA	Egyptian Environmental Affairs Agency
EGAS	Egyptian Natural Gas Holding Company
EIA	Environmental Impact Assessment
ESIA	Environmental and Social Impact Assessment
ESMF	Environmental and Social Management framework
ESMP	Environmental and Social Management Plan
FGD	Focus Group Discussion
GPS	Global Positioning System
HH	Households
HSE	Health Safety and Environment
IFC	International Finance Corporation
LDC	Local Distribution Companies
LPG	Liquefied Petroleum Gas
mBar	milliBar
NG	Natural Gas
NGO	Non-Governmental Organizations
P&A	Property and Appliance Survey
PE	Poly Ethylene
PRS	Pressure Reduction Station
SDO	Social Development Officer
SIA	Social Impact Assessment
Town Gas	Town Gas (LDC)
WB	The World Bank
WHO	World Health Organization
$	United States Dollars
€	Euros

Exchange Rate: US$ = 17.57 EGP. as of March 2018

Exchange Rate: € = 21.69 EGP as of March 2018

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1. Introduction

1.1 Project Objectives

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. **The ESMP objectives include:**

- Describing project components in Jazirat Mohamed, El-Kom El-Ahmar, Tanash, Suqayl, Ausim, Saft Al-Laban, Hadayek El-Ahram, Al-Munib, Nazlet El-Semman and Kafr El-Gabal districts and activities of relevance to the environmental and social impacts assessments
- Identifying and addressing relevant national and international legal requirements and guidelines
- Describing relevant baseline environmental and social conditions
- Assessing project alternatives if different from those presented in ESIA 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 World Bank 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 households which will be covered in this ESMP are illustrated in table 1-1:

Table 1-1: Number of Areas and Potential clients

Governorate	Local Distribution Company	Areas	Potential clients
Giza	Town Gas	Jazirat Mohamed	7000
		El-Kom El-Ahmar	4000
		Tanash	2500
		Suqayl	3000
		Ausim	12000

Governorate	Local Distribution Company	Areas	Potential clients
		Saft Al-Laban	4000
		Hadayek El-Ahram	10000
		Al-Munib	9400
		Nazlet El-Semman and Kafr El-Gabal	23500
TOTAL:		9	75400

The studied areas contain existing pressure reduction stations (PRS) and no ESIA is required for these areas. No major environmental or social risks can be foreseen which would prevent the project from reaching the targeted customers over the proposed 2-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 prepared by Petrosafe (Petroleum Safety & Environmental Services Company) and Ecoconserv Environmental Solutions (Cairo, Egypt) with collaboration and facilitation from EGAS, Town Gas HSE and Engineering Departments. The full names and roles of the Petrosafe and Ecoconserv experts who have participated in the preparation of the ESMP study listed in Annex 1 of this report.

Table 1-2: List of main contributors

Team Member	
1. **Geo. Mohamed El-Ghazaly**	2. **Dr. Khaled Gamal**
3. **Dr. Zeinab Farghaly**	4. **Chem. Mohamed Saad Abdel Moein**
5. **Chem. Mohamed Abdel Moniem Aly**	6. **Chem. Mohamed Mahmoud Abdel Rady**
7. **Dr. Mahmoud sarhan**	8. **Dr. Mahmoud Nour El-Din**

2. Project Description

2.1 Background

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

The city distribution network comprises the following components:

(The red box below denotes project activities covered by this ESMP)

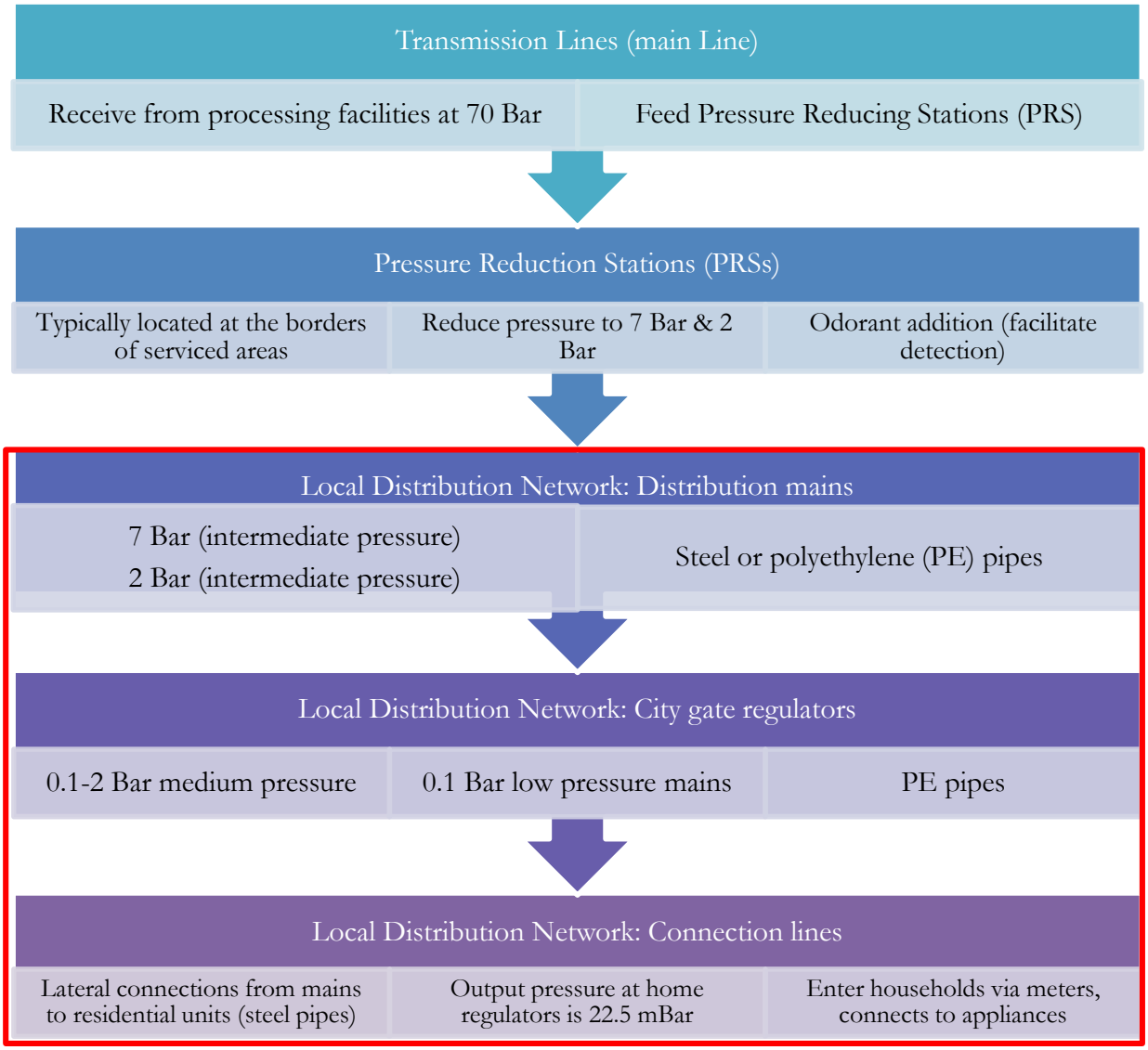


Figure 2-1: General components of Jazirat Mohamed, El-Kom El-Ahmar, Tanash, Suqayl, Ausim, Saft Al-Laban, Hadayek El-Ahram, Al-Munib and Nazlet El-Semman& Kafr El-Gabal distribution network (Surrounded by red frame)

2.2 Project Work Packages

According to the agreement between Town Gas Company and the Egyptian Natural Gas Holding Company "EGAS" signed for supplying natural gas to more than about 75400 domestic in **Jazirat Mohamed, El-Kom El-Ahmar, Tanash, Suqayl, Ausim, Saft Al-Laban, Hadayek El-Ahram, Al-Munib and Nazlet El-Semman& Kafr El-Gabal districts, Giza Governorate**. Town Gas Company will start the necessary installations needed to feed natural gas for the customers in this region. The project scope within Giza Governorate's said districts will be as follows: -

2.2.1 Intermediate Pressure Network-Main feeding line (7 bar system) for Jazirat Mohamed area:

Jazirat Moahmed area belongs to El-Warraq district, it will be connected with a polyethylene intermediate pressure feeding pipeline of about 3.665 km length.

2.2.1.1 Route

The proposed pipeline route will start from the offtake point on an existing Intermediate Pressure gas pipeline which is located at Embaba-El-Kanater Rd. (Lat. 30° 6'49.21"N, long. 31°12'36.26"E), which feeding Jazirat Mohamed area.

Figure 2-2: Satellite Map showing The Location of Offtake point

The proposed pipeline route then extends to the south direction to entrance of Gas Companies St. for about 600 meter. Then turns west in Gas companies St. for about 865 m and then 1.5 km in west direction till reaching to entrance of Jazirat Mohamed-El-Kom El-Ahmar road and going south west direction for about 700 m till reaching end point location.

Figure 2-3: Satellite Map showing the proposed pipeline route feeding Jazirat Mohamed area

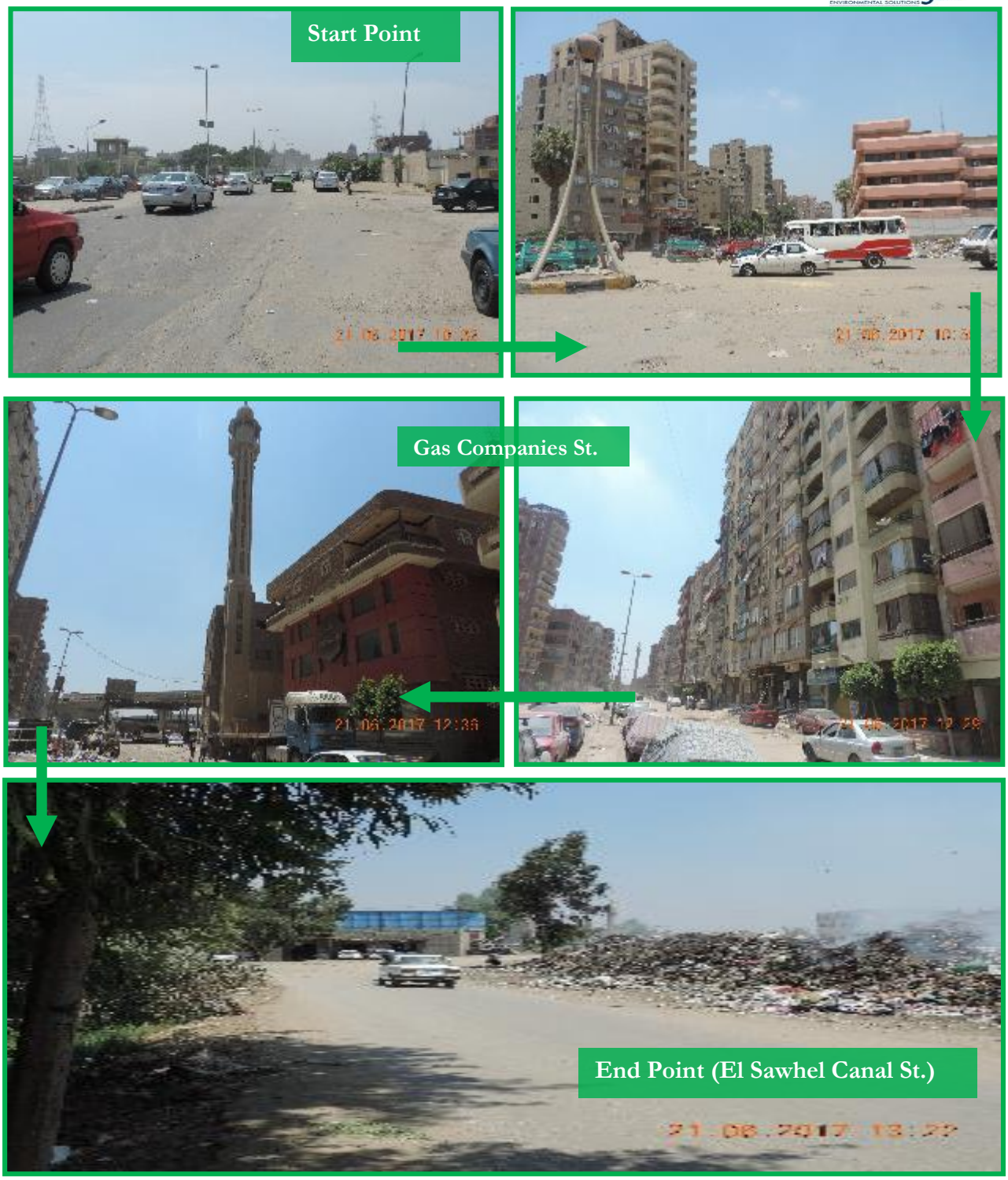


Figure 2-4: Pictures showing the proposed pipeline route feeding Jazirat Mohamed area

2.2.2 Low-pressure Distribution-Network for Jazirat Mohamed area:

Low-pressure gas exiting city regulators 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 for 10 sectors within Jazirat Mohamed as shown in figure 2-5 below.

Figure 2-5: Satellite map showing the proposed Distribution - Network Jazirat Mohamed

Samples of Streets in Jazirat Mohamed Sectors






Figure 2-6: Pictures showing Samples of Streets in Sectors of Jazirat Mohamed area.

2.2.3 Intermediate Pressure Network-Main feeding line (7 bar system) for El-Kom El-Ahmar area:

El-Kom Al-Ahmar belongs to Ausim district; it will be connected with a polyethylene intermediate pressure feeding pipeline of about 3.8 km length.

2.2.3.1 Route

The proposed pipeline route will start from the offtake point on an existing Intermediate Pressure gas pipeline which is located at Embaba-El-Kanater Rd. (Lat. 30° 6'49.21"N, long. 31°12'36.26"E), which feeding EL-Kom El-Ahmar area.

Figure 2-7: The Location of offtake point

The proposed pipeline route then extends to the south direction to entrance of Gas Companies St. for about 600 meters. Then turns west in Gas companies St. and going in the same direction for about 865 m and then turns west and extends for about 200 m till reaching to the entrance of Jazirat Mohamed and going for about 700 m in the north wet direction then turns south west and extends for about 720 m then turns in the east direction and extends for about 2.285 km till reaching end point location.

Figure 2-8: Satellite Map showing the proposed pipeline route feeding EL-Kom El-Ahmar area

Figure 2-9: Pictures showing the proposed pipeline route feeding El-Kom El-Ahmar area

2.2.4 Low-pressure Distribution-Network for EL-Kom El-Ahmar area:

Low-pressure gas exiting city regulators 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 installed horizontally underground for nine sectors within EL-Kom El-Ahmar as shown in figure 2-10 below.

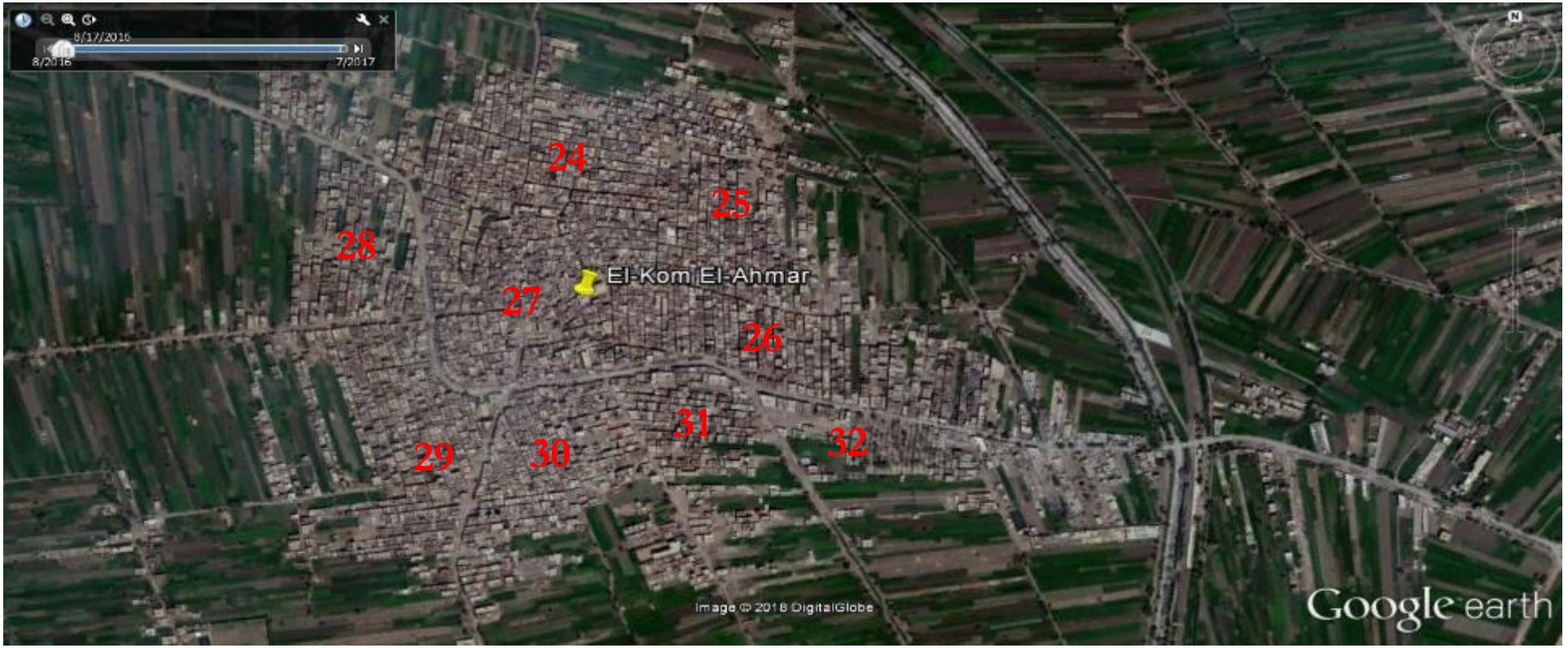


Figure 2-10: Satellite map showing the proposed distribution - network feeding EL-Kom El-Ahmar area

Samples of Streets in El-Kom El-Ahmar Sectors






Figure 2-11: Pictures showing Samples of Streets in Sectors of El-Kom El-Ahmar area.

2.2.5 Intermediate Pressure Network-Main feeding line (7 bar system) for Tanash area:

Tanash belongs to El-Warraq district; it will be connected with a polyethylene intermediate pressure feeding pipeline of about 1.3 km length.

2.2.5.1 Route

The proposed pipeline route will start from the offtake point will be on the proposed Valve room which is located at El Sawahel Canal Rd (Lat. 30° 6'42.84"N, long. 31°11'48.75"E), which feeding Tanash area.

Figure 2-12: Satellite Map showing The Location of Offtake point

The proposed pipeline route then extends from the proposed valve room to the north direction for about 1.3 km till reaching end point location.

Figure 2-13: Satellite Map showing the proposed pipeline route feeding Tanash area

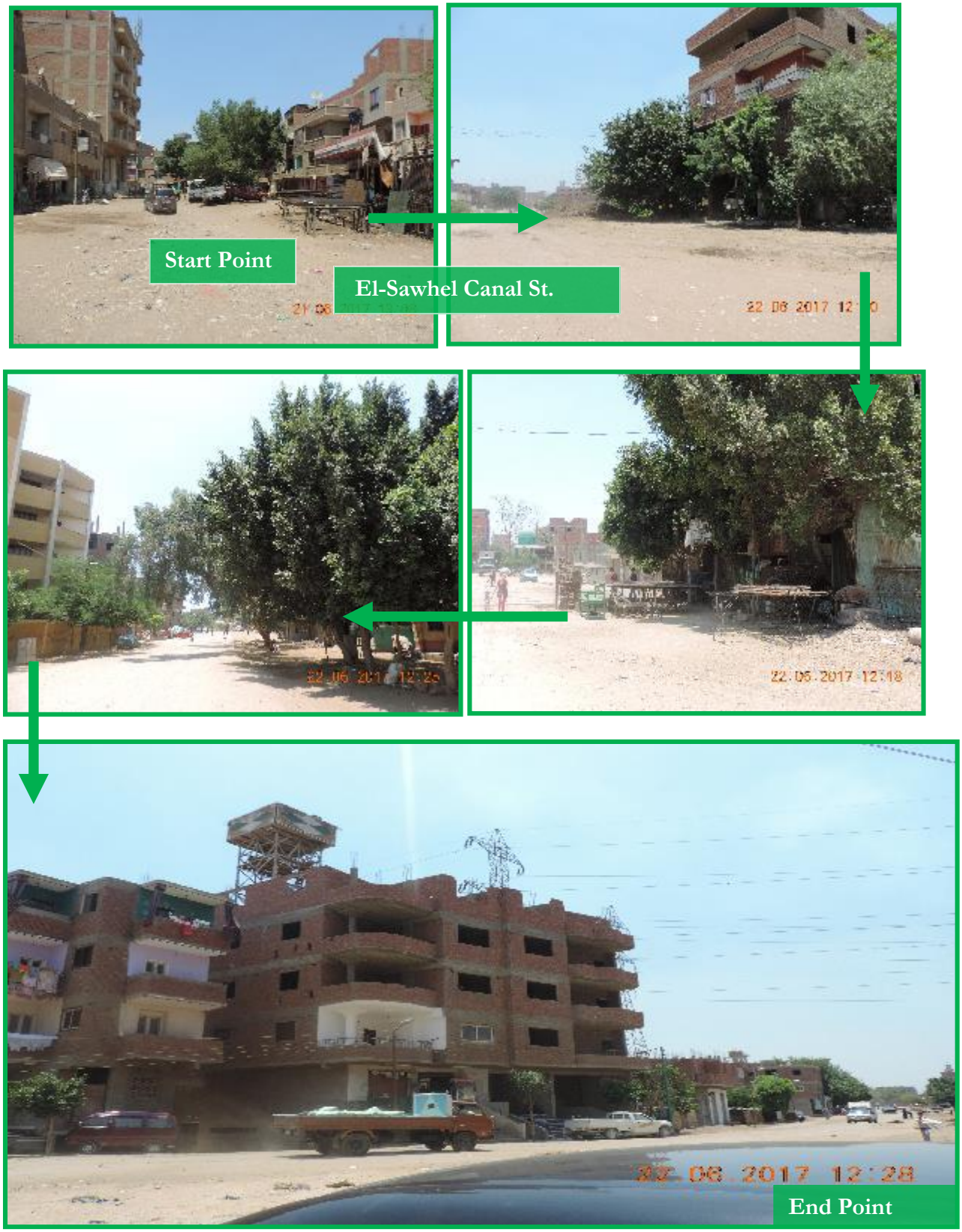


Figure 2-14: Pictures showing the proposed pipeline route feeding Tanash area

2.2.6 Low-pressure Distribution-Network Network for Tanash area:

Low-pressure gas exiting city regulators 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 installed horizontally underground for seven sectors within Tanash as shown in figure 2-15 below.

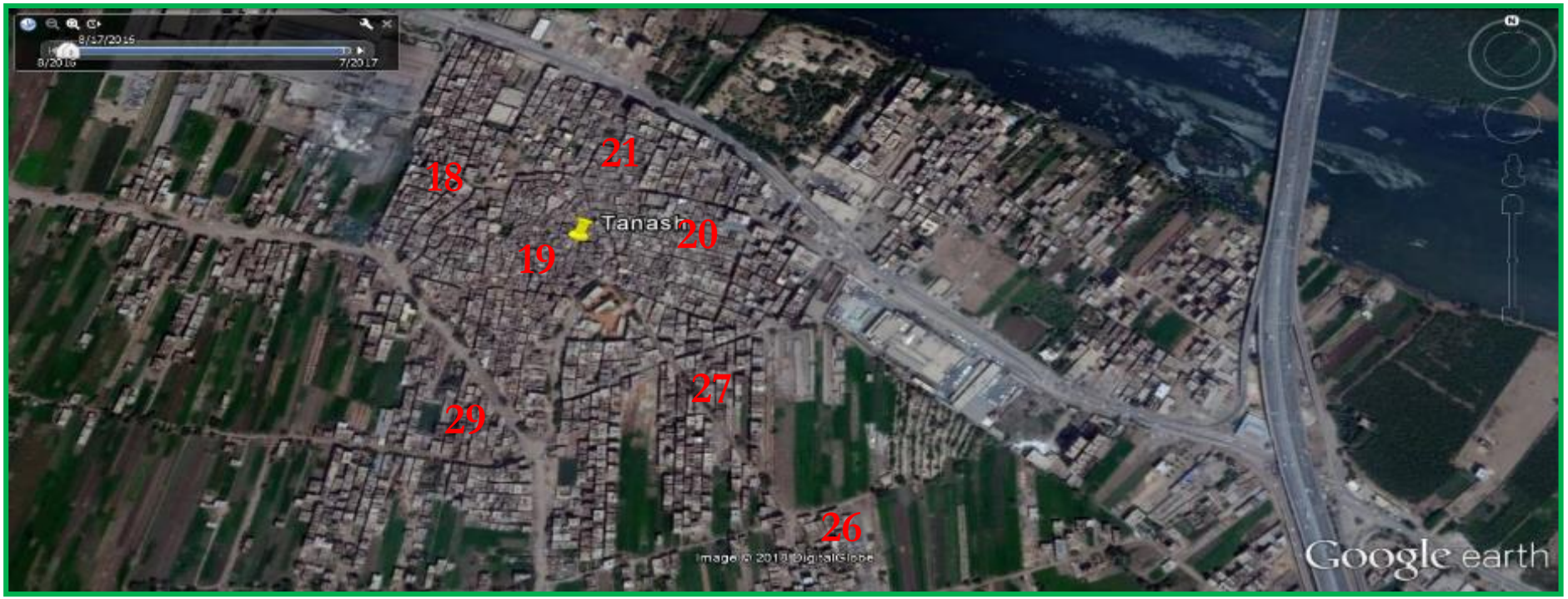


Figure 2-15: Satellite map showing the proposed distribution - network feeding Tanash area

Samples of Tanash Sectors






Figure 2-16: Pictures showing Samples of Sectors of Tanash area.

2.2.7 Intermediate Pressure Network-Main feeding line (7 bar system) for Suqayl area:

Suqayl area belongs to Ausim district, it will be connected with a polyethylene intermediate pressure feeding pipeline of about 2.4 km length.

2.2.7.1 Route

The proposed pipeline route will start from the proposed Valve room which is located at El Sawahel Canal Rd (Lat. 30° 6'42.84"N, long. 31°11'48.75"E), which feeding Suqayl area.

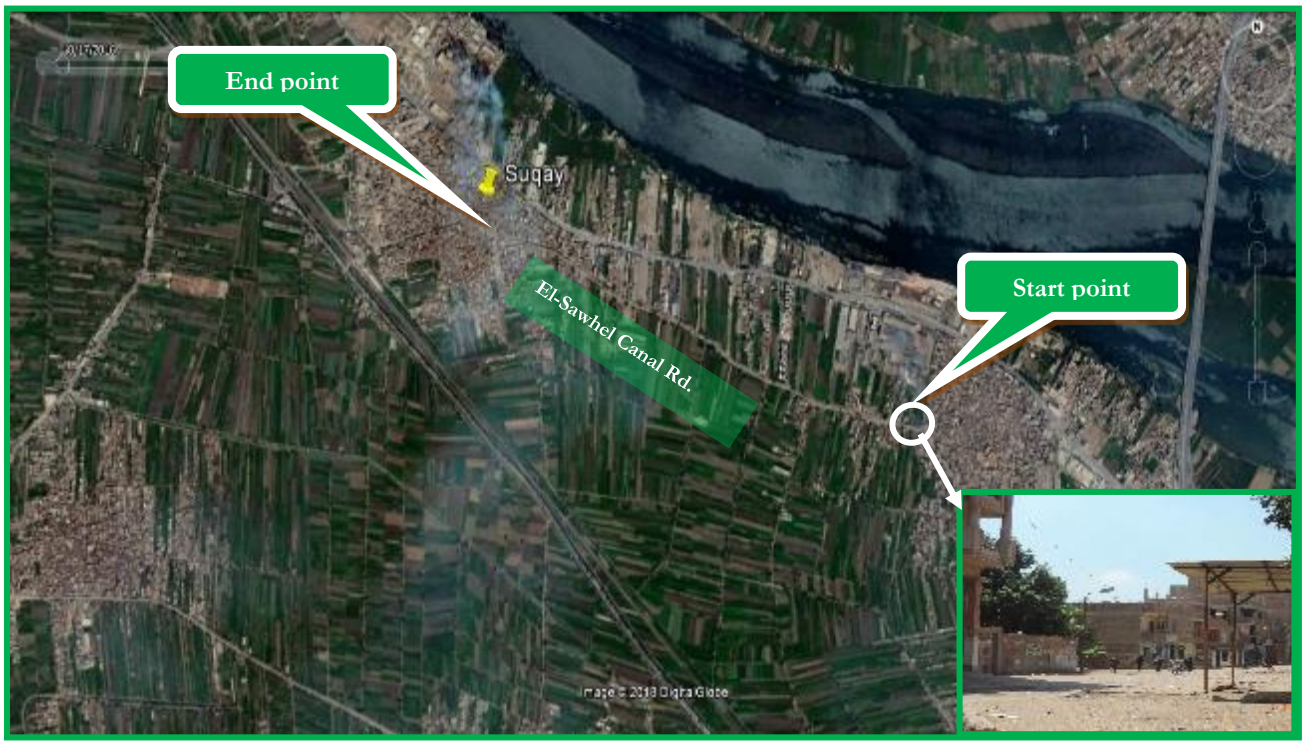


Figure 2-17: The Location of Offtake point

The proposed pipeline route then extends from the proposed valve room to the north direction for about 2.4 km till reaching end point location.

Figure 2-18: Satellite Map showing the proposed pipeline route feeding Suqayl area

2.2.8 Low-pressure Distribution-Network Network for Suqayl area:

Low-pressure gas exiting city regulators 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 installed horizontally underground for Suqayl sectors as shown in figure 2-19 below.

Figure 2-19**: Satellite map showing the proposed distribution - network feeding Suqayl area**

Samples of Suqayl Sectors

Figure 2-20: Pictures showing Samples of Sectors of Suqayl area.

2.2.9 Intermediate Pressure Network-Main feeding line (7 bar system) for Ausim area:

Ausim area belongs to Ausim markaz, they are adjacent to each other; and thus, will be connected by the same polyethylene intermediate pressure feeding pipeline of about 6.10 km length.

2.2.9.1 Route

The proposed pipeline route will start from the proposed Valve room which is located at El Sawahel Canal Rd (Lat.30° 6'42.84"N, long.31°11'48.75"E),which feeding Ausim area .as shown in figure 2-21

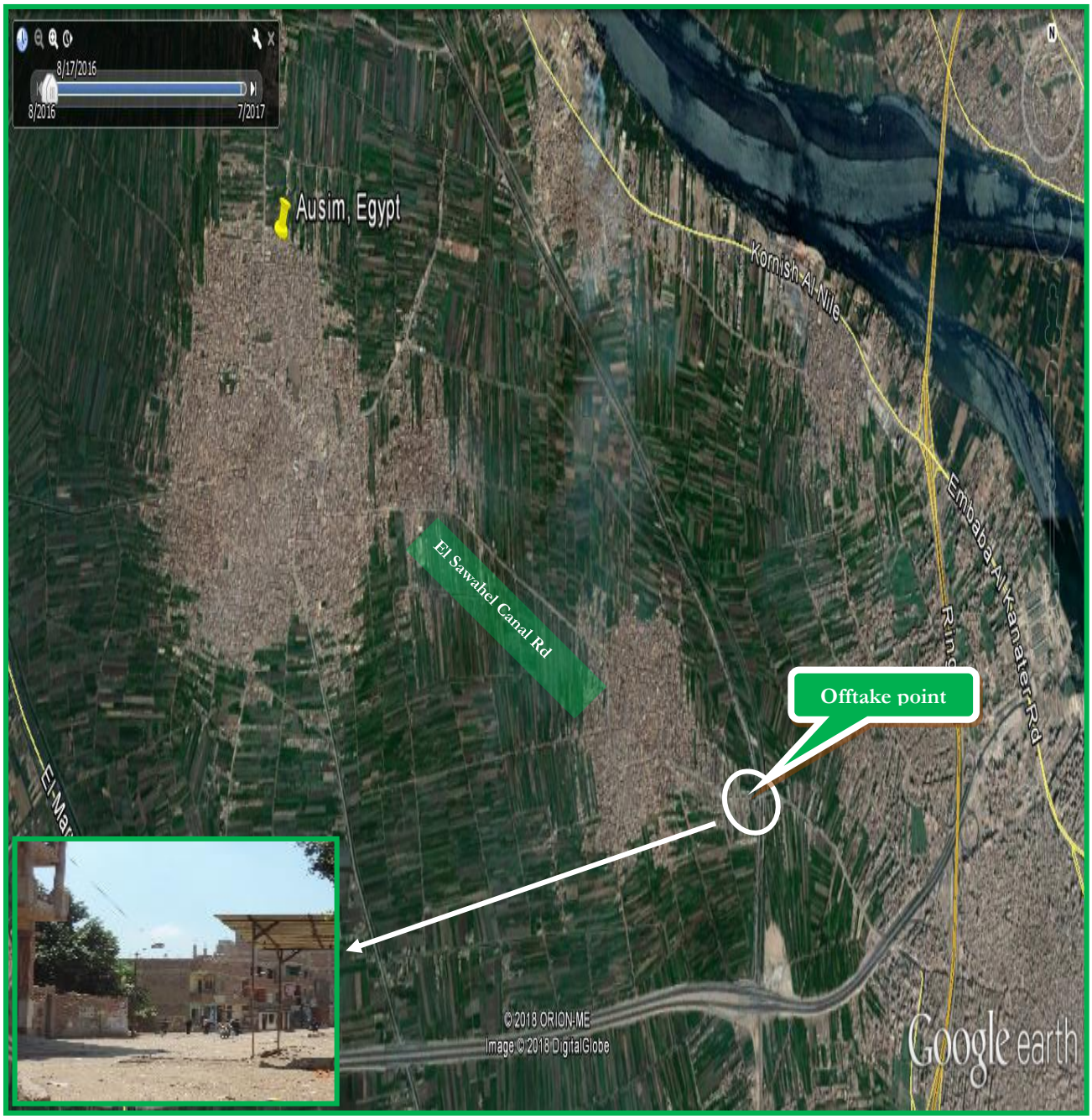


Figure 2-21: The Location of Offtake point

The proposed pipeline route then extends from the proposed valve room to the south direction to entrance of Gazirt mohamed- Alkom El Ahmer st. for about 670 meter. Then turns west in the same street and for about 2.11 km and then 3.32 km in north western direction till reaching end point location.

Figure 2-22: Satellite Map showing the proposed pipeline route feeding Ausim area

Figure 2-23: Pictures showing the proposed pipeline route feeding Ausim area

2.2.10 Low-pressure Distribution-Network Network for Ausim area:

Low-pressure gas exiting city regulators 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 installed horizontally underground for 21 sectors within Ausim. as shown in figure 2-24 below.

Figure 2-24: Satellite map showing the proposed distribution - network feeding Ausim area

Samples of Ausim Sectors





Figure 2-25: Pictures showing Samples of Sectors of Ausim area.

2.2.11 Intermediate Pressure Network-Main feeding line (7 bar system) for Saft Al-Laban area:

Saft Al-Laban area belongs to Boulaq district, it will be connected with an existing polyethylene intermediate pressure-feeding pipeline located in El-Tahrir St. (Lat. 30° 1'49.27"N, long. 31°10'2.13"E), which feeding Saft Al-Laban area. as shown in figure 2-26

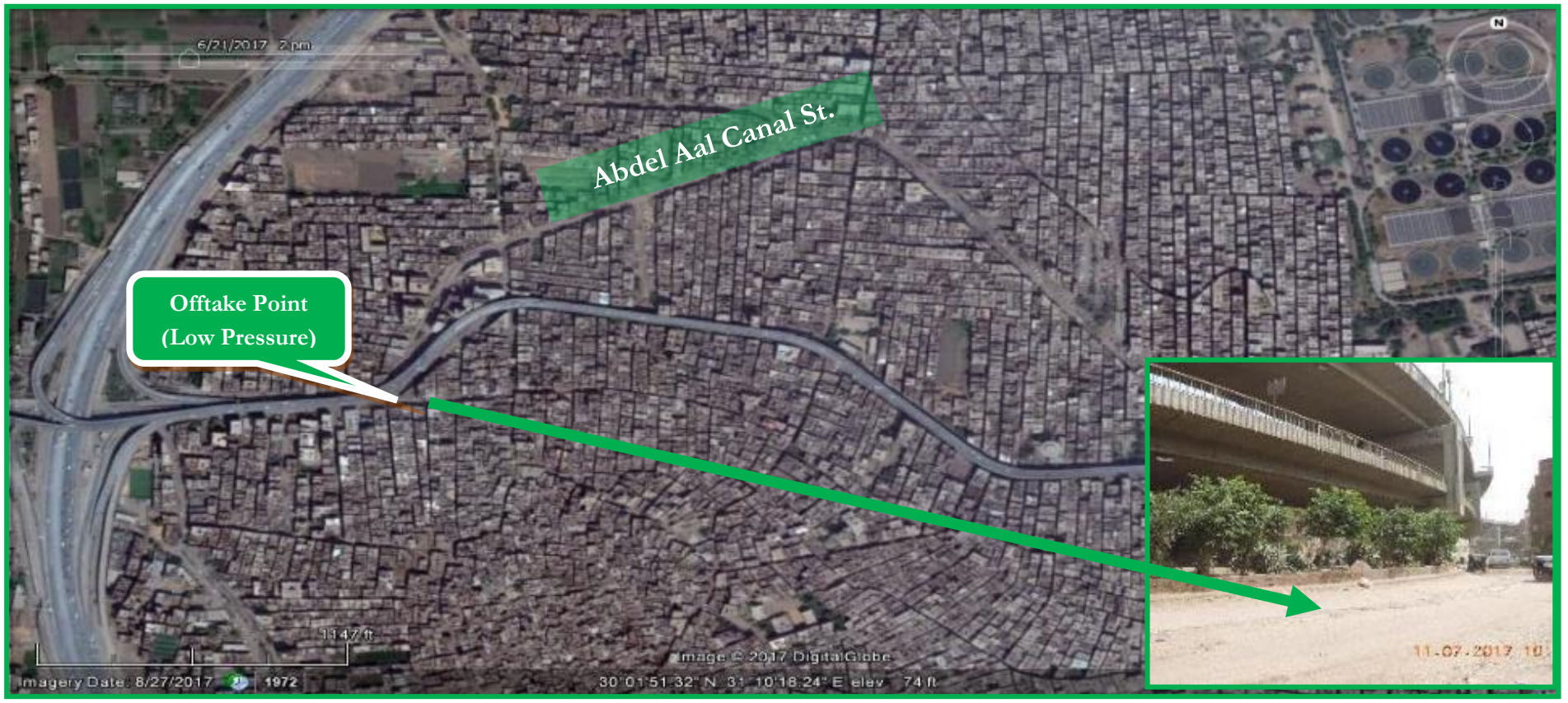


Figure 2-26: Satellite Map showing the proposed pipeline route feeding Saft Al-Laban area

2.2.12 Low-pressure Distribution-Network Network for Saft El-Laban area:

Low-pressure gas exiting city regulators 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 installed horizontally underground for one sector within Saft –El-Laban area as shown in figure 2-27 below.

Figure 2-27**: Satellite map showing the proposed distribution - network feeding Saft Al-Laban area**

Samples of Saft Al-Laban Sectors

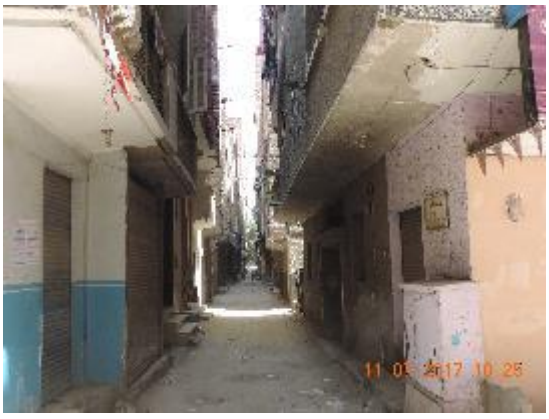


Figure 2-28: Pictures showing Samples of Sectors of Saft Al-Laban area.

2.2.13 Intermediate Pressure Network-Main feeding line (2 bar system) for Hadayek EL-Ahram area:

Hadayek El-Ahram area belongs to El-Haram district, it will be connected with a polyethylene intermediate pressure feeding pipeline of about 2.9 km length.

2.2.13.1 Route

The proposed pipeline route will start from the offtake Point on an existing metering station in street-1 (Lat. 29°58'51.76"N, long. 31° 6'14.58"E). Which is the feeding source for Hadayek EL-Ahram area (figure 2-29).

Figure 2-29: The Location of metering station

The proposed pipeline route then extends to the same street in the west direction for about 530m then turns to the south direction in street-9 northeast direction, and then going in the southern direction for about 2.410 km till reaching to the end point as shown in figure 2-29

Figure **2-30**: Satellite map showing the proposed distribution - network feeding Hadayek EL-Ahram area

Figure 2-31: Pictures showing the proposed pipeline route feeding Hadayek El-Ahram area

2.2.14 Low-pressure Distribution-Network Network for Hadayek EL-Ahram area:

Low-pressure gas exiting city regulators 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 installed horizontally underground for three sectors within Hadayek EL-Ahram as shown in figure 2-32 below.

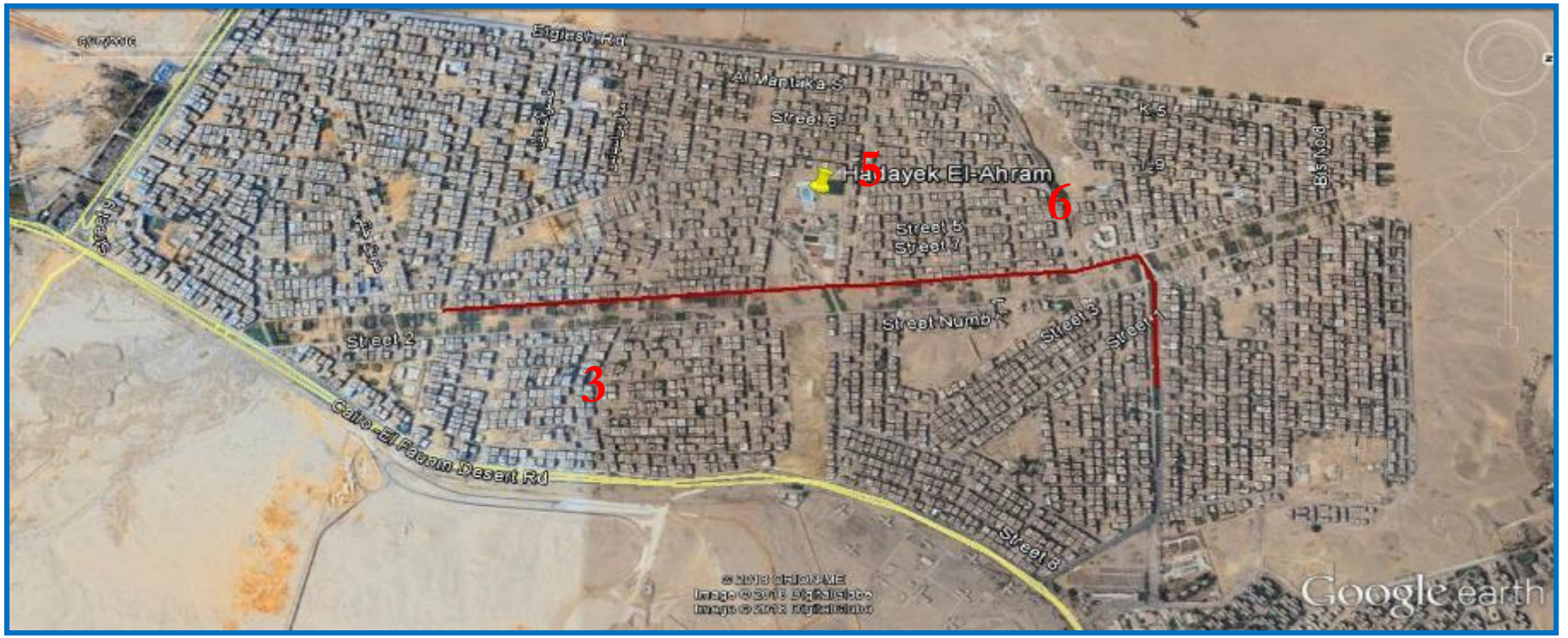


Figure 2-32: Satellite map showing the proposed distribution - network feeding Hadayek EL-Ahram area

Figure 2-33: Pictures showing Samples of Sectors of Hadayek El-Ahram area.

2.2.15 Intermediate Pressure Network-Main feeding line (2 bar system) for Al-Munib area:

Al-Munib area belongs to Ganoub El-Giza district, it will be connected with an existing polyethylene intermediate pressure-feeding pipeline, which existed in Osman Moharam St. (Lat. 29°58'53.17"N, long. 31°11'24.67"E) which is the feeding source for Al-Munib area (figure 2-34).

Figure 2-34: Satellite Map showing the proposed pipeline route feeding Al-Munib area

2.2.16 Low-pressure Distribution-Network Network for Al-Munib area:

Low-pressure gas exiting city regulators 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 installed horizontally underground for two sectors within Al-Munib as shown in figure 2-35 below.

Figure 2-35**: Satellite map showing the proposed distribution - network feeding Al-Munib area**

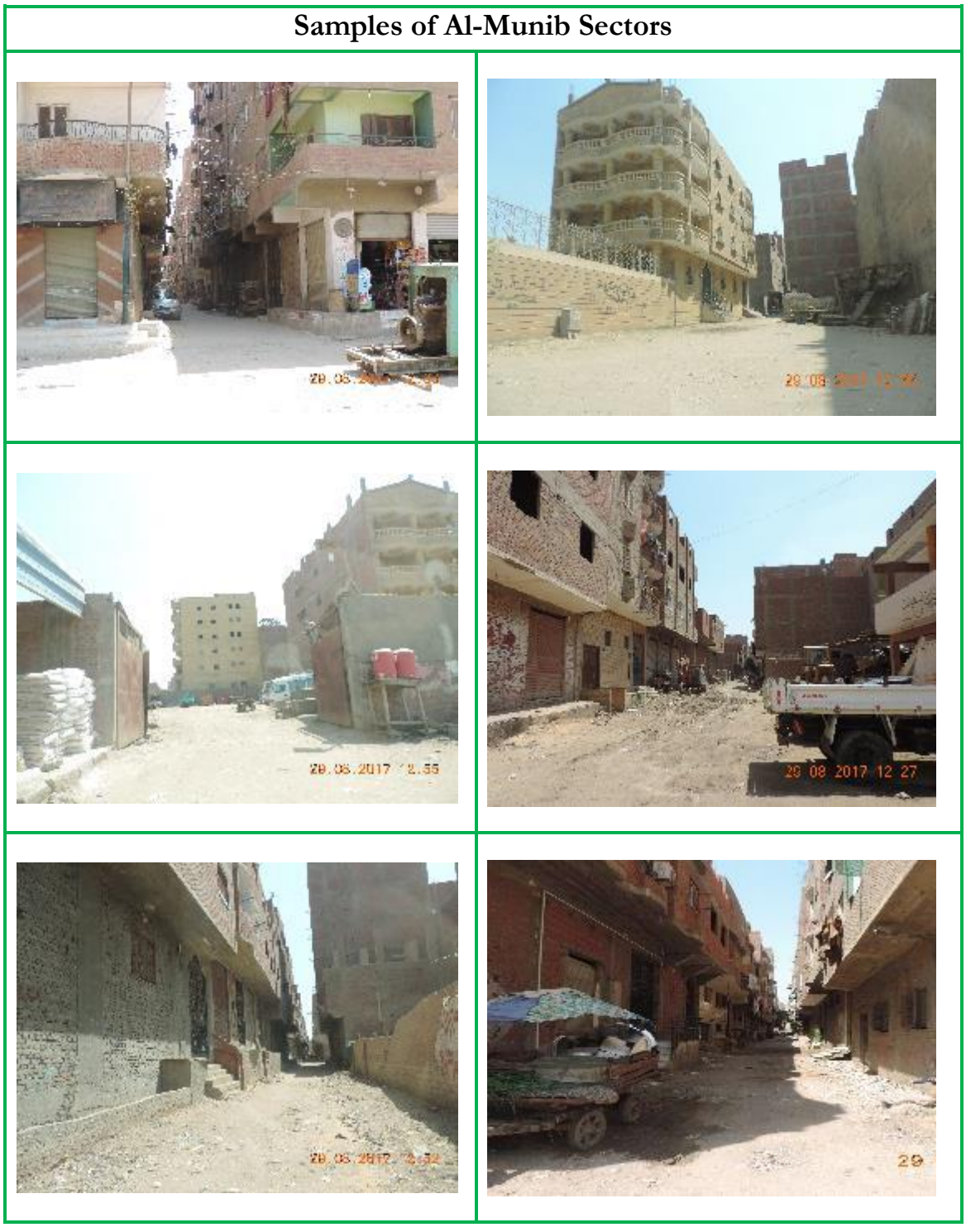


Figure 2-36: Pictures showing Samples of Sectors of Al-Munib area.

2.2.17 Intermediate Pressure Network-Main feeding line (2 bar system) for Nazlet El-Semman& Kafr EL-Gabal area:

Nazlet E-Semman& Kafr EL-Gabal area belongs to EL-Haram district, it will be connected with a polyethylene intermediate pressure feeding pipeline of about 2 km length.

2.2.17.1 Route

The proposed pipeline route will start from the offtake Point on an existing Intermediate Pressure gas pipeline which is located on El-Mansouria St. (Lat. 29°59'9.64"N, long. 31° 8'29.00"E). which is the feeding source for Nazlet El-Semman &Kafr EL-Gabal.

Figure 2-37: The Location of Offtake point

The proposed pipeline route then extends to the southern direction in the same street for about 2km, till reaching the end point location.

2.2.18 Low-pressure Distribution-Network Network for Nazlet El-Semman& Kafr El-Gabal area:

Low-pressure gas exiting city regulators 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 installed horizontally underground for five sectors within Nazlet El-Semman& Kafr El-Gabal as shown in figure 2-38 below.

Figure 2-38**: Satellite map showing the proposed distribution - network feeding Nazlet El-Semman& Kafr El-Gabal area**

Samples of Nazlet El-Semman& Kafr El-Gabal Sectors

Figure 2-39: Pictures showing Samples of Sectors of Nazlet El-Semman& Kafr El-Gabal area.

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.

The technical criteria can be summarized as follow:

- EGAS prepared a list of technical specification required to have the NG installed in the area:
- Areas that have access to all necessary public utilities especially land networks (electricity, water, sewage, telephone lines)
- Adobe and wooden houses are not eligible for NG connections
- 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.
- Areas adjacent to NG National Grid

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

- Buildings are to be located close to the local distribution network
- Buildings are to be built with concrete and red bricpks not adobe or wood
- Buildings are to be legally permitted and has access to electricity
- The possibility of installing the riser pipes along the length of the building depending on the following priority (service stairwell, stairwell, façade)
- Availability of enough space for the erection of the scaffold and the existence of access door to the stairwells
- Easy access to the entrance point of vertical line in case of emergency
- Approval of the building administration to grant access to workers
- The un-plastered apartment might cause a problem as some people cover the pipelines by cement during the plastering. This made it very difficult to maintenance staff. Therefore, it was strongly recommended to install the NG to apartments after being fully plastered and painted.

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 project area are presented below: (Also see Figures 2-6, 2-11, 2-16, 2-20, 2-25, 2-28, 2-32, 2-35& 2-38)

Table 2-1: Number of Areas, sectors and Potential clients

Governorate	Local Distribution Company	Areas	Number of Sectors	Potential clients
Giza	Town Gas	Jazirat Mohamed	9	7000
		El-Kom El-Ahmar	9	4000
		Tanash	Sectors not determined yet	2500
		Suqayl	Sectors not determined yet	3000
		Ausim	21	12000
		Saft Al-Laban	1	4000
		Hadayek El-Ahram	3	10000
		Al-Munib	2	9400
		Nazlet El-Semman and Kafr El-Gabal	5	23500
TOTAL:		9	50	75400

2.4 Construction works of Main feeding line/network "7 bar 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
- Excavation and pipe laying
- Site preparation and excavation
- Pipe laying
- 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 work, 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.

2.4.2 Repairs in households

Before any excavation activities, the Town Gas company 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. Alternatively, borings may be excavated using hydraulic drive, and finally Horizontal Directional Drilling (HDD) technique. HDD is only utilized in the case of railway crossings 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 intersections with waterways of the Nile or its major branches in the studied areas.**

HDD is anticipated in **El-Kom El-Ahmar** as it is required to cross a railway to reach it as shown in figure 2-40:

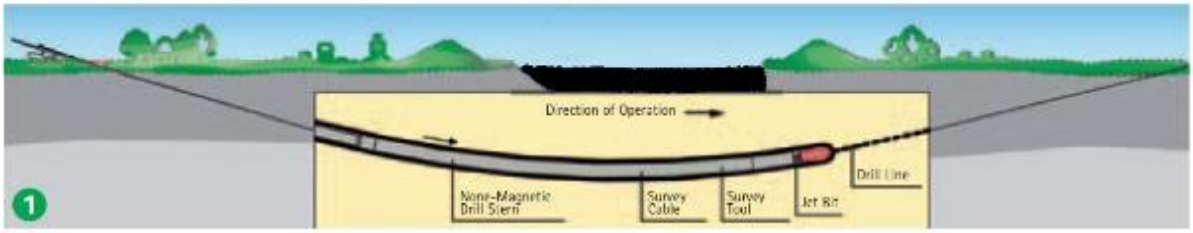
Figure 2-40: Pictures showing the proposed location HDD crossing El-Kom El-Ahmar railway crossing

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. 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.

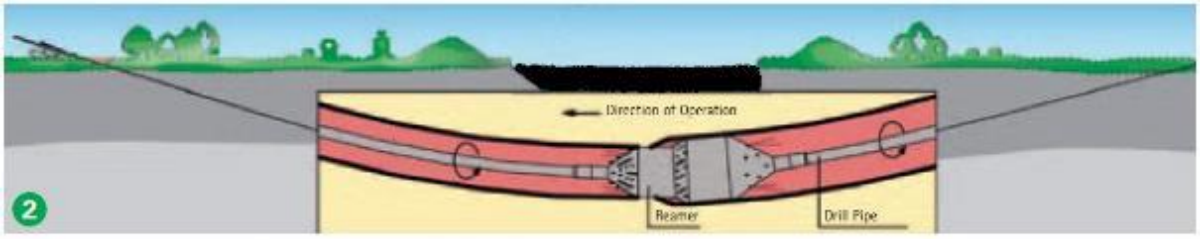
The boring process results in cuttings (spoil) which is carried through the augers and extracted from the entry side of the boring machine as shown in figure 2-41:.

Horizontal Directional Drilling (HDD) Technique

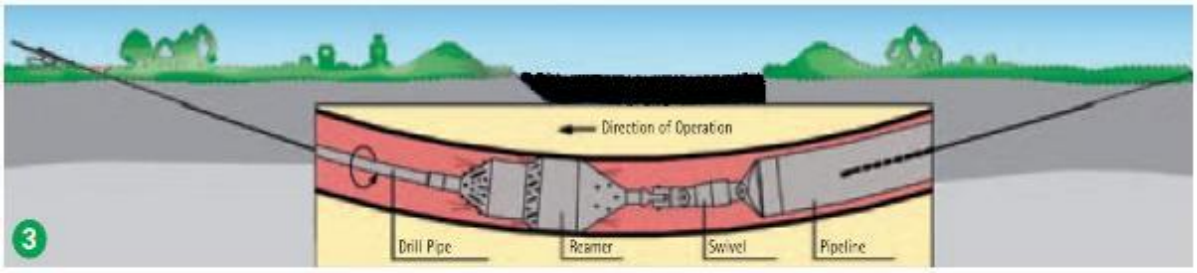
As simple as it is convincing. In the HDD method, pipelines are laid in three stages.



First, a pilot drill is carried out from the entry point. In this process step, a computer-controlled surveying system located behind the drilling bit steers the drill string along the planned route to the exit point on the other side of the obstacle to be crossed. The surveying system, the steering and the drilling tools can be adapted to any soil conditions, thus ensures the success of a project.



In the second stage, reaming the pilot drill, the drilling diameter is successively enlarged. To achieve this, the drill bit is replaced by a reamer. The reamer is equipped with jets and cutting tools, enabling it to remove the soil both hydraulically and mechanically. Depending on the soil conditions, a mixture of water and bentonite or other additives can be used for hydraulic excavation. This both supports the bore hole and reduces frictional forces, while allowing the excavated material to be transported to a separation plant on the surface.



Finally, the prefabricated pipeline or pipe bundle is **pulled-back** from the exit point into the enlarged and cleaned bore hole. To do this, the pipeline is connected to the pipe string and pulled back to the entry point. When the pipeline appears at the entry point, it has reached its final and safe position and the pipeline installation is complete.

Figure 2-41: Pictures showing Horizontal Directional Drilling (HDD) Technique.

Open-cut 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 jackhammer 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 0.09 m 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.

The excavation products are placed on the sides of the trench by distance of 61 cm so it doesn't fall down inside the trench. The followed safety procedures are presented in **Annex 2** (EGAS Health and safety guidelines)

Figure 2-42: Pictures showing sample of Typical trench for PE pipes by Town Gas

2.4.4 Types and Number of Equipment Used

The following table shows the types and numbers of equipment used:

Table 2-2: Types and Numbers of Equipment used

Serial	Equipment	
	Types	Numbers
1	Heavy Truck	1
2	Medium Truck	7
3	Light Truck	2
4	Pickup Truck	1
5	Mini Van	2
6	Compressors	4
7	Excavator	4
8	110 V Generator	7
9	220 V Generator	21
10	Welding machine	3
11	Cold cut machine	9
12	Hilti drill machine	32
13	Test Pump	18
14	Crane	1

Figure 2-43: Pictures showing sample equipment (Medium Truck -Crane)

3. Legislative and Regulatory Framework

3.1 Applicable Environmental and Social Legislation in Egypt

- Law 217/1980 for Natural Gas.
- Law 4 for Year 1994 for the environmental protection, amended by Law 9/2009 and law 105 for the year 2015 and its 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.
  - 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). Environmental Assessment (OP/BP 4.01) is the only applicable policy for the proposed project. OP/BP 4.12 will not be applicable to the low-pressure pipelines of Giza governorate since no pipelines will cross agricultural lands accordingly no land acquisition or resettlement is 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 Jazirat Mohamed, El-Kom El-Ahmar, Tanash, Suqayl, Ausim, Saft Al Laban, Hadayek El-Ahram, Al-Munib, Nazlet El-Semman and Kafr El-Gabal. accordingly no land acquisition or resettlement activities are anticipated and accordingly no compensation will be applied.

World Bank Group General Environmental, Health and Safety Guidelines & WB Environmental, Health and Safety Guidelines for Gas Distribution Systems-IFC Guideline

The General EHS Guidelines are designed to be used together with the relevant Industry Sector EHS Guidelines, which provide guidance to users on EHS issues in specific industry sectors. Gas distribution system – HSE Guideline (provided in **Annex-3** from the report) are applicable to the project. Gaps between requirements outlined by WBG guidelines and actions detailed by the ESIA have been analyzed. There are no significant differences between the requirements outlined by the WBG EHS GUIDELINE on GAS DISTRIBUTION SYSTEMS and the management and monitoring actions outlined by the ESIA. In addition to the above-mentioned safeguards policies, the Directive and Procedure on Access to Information[1] will be followed by the Project.

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

3.3 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.

4. Environmental and Social Baseline

4.1 Description of the Environment

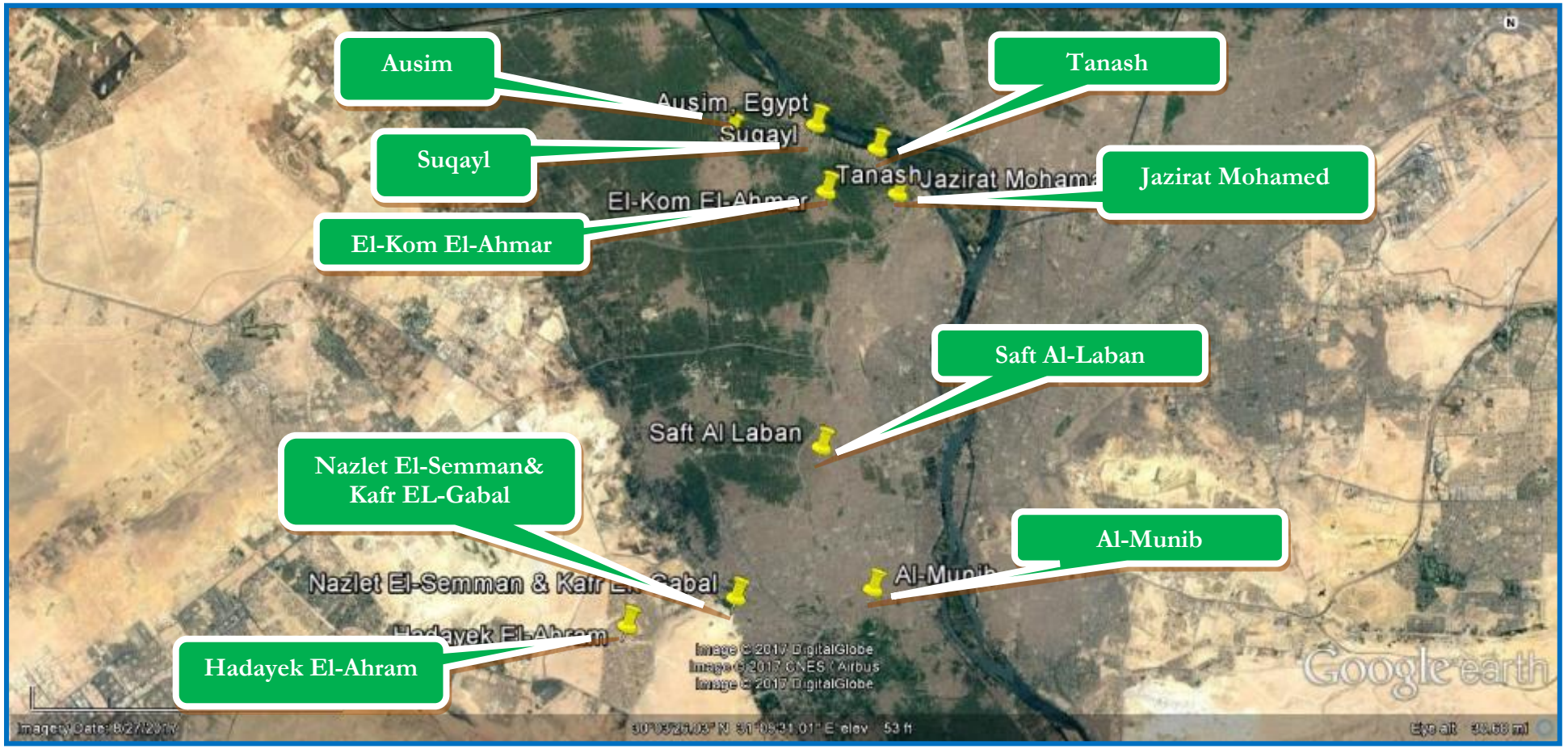


Figure 4-1: Distribution of cities in Giza governorate and proposed gas connections districts location

The proposed project aiming to construct a natural gas network feeding some districts of Giza governorate as per the following:

- **Jazirat Mohamed**

  Jazirat Mohamed district is located in El-Warraq district, bordered from north by Tanash district and from south by Kafr EL-Hanadwa district and from east by Jazirat Warraq El Hadar district and from west by El-Kom El-Ahmar district. (Figure 4-2)

Figure 4-2: Satellite map showing Jazirat Mohamed and surrounding communities

- **EL-Kom El-Ahmar**

  EL-Kom El-Ahmar district is located in Ausim district, bordered from north by Suqayl district and from south by El-Barajil district and from east by Jazirat Mohamed district and from west by Ausim district. (Figure 4-3)

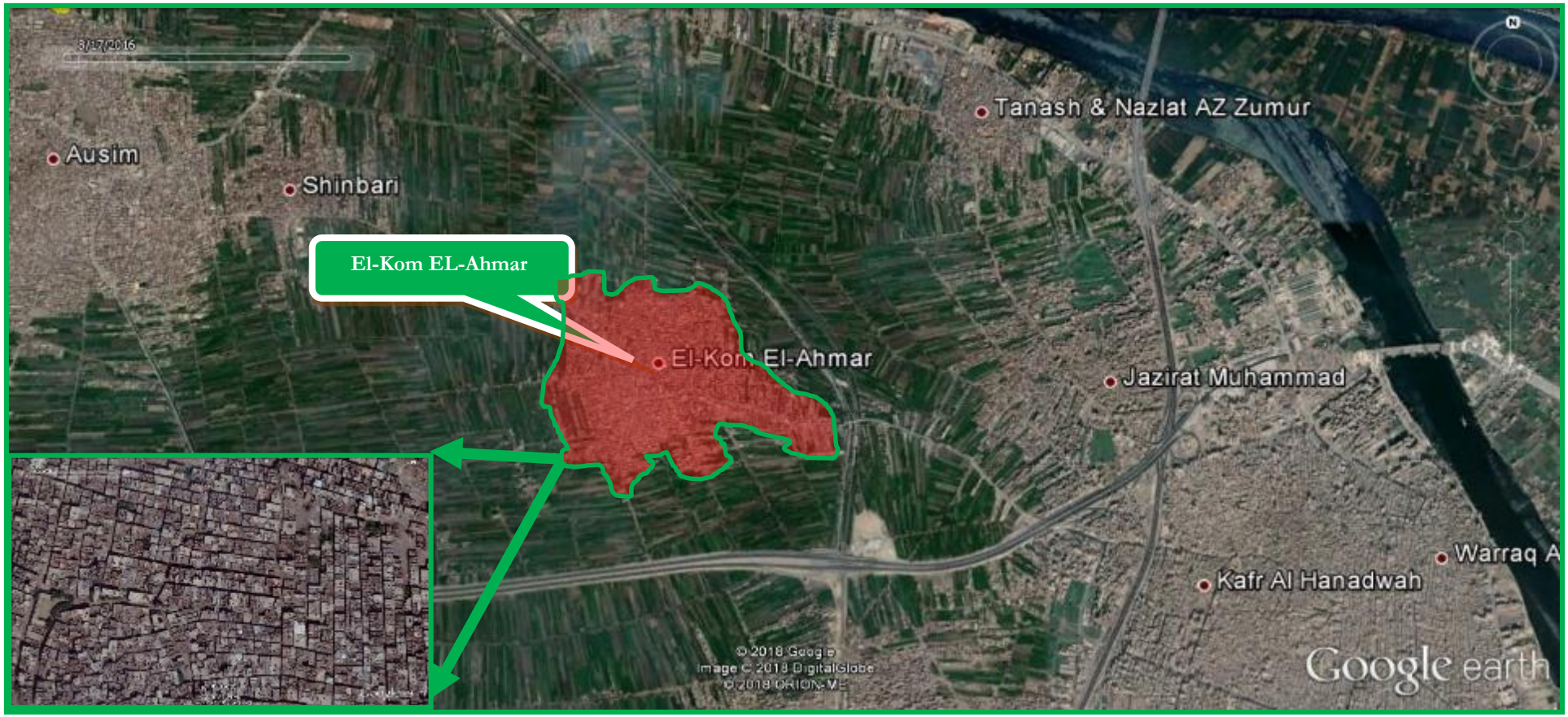


Figure 4-3: Satellite map showing EL-Kom EL-Ahmar district and surrounding communities

- **Tanash**

  Tanash district is located in Ausim district, bordered from north by Suqayl district and from south by Warraq El-Hadar district and from east by Nile River and from west by Ausim district. (Figure 4-4)

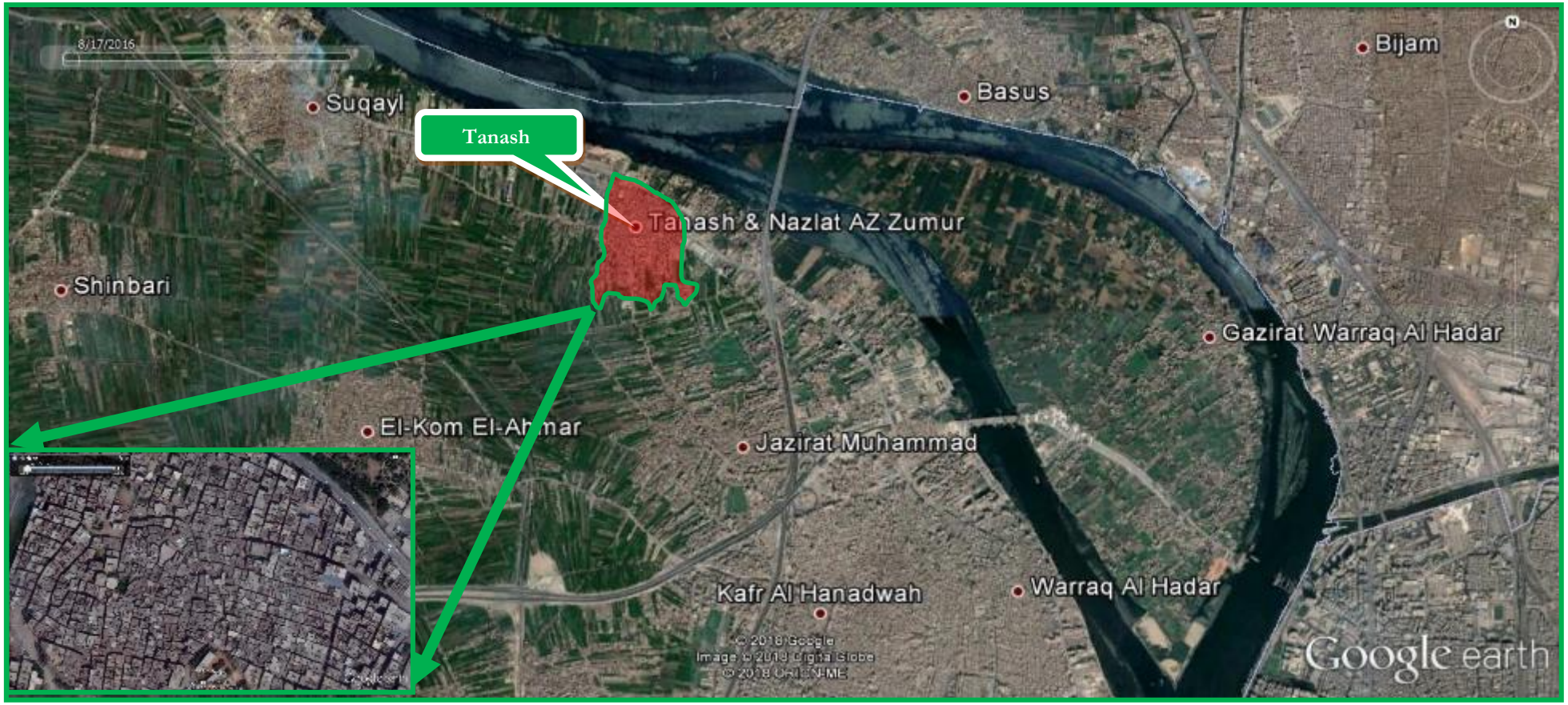


Figure 4-4: Satellite map showing Tanash district and surrounding communities

- **Suqayl**

  Suqayl district is located in Ausim district, bordered from north by Nile River and from south by El-Kom El-Ahmar and from east by Tanash district and from west Ausim district. (Figure 4-5)

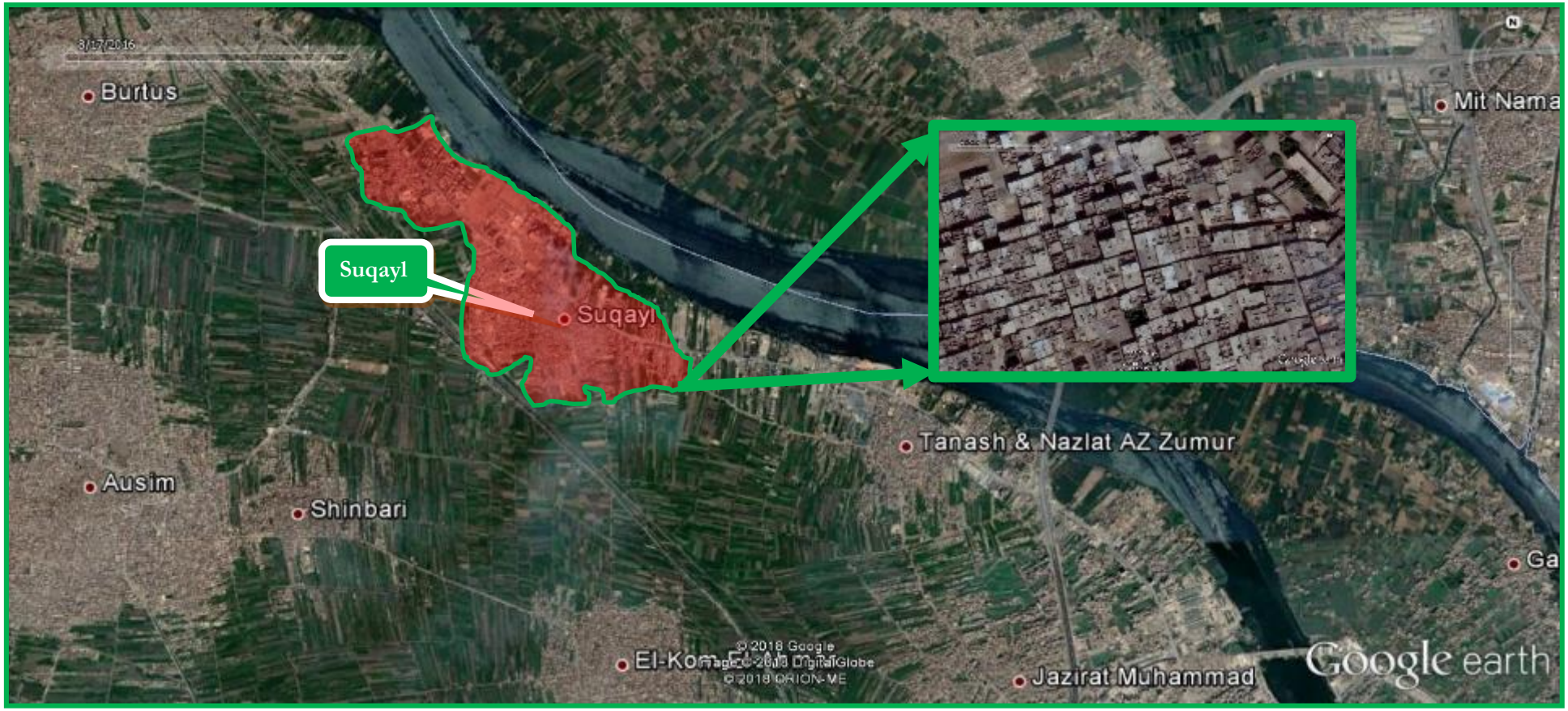


Figure 4-5: Satellite map showing for Suqayl district and surrounding communities

- **Ausim**

  Ausim is located in Ausim district, bordered from north by Burtus district and from south by Al-Brajil district and from East by Suqayl district and from west by Mahmoud Abdel Samad district. (Figure 4-6)

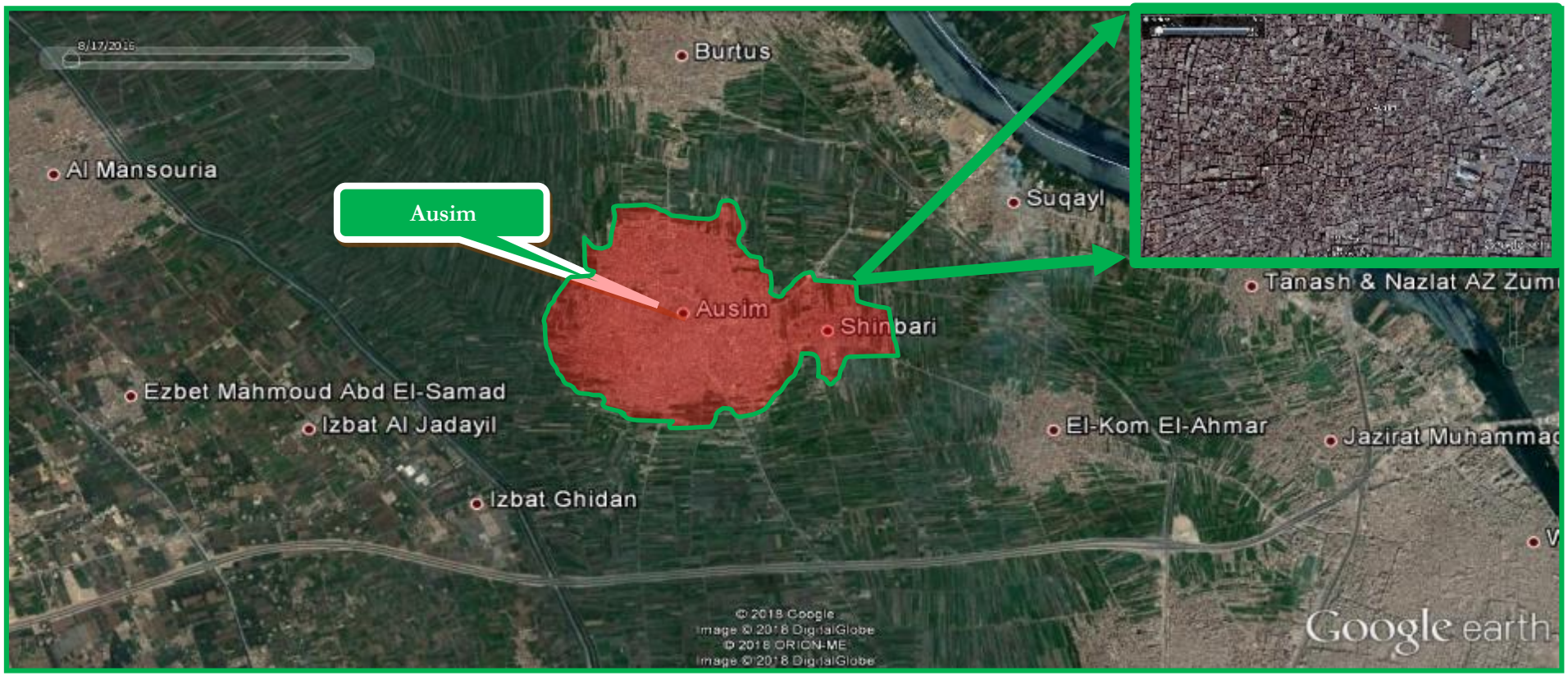


Figure 4-6: Satellite map showing Ausim and surrounding communities

- **Saft Al-Laban**

  Saft Al-Laban is located in Boulaq district, bordered from north by Zinayn and Bulaq El-Dakror and from south by Faisal and from east by Nile River and from west Monshaat EL-Bakkary. (Figure 4-7)

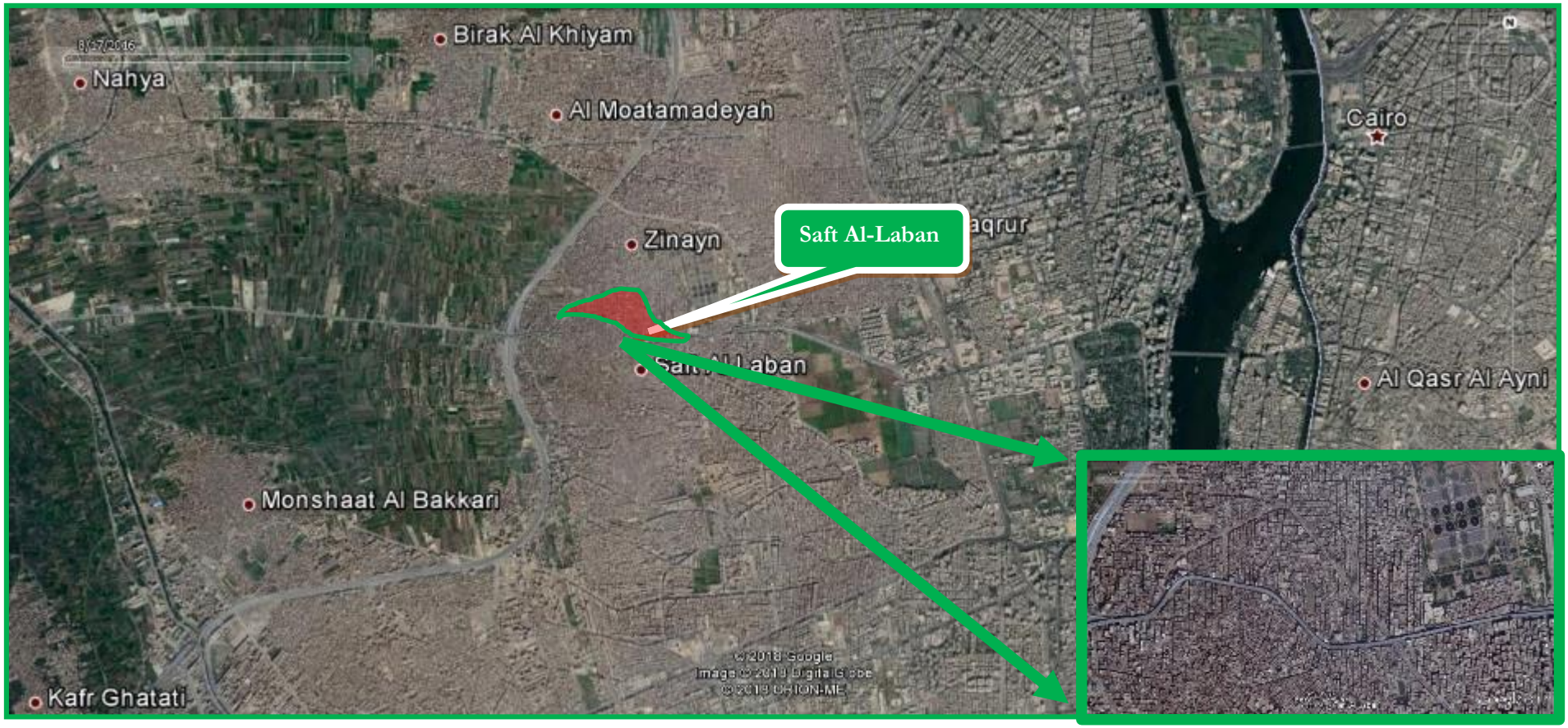


Figure 4-7: Satellite map showing for Saft Al-Laban and surrounding communities

- **Hadayek El-Ahram**

  Hadayek El-Ahram is located in El-Haram, bordered from north Kafr Ghatati and from south by Cairo-El-Fayum desert road and from east by Nazlet El-Semman& Kafr El-Gabal and from west October City. (Figure 4-8)

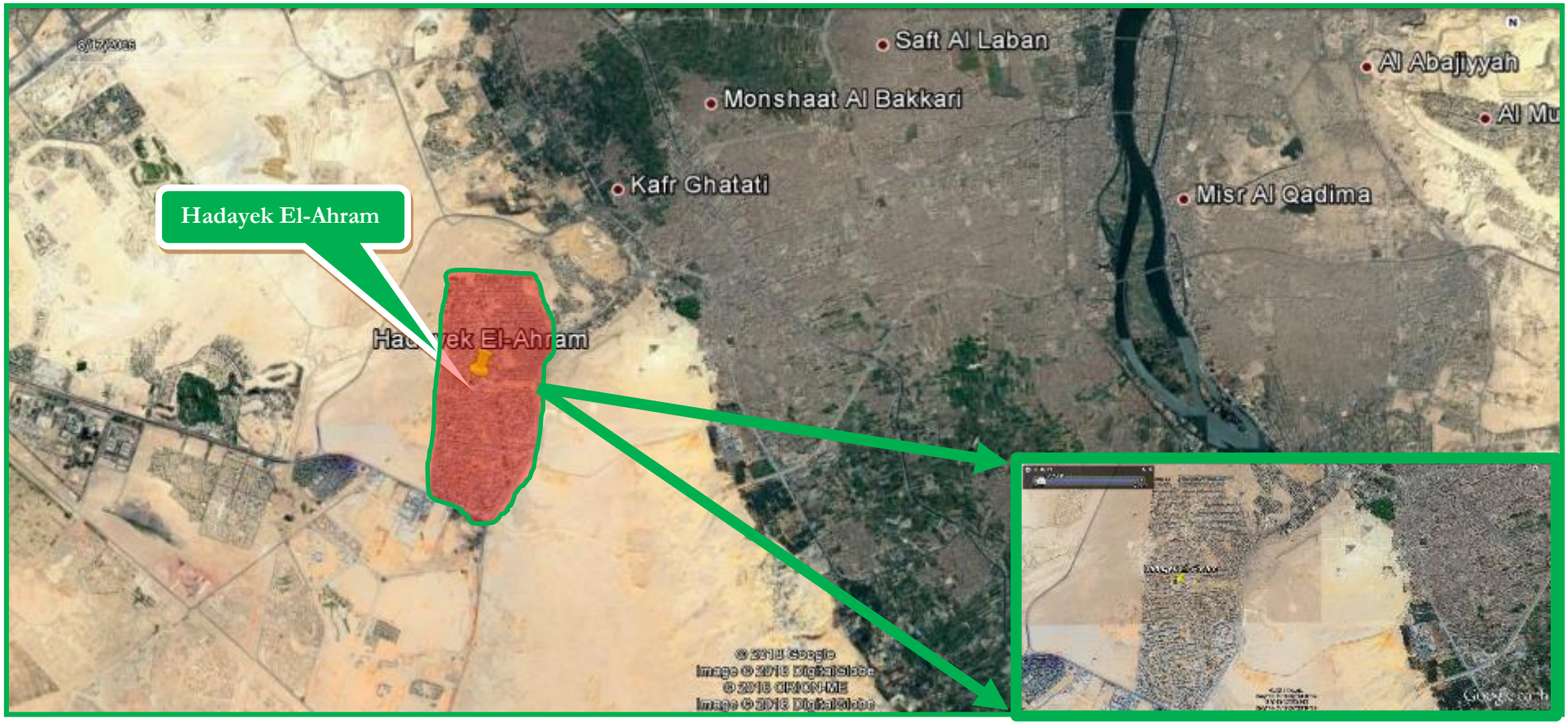


Figure 4-8: Satellite map showing for Hadayek El-Ahram and surrounding communities

- **Al-Munib**

  Al-Munib is located in Ganoub El-Giza district, bordered from north by Saft Al-Laban and from east by Misr AL-Qadima and from west Nazlet El-Semman& Kafr El-Gabal. (Figure 4-9)

Figure 4-9: Satellite map showing for Al-Munib and surrounding communities

- **Nazlet El-Semman& Kafr El-Gabal**

  Nazlet El-Semman& Kafr El-Gabal is located in El-Haram district, bordered from north by Kafr Ghatati and from south by Cairo-AL-Fayum desert road and from east by Al-Munib and from west Hadayek El-Ahram. (Figure 4-10)

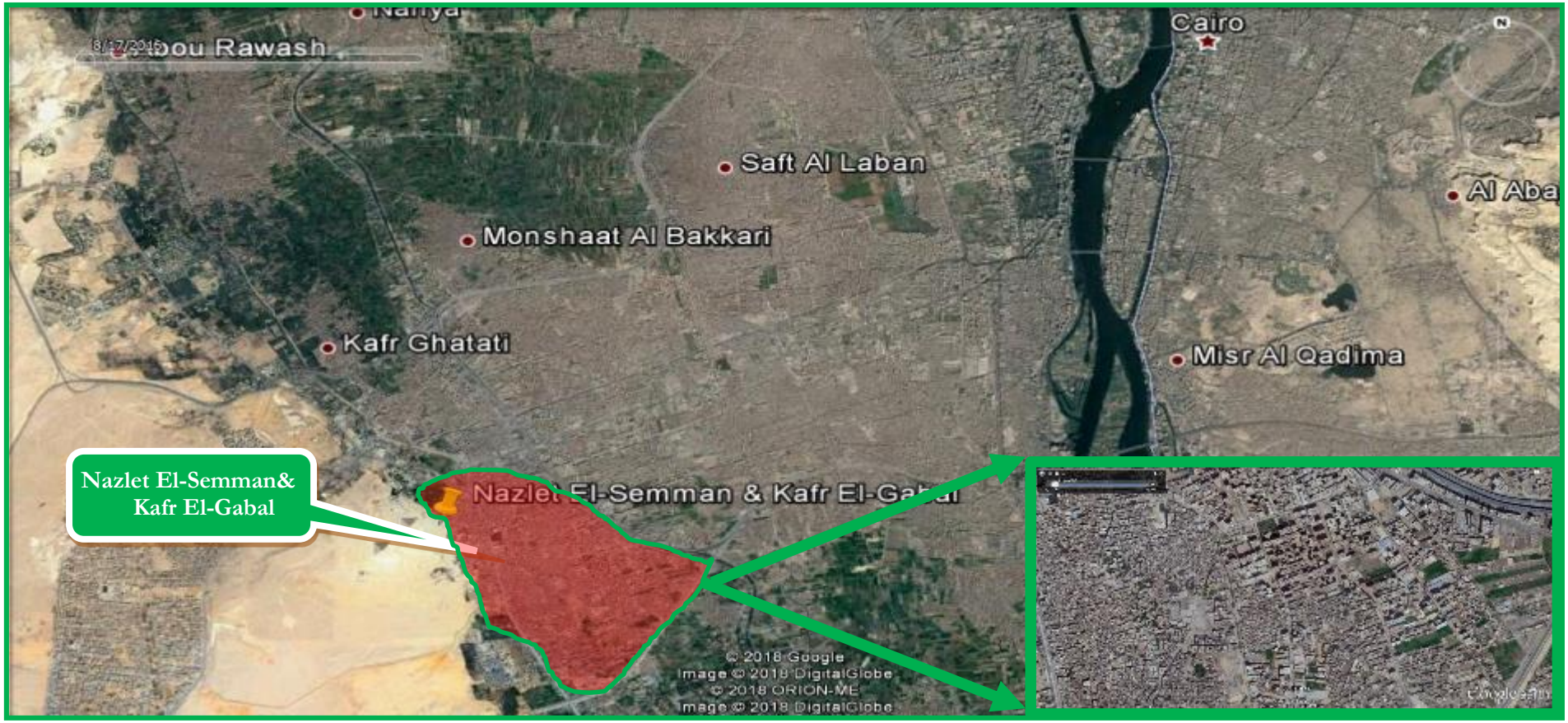


Figure 4-10: Satellite map showing for Nazlet El-Semman& Kafr El-Gabal and surrounding communities

4.1.1 Air Quality

4.1.1.1 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 is 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 are shown in the table below.

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
Jazirat Mohamed Primary	30° 6' 50" N	31° 11' 40" E
El-Kom El-Ahmar family health center	30° 6' 35" N	31° 10' 13" E
Tanash Medical Centre	30° 7' 27" N	31° 11' 31" E
Suqayl family health center	30° 7' 54" N	31° 10' 11" E
Ausim Central hospital	30° 7' 18" N	31° 8' 27" E
Saft Al-Laban Mosque/ Residential area	31° 1' 58" N	31° 10' 13" E
Hadayek El-Ahram Club/Residential area	29° 58' 8" N	31° 5' 50" E
Al-Munib - Al - Manahil Private Schools/ Residential area	29° 59' 4" N	31° 11' 13" E
Nazlet El-Semman& Kafr El-Gabal	29° 58' 24" N	31° 8' 42" E

Methodology, instrumentation, and results of Air Quality measurements are detailed in Annex 4.

Results of ambient air quality measurements:

The concentrations of measured air pollutants in the studied areas are below national and WB guidelines (Table 4.2). Construction engines are certified, i.e., exhaust is below permissible levels. Ambient concentrations of gaseous pollutants, NOx, SOx and CO are unlikely to surpass permissible levels due to operation of construction equipment. Management and mitigation plans for ambient air pollution are further addressed in chapters 6 and 7.

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 workday, therefore, the duration of permissible levels being surpassed will be intermittent for the duration of the workday i.e., 8-10 hours. Management and mitigation plans for dust concentration beyond permissible levels are further addressed in chapter 7.

Table 4-2: Jazirat Mohamed, El-Kom El-Ahmar, Tanash, Suqayl, Ausim, Saft Al-Laban, Hadayek El-Ahram, Al-Munib and Nazlet El-Semman& Kafr El-Gabal average Air Quality Measurements

Area	NO (µg/m3)	NO2 (µg/m3)	NOx (µg/m3)	SO2 (µg/m3)	CO (mg/m3)	PM10 (µg/m3)	T.S.P (µg/m3)
Jazirat Mohamed	15.78	26.91	43.24	16.38	2.39	122.12	151.66
El-Kom El-Ahmar	16.93	17.04	33.97	15.96	3.50	111	170
Tanash	15.74	26.45	41.06	18.24	1.60	101.11	130.56
Suqayl	18.80	16.14	34.94	16.09	3.49	101	129
Ausim	11.98	24.49	36.46	15.95	3.36	94	118
Saft Al-Laban	16.83	24.70	41.53	13.20	3.03	87	101
Hadayek El-Ahram	16.53	22.75	39.28	13.71	2.91	74	109
Al-Munib	17.58	22.45	40.03	15.20	3.09	80	113
Nazlet El-Semman& Kafr El-Gabal	8.89	16.79	25.70	10.79	1.60	74	109
Limits	150	200	150	350	30	150	230

4.1.2 Noise

4.1.2.1 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 as shown in Table 4-3.

Table 4-3: Jazirat Mohamed, El-Kom El-Ahmar, Tanash, Suqayl, Ausim, Saft Al-Laban, Hadayek El-Ahram, Al-Munib and Nazlet El-Semman& Kafr El-Gabal Noise Measurements

Area	LAeq	National Limits	International Limits
Jazirat Mohamed	64.74	70	70
El-Kom El-Ahmar	67.76		
Tanash	63.98		
Suqayl	65.09		
Ausim	62.96		
Saft Al-Laban	51.79		
Hadayek El-Ahram	54.16		
Al-Munib	49.46		
Nazlet El-Semman& Kafr El-Gabal	55.10		

Methodology, instrumentation, and results of Noise measurements are detailed in Annex 4.

Results of noise measurements

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

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 workday, 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.

4.1.3 Climate

4.1.3.1 Temperature

Table 4-4: nine districts Air Temperature[2]

Area	Month	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
9 Giza Districts	Temp. (°C)	13.4	14.7	17.1	21.2	24.6	27.2	28	27.8	26.3	23.6	19	14.9

4.1.3.2 Rainfall

Table 4-5: nine districts Rainfall[3]

Area	Month	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
9 Giza Districts	mm	5.5	3.6	2.6	1.2	0.7	0	0	0	0	0.8	3.5	5.2

4.1.3.3 Relative humidity

Table 4-6: nine districts Relative Humidity[4]

Area	Month	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
9 Giza Districts	RH%	63.2	58.7	55.8	48.4	46	49.1	57.2	70.1	61	59.5	63.1	63.8

4.1.3.4 Wind

Table 4-7: nine districts wind speed[5]

Area	Month	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
9 Giza Districts	Km/hr	11.5	13.3	14.8	13.7	14.8	14.8	13.7	12.2	12.6	13	11.2	11.2

[2] *Source: www.weatherbase.com*
[3] *Source: www.weatherbase.com*
[4] *Source: www.weatherbase.com*
[5] *Source: www.weatherbase.com*

4.1.4 Water resources

4.1.4.1 Groundwater

Groundwater is unavailable in the 9 studied areas.

4.1.4.2 Surface water

There are no canals or drainages in the surroundings the project areas. The areas are mainly Semi urban with scarce trees and palms. However, at the entrance of El-Kom El-Ahmar and Ausim, There is a small drainage path (brackish water from agriculture wastes). It will not be crossed by the main feeding line gas pipelines.

4.1.5 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 and urban areas.

The proposed gas pipeline route and the connections of pipelines to households are planned in areas where flora and fauna of significance do not occur

Flora

There had not been flora recorded in the studied areas except some non- significant exotic species at Jazirat Mohamed, El-Kom El-Ahmar, Tanash, Suqayl, and Ausim.

Ficus nitida	*Ficus benjamina*
	
Palm	***Willo***
	

Figure 4-11: Shows flora at study areas

Fauna

In conclusion, the project area is essentially free from any endangered or vulnerable species.

Bubulcus ibis at Tanash	Canis Lupus in Jazirat Mohamed
	
Canis Lupus in El-Kom El-Ahmar	**Felis catus at Tanash**
	

Domestic Animals exists at Study areas	
	
Camel (El-Kom El-Ahmar)	**Cows and cheeps (El-Kom El-Ahmar)**

Figure 4-12: Shows fauna at study area

4.1.6 Waste Management:

Solid Waste:

The responsibility of service planning, delivery and monitoring in Al Giza Governorate is delegated to Cleansing and Beatification Agency managed by District Presidency.

In most cases, the proportion of waste collected in El-Warraq transfer station by small trucks then transferred to dump site (Shoubramant dumpsite)

El-Warraq Transfer station	
Shoubramant dumpsite	

Figure 4-13: Shows El-Warraq transfer station and Soubramant dumpsite

Liquid Waste:

No liquid wastes are expected during the construction phase. However, if the sub-surface table is shallow, the trench should be dewatered (portable trash pumps are commonly used in construction projects) and discharge the water into a drain or sewer manhole after sampling and analysis before selecting appropriate disposal method, according to the arrangements with local authorities, where project workers will have access to public sanitary facilities. Therefore, no extra sanitary waste is anticipated.

STP at EL-Kom El-Ahmar	STP at Ausim
	
STP at Nazlet El-Semman& Kafr El-Gabal	**STP at Tanash**
	

Figure 4-14: Shows samples of sewage treatment plants at study areas

4.1.7 Potential Ecological Sensitive areas:

No ecological sensitive receptors have been observed along route of the main feed line and network extension except human receptors in residential areas such as specified in table 4-1. During the gas distribution network execution within the residential areas, the safety procedures of construction can be followed as following:

- Precaution signs,
- Security personnel.

4.2 Socioeconomic Baseline

The Social Impact Assessment (SIA) study is carried out through a combination of desktop and field survey in order to fully describe the social baseline of the Project area. The main methodology for the SIA is semi-quantitative assessment to convey accurate and relevant information for the project areas. There has been substantial data gathering on socioeconomic conditions in the area. A number of visits to the project sites were conducted during February 2017. SIA tools were employed during the field trip including observation and interviews with local officials, community leaders, local administrative units, LPG warehouse, local health units, and NGOs.

This section will highlight the following socioeconomic characteristics of the project areas including: 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.

Project Area

Giza Governorate is located in the center of the country, situated on the west bank of the Nile River opposite Cairo. Its capital is the city of Giza. It includes a stretch of the left bank of the Nile Valley around Giza, and acquired a large stretch of Egypt's Western Desert, including Bahariya Oasis. Giza is most famous as the location of the Giza Plateau: the site of some of the most impressive ancient monuments in the world, including a complex of ancient Egyptian royal mortuary and sacred structures, including the Great Sphinx, the Great Pyramid of Giza, and a number of other large pyramids and temples. Giza has always been a focal point in Egypt's history due to its location close to Memphis, the ancient Pharaonic capital of the Old Kingdom. The Great Pyramid of Giza at one time was advocated (1884) as the location for the Prime Meridian, a reference point used for determining a base longitude.

The project will be implemented in 9 districts of Giza governorate; Jazirat Mohamed, El-Kom El-Ahmar, Tanash, Suqayl, Ausim, Saft Al-Laban, Hadayek El-Ahram, Al-Munib and Nazlet El-Semman& Kafr El-Gabal. The following table illustrates the project areas.

Table 4-8 Project Areas[6]

Governorate	District	area
Giza	EL-Warraq	Jazirat Mohamed
	Ausim	El-Kom El-Ahmar
	EL-Warraq	Tanash
	Ausim	Suqayl
	Ausim	Ausim
	Boulaq	Saft Al-Laban
	EL-Haram	Hadayek El-Ahram
	Ganoub El-Giza	Al-Munib
	El-Haram	Nazlet El-Semman& Kafr El-Gabal

4.2.1 Administrative affiliation

The total area of Giza governorate is 85153 km^2. Giza's capital is the city of Giza. It is divided into (10) administrative districts (Markaz), (12) cities, (7) Sub-burb (Hay), (51) rural local units including (170) district and (581) and Ezbet/Kafr.

4.2.2 Urbanization Trends

Based on the observations during the site visits, the nine areas are various in terms of urbanization level and they can be classified as urbanized and semi-urbanized areas. On the level of each area:

Table 4-9 Urbanization indicators for the project districts[7]

Governorate	District	Urbanization Indicators	Buildings Density
Giza	Jazirat Mohamed	Semi-urbanized area overlooking River Nile. Hosts fishing community. Residential areas, large commercial activities i.e. restaurants, groceries, and local cafes.	**High**
	El-Kom El-Ahmar	Small district in Ausim surrounded by agriculture lands. Residential areas, small commercial activities i.e. basic restaurants, groceries, and local cafes.	**Medium**
	Tanash	District overlooking River Nile. Surrounded by agriculture lands. Large commercial activities i.e. El-Nasr for casting, Mostafa Aly for illumination,…etc	**Medium**
	Suqayl	Small district in Ausim overlooking River Nile and surrounded by agriculture lands. Residential areas, small commercial activities i.e. basic restaurants, groceries, and local cafes.	**Medium**
	Ausim	Semi urbanized city overlooking and surrounded by agriculture lands. Residential areas, larger commercial activities i.e. governmental offices, restaurants, groceries, and local cafes.	**High**
	Saft Al-Laban	Urbanized area and highly populated most commercial activities; shopping area, restaurants, groceries, local cafes.	**High**

[6] ***Source: CAPMAS***

[7] ***Source: field visits observations***

Governorate	District	Urbanization Indicators	Buildings Density
	Hadayek El-Ahram	Newly established urbanized area, residential areas, most commercial activities; restaurants, groceries, local cafes, shopping areas and sporting clubs. Increasingly growing population due to the affordable housing especially for middle-class citizens.	**Medium**
	Al-Munib	Semi urbanized area Overlooking the ring road most commercial activities; Trade, shopping areas, groceries	**High**
	Nazlet El-Semman& Kafr El-Gabal	urbanized areas. Being near Giza Pyramids makes Nazlet Al-Semman a tourism service center for Giza area. Residential areas, small commercial activities i.e. restaurants, Bazaar , groceries, and local cafes.	**H**

Jazirat Mohamed (Masjid Osman Maan)	El-Kom El-Ahmar (Local Unit)
	
Tanash Azhar Institute (Tanash)	**Family Health Center (Saft Al-Laban)**
	

Central hospital (Ausim)	Hadayek El-Ahram Club
	
Church of St. George (Al-Munib)	**Applied Research Center for Medical Plants (Nazlet El-Semman& Kafr El-Gabal)**
	

Figure 4-15: Pictures showing some of Jazirat Mohamed, El-Kom El-Ahmar, Tanash, Suqayl, Ausim, Saft Al-Laban, Hadayek El-Ahram, Al-Munib and Nazlet El-Semman& Kafr El-Gabal Landmarks.

Dwelling Characteristics:

Giza Governorate has both urban and rural areas. Most houses in the project areas are usually built of red brick, concrete and white stone are used too in rural areas. In populated areas, the houses are joined to one another in a continuous row. Concrete is used more in the construction of ceilings of houses. Only the suitable houses (according to the best gas connections codes and standards) will be connected.

Table 4-10 Dwelling indicators[8]

Governorate	District	Urbanization Indicators
Giza	Jazirat Mohamed	Housing density is high. High to medium buildings height with 4-12 floors in average. Standard buildings' type with red bricks and concrete of ceiling. In many areas, the houses are joined to one another in a continuous row
	El-Kom El-Ahmar	Housing density is medium. Medium height buildings with 4-6 Floors in average. Standard buildings' type with red bricks and concrete of ceiling. In many areas, the houses are joined to one another in a continuous row.
	Tanash	Housing density is medium. High to medium height buildings with 4-10 Floors in average. Standard buildings' type with red bricks and concrete of ceiling. In many areas, the houses are joined to one another in a continuous row
	Suqayl	Housing density is medium. Medium height buildings with 4-6 Floors in average. Standard buildings' type with red bricks and concrete of ceiling. In many areas, the houses are joined to one another in a continuous row.
	Ausim	Housing density is high. Medium height buildings with 4-6 Floors in average. Standard buildings' type with red bricks and concrete of ceiling.
	Saft Al-Laban	Housing density is high. High to medium height buildings with 4-12 Floors in average. Standard buildings' type with red bricks and concrete of ceiling. In many areas, the houses are joined to one another in a continuous row
	Hadayek El-Ahram	Housing density is medium. Mostly medium height buildings with 3-5 Floors in average. Relatively good looking and newly established buildings' type with red bricks and concrete of ceiling. Most houses has small gardens.
	Al-Munib	Housing density is high. Medium height buildings with 4-6 Floors in average. Standard buildings' type with red bricks and concrete of ceiling.
	Nazlet El-Semman& Kafr El-Gabal	Housing density is medium. High to medium height buildings with 4-10 Floors in average. Standard buildings' type with red bricks and concrete of ceiling

[8] ***Source: field visits observations***

Twelve floors building in Jazirat mohamed, red bricks	El-Kom El-Ahmar Buildings
	
Tanash buildings	Suqayl Buildings
	
Ausim buildings	Saft Al-Laban buildings& shop area
	
Hadayek –EL-Ahram buildings	Al-Munib buildings
	

Figure 4-16: Pictures showing some Dwelling indicators.

4.2.3 Road distribution network and traffic

The nine areas are connected to other areas by asphalt roads. Local streets consist mainly of asphalt or dirt, and winding footpaths in some areas. The width of the main streets varies within the nine project areas; in average between 10-20 meters, while the width of the sub streets varies between 6-10 meters. Following table, provide more details on streets status.

Table 4-11 Streets status and traffic in the project areas

Governorate	District	Streets status	Traffic density
Giza	Jazirat Mohamed	Main streets are wide (5-8m) with asphalt where local streets are mix of asphalt and dirt, narrow and winding in some areas. Microbuses and Tuk Tuk are main means of transportation.	High traffic density.
	El-Kom El-Ahmar	Local streets consist mainly of narrow, dirt and winding footpaths. Tuk Tuk, motorcycle, microbus are main means of transportation.	Medium traffic density.
	Tanash	Main streets are wide. Local streets consist mainly of narrow, dirt and winding footpaths. Private cars, trucks, motorcycle, microbus are main means of transportation.	High traffic density
	Suqayl	District area. Local streets consist mainly of narrow, dirt and winding footpaths. Tuk Tuk, motorcycle, microbus are main means of transportation.	Low traffic density.
	Ausim	Main streets are wide (10-20m), Local streets are mix between asphat and dirt and winding footpaths. Private cars, microbus, Tuk Tuk, motorcycle are main means of transportation.	Medium traffic density.
	Saft Al-Laban	Main streets are wide (5-10m) with asphalt where local streets are mix of asphalt and dirt, narrow and winding in some areas.	Medium traffic density.
	Hadayek El-Ahram	New area. Main streets are wide (10-20m) with asphalt where local streets are mix of asphalt and dirt. Local streets are wide in most areas.	Medium to low traffic density
	Al-Munib	Local streets consist mainly of narrow, dirt and winding footpaths.	High traffic density
	Nazlet El-Semman& Kafr El-Gabal	Main streets are wide (20-40m) with asphalt where local streets are mix of asphalt and dirt, narrow and winding in some areas. Microbuses, private cars, bus, and Tuk Tuk are main means of transportation.	High traffic density

Asphalt main street in Jazirat Mohamed	Local street in El-Kom El-Ahmar
	
Main street in Tanash	**local street in Suqayl**
	
Main street in Ausim	**local street in Saft Al-laban**
	
Main street in Hadayek El-Ahram	**Main street in Al-Munib**
	
Main street in Nazlet El-Semman& Kafr El-Gabal	
	

Figure 4-17: main streets in study area

4.2.4 Demographic Characteristics

Total population:

Total population of Giza governorate is 7,844,098 persons (2016 census). The population density is 4785 inhabitant/km2. At the governorate level, it has a male population of 51.72% and females 48.28% of the total population. As for the rural urban structure, the urban population reached 60.8% of the total population. It is noted that the proportion of the population of the urban population of the province is 57%. The city of Giza has the highest percentage of the population of the governorate accounting for 75.3%. About 10% of the population of the governorate is located in the center of Al-Warraq and about 4.8% and 8.1% in Al-Badrashin and Ausim Respectively, while the remaining 8.8% is distributed to the rest of the centers with an average of approximately 5.1%. Total population and number of households, within the nine areas are presented in the table below:

Table 4-12 Distribution of population in project areas[9]

Governorate	District	Population	Potential clients
Giza	Jazirat Mohamed	25,121	7000
	El-Kom El-Ahmar	39,927	4000
	Tanash	19,789	2500
	Suqayl	27,842	3000
	Ausim	101,745	12000
	Saft Al-Laban	165,523	4000
	Hadayek El-Ahram	350000	10000
	Al-Munib	106,858	9400
	Nazlet El-Semman& Kafr El-Gabal	60,215	23500
Total	9	897,020	75,400

[9] ***Source: districts local units, CAPMAS, Town Gas***

Rate of natural increase:

The annual population growth rate in the Giza governorate is estimated at 2.4% per year, the birth rate is 24 per thousand, the mortality rate is 5.6 per thousand.

Household size

A household is defined as "Family (and non-family) members who share residence and livelihood, and operate as one social and economic unit". The average number of household members in Giza Governorate is 4.49. The average number of family members varies according to the rural or urban environment. The following table illustrates the average family size in the project areas.

Table 4-13 Average family size[10]

Governorate	District	Family size
Giza	Jazirat Mohamed	4.34
	El-Kom El-Ahmar	5.01
	Tanash	4.34
	Suqayl	5.01
	Ausim	5.01
	Saft Al-Laban	4.59
	Hadayek El-Ahram	
	Al-Munib	4.13
	Nazlet El-Semman& Kafr El-Gabal	4.21

4.2.5 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 project sites found to have access to basic services, such as; electricity, sanitation, and potable water. Thus, it will be possible to install the NG to the nine areas.

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

[10] ***Source: districts local units, CAPMAS***

Table 4-14 Access to basic services[11]

Governorate	District	Percentage of persons having access to portable water	Percentage of persons using electricity for lighting	Percentage of persons having public sanitation network
Giza	Jazirat Mohamed	92.1%	89.7 %	92%
	El-Kom El-Ahmar	92.2 %	96.2%	89.7%
	Tanash	92.1%	96.1%	89.7%
	Suqayl	92.1%	96%	89.6%
	Ausim	92.1%	96.1%	89.7%
	Saft Al-Laban	91.9%	95.9%	89.5%
	Hadayek El-Ahram	92 %	96 %	89.6 %
	Al-Munib	92.1%	96%	89.6 %
	Nazlet El-Semman& Kafr El-Gabal	92.1%	96.1%	89.7%

4.2.6 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.

Table 4-15 population and Human Development Index[12]

Governorate	Area	Population	GDP per capita	Human Development Index
Giza	Jazirat Mohamed	25,121	4172.4	0.635
	El-Kom El-Ahmar	39,927	3818.2	0.635
	Tanash	19,789	4203.6	0.627
	Suqayl	27,842	3874	0.655
	Ausim	165,523	4142.1	0.637
	Saft Al-Laban	91.9%	95.9%	89.5%
	Hadayek El-Ahram	350000	N.A	N.A
	Al-Munib	106,858	9283.1	0.704
	Nazlet El-Semman& Kafr El-Gabal	60,215	9069	0.739

[11] ***Source: local units and city council's during site visit***

[12] CAPMAS

Education:

There are several educational institutions in the Giza governorate, which prepare annually a large number of skilled workers, a variety of expertise and competencies to enable them to join different fields of economic activity. The higher education institutions include Cairo University, Al-Azhar educational institutions and other public and private educational institutions. There are 33 vocational training centers in different locations in Giza governorate. There are wealth of trained workers in various professions and activities that can be utilized in the activities of the proposed NG project. The percentage of enrollment at all levels of education in Giza reached 74.5% (81% in urban areas and 65.7% in rural areas). The indicators show that the illiteracy rate among adults is 29% (40.8% in rural areas, 22% in urban areas). According to the Egypt's Human Development Report 2010, the education index for Giza is as high as 0.794 (Egypt is 0.689).

Unemployment and work status

In Giza, labour force (15+) is 29.3 % of total population at the governorate level according to the Human Development Report 2010. Percentage of women in labor force (15+)

Reached percentage14.4. Percentage of labor force (15 +) who work in agriculture is 11.1%, industry 32.6%, and services 56.3%. Professional & technical staff (% of labor force 15+) reached 15.6%, wage earners (% of labor force 15+) is 67.3%, where employees in governmental public sector & public enterprise sector (% of total labor force (15+) is 23.4%. Number of unemployed persons in Giza has reached 124,000 persons (HDR 2010).

Observations from field visits and social assessment show that the majority of population resides in project area are skilled workers, government employees, and craftsmen. In Tanash, Al-Kom Al-Ahmar, Ausim, Suqayl, and are more skilled workers i.e. carpenters, drivers, and workers. There are no manufacturing projects, very few skills workers and craftsmen. In larger area i.e. Al-Al-Munib and Saft Al-Laban most set of skills is available. Hadayek Al-Ahram is relatively new area and mostly does not possess as much skills works as other areas.

Thus, the Gas Connection Company, should consider the current skills profile during local hiring. Observations and discussions indicates that the households can afford to pay NG installation costs where the availability of reasonable payments plan is highly desired.

The formal Statistics obtained from the Poverty Mapping Data 2013 regarding manpower reflected that the age of starting work is 15 years old.[13] 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, rigid restrictions to employ this category must be added to the contractor obligations.

4.2.7 Poverty index

Although the prevalence of poverty (poverty rate) is higher in rural areas and highest in rural Upper Egypt, poverty grew the most in urban areas in Egypt during 2009-2011 (by 39.1 percent in urban governorates, by 41.1 percent in urban Lower Egypt and by 38 percent in urban Upper Egypt) where considerable pockets of poverty exist. Around 23% of people in Giza are considered poor. Number of poor persons in Giza has reached is 1,492,000 persons (HDR 2010). (CAPMAS 2013). Poverty percentage is estimated to be higher in Jazirat Mohamad, Tanash, Al-Kom Al-Ahmar, Ausim, and Suqayl, since they are rural areas where poverty rates are usually higher due to lack of industrial, commercial activities, income sources and job opportunities. During the social assessment, 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.

4.2.8 Income and expenditure

GDP refers to the total value of services produced using internal and external resources where the economic situation is one of the main pillars of human development. According to Egypt Human Development Report 2010, Giza per capita reaches for GDP to 8240 EGP (Port Said the highest is 10527 EGP). The level of income is higher in Al-Munib, Nazlet Al-Semman & Kafr Al-Gabal, Saft Al-Laban, and Hadayek Al-Ahram as they are urban areas with more economic activities. Main sources of income are commercial businesses, industry, agriculture, and governmental occupation. Most of salaries are relatively medium in urban areas and low in rural

[13] Based on Labor law number 12 of year 2003 and The Child Law (No. 12, 1996). There are certain critical obligations to recruit children below 15 years old. Article 98-103 of Labor law put limitations related to age, type of occupation, hazards work…etc.

areas. Social Assessment field visits estimates refers to the average income for adults in Jazirat Mohamad, Tanash, Al-Kom Al-Ahmar, Ausim, and Suqayl is between 2000-3000 EGP per month; Al-Munib, Nazlet Al-Semman & Kafr Al-Gabal, Saft Al-Laban, and Hadayek Al-Ahram 3000-4000 EGP per month.

4.2.9 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 is the LPG cylinders. The source of aforementioned type is mainly the LPG vendors (Sareha). The second source is the LPG outlets. Field survey stated that, the average cost of LPG cylinders per household in project areas is 30-45 EGP per month / 360 –540 EGP per year. This cost is relatively high cost comparing to local people income.

The average consumption of LPG cylinders for cooking per household is ranges between 1 to 2 cylinders monthly. While during winter, each household consumes around 2 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 very few percentages of the samples surveyed rely upon electricity.

4.2.10 Problems faced with the current household fuel

The study aimed at highlighting problems associated with the LPG cylinders in order to verify the willingness of community people to convert to the natural gas. The majority of the samples surveyed in the 9 districts 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.

4.2.11 Perception towards the project

During the social assessment fieldwork, the team recorded notable and tremendous public acceptance 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 (Nazlet Al-Semman & Kafr Al-Gabal, Jazirat Mohamad, Tanash, Al-Kom Al-Ahmar, Ausim, Suqayl, Saft Al-Laban, Hadayek Al-Ahram) 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 bills

4.2.12 Gender dimension of the current type of fuel

- Females are the main player as they play a major role in the domestic labor relating handling LPG. According to the interviews and the focus group discussions,
- In most project areas, there is LPG outlet and LPG vendors spread in the area; however, women also are in charge of waiting the vendors in order to change the cylinders.

4.2.13 Willingness and affordability to pay

For the planned NG connection project, the contracting fee for each client is estimated to be 2160 EGP. This includes the cost for up to two devices (cooker / heater). There is an option for a payment plan through an agreement with El-Ahly bank, as a facilitation for the clients. From the social assessment and the field visits discussion, it has been found that most people at the project districts are highly willing to convert to the NG. This is due to the high cost, difficulties of securing LPG cylinders and the associated risks issues. Community people are much in favor to host the project. However, it is crucial for the NG company to provide clear information about the project in order to guarantee community support to the project. The majority of the samples cannot pay NG installation costs in one installment, they strongly recommended to have payment plan or the NGOs pay for the installation of the NG to poor households. 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.

4.2.14 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 9 districts, but they are of no direct relevance to the project areas where the NG connections installed in.

Low pressure Natural Gas installation pipework shall only take place in the semi-urbanized areas in the project areas. These areas have already been excavated beforehand, in order to install other public utilities such as water, sanitary, sewage and electricity networks. It is least likely to find any artifacts or antiquities where low pressure NG installation pipework is going to take place. There are no identified archeological sites or sites with cultural or historical value, located within those semi-urban areas that would be affected by the NG pipework.

4.2.15 Physical Structures

The majority of buildings, to which NG is to be connected, are built with concrete and red bricks in relatively tight streets. It was reported that all of the sample surveyed live in apartment buildings that are constructed with concrete and red bricks. The majority of streets are paved out, and in a good condition. Alleyways are mostly leveled out tracks.

5. Environmental and Social Impacts

The environmental and social impact assessment 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 positive ones. The evaluation of the potential impacts on various receptors is based on a significance ranking process described in the following subsection. Details are presented in **Annex 5**.

5.1 Impact Assessment Methodology

The impact assessment methodology adopted for this ESIA is a semi-quantitative "cause-effect" matrix modified from Leopold and Buroz´s Relevant Integrated Criteria. The Leopold matrix is two-dimensional, where the stages of the project (activities) are assessed in relation to the existing environmental characteristics and conditions that may be affected during the execution of those actions. 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 if magnitude and importance are of minor severity. Then the importance of each impact by activity is determined based on the Buroz relevant integrated criteria. The importance of each impact by activity is assessed by assigning a score for intensity (IN), extension (EX), momentum (MO), persistence (PE), reversibility (RV), recoverability (MC), synergy(SI), accumulation (AC), effect (EF) and frequency (PR) of the impact. The importance, I, is determined according to **$I = \pm (3IN + 2EX + MO + PE + RV + SI + AC + EF + PR + MC)$.** For both methods, the severity of the impact is defined as either irrelevant, minor, medium, or major. Results from both methods are summarized and presented according to the following scheme:

Table 5-1 Impact Assessment Methodology

Importance of Impact	Impact Rating	Color Code
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).	

Detailed impact assessments results are presented in two tables in **Annex 5**.

5.2 Impacts during Construction phase

5.2.1 Positive impacts

The project may result in the creation of job opportunities, both directly and indirectly.

– **Provide direct job opportunities to skilled and semi-skilled laborers**

The project is anticipated to result in creation of different job opportunities. Based on similar projects implemented recently by EGAS and the local distribution company, 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, According the information from TownGas, the construction of the low pressure network in Giza is anticipated to generate on average 75-100 worker, four engineers and 30 technicians.

- **Indirect benefits**

  As part of the construction stage, a lot of indirect benefits are expected to be sensed in the targeted areas due to the need for more supporting services to the workers and contractors who will be working in the various locations. This could include, but will not be limited to accommodation, food supply, transport, trade, security, manufacturing… etc. For example, the transportation of workers from El Warrak to the project districts will work for the benefit of car lease offices.

5.2.2 Negative Impacts

The process of environmental impact assessment during construction phase indicate that some receptors have irrelevant impacts; those receptors include Subsurface water, Ecological (fauna or flora), vulnerable structures, cultural sites and land use. The receptors which might be affected during the construction phase will be as follows:

5.2.2.1 Air Emissions

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. Table (4-2) showing that the concentrations of measured air pollutants in the studied areas are below national and WB guidelines. As a result, we can conclude that ambient concentrations of gaseous pollutants, NOx, SOx and CO are unlikely to surpass permissible levels due to operation of construction equipment. Also, construction activities will be conducted for a short period. 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 SOx, NOx, CO, VOCs, etc.
- Fugitive dust emissions (PM10, PM2.5)
- Traffic congestions resulting from road closure or slowing down of traffic due to excavation works.

5.2.2.2 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.

5.2.2.3 Gaseous pollutants emissions

Machinery used during construction such as excavators, generators, boring machines, 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 district 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 TukTuk stations.

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

5.2.2.4 Noise

Environmental impacts

Table (4-3) showing that noise levels in the studied areas are below national and WB guidelines. As a result, we can conclude that Noise levels unlikely to surpass permissible levels due to operation of construction equipment. 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 district 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 TukTuk stations.

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

5.2.2.5 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 0.2 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 (e.g. El-Kom El-Ahmar Railway line). In addition, potential soil contamination may take place as a result of spillage or leaks.

The impact on soil considered **medium severity.**

5.2.2.6 Water

Surface water

There are no canals or drainages in the surroundings in the project areas. The areas are mainly Semi urban with scarce trees and palms.

However, at the entrance of El-Kom El-Ahmar and Ausim, there is a small drainage path (brackish water from agriculture wastes). Although It will not be crossed by pipelines, it may be susceptible to pollution resulting from uncontrolled dumping of wastes generated during construction.

The impact on surface water pollution is of **minor severity**

5.2.2.7 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, including sewage and garbage collected from the labor camp location. 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.

Socioeconomic impacts

Waste 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**

5.2.2.8 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 vary from district to another according to the population and the services within each district.

- In Jazirat Mohamed, Tanash, Al-Munib and Nazlet El-Semman& Kafr El-Gabal districts, the traffic density is higher than other project sites. The main streets have high traffic density. As well as, the sensitive receptors i.e. the main commercial areas, local markets, transportation stations and service areas. Therefore, there is a high traffic density at peak times.
- In El-Kom El-Ahmar and Ausim, Saft Al-Laban districts the traffic density in relatively within the medium range.
- In Hadayek El-Ahram district, the traffic density is medium to low, while the lowest traffic density observed in Suqayl district.

– Traffic congestion may affect the drivers and vehicles in case of non-rehabilitation of streets after the project implementation. There should be clear traffic diversion plan for pedestrians, cars, Tuk Tuk and microbus drivers.
– 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 could affect access to shops.

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

5.2.2.9 Occupational health and safety

General risks associated with construction sites are anticipated including 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 result 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 shocks and Working at heights

- 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**

5.2.2.10 Risk on Infrastructure and underground utilities

Environmental Impacts

Prior to excavation, the LDC (Town 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

5.2.2.11 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 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 buildings 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, and no trenches will be 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 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 & safety

5.2.2.12 Temporary Labour 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 location 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.

5.2.2.13 Child Labour:

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.**

5.2.2.14 Street condition deterioration

Environmental Impact

Streets rehabilitation or restoration following pipeline network installation: is referred to by an Egyptian legal/institutional expression 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 on 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**.

5.2.2.15 Land

Land needed

The network will pass through the main urban roads/streets and side roads without causing any damage to private assets or lands. No land acquisition or resettlement activities are anticipated.

The implementation companies will rent site storage areas in order to store the equipment and excavation tools, in addition, temporary equipment for workers' services. As well as, the companies will coordinate with the district in order to provision sanitation and potable water services.

Land acquisition is not expected. No impact

5.2.2.16 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 may have impact on visual resources and landscaping.

Impact related to visual resources and landscaping is temporary, local and minor

5.3 Impacts during Operation

5.3.1 Positive impacts

- As indicated in the Baseline Chapter, women are key players in the current domestic activities related to handling LPG and managing its shortage. Being the arty 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 the price of consumption fees. 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 achieve the safety factor, as the LPG vendors will not enter the households in order to change the LPG
- Constantly available and reliable fuel for home use
- Reduced expenditure on LPG importation and subsidies. The NG will reduce the consumption of LPG by 1,809,600 cylinders per year at the project nine areas. Recent estimates refer to the fact that the governmental subsidy for each LPG cylinder is 90 EGP. Consequently, this phase of the Giza NG project is expected to reduce the subsidies of LPG for the project area by 162,578,988 EGP per year. (calculations based on number of potential NG project clients multiply annual LPG use per each area multiply subsidy for each LPG cylinder 90 EGP).
- Significantly lower leakage and fire risk compared to LPG
- Improved safety due to low pressure (20 mBar) compared to cylinders
- Beneficiaries to benefit from good customer service and emergency response by qualified personnel/technicians **as presented in Annex 6**
- Elimination of insects and dirt typically associated with LPG cylinders

- Limiting the LPG cylinder "black market" due to lower demand
- Eliminate the hardships that special groups like physically challenged, women, and the elderly had to face in handling LPG
- Limiting possible child labor in LPG cylinder distribution

5.3.2 Negative impacts

The process of environmental impact assessment during the operation phase indicate that some receptors have irrelevant impacts; those receptors include waste management, noise, air emission, soil and Ecological (Fauna and flora). The receptors which might be affected during the operation phase will be as follows:

5.3.2.1 Community health and safety

In addition to a full array of safety and emergency precautions taken by EGAS and the implementing entities (Local Distribution Companies: Town 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.**

5.3.2.2 Integrity of natural gas piping

Environmental impacts

- Low-probability events may impact the integrity and safety of the NG network and components during the years of the operation phase.
- Geological and geotechnical events: earthquakes may result in geotechnical instabilities that lead to network breakage or leakage in multiple locations simultaneously. The geological and geotechnical history of the area may also lead to possible events.
- Sabotage: pipelines and other components may be targeted for sabotage.

Socioeconomic impacts

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

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

5.3.2.3 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 4.2.13). 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 Economic disturbance is **minor** as LPG distributors manage to perform alternative job

5.3.2.4 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

Table 5-2 Impact Assessment

Detailed impact assessments results are presented in two tables in **Annex 5**.

Impact	Description	Type	Significance
During Construction			
Air emissions	Air emissions (gases and particulates) during construction can exceed permissible limits and shall arise from: - Particulate matter and suspended solids from excavation/backfilling operations - Possible dispersion from stockpiles of waste or sand used for filling trenches. - Exhaust from excavation equipment and heavy machinery (excavators, trenchers, loaders, trucks) containing SOx, NOx, CO, VOCs, etc. - Traffic congestions resulting from road closure or slowing down of traffic due to excavation works. Dust The impact of dust generation (particulate matter) will be limited to the working hours as excavation and backfilling are carried out within the same day. Excavation on dusty or rocky roads such as local roads and some urban roads are likely to generate more dust compared to asphalted streets due to the dusty status of those roads.	Negative	Medium
	<u>Gaseous pollutants emissions</u> Provided machinery used during construction is certified and maintained as per guidelines, the increase in emissions stemming from the exhaust of machinery is unlikely to increase ambient levels beyond national and WB permissible levels. On urban roads, traffic congestion may lead to increased exhaust emissions. Traffic management with local authority will reduce the impact of works on road congestion and associated emissions.	Negative	Medium
Noise	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.	Negative	Minor
Soil	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.	Negative	Medium
Water	Surface Water: Uncontrolled dumping of waste in canals can result in water pollution	Negative	Minor
Waste generation	Inappropriate waste disposal and improper management of construction waste materials which could lead to spillages that will cause soil contamination. 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. Poor handling of Hazardous and non-hazardous materials may result in poor containment of induced leaks.	Negative	Medium

Impact	Description	Type	Significance
Traffic & Accessibility	- Traffic congestion and loss of access due to the excavation and installation works will be vary from district to another according to the population and the services within each district. - 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, 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.	Negative	Medium
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 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.	Negative	Medium
Risk on Infrastructure and underground utilities	- Underground utilities and infrastructure pipelines (such as water, sewerage and telecommunication) have been installed years ago without accurate documentation and maps for its routes and depths. Therefore, the risk of damage to such utilities during excavations for natural gas pipeline installation is possible. - The most significant potential environmental impact will arise in case a sewerage pipe is broken and wastewater potentially accumulating in the trench. There is also the possibility of overflowing to the streets causing nuisance to the surrounding environment. - 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 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.	Negative	Minor

Impact	Description	Type	Significance
Community health and safety	The excavation works within the project areas will affect the community health and safety by the following means: - 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. - Project infrastructure excavation works will result in the presence of open trenches in areas accessible to local community (e.g., in front of buildings 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, 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. - Child labor and school dropout	Negative	Medium
Temporary Labor Influx	Possible social adverse impacts from Temporary Labor Influx - Risk of social conflict - Increased risk of illicit behavior and crime - Increased risk of communicable diseases and burden on local health services - Influx of additional population - Increase in traffic and related accidents - Increased pressure on accommodation and rents - Local inflation of prices - Overconsumption of community resource	Negative	Minor
Child labor	As mentioned in the baseline, child labor is a common practice in the project communities. Children below 18 works almost in all projects as they receive low salaries and they are less demanding. This risk should be carefully handled in the ESMP and restrict obligations and monitoring should be applied in the contractor obligations.	Negative	Medium
Street condition deterioration	Street condition deterioration Streets rehabilitation or restoration following pipeline network installation: is referred to by an Egyptian legal/institutional expression 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". 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.	Negative	Minor

Impact	Description	Type	Significance
Land	Land needed Regard to the land needed, there will no land needed for the project, as there is PRS already existed. The implementation companies will be temporary storage area which maybe small plots of land usually are rented land or rented shops that will be rented for few days in order to store the equipment and excavation tools, in addition, temporary equipment for workers' services.	None	None
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 may have impact on visual resources and landscaping.	Negative	Minor
Operation			
Community health and safety	In addition to a full array of safety and emergency precautions taken by EGAS and Town 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.	Negative	Minor
Integrity of natural gas piping	- 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. - Sabotage: pipelines and other components may be targeted for sabotage. Adverse impact is expected in raising the fear of disruption of Gas supply	Negative	Minor
Economic disturbance	- For those who will pay in installments, this may be an added financial burden on the poor families. 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.	Negative	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.

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

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.

6.1.1 Trenchless Technologies

HDD[14] will be implemented only in the crossing of El-Kom El-Ahmar railway line, 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.

[14] **See figure number 2-22**

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 9 studied areas since the pipeline route passes through urban and local roads and does not cross any main road or railway except the crossing of El-Kom El-Ahmar railway line, 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.

6.3 Regulators

Two types of 100 mbar regulators outlet pressure were considered; Kiosk regulators and 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. Such market should be avoided if possible. 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 15590 EGP and consumers contribute a part of it because the balance is subsidized by the Government. The government of Egypt is negotiating with the project's financing organizations in order to secure additional subsidy to poor and marginalized groups. Currently, they offer flexible payment schemes for the installation cost.

7. Environmental and Social Management & Monitoring Plan

7.1 Objectives of the ESM&MP

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

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

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

7.2 Mitigation Measures During Construction Phase

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 **as per presented in Annex 6**.

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.

7.2.1 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 PM10 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.

7.2.2 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.

7.2.3 Soil

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

7.2.4 Mitigation measures of surface water

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

7.2.5 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.

7.2.6 Management of Traffic Impacts

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

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

A comprehensive and practical occupational health and safety management system must be enforced. The OH&S measures are to comply with all relevant national legal requirements well as international Best Practice such as the IFC EHS General Guidelines. Practical and administrative measures should be taken by EGAS and the LDC to ensure adherence of site crews to EGAS OH&S procedures and measures. **Annex 2, Annex 6** presents OH&S for Town Gas. Avoiding unacceptable, and illegal, noise levels.

7.2.8 Management of Community health and safety

In addition to all the environmental and social management and monitoring measures in this section which aim for health and safety, awareness-raising actions and signs should be provided to workers and community members to promote safety and health, safety supervisors should be hired by the LDCs to oversee work sites and they will be largely responsible for children and their safety around the construction site. LDC should share with the community the timeline of the project especially when the LDC will be entering their street Mitigation measures proposed for minimizing community H&S impacts detailed in the ESMP matrix below.

7.2.9 Management of Temporary Labor influx

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

7.2.10 Management of 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.

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

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

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

Effective grievance management helps to:

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

The detailed grievance mechanism (GRM) below is to be shared with the community beneficiaries. Posters will be prepared and made available to the beneficiaries in the contracting office. Additionally, they will be availed in the customer services office. Thus, sufficient and appropriate information about the GRM will be disseminated to the communities prior to the construction phase. Information dissemination about the GRM should be shared with the beneficiaries during the process of contracting and disclosed in the contracting office and other publicly accessible venues. Following are the various stages of grievances. The proposed mechanism is built on three tiers of grievances:

1-The level of site engineer of Town Gas in the 9 studied areas
2-On the level of LDC headquarter
3-On the level of EGAS

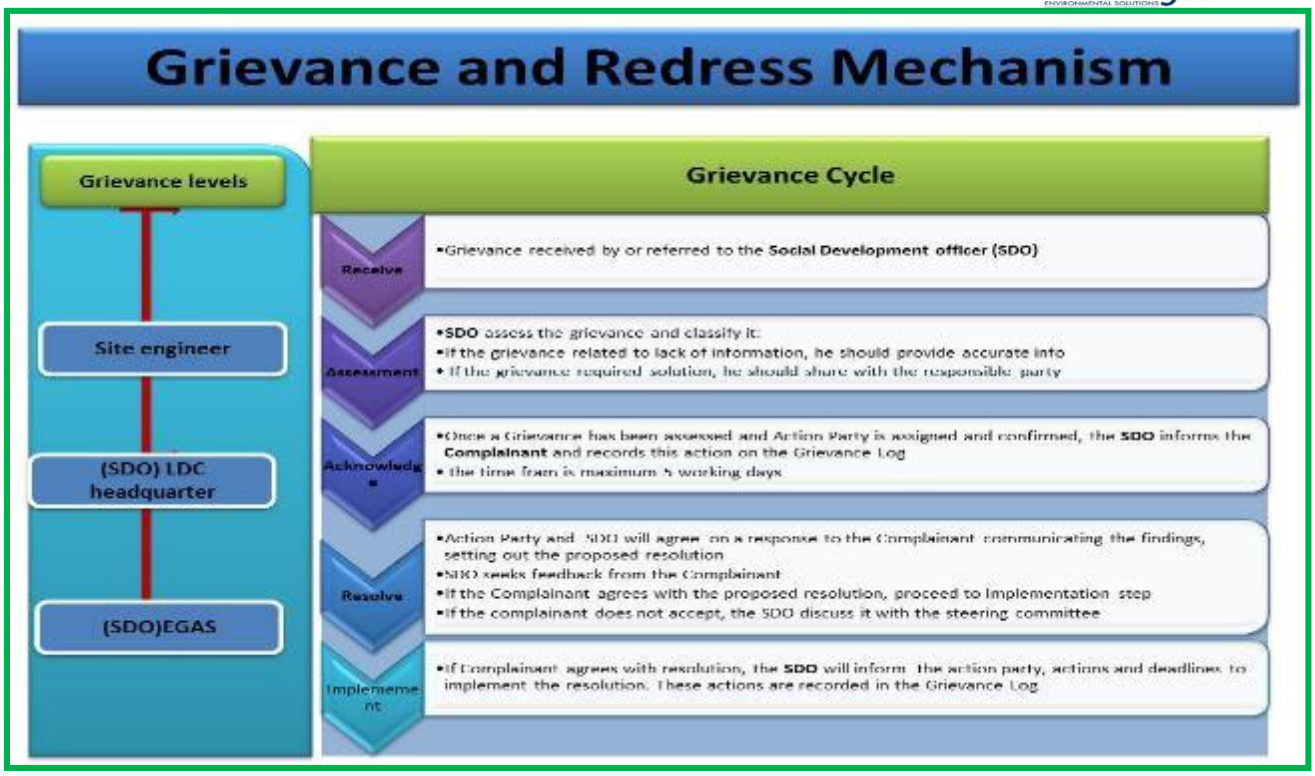


Figure 7-1 Proposed Grievance and Redress Mechanism

7.2.11.1 First tier of grievances

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

The grievances should be presented to the following:

- The foreman working on the ground in the 9 studied areas,
- The project manager in the 9 studied areas,

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

7.2.11.2 Second tier of grievances:

If the aggrieved person is not satisfied with the decision of the first tier, they can present the case to Town Gas headquarters. Complaint form is attached in **Annex 2**. SDO where they should provide resolution within 15 calendar days, following is the second level of grievances:

- The Social Development Officer in Town Gas headquarters will handle technical, environmental and land acquisition complaints. Town Gas headquarters SDO should receive the unsolved problems. Thereafter, the SDO gets in contact with the petitioner for more information and forwards the complaint to the implementing entities for a solution.
- The SDO should follow the complaints and document how they were solved within 15 days.

Figure 7-2: Town Gas customer service within one of its headquarters

7.2.11.3 Third tier of grievances:

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

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

7.2.11.4 Grievance channels

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

- 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
- Hotline: 129 is the hotline for Town Gas.
- The SDO within the LDC and EGAS
- 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.

7.2.11.5 Response to grievances

Response to grievance will be through the following channels

- 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.
- 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.
- EGAS and Town Gas should maintain record of complaints and results.

Table 7-1 Means of verification and indicators

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

7.2.11.6 Monitoring of grievances

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

7.2.11.7 Institutional Responsibility for the Grievances

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

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

7.3 Environmental and Social Management Matrix during CONSTRUCTION

Table 7-2: Environmental and Social Management Matrix during CONSTRUCTION

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

Receptor	Impact	Mitigation measures	Responsibility		Means of supervision	Estimated Cost of mitigation / supervision
			Mitigation	Supervision		
	pollutants	Compliance to legal limits of air emissions from all relevant equipment			Measure and document emissions of machinery by regular audits request emission measurements	
		– Availability of 24-7 hotline service (129) to all beneficiaries and the public for reporting possible leaks, damages or emergencies – Quick response to gas leaks by evacuation of the affected area – Repair or replacement of failed component	LDC	LDC HSE	Field Supervision	
Ambient noise levels Local community Workers	**Increased noise levels beyond WB/National permissible levels**	Ear muffs, ear plugs, certified noise PPE for workers	– LDC – Excavation Contractor	LDC HSE	Contractual clauses + Field supervision (audits)	– Contractor costs – LDC management costs
		Avoid noisy works at night whenever possible			Field supervision Complaints receipt from local administration	
Ground utilities' integrity Local community	**Damage to underground utilities resulting in water/wastewater leaks, telecommunication and**	Coordination with departments of potable water, wastewater, electricity, and telecom authorities to obtain maps/ data on underground utilities, whenever available	Excavation Contractor	LDC HSE	Official coordination proceedings signed by representatives of utility authorities – Examination of site-specific reports and records – Field supervision	– Contractor management costs – LDC management costs

Receptor	Impact	Mitigation measures	Responsibility		Means of supervision	Estimated Cost of mitigation / supervision
			Mitigation	Supervision		
	electricity interruptions	If maps/data are unavailable: Perform limited trial pits or boreholes to explore and identify underground utility lines using non-intrusive equipment		LDC HSE Supervisor	– Contractual clauses + Field supervision	
		Preparation and analysis of accidental damage reports		LDC HSE	– Review periodic HSE reports	
		Repair and rehabilitation of damaged components		LDC HSE Local Government Unit Local Police	– Contractual clauses + Field supervision	
Surface water	**Uncontrolled dumping of waste in drainage 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. • Adequate management and proper handling and storage of construction materials, oils and fuel to avoid spillages	LDC Contractor	LDC HSE department	– Field supervision (audits)	– Contractor costs – LDC management costs

Receptor	Impact	Mitigation measures	Responsibility		Means of supervision	Estimated Cost of mitigation / supervision
			Mitigation	Supervision		
Streets (physical status) local community and workers (health and safety)	**Hazardous waste accumulation**	– Temporary storage in areas with impervious floor – Safe handling using PPE and safety precautions – Transfer to LDC depots for temporary storage – Disposal at licensed Alexandria hazardous waste facilities (Nasreya) – Hand-over selected oils and lubricants and their containers to Petrotrade for recycling	– LDC – Excavation Contractor	LDC HSE	Field supervision and review of certified waste handling, transportation, and disposal chain of custody	Indicative cost items included in contractor bid: Chemical analysis of hazardous waste Trucks from licensed handler Pre-treatment (if needed) Disposal cost at Nasreya Approximate cost of the above (to be revised upon project execution): 7890-9863 EGP per ton
		– Adequate management of asbestos and any possible hazardous waste	Water Authority + contractor		Field supervision + review of Water Authority manifests	– Contractor costs – LDC management

Receptor	Impact	Mitigation measures	Responsibility		Means of supervision	Estimated Cost of mitigation / supervision
			Mitigation	Supervision		
		_ Minimize fueling, lubricating and any activity onsite that would entail production of hazardous materials empty containers _ Pre-Plan the anticipated amounts of hazardous liquid materials (such as paint, oils, lubricants, fuel) to be used in the various activities in order to minimize leftovers and residuals. _ To the extent practical, seek to combine leftovers or residuals of the same liquid material/waste in order to minimize the number of containers containing hazardous residuals _ Ensure hazardous liquid material/waste containers are always sealed properly and secured from tipping/falling/damage/direct sunlight during transportation and storage _ In case of spillage: o avoid inhalation and sources of ignition o cover and mix with sufficient amounts of sand using PPE o collect contaminated sand in clearly marked secure containers/bags _ Add sand to inventory of hazardous waste	_ LDC _ Excavation Contractor		Field supervision	costs

Receptor	Impact	Mitigation measures	Responsibility		Means of supervision	Estimated Cost of mitigation / supervision
			Mitigation	Supervision		
Local community	**Non-hazardous waste accumulation**	1. Designate adequate areas on-site for temporary storage of backfill and non-hazardous waste 2. Segregate waste streams to the extent possible to facilitate re-use/recycling, if applicable 3. Reuse non-hazardous waste to the extent possible 4. Estimate size of fleet required to transport wastes. **5.** Transfer waste to disposal facility East of the project area **6.** if the sub-surface table is encountered, the trench should be dewatered and discharge the water into a drain or sewer manhole after sampling and analysis before selecting appropriate disposal method,	– LDC – Excavation Contractor	LDC HSE	– Contractual clauses – Monitoring of waste management plan – Field supervision	– Contractor costs – LDC management costs
Local community	**Destruction of streets and pavement**	– Arrange Restoration and re-pavement (رد الشئ لأصله) with local unit – Communication with local community on excavation and restoration schedules.	– LDC	EGAS	Field supervision Coordination with LGU as needed	Included in re-pavement budget agreed by LDC with local units or Roads and Bridges Directorate

Receptor	Impact	Mitigation measures	Responsibility		Means of supervision	Estimated Cost of mitigation / supervision
			Mitigation	Supervision		
Occupational health and safety	**Health and safety**	_ The project will hire a qualified contractor/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 its mitigation measures to be followed during construction. _ Standard protection by placing clear project signs. _ Time management for vehicles movement; especially avoiding the peak hours _ Standard protection for the workers especially working at elevated heights or trench. _ Regular inspection to compelling worker to used their PPE _ Training and licensing industrial vehicle operators of specialized vehicles. _ The contractor also should keep attendance worksheet and laborers ID in order to verify the age of workers _ Health insurance should be applicable to the contractor workers and workers contracted by a sub-contractor _ Full compliance to EGAS and LDC HSE requirements, manuals, and actions as per detailed manuals adopted by EGAS _ Ensure the provision of the appropriate personal protective Equipment and other equipment needed to ensure compliance to HSE manuals	Excavation Contractor	LDC HSE	Field supervision	_ Contractor costs _ LDC management costs

Receptor	Impact	Mitigation measures	Responsibility		Means of supervision	Estimated Cost of mitigation / supervision
			Mitigation	Supervision		
Labor conditions	**Child labor**	• The ToR to be prepared for both contractor and subcontractors will prohibit any kind of hiring child labor in the project. • Rigid obligations and penalties will be added to the contractor ToR in order to warrantee no child labor is occurred in the project • The ToR also will oblige the contractor to keep a copy of IDs of laborers in order to monitor the hired staff below 18 years old • The contractor also will be obliged to maintain daily attendance sheets in order to verify the attendance of workers in case of accidents and provide the injured persons with proper health insurance	LDC Excavation Contractor/ subcontractor	LDC HSE	_ Field supervision and review of HSE report+ Field supervision (audits)	_ Contractor costs LDC management costs

Receptor	Impact	Mitigation measures	Responsibility		Means of supervision	Estimated Cost of mitigation / supervision
			Mitigation	Supervision		
Local communities and businesses	**Lack of accessibility to businesses due to delay in street rehabilitation**	• Access to business due to digging 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 digging main streets in the commercial areas, this can be only done during night after business closing • Ensure transparent information sharing • The telephone numbers of the social development officer responsible for grievances should be shared with the community people	During digging process LDC The sub-contractors	EGAS (SDO) LDC	– Ensure the implementation of GRM – Supervision on Contractors performance	No cost

Receptor	Impact	Mitigation measures	Responsibility		Means of supervision	Estimated Cost of mitigation / supervision
			Mitigation	Supervision		
Local community Health and safety	**Threat to Safety of users and houses (due to limited level of awareness and misconceptions)**	Prepare Citizen engagement and stakeholder plan Awareness raising campaigns should be tailored in cooperation with the community-based organizations. Following are some mitigation procedures to be adopted: _Using caution tapes that help to keep people away of the site, _Informing residents and shopkeepers about the timeline of the project (street by street) in order for the residents to know when to avoid certain streets _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	During the construction LDC	EGAS (SDO) LDC	_ List of awareness activities applied _ Lists of participants _ Documentation with photos _ Awareness reports	_ 40838 EGP per awareness raising campaign _ 40838 for brochure and leaflets to be distributed (material available by EGAS-$ spent)

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% ,opacity, TSP, PM10 and PM 2.5	LDC HSE	Once before construction + once every six months for each vehicle	Construction site	Measurements and reporting of dust and 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	weekly during site inspections	Construction site (residential area or near sensitive receptors such as hospitals)	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

Receptor	Impact	Monitoring indicators	Responsibility of monitoring	Frequency of monitoring	Location of monitoring	Methods of monitoring	Estimated Cost of monitoring
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.	Construction site	Documentation in HSE monthly reports	LDC management costs
		Observation of water accumulations resulting from dewatering (if encountered)	LDC HSE	During construction. Monthly reports	Around construction site	HSE monthly reports	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	Damaging to the streets	– Streets quality after finishing digging – Number of complaints due to street damage	LDC, EGAS	Four times per year, each three months	Site and Desk work	Checklists and complaints log	No cost
	Threat to Safety of users and houses (due to limited level of awareness and misconceptions)	– Observation of water accumulations resulting from dewatering (if encountered)	LDC, EGAS	Quarterly monitoring	Office	Reports Photos Lists of participants	LDC management costs

Receptor	Impact	Monitoring indicators	Responsibility of monitoring	Frequency of monitoring	Location of monitoring	Methods of monitoring	Estimated Cost of monitoring
Labor conditions	Occupational Health and Safety	Total number of complaints raised by workers 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

7.5 Mitigation Measures During Operation Phase

7.5.1 Hotline

As mentioned previously, odorant is added to odorless natural gas to facilitate leakage detection by smell/odor. a 24-7 Hotline (**129**) is available for customers and the public to report leaks, damage, emergencies, and/or incidents related to gas connections, components, infrastructure, and activities (inside or outside households) and to request repairs/emergency response/assistance **as per presented in Annex 6**.(Emergency response plan)

Figure 7-3: Town Gas emergency vehicle

7.5.2 Community health and safety

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

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

7.5.3 Management of network integrity

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

7.5.4 Emergency Response

In case of emergencies, the proper action will be taken according to Town Gas Emergency Response Procedure. The procedure includes the key personnel responsibilities and communication methods, as well as the emergency classes. Reports will be prepared after the necessary actions are taken to document the cause of the emergency and the remedial actions taken **as per presented in Annex 6**.

7.5.5 Management of financial disturbance

Residential gas connection installation costs are around 15590 EGP. Customers pay 2160 EGP of that cost in cash. The balance is subsidized by the government of Egypt. The 2160 EGP can be made either upfront or in installments over a period of time. Typically, households opt for flexible monthly payment plans facilitated by the LDCs and local banks. 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 4.2.13). This initiative has been approved and is currently being applied to all project areas.

7.6 Environmental and Social Management Matrix during OPERATION

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

Receptor	Impact	Mitigation measures	Residual impact	Institutional Responsibility for Implementation		Means of supervision	Estimated Cost of mitigation / supervision
				Mitigation	Supervision		
Integrity of natural gas piping	**Network integrity**	_ Detailed review of the geotechnical 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 affected area _ Repair or replacement of failed component	Minor	LDC	LDC HSE.	- Map and local geotechnical report review - Site inspections - Awareness actions - Periodical drills	LDC management costs

Receptor	Impact	Mitigation measures	Residual impact	Institutional Responsibility for Implementation		Means of supervision	Estimated Cost of mitigation / supervision
				Mitigation	Supervision		
Economically disadvantaged Community members	**Financial burden on economically disadvantaged due to the installments**	- Petrotrade Co. 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	Petrotrade (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
Community health and safety	**Possibility of Gas leakage**	- Information should be provided to people in order to be fully aware about safety procedures - The hotline should be operating appropriately - People should be informed of the Emergency Numbers - People should be also informed about GRM telephone numbers The Egyptian Emergency Response Procedure. In addition, reference to the ERP is made in different sections of the report	Minor	LDC	LDC	Complaints raised due to Gas leakage	LDC management costs

Receptor	Impact	Mitigation measures	Residual impact	Institutional Responsibility for Implementation		Means of supervision	Estimated Cost of mitigation / supervision
				Mitigation	Supervision		
Labor conditions	**Occupational Health and Safety**	- Total number of complaints raised by workers - Periodic Health report - Periodic safety inspection report	Irrelevant	LDC HSE	LDC	-Safety supervisor should follow commitment of workers to use protective equipment -Inspection and recording of the performance -Reports about the workers and complaints	LDC management costs

7.7 Environmental and Social Monitoring Matrix during OPERATION

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

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

7.8 Reporting of Mitigation and Monitoring Activities

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

During construction, phase monthly reports should include as a minimum:

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

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

7.9 Institutional Framework for ESM&MP Implementation

7.9.1 Environmental Management Structures

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

7.9.2 Required Actions

- Involvement of environmental and social officers during the design, costing, tendering, and construction phases would be advantageous.
- Detailed HSE manuals covering each activity must be developed and institutionalized in Town Gas Several versions of such manuals have been developed by Town Gas and should be mainstreamed to other LDCs, accompanied by the appropriate capacity building.
- An updated and detailed assessment of Town Gas EHS institutional capacity and available resources for implementation of the ESMP

Specifically, Town 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.
Stakeholder Engagement and Public Consultation

8. Stakeholder Engagement and Public Consultation

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

- Consultation activities (including site visits) were conducted on February 2017
- Public consultation session was conducted on 30 April 2017 in Giza city

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,
  - Directive and Procedure on Access to Information
  - World Bank Operational Policy (OP 4.01)
- Egyptian regulations related to the public consultation
  - Environmental law No 4/1994 modified by Law 9/2009 and 105/2015 and its executive regulation until the last amendment by ministerial decrees no. 1963/2017
- While WB safeguards and regulations state that a minimum of two large-scale, well-publicized public consultation sessions are a must for projects classified as category "A" projects like the one at hand, additional consultation efforts (for example through focus group discussions, in-depth meetings, and interviews) were implemented to reach the most affected 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.
- **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 March 2014
  - **Phase II:** The site-specific studies in 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
- Local community representatives
- Governmental Organizations and Authorities
- NGOs
- Educational institutions and universities
- Health departments
- Environmental administrations
- Formal and informal LPG distributors.
- In addition to, Town Gas company.

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;
- Communicating and implementing a viable community feedback mechanism.

The consultation outcomes will be used in:

- Define potential project stakeholders and suggest their possible project roles
- 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 ESMP 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 7 & 8.**

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 in 30 April 2017 in Giza governorate.

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 March 2014
   - Phase II: The site-specific studies in 2016
   - Phase III: The consultation activities in April 2017
3- The study team divided the various engagement activities of the project to:
   - Scoping phase,
   - Data collection phase,
   - Consultation activities and final public consultation.
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 Field Consultation Activities in Giza Governorate

participants	Location	Number of participants (Male)	Number of participants (Female)	Methods	Date
Potential beneficiaries	Jazirat Mohamed	3	2	FGD In depth	February 2017
	El-Kom El-Ahmar	2	1		
	Tanash	3	2		
	Suqayl	2	2		
	Ausim	3	1		
	Saft Al-Laban	4	3		
	Hadayek El-Ahram	2	1		
	Al-Munib	3	2		
	Nazlet El-Semman and Kafr El-Gabal	5	3		
LPG vendors	Jazirat Mohamed	2	-	Structured questionnaire	February 2017
	El-Kom El-Ahmar	1	-		
	Tanash	2	-		
	Suqayl	1	-		
	Ausim	2	-		
	Saft Al-Laban	3	-		
	Hadayek El-Ahram	2	-		
	Al-Munib	2	-		
	Nazlet El-Semman and Kafr El-Gabal	3	-		
Governmental and NGOs	Jazirat Mohamed	2	1	In depth	February 2017
	El-Kom El-Ahmar	3	4		
	Tanash	2	2		
	Suqayl	3	2		
	Ausim	2	1		
	Saft Al-Laban	5	4		
	Hadayek El-Ahram	2	2		
	Al-Munib	2	4		
	Nazlet El-Semman and Kafr El-Gabal	3	2		
Community people	Jazirat Mohamed	3	2	FGD Structured questionnaire	February 2017
	El-Kom El-Ahmar	4	1		
	Tanash	2	1		
	Suqayl	4	2		
	Ausim	2	1		
	Saft Al-Laban	2	3		
	Hadayek El-Ahram	2	1		
	Al-Munib	3	1		
	Nazlet El-Semman and Kafr El-Gabal	2	1		
TOTAL		93	52		
Representatives from Town Gas		4	-	in–depth	February 2017
TOTAL		97	52		

8.5 Consultation processes

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

- Phase I: Preparation of the framework study 2014
- Phase II: Consultation activities and Final public consultation 2017

The results of the phases will be presented as follows:

Summary of phase I: Preparation of the framework study 2014 (see Annex 7)

The consultation session was conducted on December 2013

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

Summary of Phase II: Final public consultation 2017 (see Annex 8)

- The Consultation session was conducted in Giza governorate on 30 April 2017
  - Consultants (Petrosafe environmental and social) attended meeting
  - Representatives of EGAS and Town Gas
  - Representatives of EEAA accompanied the teams
  - Administrative managers
  - Media related expert was recruited to invite media people
  - Community people
- Key comments and concerns raised during the Final Public Consultations

Table 8-2: Consultation session 2017

Subject	Questions and comments	Responses	Addressed in the ESMP study
NG coverage	**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, 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**	**within Section 2.3.1**
LPG problems	The community appreciate having the NG project as the LPG cause many problems: -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 ambitious plan to connect the NG to 2.4 million households. This will solve LPG problems.	**within Section 4.2.11**
Coordination	**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.**	**See Section 7.2 Environmental and Social Management Matrix During Construction**
Street restoration	**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**	**See Section 7.2 Environmental and Social Management Matrix During Construction**
NG benefits	Members of the community acknowledged the importance of NG and the benefits of having NG connection to their households.	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 It will save electricity that is used in electricity heater and reduce the cost of electricity bill	**within Section 4.2.12**

Subject	Questions and comments	Responses	Addressed in the ESMP study
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 2160 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 through a deal with some banks.	See section 4.2.14 Willingness and affordability to pay
Role of NGOs	NGOs can pay for the installation of the NG to poor households. Alternatively, they can pay the advance payment. Thereafter, the poor people can pay few amounts of money as installment	This will be from the recommendations, but the project will be not obligated to achieve that	within Section 7
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	within Section 4.2.13
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 less safe in houses	See The potential adverse impacts during the operation phase within Section 5.3.2.3 (Economic disturbance)
Information desk	· It is recommended to have an information desk to 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 · Information provided should be in a simple form	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 Annex
Role of community people	Community people can mobilize each other to install the NG. Additionally, they can provide guidance to the illiterate groups	The study recommended the participation of the community people in sharing information about NG project with the other people especially the illiterate groups Awareness raising campaigns should be tailored in cooperation with the community- based organizations	See Section 7.2 Environmental and Social Management Matrix During Construction
Safety Measures in	Safety measures in cases of natural disasters	High pressure pipeline : The ESMP study scope not	See Section 2.2 Project Work

Subject	Questions and comments	Responses	Addressed in the ESMP study
case of natural disasters	(earthquakes) especially there is a risk of the high pressure and intermediate pressure pipelines	include PRS or HP pipeline . intermediate and low-Pressure network: intermediate and low-Pressure network pipelines are made from polyethylene which is a shrinkable material and all risers outside the houses ended with a flexible joint	packages
community health and safety	workers carrying out the installation within the household and maintenance works should be aware of and able to communicate the safe use of NG and procedures in case of emergency; in an appropriate manner that suits the culture of the customers	All LDC workers are well trained to inform all customers regarding the safe use of NG and procedures in case of emergency, in addition to safety and emergency precautions taken by EGAS and the implementing entities (Local Distribution Companies: Town Gas), user safety is prioritized by stating emergency precautions on the household gas meter and by setting up emergency response centers	See Section 5.3.2.1 Community Health and Safety

Figure 8-1: Site visit consultation in Giza – February 2017

Figure 8-2: Public consultation in Giza – 30th of April 2017

8.6 Summary of consultation outcomes

The consultation outcomes revealed that:

- 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.
- 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)
- 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
- 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. For poor people, the study recommended that NGOs can act as communication channels with 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 4.2.13). This initiative has been approved and is currently being applied to all project areas. 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 clearance from the World Bank and approval from EEAA, a final report, in English and Arabic, will be published on the WB, EGAS and Town 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 ESMP and the website link for the full ESMP study